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The Illinois Native Plant Society is dedicated to the preservation, conservation, and study of the native plants and vegetation of Illinois.

ERIGENIA is named for *Erigenia bulbosa* (Michx.) Nutt. (harbinger of spring), one of our earliest blooming woodland plants. The first issue was published in August 1982.

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COVER ILLUSTRATION

Original drawing by Mark Mohlenbrock of five examples of our Illinois flora: *Camassia scilloides* (Raf.) Cory, *Carex pensylvanica* Lam., *Dodecatheon meadia* L., *Quercus macrocarpa* Michx., and *Tradescantia virginiana* L.

It is dedicated to Mark's father, Dr. Robert H. Mohlenbrock, who has devoted his career to the study of our state's flora.

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FLORISTIC QUALITY ASSESSMENT FOR VEGETATION IN ILLINOIS A METHOD FOR ASSESSING VEGETATION INTEGRITY

John B. Taft[1], Gerould S. Wilhelm[2], Douglas M. Ladd[3], and Linda A. Masters[2]

ABSTRACT: Floristic Quality Assessment (FQA) is proposed as a method to assess floristic integrity in Illinois. For the application of FQA, each taxon in the Illinois vascular flora was assigned an integer from 0 to 10 termed a coefficient of conservatism (C). Two basic ecological tenets that the coefficients represent are that plant species differ in their tolerance to disturbance and disturbance types, and that plant species display varying degrees of fidelity to habitat integrity.

With these principles as a guide, the coefficient applied to each taxon represents a rank based on observed behavior and patterns of occurrence in Illinois plant communities and our confidence that a taxon is remnant (natural area) dependent. Species given a C value of 0–1 are taxa adapted to severe disturbances, particularly anthropogenic disturbances, occurring so frequently that often only brief periods are available for growth and reproduction. Species ranked with a C value of 2–3 are associated with somewhat more stable, though degraded, environments. Those species with coefficients 4–6 include many dominant or matrix species for several habitats; they have a high consistency of occurrence within given community types. Species with C values 7–8 are taxa we associate mostly with natural areas, but that can be found persisting where the habitat has been degraded somewhat. Those species with coefficients 9–10 are considered to be restricted to high-quality natural areas.

A floristic quality index (FQI) and a mean coefficient of conservatism ($\bar{C}$) are two of the values derived from floristic inventory data. Other derived parameters include species richness, relative importance, percent of taxa that are native and adventive, number of rare species, and guild diversity (including wetness and conservatism ranks, and physiognomic classes). We suggest that FQA is a promising tool that can be used to discriminate natural quality of vegetation on the Illinois landscape and to make time-series comparisons in ecological studies. We suggest the use of certain parametric and nonparametric statistical tests, such as analysis of variance, mean-separation techniques, and goodness-of-fit tests, that can aid in distinguishing nonrandom differences in floristic quality.

INTRODUCTION

Patterns of vegetation are reliable indicators of several biotic and abiotic factors. Biotic interactions among species and abiotic factors (including edaphic and climatic characteristics) influence plant assemblages in many complex ways that lead to the expression of differences at the species, community, and ecosystem levels. Overlying these influences is disturbance history. Disturbances differ in frequency, intensity, and duration. Infrequent disturbances of low intensity and short duration can have relatively negligible impacts on the integrity of a plant community. However, as frequency, intensity, and/or duration increase, damage and ultimately degradation can occur, resulting in predictable changes in plant community characteristics, particularly composition. Differentiating vegetation on the basis of level of degradation is an important step in attempting to conserve biodiversity. For example, preserve selection and design (size and shape) of areas often are influenced by qualitative differences in vegetation. This paper describes a method for discerning floristic integrity in Illinois.

Floristic Quality Assessment (FQA) is a method that uses a floristic quality index (FQI), introduced by Wilhelm (1977) and Swink and Wilhelm (1979, 1994), and modified here for the Illinois vascular flora. FQA integrates FQI with other vegetation parameters. These include mean coefficient of conservatism, species richness, percent native and adventive species, guild diversity for various physiognomic and conservatism classes, number of threatened and endangered species, and type of natural community and grades following the classification and grading criteria established by the Illinois Natural Areas Inventory (White 1978). FQA can be used to make spatial as well as time-series comparisons, and in this way FQA can be effective in tracking vegetational changes in restoration,

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reconstruction, or control situations, and in evaluating parameters across environmental and disturbance gradients. Species abundance measures also can be included in FQA evaluations. In this paper we discuss key terminology, describe the method of FQA for the Illinois vascular flora, offer suggested applications and statistical analyses, and urge experimental tests of hypotheses related to floristic quality. We caution that any vegetative assessment based on a single index is likely to be insufficient to account for all possible relevant aspects. As an introduction, a short history of habitat assessment methods, particularly those used in Illinois, is given. Selected issues in plant-community ecology are included as background information.

Background on Assessment Methods for Natural Areas

Methods for making qualitative assessments of biological communities have had expanding roles in the conservation of lands and habitats as development pressures increase. An Index of Biological Integrity has been developed based on characteristics of fish community composition (Karr et al. 1986) and for ant populations (Majer and Beeston 1996). Migratory bird species have been ranked according to perceived prioritization of habitat and species conservation goals (Hunter et al. 1993). There is a recognized need for simple, sensitive, readily interpretable, and ecologically meaningful methods of classifying vegetation according to levels of ecological integrity (Keddy et al. 1993), particularly for use by the nonspecialist (Grime 1974). In addition, a rapid method of assessment often is needed, particularly when evaluating large portions of a landscape (e.g., proposed highway-construction corridors that cross numerous remnants of native vegetation and natural community types). Ordination techniques can be used effectively to examine relationships among vegetation (and abiotic) sample data. However, these indirect measures are not particularly rapid and are value-neutral, limiting their application for making qualitative assessments of biotic communities, particularly in the heterogeneous landscape.

Two developments have been key in the identification and protection of natural areas in Illinois. First, in 1963, the Illinois Nature Preserves Commission was formed to administer the development of a system of nature preserves as representative examples of the natural history of the state. Second, during the mid 1970s, the Illinois Natural Areas Inventory (INAI) was an effort to conduct a comprehensive county-by-county inventory of natural areas (White 1978). A method for assessing habitat qualities was developed for the INAI, to aid in the identification of significant remnants of natural communities. Several site characteristics were integrated in the natural community grading method, including aspects of vegetation such as perceived successional stage, evidence of disturbance, and presence and relative-abundance patterns for species characteristic of particular habitats and levels of disturbance. The INAI used a discontinuous, determinant grading scale, where habitat remnants received a grade of A, B, C, D, or E (defined under Illinois Natural Areas Inventory Grades in the glossary) in accordance with increasing degrees of disturbance reflected in the community characteristics (White 1978). Herein, reference to INAI natural areas will be made with capital letters (Natural Area).

Independent of the INAI was the development of a method of natural area identification using a continuous, indeterminate scale called a Natural Area Rating Index (NARI) based on floristic composition (Wilhelm 1977, Swink and Wilhelm 1979, Wilhelm and Ladd 1988). The NARI was developed as an aid in discriminating natural quality of vegetation among open lands in the Chicago region and is based on an index derived from the composition of vascular plants at a site. Because vegetation spans the entire disturbance gradient from an urban lot or cropland to relatively "pristine" habitats, a continuous scale offers some refinement to qualitative distinctions of floristic characteristics. This characteristic in particular made the Natural Area Rating Index a valuable tool for identifying degraded remnants of native vegetation having recovery potential, given appropriate management.

Principal criticisms of the method have included the following: 1) the coefficient range chosen, which began with −3 for the most invasive adventive species and increased by intervals of 1 to a coefficient of 10 (coefficients of 15 and 20 were used for very rare species), 2) a lack of consideration for species abundance, and 3) the subjective nature of coefficients assigned to each taxon and differences in interpretation of them. Refinements of the method led to a revised scale of coefficients that ranged from 0 to 10; all adventive species were assigned an asterisk with a numerical value of 0. For clarity the method was renamed Floristic Quality Assessment (Swink and Wilhelm 1994).

Abundance measures for species, as described later in this paper, are readily accommodated in FQA and should be included in any assessment of vegetation when possible. It is important to acknowledge that natural quality assessments are subject to bias and require more or less subjective judgements at the current state of community ecological science (Crovello 1970). The FQA method, though subjective, permits dispassionate and repeatable application because its value judgements are predetermined. Assessment methods based on FQA have been developed in Ohio (Andreas and Lichvar 1995), Michigan (Herman et al. 1996), Missouri (Ladd 1993), and southern Ontario (Oldham et al. 1995), and elaborated on by Masters (1997).

In addition to investigating the current composition and structure of the vegetation, any assessment of vegetation quality should also give attention to degradation factors at the landscape, ecosystem, and community levels, and the historic (presettlement) and contemporary natural disturbance regimes.

Principles of Plant Community Ecology Relative to Floristic Quality Assessment

Plants can be classified into groupings based on a variety of species characteristics such as physiognomy, phenology, and ecophysiology, and habitat characteristics such as soil type, light, moisture, and disturbance regimes. In heavily developed landscapes such as Illinois, and similarly in Great Britain, contemporary anthropogenic disturbances to vegetation are often the predominant influences on composition (Hodgson 1986), and thus are dominant among assembly and response rules for communities (*sensu* Keddy 1992). Species sort selectively into this disturbance matrix; the opportunistic species become more common as the landscape becomes more unstable. The coefficients of conservatism used in FQA are an attempt to categorize species according to their response to levels of habitat degradation.

Three general topics in plant community ecology—disturbance ecology, the maintenance of diversity, and successional theory—are particularly relevant to the concept of floristic quality because they provide a framework for understanding patterns and trends, particularly at the population and community levels. Disturbance is a general term referring to any perturbation. Plant communities can be *damaged* when severely disturbed and are *degraded* when recovery to its native biological diversity (original condition) is unlikely under normal circumstances. Degraded lands have lost some aspects of ecosystem structure such as species composition. Degraded lands are termed *derelict* when land use becomes very limited (Brown and Lugo 1994). They can be further distinguished as those that can be *restored* to nearly original condition through some management effort, *rehabilitated* to a condition somewhat similar to the original but where compositional differences remain (Lovejoy 1975) or, at best, *reclaimed* to a limited degree in severe cases such as strip mining.

Many midwestern plant communities were formed and historically maintained with landscape-scale processes that include disturbances such as periodic fire, as well as grazing or browsing impacts by large herbivores (Anderson 1983, 1990). Additional considerations in regard to disturbance regimes are addressed under Ecological Integrity in the methods section and in the discussion of succession below.

Different survival strategies have evolved among organisms for coping with disturbances. Among the hypotheses of mechanisms to account for these strategies are MacArthur and Wilson's (1967) r- and K-selected species, Grubb's (1977) regeneration niche, and Grime's regenerative flexibility for ecological amplitude (Grime 1974, Grime et al. 1988). For the latter, species survival strategies are considered to be shaped by an equilibrium among the ecological forces of competition, stress, and disturbance. These forces serve as axes for ordinating species' responses in Grime's "triangles." These ordinations yield three general life strategies referred to as the C-S-R model: competitors, stress tolerators, and ruderals.

Whittaker (1965) recognized that plant communities could be described by three basic dominance-diversity curves that differ in the cumulative proportion of importance of species. Species-poor communities are strongly dominated by a few taxa; in communities with high species richness, no species is strongly dominant. Many communities are intermediate, composed of a few taxa with high relative abundance and many intermediate and rare species. Several studies suggest that intermediate levels of available resources (nutrients and physical factors) support the greatest diversity (Tilman 1986, Ashton 1989, Tilman and Pacala 1993). Intermediate levels of disturbance also appear important in the maintenance of diversity in many communities (Connell 1978, Tester 1989), although the maintenance of peak levels of plant species diversity in some particularly fire-dependent systems appears to require frequent perturbations (Walker and Peet 1983).

The groupings described above are useful in that they attempt to provide both order to species assemblages and predictability regarding the rate and direction of changes in response to such things as human-influenced disruptions. In all of the models, spatial and temporal heterogeneity within and among habitats is a critical factor in the maintenance of species diversity at the community level of organization or higher.

Succession is a frequently used term for the description of vegetational change through time. Clements (1936) argued that succession was an orderly and predictable process leading to a "climax" community, depending on climate and other factors. Typically, primary succession is initiated on exposed parent materials, while secondary succession involves changes in vegetational characteristics following events such as abandonment of cropland, clear-cutting of forests, or drainage of wetlands. However, climax is an ambiguous term (Crawley 1986) and appears to have little practical meaning if considered without regard to regional disturbance regimes or historical antecedents. In landscapes such as those in the Midwest, the development of many native plant communities was dependent on anthropogenic fires, the practice of which dates back to the postglacial era. In such circumstances the cessation of fire could be regarded as a "disturbance."

Indiscriminate use of the term succession may obfuscate the fact that certain plant communities require periodic perturbations such as fire for the maintenance of structural characteristics and compositional diversity. If unidirectional successional trends in these communities were among our conservation goals, we would not be concerned with vegetational changes such as those from prairie communities to forest-like assemblages or from biodiverse oak-dominated woodlands to maple-dominated forest. Such changes, however, often result in a loss of species richness (Wilhelm 1991, Taft et al. 1995), particularly in our highly fragmented landscape, where species immigration, needed to compensate for local extirpations of species, is seriously challenged.

The term succession, when used for changes in vegetation following severe anthropogenic disturbances, may be misleading. Without detailed experimental studies of various disturbance factors on different vegetation types, we do not know how extensively vegetation "succeeds" or recovers to a more stable condition. Without knowledge of the immigration potential for replacement species, we have no way to predict accurately the composition or structure of subsequent communities. Consequently, the assumptions of directional trends in secondary succession leading toward the original (presettlement) plant community may have lost relevance where the landscape is highly fragmented. Using terminology from disturbance ecology (e.g., degraded, derelict) when describing the natural condition of a site may be clearer than speculations about successional phases (e.g., early successional, late successional) of disturbed vegetation. Apparently, many degraded sites persist in states of perpetual botanical purgatory (Taft 1996).

METHODS

In Floristic Quality Assessment (FQA), floristic inventory data are used to calculate several parameters of vegetation. These include the following measures, each defined and described in greater detail in subsequent sections: 1) species richness, 2) floristic quality index (FQI), 3) mean coefficient of conservatism ($\bar{C}$), 4) guild diversity (frequency distribution among physiognomic and conservatism classes), 5) species relative importance, 6) number and percent rare and adventive species, and 7) wetness characteristics. These data are presented in a summary table. The FQI and $\bar{C}$ are derived from coefficients of conservatism assigned to each taxon in the Illinois vascular flora. Important terms related to FQA are defined in the glossary; key concepts and terminology underlying the general philosophy of FQA are discussed below. Recommendations for applying and analyzing selected FQA results are included. We undertake this effort with the knowledge that contending with the entire flora of Illinois overextends our collective experience to some extent. The judgments presented here are based primarily on our cumulative total of over 60 years of botanical and ecological field study throughout Illinois and the Midwest.

Botanical nomenclature in the text and appendix approximates Mohlenbrock (1986). Many hybrids and certain subspecific taxa such as *forma* are not included; some varieties were omitted when we perceived them not to vary ecologically from the typical variety. Recently recorded species for Illinois are also included. The listing of species in Appendix I is not to be interpreted as a definitive flora of Illinois; it is intended solely to be reference database for applications of Floristic Quality Assessment.

The list in Appendix I comprises 2,091 native taxa and 955 non-native taxa, for a total of 3,046 taxa, compared with Mohlenbrock's (1986) total of 3,203 taxa, which included 101 hybrids. It is beyond the scope of this paper to list currently accepted nomenclatural synonomy for each taxon; such a list soon would be out of date. Unfortunately, scientific names of plants in North America are in a state of flux, with often conflicting nomenclatural treatments (Little 1979, Kartesz and Kartesz 1980, Soil Conservation Service 1982, Gunn et al. 1992, Morin 1993, and Kartesz 1994). Only a single common name for each taxon is offered, despite the fact that many taxa are known by a variety of colloquial names. An attempt was made to use common names with the widest appeal; they are taken mostly from Mohlenbrock (1986), Swink and Wilhelm (1994), and Robertson (1994).

Physiognomic designations are subject to interpretation. Terms such as annual, biennial, perennial, shrub, and tree sometimes imperfectly depict the habit of plants, but for the purposes of guild formation in FQA analysis, such designations can be useful in describing structural differences or changes.

Terminology and Concepts

<u>Coefficient of Conservatism.</u> For the application of FQA, each taxon in the Illinois vascular flora was assigned an integer from 0 to 10, termed a coefficient of conservatism (C). The coefficients represent two basic ecological tenets: plants differ in their tolerance to disturbance type, frequency, and amplitude, and plants display varying degrees of fidelity to habitat integrity. With these principles as a guide, the C value applied to each taxon represents a relative rank based on observed behavior and patterns of occurrence in Illinois plant communities and our confidence that a taxon is remnant (natural area) dependent. The authors reached consensus on these coefficients through committee effort and, in some cases, with consultation from reviewers of the manuscript. For certain taxa we supplemented our field experience by examining range maps (Mohlenbrock and Ladd 1978) and reviewing comments regarding habitats in several floras (Deam 1940, Gleason 1952, Steyermark 1963, Sheviak 1974, Mohlenbrock 1986, Swink and Wilhelm 1994). The native species most successful in badly damaged habitats were given C values of 0. At the other end of the spectrum, species virtually restricted to natural areas in Illinois received C values of 10. All 957 non-native species were assigned asterisks (*) and are treated as 0s in the calculations for site indices (FQI and $\bar{C}$). These calculations are further discussed in comments under Floristic Quality Index below and in the glossary. Species native to Illinois, but also occurring escaped from cultivation (e.g., *Pinus* spp.), should be ranked as non-native species when found in such situations.

With these criteria for designating coefficients, our approach was somewhat different from past efforts. For example, we are not intending to estimate the degree to which a species is restricted to a certain habitat, or to gauge its modality according to Curtis (1959). Many relatively conservative taxa (e.g., *Amorpha canescens, Baptisia leucophaea, Cypripedium candidum, Drosera rotundifolia, Gaylussacia baccata, Osmunda cinnamomea, Ceanothus americanus,* and *Viola pedata*) occur regularly in more than one plant community, as defined by White and Madany (1978). In addition, we were not attempting to estimate rarity, although some circularity of reasoning was unavoidable when evaluating very rare taxa known only from a few natural areas.

Reasons for rarity in the Illinois flora are many (Taft 1995) and include several recognized by Rabinowitz (1981). Scale of inference influences what is considered a rare species. Many species that are rare within the political boundaries of Illinois are abundant elsewhere. Many conservative taxa are not at risk of extirpation from the state, but are regionally quite rare because of habitat loss and degradation. Commonness and rarity of plant species in England have been considered in terms of ecological, taxonomic, and evolutionary processes within a landscape characterized by tremendous habitat loss and degradation (Hodgson 1986). Although common and rare species at local scales may be strongly correlated to measurable traits, there is so much variability in ecological, taxonomic, and evolutionary characteristics of species at the statewide scale (Schwartz 1993) that these groupings do not address consistently our criteria for conservatism. Although rarity is not a criterion for assignment of C values, it forms a part of the matrix of parameters in FQA.

The coefficients, in part, can be considered in terms of Grime's (1974) survival strategies. Species given a C value of 0–1 correspond to Grime's ruderal species and those with a C value of 2–3 correspond to ruderal-competitive species. This broad, combined species guild includes taxa adapted to frequent and severe disturbances, including anthropogenic disturbances that often result in only brief opportunities for reproduction. Under such a disturbance regime, only species capable of maintaining populations under such conditions are present, including those that rapidly grow, flower, and produce fruits (e.g., *Ambrosia trifida, Amaranthus rudis, Cassia fasciculata, Conyza canadensis, Erigeron annuus, Impatiens capensis, Lactuca canadensis, Lepidium virginicum, Oxalis stricta, Parietaria pensylvanica,* and *Vulpia octoflora*). Many are capable of persisting in seed banks, and some have wind-dispersed seeds—two strategies that allow species to sort into suitable, newly disturbed habitats. Some longer-lived species capable of persisting with frequent disturbances such as siltation, flooding, and grazing are also included in this group (e.g., *Acer saccharinum, Crataegus pruinosa, Gleditsia triacanthos, Populus deltoides, Ribes missouriense, Rubus occidentalis,* and *Symphoricarpos orbiculatus*). These taxa constitute approximately 17% of our native flora. In conjunction with many of the adventive elements, these species now dominate the contemporary Illinois landscape.

Species assigned coefficients 4–6 correspond roughly to Grime's competitors. These include many dominant or matrix species for several habitats (e.g., *Andropogon gerardii, Carex artitecta, C. pensylvanica, C. stricta, Carya ovata, Panicum virgatum, Quercus alba, Schizachyrium scoparium,* and *Sorghastrum nutans*) and species that are often expected, or have high consistency, in a given community type (e.g., *Aesculus glabra, Arisaema triphyllum, Delphinium tricorne, Phlox divaricata, Silphium integrifolium, Smilacina racemosa, Thalictrum dioicum, Trillium recurvatum,* and *Zizia aurea*). Many can persist with light to moderate disturbances for intermediate periods, but may decline with an increase in intensity, frequency, or duration of disturbance. Some species that are range restricted, such as *Boltonia decurrens,* which is listed as a threatened species by the U.S. Fish and Wildlife Service (USFWS 1988) and the Illinois Endangered Species Protection Board (Herkert 1991), and other species that are rare in Illinois such as *Scirpus paludosus,* and *Tradescantia bracteata,* are included in the 4–6 category. In the contemporary Illinois landscape these species demonstrate considerable tolerance to disturbance and even habitat degradation, but usually not to the extent characteristic of the ruderal-competitor species guild.

On occasion, during the coefficient assessment phase of this project, we needed to evaluate taxa that demonstrate regional behavioral differences in Illinois, such as *Asclepias tuberosa* and *Oxalis violacea*. These species are occasional to common in degraded habitats in far southern Illinois, but in central and northern Illinois they are more restricted to remnant areas. In these instances, we assigned an intermediate value such as 5.

The species having C values of 7–10 are less clearly aligned with Grime's model. Grime et al. (1988) defined the third guild, stress tolerators, to include species that persist where plant productivity is continuously limited by the environment. A more specific definition of Grime's stress tolerators, offered in an editorial by Duffey (1986), includes "species that are slow-growing, long-lived and often rather immobile plants of infertile habitats or late-successional vegetation." Our criteria for species ranked with coefficients 7–10 allow the inclusion of species that may tolerate stress, but through a variety of mechanisms. More germane to qualitative floristic assessments, these taxa do not tolerate much habitat degradation. Consequently, this guild includes some annuals and biennials (e.g., *Agalinis gattingeri, Draba cuneifolia, Hottonia inflata, Iresine rhizomatosa, Lechea intermedia, Oenothera linifolia, Polygala incarnata,* and *Utricularia minor*). However, like Grime's stress tolerators, most taxa in this guild are long-lived perennials (e.g., *Asclepias meadii, A. viridiflora, Carex disperma, C. pedunculata, C. prasina, Clitoria mariana, Cystopteris bulbifera, Gymnocarpium dryopteris, Lilium philadelphicum, Mentzelia oligosperma, Sedum telephioides, S. ternatum,* and *Talinum parviflorum, Woodsia ilvensis*). The species ranked with coefficients 7–8 include taxa we associate mostly with natural areas but which can be found persisting where the habitat has been degraded somewhat (e.g., *Actaea pachypoda, Caulophyllum thalictroides, Ceanothus americanus, Lysimachia quadriflora, Peltandra virginica, Phlox pilosa, Spigelia marilandica,* and *Viburnum rufidulum*). Like the matrix species (C values of 4–6), if the disturbance resulting in degradation increases in frequency, intensity, or duration, these taxa are expected to undergo reduction in population sizes and eventually be prone to local extirpation. Species with coefficients 9–10 are considered to be restricted to relatively intact natural areas.

Though there is some commonality between the C-S-R model (Grime et al. 1988) and the concept of conservatism, we lack the experimental autecological evidence to ordinate species into Grime's triangles. Further, species assigned C values of 7–10 do not fit consistently into Grime's C-S-R model, unless the stress-tolerator guild is more broadly defined to include species found primarily in semistable habitat remnants (sometimes referred to as "late-successional" communities).

Unfortunately, taxa included among each major cohort of coefficients (0–3, 4–6, 7–10) span a range that is too broad taxonomically, ecologically, and physiognomically for any objective natural sorting to serve as a guide to species rankings that meet our guiding principles for the coefficients of conservatism (see above). For that reason, we based our judgments for the assignments of the coefficients on the observed behavior of individual elements of the flora within the context of their Illinois ranges. Applying our judgments was necessary since it is likely we will never have sufficient experimental data to make predictions about floristic quality and ecological integrity for the diversity of habitats, species, and disturbance regimes in Illinois using more ostensibly "objective" methods. Furthermore, rapid and repeatable techniques for evaluating the integrity of plant communities are needed now, particularly when assessing complex patterns of vegetation in large sections of the landscape.

<u>Ecological and Community Integrity.</u> There are both functional and structural aspects of ecosystems. Ecosystem function involves the flow of energy and matter, while structure is characterized by biotic interactions, composition, and form. Ecological or community integrity can be viewed as the degree to which self-correcting properties are exhibited when an ecosystem is exposed to disturbance (Regier 1993). Natural disturbances are perturbations that occur routinely in a system and to which the component taxa have tolerance or adaptations. They can occur at many different scales. Tree falls and gopher mounds are examples of small-scale perturbations. Fire is an example of a large-scale natural disturbance in many Midwestern plant communities, and fire frequency and timing are important determining factors for many community characteristics. Fire absence can result in dramatic changes in community structural characteristics (Taft 1997). Perturbations that exceed the intensity, frequency, or duration of the natural disturbance regime can result in loss of species that lack tolerance or adaptations to the new levels. When certain species, or assemblages of taxa, are extirpated from a community, the system's capability for restoration is diminished, and integrity is lowered.

Integrity can be lowered not only by the loss of species and the diminishment of abiotic processes and certain aboriginal practices, but also from the invasion of adventive taxa. Adventive taxa in a system may sort into disturbance or habitat niches, replace many native taxa over time, and interfere with rates of recovery processes (Cohen et al. 1995).

Measuring ecological integrity based on ecosystem function alone may not provide the resolution needed to detect important changes. For example, biomass and productivity may not change dramatically in a palustrine wetland impacted by siltation or altered flooding regimes where only a few tolerant taxa persist (e.g., *Typha* spp. and *Phalaris arundinacea*). However, the structural integrity of a formerly diverse graminoid wetland is lost in this near monoculture, as when, for example, a discharge wetland is converted to a surface runoff wetland as a result of ambient watershed alterations. Integrity of both ecosystem structure and function is reduced in a heavily grazed (or browsed) woodland when soil compaction and intense herbivory result in losses in moisture, nutrient availability, biomass, and diversity, as well as changes in species composition. Floristic Quality Assessment addresses the structural aspects of ecosystem integrity.

<u>Floristic Quality Index.</u> The FQI is a weighted index of species richness (N), and is the arithmetic product of the average coefficient of conservatism ($\bar{C}$) and the square-root of species richness ($\sqrt{N}$) of an inventory unit. The square-root transformation of N limits the variable influence of area alone on species richness (Swink and Wilhelm 1979, 1994). In practice, it is possible for two sites with the same $\bar{C}$ to have different FQIs, and it is possible for two sites with the same FQI to have different $\bar{C}$ values. Relatively degraded sites can have an FQI similar to or greater than high-quality natural areas if they support a much greater native species richness. This can occur when there are substantial differences in size, levels of habitat heterogeneity, or inventory effort among compared sites. This and other relationships among the FQI, $\bar{C}$, and N are illustrated in figure 1. Thus, rather than relying on a single index to describe floristic integrity, it is usually necessary to include more than one parameter of the composition to estimate more precisely site floristic integrity.

For the floristic parameters FQI, $\bar{C}$, and N, we recommend that calculations be made using all species (native and adventive) as well as native species only. As noted previously, the establishment of exotic species in a natural community often can result in the replacement

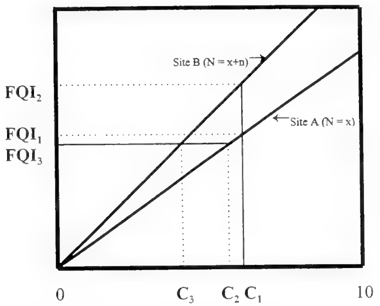

FIGURE 1. Baseline model comparing floristic quality index (FQI) and mean coefficients of conservatism (C) from two sites with differing total species richness. Site A has N (species richness) = x, and Site B has N = x + n. The examples illustrate where two sites with different total species richness but similar mean coefficient of conservatism (C_1) will differ in floristic quality indices (FQI_1 and FQI_2), and where two sites with similar floristic quality indices (FQI_3) will differ in mean C values (C_2 and C_3).

of native species and interfere with recovery processes. Differences in these values among sites provide measures for the erosion of floristic integrity (Swink and Wilhelm 1994).

Natural Area. A gradient of natural quality exists from the most pristine habitat that largely has escaped postsettlement anthropogenic damage to cropland or pavement. The determination of where along that gradient is the demarcation of "natural area" is a matter of judgment and is goal dependent. The Illinois Natural Areas Inventory (INAI) had the very specific goal of identifying all remnants of natural communities that were viewed as significant statewide for their existing quality. It was not intended to be a comprehensive inventory of all the remnant natural communities worthy of preservation or restoration activities. The results of the INAI revealed that a mere 0.07% of the land area of Illinois remains in a high-quality, undegraded, natural condition (White 1978). These Natural Areas tend to be isolated remnants scattered across the state with concentrations in northeastern and far southern Illinois, as well as along its western border by the Mississippi River. Many more areas persist that retain exceptional or noteworthy natural features, but that fall somewhere between INAI eligibility and recently fallowed land. For this paper we are broadly considering a natural area to be a natural community that is judged to be representative of presettlement vegetation for the site. This general definition includes all Natural Areas; it also includes areas that presently do not meet the standards for the INAI but that, with management and time, probably could be restored to a community with floristic composition, structure, and diversity similar to presettlement condition.

Physiognomy. Tracking physiognomic classes, particularly in time-series comparisons, can be an important component of FQA, since it is theoretically possible for dramatic changes in community structure to occur without changes in the FQI or $\bar{C}$. The physiognomic classes included for each taxon in the appendix are listed under Physiognomy in the glossary.

Application of Floristic Quality Assessment

FQA summarizes floristic data from an inventory unit, or units, including species diversity (e.g., species richness and FQI), mean coefficient of conservatism, number and percent rare and adventive species, relative importance of species, and guild diversity (for physiognomic groups, wetness ranks, and conservatism ranks). All of these parameters can be calculated readily. However, if assessments are made on numerous areas, an automated program (Masters, in preparation) can reduce assessment time. In addition, it produces summary tables of these parameters and generates a list of species along with a common name, conservatism and wetness value, and physiognomic class for each taxon. The INAI grade and community type can be included in a summary of a floristic assessment unit. Species abundance measures taken from an inventory unit (e.g., relative abundance estimates, importance values) also can be entered for each taxon.

Floristic Quality Assessment Program. Most of the parameters in FQA for assessment units can be calculated using the computer program (Masters, in preparation) mentioned above, which is designed to summarize these vegetational traits from floristic data. By entering plant names or a six-letter acronym, the FQA program provides information for a floristic inventory and analysis unit. Both an overall site inventory method and sampling methods are available in the program. For the inventory program, indices and means are calculated for the entire inventory unit. For the sampling option, data from quadrats (which may be random, stratified random, or systematic and may or may not be permanent) are used. This latter option is useful in tracking spatial and temporal gradients of floristic integrity and wetness (see Wilhelm 1992), comparing data from large inventory units, and conducting rapid ecological assessments (Heumann et al. 1993).

Survey Intensity and Spatial and Temporal Scales of Survey Units

Measurements of an ecosystem or community usually are at a smaller scale than the target system. Since the FQI is a weighted index of species richness, larger survey units and greater inventory efforts generally yield higher indices of floristic quality (figure 1), if increased size corresponds to increased richness of conservative species. Determining the extent and configuration of the survey unit often is not a trivial question. Where the unit of floristic analysis is an isolated habitat fragment, the sample area usually is readily apparent. In landscapes with more contiguous vegetation, however, determining the sample unit is less obvious and in many ways dependent on the questions and interests of the investigation. Goals of the analysis may include a complete species inventory, but it should be noted that a complete inventory usually is not possible because of spatial and especially temporal variability in floristic composition. Thus, a single site visit will not comprehensively account for all species in a community or site. With repeated visits over the growing season most species that are actively growing at a site can be identified, but this would not be adequate to evaluate the seed bank. Experience in midwestern vegetation types has demonstrated that a single visit made between early June and late August by a competent botanist can achieve a roughly 80% complete inventory. Subsampling, spatially and temporally, is a practical option, particularly where habitat integrity appears relatively uniform and the survey unit is too large to inventory completely within the time available. Details of the survey method and effort always should accompany any reporting of results from FQA. Indiscriminate comparisons of floristic quality can be misleading if the methods used for the evaluations are not similar. Where area and heterogeneity of habitats or community remnants are considerably different, the mean coefficient of conservatism provides an area-independent variable for comparisons of floristic quality. Wilhelm (Swink and Wilhelm 1979) provides insights for how to treat spatially heterogenous habitats such as dune and swale communities near Lake Michigan.

Data Analysis

When distinguishing the qualitative condition of habitat remnants using FQA, a typical goal is to determine if the composition of two or more sites differs significantly from random expectation in the frequency distribution of the coefficients of conservatism. Three properties of the data influence the approach to be taken to make this determination. If the sample data have an acceptably normal distribution, have equal variances (homoscidastic), and are independent, then parametric statistics may be applied (but see below). If, however, the data lack central-normal tendency or have unequal variances (heteroscidastic), a nonparametric or distribution-free method is suggested (independence of the data is assumed). Central-normal tendency usually occurs with rank data when sample size (e.g., number of species) is greater than about 50.

Methods used for examples in this text include parametric and nonparametric two-sample tests (e.g., two-sample t-tests with unpooled variances, the Mann-Whitney U test, and the Kolmogorov-Smirnov [K-S] two-sample goodness-of-fit test). Comparisons of multiple samples are tested with one-way analysis of variance (ANOVA), Tukey's Honestly Significant Difference (HSD) test, and the Kruskall-Wallis ANOVA. All statistical analyses were made using Systat version 7.0 (Wilkinson 1997).

RESULTS AND DISCUSSION

Coefficients of conservatism assigned to each taxon recognized here for the vascular flora of Illinois are presented in the appendix. The frequency distribution of coefficients of conservatism (0–10) for native species is left-skewed due to a strong peak at coefficient 10 (figure 2). Distribution of species by physiognomic classes indicates that most species in the Illinois flora are perennial dicot forbs, followed by adventive annual forbs (figure 3). Perennial sedges and grasses are notably more important in the native flora than in the adventive flora. The distribution of wetness coefficients for the native and adventive flora of Illinois (figure 4) shows that most taxa, including native and adventive, are (obligate) upland species; only about 91 adventive taxa are wetland species

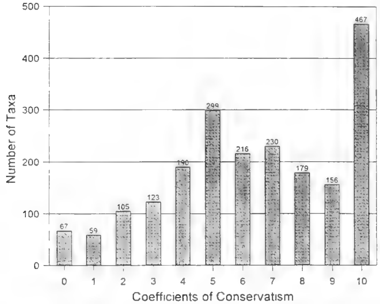

FIGURE 2. Distribution of vascular plant species occurring in Illinois by coefficient of conservatism ranks. In addition to the native taxa, there are 957 adventive or non-native taxa ranked at coefficient 0 (not shown). See text for definitions of conservatism and ranks.

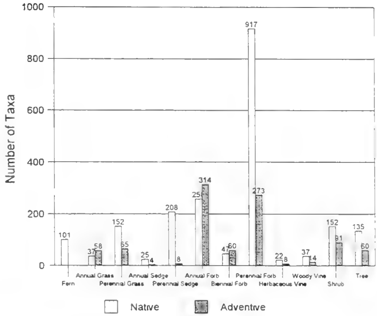

FIGURE 3. Distribution of native and adventive (non-native) taxa in the Illinois vascular flora by physiognomic classes.

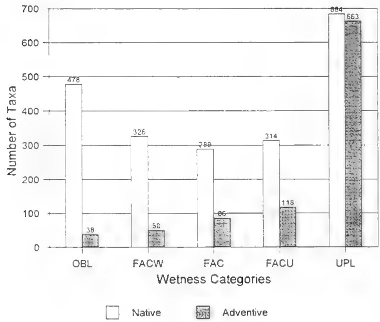

FIGURE 4. Distribution of native and adventive (non-native) taxa in the Illinois vascular flora by indicator wetness categories. Wetness categories are OBL (obligate wetland species), FACW (facultative wetland species), FAC (facultative species – equally likely to occur in wetland and upland habitats), FACU (facultative upland species), and UPL (obligate upland species).

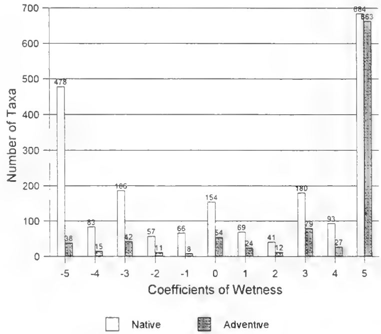

FIGURE 5. Distribution of native and adventive (non-native) taxa in the Illinois vascular flora by numerical wetness ranks. −5= OBL, −4=FACW+, −3=FACW, −2=FACW−, −1=FAC+, 0= FAC, 1=FAC−, 2=FACU+, 3=FACU, 4=FACU−, 5=UPL.

(~10% of all wetland species). Figure 5 shows the distribution of wetness categories.

The need for weighting species, rather than merely counting them, has been recognized (Diamond 1976). However, efforts to explain patterns of plant species survival and diversity in habitats have lacked any clear models that consider taxa modal to natural areas. It is understood in Grime's triangle that no vascular plant species can survive with high levels of stress and disturbance. However, the C-S-R model does not accommodate species intolerant of stress and disturbance that also are lacking in competitive abilities. About 50% of the native species of vascular plants in the Illinois flora were assigned coefficients (0–6) that more or less correspond to Grime's ruderals (16.8%) or competitors (33.8%). Some taxa in this broad guild demonstrate tolerance to environmental stress (e.g., *Opuntia humifusa, Quercus marilandica,* and *Vaccinium arboreum*). The remaining flora—the species modal to relatively stable natural areas—may only loosely fit the stress-tolerator guild. Despite a long history of habitat loss and degradation in Illinois, there are remnant plant communities in localized little-disturbed areas on both nutrient-poor and nutrient-rich sites. These remnants typically are rich in species and include many taxa that lack ruderal characteristics, strong competitive abilities, or tolerance to high stress levels (e.g., *Asclepias perennis, Caulophyllum thalictroides, Cypripedium reginae, Dalea candida, Lilium philadelphicum, Trillium grandiflorum,* and *Viburnum acerifolium*).

Any assessment of ecosystem integrity based on a single index is likely to be insufficient to account for all relevant aspects. For example, the FQI or $\bar{C}$ when reported alone can be misleading (figure 1). Also, species richness alone can be an insensitive indicator of habitat quality, since it is possible for a degraded site to support a similar or greater number of taxa than an undegraded site. Six measures of biological integrity for wetlands have been suggested by Keddy et al. (1993): species diversity, indicator guilds, exotic species, rare species, plant biomass, and amphibian biomass. Diversity is viewed as an essential indicator of integrity (Keddy et al. 1993). However, instead of only measuring species richness, Keddy et al. (1993) also recommend assessing guild diversity. FQA readily addresses the first four recommended measures, provides an index of wetness characteristics, and can be applied to wetland and upland vegetation; moreover, it can be expanded to include other community traits or particular interests such as INAI grades.

Examples of Floristic Quality Assessment

The following three examples of Floristic Quality Assessment application are not intended as proof or strenuous testing of the method, but rather as illustrations of cases where FQA and analytic methods are used in an attempt to differentiate vegetation quality.

Example 1: Four Herbaceous Communities. Sites 1, 2, and 3 are prairie remnants. Site 1 is a high-quality Natural Area; Sites 2 and 3 have been damaged by past disturbances but are dominated by native prairie species. Site 4 is an old field with a history of cultivation. All sites are similar in area (~2 to 4 ha) and were surveyed with similar inventory efforts. Parameters of floristic quality from all sites are compared in table 1. Comparisons of all sites are shown for the cumulative proportion of species by conservatism ranks (figure 6) and distribution pattern of coefficients for each site using box plots (figure 7).

Data Analysis. Frequency of the coefficient of conservatism for each taxon present at each site are normally distributed and meet the equal variance assumptions, although data from the old field (Site 4, n = 51) are extremely skewed to the right (normality test p = 0.084). Results are compared first using parametric techniques and then (as a precaution against possible nonnormal distributions and unequal group size) compared using results from nonparametric methods. For parametric tests, qualitative differences in composition among all four sites were examined with analysis of variance (ANOVA); multiple comparisons were examined with Tukey's HSD mean-separation technique (table 2). ANOVA indicates that a significant difference ($p < 0.000001$) exists in floristic quality among the sites examined, as measured by the frequency

TABLE 1. Floristic integrity assessment summary data comparing four herbaceous communities (Sites 1-4).

Parameter	Site 1	Site 2	Site 3	Site 4
INAI Community Classsification	Dolomite Prairie	Dry-Mesic Prairie	Dolomite Prairie	Old Field
INAI Grade	B	C	C	na (E)
Total Species Richness	58	52	33	51
Native Species Richness	56	42	27	37
% Adventive	3.4	19.2	18.2	27.5
Floristic Quality Index (FQI)	44.0	21.6	22.6	14.3
FQI (natives only)	44.8	24.1	25.0	16.8
Mean Conservatism	5.8	3.0	3.9	2.0
Mean Conservatism (natives only)	6.0	3.7	4.8	2.8
Mean Wetness	3.8	2.9	4.0	1.6
Mean Wetness (natives only)	3.8	2.9	3.9	1.1
# Rare Species (T&E)	1	0	0	0
Guild Diversity - Coef. Conserv.	Figure 6	Figure 6	Figure 6	Figure 6

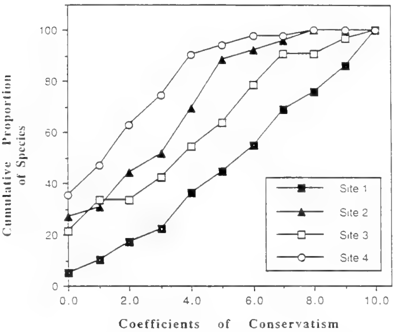

FIGURE 6. Cumulative proportion of species by coefficients of conservatism comparing curves among four herbaceous communities. See text for site descriptions. Significant differences in these profiles exist between Site 1 (high quality prairie) and all other sites, and between Site 3 (degraded prairie) and Site 4 (old field). No significant differences exist between Sites 2 (degraded prairie) and 4 and Sites 2 and 3. See Table 3 for significance levels in paired comparisons.

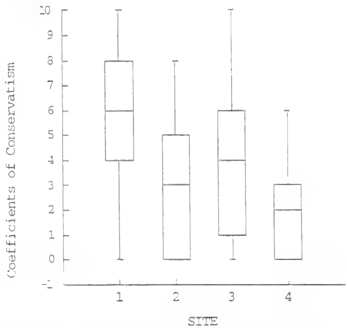

FIGURE 7. Box plot of four grasslands (Sites 1–4) showing medians, quartiles, and spread of the coefficients of conservatism among the floristic data. Horizontal bar in box is median; boundaries of the box represent 25th and 75th percentiles and describe the range of the middle half of the distribution; vertical lines extending from the box represent the range of observed values within 1.5 times the value of the interquartile range. See text for site descriptions.

distribution of the C values. Tukey's HSD test indicates the Natural Area (Site 1) is distinct from all other sites. The old field (Site 4), which contains a few prairie species, is distinct from one degraded prairie remnant (Site 3) but not the other (Site 2). The two degraded prairie remnants (Sites 2 and 3) are qualitatively similar (table 2).

TABLE 2. Analysis of variance and Tukey Honestly Significant Difference multiple comparison test of probabilities for Floristic Quality Assessment of four grasslands.

ANALYSIS OF VARIANCE

Source	Sum-of Squares	DF	Mean Square	F-Ratio	P
Site	424.556	3	141.519	20.652	0.000
Error	1301.965	190	6.852		

LEAST SQUARES MEANS

Site	LS Mean	SE	N
1	5.776	0.344	58
2	3.000	0.363	52
3	3.939	0.456	33
4	2.000	0.367	51

TUKEY HSD MULTIPLE COMPARISONS

Matrix of Pairwise Comparison Probabilities

Site	1	2	3	4
1	1.0000			
2	0.0000	1.0000		
3	0.0070	0.3720	1.0000	
4	0.0000	0.2120	0.0050	1.0000

The Kruskal-Wallis test is a one-way ANOVA on ranked data (a nonparametric test) and is suitable when the asssumptions of parametric tests can not be met. The results of the Kruskal-Wallis test agree with the ANOVA, showing that a significant difference exists among sites (test statistic is 44.4, 3 df, $p<0.000001$). Multiple comparisons can be made by performing Tukey's HSD mean-separation technique on ranked data (Zar 1984). Multiple (planned) comparisons also can be made with t-tests, Mann-Whitney U tests (the nonparametric equivalant to the t-test), or the Kolmogorov-Smirnov (K-S) goodness-of-fit two-sample test. However, with these two-sample tests, the probability levels must be adjusted (e.g., Bonferroni correction) to avoid inflating the Type I error rate. When comparisons are numerous, these tests can become too conservative (less statistical power), and the probability of Type II errors (probability of accepting the null hypothesis when it is false) is increased (Zolman 1993).

The results of these multiple comparisons are shown in table 3. The K-S test is based on the maximum difference between cumulative frequency distribution patterns among C values (for this example); it tests differences in the respective cumulative proportion curves (figure 6). The K-S test is more conservative (has less statistical power) when applied to rank data (Zar

TABLE 3. Floristic quality comparisons among four herbaceous communities. Probability levels shown compare results from two parametric tests and two nonparametric tests. See text for site descriptions. The adjusted critical values for the two-sample tests are shown for these multiple comparisons (e.g., p<0.0083).

Parametric Tests

Tukey HSD Test, alpha=0.05

Site	1	2	3	4
1	1.000			
2	0.000	1.000		
3	0.007	0.372	1.000	
4	0.000	0.212	0.005	1.000

Student's t-test, adjusted alpha=0.0083

Site	1	2	3	4
1	1.000			
2	0.000	1.000		
3	0.007	0.138	1.000	
4	0.000	0.023	0.002	1.000

Nonparametric Tests, adjusted alpha=0.0083

Site	1	2	3	4
1	1.000			
2	0.000	1.000		
3	0.008	0.139	1.000	
4	0.000	0.029	0.003	1.000

Kolmogorov-Smirnov Test, adjusted alpha=0.0083

Site	1	2	3	4
1	1.000			
2	0.000	1.000		
3	0.049	0.143	1.000	
4	0.000	0.124	0.009	1.000

1984) and generally yields the most conservative probability estimates among the tests compared here (table 3).

As with analysis of cumulative proportion curves among C values, membership differences for other guilds among sites or time sequences also can be examined. With time-series or comparative ecological management studies, changes in guilds (e.g., physiographic classes or wetness ranks) may be of specific interest and could be explored with the K-S test or contingency table analysis.

Example 2: Two Mesic Upland Forest Communities. Parameters of floristic integrity are compared in table 4. Woodland 1 (Grade C) had been grazed by livestock for an extended period, while Woodland 2 (Grade B) did not appear to have a damaging grazing history. Woodland 1 is larger and topographically more diverse with dissected ravines, different aspects (primarily N, W, and S), and localized dolomite outcrops. Woodland 2 is on a steep east-facing slope with local exposures of dolomite.

TABLE 4. Floristic integrity assessment summary data comparing two mesic upland forests. Woodland 1 has been grazed while Woodland 2, a smaller forest, apparently has not.

Parameter	Woods 1	Woods 2
INAI Community Classification	Mesic Upland Forest	Mesic Upland Forest
INAI Grade	C	B
Total Species Richness	93	57
Native Species Richness	91	57
% Adventive	2.2	0
Floristic Quality Index (FQI)	42.1	41.2
FQI (natives only)	42.6	41.2
Mean Conservatism	4.4	5.5
Mean Conservatism (natives only)	4.5	5.5
Mean Wetness	2.2	2.3
Mean Wetness (natives only)	2.3	2.3
# Rare Species (T&E)	1	0
Guild Diversity - Coef. Conserv.	Figure 8	Figure 8

Though many more species were recorded from Woodland 1, Woodland 2 is rated with a similar FQI and a higher $\bar{C}$ (table 4). A comparison of the cumulative proportion of species by conservatism ranks at the two sites is shown in figure 8, and the distribution shape of coefficients for each site is given in figure 9.

Data Analysis. A test of the difference (using nonparametric methods) between $\bar{C}$ values indicates significant differences between sites (Mann-Whitney U statistic = 1939.0, p = 0.005). However, the K-S goodness-of-fit comparison (figure 8) yields nonsignificant differences (Dmax = 0.2111, p = 0.088). The two tests, however, provide answers to two different questions and may not be contradictory. When the interest is in comparing mean coefficients of conservatism of the sites, the Mann-Whitney U statistic (or the parametric equivalent t-test) is the appropriate approach. When the interest is in a measure of differences in guild diversity, comparison and analysis of cumulative proportion profiles with the K-S test is suggested, but caution is warranted because of increased Type II errors with this conservative test. Although these floristic data indicate that no differences exist in guild profiles, quantitative data on ground cover species (not available with these data) may reveal important differences in the guild profiles.

Example 3: Two Southern Flatwoods Communities. Parameters of floristic integrity are compared in table 5. Both sites are recognized by the INAI as high-quality Natural Areas. Lake Sara Flatwoods (Grade B) had been managed with prescribed fire for 20 years prior to study. Williams Creek Flatwoods (Grades A and B) had not

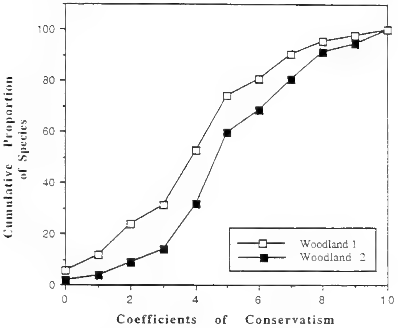

FIGURE 8. Cumulative proportion of species by coefficients of conservatism comparing curves among two woodland communities. Woodland 1 (Grade C) is a larger site with a damaging grazing history, Woodland 2 (Grade B) is on a steep slope and apparently lacks a damaging grazing history. The maximum difference between the profiles, tested with the Kolmogorov-Smirnov two-sample goodness-of-fit test, is Dmax 0.2111 (n1=93, n2=57; p=0.088). See text for additional site descriptions.

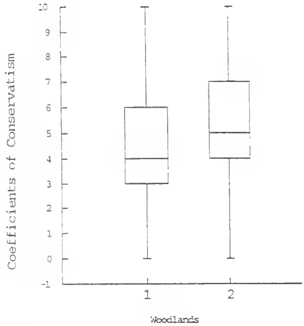

FIGURE 9. Box plot for Woodland 1 (Grade C) and Woodland 2 (Grade B) showing medians, quartiles, and spread of the data. Horizontal bar in box is median; boundaries of the box represent 25th and 75th percentiles and describe the range of the middle half of the distribution; vertical lines extending from the box represent the range of observed values within 1.5 times the value of the interquartile range. See text for site descriptions.

been managed prior to study. Both sites were among locations selected as part of an ecological study of flatwoods on the Illinoian till plain that examined quantitative aspects of vegetation and soils (Taft et al. 1995). Guild diversity among coefficients of conservatism is compared for both sites (figure 10); comparisons are shown for the cumulative proportion of species and cumulative proportion of Importance Value (IV 200 = sum of relative frequency and relative cover).

Data Analysis. Several measures of diversity, including species richness, species density, dominance concentration, and Shannon-Weiner Equitability Index, indicate that significant differences exist between Lake Sara Flatwoods and the other sites studied, including Williams Creek Flatwoods (Taft et al. 1995). The fire management history at Lake Sara appears to have contributed to the greater measures of diversity there. However, a two-sample means test (t-test) on presence-absence floristic data from the Lake Sara and Williams Creek flatwoods indicates that no significant differences exist between $\bar{C}$ values. Guild diversity analysis based on cumulative proportion of species among C values (K-S test) also indicates that no differences exist (figure 10). In contrast, quantitative data for the ground cover vegetation (using IVs) reveal that significant differences exist ($p < 0.001$) in the pattern of abundance among C values (figure 10).

Judging from the first two examples above, significance tests on FQA data have promise as aids in qualitatively differentiating vegetation as measured by floristic presence-absence data alone when the sites are characterized by distinctly different disturbance histories. However, the third example suggests that statistical tests based on floristic data alone may be relatively insensitive for differentiating among similar habitats with important

TABLE 5. Floristic integrity assessment summary data comparing quadrat sampling data from the ground cover in two high-quality flatwoods. Lake Sara had a 20-year history of prescribed fire prior to sampling.

Parameter	Lake Sara	Williams Creek
INAI Community Classsification	Southern Flatwoods	Southern Flatwoods
INAI Grade	B	A and B
Total Species Richness	83	49
Native Species Richness	82	49
% Adventive	1.2	0
Floristic Quality Index (FQI)	37.6	27.7
FQI (natives only)	37.9	27.7
Mean Conservatism	4.1	4.0
Mean Conservatism (natives only)	4.2	4.0
Mean Wetness	2.7	1.8
Mean Wetness (natives only)	2.7	1.8
# Rare Species (T&E)	1	0
Guild Diversity - Coef. Conserv.	Figure 10	Figure 10

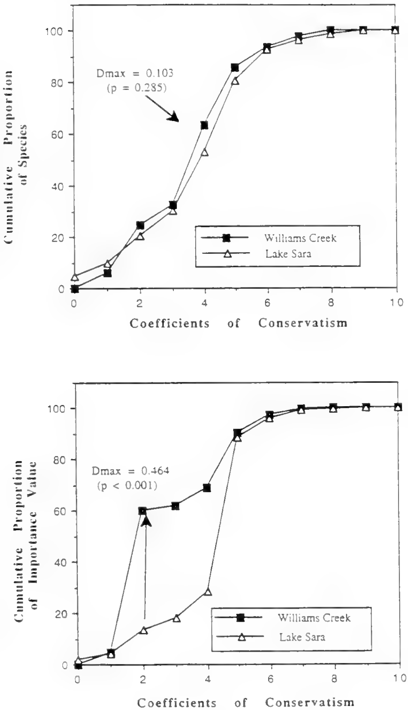

FIGURE 10. Cumulative proportion of species (top figure – no significant difference) and cumulative proportion of importance value (bottom figure – significant difference) by coefficients of conservatism (C) comparing curves among the ground cover vegetation of two high quality (Grades A and B) flatwoods remnants. Distribution patterns of importance values indicates that at Lake Sara a greater proportion of the species importance values are in the upper range of the C values. Lake Sara had a prior history of prescribed-fire management; Williams Creek Flatwoods had no prior vegetation management. See text for additional details.

differences in diversity and/or abundance patterns, particularly where only slight differences exist in levels of habitat degradation. These illustrations suggest that examining differences in FQI, $\bar{C}$, guild profiles, and quantitative data may contribute to greater sensitivity in interpretation, when needed, in the assessment of floristic integrity.

Keddy et al. (1993) recommended establishing limits that reflect tolerable and desirable levels for indicator traits. We find that sites with an FQI of less than 20, based on "complete" inventory data, are usually severely degraded or derelict plant communities, or are very small habitat remnants. Sites with an FQI greater than 20 may be degraded but generally have potential for some level of recovery. Sites with indices greater than 35 are at least regionally noteworthy and often are sharply distinct from the predominant heavily degraded matrix areas in the landscape. Sites with indices greater than 45 are often also statewide-significant Natural Areas. Wetland or prairie reconstructions seldom exceed an FQI of 35, at least in the short term, and only do so with intensive efforts. The long-term potential or stability of many reconstructions has not been determined. Many reconstructions in early developmental stages appear to be prone to rapid fluctuations in composition, diversity, and community structure. Limits and goals for other traits in FQA are variable according to the specific goals of ecosystem management. While goals for richness of exotic species may be 0, this may not be achievable in certain regions of Illinois, particularly where aggressive, adventive species are abundant.

Testable Paradigm

A goal of many biological indices is to make predictions about responses to perturbations. FQA appears to meet this general goal. We predict that intact natural communities exposed to damage will show a reduction of floristic integrity to which FQI, $\bar{C}$, and ultimately the cumulative proportion curves (among C values) are sensitive. For example, in a mesic tallgrass prairie remnant exposed to a regime of soil disturbances or sustained heavy grazing, populations of typical "conservative" species such as *Amorpha canescens*, *Asclepias viridiflora*, *Baptisia leucophaea*, *Cacalia tuberosa*, *Polytaenia nuttalii*, and *Sporobolus heterolepis* (C guild 7–10) will decline to extirpation. Other species such as *Andropogon gerardii*, *Sorghastrum nutans*, and *Panicum virgatum* (C guild 4–6: Grime's competitors) temporarily may increase under certain circumstances in cover if not in frequency. If the disturbance is continued, species such as *Solidago rigida*, *S. canadensis*, *Helianthus rigidus*, *Ratibida pinnata*, and *Asclepias verticillata* (C guild 1–4: species that are intermediate between Grime's ruderals and competitors) become predominant, and adventive species often become common. If the frequency and duration of the disturbance are increased, species with regeneration intervals shorter than the disturbance frequencies (C guild 0–2[3]: Grime's ruderals) become dominant, including many adventive species.

The reverse of this paradigm is the recovery of a degraded system. Restoration seeks to return damaged habitats or communities to their qualitative, compositional, and structural states prior to degradation. We predict that both the FQI and $\bar{C}$ will increase at a site with the introduction of appropriate vegetation management. In the Midwest, many studies have been conducted, or are ongoing, that track the recovery of plant communities with the reintroduction of fire (Tester 1989; DeSelm and Clebsch 1991; Apfelbaum and Haney 1991; Wilhelm nd Masters 1994; Taft, unpublished data). FQA offers a method to track changes in floristic composition that may be helpful in goal development and assessment (Masters 1997). Again, quantitative data provide the most accurate account of the relative abundance of species at a site. Species at low population levels sometimes are at greater risk of extinction (May 1973). If, by chance, most of the taxa with high C values are at low population levels, the species pool may be unstable and susceptible to rapid changes in the FQI and $\bar{C}$. As always, the cost in time needed to collect and analyze quantitative data has to be contrasted with the ease, rapidity, and qualitatively thorough nature of floristic presence-absence data collection. Inventory goals will determine the approach to be taken.

CONCLUSIONS

We offer Floristic Quality Assessment (FQA) for the Illinois flora as a versatile, relatively rapid, dispassionate, and repeatable method for making qualitative assessments of plant communities and for assessing effectiveness of ecological restoration activities. Using floristic inventory data, FQA summarizes several parameters of plant communities, including a weighted measure of species richness (FQI), a mean coefficient of conservatism ($\bar{C}$), guild diversity, proportion of adventive taxa, wetness characteristics, relative importance of native species, physiognomic characteristics, and rare species. The FQI is calculated from coefficients of conservatism (on a scale of 0–10) assigned to each taxon in the Illinois flora. The philosophy underlying the assignment of the coefficients is a recognition that plant species are unequal contributors to habitat quality. Factors that influence diversity and composition also influence the FQI (e.g., habitat size, heterogeneity, disturbance history, and level of degradation). The mean coefficient of conservatism (and quadrat-based sampling methods) provides an area-independent means of making qualitative comparisons among sites. FQA can accommodate measures of species abundance and can accompany other measures of natural community quality such as Illinois Natural Areas Inventory grades. We suggest testing the method by comparing floristic composition among sites and time intervals with known levels of disturbances and restoration activities using mean-separation techniques and analysis of guild diversity. Although similar results may be achieved with parametric statistics, nonparametric tests may be preferred for small sample sizes when all assumptions of parametric methods may not be met.

GLOSSARY

Adventive – Not native to Illinois. Adventive is synonymous with the terms exotic and alien. Species that have limited natural ranges in Illinois, but that are widely planted or escaped, such as *Pinus strobus* and *Robinia pseudoacacia,* should be treated as adventive when encountered outside their natural Illinois distributions, and assigned a C value of 0 in the calculation of the floristic quality index and mean coefficient of conservatism.

Coefficient of Conservatism (C) – An integer from 0 to 10 assigned to each taxon in the Illinois flora and used in calculating the floristic quality index. Each value reflects an estimate of a plant's tendency to be restricted to "natural areas" (see detailed description in methods section). The mean coefficient of conservatism ($\bar{C}$) is calculated by summing all coefficients in an inventory unit and dividing by number of species (N), or $\bar{C} = \Sigma C/N$.

Conservatism – The tendency of a taxon to be restricted to natural areas. Similar to remnant dependency (Panzer et al. 1995).

Floristic Quality Index (FQI) – An index derived from floristic inventory data and calculated by the following formula from Swink and Wilhelm (1979, 1994):

$I = \bar{C}(\sqrt{N})$, in which:

C = coefficient of conservatism

$\bar{C}$ = $\Sigma C/N$

N = number of taxa.

Guild Diversity – Guild diversity is measured from frequency distributions for species among traits such as physiognomic classes, wetness ranks (see Wetness), or conservatism ranks. These frequency data allow for graphical depictions of these guilds for comparison among sites and time periods (see Data Analysis in results section).

Illinois Natural Areas Inventory Grades – Definitions taken from White (1978, p. 31):

Grade A = Relatively stable or undisturbed communities. *Example:* old growth, ungrazed forest.

Grade B = Late successional or lightly disturbed communities. *Example:* old growth forest that was selectively logged 5 years ago.

Grade C = Mid-successional or moderately to heavily disturbed communities. *Example:* young to mature second-growth forest.

Grade D = Early successional or severely disturbed communities. *Example:* severely grazed forest of any age.

Grade E = Very early successional or very severely disturbed communities. *Example:* cropland.

Integrity, Ecological and Community – Integrity implies an unimpaired, complete condition. Ecological or community integrity refers to the degree to which self-correcting properties in an ecosystem or community exert themselves when that community is exposed to disturbance.

Natural Area – In a broad sense, a natural area is considered to be a natural community that is (presumably) representative of the presettlement vegetation for the site. This general definition includes all Natural Areas (INAI sites graded A and B), but also areas that presently do not meet the standards for the INAI but that, with management and time, have potential for restoration to a community with floristic composition and diversity similar to the presettlement condition.

Physiognomy – Broadly defined, physiognomy includes plant habit (architectural characteristics), life history, and certain taxonomic classes. Physiognomic classes assigned to each taxon in the Illinois flora are Fern (including fern allies), Annual Forb, Biennial Forb, Perennial Forb, Annual Grass, Perennial Grass, Annual Sedge, Perennial Sedge, Herbaceous Vine, Woody Vine, Shrub, and Tree. Tracking physiognomic classes can be an important component of FQA, since it is theoretically possible for dramatic changes in community structure to occur without changes in the FQI or $\bar{C}$.

Rare Species – Plant species listed as threatened or endangered by the Illinois Endangered Species Protection Board (Herkert 1991, 1994).

Species richness – Total number of native and adventive species.

Wetness – Wetness classification is based on the National Wetland Category for Region 3 of the United States Fish and Wildlife Service (Reed 1988). Plants are designated as *Obligate Wetland, Facultative Wetland, Facultative, Facultative Upland,* and *Upland*. These classes are further ranked by "+" and "-" values for the three facultative classes, thereby providing greater resolution. These nominal classes have been sorted into ordinate values:

-5	=	Obligate Wetland	(OBL)
-4	=	Facultative Wetland+	(FACW+)
-3	=	Facultative Wetland	(FACW)
-2	=	Facultative Wetland -	(FACW-)
-1	=	Facultative +	(FAC+)
0	=	Facultative	(FAC)
+1	=	Facultative -	(FAC-)
+2	=	Facultative Upland +	(FACU+)
+3	=	Facultative Upland	(FACU)
+4	=	Facultative Upland -	(FACU-)
+5	=	Upland	(UPL).

Mean wetness is an average derived from all wetness (ordinate) values in a floristic inventory unit; it provides an index that characterizes the plant community in terms of hydrological characteristics.

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APPENDIX: Vegetation of Illinois Database

The following is a listing of selected vascular plant taxa, sorted alphabetically by genus and then by species, for use in the application of Floristic Quality Assessment in Illinois. Native species are rendered in a standard type face, while introduced or adventive species are shown in ALL CAPS; each is followed by a single colloquial name. This listing is not to be construed as an authoritative treatise on the flora of Illinois, nor was there any attempt to justify the Latin name as nomenclaturally legitimate. Indeed, for taxonomic concept and nomenclature, we have approximated Mohlenbrock (1986), wherein authorities for most of the names may be found.

Each species is preceded by a six-letter acronym, based upon the first three letters of the genus followed by the first three letters of the species, or by the first two letters of the species and the first letter of a subspecific taxon (e.g. *Abu*tilon *the*ophrasti = ABUTHE; *Acer* *ru*brum var. *d*rummondii (ACERUD). Where ambiguity results, such as in *Pol*ygonum *hyd*ropiper (POLHYR) and *Pol*ygonum *hyd*ropiperoides (POLHYS) a nonintuitive acronym has been created. Use of such acronyms makes field notes go much faster, and the acronyms serve as easily rendered extraction tags for the plants in the data base.

Following the acronym is the assigned C value (coefficient of conservatism) for native species or by an asterisk for non-native species. After the colloquial name is the coefficient of wetness, followed by its corresponding National Wetland Category. The categories were assigned based on observations of their behavior throughout "Region 3" of the U.S. Fish & Wildlife Service. Obligate wetland species (OBL, -5) have 99% probability of occurring in wetlands, facultative/wet species (FACW, -3) a 67%-99% probability, facultative species (FAC, 0) a 34%-66% probability, facultative/upland species (FACU, 3) a 1%-33% probability, and upland species (UPL, 5) have less than a 1% probability of occurring in wetlands.

Each species has been designated with a physiognomic characteristic, using commonly applied terms such as tree, shrub, forb, vine, grass, sedge, and cryptogam. The forbs, grasses, and sedges are preceded by modifiers such as A (annual), B (biennial), and P (perennial). These are followed by a family name, following the delineation in Mohlenbrock (1986).

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
ABEESC	*	ABELMOSCHUS ESCULENTUS	OKRA	A-FORB	5	UPL	MALVACEAE
ABUTHE	*	ABUTILON THEOPHRASTI	BUTTONWEED	A-FORB	4	FACU-	MALVACEAE
ACADEA	8	Acalypha deamii	LARGE-SEEDED MERCURY	A-FORB	5	UPL	EUPHORBIACEAE
ACAGRA	4	Acalypha gracilens	SLENDER THREE-SEEDED MERCURY	A-FORB	5	UPL	EUPHORBIACEAE
ACAOST	1	Acalypha ostryaefolia	THREE-SEEDED MERCURY	A-FORB	5	UPL	EUPHORBIACEAE
ACARHO	0	Acalypha rhomboidea	THREE-SEEDED MERCURY	A-FORB	3	FACU	EUPHORBIACEAE
ACAVIR	2	Acalypha virginica	THREE-SEEDED MERCURY	A-FORB	3	FACU	EUPHORBIACEAE
ACEFLO	5	Acer floridanum	SOUTHERN SUGAR MAPLE	TREE	3	FACU	ACERACEAE
ACEGIN	*	ACER GINNALA	AMUR MAPLE	TREE	5	UPL	ACERACEAE
ACENEG	1	Acer negundo	BOXELDER	TREE	-2	FACW-	ACERACEAE
ACENIG	6	Acer nigrum	BLACK MAPLE	TREE	5	UPL	ACERACEAE
ACEPLA	*	ACER PLATANOIDES	NORWAY MAPLE	TREE	5	UPL	ACERACEAE
ACEPSE	*	ACER PSEUDOPLATANUS	SYCAMORE MAPLE	TREE	5	UPL	ACERACEAE
ACERUR	5	Acer rubrum	RED MAPLE	TREE	0	FAC	ACERACEAE
ACERUD	5	Acer rubrum v. drummondii	DRUMMOND'S RED MAPLE	TREE	-5	OBL	ACERACEAE
ACERUT	5	Acer rubrum v. trilobum	RED MAPLE	TREE	3	FACU	ACERACEAE
ACESAI	1	Acer saccharinum	SILVER MAPLE	TREE	-3	FACW	ACERACEAE
ACESAU	4	Acer saccharum	SUGAR MAPLE	TREE	3	FACU	ACERACEAE
ACHMIL	*	ACHILLEA MILLEFOLIUM	COMMON MILFOIL	P-FORB	3	FACU	ASTERACEAE
ACOAME	4	Acorus americanus	FLAG ROOT	P-FORB	-5	OBL	ARACEAE
ACTPAC	7	Actaea pachypoda	DOLL'S-EYES	P-FORB	5	UPL	RANUNCULACEAE
ACTRUB	8	Actaea rubra	RED BANEBERRY	P-FORB	5	UPL	RANUNCULACEAE
ADIPED	6	Adiantum pedatum	MAIDENHAIR FERN	FERN	1	FAC-	ADIANTACEAE
ADLFUN	*	ADLUMIA FUNGOSA	ALLEGHENY VINE	B-FORB	5	UPL	PAPAVERACEAE
ADOMOS	10	Adoxa moschatellina	MOSCHATEL	P-FORB	0	FAC	ADOXACEAE
AEGPOD	*	AEGOPODIUM PODAGRARIA	GOUTWEED	P-FORB	0	FAC	APIACEAE
AESGLA	5	Aesculus glabra	OHIO BUCKEYE	TREE	-1	FAC+	HIPPOCASTANACEAE
AESHIP	*	AESCULUS HIPPOCASTANUM	HORSE-CHESTNUT	TREE	5	UPL	HIPPOCASTANACEAE
AESPAV	7	Aesculus pavia	RED BUCKEYE	TREE	-1	FAC+	HIPPOCASTANACEAE
AETCYN	*	AETHUSA CYNAPIUM	FOOL'S PARSLEY	A-FORB	5	UPL	APIACEAE
AGAASP	10	Agalinis aspera	ROUGH FALSE FOXGLOVE	A-FORB	5	UPL	SCROPHULARIACEAE
AGABES	5	Agalinis besseyana	SLENDER FALSE FOXGLOVE	A-FORB	5	UPL	SCROPHULARIACEAE
AGAFAS	6	Agalinis fasciculata	FALSE FOXGLOVE	A-FORB	-3	FACW	SCROPHULARIACEAE
AGAGAT	10	Agalinis gattingeri	ROUND-STEMMED FALSE FOXGLOVE	A-FORB	5	UPL	SCROPHULARIACEAE
AGAPAU	7	Agalinis paupercula	FALSE FOXGLOVE	A-FORB	-5	OBL	SCROPHULARIACEAE
AGAPUR	6	Agalinis purpurea	FALSE FOXGLOVE	A-FORB	-3	FACW	SCROPHULARIACEAE
AGASKI	9	Agalinis skinneriana	PALE FALSE FOXGLOVE	A-FORB	5	UPL	SCROPHULARIACEAE
AGATEN	5	Agalinis tenuifolia	SLENDER FALSE FOXGLOVE	A-FORB	-3	FACW	SCROPHULARIACEAE
AGANEP	4	Agastache nepetoides	YELLOW GIANT HYSSOP	P-FORB	3	FACU	LAMIACEAE
AGASCR	5	Agastache scrophulariaefolia	PURPLE GIANT HYSSOP	P-FORB	5	UPL	LAMIACEAE
AGRGRY	3	Agrimonia gryposepala	TALL AGRIMONY	P-FORB	2	FACU+	ROSACEAE
AGRPAR	5	Agrimonia parviflora	SWAMP AGRIMONY	P-FORB	-1	FAC+	ROSACEAE
AGRPUB	4	Agrimonia pubescens	SOFT AGRIMONY	P-FORB	5	UPL	ROSACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
AGRROS	4	Agrimonia rostellata	WOODLAND AGRIMONY	P-FORB	3	FACU	ROSACEAE
AGRMAC	*	AGROHORDEUM MACOUNII	MACOUN'S WILD RYE	P-GRASS	5	UPL	POACEAE
AGRCRI	*	AGROPYRON CRISTATUM	CRESTED WHEAT GRASS	P-GRASS	5	UPL	POACEAE
AGRDES	*	AGROPYRON DESERTORUM	CRESTED WHEAT GRASS	P-GRASS	5	UPL	POACEAE
AGRRER	*	AGROPYRON REPENS	QUACK GRASS	P-GRASS	3	FACU	POACEAE
AGRREA	*	AGROPYRON REPENS v. ARISTATUM	QUACK GRASS	P-GRASS	3	FACU	POACEAE
AGRSMS	*	AGROPYRON SMITHII	COLORADO BLUESTEM	P-GRASS	4	FACU-	POACEAE
AGRSMM	*	AGROPYRON SMITHII v. MOLLE	WESTERN WHEAT GRASS	P-GRASS	4	FACU-	POACEAE
AGRTRT	8	Agropyron trachycaulum	BEARDED WHEAT GRASS	P-GRASS	0	FAC	POACEAE
AGRTRU	8	Agropyron trachycaulum v. unilaterale	BEARDED WHEAT GRASS	P-GRASS	3	FACU	POACEAE
AGRGIT	*	AGROSTEMMA GITHAGO	CORN COCKLE	P-FORB	5	UPL	CARYOPHYLLACEAE
AGRALA	0	Agrostis alba	RED TOP	P-GRASS	-3	FACW	POACEAE
AGRALP	8	Agrostis alba v. palustris	CREEPING BENT GRASS	P-GRASS	-3	FACW	POACEAE
AGRCAP	*	AGROSTIS CAPILLARIS	COLONIAL BENT GRASS	P-GRASS	-3	FACW	POACEAE
AGRELL	5	Agrostis elliottiana	AWNED BENT GRASS	A-GRASS	5	UPL	POACEAE
AGRHYE	2	Agrostis hyemalis	HAIR GRASS	P-GRASS	1	FAC-	POACEAE
AGRPER	4	Agrostis perennans	AUTUMN BENT GRASS	P-GRASS	1	FAC-	POACEAE
AGRSCA	5	Agrostis scabra	ROUGH BENT GRASS	P-GRASS	0	FAC	POACEAE
AILALT	*	AILANTHUS ALTISSIMA	TREE-OF-HEAVEN	TREE	5	UPL	SIMAROUBACEAE
AIRCAR	*	AIRA CARYOPHYLLAEA	SILVER HAIR GRASS	A-GRASS	3	FACU	POACEAE
AJUGEN	*	AJUGA GENEVENSIS	GENEVA BUGLEWEED	P-FORB	5	UPL	LAMIACEAE
AJUREP	*	AJUGA REPTANS	CARPET BUGLE	P-FORB	5	UPL	LAMIACEAE
ALBJUL	*	ALBIZIA JULIBRISSIN	MIMOSA	TREE	5	UPL	MIMOSACEAE
ALCROS	*	ALCEA ROSEA	HOLLYHOCK	P-FORB	5	UPL	MALVACEAE
ALEFAR	9	Aletris farinosa	COLIC ROOT	P-FORB	0	FAC	LILIACEAE
ALIPAM	2	Alisma plantago-aquatica v. americanum	AMERICAN WATER PLANTAIN	P-FORB	-5	OBL	ALISMATACEAE
ALIPPA	2	Alisma plantago-aquatica v. parviflorum	COMMON WATER PLANTAIN	P-FORB	-5	OBL	ALISMATACEAE
ALLPET	*	ALLIARIA PETIOLATA	GARLIC MUSTARD	B-FORB	0	FAC	BRASSICACEAE
ALLAMP	*	ALLIUM AMPELOPRASUM v. ATROVIOLACEUM	WILD ONION	P-FORB	5	UPL	LILIACEAE
ALLBUR	6	Allium burdickii	WILD LEEK	P-FORB	2	FACU+	LILIACEAE
ALLCAC	2	Allium canadense	WILD GARLIC	P-FORB	3	FACU	LILIACEAE
ALLCAM	3	Allium canadense v. mobilense	GLADE ONION	P-FORB	5	UPL	LILIACEAE
ALLCEP	*	ALLIUM CEPA	ONION	P-FORB	5	UPL	LILIACEAE
ALLCER	7	Allium cernuum	NODDING WILD ONION	P-FORB	5	UPL	LILIACEAE
ALLFIS	*	ALLIUM FISTULOSUM	WELCH ONION	P-FORB	5	UPL	LILIACEAE
ALLPOR	*	ALLIUM PORRUM	LEEK	P-FORB	5	UPL	LILIACEAE
ALLSAT	*	ALLIUM SATIVUM	GARLIC	P-FORB	5	UPL	LILIACEAE
ALLSSC	*	ALLIUM SCHOENOPRASUM	CHIVES	P-FORB	5	UPL	LILIACEAE
ALLSSI	*	ALLIUM SCHOENOPRASUM v. SIBIRICUM	WILD CHIVES	P-FORB	5	UPL	LILIACEAE
ALLSTE	10	Allium stellatum	CLIFF ONION	P-FORB	5	UPL	LILIACEAE
ALLTRI	7	Allium tricoccum	WILD LEEK	P-FORB	2	FACU+	LILIACEAE
ALLVIN	*	ALLIUM VINEALE	FIELD GARLIC	P-FORB	3	FACU	LILIACEAE
ALNGLU	*	ALNUS GLUTINOSA	BLACK ALDER	TREE	-2	FACW-	BETULACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
ALNINC	7	Alnus incana v. rugosa	SPECKLED ALDER	SHRUB	-5	OBL	BETULACEAE
ALNSER	7	Alnus serrulata	COMMON ALDER	SHRUB	-5	OBL	BETULACEAE
ALOAEQ	6	Alopecurus aequalis	FOXTAIL	P-GRASS	-5	OBL	POACEAE
ALOCAR	0	Alopecurus carolinianus	ANNUAL FOXTAIL	A-GRASS	-3	FACW	POACEAE
ALOPRA	*	ALOPECURUS PRATENSIS	MEADOW FOXTAIL	P-GRASS	-3	FACW	POACEAE
ALYALY	*	ALYSSUM ALYSSOIDES	PALE ALYSSUM	A-FORB	5	UPL	BRASSICACEAE
AMAALB	0	Amaranthus albus	TUMBLEWEED	A-FORB	3	FACU	AMARANTHACEAE
AMAAMB	0	Amaranthus ambigens	WATER HEMP	A-FORB	5	UPL	AMARANTHACEAE
AMAARE	*	AMARANTHUS ARENICOLA	TORREY'S AMARANTH	A-FORB	3	FACU	AMARANTHACEAE
AMACAU	*	AMARANTHUS CAUDATUS	PURPLE AMARANTH	A-FORB	0	FAC	AMARANTHACEAE
AMACRU	*	AMARANTHUS CRUENTUS	LOVE-LIES-BLEEDING	A-FORB	5	UPL	AMARANTHACEAE
AMAGRA	*	AMARANTHUS GRAECIZANS	PROSTRATE AMARANTH	A-FORB	5	UPL	AMARANTHACEAE
AMAHYB	*	AMARANTHUS HYBRIDUS	GREEN AMARANTH	P-FORB	5	UPL	AMARANTHACEAE
AMAPAL	*	AMARANTHUS PALMERI	PALMER'S AMARANTH	A-FORB	3	FACU	AMARANTHACEAE
AMAPOW	*	AMARANTHUS POWELLII	SMOOTH PIGWEED	A-FORB	5	UPL	AMARANTHACEAE
AMARET	*	AMARANTHUS RETROFLEXUS	ROUGH PIGWEED	A-FORB	2	FACU+	AMARANTHACEAE
AMARUD	0	Amaranthus rudis	TAMARISK WATERHEMP	A-FORB	-3	FACW	AMARANTHACEAE
AMASPI	*	AMARANTHUS SPINOSUS	SPINY PIGWEED	A-FORB	3	FACU	AMARANTHACEAE
AMATUB	1	Amaranthus tuberculatus	TALL WATERHEMP	A-FORB	-5	OBL	AMARANTHACEAE
AMBART	0	Ambrosia artemisiifolia	COMMON RAGWEED	A-FORB	3	FACU	ASTERACEAE
AMBBID	0	Ambrosia bidentata	LANCELEAF RAGWEED	A-FORB	4	FACU-	ASTERACEAE
AMBPSI	2	Ambrosia psilostachya	WESTERN RAGWEED	P-FORB	1	FAC-	ASTERACEAE
AMBTOM	*	AMBROSIA TOMENTOSA	FALSE RAGWEED	P-FORB	5	UPL	ASTERACEAE
AMBTRI	0	Ambrosia trifida	GIANT RAGWEED	A-FORB	-1	FAC+	ASTERACEAE
AMEARB	7	Amelanchier arborea	JUNEBERRY	TREE	3	FACU	ROSACEAE
AMEHUM	7	Amelanchier humilis	LOW SHADBUSH	SHRUB	5	UPL	ROSACEAE
AMEINT	8	Amelanchier interior	SHADBUSH	TREE	5	UPL	ROSACEAE
AMELAE	7	Amelanchier laevis	SHADBUSH	TREE	5	UPL	ROSACEAE
AMESAN	10	Amelanchier sanguinea	ROUND-LEAVED SERVICEBERRY	SHRUB	5	UPL	ROSACEAE
AMMAUR	8	Ammannia auriculata	SCARLET LOOSESTRIFE	A-FORB	-5	OBL	LYTHRACEAE
AMMCOC	5	Ammannia coccinea	LONG-LEAVED AMMANNIA	A-FORB	-5	OBL	LYTHRACEAE
AMMBRE	9	Ammophila breviligulata	BEACH GRASS	P-GRASS	5	UPL	POACEAE
AMOCAN	8	Amorpha canescens	LEAD PLANT	SHRUB	5	UPL	FABACEAE
AMOFRF	6	Amorpha fruticosa	FALSE INDIGO BUSH	SHRUB	-4	FACW+	FABACEAE
AMOFRA	6	Amorpha fruticosa v. angustifolia	FALSE INDIGO BUSH	SHRUB	-4	FACW+	FABACEAE
AMOFRC	6	Amorpha fruticosa v. croceolanata	FALSE INDIGO BUSH	SHRUB	4	FACU-	FABACEAE
AMONIT	9	Amorpha nitens	SMOOTH FALSE INDIGO BUSH	SHRUB	-3	FACW	FABACEAE
AMPARB	6	Ampelopsis arborea	PEPPER-VINE	W-VINE	-3	FACW	VITACEAE
AMPBRE	*	AMPELOPSIS BREVIPEDUNCULATA	TURQUOIS BERRY	W-VINE	1	FAC-	VITACEAE
AMPCOR	2	Ampelopsis cordata	RACCOON GRAPE	W-VINE	-1	FAC+	VITACEAE
AMPDRA	*	AMPHIACHYRIS DRACUNCULOIDES	BROOMWEED	A-FORB	5	UPL	ASTERACEAE
AMPBRB	4	Amphicarpa bracteata	HOG PEANUT	H-VINE	0	FAC	FABACEAE
AMPBRC	4	Amphicarpa bracteata v. comosa	HOG PEANUT	H-VINE	0	FAC	FABACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
AMSLYC	*	AMSINCKIA LYCOPSOIDES	TARWEED	A-FORB	5	UPL	BORAGINACEAE
AMSSPE	*	AMSINCKIA SPECTABILIS	FIDDLE-NECK	A-FORB	5	UPL	BORAGINACEAE
AMSTAT	6	Amsonia tabernaemontana	BLUE STAR	P-FORB	-3	FACW	APOCYNACEAE
AMSTAS	6	Amsonia tabernaemontana v. salicifolia	BLUE STAR	P-FORB	-3	FACW	APOCYNACEAE
ANAARV	*	ANAGALLIS ARVENSIS	POOR MAN'S WEATHERGLASS	A-FORB	5	UPL	PRIMULACEAE
ANAMIN	5	Anagallis minima	CHAFFWEED	A-FORB	4	FACU-	PRIMULACEAE
ANAMAR	*	ANAPHALIS MARGARITACEA	PEARLY EVERLASTING	P-FORB	5	UPL	ASTERACEAE
ANCOFF	*	ANCHUSA OFFICINALIS	COMMON ALKANET	P-FORB	5	UPL	BORAGINACEAE
ANDPOL	10	Andromeda polifolia v. glaucophylla	BOG ROSEMARY	SHRUB	-5	OBL	ERICACEAE
ANDELL	3	Andropogon elliottii	ELLIOTT'S BROOM SEDGE	P-GRASS	5	UPL	POACEAE
ANDGER	5	Andropogon gerardii	BIG BLUESTEM	P-GRASS	1	FAC-	POACEAE
ANDHAL	*	ANDROPOGON HALLII	SAND BLUESTEM	P-GRASS	5	UPL	POACEAE
ANDTER	8	Andropogon ternarius	BEARD GRASS	P-GRASS	3	FACU	POACEAE
ANDVIR	1	Andropogon virginicus	BROOM SEDGE	P-GRASS	1	FAC-	POACEAE
ANDOCC	4	Androsace occidentalis	ANDROSACE	A-FORB	4	FACU-	PRIMULACEAE
ANECAN	4	Anemone canadensis	MEADOW ANEMONE	P-FORB	-3	FACW	RANUNCULACEAE
ANECAR	9	Anemone caroliniana	CAROLINA ANEMONE	P-FORB	5	UPL	RANUNCULACEAE
ANECYL	8	Anemone cylindrica	CANDLE ANEMONE	P-FORB	5	UPL	RANUNCULACEAE
ANEQUI	7	Anemone quinquefolia	WOOD ANEMONE	P-FORB	0	FAC	RANUNCULACEAE
ANEVIR	4	Anemone virginiana	TALL ANEMONE	P-FORB	5	UPL	RANUNCULACEAE
ANEGRA	*	ANETHUM GRAVEOLENS	DILL	A-FORB	5	UPL	APIACEAE
ANGATR	6	Angelica atropurpurea	ANGELICA	P-FORB	-5	OBL	APIACEAE
ANGVEN	8	Angelica venenosa	WOOD ANGELICA	P-FORB	5	UPL	APIACEAE
ANOCRI	*	ANODA CRISTATA	CRESTED ANODA	A-FORB	0	FAC	MALVACEAE
ANTNEG	4	Antennaria neglecta	CAT'S FOOT	P-FORB	5	UPL	ASTERACEAE
ANTPLA	4	Antennaria plantaginifolia	PUSSY TOES	P-FORB	5	UPL	ASTERACEAE
ANTARV	*	ANTHEMIS ARVENSIS	CORN CHAMOMILE	A-FORB	5	UPL	ASTERACEAE
ANTCOT	*	ANTHEMIS COTULA	DOG FENNEL	A-FORB	3	FACU	ASTERACEAE
ANTTIN	*	ANTHEMIS TINCTORIA	GOLDEN CHAMOMILE	P-FORB	5	UPL	ASTERACEAE
ANTARI	*	ANTHOXANTHUM ARISTATUM	ANNUAL SWEET GRASS	A-GRASS	5	UPL	POACEAE
ANTODO	*	ANTHOXANTHUM ODORATUM	SWEET VERNAL GRASS	P-GRASS	3	FACU	POACEAE
ANTCER	*	ANTHRISCUS CEREFOLIUM	CHERVIL	A-FORB	5	UPL	APIACEAE
ANTSYL	*	ANTHRISCUS SYLVESTRIS	FALSE CHERVIL	B-FORB	5	UPL	APIACEAE
ANTVUL	*	ANTHYLLIS VULNERARIA	LADY'S FINGERS	A-FORB	5	UPL	FABACEAE
ANTMAJ	*	ANTIRRHINUM MAJUS	COMMON SNAPDRAGON	P-FORB	5	UPL	SCROPHULARIACEAE
APIAME	3	Apios americana	GROUND NUT	H-VINE	-3	FACW	FABACEAE
APIPRI	10	Apios priceana	PRICE'S GROUNDNUT	H-VINE	0	FAC	FABACEAE
APLHYE	7	Aplectrum hyemale	ADAM-AND-EVE	P-FORB	1	FAC-	ORCHIDACEAE
APOAND	6	Apocynum androsaemifolium	SPREADING DOGBANE	P-FORB	5	UPL	APOCYNACEAE
APOCAN	2	Apocynum cannabinum	DOGBANE	P-FORB	0	FAC	APOCYNACEAE
APOMED	6	Apocynum ×medium	INTERMEDIATE DOGBANE	P-FORB	5	UPL	APOCYNACEAE APOSIB
	2	Apocynum sibiricum	INDIAN HEMP	P-FORB	-1	FAC+	APOCYNACEAE
AQUCAN	5	Aquilegia canadensis	COLUMBINE	P-FORB	1	FAC-	RANUNCULACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
AQUVUL	*	AQUILEGIA VULGARIS	GARDEN COLUMBINE	P-FORB	5	UPL	RANUNCULACEAE
ARATHA	*	ARABIDOPSIS THALIANA	MOUSE-EARED CRESS	A-FORB	5	UPL	BRASSICACEAE
ARACAN	6	Arabis canadensis	SICKLEPOD	B-FORB	5	UPL	BRASSICACEAE
ARADIV	4	Arabis divaricarpa	PURPLE ROCK CRESS	B-FORB	5	UPL	BRASSICACEAE
ARADRU	10	Arabis drummondii	DRUMMOND'S ROCK CRESS	B-FORB	3	FACU	BRASSICACEAE
ARAGLA	6	Arabis glabra	TOWER MUSTARD	B-FORB	5	UPL	BRASSICACEAE
ARAHIR	5	Arabis hirsuta	HAIRY ROCK CRESS	B-FORB	3	FACU	BRASSICACEAE
ARALAE	4	Arabis laevigata	SMOOTH ROCK CRESS	B-FORB	5	UPL	BRASSICACEAE
ARALYR	7	Arabis lyrata	LYRE-LEAVED ROCK CRESS	B-FORB	4	FACU-	BRASSICACEAE
ARASHO	6	Arabis shortii	TOOTHED CRESS	B-FORB	5	UPL	BRASSICACEAE
ARACHI	*	ARALIA CHINENSIS	CHINESE ANGELICA TREE	SHRUB	5	UPL	ARALIACEAE
ARAELA	*	ARALIA ELATA	JAPANESE ANGELICA TREE	SHRUB	5	UPL	ARALIACEAE
ARAHIS	10	Aralia hispida	BRISTLY SARSAPARILLA	P-FORB	5	UPL	ARALIACEAE
ARANUD	7	Aralia nudicaulis	WILD SARSAPARILLA	SHRUB	3	FACU	ARALIACEAE
ARARAC	8	Aralia racemosa	AMERICAN SPIKENARD	P-FORB	5	UPL	ARALIACEAE
ARASPI	6	Aralia spinosa	DEVIL'S WALKING STICK	SHRUB	-2	FACW-	ARALIACEAE
ARCLAP	*	ARCTIUM LAPPA	GREAT BURDOCK	B-FORB	5	UPL	ASTERACEAE
ARCMIN	*	ARCTIUM MINUS	COMMON BURDOCK	B-FORB	5	UPL	ASTERACEAE
ARCTOM	*	ARCTIUM TOMENTOSUM	COTTON BURDOCK	B-FORB	5	UPL	ASTERACEAE
ARCUVA	10	Arctostaphylos uva-ursi v. coactilis	BEARBERRY	SHRUB	5	UPL	ERICACEAE
ARESER	*	ARENARIA SERPYLLIFOLIA	THYME-LEAVED SANDWORT	A-FORB	0	FAC	CARYOPHYLLACEAE
ARGALB	*	ARGEMONE ALBIFLORA	WHITE PRICKLY POPPY	A-FORB	5	UPL	PAPAVERACEAE
ARGMEX	*	ARGEMONE MEXICANA	MEXICAN POPPY	A-FORB	5	UPL	PAPAVERACEAE
ARIDRA	4	Arisaema dracontium	GREEN DRAGON	P-FORB	-3	FACW	ARACEAE
ARITRI	4	Arisaema triphyllum	INDIAN TURNIP	P-FORB	-2	FACW-	ARACEAE
ARIBAS	6	Aristida basiramea	FORKED-TIP THREE-AWN GRASS	A-GRASS	5	UPL	POACEAE
ARICUR	3	Aristida curtissii	CURTISS THREE AWN GRASS	A-GRASS	3	FACU	POACEAE
ARIDES	9	Aristida desmantha	THREE AWN	A-GRASS	5	UPL	POACEAE
ARIDIC	2	Aristida dichotoma	POVERTY GRASS	A-GRASS	3	FACU	POACEAE
ARIINT	6	Aristida intermedia	FALSE ARROW FEATHER	A-GRASS	5	UPL	POACEAE
ARILON	2	Aristida longespica	THREE AWN	A-GRASS	4	FACU-	POACEAE
ARIOLI	0	Aristida oligantha	PLAINS THREE AWN GRASS	A-GRASS	5	UPL	POACEAE
ARIPUR	5	Aristida purpurascens	ARROWFEATHER	P-GRASS	5	UPL	POACEAE
ARIRAM	3	Aristida ramosissima	SLENDER THREE AWN	A-GRASS	5	UPL	POACEAE
ARITUB	9	Aristida tuberculosa	BEACH THREE AWN GRASS	A-GRASS	5	UPL	POACEAE
ARISES	6	Aristolochia serpentaria	BIRTHWORT	P-FORB	5	UPL	ARISTOLOCHIACEAE
ARISEH	10	Aristolochia serpentaria v. hastata	NARROW-LEAVED SNAKEROOT	P-FORB	-1	FAC+	ARISTOLOCHIACEAE
ARITOM	6	Aristolochia tomentosa	DUTCHMAN'S PIPE	W-VINE	0	FAC	ARISTOLOCHIACEAE
ARMAQU	10	Armoracia aquatica	LAKE CRESS	P-FORB	-5	OBL	BRASSICACEAE
ARMRUS	*	ARMORACIA RUSTICANA	HORSE RADISH	P-FORB	0	FAC	BRASSICACEAE
AROMEL	8	Aronia melanocarpa	BLACK CHOKEBERRY	SHRUB	-2	FACW-	ROSACEAE
AROPRU	8	Aronia prunifolia	PURPLE CHOKEBERRY	SHRUB	-2	FACW-	ROSACEAE
ARRELA	*	ARRHENATHERUM ELATIUS	TALL OAT GRASS	P-GRASS	3	FACU	POACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
ARTABR	*	ARTEMISIA ABROTANUM	SOUTHERNWOOD	SHRUB	5	UPL	ASTERACEAE
ARTABS	*	ARTEMISIA ABSINTHIUM	COMMON WORMWOOD	P-FORB	5	UPL	ASTERACEAE
ARTANN	*	ARTEMISIA ANNUA	ANNUAL WORMWOOD	A-FORB	3	FACU	ASTERACEAE
ARTBIE	*	ARTEMISIA BIENNIS	BIENNIAL WORMWOOD	B-FORB	-2	FACW-	ASTERACEAE
ARTCAM	4	Artemisia campestris	BEACH WORMWOOD	B-FORB	5	UPL	ASTERACEAE
ARTDRA	9	Artemisia dracunculus	FALSE TARRAGON	P-FORB	5	UPL	ASTERACEAE
ARTFRI	*	ARTEMISIA FRIGIDA	FRINGED SAGEBRUSH	SHRUB	5	UPL	ASTERACEAE
ARTLUD	2	Artemisia ludoviciana	WHITE SAGE	P-FORB	5	UPL	ASTERACEAE
ARTPON	*	ARTEMISIA PONTICA	ROMAN WORMWOOD	SHRUB	0	FAC	ASTERACEAE
ARTSER	10	Artemisia serrata	SAW-TOOTHED SAGEBRUSH	P-FORB	5	UPL	ASTERACEAE
ARTVUL	*	ARTEMISIA VULGARIS	MUGWORT	P-FORB	5	UPL	ASTERACEAE
ARUITA	*	ARUM ITALICUM	ARUM	P-FORB	5	UPL	ARACEAE
ARUDIO	7	Aruncus dioicus	GOAT'S-BEARD	P-FORB	3	FACU	ROSACEAE
ARUGIG	5	Arundinaria gigantea	GIANT CANE	P-GRASS	-3	FACW	POACEAE
ARUDON	*	ARUNDO DONAX	GIANT REED	P-GRASS	-3	FACW	POACEAE
ASACAN	5	Asarum canadense	CANADA WILD GINGER	P-FORB	5	UPL	ARISTOLOCHIACEAE
ASCAMP	7	Asclepias amplexicaulis	SAND MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCEXA	8	Asclepias exaltata	POKE MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCHIR	6	Asclepias hirtella	TALL GREEN MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCINC	4	Asclepias incarnata	SWAMP MILKWEED	P-FORB	-5	OBL	ASCLEPIADACEAE
ASCMEA	10	Asclepias meadii	MEAD'S MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCONT	10	Asclepias otarioides	WOOLLY MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCOVA	10	Asclepias ovalifolia	OVAL MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCPER	10	Asclepias perennis	WHITE MILKWEED	P-FORB	-5	OBL	ASCLEPIADACEAE
ASCPUR	7	Asclepias purpurascens	PURPLE MILKWEED	P-FORB	3	FACU	ASCLEPIADACEAE
ASCQUA	6	Asclepias quadrifolia	WHORLED MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCSPE	*	ASCLEPIAS SPECIOSA	SHOWY MILKWEED	P-FORB	0	FAC	ASCLEPIADACEAE
ASCSTE	10	Asclepias stenophylla	NARROW-LEAVED GREEN MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCSUL	7	Asclepias sullivantii	PRAIRIE MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCSYR	0	Asclepias syriaca	COMMON MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCTUB	5	Asclepias tuberosa v. interior	BUTTERFLYWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCVAR	8	Asclepias variegata	VARIEGATED MILKWEED	P-FORB	4	FACU-	ASCLEPIADACEAE
ASCVER	1	Asclepias verticillata	HORSETAIL MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCVIF	9	Asclepias viridiflora	GREEN MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASCVIS	6	Asclepias viridis	GREEN-FLOWERED MILKWEED	P-FORB	5	UPL	ASCLEPIADACEAE
ASITRI	4	Asimina triloba	PAPAW	TREE	0	FAC	ANNONACEAE
ASPOFF	*	ASPARAGUS OFFICINALIS	GARDEN ASPARAGUS	P-FORB	3	FACU	LILIACEAE
ASPPRO	*	ASPERUGO PROCUMBENS	MADWORT	A-FORB	5	UPL	BORAGINACEAE
ASPBRA	10	Asplenium bradleyi	BRADLEY'S SPLEENWORT	FERN	5	UPL	ASPLENIACEAE
ASPEBE	10	Asplenium ×ebenoides	SCOTT'S SPLEENWORT	FERN	5	UPL	ASPLENIACEAE
ASPGRA	10	Asplenium ×gravesii	GRAVES' SPLEENWORT	FERN	5	UPL	ASPLENIACEAE
ASPHER	10	Asplenium ×herb-wagneri	WAGNER'S SPLEENWORT	FERN	5	UPL	ASPLENIACEAE
ASPKEN	10	Asplenium ×kentuckiense	KENTUCKY SPLEENWORT	FERN	5	UPL	ASPLENIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
ASPPIN	10	Asplenium pinnatifidum	PINNATIFID SPLEENWORT	FERN	5	UPL	ASPLENIACEAE
ASPPLA	4	Asplenium platyneuron	EBONY SPLEENWORT	FERN	3	FACU	ASPLENIACEAE
ASPRES	10	Asplenium resiliens	BLACK SPLEENWORT	FERN	5	UPL	ASPLENIACEAE
ASPRHI	8	Asplenium rhizophyllum	WALKING FERN	FERN	5	UPL	ASPLENIACEAE
ASPRUT	10	Asplenium ruta-muraria	WALL-RUE SPLEENWORT	FERN	5	UPL	ASPLENIACEAE
ASPSHA	10	Asplenium ×shawneense	SHAWNEE SPLEENWORT	FERN	5	UPL	ASPLENIACEAE ASPTRT
	10	Asplenium trichomanes	MAIDENHAIR SPLEENWORT	FERN	5	UPL	ASPLENIACEAE
ASPTRQ	10	Asplenium trichomanes v. quadrivalens	MAIDENHAIR SPLEENWORT	FERN	5	UPL	ASPLENIACEAE
ASPTRU	10	Asplenium ×trudellii	TRUDELL'S SPLEENWORT	FERN	5	UPL	ASPLENIACEAE
ASTAME	5	Aster ×amethystinus	AMETHYST ASTER	P-FORB	0	FAC	ASTERACEAE
ASTANO	8	Aster anomalus	BLUE ASTER	P-FORB	5	UPL	ASTERACEAE
ASTAZU	7	Aster azureus	SKY-BLUE ASTER	P-FORB	5	UPL	ASTERACEAE
ASTBOR	10	Aster borealis	RUSH ASTER	P-FORB	-5	OBL	ASTERACEAE
ASTBRA	*	ASTER BRACHYACTIS	RAYLESS ASTER	P-FORB	0	FAC	ASTERACEAE
ASTCOR	6	Aster cordifolius	HEART-LEAVED ASTER	P-FORB	5	UPL	ASTERACEAE
ASTDRU	3	Aster drummondii	DRUMMOND'S ASTER	P-FORB	3	FACU	ASTERACEAE
ASTDUM	5	Aster dumosus	BUSHY ASTER	P-FORB	-1	FAC+	ASTERACEAE
ASTERI	4	Aster ericoides	HEATH ASTER	P-FORB	4	FACU-	ASTERACEAE
ASTFIR	5	Aster firmus	SHINING ASTER	P-FORB	-5	OBL	ASTERACEAE
ASTFUR	9	Aster furcatus	FORKED ASTER	P-FORB	5	UPL	ASTERACEAE
ASTLAE	8	Aster laevis	SMOOTH BLUE ASTER	P-FORB	5	UPL	ASTERACEAE
ASTLAT	2	Aster lateriflorus	SIDE-FLOWERING ASTER	P-FORB	-2	FACW-	ASTERACEAE
ASTLIN	9	Aster linariifolius	FLAX-LEAVED ASTER	P-FORB	5	UPL	ASTERACEAE
ASTMAC	9	Aster macrophyllus	BIG-LEAVED ASTER	P-FORB	5	UPL	ASTERACEAE
ASTNOV	4	Aster novae-angliae	NEW ENGLAND ASTER	P-FORB	-3	FACW	ASTERACEAE
ASTOBL	7	Aster oblongifolius	AROMATIC ASTER	P-FORB	5	UPL	ASTERACEAE
ASTONT	4	Aster ontarionis	ONTARIO ASTER	P-FORB	0	FAC	ASTERACEAE
ASTPAR	3	Aster parviceps	SMALL-HEADED ASTER	P-FORB	5	UPL	ASTERACEAE
ASTPAT	6	Aster patens	PURPLE DAISY	P-FORB	5	UPL	ASTERACEAE
ASTPIL	0	Aster pilosus	HAIRY ASTER	P-FORB	4	FACU-	ASTERACEAE
ASTPRA	4	Aster praealtus	WILLOW ASTER	P-FORB	-5	OBL	ASTERACEAE
ASTPRE	10	Aster prenanthoides	CROOKED ASTER	P-FORB	-5	OBL	ASTERACEAE
ASTPUN	7	Aster puniceus	BRISTLY ASTER	P-FORB	-5	OBL	ASTERACEAE
ASTSAG	4	Aster sagittifolius	ARROW-LEAVED ASTER	P-FORB	5	UPL	ASTERACEAE
ASTSCH	10	Aster schreberi	SMOOTH FORKED ASTER	P-FORB	5	UPL	ASTERACEAE
ASTSER	9	Aster sericeus	SILKY ASTER	P-FORB	5	UPL	ASTERACEAE
ASTSHO	6	Aster shortii	SHORT'S ASTER	P-FORB	5	UPL	ASTERACEAE
ASTSIM	3	Aster simplex	PANICLED ASTER	P-FORB	-5	OBL	ASTERACEAE
ASTSUB	*	ASTER SUBULATUS	EXPRESSWAY ASTER	A-FORB	-5	OBL	ASTERACEAE
ASTTAT	*	ASTER TATARICUS	TARTARIAN ASTER	P-FORB	5	UPL	ASTERACEAE
ASTTUR	7	Aster turbinellus	PRAIRIE ASTER	P-FORB	5	UPL	ASTERACEAE
ASTUMB	8	Aster umbellatus	FLAT-TOP ASTER	P-FORB	-3	FACW	ASTERACEAE
ASTUND	9	Aster undulatus	WAVY-LEAVED ASTER	P-FORB	5	UPL	ASTERACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
ASTVIM	3	Aster vimineus	SMALL WHITE ASTER	P-FORB	-2	FACW-	ASTERACEAE
ASTAGR	*	ASTRAGALUS AGRESTIS	FIELD MILK VETCH	P-FORB	-2	FACW-	FABACEAE
ASTCAN	7	Astragalus canadensis	CANADIAN MILK VETCH	P-FORB	-1	FAC+	FABACEAE
ASTCRA	8	Astragalus crassicarpus v. trichocalyx	LARGE GROUND PLUM	P-FORB	5	UPL	FABACEAE
ASTDIS	8	Astragalus distortus	BENT MILK VETCH	P-FORB	5	UPL	FABACEAE
ASTTEN	10	Astragalus tennesseensis	TENNESSEE MILK VETCH	P-FORB	5	UPL	FABACEAE
ATHANG	6	Athyrium angustum	LADY FERN	FERN	0	FAC	ASPLENIACEAE
ATHASP	6	Athyrium asplenioides	SOUTHERN LADY FERN	FERN	0	FAC	ASPLENIACEAE
ATHPYC	10	Athyrium pycnocarpon	GLADE FERN	FERN	1	FAC-	ASPLENIACEAE
ATHTHE	10	Athyrium thelypterioides	SILVERY SPLEENWORT	FERN	0	FAC	ASPLENIACEAE
ATRARG	*	ATRIPLEX ARGENTEA	SILVER ORACH	A-FORB	0	FAC	CHENOPODIACEAE
ATRGLA	*	ATRIPLEX GLABRIUSCULA	SMOOTH ORACH	A-FORB	5	UPL	CHENOPODIACEAE
ATRHOR	*	ATRIPLEX HORTENSIS	GARDEN ORACH	A-FORB	0	FAC	CHENOPODIACEAE
ATRPAT	*	ATRIPLEX PATULA	FAT-HEN SALTBUSH	A-FORB	2	FACU+	CHENOPODIACEAE
ATRROS	*	ATRIPLEX ROSEA	RED ORACHE	A-FORB	2	FACU+	CHENOPODIACEAE
AURFLA	8	Aureolaria flava	SMOOTH FALSE FOXGLOVE	P-FORB	5	UPL	SCROPHULARIACEAE
AURGRA	6	Aureolaria grandiflora v. pulchra	YELLOW FALSE FOXGLOVE	P-FORB	5	UPL	SCROPHULARIACEAE
AURPED	9	Aureolaria pedicularia v. ambigens	CLAMMY FALSE FOXGLOVE	A-FORB	5	UPL	SCROPHULARIACEAE
AVEFAT	*	AVENA FATUA	WILD OATS	A-GRASS	5	UPL	POACEAE
AVESAT	*	AVENA SATIVA	OATS	A-GRASS	5	UPL	POACEAE
AZOMEX	8	Azolla mexicana	MEXICAN AZOLLA	FERN	-5	OBL	SALVINIACEAE
BACROT	5	Bacopa rotundifolia	WATER HYSSOP	P-FORB	-5	OBL	SCROPHULARIACEAE
BALNIG	*	BALLOTA NIGRA	BLACK HOREHOUND	P-FORB	5	UPL	LAMIACEAE
BALMAJ	*	BALSAMITA MAJOR	COSTMARY	P-FORB	5	UPL	ASTERACEAE
BAPAUA	*	BAPTISIA AUSTRALIS	BLUE WILD INDIGO	P-FORB	5	UPL	FABACEAE
BAPAUM	*	BAPTISIA AUSTRALIS v. MINOR	BLUE WILD INDIGO	P-FORB	5	UPL	FABACEAE
BAPLAC	6	Baptisia lactea	WHITE WILD INDIGO	P-FORB	3	FACU	FABACEAE
BAPLEL	9	Baptisia leucophaea	CREAM WILD INDIGO	P-FORB	5	UPL	FABACEAE
BAPLEG	9	Baptisia leucophaea v. glabrescens	CREAM WILD INDIGO	P-FORB	5	UPL	FABACEAE
BAPTIN	10	Baptisia tinctoria v. crebra	YELLOW WILD INDIGO	P-FORB	5	UPL	FABACEAE
BARVER	*	BARBAREA VERNA	EARLY WINTER CRESS	B-FORB	5	UPL	BRASSICACEAE
BARVUL	*	BARBAREA VULGARIS	WINTER CRESS	B-FORB	0	FAC	BRASSICACEAE
BARPAN	10	Bartonia paniculata	SCREWSTEM	A-FORB	-5	OBL	GENTIANACEAE
BARVIR	10	Bartonia virginica	YELLOW BARTONIA	A-FORB	-4	FACW+	GENTIANACEAE
BECSYZ	10	Beckmannia syzigachne	AMERICAN SLOUGH GRASS	A-GRASS	-5	OBL	POACEAE
BELCHI	*	BELAMCANDA CHINENSIS	BLACKBERRY LILLY	P-FORB	5	UPL	IRIDACEAE
BELPER	*	BELLIS PERENNIS	ENGLISH DAISY	P-FORB	5	UPL	ASTERACEAE
BERCAN	10	Berberis canadensis	ALLEGHENY BARBERRY	SHRUB	5	UPL	BERBERIDACEAE
BERTHU	*	BERBERIS THUNBERGII	JAPANESE BARBERRY	SHRUB	4	FACU-	BERBERIDACEAE
BERVUL	*	BERBERIS VULGARIS	COMMON BARBERRY	SHRUB	3	FACU	BERBERIDACEAE
BERSCA	5	Berchemia scandens	SUPPLE-JACK	W-VINE	-1	FAC+	RHAMNACEAE
BERTEX	10	Bergia texana	BERGIA	A-FORB	-5	OBL	ELATINACEAE
BERINC	*	BERTEROA INCANA	HOARY ALYSSUM	A-FORB	5	UPL	BRASSICACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
BERERE	10	Berula erecta	WATER PARSNIP	P-FORB	-5	OBL	APIACEAE
BESBUL	8	Besseya bullii	KITTEN TAILS	P-FORB	5	UPL	SCROPHULARIACEAE
BETALL	10	Betula alleghaniensis	YELLOW BIRCH	TREE	0	FAC	BETULACEAE
BETNIG	4	Betula nigra	RIVER BIRCH	TREE	-3	FACW	BETULACEAE
BETPAP	7	Betula papyrifera	PAPER BIRCH	TREE	2	FACU+	BETULACEAE
BETPEN	*	BETULA PENDULA	EUROPEAN WHITE BIRCH	TREE	2	FACU+	BETULACEAE
BETPOP	*	BETULA POPULIFOLIA	GRAY BIRCH	TREE	0	FAC	BETULACEAE
BETPUM	10	Betula pumila	DWARF BIRCH	SHRUB	-5	OBL	BETULACEAE
BIDARA	1	Bidens aristosa	SWAMP MARIGOLD	A-FORB	-3	FACW	ASTERACEAE
BIDARR	1	Bidens aristosa v. retrorsa	BUR MARIGOLD	A-FORB	-3	FACW	ASTERACEAE
BIDBIP	*	BIDENS BIPINNATA	SPANISH NEEDLES	A-FORB	-2	FACW-	ASTERACEAE
BIDCER	2	Bidens cernua	NODDING BUR MARIGOLD	A-FORB	-5	OBL	ASTERACEAE
BIDCON	2	Bidens connata	PURPLESTEMMED TICKSEED	A-FORB	-5	OBL	ASTERACEAE
BIDCOR	7	Bidens coronata	TALL SWAMP MARIGOLD	A-FORB	-5	OBL	ASTERACEAE
BIDDIS	6	Bidens discoidea	SWAMP BEGGAR'S TICKS	A-FORB	-3	FACW	ASTERACEAE
BIDFRO	1	Bidens frondosa	COMMON BEGGAR'S TICKS	A-FORB	-3	FACW	ASTERACEAE
BIDTRI	2	Bidens tripartita	SWAMP TICKSEED	A-FORB	-5	OBL	ASTERACEAE
BIDVUL	0	Bidens vulgata	TALL BEGGAR'S TICKS	A-FORB	-3	FACW	ASTERACEAE
BIGCAP	8	Bignonia capreolata	CROSS VINE	W-VINE	-3	FACW	BIGNONIACEAE
BLECIL	6	Blephilia ciliata	OHIO HORSE MINT	P-FORB	5	UPL	LAMIACEAE
BLEHIR	5	Blephilia hirsuta	WOOD MINT	P-FORB	4	FACU-	LAMIACEAE
BOECYC	3	Boehmeria cylindrica	FALSE NETTLE	P-FORB	-5	OBL	URTICACEAE
BOECYD	3	Boehmeria cylindrica v. drummondiana	ROUGH FALSE NETTLE	P-FORB	-5	OBL	URTICACEAE
BOLAST	5	Boltonia asteroides	FALSE ASTER	P-FORB	-3	FACW	ASTERACEAE
BOLDEC	4	Boltonia decurrens	ILLINOIS FALSE ASTER	P-FORB	-5	OBL	ASTERACEAE
BOLDIF	4	Boltonia diffusa	FALSE ASTER	P-FORB	-3	FACW	ASTERACEAE
BOROFF	*	BORAGO OFFICINALIS	BORAGE	A-FORB	5	UPL	BORAGINACEAE
BOTSAC	*	BOTHRIOCHLOA SACCHAROIDES	SILVER BEARDGRASS	P-GRASS	5	UPL	POACEAE
BOTBIT	7	Botrychium biternatum	SOUTHERN GRAPE FERN	FERN	1	FAC-	OPHIOGLOSSACEAE
BOTDID	6	Botrychium dissectum	BRONZE FERN	FERN	0	FAC	OPHIOGLOSSACEAE
BOTDIO	4	Botrychium dissectum v. obliquum	BRONZE FERN	FERN	0	FAC	OPHIOGLOSSACEAE
BOTMAT	10	Botrychium matricariaefolium	DAISY-LEAF GRAPE FERN	FERN	3	FACU	OPHIOGLOSSACEAE
BOTMUL	10	Botrychium multifidum	NORTHERN GRAPE FERN	FERN	3	FACU	OPHIOGLOSSACEAE
BOTONE	10	Botrychium oneidense	ONEIDA GRAPE FERN	FERN	5	UPL	OPHIOGLOSSACEAE
BOTSIM	4	Botrychium simplex	DWARF GRAPE FERN	FERN	0	FAC	OPHIOGLOSSACEAE
BOTVIR	4	Botrychium virginianum	RATTLESNAKE FERN	FERN	3	FACU	OPHIOGLOSSACEAE
BOUCUR	7	Bouteloua curtipendula	SIDE-OATS GRAMA	P-GRASS	5	UPL	POACEAE
BOUGRA	5	Bouteloua gracilis	BLUE GRAMA	P-GRASS	5	UPL	POACEAE
BOUHIR	9	Bouteloua hirsuta	HAIRY GRAMA	P-GRASS	5	UPL	POACEAE
BRAERE	7	Brachyelytrum erectum	LONG-AWNED WOOD GRASS	P-GRASS	5	UPL	POACEAE
BRASCH	7	Brasenia schreberi	WATERSHIELD	P-FORB	-5	OBL	CABOMBACEAE
BRAHIR	*	BRASSICA HIRTA	WHITE MUSTARD	A-FORB	5	UPL	BRASSICACEAE
BRAJUN	*	BRASSICA JUNCEA	INDIAN MUSTARD	A-FORB	5	UPL	BRASSICACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
BRAKAB	0	Brassica kaber	CHARLOCK	A-FORB	5	UPL	BRASSICACEAE
BRANAP	*	BRASSICA NAPUS	TURNIP	A-FORB	5	UPL	BRASSICACEAE
BRANIG	*	BRASSICA NIGRA	BLACK MUSTARD	A-FORB	5	UPL	BRASSICACEAE
BRAOLE	*	BRASSICA OLERACEA	MUSTARD	A-FORB	5	UPL	BRASSICACEAE
BRARAP	*	BRASSICA RAPA	BIRD'S RAPE	A-FORB	5	UPL	BRASSICACEAE
BRIEUP	6	Brickellia eupatorioides	FALSE BONESET	P-FORB	5	UPL	ASTERACEAE
BRIMAX	*	BRIZA MAXIMA	BIG QUAKING GRASS	A-GRASS	5	UPL	POACEAE
BROARV	*	BROMUS ARVENSIS	CHESS	P-GRASS	5	UPL	POACEAE
BROBRI	*	BROMUS BRIZAEFORMIS	RATTLESNAKE CHESS	A-GRASS	5	UPL	POACEAE
BROCAR	*	BROMUS CARINATUS	CALIFORNIA BROME	P-GRASS	5	UPL	POACEAE
BROCAT	*	BROMUS CATHARTICUS	RESCUE GRASS	A-GRASS	5	UPL	POACEAE
BROCIL	10	Bromus ciliatus	FRINGED BROME	P-GRASS	-5	OBL	POACEAE
BROCOM	*	BROMUS COMMUTATUS	HAIRY BROME	A-GRASS	5	UPL	POACEAE
BROERE	*	BROMUS ERECTUS	ERECT BROME GRASS	P-GRASS	5	UPL	POACEAE
BROHOR	*	BROMUS HORDEACEUS	SOFT CHESS	A-GRASS	5	UPL	POACEAE
BROINE	*	BROMUS INERMIS	HUNGARIAN BROME	P-GRASS	5	UPL	POACEAE
BROJAP	*	BROMUS JAPONICUS	JAPANESE CHESS	A-GRASS	3	FACU	POACEAE
BROKAL	10	Bromus kalmii	PRAIRIE BROME	P-GRASS	0	FAC	POACEAE
BROMAR	*	BROMUS MARGINATUS	MOUNTAIN BROME	P-GRASS	5	UPL	POACEAE
BRONOT	10	Bromus nottowayanus	WOODLAND BROME	P-GRASS	3	FACU	POACEAE
BROPUB	5	Bromus pubescens	WOODLAND BROME	P-GRASS	2	FACU+	POACEAE
BROPUR	7	Bromus purgans	EAR-LEAVED BROME	P-GRASS	-2	FACW-	POACEAE
BRORAC	*	BROMUS RACEMOSUS	SMOOTH CHESS	A-GRASS	5	UPL	POACEAE
BROSEC	*	BROMUS SECALINUS	CHEAT GRASS	A-GRASS	5	UPL	POACEAE
BROSQU	*	BROMUS SQUARROSUS	NODDING BROME	A-GRASS	5	UPL	POACEAE
BROSTE	*	BROMUS STERILIS	POVERTY BROME	A-GRASS	5	UPL	POACEAE
BROTEC	*	BROMUS TECTORUM	CHEAT GRASS	A-GRASS	5	UPL	POACEAE
BROPAP	*	BROUSSONETIA PAPYRIFERA	PAPER MULBERRY	TREE	5	UPL	MORACEAE
BRUOVA	7	Brunnichia ovata	BUCKWHEAT VINE	W-VINE	-3	FACW	POLYGONACEAE
BUCDAC	*	BUCHLOE DACTYLOIDES	BUFFALO GRASS	P-GRASS	4	FACU-	POACEAE
BUCAME	10	Buchnera americana	BLUE HEARTS	P-FORB	1	FAC-	SCROPHULARIACEAE
BUGARV	*	BUGLOSSOIDES ARVENSE	CORN GROMWELL	A-FORB	5	UPL	BORAGINACEAE
BULCAP	4	Bulbostylis capillaris	HAIR SEDGE	A-SEDGE	2	FACU+	CYPERACEAE
BUMLAN	10	Bumelia lanuginosa	CHITTAM WOOD	TREE	3	FACU	SAPOTACEAE
BUMLYC	10	Bumelia lycioides	SOUTHERN BUCKTHORN	SHRUB	-3	FACW	SAPOTACEAE
BUPROT	*	BUPLEURUM ROTUNDIFOLIUM	THOROUGHWAX	A-FORB	5	UPL	APIACEAE
BUTUMB	*	BUTOMUS UMBELLATUS	FLOWERING RUSH	P-FORB	-5	OBL	BUTOMACEAE
CABCAR	8	Cabomba caroliniana	CABOMBA	P-FORB	-5	OBL	CABOMBACEAE
CACATR	5	Cacalia atriplicifolia	PALE INDIAN PLANTAIN	P-FORB	5	UPL	ASTERACEAE
CACMUH	10	Cacalia muhlenbergii	GREAT INDIAN PLANTAIN	P-FORB	5	UPL	ASTERACEAE
CACPLA	10	Cacalia plantaginea	PRAIRIE INDIAN PLANTAIN	P-FORB	0	FAC	ASTERACEAE
CACSUA	10	Cacalia suaveolens	SWEET INDIAN PLANTAIN	P-FORB	-5	OBL	ASTERACEAE
CAKLAC	9	Cakile edentula v. lacustris	SEA ROCKET	A-FORB	3	FACU	BRASSICACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
CALCAN	3	Calamagrostis canadensis	BLUE JOINT GRASS	P-GRASS	-5	OBL	POACEAE
CALEPI	*	CALAMAGROSTIS EPIGEIOS	FEATHERTOP	P-GRASS	-5	OBL	POACEAE
CALINE	5	Calamagrostis inexpansa v. brevior	BOG REED GRASS	P-GRASS	-4	FACW+	POACEAE
CALNEG	*	CALAMAGROSTIS NEGLECTA	REED-BENT GRASS	P-GRASS	-4	FACW+	POACEAE
CALARK	8	Calamintha arkansana	LOW CALAMINT	P-FORB	-3	FACW	LAMIACEAE
CALLON	8	Calamovilfa longifolia	SAND REED	P-GRASS	5	UPL	POACEAE
CALLPA	10	Calla palustris	WATER ARUM	P-FORB	-5	OBL	ARACEAE
CALALC	5	Callirhoe alcaeoides	PALE POPPY MALLOW	P-FORB	5	UPL	MALVACEAE
CALDIG	*	CALLIRHOE DIGITATA	POPPY MALLOW	P-FORB	5	UPL	MALVACEAE
CALINV	*	CALLIRHOE INVOLUCRATA	PURPLE POPPY MALLOW	P-FORB	5	UPL	MALVACEAE
CALTRI	9	Callirhoe triangulata	CLUSTERED POPPY MALLOW	P-FORB	5	UPL	MALVACEAE
CALHET	5	Callitriche heterophylla	LARGE WATER STARWORT	A-FORB	-5	OBL	CALLITRICHACEAE
CALTER	2	Callitriche terrestris	TERRESTRIAL STARWORT	A-FORB	3	FACU	CALLITRICHACEAE
CALVER	5	Callitriche verna	COMMON WATER STARWORT	P-FORB	-5	OBL	CALLITRICHACEAE
CALTUB	10	Calopogon tuberosus	GRASS PINK ORCHID	P-FORB	-5	OBL	ORCHIDACEAE
CALTPA	7	Caltha palustris	COWSLIP	P-FORB	-5	OBL	RANUNCULACEAE
CALFLO	*	CALYCANTHUS FLORIDUS	STRAWBERRY-SHRUB	SHRUB	5	UPL	CALYCANTHACEAE
CALLYO	7	Calycocarpum lyonii	CUPSEED	W-VINE	-3	FACW	MENISPERMACEAE
CALSER	*	CALYLOPHUS SERRULATUS	TOOTHED EVENING PRIMROSE	SHRUB	5	UPL	ONAGRACEAE
CALPUB	*	CALYSTEGIA PUBESCENS	CALIFORNIA ROSE	P-FORB	5	UPL	CONVOLVULACEAE
CALSEP	1	Calystegia sepium	AMERICAN BINDWEED	P-FORB	0	FAC	CONVOLVULACEAE
CALSPI	10	Calystegia spithamaea	DWARF BINDWEED	P-FORB	5	UPL	CONVOLVULACEAE
CAMANG	7	Camassia angusta	WILD HYACINTH	P-FORB	5	UPL	LILIACEAE
CAMSCI	7	Camassia scilloides	WILD HYACINTH	P-FORB	-1	FAC+	LILIACEAE
CAMMIC	*	CAMELINA MICROCARPA	SMALL-FRUITED FALSE FLAX	A-FORB	5	UPL	BRASSICACEAE
CAMSAT	*	CAMELINA SATIVA	FALSE FLAX	A-FORB	5	UPL	BRASSICACEAE
CAMAME	4	Campanula americana	AMERICAN BELLFLOWER	A-FORB	0	FAC	CAMPANULACEAE
CAMAPA	8	Campanula aparinoides	MARSH BELLFLOWER	P-FORB	-5	OBL	CAMPANULACEAE
CAMGLO	*	CAMPANULA GLOMERATA	CLUSTERED BELLFLOWER	P-FORB	5	UPL	CAMPANULACEAE
CAMRAP	*	CAMPANULA RAPUNCULOIDES	EUROPEAN BELLFLOWER	P-FORB	5	UPL	CAMPANULACEAE
CAMROT	8	Campanula rotundifolia	HAREBELL	P-FORB	1	FAC-	CAMPANULACEAE
CAMULI	10	Campanula uliginosa	MARSH BELLFLOWER	P-FORB	-5	OBL	CAMPANULACEAE
CAMRAD	2	Campsis radicans	TRUMPET CREEPER	W-VINE	0	FAC	BIGNONIACEAE
CANENS	*	CANAVALIA ENSIFORMIS	JACK BEAN	A-FORB	5	UPL	FABACEAE
CANSAT	*	CANNABIS SATIVA	HASHISH	A-FORB	0	FAC	MORACEAE
CAPBUR	*	CAPSELLA BURSA-PASTORIS	SHEPHERD'S PURSE	A-FORB	1	FAC-	BRASSICACEAE
CARARB	*	CARAGANA ARBORESCENS	PEA TREE	SHRUB	5	UPL	FABACEAE
CARBUL	5	Cardamine bulbosa	BULB BITTERCRESS	P-FORB	-5	OBL	BRASSICACEAE
CARDOU	6	Cardamine douglassii	NORTHERN BITTER CRESS	P-FORB	-3	FACW	BRASSICACEAE
CARHIR	*	CARDAMINE HIRSUTA	HAIRY BITTER CRESS	A-FORB	3	FACU	BRASSICACEAE
CARPAR	2	Cardamine parviflora v. arenicola	SMALL-FLOWERED BITTER CRESS	A-FORB	0	FAC	BRASSICACEAE
CARPEN	3	Cardamine pensylvanica	BITTER CRESS	B-FORB	-4	FACW+	BRASSICACEAE
CARPRA	10	Cardamine pratensis v. palustris	CUCKOO FLOWER	P-FORB	-5	OBL	BRASSICACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
CARDRA	*	CARDARIA DRABA	HOARY CRESS	P-FORB	5	UPL	BRASSICACEAE
CARHAL	*	CARDIOSPERMUM HALICACABUM	LOVE-IN-A-PUSS	A-FORB	0	FAC	SAPINDACEAE
CARACA	*	CARDUUS ACANTHOIDES	ACANTHUS BRISTLE THISTLE	B-FORB	5	UPL	ASTERACEAE
CARNUT	*	CARDUUS NUTANS	MUSK BRISTLE THISTLE	B-FORB	5	UPL	ASTERACEAE
CXAGGR	4	Carex aggregata	SMOOTH CLUSTERED SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXALAT	10	Carex alata	WINGED OVAL SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXALBO	9	Carex albolutescens	LONG-FRUITED OVAL SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXALBU	7	Carex albursina	BLUNT-SCALED WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXALOP	4	Carex alopecoidea	BROWN-HEADED FOX SEDGE	P-SEDGE	-4	FACW +	CYPERACEAE
CXAMPH	7	Carex amphibola	GRAY SEDGE	P-SEDGE	-1	FAC +	CYPERACEAE
CXANNA	3	Carex annectens	LARGE YELLOW FOX SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXANNX	3	Carex annectens v. xanthocarpa	SMALL YELLOW FOX SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXARKA	8	Carex arkansana	ARKANSAS SEDGE	P-SEDGE	3	FACU	CYPERACEAE
CXARTI	5	Carex artitecta	BLUNT-SCALED OAK SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXATHE	6	Carex atherodes	HAIRY-LEAVED LAKE SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXAURE	9	Carex aurea	GOLDEN SEDGE	P-SEDGE	-4	FACW +	CYPERACEAE
CXBEBB	8	Carex bebbii	BEBB'S OVAL SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXBICK	8	Carex bicknellii	BICKNELL'S SEDGE	P-SEDGE	1	FAC-	CYPERACEAE
CXBLAN	2	Carex blanda	COMMON WOOD SEDGE	P-SEDGE	0	FAC	CYPERACEAE
CXBREV	4	Carex brevior	PLAINS OVAL SEDGE	P-SEDGE	0	FAC	CYPERACEAE
CXBROM	10	Carex bromoides	BROME HUMMOCK SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXBRUN	10	Carex brunnescens v. sphaerostachya	GREEN BOG SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXBUSH	4	Carex bushii	LONG-SCALED GREEN SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXBUXB	9	Carex buxbaumii	DARK-SCALED SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXCANE	10	Carex canescens v. disjuncta	GRAY BOG SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXCARE	10	Carex careyana	CAREY'S WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXCARO	7	Carex caroliniana	SHORT-SCALED GREEN SEDGE	P-SEDGE	0	FAC	CYPERACEAE
CXCEPD	5	Carex cephaloidea	ROUGH CLUSTERED SEDGE	P-SEDGE	2	FACU +	CYPERACEAE
CXCEPP	3	Carex cephalophora	SHORT-HEADED BRACTED SEDGE	P-SEDGE	3	FACU	CYPERACEAE
CXCHOR	10	Carex chordorrhiza	CORDROOT SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXCOMM	9	Carex communis	COMMON BEECH SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXCOMO	6	Carex comosa	BRISTLY SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXCONJ	5	Carex conjuncta	GREEN-HEADED FOX SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXCONO	10	Carex conoidea	PRAIRIE GRAY SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXCRAE	7	Carex crawei	EARLY FEN SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXCRAF	7	Carex crawfordii	CRAWFORD'S OVAL SEDGE	P-SEDGE	-1	FAC +	CYPERACEAE
CXCRIN	8	Carex crinita	FRINGED SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXCRIS	3	Carex cristatella	CRESTED OVAL SEDGE	P-SEDGE	-4	FACW +	CYPERACEAE
CXCRUS	6	Carex crus-corvi	CROWFOOT FOX SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXCRYP	9	Carex cryptolepis	SMALL YELLOW SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXCUMU	10	Carex cumulata	CROWDED OVAL SEDGE	P-SEDGE	4	FACU-	CYPERACEAE
CXDAVI	3	Carex davisii	AWNED GRACEFUL SEDGE	P-SEDGE	-1	FAC +	CYPERACEAE
CXDEBI	10	Carex debilis	WEAK SEDGE	P-SEDGE	-3	FACW	CYPERACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
CXDECO	10	Carex decomposita	BROAD-LEAVED PANICLED SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXDIAN	10	Carex diandra	BOG PANICLED SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXDIGI	8	Carex digitalis	NARROW-LEAVED WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXDISP	10	Carex disperma	TWO-SEEDED SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXEBUR	9	Carex eburnea	IVORY SEDGE	P-SEDGE	4	FACU-	CYPERACEAE
CXECHI	10	Carex echinata	LARGE-FRUITED STAR SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXEMMO	10	Carex emmonsii	SHARP-SCALED OAK SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXEMOR	6	Carex emoryi	RIVERBANK SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXFEST	6	Carex festucacea	FESCUE OVAL SEDGE	P-SEDGE	0	FAC	CYPERACEAE
CXFLAC	10	Carex flaccosperma	PALE GRAY SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXFOEN	7	Carex foenea	RUNNING SAVANNA SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXFORM	10	Carex formosa	AWNLESS GRACEFUL SEDGE	P-SEDGE	-4	FACW +	CYPERACEAE
CXFRAN	4	Carex frankii	BRISTLY CATTAIL SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXGARB	10	Carex garberi	FALSE GOLDEN SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXGIGA	10	Carex gigantea	GREATER HOP SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXGLAU	5	Carex glaucodea	BLUE SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXGRAS	7	Carex gracilescens	SLENDER WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXGRAM	9	Carex gracillima	PURPLE-SHEATHED	P-SEDGE	3	FACU	CYPERACEAE
CXGRNG	2	Carex granularis	PALE SEDGE	P-SEDGE	-4	FACW +	CYPERACEAE
CXGRAH	2	Carex granularis v. haleana	PALE SEDGE	P-SEDGE	-4	FACW +	CYPERACEAE
CXGRVG	4	Carex gravida	LONG-AWNED BRACTED SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXGRAL	4	Carex gravida v. lunelliana	LONG-AWNED BRACTED SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXGRAY	6	Carex grayi	COMMON BUR SEDGE	P-SEDGE	-4	FACW +	CYPERACEAE
CXGRIS	3	Carex grisea	WOOD GRAY SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXHAYD	7	Carex haydenii	LONG-SCALED TUSSOCK SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXHIRS	5	Carex hirsutella	HAIRY GREEN SEDGE	P-SEDGE	4	FACU-	CYPERACEAE
CXHIRT	6	Carex hirtifolia	HAIRY WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXHITC	10	Carex hitchcockiana	HAIRY GRAY SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXHYAL	4	Carex hyalinolepis	SOUTHERN LAKE SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXHYST	6	Carex hystericina	PORCUPINE SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXINCO	10	Carex incomperta	ATLANTIC STAR SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXINTE	8	Carex interior	PRAIRIE STAR SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXINTU	9	Carex intumescens	SHINING BUR SEDGE	P-SEDGE	-4	FACW +	CYPERACEAE
CXJAME	4	Carex jamesii	GRASS SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXLACU	6	Carex lacustris	COMMON LAKE SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXLAEC	10	Carex laeviconica	LONG-TOOTHED LAKE SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXLAEG	7	Carex laevivaginata	SMOOTH-SHEATHED LAKE SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXLANU	4	Carex lanuginosa	WOOLY SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXLASI	10	Carex lasiocarpa	NARROW-LEAVED WOOLLY SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXLAXC	8	Carex laxiculmis	WEAK-STEMMED WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXLAXF	10	Carex laxiflora	BEECH WOOD SEDGE	P-SEDGE	0	FAC	CYPERACEAE
CXLEAV	2	Carex leavenworthii	DWARF BRACTED SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXLEPT	10	Carex leptalea	SLENDER SEDGE	P-SEDGE	-5	OBL	CYPERACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
CXLIMO	10	Carex limosa	MUCK SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXLONG	8	Carex longii	ROUND-SHOULDERED OVAL SEDGE	P-SEDGE	0	FAC	CYPERACEAE
CXLOUI	9	Carex louisianica	SOUTHERN HOP SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXLUPF	5	Carex lupuliformis	KNOBBED HOP SEDGE	P-SEDGE	-4	FACW +	CYPERACEAE
CXLUPN	5	Carex lupulina	COMMON HOP SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXLURI	7	Carex lurida	BOTTLEBRUSH SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXMEAD	6	Carex meadii	MEAD'S STIFF SEDGE	P-SEDGE	4	FACU-	CYPERACEAE
CXMOLE	2	Carex molesta	FIELD OVAL SEDGE	P-SEDGE	0	FAC	CYPERACEAE
CXMUHM	5	Carex muhlenbergii	SAND BRACTED SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXMUHE	5	Carex muhlenbergii v. enervis	SAND BRACTED SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXMUSK	6	Carex muskingumensis	SWAMP OVAL SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXNEBR	*	CAREX NEBRASKENSIS	PLAINS TUSSOCK SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXNIGR	10	Carex nigromarginata	DARK BRACTED OAK SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXNORM	4	Carex normalis	SPREADING OVAL SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXOLIC	5	Carex oligocarpa	FEW-FRUITED GRAY SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXOLIS	10	Carex oligosperma	RUNNING BOG SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXOXYL	10	Carex oxylepis	SHORT-STALKED GRACEFUL SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXPALL	10	Carex pallescens	PALE GREEN SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXPEDU	10	Carex pedunculata	LONG-STALKED HUMMOCK SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXPENP	5	Carex pensylvanica	PENNSYLVANIA OAK SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXPEND	5	Carex pensylvanica v. distans	PENNSYLVANIA OAK SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXPHYS	10	Carex physorhyncha	SLENDER OAK SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXPLAN	10	Carex plantaginea	PLANTAIN-LEAVED WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXPLAT	10	Carex platyphylla	BROAD-LEAVED WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXPRAE	*	CAREX PRAEGRACILIS	EXPRESSWAY SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXPRAI	10	Carex prairea	FEN PANICLED SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXPRAS	10	Carex prasina	LEEK SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXPRAT	*	CAREX PRATICOLA	LARGE-FRUITED OVAL SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXPROJ	4	Carex projecta	LOOSE-HEADED OVAL SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXRADI	5	Carex radiata	STRAIGHT-STYLED WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXRENI	10	Carex reniformis	GREATER OVAL SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXRETF	5	Carex retroflexa	BENT BRACTED SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXRETS	7	Carex retrorsa	DEFLEXED BOTTLEBRUSH SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXRICS	10	Carex richardsonii	PRAIRIE HUMMOCK SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXRICI	10	Carex richii	AWNED OVAL SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXROSE	5	Carex rosea	CURLY-STYLED WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXSART	5	Carex sartwellii	RUNNING MARSH SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXSCOP	5	Carex scoparia	LANCE-FRUITED OVAL SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXSHOR	4	Carex shortiana	SHORT'S SEDGE	P-SEDGE	-4	FACW +	CYPERACEAE
CXSOCI	10	Carex socialis	CREEPING WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXSPAR	4	Carex sparganioides	LOOSE-HEADED BRACTED SEDGE	P-SEDGE	0	FAC	CYPERACEAE
CXSPIC	*	CAREX SPICATA	SPIKED BRACTED SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXSPRE	8	Carex sprengelii	LONG-BEAKED SEDGE	P-SEDGE	0	FAC	CYPERACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
CXSQUA	5	Carex squarrosa	NARROW-LEAVED CATTAIL SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXSTEN	*	CAREX STENOPHYLLA v. ENERVIS	SPIKERUSH SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXSTER	10	Carex sterilis	FEN STAR SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXSTIP	2	Carex stipata	COMMON FOX SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXSTRT	10	Carex striatula	SOUTHERN WOOD SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXSTRC	5	Carex stricta	COMMON TUSSOCK SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXSUBE	7	Carex suberecta	WEDGE-FRUITED OVAL SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXSUBI	5	Carex ×subimpressa	HYBRID LAKE SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXSUBS	6	Carex substricta	LONG-BRACTED TUSSOCK SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXSWAN	8	Carex swanii	DOWNY GREEN SEDGE	P-SEDGE	3	FACU	CYPERACEAE
CXTENE	5	Carex tenera	NARROW-LEAVED OVAL SEDGE	P-SEDGE	-1	FAC+	CYPERACEAE
CXTETA	5	Carex tetanica	COMMON STIFF SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CXTEXE	6	Carex texensis	TEXAS BRACTED SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXTONS	8	Carex tonsa	SMOOTH-FRUITED OAK SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXTORT	8	Carex torta	BEAKED RIVERBANK SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXTRIB	3	Carex tribuloides	AWL-FRUITED OVAL SEDGE	P-SEDGE	-4	FACW+	CYPERACEAE
CXTRIC	6	Carex trichocarpa	HAIRY-FRUITED LAKE SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXTRIS	10	Carex trisperma	THREE-SEEDED BOG SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXTUCK	10	Carex tuckermanii	BENT-SEEDED HOP SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXTYPH	6	Carex typhina	COMMON CATTAIL SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXUMBE	6	Carex umbellata	EARLY OAK SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXUTRI	9	Carex utriculata	COMMON YELLOW LAKE SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXVESI	9	Carex vesicaria	TUFTED LAKE SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXVIRE	10	Carex virescens	SLENDER GREEN SEDGE	P-SEDGE	3	FACU	CYPERACEAE
CXVIRI	9	Carex viridula	GREEN YELLOW SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXVULP	3	Carex vulpinoidea	BROWN FOX SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
CXWILL	9	Carex willdenowii	WILLDENOW'S GRASS SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CXWOOD	10	Carex woodii	WOOD'S STIFF SEDGE	P-SEDGE	0	FAC	CYPERACEAE
CARCAL	6	Carpinus caroliniana	BLUE BEECH	TREE	0	FAC	CORYLACEAE
CARTIN	*	CARTHAMUS TINCTORIUS	SAFFLOWER	A-FORB	5	UPL	ASTERACEAE
CARCAV	*	CARUM CARVI	CARAWAY	B-FORB	5	UPL	APIACEAE
CARAQU	10	Carya aquatica	WATER HICKORY	TREE	-5	OBL	JUGLANDACEAE
CARCOR	4	Carya cordiformis	BITTERNUT HICKORY	TREE	0	FAC	JUGLANDACEAE
CARGLA	5	Carya glabra	PIGNUT HICKORY	TREE	3	FACU	JUGLANDACEAE
CARILL	6	Carya illinoensis	PECAN	TREE	-3	FACW	JUGLANDACEAE
CARLAC	7	Carya laciniosa	BIG SHELLBARK	TREE	-3	FACW	JUGLANDACEAE
CAROVL	5	Carya ovalis	FALSE SHAGBARK HICKORY	TREE	5	UPL	JUGLANDACEAE
CAROVT	4	Carya ovata	SHAGBARK HICKORY	TREE	3	FACU	JUGLANDACEAE
CARPAL	10	Carya pallida	PALE HICKORY	TREE	5	UPL	JUGLANDACEAE
CARTEX	8	Carya texana	BLACK HICKORY	TREE	5	UPL	JUGLANDACEAE
CARTOM	6	Carya tomentosa	MOCKERNUT HICKORY	TREE	5	UPL	JUGLANDACEAE
CASFAS	1	Cassia fasciculata	GOLDEN CASSIA	A-FORB	4	FACU-	CAESALPINIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
CASHEB	9	Cassia hebecarpa	WILD SENNA	P-FORB	-3	FACW	CAESALPINIACEAE
CASMAR	4	Cassia marilandica	MARYLAND SENNA	P-FORB	-3	FACW	CAESALPINIACEAE
CASNIC	2	Cassia nictitans	WILD SENSITIVE PLANT	A-FORB	4	FACU-	CAESALPINIACEAE
CASOBT	2	Cassia obtusifolia	SICKLEPOD	A-FORB	5	UPL	CAESALPINIACEAE
CASOCC	*	CASSIA OCCIDENTALIS	COFFEE SENNA	A-FORB	5	UPL	CAESALPINIACEAE
CASDEN	9	Castanea dentata	AMERICAN CHESTNUT	TREE	5	UPL	FAGACEAE
CASMOL	*	CASTANEA MOLLISSIMA	CHINESE CHESTNUT	TREE	5	UPL	FAGACEAE
CASCOC	8	Castilleja coccinea	INDIAN PAINTBRUSH	A-FORB	0	FAC	SCROPHULARIACEAE
CASSES	10	Castilleja sessiliflora	DOWNY YELLOW PAINTED CUP	P-FORB	5	UPL	SCROPHULARIACEAE
CATBIG	*	CATALPA BIGNONIODES	COMMON CATALPA	TREE	3	FACU	BIGNONIACEAE
CATSPE	0	Catalpa speciosa	CIGAR TREE	TREE	3	FACU	BIGNONIACEAE
CAUTHA	8	Caulophyllum thalictroides	BLUE COHOSH	P-FORB	5	UPL	BERBERIDACEAE
CEAAME	8	Ceanothus americanus	NEW JERSEY TEA	SHRUB	5	UPL	RHAMNACEAE
CEAHER	9	Ceanothus herbaceus	INLAND NEW JERSEY TEA	SHRUB	5	UPL	RHAMNACEAE
CELORB	*	CELASTRUS ORBICULATUS	ORIENTAL BITTERSWEET	W-VINE	5	UPL	CELASTRACEAE
CELSCA	2	Celastrus scandens	CLIMBING BITTERSWEET	W-VINE	3	FACU	CELASTRACEAE
CELLAE	5	Celtis laevigata	SUGARBERRY	TREE	-3	FACW	ULMACEAE
CELOCC	3	Celtis occidentalis	HACKBERRY	TREE	1	FAC-	ULMACEAE
CELTEN	7	Celtis tenuifolia	DWARF HACKBERRY	SHRUB	5	UPL	ULMACEAE
CENLON	0	Cenchrus longispinus	MAT SANDBUR	A-GRASS	5	UPL	POACEAE
CENAME	*	CENTAUREA AMERICANA	AMERICAN BASKET FLOWER	A-FORB	5	UPL	ASTERACEAE
CENCAL	*	CENTAUREA CALCITRAPA	PURPLE STAR THISTLE	A-FORB	5	UPL	ASTERACEAE
CENCYA	*	CENTAUREA CYANUS	BACHELOR'S BUTTON	A-FORB	5	UPL	ASTERACEAE
CENDIF	*	CENTAUREA DIFFUSA	SPREADING STAR THISTLE	A-FORB	5	UPL	ASTERACEAE
CENDUB	*	CENTAUREA DUBIA	TYROL KNAPWEED	P-FORB	5	UPL	ASTERACEAE
CENJAC	*	CENTAUREA JACEA	BROWN KNAPWEED	P-FORB	5	UPL	ASTERACEAE
CENMAC	*	CENTAUREA MACULOSA	SPOTTED CENTAUREA	B-FORB	5	UPL	ASTERACEAE
CENMOS	*	CENTAUREA MOSCHATA	SWEET SULTAN	A-FORB	5	UPL	ASTERACEAE
CENNIG	*	CENTAUREA NIGRA	BLACK KNAPWEED	P-FORB	5	UPL	ASTERACEAE
CENREP	*	CENTAUREA REPENS	RUSSIAN KNAPWEED	P-FORB	5	UPL	ASTERACEAE
CENSOL	*	CENTAUREA SOLSTITIALIS	BARNABY'S THISTLE	A-FORB	5	UPL	ASTERACEAE
CENPUL	*	CENTAURIUM PULCHELLUM	SHOWY CENTAURY	A-FORB	4	FACU-	GENTIANACEAE
CEPOCC	4	Cephalanthus occidentalis	BUTTONBUSH	SHRUB	-5	OBL	RUBIACEAE
CERARV	4	Cerastium arvense	FIELD CHICKWEED	P-FORB	4	FACU-	CARYOPHYLLACEAE
CERBRA	*	CERASTIUM BRACHYPETALUM	SHORT-PEDICELLED CHICKWEED	A-FORB	5	UPL	CARYOPHYLLACEAE
CERDIF	*	CERASTIUM DIFFUSUM	FOUR-PARTED CHICKWEED	A-FORB	5	UPL	CARYOPHYLLACEAE
CERDUB	*	CERASTIUM DUBIUM	THREE-STYLED CHICKWEED	A-FORB	5	UPL	CARYOPHYLLACEAE
CERGLO	*	CERASTIUM GLOMERATUM	CLAMMY CHICKWEED	P-FORB	5	UPL	CARYOPHYLLACEAE
CERNUN	0	Cerastium nutans	NODDING CHICKWEED	A-FORB	2	FACU+	CARYOPHYLLACEAE
CERNUB	0	Cerastium nutans v. brachypodum	SHORT-PEDICELLED CHICKWEED	A-FORB	4	FACU-	CARYOPHYLLACEAE
CERPUM	*	CERASTIUM PUMILUM	CURTIS'S MOUSE-EAR CHICKWEED	A-FORB	5	UPL	CARYOPHYLLACEAE
CERSEM	*	CERASTIUM SEMIDECANDRUM	SMALL MOUSE-EAR CHICKWEED	A-FORB	5	UPL	CARYOPHYLLACEAE
CERVUL	*	CERASTIUM VULGATUM	COMMON MOUSE-EAR CHICKWEED	P-FORB	3	FACU	CARYOPHYLLACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
CERTES	*	CERATOCEPHALUS TESTICULATUS	BUR BUTTERCUP	A-FORB	5	UPL	RANUNCULACEAE
CERDEM	3	Ceratophyllum demersum	COONTAIL	P-FORB	-5	OBL	CERATOPHYLLACEAE
CERMUR	10	Ceratophyllum muricatum	SPINY COONTAIL	P-FORB	-5	OBL	CERATOPHYLLACEAE
CERCAN	3	Cercis canadensis	EASTERN REDBUD	TREE	3	FACU	CAESALPINIACEAE
CHAJAP	*	CHAENOMELES JAPONICA	JAPANESE QUINCE	SHRUB	5	UPL	ROSACEAE
CHAMIN	*	CHAENORRHINUM MINUS	DWARF SNAPDRAGON	A-FORB	5	UPL	SCROPHULARIACEAE
CHAPRC	1	Chaerophyllum procumbens	STREAMBANK CHERVIL	A-FORB	-1	FAC+	APIACEAE
CHATAI	1	Chaerophyllum tainturieri	WILD CHERVIL	A-FORB	2	FACU+	APIACEAE
CHACAL	10	Chamaedaphne calyculata v. angustifolia	LEATHERLEAF	SHRUB	-5	OBL	ERICACEAE
CHALUT	9	Chamaelirium luteum	BLAZING STAR	P-FORB	4	FACU-	LILIACEAE
CHANOB	*	CHAMAEMELUM NOBILE	GARDEN CHAMOMILE	P-FORB	5	UPL	ASTERACEAE
CHAGEY	10	Chamaesyce geyeri	GYERE'S SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
CHAGLY	3	Chamaesyce glyptosperma	SMOOTH CREEPING SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
CHAHUM	1	Chamaesyce humistrata	SPREADING SPURGE	A-FORB	-3	FACW	EUPHORBIACEAE
CHAMAC	0	Chamaesyce maculata	NODDING SPURGE	A-FORB	4	FACU-	EUPHORBIACEAE
CHAPOL	10	Chamaesyce polygonifolia	SEASIDE SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
CHAPRS	*	CHAMAESYCE PROSTRATA	MATTED SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
CHASEN	2	Chamaesyce serpens	ROUND-LEAVED SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
CHASEL	*	CHAMAESYCE SERPYLLIFOLIA	THYME-LEAVED SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
CHASUP	0	Chamaesyce supina	SPOTTED CREEPING SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
CHAVER	0	Chamaesyce vermiculata	HAIRY SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
CHALAT	4	Chasmanthium latifolium	SEA OATS	P-GRASS	-3	FACW	POACEAE
CHEFEE	8	Cheilanthes feei	BABY LIP FERN	FERN	5	UPL	ADIANTACEAE
CHELAN	7	Cheilanthes lanosa	HAIRY LIP FERN	FERN	5	UPL	ADIANTACEAE
CHEMAJ	*	CHELIDONIUM MAJUS	CELANDINE	B-FORB	5	UPL	PAPAVERACEAE
CHEGLB	7	Chelone glabra	WHITE TURTLEHEAD	P-FORB	-5	OBL	SCROPHULARIACEAE
CHEOBL	8	Chelone obliqua v. speciosa	PINK TURTLEHEAD	P-FORB	-5	OBL	SCROPHULARIACEAE
CHEALB	*	CHENOPODIUM ALBUM	LAMB'S QUARTERS	A-FORB	1	FAC-	CHENOPODIACEAE
CHEAMB	*	CHENOPODIUM AMBROSIOIDES	AMERICAN WORMSEED	A-FORB	1	FAC-	CHENOPODIACEAE
CHEBER	0	Chenopodium berlandieri	GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHEBON	*	CHENOPODIUM BONUS-HENRICUS	GOOD KING HENRY	P-FORB	5	UPL	CHENOPODIACEAE
CHEBOT	*	CHENOPODIUM BOTRYS	JERUSALEM OAK	A-FORB	1	FAC-	CHENOPODIACEAE
CHEBUS	2	Chenopodium bushianum	GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHECAP	*	CHENOPODIUM CAPITATUM	STRAWBERRY BLITE	A-FORB	5	UPL	CHENOPODIACEAE
CHEDES	0	Chenopodium desiccatum v. leptophylloides	NARROW-LEAVED GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHEGIG	3	Chenopodium gigantospermum	MAPLE-LEAVED GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHEGLC	*	CHENOPODIUM GLAUCUM	OAK-LEAVED GOOSEFOOT	A-FORB	-3	FACW	CHENOPODIACEAE
CHEMIS	1	Chenopodium missouriense	MISSOURI GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHEMUR	*	CHENOPODIUM MURALE	NETTLE-LEAVED GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHEPAL	2	Chenopodium pallescens	NARROW-LEAVED GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHEPOL	*	CHENOPODIUM POLYSPERMUM	MANY-SEEDED GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHEPUM	*	CHENOPODIUM PUMILIO	GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHERUB	*	CHENOPODIUM RUBRUM	COAST BLITE	A-FORB	-5	OBL	CHENOPODIACEAE

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CHESTA	3	Chenopodium standleyanum	WOODLAND GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHESTR	0	Chenopodium strictum v. glaucophyllum	GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHEURB	*	CHENOPODIUM URBICUM	CITY GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
CHIMAC	10	Chimaphila maculata	SPOTTED WINTERGREEN	SHRUB	5	UPL	PYROLACEAE
CHIUMB	10	Chimaphila umbellata v. cisatlantica	PIPSISSEWA	SHRUB	5	UPL	PYROLACEAE
CHLGAY	*	CHLORIS GAYANA	FINGER GRASS	P-GRASS	5	UPL	POACEAE
CHLVER	*	CHLORIS VERTICILLATA	WINDMILL GRASS	P-GRASS	5	UPL	POACEAE
CHOTEN	*	CHORISPORA TENELLA	PURPLE ROCKET	A-FORB	5	UPL	BRASSICACEAE
CICINT	*	CICHORIUM INTYBUS	CHICKORY	P-FORB	5	UPL	ASTERACEAE
CICBUL	9	Cicuta bulbifera	BULBLET-BEARING WATER HEMLOCK	P-FORB	-5	OBL	APIACEAE
CICMAC	4	Cicuta maculata	WATER HEMLOCK	B-FORB	-5	OBL	APIACEAE
CIMAME	10	Cimicifuga americana	AMERICAN BUGBANE	P-FORB	5	UPL	RANUNCULACEAE
CIMRAC	10	Cimicifuga racemosa	FALSE BUGBANE	P-FORB	0	FAC	RANUNCULACEAE
CIMRUB	10	Cimicifuga rubifolia	BLACK COHOSH	P-FORB	5	UPL	RANUNCULACEAE
CINARU	5	Cinna arundinacea	COMMON WOOD REED	P-GRASS	-3	FACW	POACEAE
CINLAT	10	Cinna latifolia	DROOPING WOOD REED	P-GRASS	-4	FACW +	POACEAE
CIRALP	5	Circaea alpina	SMALL ENCHANTER'S NIGHTSHADE	P-FORB	-3	FACW	ONAGRACEAE
CIRLUT	2	Circaea lutetiana v. canadensis	ENCHANTER'S NIGHTSHADE	P-FORB	3	FACU	ONAGRACEAE
CIRALT	3	Cirsium altissimum	TALL THISTLE	P-FORB	5	UPL	ASTERACEAE
CIRARV	*	CIRSIUM ARVENSE	FIELD THISTLE	P-FORB	3	FACU	ASTERACEAE
CIRCAR	8	Cirsium carolinianum	CAROLINA THISTLE	B-FORB	5	UPL	ASTERACEAE
CIRDIS	3	Cirsium discolor	PASTURE THISTLE	B-FORB	5	UPL	ASTERACEAE
CIRMUT	9	Cirsium muticum	FEN THISTLE	B-FORB	-5	OBL	ASTERACEAE
CIRPIT	10	Cirsium pitcheri	DUNE THISTLE	B-FORB	5	UPL	ASTERACEAE
CIRPUM	7	Cirsium pumilum	HILL'S THISTLE	P-FORB	5	UPL	ASTERACEAE
CIRUND	*	CIRSIUM UNDULATUM	WAVY-LEAVED THISTLE	P-FORB	1	FAC-	ASTERACEAE
CIRVUL	*	CIRSIUM VULGARE	BULL THISTLE	B-FORB	4	FACU-	ASTERACEAE
CITLAN	*	CITRULLUS LANATUS	WATERMELON	H-VINE	5	UPL	CUCURBITACEAE
CLAMAR	10	Cladium mariscoides	TWIG RUSH	P-SEDGE	-5	OBL	CYPERACEAE
CLALUT	10	Cladrastis lutea	YELLOWWOOD	TREE	5	UPL	FABACEAE
CLAVIR	1	Claytonia virginica	SPRING BEAUTY	P-FORB	3	FACU	PORTULACACEAE
CLECRI	10	Clematis crispa	BLUE JASMINE	W-VINE	-5	OBL	RANUNCULACEAE
CLEOCC	10	Clematis occidentalis	MOUNTAIN CLEMATIS	W-VINE	5	UPL	RANUNCULACEAE
CLEPIT	4	Clematis pitcheri	LEATHER FLOWER	W-VINE	3	FACU	RANUNCULACEAE
CLETER	*	CLEMATIS TERNIFLORA	VIRGIN'S BOWER	W-VINE	5	UPL	RANUNCULACEAE
CLEVIO	10	Clematis viorna	LEATHERFLOWER	W-VINE	5	UPL	RANUNCULACEAE
CLEVIR	3	Clematis virginiana	VIRGIN'S BOWER	W-VINE	0	FAC	RANUNCULACEAE
CLEHAS	*	CLEOME HASSLERIANA	SPIDER FLOWER	A-FORB	5	UPL	CAPPARIDACEAE
CLESER	*	CLEOME SERRULATA	PINK CLEOME	A-FORB	5	UPL	CAPPARIDACEAE
CLIVUL	*	CLINOPODIUM VULGARE	DOGMINT	P-FORB	5	UPL	LAMIACEAE
CLIBOR	10	Clintonia borealis	BLUEBEAD	P-FORB	-1	FAC +	LILIACEAE
CLIMAR	9	Clitoria mariana	BUTTERFLY PEA	P-FORB	5	UPL	FABACEAE
CNIBEN	*	CNICUS BENEDICTUS	BLESSED THISTLE	A-FORB	5	UPL	ASTERACEAE

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COCCAR	6	Cocculus carolinus	SNAILSEED	W-VINE	0	FAC	MENISPERMACEAE
COEVIR	8	Coeloglossum viride	BRACTED GREEN ORCHID	P-FORB	0	FAC	ORCHIDACEAE
COIMON	*	COINCYA MONENSIS	WALLFLOWER CABBAGE	B-FORB	5	UPL	BRASSICACEAE
COLVER	5	Collinsia verna	BLUE-EYED MARY	A-FORB	3	FACU	SCROPHULARIACEAE
COLVIO	7	Collinsia violacea	VIOLET COLLINSIA	A-FORB	5	UPL	SCROPHULARIACEAE
COLCAN	9	Collinsonia canadensis	CITRONELLA HORSE BALM	P-FORB	0	FAC	LAMIACEAE
COLLIN	*	COLLOMIA LINEARIS	SLENDERLEAF COLLOMIA	A-FORB	3	FACU	POLEMONIACEAE
COMUMB	6	Comandra umbellata	BASTARD TOAD-FLAX	P-FORB	3	FACU	SANTALACEAE
COMCOM	*	COMMELINA COMMUNIS	COMMON DAY FLOWER	A-FORB	0	FAC	COMMELINACEAE
COMDIF	3	Commelina diffusa	DAY FLOWER	A-FORB	-3	FACW	COMMELINACEAE
COMERE	5	Commelina erecta	DAY FLOWER	P-FORB	5	UPL	COMMELINACEAE
COMVIR	5	Commelina virginica	DAY FLOWER	P-FORB	-3	FACW	COMMELINACEAE
COMPER	9	Comptonia peregrina	SWEET FERN	SHRUB	5	UPL	MYRICACEAE
CONCHI	10	Conioselinum chinense	HEMLOCK PARSLEY	P-FORB	-3	FACW	APIACEAE
CONMAC	*	CONIUM MACULATUM	POISON HEMLOCK	B-FORB	-3	FACW	APIACEAE
CONAME	10	Conopholis americana	CANCER ROOT	P-FORB	5	UPL	OROBANCHACEAE
CONORI	*	CONRINGIA ORIENTALIS	HARE'S EAR MUSTARD	A-FORB	-4	FACW +	BRASSICACEAE
CONAMB	*	CONSOLIDA AMBIGUA	ROCKET LARKSPUR	A-FORB	5	UPL	RANUNCULACEAE
CONREG	*	CONSOLIDA REGALIS	FORKING LARKSPUR	A-FORB	5	UPL	RANUNCULACEAE
CONMAJ	*	CONVALLARIA MAJALIS	LILY-OF-THE-VALLEY	P-FORB	5	UPL	LILIACEAE
CONARV	*	CONVOLVULUS ARVENSIS	FIELD BINDWEED	P-FORB	5	UPL	CONVOLVULACEAE
CONINC	*	CONVOLVULUS INCANUS	NEBRASKA GLORYBIND	P-FORB	5	UPL	CONVOLVULACEAE
CONCAN	0	Conyza canadensis	HORSEWEED	A-FORB	1	FAC-	ASTERACEAE
CONRAM	1	Conyza ramosissima	DWARF FLEABANE	A-FORB	5	UPL	ASTERACEAE
CORMAC	8	Corallorhiza maculata	SPOTTED CORAL ROOT	P-FORB	4	FACU-	ORCHIDACEAE
CORODO	6	Corallorhiza odontorhiza	FALL CORAL ROOT	P-FORB	5	UPL	ORCHIDACEAE
CORTRF	10	Corallorhiza trifida	EARLY CORAL ROOT	P-FORB	-2	FACW-	ORCHIDACEAE
CORWIS	7	Corallorhiza wisteriana	CORAL ROOT	P-FORB	2	FACU +	ORCHIDACEAE
CORBAS	*	COREOPSIS BASALIS	GOLDEN WAVE	A-FORB	5	UPL	ASTERACEAE
CORGRA	*	COREOPSIS GRANDIFLORA	LARGE-FLOWERED COREOPSIS	P-FORB	5	UPL	ASTERACEAE
CORLAN	5	Coreopsis lanceolata	SAND COREOPSIS	P-FORB	3	FACU	ASTERACEAE
CORPAL	6	Coreopsis palmata	PRAIRIE COREOPSIS	P-FORB	5	UPL	ASTERACEAE
CORPUB	8	Coreopsis pubescens	STAR TICKSEED	P-FORB	1	FAC-	ASTERACEAE
CORTIN	*	COREOPSIS TINCTORIA	GOLDEN COREOPSIS	A-FORB	1	FAC-	ASTERACEAE
CORTRP	4	Coreopsis tripteris	TALL COREOPSIS	P-FORB	0	FAC	ASTERACEAE
CORSAT	*	CORIANDRUM SATIVUM	CORIANDER	A-FORB	5	UPL	APIACEAE
CORHYS	6	Corispermum hyssopifolium	COMMON BUGSEED	A-FORB	3	FACU	CHENOPODIACEAE
CORNIT	6	Corispermum nitidum	SMALL BUGSEED	A-FORB	5	UPL	CHENOPODIACEAE
CORALT	7	Cornus alternifolia	ALTERNATE-LEAVED DOGWOOD	TREE	5	UPL	CORNACEAE
CORAMO	10	Cornus amomum	SILKY DOGWOOD	SHRUB	-4	FACW +	CORNACEAE
CORCAN	10	Cornus canadensis	BUNCHBERRY	SHRUB	0	FAC	CORNACEAE
CORDRU	2	Cornus drummondii	ROUGH-LEAVED DOGWOOD	SHRUB	0	FAC	CORNACEAE
CORFLO	5	Cornus florida	FLOWERING DOGWOOD	TREE	4	FACU-	CORNACEAE

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CORFOE	7	Cornus foemina	STIFF DOGWOOD	SHRUB	-2	FACW-	CORNACEAE
COROBL	4	Cornus obliqua	PALE DOGWOOD	SHRUB	-5	OBL	CORNACEAE
CORRAC	2	Cornus racemosa	GRAY DOGWOOD	SHRUB	-2	FACW-	CORNACEAE
CORRUG	10	Cornus rugosa	ROUND-LEAVED DOGWOOD	SHRUB	5	UPL	CORNACEAE
CORSTS	4	Cornus stolonifera	RED OSIER DOGWOOD	SHRUB	-3	FACW	CORNACEAE
CORSTB	9	Cornus stolonifera v. baileyi	BAILEY'S DOGWOOD	SHRUB	5	UPL	CORNACEAE
CORVAR	*	CORONILLA VARIA	CROWN VETCH	P-FORB	5	UPL	FABACEAE
CORDID	*	CORONOPUS DIDYMUS	WART CRESS	A-FORB	5	UPL	BRASSICACEAE
CORAUR	5	Corydalis aurea	GOLDEN CORYDALIS	A-FORB	5	UPL	PAPAVERACEAE
CORCAM	5	Corydalis campestris	PLAINS CORYDALIS	B-FORB	5	UPL	PAPAVERACEAE
CORCUR	7	Corydalis curvisiliqua v. grandibracteata	BRACTED CORYDALIS	B-FORB	5	UPL	PAPAVERACEAE
CORFLA	5	Corydalis flavula	PALE CORYDALIS	B-FORB	2	FACU+	PAPAVERACEAE
CORMIM	4	Corydalis micrantha	SLENDER CORYDALIS	B-FORB	5	UPL	PAPAVERACEAE
CORMIA	10	Corydalis micrantha v. australis	HALE'S CORYDALIS	B-FORB	5	UPL	PAPAVERACEAE
CORSEM	9	Corydalis sempervirens	PINK CORYDALIS	B-FORB	5	UPL	PAPAVERACEAE
CORAME	4	Corylus americana	AMERICAN FILBERT	SHRUB	0	FAC	CORYLACEAE
CORROS	8	Corylus rostrata	BEAKED HAZELNUT	SHRUB	5	UPL	CORYLACEAE
COSBIP	*	COSMOS BIPINNATUS	COMMON COSMOS	A-FORB	-2	FACW-	ASTERACEAE
COSSUL	*	COSMOS SULPHUREUS	YELLOW COSMOS	A-FORB	5	UPL	ASTERACEAE
COTMUL	*	COTONEASTER MULTIFLORA	MANY-FLOWERED COTONEASTER	SHRUB	5	UPL	ROSACEAE
CRACAL	5	Crataegus calpodendron	SUGAR HAWTHORN	TREE	5	UPL	ROSACEAE
CRACHR	5	Crataegus chrysocarpa	FIREBERRY HAWTHORN	TREE	5	UPL	ROSACEAE
CRACOA	5	Crataegus coccinea	SCARLET HAWTHORN	TREE	5	UPL	ROSACEAE
CRACOD	5	Crataegus coccinioides	FALSE SCARLET HAWTHORN	TREE	5	UPL	ROSACEAE
CRACRU	2	Crataegus crus-galli	COCK-SPUR HAWTHORN	TREE	0	FAC	ROSACEAE
CRAFLA	5	Crataegus flabellata	LARGE-SEEDED HAWTHORN	TREE	5	UPL	ROSACEAE
CRAINT	5	Crataegus intricata	BILTMORE HAWTHORN	TREE	5	UPL	ROSACEAE
CRAMAR	10	Crataegus marshallii	PARSLEY HAW	TREE	-3	FACW	ROSACEAE
CRAMOL	2	Crataegus mollis	DOWNY HAWTHORN	TREE	-2	FACW-	ROSACEAE
CRAMON	*	CRATAEGUS MONOGYNA	ENGLISH HAWTHORN	TREE	5	UPL	ROSACEAE
CRAPHA	5	Crataegus phaenopyrum	WASHINGTON HAWTHORN	TREE	0	FAC	ROSACEAE
CRAPRU	3	Crataegus pruinosa	FROSTED HAWTHORN	TREE	5	UPL	ROSACEAE
CRAPUN	2	Crataegus punctata	DOTTED HAWTHORN	TREE	5	UPL	ROSACEAE
CRASPA	6	Crataegus spathulata	LITTLEHIP HAWTHORN	TREE	-3	FACW	ROSACEAE
CRASUC	5	Crataegus succulenta	FLESHY HAWTHORN	TREE	5	UPL	ROSACEAE
CRAVIR	5	Crataegus viridis	GREEN THORN	TREE	-3	FACW	ROSACEAE
CRECAP	*	CREPIS CAPILLARIS	HAWK'S BEARD	A-FORB	5	UPL	ASTERACEAE
CREPUL	*	CREPIS PULCHRA	HAWK'S BEARD	A-FORB	5	UPL	ASTERACEAE
CRETEC	*	CREPIS TECTORUM	NARROW-LEAVED HAWK'S BEARD	A-FORB	5	UPL	ASTERACEAE
CROSAG	3	Crotalaria sagittalis	RATTLEBOX	A-FORB	5	UPL	FABACEAE
CROSPE	*	CROTALARIA SPECTABILIS	SHOWY RATTLEBOX	A-FORB	5	UPL	FABACEAE
CROCAP	0	Croton capitatus	HOGWORT	A-FORB	5	UPL	EUPHORBIACEAE
CROGLA	1	Croton glandulosus v. septentrionalis	SAND CROTON	A-FORB	5	UPL	EUPHORBIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
CROLID	*	CROTON LINDHEIMERIANUS	ROUND-LEAVED WOOLLY CROTON	A-FORB	5	UPL	EUPHORBIACEAE
CROMON	2	Croton monanthogynus	PRAIRIE TEA	A-FORB	5	UPL	EUPHORBIACEAE
CROTEX	*	CROTON TEXENSIS	TEXAS CROTON	A-FORB	5	UPL	EUPHORBIACEAE
CROELL	5	Crotonopsis elliptica	RUSHFOIL	A-FORB	5	UPL	EUPHORBIACEAE
CROLIR	8	Crotonopsis linearis	RUSHFOIL	A-FORB	5	UPL	EUPHORBIACEAE
CRYSCH	*	CRYPSIS SCHOENOIDES	FALSE FOXTAIL	A-GRASS	5	UPL	POACEAE
CRYSTE	10	Cryptogramma stelleri	SLENDER CLIFFBRAKE	FERN	3	FACU	ADIANTACEAE
CRYCAN	1	Cryptotaenia canadensis	HONEWORT	P-FORB	0	FAC	APIACEAE
CUCMEL	*	CUCUMIS MELO	MUSKMELON	A-FORB	5	UPL	CUCURBITACEAE
CUCSAT	*	CUCUMIS SATIVUS	CUCUMBER	A-FORB	5	UPL	CUCURBITACEAE
CUCFOE	*	CUCURBITA FOETIDISSIMA	MISSOURI GOURD	H-VINE	5	UPL	CUCURBITACEAE
CUCPEP	*	CUCURBITA PEPO v. OVIFERA	PEAR GOURD	H-VINE	3	FACU	CUCURBITACEAE
CUNORI	5	Cunila origanoides	DITTANY	P-FORB	5	UPL	LAMIACEAE
CUPVIS	4	Cuphea viscosissima	BLUE WAXWEED	A-FORB	3	FACU	LYTHRACEAE
CUSCAM	2	Cuscuta campestris	FIELD DODDER	A-FORB	5	UPL	CUSCUTACEAE
CUSCEP	5	Cuscuta cephalanthi	BUTTONBUSH DODDER	A-FORB	5	UPL	CUSCUTACEAE
CUSCOM	10	Cuscuta compacta	COMPACT DODDER	A-FORB	5	UPL	CUSCUTACEAE
CUSCOR	5	Cuscuta coryli	HAZEL DODDER	A-FORB	5	UPL	CUSCUTACEAE
CUSCUS	5	Cuscuta cuspidata	STALKED DODDER	A-FORB	-4	FACW +	CUSCUTACEAE
CUSGLO	6	Cuscuta glomerata	ROPE DODDER	A-FORB	0	FAC	CUSCUTACEAE
CUSGRO	2	Cuscuta gronovii	COMMON DODDER	A-FORB	-3	FACW	CUSCUTACEAE
CUSIND	5	Cuscuta indecora	FALSE FIELD DODDER	A-FORB	0	FAC	CUSCUTACEAE
CUSPEN	5	Cuscuta pentagona	PRAIRIE DODDER	A-FORB	5	UPL	CUSCUTACEAE
CUSPOL	5	Cuscuta polygonorum	KNOTWEED DODDERE	A-FORB	5	UPL	CUSCUTACEAE
CYCATR	3	Cycloloma atriplicifolium	WINGED PIGWEED	A-FORB	3	FACU	CHENOPODIACEAE
CYDOBL	*	CYDONIA OBLONGA	COMMON QUINCE	TREE	5	UPL	ROSACEAE
CYMMUR	*	CYMBALARIA MURALIS	KENILWORTH IVY	P-FORB	5	UPL	SCROPHULARIACEAE
CYNLAE	1	Cynanchum laeve	BLUE VINE	W-VINE	0	FAC	ASCLEPIADACEAE
CYNNIG	*	CYNANCHUM NIGRUM	BLACK SWALLOW-WORT	P-FORB	5	UPL	ASCLEPIADACEAE
CYNDAC	*	CYNODON DACTYLON	BERMUDA GRASS	P-GRASS	3	FACU	POACEAE
CYNOFF	*	CYNOGLOSSUM OFFICINALE	COMMON HOUND'S TONGUE	B-FORB	5	UPL	BORAGINACEAE
CYNVIR	6	Cynoglossum virginianum	WILD COMFREY	P-FORB	5	UPL	BORAGINACEAE
CYNDIG	9	Cynosciadium digitatum	FALSE COWBANE	A-FORB	-3	FACW	APIACEAE
CYPACU	2	Cyperus acuminatus	SHORT-POINTED FLAT SEDGE	A-SEDGE	-5	OBL	CYPERACEAE
CYPARI	2	Cyperus aristatus	AWNED FLAT SEDGE	A-SEDGE	-5	OBL	CYPERACEAE
CYPCOM	*	CYPERUS COMPRESSUS	FLAT SEDGE	A-SEDGE	-4	FACW +	CYPERACEAE
CYPDEN	0	Cyperus densicaespitosus	TUFTED FLAT SEDGE	A-SEDGE	5	UPL	CYPERACEAE
CYPDIA	7	Cyperus diandrus	UMBRELLA FLAT SEDGE	A-SEDGE	-4	FACW +	CYPERACEAE
CYPENG	7	Cyperus engelmannii	FALSE RUSTY NUT SEDGE	A-SEDGE	-5	OBL	CYPERACEAE
CYPERY	1	Cyperus erythrorhizos	RED-ROOTED NUT SEDGE	A-SEDGE	-5	OBL	CYPERACEAE
CYPESC	0	Cyperus esculentus	FIELD NUT SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CYPFER	1	Cyperus ferruginescens	RUSTY NUT SEDGE	A-SEDGE	-5	OBL	CYPERACEAE
CYPFIN	*	CYPERUS FILICINUS	SLENDER FLAT SEDGE	A-SEDGE	-5	OBL	CYPERACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
CYPFIM	5	Cyperus filiculmis	SLENDER SAND SEDGE	P-SEDGE	4	FACU-	CYPERACEAE
CYPFLA	8	Cyperus flavescens	YELLOW FLAT SEDGE	A-SEDGE	-5	OBL	CYPERACEAE
CYPGRA	8	Cyperus grayioides	GALINGALE	P-SEDGE	5	UPL	CYPERACEAE
CYPHOU	7	Cyperus houghtonii	SMOOTH SAND SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CYPIRI	*	CYPERUS IRIA	BLACK-SEEDED IRIA	A-SEDGE	-3	FACW	CYPERACEAE
CYPLAN	7	Cyperus lancastriensis	LANCASTER UMBRELLA SEDGE	P-SEDGE	1	FAC-	CYPERACEAE
CYPMES	4	Cyperus ×mesochorus	MIDLAND SAND SEDGE	P-SEDGE	5	UPL	CYPERACEAE
CYPOVU	2	Cyperus ovularis	HEDGEHOG CLUB RUSH	P-SEDGE	0	FAC	CYPERACEAE
CYPPSE	5	Cyperus pseudovegetus	FALSE GREEN FLAT SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CYPRET	*	CYPERUS RETRORSUS	FALSE HEDGEHOG CLUB RUSH	P-SEDGE	1	FAC-	CYPERACEAE
CYPRIV	4	Cyperus rivularis	BROOK FLAT SEDGE	A-SEDGE	-4	FACW+	CYPERACEAE
CYPSCH	5	Cyperus schweinitzii	ROUGH SAND SEDGE	P-SEDGE	2	FACU+	CYPERACEAE
CYPSTR	0	Cyperus strigosus	LONGL-SCALED NUT SEDGE	P-SEDGE	-3	FACW	CYPERACEAE
CYPACA	10	Cypripedium acaule	MOCCASIN FLOWER	P-FORB	-3	FACW	ORCHIDACEAE
CYPAND	10	Cypripedium ×andrewsii	HYBRID LADY'S SLIPPERS	P-FORB	-3	FACW	ORCHIDACEAE CYPCAN
	10	Cypripedium candidum	WHITE LADY'S SLIPPER	P-FORB	-5	OBL	ORCHIDACEAE
CYPFAV	10	Cypripedium ×favillianum	HYBRID LADY'S SLIPPERS	P-FORB	-3	FACW	ORCHIDACEAE CYPPAR
	10	Cypripedium parviflorum	SMALL YELLOW LADY'S SLIPPER	P-FORB	-1	FAC+	ORCHIDACEAE
CYPPUB	8	Cypripedium pubescens	LARGE YELLOW LADY'S SLIPPER	P-FORB	-1	FAC+	ORCHIDACEAE
CYPREG	10	Cypripedium reginae	SHOWY LADY'S SLIPPER	P-FORB	-4	FACW+	ORCHIDACEAE
CYSBUL	8	Cystopteris bulbifera	BERRY BLADDER FERN	FERN	-2	FACW-	ASPLENIACEAE
CYSILL	10	Cystopteris ×illinoensis	HYBRID FRAGILE FERN	FERN	3	FACU	ASPLENIACEAE
CYSLAU	10	Cystopteris ×laurentiana	HYBRID FRAGILE FERN	FERN	3	FACU	ASPLENIACEAE
CYSPRO	4	Cystopteris protrusa	HYBRID FRAGILE FERN	FERN	3	FACU	ASPLENIACEAE
CYSTES	9	Cystopteris ×tennesseensis	TENNESSEE FRAGILE FERN	FERN	3	FACU	ASPLENIACEAE
CYSTEU	10	Cystopteris ×tenuis	HYBRID FRAGILE FERN	FERN	3	FACU	ASPLENIACEAE
DACGLO	*	DACTYLIS GLOMERATA	ORCHARD GRASS	P-GRASS	3	FACU	POACEAE
DACAEG	*	DACTYLOCTENIUM AEGYPTIUM	CROWFOOT GRASS	A-GRASS	5	UPL	POACEAE
DALCAN	9	Dalea candida	WHITE PRAIRIE CLOVER	P-FORB	5	UPL	FABACEAE
DALFOL	10	Dalea foliosa	LEAFY PRAIRIE CLOVER	P-FORB	5	UPL	FABACEAE
DALLEP	*	DALEA LEPORINA	FOXTAIL DALEA	A-FORB	5	UPL	FABACEAE
DALPUR	8	Dalea purpurea	PURPLE PRAIRIE CLOVER	P-FORB	5	UPL	FABACEAE
DANSPI	3	Danthonia spicata	POVERTY OAT GRASS	P-GRASS	5	UPL	POACEAE
DASMAC	7	Dasistoma macrophylla	MULLEIN FOXGLOVE	P-FORB	4	FACU-	SCROPHULARIACEAE
DATINN	*	DATURA INNOXIA	ANGEL'S TRUMPET	P-FORB	4	FACU-	SOLANACEAE
DATSTS	*	DATURA STRAMONIUM	JIMSONWEED	A-FORB	4	FACU-	SOLANACEAE
DATSTT	*	DATURA STRAMONIUM v. TATULA	PURPLE JIMSONWEED	A-FORB	4	FACU-	SOLANACEAE
DAUCAR	*	DAUCUS CAROTA	QUEEN ANNE'S LACE	B-FORB	4	FACU-	APIACEAE
DAUPUS	*	DAUCUS PUSILLUS	SMALL WILD CARROT	B-FORB	4	FACU-	APIACEAE
DECVER	8	Decodon verticillatus	SWAMP LOOSESTRIFE	SHRUB	-5	OBL	LYTHRACEAE
DELCAC	10	Delphinium carolinianum v. crispum	WILD BLUE LARKSPUR	P-FORB	5	UPL	RANUNCULACEAE
DELCAP	10	Delphinium carolinianum v. penardii	WILD BLUE LARKSPUR	P-FORB	5	UPL	RANUNCULACEAE
DELTRI	6	Delphinium tricorne	DWARF LARKSPUR	P-FORB	5	UPL	RANUNCULACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
DENPUN	10	Dennstaedtia punctilobula	HAY-SCENTED FERN	FERN	5	UPL	DENNSTAEDTIACEAE
DENDIP	10	Dentaria diphylla	CRINKLEROOT	P-FORB	-1	FAC+	BRASSICACEAE
DENLAC	4	Dentaria laciniata	TOOTHWORT	P-FORB	4	FACU	BRASSICACEAE
DESCES	8	Deschampsia cespitosa v. glauca	TUFTED HAIR GRASS	P-GRASS	-4	FACW+	POACEAE
DESPIP	7	Descurainia pinnata	TANSY MUSTARD	A-FORB	5	UPL	BRASSICACEAE
DESPIB	*	DESCURAINIA PINNATA v. BRACHYCARPA	TANSY MUSTARD	A-FORB	5	UPL	BRASSICACEAE
DESSOP	*	DESCURAINIA SOPHIA	FLIXWEED	A-FORB	5	UPL	BRASSICACEAE
DESILS	4	Desmanthus illinoensis	ILLINOIS BUNDLE FLOWER	P-FORB	1	FAC-	MIMOSACEAE
DESCAD	5	Desmodium canadense	SHOWY TICK TREFOIL	P-FORB	1	FAC-	FABACEAE
DESCAS	4	Desmodium canescens	HOARY TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESCIL	7	Desmodium ciliare	HAIRY TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESCUC	6	Desmodium cuspidatum	BRACTED TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESCUL	6	Desmodium cuspidatum v. longifolium	HAIRY BRACTED TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESGLA	3	Desmodium glabellum	SMOOTH TICK TREFOIL	P-FORB	3	FACU	FABACEAE
DESGLU	3	Desmodium glutinosum	POINTED TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESILE	5	Desmodium illinoense	ILLINOIS TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESLAE	7	Desmodium laevigatum	GLAUCOUS TICK TREFOIL	P-FORB	3	FACU	FABACEAE
DESMAR	6	Desmodium marilandicum	SMALL-LEAVED TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESNUD	5	Desmodium nudiflorum	BARE-STEMMED TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESNUT	9	Desmodium nuttallii	NUTTALL'S TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESOBT	5	Desmodium obtusum	STIFF TICK TREFOIL	P-FORB	3	FACU	FABACEAE
DESPAN	2	Desmodium paniculatum	PANICLED TICK TREFOIL	P-FORB	3	FACU	FABACEAE
DESPAU	8	Desmodium pauciflorum	FEW-FLOWERED TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESROT	9	Desmodium rotundifolium	ROUND-LEAVED TICK TREFOIL	P-FORB	5	UPL	FABACEAE
DESSES	6	Desmodium sessilifolium	SESSILE-LEAVED TICKTREFOIL	P-FORB	5	UPL	FABACEAE
DEUSCA	*	DEUTZIA SCABRA	PRIDE-OF-ROCHESTER	SHRUB	5	UPL	PHILADELPHACEAE
DIAARM	*	DIANTHUS ARMERIA	DEPTFORD PINK	A-FORB	5	UPL	CARYOPHYLLACEAE
DIABAR	*	DIANTHUS BARBATUS	SWEET WILLIAM	P-FORB	5	UPL	CARYOPHYLLACEAE
DIADEL	*	DIANTHUS DELTOIDES	MAIDEN PINK	P-FORB	5	UPL	CARYOPHYLLACEAE
DIAAME	7	Diarrhena americana	BEAK GRASS	P-GRASS	-3	FACW	POACEAE
DICCAN	7	Dicentra canadensis	SQUIRREL CORN	P-FORB	5	UPL	PAPAVERACEAE
DICCUC	5	Dicentra cucullaria	DUTCHMAN'S BREECHES	P-FORB	5	UPL	PAPAVERACEAE
DICEXI	*	DICENTRA EXIMIA	WILD BLEEDING HEART	P-FORB	5	UPL	PAPAVERACEAE
DICBRA	10	Dicliptera brachiata	BRACTED WATER WILLOW	A-FORB	-3	FACW	ACANTHACEAE
DIDDIA	6	Didiplis diandra	WATER PURSLANE	P-FORB	-5	OBL	LYTHRACEAE
DIELON	9	Diervilla lonicera	DWARF HONEYSUCKLE	SHRUB	5	UPL	CAPRIFOLIACEAE
DIGCIL	*	DIGITARIA CILIARIS	CILIATE CRAB GRASS	A-GRASS	3	FACU	POACEAE
DIGFIL	4	Digitaria filiformis	SLENDER CRAB GRASS	A-GRASS	5	UPL	POACEAE
DIGISC	*	DIGITARIA ISCHAEMUM	SMOOTH CRAB GRASS	A-GRASS	3	FACU	POACEAE
DIGSAN	*	DIGITARIA SANGUINALIS	HAIRY CRAB GRASS	A-GRASS	3	FACU	POACEAE
DIGVIL	4	Digitaria villosa	HAIRY FINGER GRASS	A-GRASS	5	UPL	POACEAE
DIOTER	2	Diodia teres	BUTTONWEED	A-FORB	3	FACU	RUBIACEAE
DIOVIG	4	Diodia virginiana	LARGE BUTTONWEED	P-FORB	-3	FACW	RUBIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
DIOBAT	*	DIOSCOREA BATATAS	CHINESE YAM	H-VINE	4	FACU-	DIOSCOREACEAE
DIOQUA	5	Dioscorea quaternata	WILD YAM	H-VINE	3	FACU	DIOSCOREACEAE
DIOVIL	4	Dioscorea villosa	WILD YAM	H-VINE	1	FAC-	DIOSCOREACEAE
DIOVIN	2	Diospyros virginiana	PERSIMMON	TREE	0	FAC	EBENACEAE
DIPMUR	*	DIPLOTAXIS MURALIS	WALL ROCKET	A-FORB	5	UPL	BRASSICACEAE
DIPTEN	*	DIPLOTAXIS TENUIFOLIA	SAND ROCKET	SHRUB	5	UPL	BRASSICACEAE
DIPLAC	*	DIPSACUS LACINIATUS	CUT-LEAVED TEASEL	B-FORB	5	UPL	DIPSACACEAE
DIPSYL	*	DIPSACUS SYLVESTRIS	COMMON TEASEL	B-FORB	5	UPL	DIPSACACEAE
DIRPAL	8	Dirca palustris	LEATHERWOOD	SHRUB	0	FAC	THYMELAEACEAE
DISSTR	*	DISTICHLIS STRICTA	INLAND SALT GRASS	P-GRASS	5	UPL	POACEAE
DODAME	9	Dodecatheon amethystinum	JEWELED SHOOTING STAR	P-FORB	5	UPL	PRIMULACEAE
DODFRE	10	Dodecatheon frenchii	FRENCH'S SHOOTING STAR	P-FORB	5	UPL	PRIMULACEAE
DODMEA	6	Dodecatheon meadia	SHOOTING STAR	P-FORB	3	FACU	PRIMULACEAE
DRABRA	2	Draba brachycarpa	SHORT-FRUITED WHITLOW GRASS	A-FORB	5	UPL	BRASSICACEAE
DRACUN	10	Draba cuneifolia	WEDGE-LEAVED WHITLOW GRASS	A-FORB	5	UPL	BRASSICACEAE
DRANEM	*	DRABA NEMOROSA	WHITLOW GRASS	A-FORB	5	UPL	BRASSICACEAE
DRAREP	3	Draba reptans	COMMON WHITLOW GRASS	A-FORB	5	UPL	BRASSICACEAE
DRAPAR	*	DRACOCEPHALUM PARVIFLORUM	AMERICAN DRAGONHEAD	B-FORB	3	FACU	LAMIACEAE
DRAAMP	*	DRACOPIS AMPLEXICAULIS	ANNUAL BLACK-EYED SUSAN	A-FORB	4	FACU-	ASTERACEAE
DROINT	10	Drosera intermedia	NARROW-LEAVED SUNDEW	P-FORB	-5	OBL	DROSERACEAE
DROROT	10	Drosera rotundifolia	ROUND-LEAVED SUNDEW	P-FORB	-5	OBL	DROSERACEAE
DRYBOO	10	Dryopteris ×boottii	BOOTT'S WOOD FERN	FERN	-3	FACW	ASPLENIACEAE
DRYCAR	6	Dryopteris carthusiana	SPINULOSE WOOD FERN	FERN	5	UPL	ASPLENIACEAE
DRYCEL	10	Dryopteris celsa	LOG FERN	FERN	-5	OBL	ASPLENIACEAE
DRYCLI	,10	Dryopteris ×clintoniana	CLINTON'S WOOD FERN	FERN	-4	FACW+	ASPLENIACEAE DRYCRI
	8	Dryopteris cristata	CRESTED WOOD FERN	FERN	-5	OBL	ASPLENIACEAE
DRYFIL	9	Dryopteris filix-mas	MALE FERN	FERN	5	UPL	ASPLENIACEAE
DRYGOL	10	Dryopteris goldiana	GOLDIE FERN	FERN	0	FAC	ASPLENIACEAE
DRYINT	7	Dryopteris intermedia	COMMON WOOD FERN	FERN	0	FAC	ASPLENIACEAE
DRYMAR	6	Dryopteris marginalis	MARGINAL SHIELD FERN	FERN	3	FACU	ASPLENIACEAE
DRYNEO	10	Dryopteris ×neo-wherryi	HYBRID WOOD FERN	FERN	5	UPL	ASPLENIACEAE
DRYTRI	10	Dryopteris ×triploidea	WOOD FERN	FERN	0	FAC	ASPLENIACEAE
DUCIND	*	DUCHESNEA INDICA	INDIAN STRAWBERRY	P-FORB	4	FACU-	ROSACEAE
DULARU	9	Dulichium arundinaceum	THREE-WAY SEDGE	P-SEDGE	-5	OBL	CYPERACEAE
DYSPAP	*	DYSSODIA PAPPOSA	FETID MARIGOLD	A-FORB	5	UPL	ASTERACEAE
ECHPAL	7	Echinacea pallida	PALE PURPLE CONEFLOWER	P-FORB	5	UPL	ASTERACEAE
ECHPUR	6	Echinacea purpurea	BROAD-LEAVED PURPLE CONEFLOWER	P-FORB	5	UPL	ASTERACEAE
ECHCOL	*	ECHINOCHLOA COLONUM	JUNGLE RICE	A-GRASS	-3	FACW	POACEAE
ECHCRU	*	ECHINOCHLOA CRUSGALLI	BARNYARD GRASS	A-GRASS	-3	FACW	POACEAE
ECHMUR	0	Echinochloa muricata	SPINY BARNYARD GRASS	A-GRASS	-5	OBL	POACEAE
ECHWAL	5	Echinochloa walteri	SALT-MARSH COCKSPUR GRASS	A-GRASS	-5	OBL	POACEAE
ECHLOB	4	Echinocystis lobata	WILD CUCUMBER	H-VINE	-2	FACW-	CUCURBITACEAE
ECHBER	6	Echinodorus berteroi v. lanceolatus	LANCE-LEAVED BURHEAD	P-FORB	-5	OBL	ALISMATACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
ECHCOR	6	Echinodorus cordifolius	CREEPING BURHEAD	P-FORB	-5	OBL	ALISMATACEAE
ECHTEN	10	Echinodorus tenellus v. parvulus	SMALL BURHEAD	P-FORB	-5	OBL	ALISMATACEAE
ECHSPH	*	ECHINOPS SPHAEROCEPHALUS	GLOBE THISTLE	P-FORB	5	UPL	ASTERACEAE
ECHVUL	*	ECHIUM VULGARE	VIPER'S BUGLOSS	B-FORB	5	UPL	BORAGINACEAE
ECLPRO	2	Eclipta prostrata	YERBA DE TAJO	A-FORB	-3	FACW	ASTERACEAE
EGEDEN	*	EGERIA DENSA	GIANT WATERWEED	P-FORB	-5	OBL	HYDROCHARITACEAE
ELAANG	*	ELAEAGNUS ANGUSTIFOLIA	RUSSIAN OLIVE	SHRUB	4	FACU-	ELAEAGNACEAE
ELAMUL	*	ELAEAGNUS MULTIFLORA	OLEASTER	SHRUB	5	UPL	ELAEAGNACEAE
ELAUMB	*	ELAEAGNUS UMBELLATA	AUTUMN OLIVE	SHRUB	5	UPL	ELAEAGNACEAE
ELABRA	10	Elatine brachysperma	WATERWORT	A-FORB	-3	FACW	ELATINACEAE
ELEACI	3	Eleocharis acicularis	NEEDLE SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEELE	8	Eleocharis elliptica	GOLDEN-SEEDED SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEELC	7	Eleocharis elliptica v. compressa	FLAT-STEMMED SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEEQU	10	Eleocharis equisetoides	HORSETAIL SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEERY	3	Eleocharis erythropoda	RED-ROOTED SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEGEN	10	Eleocharis geniculata	KNEE SPIKE RUSH	A-SEDGE	-3	FACW	CYPERACEAE
ELEINT	7	Eleocharis intermedia	MATTED SPIKE RUSH	A-SEDGE	-3	FACW	CYPERACEAE
ELEOBT	2	Eleocharis obtusa	BLUNT SPIKE RUSH	A-SEDGE	-5	OBL	CYPERACEAE
ELEOLI	10	Eleocharis olivacea	WRINKLE-SHEATHED SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEPAL	8	Eleocharis palustris	GREAT SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEPAR	*	ELEOCHARIS PARVULA	DWARF SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEPAU	10	Eleocharis pauciflora	MATTED SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEQUA	6	Eleocharis quadrangulata	ANGLED SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEROS	10	Eleocharis rostellata	WICKET SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELESMA	5	Eleocharis smallii	MARSH SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEVER	7	Eleocharis verrucosa	SLENDER SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELEWOL	9	Eleocharis wolfii	WOLF'S SPIKE RUSH	P-SEDGE	-5	OBL	CYPERACEAE
ELECAR	3	Elephantopus carolinianus	ELEPHANT'S FOOT	P-FORB	1	FAC-	ASTERACEAE
ELEIND	*	ELEUSINE INDICA	CROWFOOT GRASS	A-GRASS	3	FACU	POACEAE
ELLNYC	1	Ellisia nyctelea	AUNT LUCY	A-FORB	-1	FAC+	HYDROPHYLLACEAE
ELOCAN	5	Elodea canadensis	COMMON WATERWEED	P-FORB	-5	OBL	HYDROCHARITACEAE
ELONUT	6	Elodea nuttallii	SLENDER WATERWEED	P-FORB	-5	OBL	HYDROCHARITACEAE
ELYARE	*	ELYMUS ARENARIUS	LYME GRASS	P-GRASS	3	FACU	POACEAE
ELYCAN	4	Elymus canadensis	CANADA WILD RYE	P-GRASS	1	FAC-	POACEAE
ELYHYS	5	Elymus hystrix	BOTTLEBRUSH GRASS	P-GRASS	5	UPL	POACEAE
ELYRIP	6	Elymus riparius	RIVERBANK WILD RYE	P-GRASS	-3	FACW	POACEAE
ELYVIL	4	Elymus villosus	SILKY WILD RYE	P-GRASS	3	FACU	POACEAE
ELYVIR	4	Elymus virginicus	VIRGINIA WILD RYE	P-GRASS	-2	FACW-	POACEAE
EPIVIR	9	Epifagus virginiana	BEECH DROPS	P-FORB	5	UPL	OROBANCHACEAE
EPIREP	10	Epigaea repens	TRAILING ARBUTUS	P-FORB	5	UPL	ERICACEAE
EPIANG	3	Epilobium angustifolium	FIREWEED	P-FORB	0	FAC	ONAGRACEAE
EPICIL	6	Epilobium ciliatum	NORTHERN WILLOW HERB	P-FORB	3	FACU	ONAGRACEAE
EPICOL	3	Epilobium coloratum	CINNAMON WILLOW HERB	P-FORB	-5	OBL	ONAGRACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
EPIHIR	*	EPILOBIUM HIRSUTUM	HAIRY WILLOW HERB	P-FORB	-4	FACW+	ONAGRACEAE
EPILEP	9	Epilobium leptophyllum	FEN WILLOW HERB	P-FORB	-5	OBL	ONAGRACEAE
EPISTR	10	Epilobium strictum	DOWNY WILLOW HERB	P-FORB	-5	OBL	ONAGRACEAE
EPIHEL	*	EPIPACTIS HELLEBORINE	HELLEBORINE ORCHID	P-FORB	5	UPL	ORCHIDACEAE
EQUARV	0	Equisetum arvense	COMMON HORSETAIL	FERN	0	FAC	EQUISETACEAE
EQUFER	2	Equisetum × ferrissii	JOLIET HORSETAIL	FERN	-3	FACW	EQUISETACEAE EQUFLU
	7	Equisetum fluviatile	PIPES	FERN	-5	OBL	EQUISETACEAE
EQUHYE	2	Equisetum hyemale affine	TALL SCOURING RUSH	FERN	-2	FACW-	EQUISETACEAE
EQULAE	4	Equisetum laevigatum	SMOOTH SCOURING RUSH	FERN	-3	FACW	EQUISETACEAE
EQULIT	10	Equisetum × litorale	SHORELINE HORSETAIL	FERN	-5	OBL	EQUISETACEAE
EQUNEL	10	Equisetum × nelsonii	NELSON'S HORSETAIL	FERN	-1	FAC+	EQUISETACEAE
EQUPAL	10	Equisetum palustre	MARSH HORSETAIL	FERN	-3	FACW	EQUISETACEAE
EQUPRA	9	Equisetum pratense	MEADOW HORSETAIL	FERN	-3	FACW	EQUISETACEAE
EQUSCI	10	Equisetum scirpoides	DWARF SCOURING RUSH	FERN	-1	FAC+	EQUISETACEAE
EQUSYL	10	Equisetum sylvaticum	WOOD HORSETAIL	FERN	-3	FACW	EQUISETACEAE
EQUTRA	10	Equisetum × trachyodon	JESUP'S HORSETAIL	FERN	-4	FACW+	EQUISETACEAE
EQUVAR	8	Equisetum variegatum	SMALL SCOURING RUSH	FERN	-3	FACW	EQUISETACEAE
ERACAP	5	Eragrostis capillaris	LACE GRASS	A-GRASS	-3	FACW	POACEAE
ERACIL	*	ERAGROSTIS CILIANENSIS	STINK GRASS	A-GRASS	3	FACU	POACEAE
ERACUR	*	ERAGROSTIS CURVULA	WEEPING LOVE GRASS	P-GRASS	0	FAC	POACEAE
ERADIF	*	ERAGROSTIS DIFFUSA	WESTERN LOVE GRASS	A-GRASS	5	UPL	POACEAE
ERAFRA	2	Eragrostis frankii	SANDBAR LOVE GRASS	A-GRASS	-3	FACW	POACEAE
ERAHIR	5	Eragrostis hirsuta	HAIRY LOVE GRASS	P-GRASS	3	FACU	POACEAE
ERAHYP	5	Eragrostis hypnoides	CREEPING LOVE GRASS	A-GRASS	-5	OBL	POACEAE
ERAMIN	*	ERAGROSTIS MINOR	LESSER LOVE GRASS	A-GRASS	5	UPL	POACEAE
ERANEO	*	ERAGROSTIS NEOMEXICANA	NEW MEXICAN LOVE GRASS	A-GRASS	5	UPL	POACEAE
ERAPEC	0	Eragrostis pectinacea	SMALL LOVE GRASS	A-GRASS	0	FAC	POACEAE
ERAPIL	*	ERAGROSTIS PILOSA	INDIA LOVE GRASS	A-GRASS	3	FACU	POACEAE
ERASPE	3	Eragrostis spectabilis	PURPLE LOVE GRASS	P-GRASS	5	UPL	POACEAE
ERATRI	5	Eragrostis trichodes	ICE CREAM GRASS	P-GRASS	5	UPL	POACEAE
ERAHYE	*	ERANTHIS HYEMALIS	WINTER ACONITE	P-FORB	5	UPL	RANUNCULACEAE
EREHIE	2	Erechtites hieracifolia	FIREWEED	A-FORB	3	FACU	ASTERACEAE
ERIALO	4	Erianthus alopecuroides	SILVER PLUME GRASS	P-GRASS	4	FACU-	POACEAE
ERIBRE	10	Erianthus brevibarbis	BROWN PLUME GRASS	P-GRASS	-5	OBL	POACEAE
ERIRAV	*	ERIANTHUS RAVENNAE	PLUME GRASS	P-GRASS	-3	FACW	POACEAE
ERIBUL	7	Erigenia bulbosa	HARBINGER OF SPRING	P-FORB	5	UPL	APIACEAE
ERIANN	1	Erigeron annuus	ANNUAL FLEABANE	B-FORB	1	FAC-	ASTERACEAE
ERIPHI	3	Erigeron philadelphicus	MARSH FLEABANE	P-FORB	-3	FACW	ASTERACEAE
ERIPUL	5	Erigeron pulchellus	ROBIN'S PLANTAIN	P-FORB	3	FACU	ASTERACEAE
ERISTR	2	Erigeron strigosus	DAISY FLEABANE	P-FORB	1	FAC-	ASTERACEAE
ERICON	*	ERIOCHLOA CONTRACTA	PRAIRIE CUP GRASS	A-GRASS	0	FAC	POACEAE
ERILEM	*	ERIOCHLOA LEMMONII v. GRACILIS	SLENDER CUP GRASS	A-GRASS	-3	FACW	POACEAE
ERIVIL	*	ERIOCHLOA VILLOSA	CHINESE CUP GRASS	A-GRASS	0	FAC	POACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
ERIVEV	*	ERIOPHILA VERNA	MOUSE-EARED WHITLOW GRASS	A-GRASS	5	UPL	POACEAE
ERIVEP	*	ERIOPHILA VERNA v. PRAECOX	MOUSE-EARED WHITLOW GRASS	A-GRASS	5	UPL	POACEAE
ERIANG	10	Eriophorum angustifolium	NARROW-LEAVED COTTON GRASS	P-SEDGE	-5	OBL	CYPERACEAE
ERIGRA	10	Eriophorum gracile	SLENDER COTTON GRASS	P-SEDGE	-5	OBL	CYPERACEAE
ERITEN	10	Eriophorum tenellum	WEAK COTTON GRASS	P-SEDGE	-5	OBL	CYPERACEAE
ERIVIG	10	Eriophorum virginicum	RUSTY COTTON GRASS	P-SEDGE	-5	OBL	CYPERACEAE
ERIVID	10	Eriophorum viridi-carinatum	TALL COTTON GRASS	P-SEDGE	-5	OBL	CYPERACEAE
EROCIC	*	ERODIUM CICUTARIUM	STORKSBILL	B-FORB	5	UPL	GERANIACEAE
ERUVES	*	ERUCA VESICARIA	GARDEN ROCKET	A-FORB	5	UPL	BRASSICACEAE
ERUGAL	*	ERUCASTRUM GALLICUM	DOG MUSTARD	A-FORB	5	UPL	BRASSICACEAE
ERYPRO	5	Eryngium prostratum	ERYNGO	P-FORB	-5	OBL	APIACEAE
ERYYUC	7	Eryngium yuccifolium	RATTLESNAKE MASTER	P-FORB	-1	FAC+	APIACEAE
ERYCAP	7	Erysimum capitatum	WESTERN WALLFLOWER	B-FORB	5	UPL	BRASSICACEAE
ERYCHE	*	ERYSIMUM CHEIRANTHOIDES	WORMSEED MUSTARD	A-FORB	3	FACU	BRASSICACEAE
ERYHIE	*	ERYSIMUM HIERACIFOLIUM	HAWKWEED MUSTARD	P-FORB	5	UPL	BRASSICACEAE
ERYINC	*	ERYSIMUM INCONSPICUUM	SMALL WORMSEED MUSTARD	P-FORB	5	UPL	BRASSICACEAE
ERYREP	*	ERYSIMUM REPANDUM	TREACLE MUSTARD	A-FORB	5	UPL	BRASSICACEAE
ERYALB	4	Erythronium albidum	WHITE ADDER'S TONGUE	P-FORB	5	UPL	LILIACEAE
ERYAME	7	Erythronium americanum	YELLOW ADDER'S TONGUE	P-FORB	5	UPL	LILIACEAE
ERYMES	9	Erythronium mesochoreum	WHITE DOG-TOOTH VIOLET	P-FORB	5	UPL	LILIACEAE
ESCCAL	*	ESCHSCHOLTZIA CALIFORNICA	CALIFORNIA POPPY	A-FORB	5	UPL	PAPAVERACEAE
EUOALA	*	EUONYMUS ALATUS	WINGED EUONYMUS	SHRUB	5	UPL	CELASTRACEAE
EUOAME	10	Euonymus americanus	STRAWBERRY BUSH	SHRUB	1	FAC-	CELASTRACEAE
EUOATR	5	Euonymus atropurpureus	WAHOO	SHRUB	1	FAC-	CELASTRACEAE
EUOBUN	*	EUONYMUS BUNGEANUS	CHINESE SPINDLE TREE	SHRUB	5	UPL	CELASTRACEAE
EUOEUR	*	EUONYMUS EUROPAEUS	EUROPEAN SPINDLE-TREE	SHRUB	5	UPL	CELASTRACEAE
EUOFOR	*	EUONYMUS FORTUNEI	WINTERCREEPER	SHRUB	5	UPL	CELASTRACEAE
EUOHAM	*	EUONYMUS HAMILTONIANUS	JAPANESE SPINDLE TREE	SHRUB	5	UPL	CELASTRACEAE
EUOKIA	*	EUONYMUS KIAUTSCHOVICUS	CLIMBING EUONYMUS	SHRUB	5	UPL	CELASTRACEAE
EUOOBO	7	Euonymus obovatus	RUNNING STRAWBERRY BUSH	SHRUB	5	UPL	CELASTRACEAE
EUPALT	2	Eupatorium altissimum	TALL BONESET	P-FORB	3	FACU	ASTERACEAE
EUPCOE	3	Eupatorium coelestinum	MISTFLOWER	P-FORB	-1	FAC+	ASTERACEAE
EUPFIS	7	Eupatorium fistulosum	HOLLOW JOE PYE WEED	P-FORB	-5	OBL	ASTERACEAE
EUPINC	9	Eupatorium incarnatum	THOROUGHWORT	P-FORB	0	FAC	ASTERACEAE
EUPMAC	5	Eupatorium maculatum	SPOTTED JOE PYE WEED	P-FORB	-5	OBL	ASTERACEAE
EUPPER	4	Eupatorium perfoliatum	COMMON BONESET	P-FORB	-4	FACW+	ASTERACEAE
EUPPUR	5	Eupatorium purpureum	PURPLE JOE PYE WEED	P-FORB	0	FAC	ASTERACEAE
EUPRUG	2	Eupatorium rugosum	WHITE SNAKEROOT	P-FORB	3	FACU	ASTERACEAE
EUPSER	1	Eupatorium serotinum	LATE BONESET	P-FORB	-1	FAC+	ASTERACEAE
EUPSES	8	Eupatorium sessilifolium	UPLAND BONESET	P-FORB	5	UPL	ASTERACEAE
EUPCOM	6	Euphorbia commutata	TINTED SPURGE	P-FORB	5	UPL	EUPHORBIACEAE
EUPCOR	3	Euphorbia corollata	FLOWERING SPURGE	P-FORB	5	UPL	EUPHORBIACEAE
EUPCYP	*	EUPHORBIA CYPARISSIAS	CYPRESS SPURGE	P-FORB	5	UPL	EUPHORBIACEAE

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EUPESU	*	EUPHORBIA ESULA	LEAFY SPURGE	P-FORB	5	UPL	EUPHORBIACEAE
EUPHEL	*	EUPHORBIA HELIOSCOPIA	SUN SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
EUPHEX	*	EUPHORBIA HEXAGONA	ANGLED SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
EUPLAT	*	EUPHORBIA LATHYRIS	CAPER SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
EUPMAR	*	EUPHORBIA MARGINATA	SNOW-ON-THE-MOUNTAIN	A-FORB	4	FACU-	EUPHORBIACEAE
EUPOBT	5	Euphorbia obtusata	BLUNT-LEAVED SPURGE	A-FORB	3	FACU	EUPHORBIACEAE
EUPPEP	*	EUPHORBIA PEPLUS	PETTY SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
EUPSPA	10	Euphorbia spathulata	SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
EUTGRA	3	Euthamia graminifolia	GRASS-LEAVED GOLDENROD	P-FORB	-2	FACW-	ASTERACEAE
EUTGYM	5	Euthamia gymnospermoides	VISCID GRASS-LEAVED GOLDENROD	P-FORB	-1	FAC+	ASTERACEAE
EVOPIL	*	EVOLVULUS PILOSUS	OZARK MORNING-GLORY	P-FORB	5	UPL	CONVOLVULACEAE
FAGESC	*	FAGOPYRUM ESCULENTUM	BUCKWHEAT	A-FORB	5	UPL	POLYGONACEAE
FAGGRA	8	Fagus grandifolia	AMERICAN BEECH	TREE	3	FACU	FAGACEAE
FALVUL	*	FALCARIA VULGARIS	SICKLEWEED	P-FORB	5	UPL	APIACEAE
FESARU	*	FESTUCA ARUNDINACEA	TALL FESCUE	P-GRASS	2	FACU+	POACEAE
FESDUR	*	FESTUCA DURIUSCULA	SHEEP FESCUE	P-GRASS	5	UPL	POACEAE
FESOBT	5	Festuca obtusa	NODDING FESCUE	P-GRASS	2	FACU+	POACEAE
FESPAR	6	Festuca paradoxa	GREATER NODDING FESCUE	P-GRASS	0	FAC	POACEAE
FESPRA	*	FESTUCA PRATENSIS	MEADOW FESCUE	P-GRASS	4	FACU-	POACEAE
FESRUB	*	FESTUCA RUBRA	RED FESCUE	P-GRASS	1	FAC-	POACEAE
FESTEN	*	FESTUCA TENUIFOLIA	SLENDER FESCUE	P-GRASS	5	UPL	POACEAE
FILRUB	10	Filipendula rubra	QUEEN OF THE PRAIRIE	P-FORB	-4	FACW+	ROSACEAE
FILULM	*	FILIPENDULA ULMARIA	QUEEN OF THE MEADOW	P-FORB	5	UPL	ROSACEAE
FIMANN	6	Fimbristylis annua	BALDWIN'S FIMBRISTYLIS	A-SEDGE	4	FACU-	CYPERACEAE
FIMAUT	- 6	Fimbristylis autumnalis	AUTUMN SEDGE	A-SEDGE	-4	FACW+	CYPERACEAE
FIMPUB	9	Fimbristylis puberula v. drummondii	CHESTNUT SEDGE	P-SEDGE	5	UPL	CYPERACEAE
FIMVAH	9	Fimbristylis vahlii	VAHL'S FIMBRISTYLIS	A-SEDGE	-5	OBL	CYPERACEAE
FLOPRO	7	Floerkea proserpinacoides	FALSE MERMAID	A-FORB	-1	FAC+	LIMNANTHACEAE
FOEVUL	*	FOENICULUM VULGARE	FENNEL	P-FORB	5	UPL	APIACEAE
FORACU	6	Forestiera acuminata	SWAMP PRIVET	TREE	-5	OBL	OLEACEAE
FRAAMR	8	Fragaria americana	HILLSIDE STRAWBERRY	P-FORB	5	UPL	ROSACEAE
FRAANA	*	FRAGARIA ×ANANASSA	CULTIVATED STRAWBERRY	P-FORB	5	UPL	ROSACEAE
FRAVES	*	FRAGARIA VESCA	STRAWBERRY	P-FORB	5	UPL	ROSACEAE
FRAVIR	2	Fragaria virginiana	WILD STRAWBERRY	P-FORB	1	FAC-	ROSACEAE
FRACAR	8	Frasera caroliniensis	AMERICAN COLUMBO	B-FORB	5	UPL	GENTIANACEAE
FRAAMC	4	Fraxinus americana	WHITE ASH	TREE	3	FACU	OLEACEAE
FRANIG	8	Fraxinus nigra	BLACK ASH	TREE	-4	FACW+	OLEACEAE
FRAPEP	5	Fraxinus pennsylvanica	RED ASH	TREE	-3	FACW	OLEACEAE
FRAPES	2	Fraxinus pennsylvanica v. subintegerrima	GREEN ASH	TREE	-3	FACW	OLEACEAE
FRAPRO	8	Fraxinus profunda	PUMPKIN ASH	TREE	-5	OBL	OLEACEAE
FRAQUA	6	Fraxinus quadrangulata	BLUE ASH	TREE	5	UPL	OLEACEAE
FROFLO	5	Froelichia floridana v. campestris	COTTONWEED	A-FORB	5	UPL	AMARANTHACEAE
FROGRA	*	FROELICHIA GRACILIS	COTTONWEED	A-FORB	5	UPL	AMARANTHACEAE

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FUISCI	*	FUIRENA SCIRPOIDEA	UMBRELLA GRASS	P-SEDGE	-5	OBL	CYPERACEAE
FUMOFF	*	FUMARIA OFFICINALIS	FUMITORY	A-FORB	5	UPL	PAPAVERACEAE
GAIAES	10	Gaillardia aestivalis	PERENNIAL GAILLARDIA	B-FORB	5	UPL	ASTERACEAE
GAIARI	*	GAILLARDIA ARISTATA	COMMON PERENNIAL GAILLARDIA	P-FORB	5	UPL	ASTERACEAE
GAIPUL	*	GAILLARDIA PULCHELLA	FIREWHEELS	A-FORB	5	UPL	ASTERACEAE
GALMOH	7	Galactia mohlenbrockii	BOYKIN'S DIOCLEA	H-VINE	5	UPL	FABACEAE
GALREG	7	Galactia regularis	MILK PEA	H-VINE	5	UPL	FABACEAE
GALSPE	7	Galearis spectabilis	SHOWY ORCHIS	P-FORB	5	UPL	ORCHIDACEAE
GALLAD	*	GALEOPSIS LADANUM	RED HEMP NETTLE	A-FORB	5	UPL	LAMIACEAE
GALTET	*	GALEOPSIS TETRAHIT	COMMON HEMP NETTLE	A-FORB	5	UPL	LAMIACEAE
GALPAR	*	GALINSOGA PARVIFLORA	SMOOTH PERUVIAN DAISY	A-FORB	5	UPL	ASTERACEAE
GALQUA	*	GALINSOGA QUADRIRADIATA	PERUVIAN DAISY	A-FORB	5	UPL	ASTERACEAE
GALAPA	0	Galium aparine	ANNUAL BEDSTRAW	A-FORB	3	FACU	RUBIACEAE
GALASP	7	Galium asprellum	ROUGH BEDSTRAW	P-FORB	-5	OBL	RUBIACEAE
GALBOR	7	Galium boreale	NORTHERN BEDSTRAW	P-FORB	0	FAC	RUBIACEAE
GALCIR	4	Galium circaezans	WILD LICORICE	P-FORB	4	FACU-	RUBIACEAE
GALCON	4	Galium concinnum	SHINING BEDSTRAW	P-FORB	3	FACU	RUBIACEAE
GALLAB	10	Galium labradoricum	BOG BEDSTRAW	P-FORB	-5	OBL	RUBIACEAE
GALLAN	10	Galium lanceolatum	LANCE-LEAVED WILD LICORICE	P-FORB	5	UPL	RUBIACEAE
GALMOL	*	GALIUM MOLLUGO	WHITE BEDSTRAW	P-FORB	5	UPL	RUBIACEAE
GALOBT	5	Galium obtusum	WILD MADDER	P-FORB	-4	FACW +	RUBIACEAE
GALPED	*	GALIUM PEDEMONTANUM	FOOTHILL BEDSTRAW	A-FORB	5	UPL	RUBIACEAE
GALPIL	7	Galium pilosum	HAIRY BEDSTRAW	P-FORB	5	UPL	RUBIACEAE
GALTIN	6	Galium tinctorium	STIFF BEDSTRAW	P-FORB	-5	OBL	RUBIACEAE
GALTRU	10	Galium trifidum	SMALL BEDSTRAW	P-FORB	-4	FACW +	RUBIACEAE
GALTRO	4	Galium triflorum	SWEET-SCENTED BEDSTRAW	P-FORB	2	FACU +	RUBIACEAE
GALVER	*	GALIUM VERUM	YELLOW BEDSTRAW	P-FORB	5	UPL	RUBIACEAE
GALVIR	10	Galium virgatum	DWARF BEDSTRAW	A-FORB	5	UPL	RUBIACEAE
GAUPRO	9	Gaultheria procumbens	CHECKERBERRY	SHRUB	3	FACU	ERICACEAE
GAUBIE	2	Gaura biennis	BIENNIAL GAURA	B-FORB	4	FACU-	ONAGRACEAE
GAUFIL	5	Gaura filipes	SLENDER GAURA	P-FORB	5	UPL	ONAGRACEAE
GAULON	5	Gaura longiflora	COMMON GAURA	B-FORB	5	UPL	ONAGRACEAE
GAUPAR	*	GAURA PARVIFLORA	SMALL-FLOWERED GAURA	B-FORB	5	UPL	ONAGRACEAE
GAYBAC	8	Gaylussacia baccata	BLACK HUCKLEBERRY	SHRUB	3	FACU	ERICACEAE
GENALB	9	Gentiana alba	PALE GENTIAN	P-FORB	3	FACU	GENTIANACEAE
GENAND	7	Gentiana andrewsii	CLOSED GENTIAN	P-FORB	-3	FACW	GENTIANACEAE
GENCLA	10	Gentiana clausa	CLOSED GENTIAN	P-FORB	-4	FACW +	GENTIANACEAE
GENPUB	9	Gentiana puberulenta	DOWNY GENTIAN	P-FORB	3	FACU	GENTIANACEAE
GENSAP	9	Gentiana saponaria	SOAPWORT GENTIAN	P-FORB	-2	FACW-	GENTIANACEAE
GENSEP	*	GENTIANA SEPTEMFIDA	GARDEN GENTIAN	P-FORB	5	UPL	GENTIANACEAE
GENQUI	7	Gentianella quinquefolia v. occidentalis	STIFF GENTIAN	A-FORB	0	FAC	GENTIANACEAE
GENCRI	10	Gentianopsis crinita	FRINGED GENTIAN	A-FORB	-4	FACW +	GENTIANACEAE
GENPRO	10	Gentianopsis procera	SMALL FRINGED GENTIAN	A-FORB	-5	OBL	GENTIANACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
GERBIC	9	Geranium bicknellii	NORTHERN CRANESBILL	A-FORB	5	UPL	GERANIACEAE
GERCAR	2	Geranium carolinianum	CAROLINA CRANESBILL	A-FORB	5	UPL	GERANIACEAE
GERDIS	*	GERANIUM DISSECTUM	WRINKLE-SEEDED CRANESBILL	A-FORB	5	UPL	GERANIACEAE
GERMAC	4	Geranium maculatum	WILD GERANIUM	P-FORB	3	FACU	GERANIACEAE
GERPUS	*	GERANIUM PUSILLUM	SMALL GERANIUM	A-FORB	5	UPL	GERANIACEAE
GERROB	9	Geranium robertianum	HERB ROBERT	A-FORB	5	UPL	GERANIACEAE
GERSAN	*	GERANIUM SANGUINEUM	BLOOD-RED CRANESBILL	P-FORB	5	UPL	GERANIACEAE
GERSIB	*	GERANIUM SIBIRICUM	SIBERIAN CRANESBILL	P-FORB	5	UPL	GERANIACEAE
GEUALE	6	Geum aleppicum	YELLOW AVENS	P-FORB	-1	FAC+	ROSACEAE
GEUCAN	2	Geum canadense	WHITE AVENS	P-FORB	0	FAC	ROSACEAE
GEULAC	2	Geum laciniatum	ROUGH AVENS	P-FORB	-3	FACW	ROSACEAE
GEURIV	10	Geum rivale	PURPLE AVENS	P-FORB	-5	OBL	ROSACEAE
GEUTRI	9	Geum triflorum	PRAIRIE AVENS	P-FORB	4	FACU-	ROSACEAE
GEUVER	1	Geum vernum	SPRING AVENS	P-FORB	1	FAC-	ROSACEAE
GEUVIR	7	Geum virginianum	PALE AVENS	P-FORB	4	FACU-	ROSACEAE
GILCAP	*	GILIA CAPITATA	GILIA	A-FORB	5	UPL	POLEMONIACEAE
GLACOL	*	GLADIOLUS ×COLVILLEI	SCARLET GLADIOLUS	P-FORB	5	UPL	IRIDACEAE
GLACAN	7	Glandularia canadensis	ROSE VERBENA	P-FORB	5	UPL	VERBENACEAE
GLAPER	*	GLANDULARIA PERUVIANA	PERUVIAN VERVAIN	P-FORB	5	UPL	VERBENACEAE
GLEHED	*	GLECHOMA HEDERACEA	GROUND IVY	P-FORB	3	FACU	LAMIACEAE
GLEAQU	9	Gleditsia aquatica	WATER LOCUST	TREE	-5	OBL	CAESALPINIACEAE
GLETRI	2	Gleditsia triacanthos	HONEY LOCUST	TREE	0	FAC	CAESALPINIACEAE
GLYARK	10	Glyceria arkansana	MANNA GRASS	P-GRASS	-5	OBL	POACEAE
GLYBOR	10	Glyceria borealis	NORTHERN MANNA GRASS	P-GRASS	-5	OBL	POACEAE
GLYCAN	-10	Glyceria canadensis	RATTLESNAKE MANNA GRASS	P-GRASS	-5	OBL	POACEAE
GLYGRA	8	Glyceria grandis	REED MANNA GRASS	P-GRASS	-5	OBL	POACEAE
GLYSEP	6	Glyceria septentrionalis	FLOATING MANNA GRASS	P-GRASS	-5	OBL	POACEAE
GLYSTR	4	Glyceria striata	FOWL MANNA GRASS	P-GRASS	-5	OBL	POACEAE
GLYMAX	*	GLYCINE MAX	SOYBEAN	A-FORB	5	UPL	FABACEAE
GLYLEP	*	GLYCYRRHIZA LEPIDOTA	WILD LICORICE	P-FORB	4	FACU-	FABACEAE
GNAOBT	2	Gnaphalium obtusifolium	OLD-FIELD BALSAM	B-FORB	5	UPL	ASTERACEAE
GNAPUR	2	Gnaphalium purpureum	EARLY CUDWEED	A-FORB	3	FACU	ASTERACEAE
GNAULI	*	GNAPHALIUM ULIGINOSUM	LOW CUDWEED	A-FORB	0	FAC	ASTERACEAE
GNAVIS	10	Gnaphalium viscosum	CLAMMY CUDWEED	B-FORB	5	UPL	ASTERACEAE
GOOPUB	7	Goodyera pubescens	RATTLESNAKE PLANTAIN	P-FORB	0	FAC	ORCHIDACEAE
GOSHIR	*	GOSSYPIUM HIRSUTUM	COTTON	A-FORB	5	UPL	MALVACEAE
GRAAUR	10	Gratiola aurea	GOLDENPERT	P-FORB	-5	OBL	SCROPHULARIACEAE
GRANEG	5	Gratiola neglecta	CLAMMY HEDGE HYSSOP	A-FORB	-5	OBL	SCROPHULARIACEAE
GRAVIR	5	Gratiola virginiana	ROUND-FRUITED HEDGE HYSSOP	A-FORB	-5	OBL	SCROPHULARIACEAE
GRISQU	*	GRINDELIA SQUARROSA	GUM PLANT	B-FORB	3	FACU	ASTERACEAE
GUTTEX	*	GUTIERREZIA TEXANA	BROOMWEED	A-FORB	5	UPL	ASTERACEAE
GYMDRY	10	Gymnocarpium dryopteris	OAK FERN	FERN	0	FAC	ASPLENIACEAE
GYMROB	10	Gymnocarpium robertianum	SCENTED OAK FERN	FERN	3	FACU	ASPLENIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
GYMDIO	6	Gymnocladus dioica	KENTUCKY COFFEE TREE	TREE	5	UPL	CAESALPINIACEAE
GYMAMB	10	Gymnopogon ambiguus	BEARD GRASS	P-GRASS	5	UPL	POACEAE
GYPELE	*	GYPSOPHILA ELEGANS	BABY'S BREATH	A-FORB	5	UPL	CARYOPHYLLACEAE
GYPPAN	*	GYPSOPHILA PANICULATA	COMMON BABY'S BREATH	P-FORB	5	UPL	CARYOPHYLLACEAE
GYPSCO	*	GYPSOPHILA SCORZONERIFOLIA	BIG BABY'S BREATH	P-FORB	5	UPL	CARYOPHYLLACEAE
HACDEF	8	Hackelia deflexa v. americana	STICKSEED	P-FORB	5	UPL	BORAGINACEAE
HACVIR	1	Hackelia virginiana	STICKSEED	P-FORB	1	FAC-	BORAGINACEAE
HALCAR	10	Halesia carolina	SILVERBELL TREE	TREE	2	FACU+	STYRACACEAE
HAMVIR	8	Hamamelis virginiana	WITCH HAZEL	SHRUB	3	FACU	HAMAMELIDACEAE
HEDHIS	2	Hedeoma hispida	ROUGH PENNYROYAL	A-FORB	5	UPL	LAMIACEAE
HEDPUL	4	Hedeoma pulegioides	AMERICAN PENNYROYAL	A-FORB	5	UPL	LAMIACEAE
HEDHEL	*	HEDERA HELIX	ENGLISH IVY	W-VINE	5	UPL	ARALIACEAE
HEDCAE	7	Hedyotis caerulea	BLUETS	P-FORB	0	FAC	RUBIACEAE
HEDCRA	3	Hedyotis crassifolia	TINY BLUETS	P-FORB	4	FACU-	RUBIACEAE
HEDLON	7	Hedyotis longifolia	LONG-LEAVED BLUETS	P-FORB	5	UPL	RUBIACEAE
HEDNIG	7	Hedyotis nigricans	NARROW-LEAVED BLUETS	P-FORB	5	UPL	RUBIACEAE
HEDNUT	7	Hedyotis nuttalliana	SLENDER-LEAVED BLUETS	P-FORB	5	UPL	RUBIACEAE
HEDPUP	10	Hedyotis purpurea	BROAD-LEAVED BLUETS	P-FORB	5	UPL	RUBIACEAE
HEDPUC	6	Hedyotis purpurea v. calycosa	BROAD-LEAVED BLUETS	P-FORB	5	UPL	RUBIACEAE
HEDPUS	3	Hedyotis pusilla	SMALL BLUETS	A-FORB	5	UPL	RUBIACEAE
HELAMA	0	Helenium amarum	BITTERWEED	A-FORB	3	FACU	ASTERACEAE
HELAUT	3	Helenium autumnale	SNEEZEWEED	P-FORB	-4	FACW+	ASTERACEAE
HELFLE	4	Helenium flexuosum	PURPLE-HEADED SNEEZEWEED	P-FORB	-1	FAC+	ASTERACEAE
HELBIC	7	Helianthemum bicknellii	ROCKROSE	P-FORB	5	UPL	CISTACEAE
HELCAN	7	Helianthemum canadense	COMMON ROCKROSE	P-FORB	5	UPL	CISTACEAE
HELANG	10	Helianthus angustifolius	NARROW-LEAVED SUNFLOWER	P-FORB	-2	FACW-	ASTERACEAE
HELANN	*	HELIANTHUS ANNUUS	COMMON SUNFLOWER	A-FORB	1	FAC-	ASTERACEAE
HELCIL	*	HELIANTHUS CILIARIS	BLUEWEED SUNFLOWER	A-FORB	5	UPL	ASTERACEAE
HELDEC	5	Helianthus decapetalus	PALE SUNFLOWER	P-FORB	5	UPL	ASTERACEAE
HELDIV	5	Helianthus divaricatus	WOODLAND SUNFLOWER	P-FORB	5	UPL	ASTERACEAE
HELGIG	9	Helianthus giganteus	TALL SUNFLOWER	P-FORB	-3	FACW	ASTERACEAE
HELGRO	2	Helianthus grosseserratus	SAWTOOTH SUNFLOWER	P-FORB	-2	FACW-	ASTERACEAE
HELHIR	5	Helianthus hirsutus	BRISTLY SUNFLOWER	P-FORB	5	UPL	ASTERACEAE
HELMAX	*	HELIANTHUS MAXIMILIANII	MAXIMILIAN'S SUNFLOWER	P-FORB	5	UPL	ASTERACEAE
HELMIC	8	Helianthus microcephalus	SMALL WOOD SUNFLOWER	P-FORB	4	FACU-	ASTERACEAE
HELMOL	7	Helianthus mollis	DOWNY SUNFLOWER	P-FORB	5	UPL	ASTERACEAE
HELOCC	7	Helianthus occidentalis	WESTERN SUNFLOWER	P-FORB	4	FACU-	ASTERACEAE
HELPET	*	HELIANTHUS PETIOLARIS	PETIOLED SUNFLOWER	A-FORB	5	UPL	ASTERACEAE
HELRIG	6	Helianthus rigidus	PRAIRIE SUNFLOWER	P-FORB	5	UPL	ASTERACEAE
HELSAL	*	HELIANTHUS SALICIFOLIUS	WILLOW-LEAVED SUNFLOWER	P-FORB	5	UPL	ASTERACEAE
HELSIL	10	Helianthus silphioides	FALSE ROSIN WEED	P-FORB	0	FAC	ASTERACEAE
HELSTR	3	Helianthus strumosus	PALE-LEAVED SUNFLOWER	P-FORB	5	UPL	ASTERACEAE
HELTUB	3	Helianthus tuberosus	JERUSALEM ARTICHOKE	P-FORB	0	FAC	ASTERACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
HELHEL	4	Heliopsis helianthoides	FALSE SUNFLOWER	P-FORB	5	UPL	ASTERACEAE
HELCUR	*	HELIOTROPIUM CURASSAVICUM	SEASIDE HELIOTROPE	A-FORB	-5	OBL	BORAGINACEAE
HELEUR	*	HELIOTROPIUM EUROPAEUM	EUROPEAN HELIOTROPE	A-FORB	5	UPL	BORAGINACEAE
HELIND	*	HELIOTROPIUM INDICUM	INDIAN HELIOTROPE	A-FORB	-3	FACW	BORAGINACEAE
HELTEN	10	Heliotropium tenellum	SLENDER HELIOTROPE	A-FORB	5	UPL	BORAGINACEAE
HELVIR	*	HELLEBORUS VIRIDIS	GREEN HELLEBORE	P-FORB	5	UPL	RANUNCULACEAE
HEMFUL	*	HEMEROCALLIS FULVA	ORANGE DAY LILY	P-FORB	5	UPL	LILIACEAE
HEMLIL	*	HEMEROCALLIS LILIO-ASPHODELUS	LEMON DAY LILY	P-FORB	5	UPL	LILIACEAE
HEPNOA	7	Hepatica nobilis v. acuta	SHARP-LOBED HEPATICA	P-FORB	5	UPL	RANUNCULACEAE
HEPNOO	10	Hepatica nobilis v. obtusa	ROUND-LEAVED HEPATICA	P-FORB	5	UPL	RANUNCULACEAE
HERLAN	6	Heracleum lanatum	COW PARSNIP	P-FORB	-3	FACW	APIACEAE
HESMAT	*	HESPERIS MATRONALIS	DAME'S ROCKET	P-FORB	5	UPL	BRASSICACEAE
HETLIM	9	Heteranthera limosa	DUCK SALAD	P-FORB	-5	OBL	PONTEDERIACEAE
HETREN	9	Heteranthera reniformis	MUD PLANTAIN	P-FORB	-5	OBL	PONTEDERIACEAE
HETCAM	5	Heterotheca camporum	GOLDEN ASTER	P-FORB	5	UPL	ASTERACEAE
HETLAT	2	Heterotheca latifolia	CAMPHORWEED	A-FORB	4	FACU-	ASTERACEAE
HEUAME	7	Heuchera americana v. hirsuticaulis	TALL ALUMROOT	P-FORB	4	FACU-	SAXIFRAGACEAE
HEUPAR	8	Heuchera parviflora v. rugelii	LATE ALUMROOT	P-FORB	5	UPL	SAXIFRAGACEAE
HEURIC	7	Heuchera richardsonii v. grayana	PRAIRIE ALUMROOT	P-FORB	1	FAC-	SAXIFRAGACEAE
HEXSPI	10	Hexalectris spicata	CRESTED CORAL ROOT	P-FORB	5	UPL	ORCHIDACEAE
HIBLAE	4	Hibiscus laevis	HALBERD-LEAVED ROSE MALLOW	P-FORB	-5	OBL	MALVACEAE
HIBLAS	5	Hibiscus lasiocarpus	HAIRY ROSE MALLOW	P-FORB	-4	FACW+	MALVACEAE
HIBMOS	6	Hibiscus moscheutos	SWAMP ROSE MALLOW	P-FORB	-5	OBL	MALVACEAE
HIBSYR	*	HIBISCUS SYRIACUS	ROSE-OF-SHARON	SHRUB	5	UPL	MALVACEAE
HIBTRI	*	HIBISCUS TRIONUM	FLOWER-OF-AN-HOUR	A-FORB	5	UPL	MALVACEAE
HIEAUR	*	HIERACIUM AURANTIACUM	DEVIL'S PAINT BRUSH	P-FORB	5	UPL	ASTERACEAE
HIECAE	*	HIERACIUM CAESPITOSUM	FIELD HAWKWEED	P-FORB	5	UPL	ASTERACEAE
HIECAN	5	Hieracium canadense	CANADA HAWKWEED	P-FORB	5	UPL	ASTERACEAE
HIEFLO	*	HIERACIUM FLORENTINUM	KING DEVIL	P-FORB	5	UPL	ASTERACEAE
HIEGRO	5	Hieracium gronovii	HAIRY HAWKWEED	P-FORB	5	UPL	ASTERACEAE
HIELON	6	Hieracium longipilum	LONG-BEARDED HAWKWEED	P-FORB	5	UPL	ASTERACEAE
HIEMUR	*	HIERACIUM MURORUM	GOLDEN LUNGWORT	P-FORB	5	UPL	ASTERACEAE
HIESCA	5	Hieracium scabrum	ROUGH HAWKWEED	P-FORB	5	UPL	ASTERACEAE
HIEODO	7	Hierochloe odorata	SWEET GRASS	P-GRASS	-3	FACW	POACEAE
HIPVUL	10	Hippuris vulgaris	MARE'S TAIL	P-FORB	-5	OBL	HIPPURIDACEAE
HOLLAN	*	HOLCUS LANATUS	VELVET GRASS	P-GRASS	4	FACU-	POACEAE
HOLUMB	*	HOLOSTEUM UMBELLATUM	JAGGED CHICKWEED	A-FORB	5	UPL	CARYOPHYLLACEAE
HORBRA	*	HORDEUM BRACHYANTHERUM	MEADOW BARLEY	P-GRASS	-2	FACW-	POACEAE
HORGEN	*	HORDEUM GENICULATUM	KNEE BARLEY	P-GRASS	5	UPL	POACEAE
HORJUB	*	HORDEUM JUBATUM	SQUIRREL-TAIL GRASS	P-GRASS	-1	FAC+	POACEAE
HORPUS	0	Hordeum pusillum	LITTLE BARLEY	A-GRASS	0	FAC	POACEAE
HORVUL	*	HORDEUM VULGARE	COMMON BARLEY	A-GRASS	5	UPL	POACEAE
HOSAME	*	HOSACKIA AMERICANA	DEER VETCH	A-FORB	5	UPL	FABACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
HOSLAN	*	HOSTA LANCIFOLIA	PLANTAIN LILY	P-FORB	5	UPL	LILIACEAE
HOTINF	9	Hottonia inflata	FEATHERFOIL	A-FORB	-5	OBL	PRIMULACEAE
HUDTOM	9	Hudsonia tomentosa	FALSE HEATHER	SHRUB	5	UPL	CISTACEAE
HUMJAP	*	HUMULUS JAPONICUS	JAPANESE HOPS	H-VINE	3	FACU	MORACEAE
HUMLUP	2	Humulus lupulus	COMMON HOPS	H-VINE	3	FACU	MORACEAE
HYBCON	7	Hybanthus concolor	GREEN VIOLET	P-FORB	2	FACU+	VIOLACEAE
HYDARB	6	Hydrangea arborescens	WILD HYDRANGEA	SHRUB	4	FACU-	HYDRANGEACEAE
HYDCAS	7	Hydrastis canadensis	GOLDEN SEAL	P-FORB	5	UPL	RANUNCULACEAE
HYDRAN	5	Hydrocotyle ranunculoides	BUTTERCUP PENNYWORT	P-FORB	-5	OBL	APIACEAE
HYDUNI	9	Hydrolea uniflora	ONE-FLOWERED HYDROLEA	P-FORB	-5	OBL	HYDROPHYLLACEAE
HYDAPP	6	Hydrophyllum appendiculatum	GREAT WATERLEAF	P-FORB	5	UPL	HYDROPHYLLACEAE
HYDCAE	6	Hydrophyllum canadense	CANADA WATERLEAF	P-FORB	-2	FACW-	HYDROPHYLLACEAE
HYDMAC	7	Hydrophyllum macrophyllum	LARGE-LEAF WATERLEAF	P-FORB	5	UPL	HYDROPHYLLACEAE
HYDVIR	5	Hydrophyllum virginianum	VIRGINIA WATERLEAF	P-FORB	-2	FACW-	HYDROPHYLLACEAE
HYMCAR	9	Hymenocallis caroliniana	SPIDER LILY	P-FORB	-5	OBL	LILIACEAE
HYMSCA	9	Hymenopappus scabiosaeus	OLD PLAINSMAN	B-FORB	5	UPL	ASTERACEAE
HYMACA	10	Hymenoxys acaulis v. glabra	FOUR-NERVED STARFLOWER	P-FORB	5	UPL	ASTERACEAE
HYONIG	*	HYOSCYAMUS NIGER	BLACK HENBANE	A-FORB	5	UPL	SOLANACEAE
HYPADP	9	Hypericum adpressum	SHORE ST. JOHN'S WORT	P-FORB	-5	OBL	HYPERICACEAE
HYPBOR	10	Hypericum boreale	NORTHERN ST. JOHN'S WORT	P-FORB	-5	OBL	HYPERICACEAE
HYPCAN	8	Hypericum canadense	CANADIAN ST. JOHN'S WORT	A-FORB	-3	FACW	HYPERICACEAE
HYPDES	10	Hypericum densiflorum	SHRUBBY ST.JOHN'S WORT	P-FORB	-2	FACW-	HYPERICACEAE
HYPDET	9	Hypericum denticulatum	TOOTHED ST. JOHN'S WORT	P-FORB	-2	FACW-	HYPERICACEAE
HYPDRU	6	Hypericum drummondii	NITS-AND-LICE	A-FORB	3	FACU	HYPERICACEAE
HYPELL	5	Hypericum ellipticum	CREEPING ST. JOHN'S WORT	P-FORB	-5	OBL	HYPERICACEAE
HYPGEN	6	Hypericum gentianoides	PINEWEED	A-FORB	3	FACU	HYPERICACEAE
HYPGYM	9	Hypericum gymnanthum	CLASPING ST. JOHN'S WORT	P-FORB	-5	OBL	HYPERICACEAE
HYPHYP	9	Hypericum hypericoides	ST. ANDREW'S CROSS	SHRUB	3	FACU	HYPERICACEAE
HYPKAL	10	Hypericum kalmianum	KALM'S ST. JOHN'S WORT	SHRUB	-2	FACW-	HYPERICACEAE
HYPLOB	10	Hypericum lobocarpum	SHRUBBY ST. JOHN'S WORT	SHRUB	5	UPL	HYPERICACEAE
HYPMAJ	7	Hypericum majus	SAND ST. JOHN'S WORT	P-FORB	-3	FACW	HYPERICACEAE
HYPMUT	5	Hypericum mutilum	DWARF ST. JOHN'S WORT	P-FORB	-3	FACW	HYPERICACEAE
HYPPER	*	HYPERICUM PERFORATUM	COMMON ST. JOHN'S WORT	P-FORB	5	UPL	HYPERICACEAE
HYPPRO	6	Hypericum prolificum	SHRUBBY ST. JOHN'S WORT	SHRUB	3	FACU	HYPERICACEAE
HYPPSE	7	Hypericum pseudomaculatum	SPOTTED ST. JOHN'S WORT	P-FORB	5	UPL	HYPERICACEAE
HYPPUN	3	Hypericum punctatum	SPOTTED ST. JOHN'S WORT	P-FORB	-1	FAC+	HYPERICACEAE
HYPPYR	8	Hypericum pyramidatum	GIANT ST. JOHN'S WORT	P-FORB	-1	FAC+	HYPERICACEAE
HYPSPH	5	Hypericum sphaerocarpum	ROUND-FRUITED ST. JOHN'S WORT	P-FORB	3	FACU	HYPERICACEAE
HYPSTR	8	Hypericum stragulum	ST. ANDREW'S CROSS	SHRUB	5	UPL	HYPERICACEAE
HYPGLA	*	HYPOCHAERIS GLABRA	SMOOTH CAT'S EAR	A-FORB	5	UPL	ASTERACEAE
HYPRAD	*	HYPOCHAERIS RADICATA	SPOTTED CAT'S EAR	P-FORB	5	UPL	ASTERACEAE
HYPHIR	6	Hypoxis hirsuta	YELLOW STAR GRASS	P-FORB	0	FAC	LILIACEAE
ILEDEC	6	Ilex decidua	SWAMP HOLLY	SHRUB	-3	FACW	AQUIFOLIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
ILEOPA	*	ILEX OPACA	AMERICAN HOLLY	TREE	2	FACU+	AQUIFOLIACEAE
ILEVER	9	Ilex verticillata	WINTERBERRY	SHRUB	-4	FACW+	AQUIFOLIACEAE
ILIREM	10	Iliamna remota	KANKAKEE MALLOW	P-FORB	5	UPL	MALVACEAE
IMPCAP	2	Impatiens capensis	SPOTTED TOUCH-ME-NOT	A-FORB	-3	FACW	BALSAMINACEAE
IMPPAL	4	Impatiens pallida	PALE TOUCH-ME-NOT	A-FORB	-3	FACW	BALSAMINACEAE
INUHEL	*	INULA HELENIUM	ELECAMPANE	P-FORB	5	UPL	ASTERACEAE
IODPIN	6	Iodanthus pinnatifidus	VIOLET CRESS	P-FORB	-3	FACW	BRASSICACEAE
IPOCOC	*	IPOMOEA COCCINEA	RED MORNING GLORY	H-VINE	0	FAC	CONVOLVULACEAE
IPOHED	*	IPOMOEA HEDERACEA	IVY-LEAVED MORNING GLORY	A-FORB	0	FAC	CONVOLVULACEAE
IPOLAC	1	Ipomoea lacunosa	SMALL MORNING GLORY	A-FORB	-3	FACW	CONVOLVULACEAE
IPOPAN	2	Ipomoea pandurata	WILD SWEET POTATO	P-FORB	3	FACU	CONVOLVULACEAE
IPOPUR	*	IPOMOEA PURPUREA	COMMON MORNING GLORY	A-FORB	4	FACU-	CONVOLVULACEAE
IPORUB	*	IPOMOPSIS RUBRA	STANDING CYPRESS	B-FORB	5	UPL	POLEMONIACEAE
IRERHI	8	Iresine rhizomatosa	BLOODLEAF	P-FORB	-2	FACW-	AMARANTHACEAE
IRIBRE	9	Iris brevicaulis	BLUE WATER IRIS	P-FORB	-5	OBL	IRIDACEAE
IRICRI	10	Iris cristata	DWARF CRESTED IRIS	P-FORB	5	UPL	IRIDACEAE
IRIFLA	*	IRIS FLAVESCENS	PALE YELLOW IRIS	P-FORB	5	UPL	IRIDACEAE
IRIFUL	9	Iris fulva	COPPER IRIS	P-FORB	-5	OBL	IRIDACEAE
IRIGER	*	IRIS GERMANICA	GERMAN IRIS	P-FORB	5	UPL	IRIDACEAE
IRIPSE	*	IRIS PSEUDACORUS	TALL YELLOW IRIS	P-FORB	-5	OBL	IRIDACEAE
IRIPUM	*	IRIS PUMILA	DWARF IRIS	P-FORB	5	UPL	IRIDACEAE
IRISHR	5	Iris shrevei	SOUTHERN BLUE FLAG	P-FORB	-5	OBL	IRIDACEAE
ISATIN	*	ISATIS TINCTORIA	DYER'S WOAD	B-FORB	5	UPL	BRASSICACEAE
ISOBUT	10	Isoetes butleri	GLADE QUILLWORT	FERN	-5	OBL	ISOETACEAE
ISOENG	9	Isoetes engelmannii	ENGELMANN'S QUILLWORT	FERN	-5	OBL	ISOETACEAE
ISOMEL	10	Isoetes melanopoda	BLACK QUILLWORT	FERN	-5	OBL	ISOETACEAE
ISOBIT	5	Isopyrum biternatum	FALSE RUE ANEMONE	P-FORB	0	FAC	RANUNCULACEAE
ISOMED	10	Isotria medeoloides	SMALL WHORLED POGONIA	P-FORB	3	FACU	ORCHIDACEAE
ISOVER	10	Isotria verticillata	FIVE LEAVES	P-FORB	0	FAC	ORCHIDACEAE
ITEVIR	10	Itea virginica	VIRGINIA WILLOW	SHRUB	-5	OBL	ESCALLONIACEAE
IVAANN	0	Iva annua	MARSH ELDER	A-FORB	0	FAC	ASTERACEAE
IVAXAN	*	IVA XANTHIFOLIA	RAG SUMPWEED	A-FORB	0	FAC	ASTERACEAE
JACTAM	*	JACQUEMONTIA TAMNIFOLIA	TIE VINE	A-FORB	5	UPL	CONVOLVULACEAE
JEFDIP	10	Jeffersonia diphylla	TWINLEAF	P-FORB	5	UPL	BERBERIDACEAE
JUGCIN	7	Juglans cinerea	BUTTERNUT	TREE	2	FACU+	JUGLANDACEAE
JUGNIG	4	Juglans nigra	BLACK WALNUT	TREE	3	FACU	JUGLANDACEAE
JUNACU	4	Juncus acuminatus	SHARP-FRUITED RUSH	P-FORB	-5	OBL	JUNCACEAE
JUNALP	8	Juncus alpinus	RICHARDSON'S RUSH	P-FORB	-5	OBL	JUNCACEAE
JUNART	9	Juncus articulatus	JOINTED RUSH	P-FORB	-5	OBL	JUNCACEAE
JUNBAL	6	Juncus balticus v. littoralis	LAKE SHORE RUSH	P-FORB	-5	OBL	JUNCACEAE
JUNBIF	5	Juncus biflorus	TWO-FLOWERED RUSH	P-FORB	-3	FACW	JUNCACEAE
JUNBRR	5	Juncus brachycarpus	SHORT-FRUITED RUSH	P-FORB	-3	FACW	JUNCACEAE
JUNBRP	9	Juncus brachycephalus	SHORT-HEADED RUSH	P-FORB	-5	OBL	JUNCACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
JUNBUF	2	Juncus bufonius	TOAD RUSH	A-FORB	-4	FACW+	JUNCACEAE
JUNCAN	6	Juncus canadensis	CANADIAN RUSH	P-FORB	-5	OBL	JUNCACEAE
JUNDIF	7	Juncus diffusissimus	SLIMPOD RUSH	P-FORB	-3	FACW	JUNCACEAE
JUNDUD	4	Juncus dudleyi	DUDLEY'S RUSH	P-FORB	0	FAC	JUNCACEAE
JUNEFS	4	Juncus effusus v. solutus	COMMON RUSH	P-FORB	-5	OBL	JUNCACEAE
JUNGER	*	JUNCUS GERARDII	BLACK GRASS	P-FORB	-5	OBL	JUNCACEAE
JUNGRE	7	Juncus greenei	GREENE'S RUSH	P-FORB	0	FAC	JUNCACEAE
JUNINT	3	Juncus interior	INLAND RUSH	P-FORB	-1	FAC+	JUNCACEAE
JUNMAR	5	Juncus marginatus	GRASS-LEAVED RUSH	P-FORB	-3	FACW	JUNCACEAE
JUNNOT	6	Juncus nodatus	STOUT RUSH	P-FORB	-5	OBL	JUNCACEAE
JUNNOS	6	Juncus nodosus	JOINT RUSH	P-FORB	-5	OBL	JUNCACEAE
JUNSCI	9	Juncus scirpoides	ROUND-HEADED RUSH	P-FORB	-4	FACW+	JUNCACEAE
JUNSEC	6	Juncus secundus	SIDE-FLOWERING RUSH	P-FORB	1	FAC-	JUNCACEAE
JUNTEN	0	Juncus tenuis	PATH RUSH	P-FORB	0	FAC	JUNCACEAE
JUNTOR	3	Juncus torreyi	TORREY'S RUSH	P-FORB	-3	FACW	JUNCACEAE
JUNVAS	10	Juncus vaseyi	VASEY'S RUSH	P-FORB	-3	FACW	JUNCACEAE
JUNCOC	10	Juniperus communis	COMMON JUNIPER	SHRUB	5	UPL	CUPRESSACEAE
JUNCOD	10	Juniperus communis v. depressa	COMMON JUNIPER	SHRUB	5	UPL	CUPRESSACEAE
JUNHOR	10	Juniperus horizontalis	TRAILING JUNIPER	SHRUB	1	FAC-	CUPRESSACEAE
JUNVIR	1	Juniperus virginiana	EASTERN RED CEDAR	TREE	3	FACU	CUPRESSACEAE
JUSAME	6	Justicia americana	WATER WILLOW	P-FORB	-5	OBL	ACANTHACEAE
JUSOVA	10	Justicia ovata	WATER WILLOW	P-FORB	-5	OBL	ACANTHACEAE
KALPAR	*	KALLSTROEMIA PARVIFLORA	HAIRY CALTROP	A-FORB	5	UPL	ZYGOPHYLLACEAE
KERJAP	*	KERRIA JAPONICA	YELLOW ROSE	SHRUB	5	UPL	ROSACEAE
KICELA	*	KICKXIA ELATINE	FLUELLIN	A-FORB	0	FAC	SCROPHULARIACEAE
KNAARV	*	KNAUTIA ARVENSIS	BLUE BUTTONS	B-FORB	5	UPL	DIPSACACEAE
KOCSCO	*	KOCHIA SCOPARIA	BELVEDERE SUMMER CYPRESS	A-FORB	4	FACU-	CHENOPODIACEAE
KOEMAC	7	Koeleria macrantha	JUNE GRASS	P-GRASS	5	UPL	POACEAE
KOEPAN	*	KOELREUTERIA PANICULATA	GOLDEN-RAIN TREE	TREE	5	UPL	SAPINDACEAE
KRIBIF	5	Krigia biflora	FALSE DANDELOIN	P-FORB	3	FACU	ASTERACEAE
KRICAE	1	Krigia caespitosa	DWARF DANDELION	P-FORB	1	FAC-	ASTERACEAE
KRIDAN	6	Krigia dandelion	DWARF DANDELION	P-FORB	3	FACU	ASTERACEAE
KRIVIR	4	Krigia virginica	DWARF DANDELION	A-FORB	5	UPL	ASTERACEAE
KUMSTI	*	KUMMEROWIA STIPULACEA	KOREAN CLOVER	A-FORB	3	FACU	FABACEAE
KUMSTR	*	KUMMEROWIA STRIATA	JAPANESE LESPEDEZA	A-FORB	3	FACU	FABACEAE
LACBIE	4	Lactuca biennis	TALL BLUE LETTUCE	B-FORB	0	FAC	ASTERACEAE
LACCAN	1	Lactuca canadensis	WILD LETTUCE	B-FORB	2	FACU+	ASTERACEAE
LACFLO	4	Lactuca floridana	BLUE LETTUCE	B-FORB	1	FAC-	ASTERACEAE
LACHIR	7	Lactuca hirsuta v. sanguinea	HAIRY WILD LETTUCE	B-FORB	5	UPL	ASTERACEAE
LACLUD	10	Lactuca ludoviciana	WESTERN WILD LETTUCE	B-FORB	5	UPL	ASTERACEAE
LACSAL	*	LACTUCA SALIGNA	WILLOW-LEAVED LETTUCE	B-FORB	3	FACU	ASTERACEAE
LACSAT	*	LACTUCA SATIVA	CULTIVATED LETTUCE	B-FORB	5	UPL	ASTERACEAE
LACSER	*	LACTUCA SERRIOLA	PRICKLY LETTUCE	B-FORB	0	FAC	ASTERACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
LACTAT	*	LACTUCA TATARICA	SHOWY BLUE LETTUCE	P-FORB	5	UPL	ASTERACEAE
LAGSIC	*	LAGENARIA SICERARIA	GOURD	H-VINE	5	UPL	CUCURBITACEAE
LAMAMP	*	LAMIUM AMPLEXICAULE	HENBIT	A-FORB	5	UPL	LAMIACEAE
LAMMAC	*	LAMIUM MACULATUM	SPOTTED DEAD NETTLE	P-FORB	5	UPL	LAMIACEAE
LAMPUR	*	LAMIUM PURPUREUM	PURPLE DEAD NETTLE	A-FORB	5	UPL	LAMIACEAE
LAPCAN	2	Laportea canadensis	CANADA WOOD NETTLE	P-FORB	-3	FACW	URTICACEAE
LAPECH	*	LAPPULA ECHINATA	BEGGAR'S LICE	A-FORB	5	UPL	BORAGINACEAE
LAPRED	*	LAPPULA REDOWSKII v. OCCIDENTALIS	WESTERN BEGGAR'S LICE	A-FORB	5	UPL	BORAGINACEAE
LAPCOM	*	LAPSANA COMMUNIS	COMMON NIPPLEWORT	A-FORB	5	UPL	ASTERACEAE
LARDEC	*	LARIX DECIDUA	EUROPEAN LARCH	TREE	5	UPL	PINACEAE
LARLAR	10	Larix laricina	AMERICAN LARCH	TREE	-5	OBL	PINACEAE
LATHIR	*	LATHYRUS HIRSUTUS	CALEY PEA	P-FORB	5	UPL	FABACEAE
LATJAP	10	Lathyrus japonicus v. glaber	BEACH PEA	P-FORB	4	FACU-	FABACEAE
LATLAT	*	LATHYRUS LATIFOLIUS	EVERLASTING PEA	P-FORB	5	UPL	FABACEAE
LATOCH	8	Lathyrus ochroleucus	PALE VETCHLING	P-FORB	5	UPL	FABACEAE
LATODO	*	LATHYRUS ODORATUS	SWEET PEA	A-FORB	5	UPL	FABACEAE
LATPAP	7	Lathyrus palustris	MARSH VETCHLING	P-FORB	-5	OBL	FABACEAE
LATPAM	6	Lathyrus palustris v. myrtifolius	MARSH VETCHLING	P-FORB	-5	OBL	FABACEAE
LATPRA	*	LATHYRUS PRATENSIS	YELLOW VETCHLING	P-FORB	5	UPL	FABACEAE
LATTUB	*	LATHYRUS TUBEROSUS	DUTCH MICE	P-FORB	5	UPL	FABACEAE
LATVEN	9	Lathyrus venosus v. intonsus	VEINY PEA	P-FORB	0	FAC	FABACEAE
LECINT	10	Lechea intermedia	SAVANNA PINWEED	P-FORB	5	UPL	CISTACEAE
LECMIN	8	Lechea minor	SMALL PINWEED	P-FORB	5	UPL	CISTACEAE
LECPUL	7	Lechea pulchella	PRETTY PINWEED	P-FORB	5	UPL	CISTACEAE
LECSTR	8	Lechea stricta	BUSHY PINWEED	P-FORB	5	UPL	CISTACEAE
LECTEN	6	Lechea tenuifolia	NARROW-LEAVED PINWEED	P-FORB	5	UPL	CISTACEAE
LECVIL	7	Lechea villosa	HAIRY PINWEED	P-FORB	5	UPL	CISTACEAE
LEELEN	5	Leersia lenticularis	CATCHFLY GRASS	P-GRASS	-5	OBL	POACEAE
LEEORY	3	Leersia oryzoides	RICE CUT GRASS	P-GRASS	-5	OBL	POACEAE
LEEVIR	4	Leersia virginica	WHITE GRASS	P-GRASS	-3	FACW	POACEAE
LEMGIB	10	Lemna gibba	SWOLLEN DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
LEMMIR	3	Lemna minor	SMALL DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
LEMMIT	5	Lemna minuta	DINKY DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
LEMOBS	5	Lemna obscura	PURPLE DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
LEMPER	8	Lemna perpusilla	LEAST DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
LEMTRN	5	Lemna trinervis	THREE-NERVED DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
LEMTRS	8	Lemna trisulca	FORKED DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
LEMVAL	5	Lemna valdiviana	PALE DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
LEOAUT	*	LEONTODON AUTUMNALIS	FALL DANDELION	P-FORB	5	UPL	ASTERACEAE
LEOTAR	*	LEONTODON TARAXACOIDES	HAWKBIT	P-FORB	5	UPL	ASTERACEAE
LEOCAR	*	LEONURUS CARDIACA	MOTHERWORT	P-FORB	5	UPL	LAMIACEAE
LEOMAR	*	LEONURUS MARRUBIASTRUM	LION'S TAIL	B-FORB	5	UPL	LAMIACEAE
LEOSIB	*	LEONURUS SIBIRICUS	SIBERIAN LION'S TAIL	B-FORB	5	UPL	LAMIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
LEPCAM	*	LEPIDIUM CAMPESTRE	FIELD CRESS	B-FORB	5	UPL	BRASSICACEAE
LEPDEN	*	LEPIDIUM DENSIFLORUM	SMALL PEPPERGRASS	A-FORB	0	FAC	BRASSICACEAE
LEPLAT	*	LEPIDIUM LATIFOLIUM	BROAD-LEAVED PEPPERCRESS	A-FORB	5	UPL	BRASSICACEAE
LEPPER	*	LEPIDIUM PERFOLIATUM	CLASPING CRESS	P-FORB	0	FAC	BRASSICACEAE
LEPRUD	*	LEPIDIUM RUDERALE	FETID PEPPERGRASS	A-FORB	5	UPL	BRASSICACEAE
LEPSAT	*	LEPIDIUM SATIVUM	GARDEN CRESS	A-FORB	5	UPL	BRASSICACEAE
LEPVIR	0	Lepidium virginicum	COMMON PEPPERGRASS	A-FORB	4	FACU-	BRASSICACEAE
LEPACU	*	LEPTOCHLOA ACUMINATA	SALT MEADOW GRASS	A-GRASS	0	FAC	POACEAE
LEPATT	7	Leptochloa attenuata	SPRANGLE TOP	A-GRASS	-4	FACW+	POACEAE
LEPFAS	0	Leptochloa fascicularis	BEARDED SPRANGLE TOP	A-GRASS	-5	OBL	POACEAE
LEPFIL	5	Leptochloa filiformis	RED SPRANGLE TOP	A-GRASS	-4	FACW+	POACEAE
LEPPAN	9	Leptochloa panicoides	SALT MEADOW GRASS	A-GRASS	-5	OBL	POACEAE
LEPUNI	*	LEPTOCHLOA UNINERVIA	MEXICAN SPRANGLETOP	A-GRASS	5	UPL	POACEAE
LEPCOG	4	Leptoloma cognatum	FALL WITCH GRASS	P-GRASS	5	UPL	POACEAE
LESBIC	*	LESPEDEZA BICOLOR	BICOLOR LESPEDEZA	SHRUB	5	UPL	FABACEAE
LESCAP	4	Lespedeza capitata	ROUND-HEADED BUSH CLOVER	P-FORB	3	FACU	FABACEAE
LESCUN	*	LESPEDEZA CUNEATA	SILKY BUSH CLOVER	P-FORB	5	UPL	FABACEAE
LESDAU	*	LESPEDEZA DAURICA	ASIAN LESPEDEZA	P-FORB	5	UPL	FABACEAE
LESHIR	6	Lespedeza hirta	HAIRY BUSH CLOVER	P-FORB	5	UPL	FABACEAE
LESINT	6	Lespedeza intermedia	WAND-LIKE BUSH CLOVER	P-FORB	5	UPL	FABACEAE
LESLEP	10	Lespedeza leptostachya	PRAIRIE BUSH CLOVER	P-FORB	5	UPL	FABACEAE
LESPRO	5	Lespedeza procumbens	TRAILING BUSH CLOVER	P-FORB	5	UPL	FABACEAE
LESREP	6	Lespedeza repens	CREEPING BUSH CLOVER	P-FORB	5	UPL	FABACEAE
LESSTU	6	Lespedeza stuevei	STUVE'S BUSH CLOVER	P-FORB	5	UPL	FABACEAE
LESTHU	*	LESPEDEZA THUNBERGII	SHRUBBY BUSH CLOVER	SHRUB	5	UPL	FABACEAE
LESVIO	5	Lespedeza violacea	VIOLET BUSH CLOVER	P-FORB	5	UPL	FABACEAE
LESVIR	5	Lespedeza virginica	SLENDER BUSH CLOVER	P-FORB	5	UPL	FABACEAE
LESGRA	*	LESQUERELLA GRACILIS	SLENDER BLADDER POD	A-FORB	5	UPL	BRASSICACEAE
LESLUD	10	Lesquerella ludoviciana	SILVERY BLADDERPOD	P-FORB	5	UPL	BRASSICACEAE
LEUVUL	*	LEUCANTHEMUM VULGARE	OX-EYE DAISY	P-FORB	5	UPL	ASTERACEAE
LEUAES	*	LEUCOJUM AESTIVUM	SNOWFLAKE	P-FORB	5	UPL	LILIACEAE
LEUMUL	3	Leucospora multifida	OBE-WAN-CONOBEA	A-FORB	-4	FACW+	SCROPHULARIACEAE
LIAASP	7	Liatris aspera	ROUGH BLAZING STAR	P-FORB	5	UPL	ASTERACEAE
LIACYL	8	Liatris cylindracea	CYLINDRICAL BLAZING STAR	P-FORB	5	UPL	ASTERACEAE
LIAPUN	*	LIATRIS PUNCTATA	DOTTED BLAZING STAR	P-FORB	5	UPL	ASTERACEAE
LIAPYC	6	Liatris pycnostachya	PRAIRIE BLAZINE STAR	P-FORB	1	FAC-	ASTERACEAE
LIASCS	8	Liatris scabra	HAIRY BLAZING STAR	P-FORB	5	UPL	ASTERACEAE
LIASCN	7	Liatris scariosa v. nieuwlandii	SAVANNA BLAZINE STAR	P-FORB	5	UPL	ASTERACEAE
LIASPI	7	Liatris spicata	MARSH BLAZING STAR	P-FORB	0	FAC	ASTERACEAE
LIASQS	7	Liatris squarrosa	BLAZING STAR	P-FORB	5	UPL	ASTERACEAE
LIASQL	10	Liatris squarrulosa	SMOOTH BLAZING STAR	P-FORB	5	UPL	ASTERACEAE
LIGOBT	*	LIGUSTRUM OBTUSIFOLIUM	BORDER PRIVET	SHRUB	5	UPL	OLEACEAE
LIGVUL	*	LIGUSTRUM VULGARE	COMMON PRIVET	SHRUB	5	UPL	OLEACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
LILLAN	*	LILIUM LANCIFOLIUM	TIGER LILY	P-FORB	5	UPL	LILIACEAE
LILMIC	6	Lilium michiganense	MICHIGAN LILY	P-FORB	-1	FAC+	LILIACEAE
LILPHI	10	Lilium philadelphicum v. andinum	PRAIRIE LILY	P-FORB	1	FAC-	LILIACEAE
LILSUP	9	Lilium superbum	SUPERB LILY	P-FORB	5	UPL	LILIACEAE
LIMSPO	10	Limnobium spongia	FROG'S BIT	P-FORB	-5	OBL	HYDROCHARITACEAE
LIMPIN	*	LIMNOSCIADIUM PINNATUM	JOINTED COWBANE	A-FORB	-3	FACW	APIACEAE
LINCAN	4	Linaria canadensis	BLUE TOADFLAX	A-FORB	5	UPL	SCROPHULARIACEAE
LINGEN	*	LINARIA GENISTIFOLIA v. DALMATICA	DALMATIAN TOADFLAX	P-FORB	5	UPL	SCROPHULARIACEAE
LINTEX	4	Linaria texana	SMOOTH BLUE TOADFLAX	A-FORB	5	UPL	SCROPHULARIACEAE
LINVUL	*	LINARIA VULGARIS	BUTTER-AND-EGGS	A-FORB	5	UPL	SCROPHULARIACEAE
LINBEB	5	Lindera benzoin	SPICEBUSH	SHRUB	-2	FACW-	LAURACEAE
LINBEP	5	Lindera benzoin v. pubescens	HAIRY SPICEBUSH	SHRUB	-5	OBL	LAURACEAE
LINDUD	5	Lindernia dubia	FALSE PIMPERNEL	A-FORB	-5	OBL	SCROPHULARIACEAE
LINDUA	5	Lindernia dubia v. anagallidea	SLENDER FALSE PIMPERNEL	A-FORB	-5	OBL	SCROPHULARIACEAE
LINBOR	10	Linnaea borealis v. americana	TWINFLOWER	SHRUB	0	FAC	CAPRIFOLIACEAE
LINMED	7	Linum medium texanum	SMALL YELLOW FLAX	P-FORB	3	FACU	LINACEAE
LINPER	*	LINUM PERENNE v. LEWISII	PERENNIAL FLAX	P-FORB	5	UPL	LINACEAE
LINSTR	8	Linum striatum	STIFF YELLOW FLAX	P-FORB	-2	FACW-	LINACEAE
LINSUL	8	Linum sulcatum	GROOVED YELLOW FLAX	P-FORB	5	UPL	LINACEAE
LINUSI	*	LINUM USITATISSIMUM	COMMON FLAX	A-FORB	5	UPL	LINACEAE
LINVIR	8	Linum virginianum	SLENDER YELLOW FLAX	P-FORB	-3	FACW	LINACEAE
LIPLIL	4	Liparis liliifolia	PURPLE TWAYBLADE	P-FORB	4	FACU-	ORCHIDACEAE
LIPLOE	8	Liparis loeselii	GREEN TWAYBLADE	P-FORB	-4	FACW+	ORCHIDACEAE
LIPMAC	10	Lipocarpha maculata	MOTTLED LIPOCARPHA	A-SEDGE	-5	OBL	CYPERACEAE
LIQSTY	6	Liquidambar styraciflua	SWEET GUM	TREE	-3	FACW	HAMAMELIDACEAE
LIRTUL	5	Liriodendron tulipifera	TULIP POPLAR	TREE	2	FACU+	MAGNOLIACEAE
LIRSPI	*	LIRIOPE SPICATA	LILYTURF	P-FORB	5	UPL	LILIACEAE
LITCAN	6	Lithospermum canescens	HOARY PUCCOON	P-FORB	5	UPL	BORAGINACEAE
LITCAR	7	Lithospermum caroliniense	HAIRY PUCCOON	P-FORB	5	UPL	BORAGINACEAE
LITINC	8	Lithospermum incisum	FRINGED PUCCOON	P-FORB	5	UPL	BORAGINACEAE
LITLAT	9	Lithospermum latifolium	AMERICAN GROMWELL	P-FORB	5	UPL	BORAGINACEAE
LITOFF	*	LITHOSPERMUM OFFICINALE	COMMON GROMWELL	P-FORB	5	UPL	BORAGINACEAE
LOBCAR	6	Lobelia cardinalis	CARDINAL FLOWER	P-FORB	-5	OBL	CAMPANULACEAE
LOBINF	4	Lobelia inflata	INDIAN TOBACCO	A-FORB	4	FACU-	CAMPANULACEAE
LOBKAL	10	Lobelia kalmii	BOG LOBELIA	P-FORB	-5	OBL	CAMPANULACEAE
LOBPUB	8	Lobelia puberula	DOWNY LOBELIA	P-FORB	-5	OBL	CAMPANULACEAE
LOBSIP	4	Lobelia siphilitica	GREAT BLUE LOBELIA	P-FORB	-4	FACW+	CAMPANULACEAE
LOBSPI	4	Lobelia spicata	PALE SPIKED LOBELIA	P-FORB	0	FAC	CAMPANULACEAE
LOBMAR	*	LOBULARIA MARITIMA	SWEET ALYSSUM	A-FORB	5	UPL	BRASSICACEAE
LOLMUL	*	LOLIUM MULTIFLORUM	ITALIAN RYE GRASS	A-GRASS	5	UPL	POACEAE
LOLPER	*	LOLIUM PERENNE	PERENNIAL RYE GRASS	P-GRASS	3	FACU	POACEAE
LOLTEM	*	LOLIUM TEMULENTUM	DARNEL	A-GRASS	5	UPL	POACEAE
LONDID	10	Lonicera dioica	LIMBER HONEYSUCKLE	W-VINE	3	FACU	CAPRIFOLIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
LONDIG	10	Lonicera dioica v. glaucescens	RED HONEYSUCKLE	W-VINE	5	UPL	CAPRIFOLIACEAE
LONBEL	*	LONICERA ×BELLA	SHOWY FLY HONEYSUCKLE	SHRUB	3	FACU	CAPRIFOLIACEAE LONFLA
	10	Lonicera flava	YELLOW HONEYSUCKLE	W-VINE	5	UPL	CAPRIFOLIACEAE
LONHEC	*	LONICERA ×HECKROTTII	GOLD FLAME HONEYSUCKLE	W-VINE	5	UPL	CAPRIFOLIACEAE LONJAP
	*	LONICERA JAPONICA	JAPANESE HONEYSUCKLE	W-VINE	3	FACU	CAPRIFOLIACEAE
LONMAA	*	LONICERA MAACKII	AMUR HONEYSUCKLE	SHRUB	5	UPL	CAPRIFOLIACEAE
LONMIN	*	LONICERA ×MINUTIFLORA	FLY HONEYSUCKLE	SHRUB	5	UPL	CAPRIFOLIACEAE LONMOR
	*	LONICERA MORROWI	MORROW'S HONEYSUCKLE	SHRUB	5	UPL	CAPRIFOLIACEAE
LONMUE	*	LONICERA ×MUENDENIENSIS	COMMON FLY HONEYSUCKLE	SHRUB	2	FACU+	CAPRIFOLIACEAE
LONMUS	*	LONICERA ×MUSCAVIENSIS	FLY HONEYSUCKLE	SHRUB	5	UPL	CAPRIFOLIACEAE
LONNOT	*	LONICERA ×NOTHA	HYBRID FLY HONEYSUCKLE	SHRUB	5	UPL	CAPRIFOLIACEAE
LONPRO	5	Lonicera prolifera	GRAPE HONEYSUCKLE	W-VINE	5	UPL	CAPRIFOLIACEAE
LONRUP	*	LONICERA RUPRECHTIANA	MANCHURIAN HONEYSUCKLE	SHRUB	5	UPL	CAPRIFOLIACEAE
LONSEM	*	LONICERA SEMPERVIRENS	TRUMPET HONEYSUCKLE	SHRUB	1	FAC-	CAPRIFOLIACEAE
LONSTA	*	LONICERA STANDISHII	HONEYSUCKLE	SHRUB	5	UPL	CAPRIFOLIACEAE
LONTAT	*	LONICERA TATARICA	TARTARIAN HONEYSUCKLE	SHRUB	3	FACU	CAPRIFOLIACEAE
LONXYD	*	LONICERA ×XYLOSTEOIDES	FLY HONEYSUCKLE	SHRUB	5	UPL	CAPRIFOLIACEAE
LONXYM	*	LONICERA XYLOSTEUM	EUROPEAN FLY HONEYSUCKLE	SHRUB	5	UPL	CAPRIFOLIACEAE
LOTCOR	*	LOTUS CORNICULATUS	BIRDSFOOT TREFOIL	P-FORB	1	FAC-	FABACEAE
LUDALT	5	Ludwigia alternifolia	SEEDBOX	P-FORB	-5	OBL	ONAGRACEAE
LUDDEC	9	Ludwigia decurrens	ERECT PRIMROSE WILLOW	A-FORB	-5	OBL	ONAGRACEAE
LUDGLA	8	Ludwigia glandulosa	FALSE LOOSESTRIFE	P-FORB	-5	OBL	ONAGRACEAE
LUDLEP	7	Ludwigia leptocarpa	HAIRY PRIMROSE WILLOW	A-FORB	-5	OBL	ONAGRACEAE
LUDPAL	4	Ludwigia palustris v. americana	MARSH PURSLANE	P-FORB	-5	OBL	ONAGRACEAE
LUDPEP	5	Ludwigia peploides v. glabrescens	CREEPING PRIMROSE WILLOW	P-FORB	-5	OBL	ONAGRACEAE
LUDPOL	5	Ludwigia polycarpa	FALSE LOOSESTRIFE	P-FORB	-5	OBL	ONAGRACEAE
LUFCYL	*	LUFFA CYLINDRICA	LUFFA	H-VINE	5	UPL	CUCURBITACEAE
LUNANN	*	LUNARIA ANNUA	HONESTY	A-FORB	5	UPL	BRASSICACEAE
LUPPER	8	Lupinus perennis	WILD LUPINE	P-FORB	5	UPL	FABACEAE
LUZACU	10	Luzula acuminata	HAIRY WOOD RUSH	P-FORB	1	FAC-	JUNCACEAE
LUZMUM	5	Luzula multiflora	COMMON WOOD RUSH	P-FORB	3	FACU	JUNCACEAE
LUZMUE	5	Luzula multiflora v. echinata	COMMON WOOD RUSH	P-FORB	3	FACU	JUNCACEAE
LYCALB	*	LYCHNIS ALBA	WHITE CAMPION	A-FORB	5	UPL	CARYOPHYLLACEAE
LYCCHA	*	LYCHNIS CHALCEDONICA	MALTESE CROSS	P-FORB	5	UPL	CARYOPHYLLACEAE
LYCCOR	*	LYCHNIS CORONARIA	MULLEIN PINK	P-FORB	5	UPL	CARYOPHYLLACEAE
LYCDIO	*	LYCHNIS DIOICA	RED CAMPION	P-FORB	5	UPL	CARYOPHYLLACEAE
LYCBAR	*	LYCIUM BARBARUM	COMMON MATRIMONY VINE	W-VINE	5	UPL	SOLANACEAE
LYCCHI	*	LYCIUM CHINENSE	CHINESE MATRIMONY VINE	W-VINE	5	UPL	SOLANACEAE
LYCESC	*	LYCOPERSICUM ESCULENTUM	TOMATO	A-FORB	5	UPL	SOLANACEAE
LYCCLC	10	Lycopodium clavatum	RUNNING GROUND PINE	FERN	0	FAC	LYCOPODIACEAE
LYCCLM	10	Lycopodium clavatum v. megastachyon	RUNNING GROUND PINE	FERN	0	FAC	LYCOPODIACEAE
LYCDEN	10	Lycopodium dendroideum	GROUND PINE	FERN	0	FAC	LYCOPODIACEAE
LYCDIG	5	Lycopodium digitatum	TRAILING GROUND PINE	FERN	5	UPL	LYCOPODIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
LYCHAB	10	Lycopodium ×habereri	HYBRID GROUND PINE	FERN	5	UPL	LYCOPODIACEAE LYCINU
	10	Lycopodium inundatum	BOG CLUB MOSS	FERN	-5	OBL	LYCOPODIACEAE
LYCLUC	10	Lycopodium lucidulum	SHINING CLUB MOSS	FERN	-1	FAC+	LYCOPODIACEAE
LYCPOR	10	Lycopodium porophilum	CLIFF CLUB MOSS	FERN	4	FACU-	LYCOPODIACEAE
LYCAME	3	Lycopus americanus	COMMON WATER HOREHOUND	P-FORB	-5	OBL	LAMIACEAE
LYCASP	*	LYCOPUS ASPER	ROUGH WATER HOREHOUND	P-FORB	-5	OBL	LAMIACEAE
LYCEUR	*	LYCOPUS EUROPAEUS	EUROPEAN WATER HOREHOUND	P-FORB	-5	OBL	LAMIACEAE
LYCRUB	8	Lycopus rubellus	STALKED WATER HOREHOUND	P-FORB	-5	OBL	LAMIACEAE
LYCUNI	7	Lycopus uniflorus	NOTHERN BUGLE WEED	P-FORB	-5	OBL	LAMIACEAE
LYCVIR	5	Lycopus virginicus	BUGLE WEED	P-FORB	-5	OBL	LAMIACEAE
LYCRAD	*	LYCORIS RADIATA	SURPRISE LILY	P-FORB	5	UPL	LILIACEAE
LYSCIL	4	Lysimachia ciliata	FRINGED LOOSESTRIFE	P-FORB	-3	FACW	PRIMULACEAE
LYSCLE	*	LYSIMACHIA CLETHROIDES	WHITE LOOSESTRIFE	P-FORB	5	UPL	PRIMULACEAE
LYSCOM	7	Lysimachia ×commixta	HYBRID LOOSESTRIFE	P-FORB	-5	OBL	PRIMULACEAE
LYSFRA	10	Lysimachia fraseri	FRASER'S LOOSESTRIFE	P-FORB	0	FAC	PRIMULACEAE
LYSHYB	7	Lysimachia hybrida	LOOSESTRIFE	P-FORB	-5	OBL	PRIMULACEAE
LYSLAN	6	Lysimachia lanceolata	LANCE-LEAVED LOOSESTRIFE	P-FORB	0	FAC	PRIMULACEAE
LYSNUM	*	LYSIMACHIA NUMMULARIA	MONEYWORT	P-FORB	-4	FACW+	PRIMULACEAE
LYSPUN	*	LYSIMACHIA PUNCTATA	DOTTED LOOSESTRIFE	P-FORB	-5	OBL	PRIMULACEAE
LYSQUR	8	Lysimachia quadriflora	NARROW-LEAVED LOOSESTRIFE	P-FORB	-5	OBL	PRIMULACEAE
LYSQUL	9	Lysimachia quadrifolia	WHORLED LOOSESTRIFE	P-FORB	5	UPL	PRIMULACEAE
LYSRAD	10	Lysimachia radicans	CREEPING LOOSESTRIFE	P-FORB	-5	OBL	PRIMULACEAE
LYSTER	8	Lysimachia terrestris	SWAMP CANDLES	P-FORB	-5	OBL	PRIMULACEAE
LYSTHY	7	Lysimachia thyrsiflora	TUFTED LOOSESTRIFE	P-FORB	-5	OBL	PRIMULACEAE
LYSVUL	*	LYSIMACHIA VULGARIS	GARDEN LOOSESTRIFE	P-FORB	-2	FACW-	PRIMULACEAE
LYTALA	5	Lythrum alatum	WINGED LOOSESTRIFE	P-FORB	-5	OBL	LYTHRACEAE
LYTSAL	*	LYTHRUM SALICARIA	PURPLE LOOSESTRIFE	P-FORB	-5	OBL	LYTHRACEAE
MACCOR	*	MACLEAYA CORDATA	PLUME POPPY	A-FORB	5	UPL	PAPAVERACEAE
MACPOM	*	MACLURA POMIFERA	HEDGE APPLE	TREE	3	FACU	MORACEAE
MAGACU	8	Magnolia acuminata	CUCUMBER MAGNOLIA	TREE	5	UPL	MAGNOLIACEAE
MAICAC	10	Maianthemum canadense	CANADA MAYFLOWER	P-FORB	0	FAC	LILIACEAE
MAICAI	9	Maianthemum canadense v. interius	WILD LILY-OF-THE-VALLEY	P-FORB	0	FAC	LILIACEAE
MALBRA	10	Malaxis brachypoda	WHITE ADDER'S MOUTH	P-FORB	5	UPL	ORCHIDACEAE
MALUNI	10	Malaxis unifolia	GREEN ADDER'S MOUTH	P-FORB	0	FAC	ORCHIDACEAE
MALAFR	*	MALCOLMIA AFRICANA	AFRICAN MALCOMIA	A-FORB	5	UPL	BRASSICACEAE
MALANG	10	Malus angustifolia	NARROW-LEAVED CRAB	TREE	5	UPL	ROSACEAE
MALBAC	*	MALUS BACCATA	SIBERIAN CRAB	TREE	5	UPL	ROSACEAE
MALCOR	5	Malus coronaria	WILD SWEET CRAB	TREE	3	FACU	ROSACEAE
MALIOE	3	Malus ioensis	IOWA CRAB	TREE	5	UPL	ROSACEAE
MALPRU	*	MALUS PRUNIFOLIA	PLUM-LEAVED CRAB	TREE	5	UPL	ROSACEAE
MALPUM	*	MALUS PUMILA	APPLE	TREE	5	UPL	ROSACEAE
MALOUL	*	MALUS ×SOULARDII	SOULARD CRAB APPLE	TREE	5	UPL	ROSACEAE
MALSIE	*	MALUS SIEBOLDII	JAPANESE CRAB	TREE	5	UPL	ROSACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
MALALC	*	MALVA ALCEA	VERVAIN MALLOW	P-FORB	5	UPL	MALVACEAE
MALMOS	*	MALVA MOSCHATA	MUSK MALLOW	P-FORB	5	UPL	MALVACEAE
MALNEG	*	MALVA NEGLECTA	CHEESES	B-FORB	5	UPL	MALVACEAE
MALROT	*	MALVA ROTUNDIFOLIA	DWARF MALLOW	B-FORB	5	UPL	MALVACEAE
MALSYL	*	MALVA SYLVESTRIS	HIGH MALLOW	B-FORB	5	UPL	MALVACEAE
MALVER	*	MALVA VERTICILLATA v. CRISPA	CURLED MALLOW	A-FORB	5	UPL	MALVACEAE
MANVIR	8	Manfreda virginica	FALSE ALOE	P-FORB	5	UPL	LILIACEAE
MARVUL	*	MARRUBIUM VULGARE	COMMON HOREHOUND	P-FORB	0	FAC	LAMIACEAE
MARQUA	*	MARSILEA QUADRIFOLIA	WATER CLOVER	P-FORB	-5	OBL	MARSILEACEAE
MATDEC	5	Matelea decipiens	CLIMBING MILKWEED	H-VINE	5	UPL	ASCLEPIADACEAE
MATGON	8	Matelea gonocarpa	CLIMBING MILKWEED	H-VINE	5	UPL	ASCLEPIADACEAE
MATOBL	10	Matelea obliqua	CLIMBING MILKWEED	H-VINE	5	UPL	ASCLEPIADACEAE
MATCHA	*	MATRICARIA CHAMOMILLA	GERMAN CHAMOMILE	A-FORB	5	UPL	ASTERACEAE
MATMAT	*	MATRICARIA MATRICARIOIDES	PINEAPPLE WEED	A-FORB	3	FACU	ASTERACEAE
MATPER	*	MATRICARIA PERFORATA	SCENTLESS CHAMOMILE	A-FORB	5	UPL	ASTERACEAE
MATSTR	9	Matteuccia struthiopteris	OSTRICH FERN	FERN	-3	FACW	ASPLENIACEAE
MATINC	*	MATTHIOLA INCANA	STOCK	A-FORB	5	UPL	BRASSICACEAE
MAZPUM	*	MAZUS PUMILUS	ANNUAL MAZUS	A-FORB	5	UPL	SCROPHULARIACEAE
MECACU	7	Mecardonia acuminata	WATER HYSSOP	P-FORB	-5	OBL	SCROPHULARIACEAE
MEDVIR	10	Medeola virginiana	INDIAN CUCUMBER ROOT	P-FORB	5	UPL	LILIACEAE
MEDARA	*	MEDICAGO ARABICA	SPOTTED MEDIC	A-FORB	5	UPL	FABACEAE
MEDFAL	*	MEDICAGO FALCATA	SICKLE ALFALFA	P-FORB	5	UPL	FABACEAE
MEDLUP	*	MEDICAGO LUPULINA	BLACK MEDICK	A-FORB	1	FAC-	FABACEAE
MEDORB	*	MEDICAGO ORBICULARIS	ROUND MEDICK	A-FORB	5	UPL	FABACEAE
MEDSAT	*	MEDICAGO SATIVA	ALFALFA	P-FORB	5	UPL	FABACEAE
MEDVAR	*	MEDICAGO ×VARIA	HYBRID ALFALFA	P-FORB	5	UPL	FABACEAE
MEGBEC	10	Megalodonta beckii	WATER MARIGOLD	P-FORB	-5	OBL	ASTERACEAE
MELLIN	10	Melampyrum lineare v. latifolium	COW WHEAT	A-FORB	1	FAC-	SCROPHULARIACEAE
MELNIV	10	Melanthera nivea	WHITE MELANTHERA	P-FORB	3	FACU	ASTERACEAE
MELVIR	10	Melanthium virginicum	BUNCH FLOWER	P-FORB	-4	FACW +	LILIACEAE
MELMUT	8	Melica mutica	NARROW MELIC GRASS	P-GRASS	5	UPL	POACEAE
MELNIT	7	Melica nitens	TALL MELIC GRASS	P-GRASS	5	UPL	POACEAE
MELALB	*	MELILOTUS ALBA	WHITE SWEET CLOVER	B-FORB	3	FACU	FABACEAE
MELALT	*	MELILOTUS ALTISSIMA	TALL SWEET CLOVER	B-FORB	5	UPL	FABACEAE
MELOFC	*	MELILOTUS OFFICINALIS	YELLOW SWEET CLOVER	B-FORB	3	FACU	FABACEAE
MELOFN	*	MELISSA OFFICINALIS	COMMON BALM	P-FORB	5	UPL	LAMIACEAE
MELCOR	*	MELOCHIA CORCHORIFOLIA	CHOCOLATE WEED	A-FORB	5	UPL	STERCULIACEAE
MELPEN	6	Melothria pendula	CREEPING CUCUMBER	P-FORB	1	FAC-	CUCURBITACEAE
MENCAN	4	Menispermum canadense	MOONSEED	W-VINE	-1	FAC +	MENISPERMACEAE
MENARV	4	Mentha arvensis v. villosa	WILD MINT	P-FORB	-3	FACW	LAMIACEAE
MENCIT	*	MENTHA ×CITRATA	HYBRID LEMON MINT	P-FORB	-5	OBL	LAMIACEAE
MENCRI	*	MENTHA CRISPA	CURLY MINT	P-FORB	-4	FACW +	LAMIACEAE
MENGEN	*	MENTHA ×GENTILIS	LITTLE-LEAVED MINT	P-FORB	-4	FACW +	LAMIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
MENPIP	*	MENTHA ×PIPERITA	PEPPERMINT	P-FORB	-5	OBL	LAMIACEAE
MENROT	*	MENTHA ×ROTUNDIFOLIA	APPLE MINT	P-FORB	-4	FACW+	LAMIACEAE
MENSPI	*	MENTHA SPICATA	SPEARMINT	P-FORB	-4	FACW+	LAMIACEAE
MENSUA	*	MENTHA SUAVEOLENS	SWEET APPLE MINT	P-FORB	5	UPL	LAMIACEAE
MENVER	*	MENTHA ×VERTICILLATA	WHORLED MINT	P-FORB	-4	FACW+	LAMIACEAE
MENVIL	*	MENTHA ×VILLOSA	FOXTAIL MINT	P-FORB	-4	FACW+	LAMIACEAE
MENDEC	*	MENTZELIA DECAPETALA	SAND LILY	P-FORB	5	UPL	LOASACEAE
MENNUD	*	MENTZELIA NUDA	LARGE-FLOWERED MENTZELIA	P-FORB	5	UPL	LOASACEAE
MENOLI	10	Mentzelia oligosperma	STICKLEAF	P-FORB	5	UPL	LOASACEAE
MENTRI	10	Menyanthes trifoliata v. minor	BUCKBEAN	P-FORB	-5	OBL	MENYANTHACEAE
MERVIR	5	Mertensia virginica	VIRGINIA BLUEBELLS	P-FORB	-3	FACW	BORAGINACEAE
MICVIM	*	MICROSTEGIUM VIMINEUM	EULALIA	A-GRASS	0	FAC	POACEAE
MICGRA	*	MICROSTERIS GRACILIS	MICROSTERIS	A-FORB	5	UPL	POLEMONIACEAE
MIKSCA	9	Mikania scandens	CLIMBING HEMPWEED	P-FORB	-5	OBL	ASTERACEAE
MILEFF	10	Milium effusum	WOOD MILLET	P-GRASS	2	FACU+	POACEAE
MIMALA	6	Mimulus alatus	WINGED MONKEY FLOWER	P-FORB	-5	OBL	SCROPHULARIACEAE
MIMGLA	9	Mimulus glabratus v. fremontii	YELLOW MONKEY FLOWER	P-FORB	-5	OBL	SCROPHULARIACEAE
MIMRIN	5	Mimulus ringens	MONKEY FLOWER	P-FORB	-5	OBL	SCROPHULARIACEAE
MINPAT	8	Minuartia patula	SLENDER SANDWORT	A-FORB	5	UPL	CARYOPHYLLACEAE
MINSTR	10	Minuartia stricta	ROCK SANDWORT	P-FORB	5	UPL	CARYOPHYLLACEAE
MIRALB	*	MIRABILIS ALBIDA	PALE UMBRELLAWORT	P-FORB	5	UPL	NYCTAGINACEAE
MIRHIR	5	Mirabilis hirsuta	HAIRY UMBRELLAWORT	P-FORB	5	UPL	NYCTAGINACEAE
MIRJAL	*	MIRABILIS JALAPA	FOUR O'CLOCK	P-FORB	5	UPL	NYCTAGINACEAE
MIRLIN	*	MIRABILIS LINEARIS	NARROW-LEAVED UMBRELLAWORT	P-FORB	5	UPL	NYCTAGINACEAE
MIRNYC	*	MIRABILIS NYCTAGINEA	WILD FOUR O'CLOCK	P-FORB	5	UPL	NYCTAGINACEAE
MISSAC	*	MISCANTHUS SACCHARIFLORUS	SILVER GRASS	P-GRASS	5	UPL	POACEAE
MISSIN	*	MISCANTHUS SINENSIS	CHINESE SILVER GRASS	P-GRASS	5	UPL	POACEAE
MISORO	*	MISOPATES ORONTIUM	LESSER SNAPDRAGON	A-FORB	5	UPL	SCROPHULARIACEAE
MITREP	8	Mitchella repens	PARTRIDGE BERRY	SHRUB	2	FACU+	RUBIACEAE
MITDIP	9	Mitella diphylla	BISHOP'S CAP	P-FORB	2	FACU+	SAXIFRAGACEAE
MOELAT	7	Moehringia lateriflora	BLUNT-LEAF SANDWORT	P-FORB	3	FACU	CARYOPHYLLACEAE
MOEERE	*	MOENCHIA ERECTA	CARYOPHYLLACEAE	5		UPL	A-FORB
MOLVER	*	MOLLUGO VERTICILLATA	CARPET WEED	A-FORB	0	FAC	AIZOACEAE
MONBRA	5	Monarda bradburiana	MONARDA	P-FORB	5	UPL	LAMIACEAE
MONCIT	*	MONARDA CITRIODORA	LEMON MINT	P-FORB	5	UPL	LAMIACEAE
MONCLI	7	Monarda clinopodia	BASIL BEE BALM	P-FORB	5	UPL	LAMIACEAE
MONDID	*	MONARDA DIDYMA	OSWEGO TEA	P-FORB	5	UPL	LAMIACEAE
MONFIS	4	Monarda fistulosa	WILD BERGAMOT	P-FORB	3	FACU	LAMIACEAE
MONPUN	5	Monarda punctata	HORSEMINT	P-FORB	5	UPL	LAMIACEAE
MONNUT	*	MONOLEPIS NUTTALLIANA	POVERTY WEED	A-FORB	5	UPL	CHENOPODIACEAE
MONHYP	8	Monotropa hypopithys	PINESAP	P-FORB	5	UPL	PYROLACEAE
MONUNI	8	Monotropa uniflora	INDIAN PIPE	P-FORB	3	FACU	PYROLACEAE
MORALB	*	MORUS ALBA	WHITE MULBERRY	TREE	0	FAC	MORACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
MORRUB	4	Morus rubra	RED MULBERRY	TREE	1	FAC-	MORACEAE
MUHASP	*	MUHLENBERGIA ASPERIFOLIA	SCRATCH GRASS	P-GRASS	-3	FACW	POACEAE
MUHBUS	6	Muhlenbergia bushii	SHORT-LEAVED SATIN GRASS	P-GRASS	5	UPL	POACEAE
MUHCAP	8	Muhlenbergia capillaris	HAIR GRASS	P-GRASS	3	FACU	POACEAE
MUHCUS	10	Muhlenbergia cuspidata	PRAIRIE SATIN GRASS	P-GRASS	5	UPL	POACEAE
MUHFRO	3	Muhlenbergia frondosa	COMMON SATIN GRASS	P-GRASS	-3	FACW	POACEAE
MUHGLA	7	Muhlenbergia glabriflora	SMOOTH SATIN GRASS	P-GRASS	5	UPL	POACEAE
MUHGLO	10	Muhlenbergia glomerata	MARSH WILD TIMOTHY	P-GRASS	-5	OBL	POACEAE
MUHMEX	4	Muhlenbergia mexicana	LEAFY SATIN GRASS	P-GRASS	-3	FACW	POACEAE
MUHRAC	0	Muhlenbergia racemosa	UPLAND WILD TIMOTHY	P-GRASS	-3	FACW	POACEAE
MUHSCH	0	Muhlenbergia schreberi	NIMBLEWILL	P-GRASS	0	FAC	POACEAE
MUHSOB	5	Muhlenbergia sobolifera	ROCK SATIN GRASS	P-GRASS	5	UPL	POACEAE
MUHSYL	7	Muhlenbergia sylvatica	WOODLAND SATIN GRASS	P-GRASS	-3	FACW	POACEAE
MUHTEN	6	Muhlenbergia tenuiflora	SLENDER SATIN GRASS	P-GRASS	5	UPL	POACEAE
MUSARM	*	MUSCARI ARMENIACUM	GRAPE HYACINTH	P-FORB	5	UPL	LILIACEAE
MUSATL	*	MUSCARI ATLANTICUM	BLUE BOTTLE	P-FORB	5	UPL	LILIACEAE
MUSBOT	*	MUSCARI BOTRYOIDES	COMMON GRAPE HYACINTH	P-FORB	5	UPL	LILIACEAE
MUSCOM	*	MUSCARI COMOSUM	GRAPE HYACINTH	P-FORB	5	UPL	LILIACEAE
MYOARV	*	MYOSOTIS ARVENSIS	FIELD SCORPION GRASS	B-FORB	0	FAC	BORAGINACEAE
MYOMAC	4	Myosotis macrosperma	SCORPION GRASS	A-FORB	0	FAC	BORAGINACEAE
MYOSCO	*	MYOSOTIS SCORPIOIDES	COMMON FORGET-ME-NOT	P-FORB	-5	OBL	BORAGINACEAE
MYOSTR	*	MYOSOTIS STRICTA	SMALL-FLOWERED FORGET-ME-NOT	A-FORB	5	UPL	BORAGINACEAE
MYOSYL	*	MYOSOTIS SYLVATICA	WOODLAND FORGET-ME-NOT	P-FORB	5	UPL	BORAGINACEAE
MYOVER	3	Myosotis verna	WHITE FORGET-ME-NOT	A-FORB	1	FAC-	BORAGINACEAE
MYOAQU	*	MYOSOTON AQUATICUM	GIANT CHICKWEED	P-FORB	-1	FAC+	CARYOPHYLLACEAE
MYOMIN	0	Myosurus minimus	MOUSETAIL	A-FORB	-3	FACW	RANUNCULACEAE
MYREXA	6	Myriophyllum exalbescens	SPIKED WATER MILFOIL	P-FORB	-5	OBL	HALORAGIDACEAE
MYRHET	10	Myriophyllum heterophyllum	VARIOUS-LEAVED WATER MILFOIL	P-FORB	-5	OBL	HALORAGIDACEAE
MYRHIP	10	Myriophyllum hippuroides	MARE'S TAIL MILFOIL	P-FORB	-5	OBL	HALORAGIDACEAE
MYRPIN	9	Myriophyllum pinnatum	ROUGH WATER MILFOIL	P-FORB	-5	OBL	HALORAGIDACEAE
MYRSPI	*	MYRIOPHYLLUM SPICATUM	EUROPEAN WATER MILFOIL	P-FORB	-5	OBL	HALORAGIDACEAE
MYRVER	9	Myriophyllum verticillatum v. pectinatum	WHORLED WATER MILFOIL	P-FORB	-5	OBL	HALORAGIDACEAE
NAJFLE	5	Najas flexilis	COMMON NAIAD	A-FORB	-5	OBL	NAJADACEAE
NAJGRA	7	Najas gracillima	SLENDER NAIAD	A-FORB	-5	OBL	NAJADACEAE
NAJGUA	5	Najas guadalupensis	SOUTHERN NAIAD	A-FORB	-5	OBL	NAJADACEAE
NAJMAR	*	NAJAS MARINA	SPINY NAIAD	A-FORB	-5	OBL	NAJADACEAE
NAJMIN	*	NAJAS MINOR	LESSER NAIAD	A-FORB	-5	OBL	NAJADACEAE
NAPDIO	4	Napaea dioica	GLADE MALLOW	P-FORB	-2	FACW-	MALVACEAE
NARMED	*	NARCISSUS ×MEDIOLUTEUS	PRIMROSE PEERLESS	P-FORB	5	UPL	LILIACEAE
NARPEO	*	NARCISSUS POETICUS	POET'S NARCISSUS	P-FORB	5	UPL	LILIACEAE
NARPSE	*	NARCISSUS PSEUDONARCISSUS	DAFFODIL	P-FORB	5	UPL	LILIACEAE
NASOFF	*	NASTURTIUM OFFICINALE	WATER CRESS	P-FORB	-5	OBL	BRASSICACEAE
NELLUT	5	Nelumbo lutea	AMERICAN LOTUS	P-FORB	-5	OBL	NELUMBONACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
NEMMUC	10	Nemopanthus mucronatus	MOUNTAIN HOLLY	SHRUB	-5	OBL	AQUIFOLIACEAE
NEPCAT	*	NEPETA CATARIA	CATNIP	P-FORB	1	FAC-	LAMIACEAE
NESPAN	*	NESLIA PANICULATA	BALL MUSTARD	A-FORB	5	UPL	BRASSICACEAE
NICPHY	*	NICANDRA PHYSALODES	APPLE-OF-PERU	A-FORB	5	UPL	SOLANACEAE
NICLON	*	NICOTIANA LONGIFLORA	LONG-FLOWERED TOBACCO	A-FORB	5	UPL	SOLANACEAE
NICRUS	*	NICOTIANA RUSTICA	WILD TOBACCO	A-FORB	5	UPL	SOLANACEAE
NIGDAM	*	NIGELLA DAMASCENA	LOVE-IN-A-MIST	A-FORB	5	UPL	RANUNCULACEAE
NOTCUS	9	Nothocalais cuspidata	PRAIRIE DANDELION	P-FORB	5	UPL	ASTERACEAE
NOTBIV	5	Nothoscordum bivalve	CROW POISON	P-FORB	5	UPL	LILIACEAE
NUPLUM	6	Nuphar luteum sp. macrophyllum	SPATTERDOCK	P-FORB	-5	OBL	NYMPHAEACEAE
NUPLUV	8	Nuphar luteum sp. variegatum	BULLHEAD LILLY	P-FORB	-5	OBL	NYMPHAEACEAE
NYMODO	6	Nymphaea odorata	FRAGRANT WATER LILY	P-FORB	-5	OBL	NYMPHAEACEAE
NYMPEL	*	NYMPHOIDES PELTATA	YELLOW FLOATING HEART	P-FORB	-5	OBL	MENYANTHACEAE
NYSAQU	10	Nyssa aquatica	SWAMP TUPELO	TREE	-5	OBL	NYSSACEAE
NYSSYL	7	Nyssa sylvatica	BLACK GUM	TREE	5	UPL	NYSSACEAE
OBOVIR	8	Obolaria virginica	PENNYWORT	P-FORB	5	UPL	GENTIANACEAE
OCIBAS	*	OCIMUM BASILICUM	BASIL	A-FORB	5	UPL	LAMIACEAE
OENBIB	1	Oenothera biennis	COMMON EVENING PRIMROSE	B-FORB	3	FACU	ONAGRACEAE
OENBIC	1	Oenothera biennis v. canescens	COMMON EVENING PRIMROSE	B-FORB	3	FACU	ONAGRACEAE
OENFRF	9	Oenothera fruticosa	SHRUBBY SUNDROPS	P-FORB	2	FACU+	ONAGRACEAE
OENFRG	9	Oenothera fruticosa v. glauca	GLANDULAR SUNDROPS	P-FORB	2	FACU+	ONAGRACEAE
OENLAC	2	Oenothera laciniata	RAGGED EVENING PRIMROSE	A-FORB	3	FACU	ONAGRACEAE
OENLIN	8	Oenothera linifolia	THREAD-LEAVED SUNDROPS	A-FORB	5	UPL	ONAGRACEAE
OENMAC	*	OENOTHERA MACROCARPA	MISSOURI PRIMROSE	P-FORB	5	UPL	ONAGRACEAE
OENNUT	*	OENOTHERA NUTTALLII	WHITE EVENING PRIMROSE	P-FORB	5	UPL	ONAGRACEAE
OENPAR	*	OENOTHERA PARVIFLORA	EVENING PRIMROSE	B-FORB	4	FACU-	ONAGRACEAE
OENPER	8	Oenothera perennis	SMALL SUNDROPS	P-FORB	0	FAC	ONAGRACEAE
OENPIL	6	Oenothera pilosella	PRAIRIE SUNDROPS	P-FORB	1	FAC-	ONAGRACEAE
OENRHO	5	Oenothera rhombipetala	SAND PRIMROSE	B-FORB	3	FACU	ONAGRACEAE
OENSPE	*	OENOTHERA SPECIOSA	SHOWY EVENING PRIMROSE	P-FORB	5	UPL	ONAGRACEAE
OENTRI	*	OENOTHERA TRILOBA	EVENING PRIMROSE	B-FORB	5	UPL	ONAGRACEAE
ONOVIC	*	ONOBRYCHIS VICIAEFOLIA	SAINFOIN	A-FORB	5	UPL	FABACEAE
ONOSEN	5	Onoclea sensibilis	SENSITIVE FERN	FERN	-3	FACW	ASPLENIACEAE
ONOSPI	*	ONONIS SPINOSA	REST HARROW	A-FORB	5	UPL	FABACEAE
ONOACA	*	ONOPORDUM ACANTHIUM	SCOTCH COTTON THISTLE	B-FORB	5	UPL	ASTERACEAE
ONOHIS	5	Onosmodium hispidissimum	ROUGH MARBLESEED	P-FORB	5	UPL	BORAGINACEAE
ONOMOM	10	Onosmodium molle	DOWNY MARBLESEED	P-FORB	5	UPL	BORAGINACEAE
ONOMOO	8	Onosmodium molle v. occidentale	DOWNY MARBLESEED	P-FORB	5	UPL	BORAGINACEAE
OPHENG	9	Ophioglossum engelmannii	CLIFF ADDER'S TONGUE FERN	FERN	4	FACU-	OPHIOGLOSSACEAE
OPHVPS	6	Ophioglossum vulgatum v. pseudopodum	NORTHERN ADDER'S TONGUE FERN	FERN	-3	FACW	OPHIOGLOSSACEAE
OPHVPY	7	Ophioglossum vulgatum v. pycnostichum	NORTHERN ADDER'S TONGUE FERN	FERN	-3	FACW	OPHIOGLOSSACEAE
OPUFRA	9	Opuntia fragilis	FRAGILE PRICKLEY PEAR	SHRUB	5	UPL	CACTACEAE
OPUHUM	5	Opuntia humifusa	EASTERN PRICKLY-PEAR	SHRUB	5	UPL	CACTACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
OPUMAC	8	Opuntia macrorhiza	PLAINS PRICKLY-PEAR	SHRUB	5	UPL	CACTACEAE
ORIVUL	*	ORIGANUM VULGARE	OREGANO	P-FORB	5	UPL	LAMIACEAE
ORNNUT	*	ORNITHOGALUM NUTANS	NODDING STAR OF BETHLEHEM	P-FORB	5	UPL	LILIACEAE
ORNUMB	*	ORNITHOGALUM UMBELLATUM	COMMON STAR OF BETHLEHEM	P-FORB	1	FAC-	LILIACEAE
OROFAS	10	Orobanche fasciculata	CLUSTERED BROOM RAPE	P-FORB	5	UPL	OROBANCHACEAE
OROLUD	10	Orobanche ludoviciana	SOUTHERN BROOM RAPE	P-FORB	5	UPL	OROBANCHACEAE
ORORAM	*	OROBANCHE RAMOSA	BRANCHED BROOM RAPE	P-FORB	5	UPL	OROBANCHACEAE
OROUNI	8	Orobanche uniflora	CANCER-ROOT	P-FORB	5	UPL	OROBANCHACEAE
ORTSEC	10	Orthilia secunda	ONE-SIDED SHINLEAF	P-FORB	-1	FAC+	PYROLACEAE
ORYASP	10	Oryzopsis asperifolia	ROUGH-LEAVED RICE GRASS	P-GRASS	5	UPL	POACEAE
ORYPUN	10	Oryzopsis pungens	SHORT-HORNED RICE GRASS	P-GRASS	5	UPL	POACEAE
ORYRAC	8	Oryzopsis racemosa	BLACK-SEEDED RICE GRASS	P-GRASS	5	UPL	POACEAE
OSMCLI	3	Osmorhiza claytonii	HAIRY SWEET CICELY	P-FORB	4	FACU-	APIACEAE
OSMLON	3	Osmorhiza longistylis	ANISE ROOT	P-FORB	4	FACU-	APIACEAE
OSMCIN	9	Osmunda cinnamomea	CINNAMON FERN	FERN	-3	FACW	OSMUNDACEAE
OSMCLN	9	Osmunda claytoniana	INTERRUPTED FERN	FERN	-1	FAC+	OSMUNDACEAE
OSMREG	8	Osmunda regalis v. spectabilis	REGAL FERN	FERN	-5	OBL	OSMUNDACEAE
OSTVIR	4	Ostrya virginiana	HOP HORNBEAM	TREE	4	FACU-	CORYLACEAE
OXACOR	*	OXALIS CORNICULATA	CREEPING WOOD SORREL	P-FORB	3	FACU	OXALIDACEAE
OXADIL	0	Oxalis dillenii	COMMON WOOD SORREL	P-FORB	3	FACU	OXALIDACEAE
OXAILL	10	Oxalis illinoensis	ILLINOIS WOOD SORREL	P-FORB	5	UPL	OXALIDACEAE
OXASTR	0	Oxalis stricta	TALL WOOD SORREL	P-FORB	3	FACU	OXALIDACEAE
OXAVIO	5	Oxalis violacea	VIOLET WOOD SORREL	P-FORB	5	UPL	OXALIDACEAE
OXYARB	*	OXYDENDRUM ARBOREUM	SOURWOOD	TREE	3	FACU	ERICACEAE
OXYRIG	7	Oxypolis rigidior	COWBANE	P-FORB	-5	OBL	APIACEAE
PACTER	*	PACHYSANDRA TERMINALIS	JAPANESE SPURGE	SHURB	5	UPL	BUXACEAE
PANQUI	7	Panax quinquefolius	GINSENG	P-FORB	5	UPL	ARALIACEAE
PANANC	3	Panicum anceps	BEAKED PANIC GRASS	P-GRASS	-3	FACW	POACEAE
PANAUB	10	Panicum auburne	RED-BROWN PANIC GRASS	P-GRASS	2	FACU+	POACEAE
PANBOR	10	Panicum boreale	NORTHERN PANIC GRASS	P-GRASS	2	FACU+	POACEAE
PANBOB	5	Panicum boscii	BEARDED BROAD-LEAVED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANBOM	5	Panicum boscii v. molle	LARGE-FRUITED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANCAP	0	Panicum capillare	OLD WITCH GRASS	A-GRASS	0	FAC	POACEAE
PANCLA	4	Panicum clandestinum	DEER-TONGUE GRASS	P-GRASS	-3	FACW	POACEAE
PANCOL	10	Panicum columbianum	HEMLOCK PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANCOC	7	Panicum commutatum	PANIC GRASS	P-GRASS	0	FAC	POACEAE
PANCOA	7	Panicum commutatum v. ashei	ASHE'S PANIC GRASS	P-GRASS	0	FAC	POACEAE
PANDEP	7	Panicum depauperatum	STARVED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANDII	0	Panicum dichotomiflorum	FALL PANICUM	A-GRASS	-2	FACW-	POACEAE
PANDIU	6	Panicum dichotomum	FORKED PANIC GRASS	P-GRASS	1	FAC-	POACEAE
PANFLE	7	Panicum flexile	SLENDER PANIC GRASS	A-GRASS	-4	FACW+	POACEAE
PANGAT	5	Panicum gattingeri	GATTINGER'S PANIC GRASS	A-GRASS	0	FAC	POACEAE
PANHIA	5	Panicum hians	PANIC GRASS	P-GRASS	-5	OBL	POACEAE

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PANIMP	2	Panicum implicatum	OLD FIELD PANIC GRASS	P-GRASS	0	FAC	POACEAE
PANJOO	10	Panicum joori	JOOR'S PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANLAT	5	Panicum latifolium	BROAD-LEAVED PANIC GRASS	P-GRASS	3	FACU	POACEAE
PANLAX	5	Panicum laxiflorum	LOOSE-FLOWERED PANIC GRASS	P-GRASS	1	FAC-	POACEAE
PANLEI	7	Panicum leibergii	PRAIRIE PANIC GRASS	P-GRASS	2	FACU+	POACEAE
PANLID	4	Panicum lindheimeri	SMOOTH WOOLLY PANIC GRASS	P-GRASS	2	FACU+	POACEAE
PANLIE	7	Panicum linearifolium	SLENDER-LEAVED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANLON	10	Panicum longifolium	LONG-LEAVED PANIC GRASS	P-GRASS	-5	OBL	POACEAE
PANMAL	10	Panicum malacophyllum	SOFT-LEAVED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANMAT	5	Panicum mattamuskeetense	FALSE BEARDED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANMER	7	Panicum meridionale	MAT PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANMIC	6	Panicum microcarpon	SMALL-FRUITED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANMIL	*	PANICUM MILIACEUM	BROOM-CORN MILLET	A-GRASS	0	FAC	POACEAE
PANOLH	5	Panicum oligosanthes v. helleri	HELLER'S PANIC GRASS	P-GRASS	3	FACU	POACEAE
PANOLS	3	Panicum oligosanthes v. scribnerianum	SCRIBNER'S PANIC GRASS	P-GRASS	3	FACU	POACEAE
PANPER	9	Panicum perlongum	LONG-STALKED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANPHI	5	Panicum philadelphicum	PHILADELPHIA PANIC GRASS	A-GRASS	5	UPL	POACEAE
PANPOL	6	Panicum polyanthes	SMALL-FRUITED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANPRA	7	Panicum praecocius	EARLY WHITE-HAIRED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANRAV	10	Panicum ravenelii	RAVENEL'S PANIC GRASS	P-GRASS	0	FAC	POACEAE
PANRIR	6	Panicum rigidulum	MUNRO GRASS	P-GRASS	-3	FACW	POACEAE
PANRIC	6	Panicum rigidulum v. condensum	MUNRO GRASS	P-GRASS	-3	FACW	POACEAE
PANSCO	6	Panicum scoparium	BROOM PANIC GRASS	P-GRASS	-3	FACW	POACEAE
PANSPH	7	Panicum sphaerocarpon	ROUND-FRUITED PANIC GRASS	P-GRASS	3	FACU	POACEAE
PANSTI	5	Panicum stipitatum	STALK-FRUITED PANIC GRASS	P-GRASS	-3	FACW	POACEAE
PANVIV	5	Panicum villosissimum	WHITE-HAIRED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANVIP	5	Panicum villosissimum v. pseudopubescens	FALSE WHITE-HAIRED PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANVIR	4	Panicum virgatum	PRAIRIE SWITCH GRASS	P-GRASS	-1	FAC+	POACEAE
PANWIL	10	Panicum wilcoxianum	WILCOX'S PANIC GRASS	P-GRASS	5	UPL	POACEAE
PANYAD	10	Panicum yadkinense	CAROLINA PANIC GRASS	P-GRASS	5	UPL	POACEAE
PAPDUB	*	PAPAVER DUBIUM	POPPY	A-FORB	5	UPL	PAPAVERACEAE
PAPRHO	*	PAPAVER RHOEAS	CORN POPPY	A-FORB	5	UPL	PAPAVERACEAE
PAPSOM	*	PAPAVER SOMNIFERUM	COMMON POPPY	A-FORB	5	UPL	PAPAVERACEAE
PARPEN	2	Parietaria pensylvanica	PENNSYLVANIA PELLITORY	A-FORB	3	FACU	URTICACEAE
PARGLA	9	Parnassia glauca	GRASS-OF-PARNASSUS	P-FORB	-5	OBL	PARNASSIACEAE
PARCAN	5	Paronychia canadensis	TALL FORKED CHICKWEED	A-FORB	5	UPL	CARYOPHYLLACEAE
PARFAS	5	Paronychia fastigiata	LOW FORKED CHICKWEED	A-FORB	5	UPL	CARYOPHYLLACEAE
PARHYS	*	PARTHENIUM HYSTEROPHORUS	SANTA MARIA	A-FORB	5	UPL	ASTERACEAE
PARINT	8	Parthenium integrifolium	WILD QUININE	P-FORB	5	UPL	ASTERACEAE
PARINS	1	Parthenocissus inserta	THICKET CREEPER	W-VINE	3	FACU	VITACEAE
PARQUI	2	Parthenocissus quinquefolia	VIRGINIA CREEPER	W-VINE	1	FAC-	VITACEAE
PARTRI	*	PARTHENOCISSUS TRICUSPIDATA	BOSTON IVY	W-VINE	5	UPL	VITACEAE
PASBUS	4	Paspalum bushii	HAIRY BEAD GRASS	P-GRASS	5	UPL	POACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
PASCIC	3	Paspalum ciliatifolium	LENS GRASS	P-GRASS	5	UPL	POACEAE
PASCIM	3	Paspalum ciliatifolium v. muhlenbergii	DOWNY LENS GRASS	P-GRASS	5	UPL	POACEAE
PASCIS	3	Paspalum ciliatifolium v. stramineum	DOWNY LENS GRASS	P-GRASS	5	UPL	POACEAE
PASDIL	*	PASPALUM DILATATUM	DALLIS GRASS	P-GRASS	5	UPL	POACEAE
PASDIS	8	Paspalum dissectum	SWAMP BEAD GRASS	P-GRASS	-5	OBL	POACEAE
PASFLO	7	Paspalum floridanum	GIANT BEAD GRASS	P-GRASS	-3	FACW	POACEAE
PASFLU	5	Paspalum fluitans	SWAMP BEAD GRASS	P-GRASS	-5	OBL	POACEAE
PASLAE	2	Paspalum laeve	SMOOTH LENS GRASS	P-GRASS	5	UPL	POACEAE
PASLEN	10	Paspalum lentiferum	TWO-ROWED BEAD GRASS	P-GRASS	5	UPL	POACEAE
PASPUB	3	Paspalum pubiflorum v. glabrum	FOUR-ROWED BEAD GRASS	P-GRASS	-3	FACW	POACEAE
PASINC	3	Passiflora incarnata	LARGE PASSION FLOWER	H-VINE	3	FACU	PASSIFLORACEAE
PASLUT	6	Passiflora lutea v. glabriflora	SMALL PASION FLOWER	H-VINE	5	UPL	PASSIFLORACEAE
PASSAT	*	PASTINACA SATIVA	WILD PARSNIP	B-FORB	5	UPL	APIACEAE
PAUTOM	*	PAULOWNIA TOMENTOSA	EMPRESS TREE	TREE	5	UPL	SCROPHULARIACEAE
PEDCAN	7	Pedicularis canadensis	WOOD BETONY	P-FORB	2	FACU +	SCROPHULARIACEAE
PEDLAN	9	Pedicularis lanceolata	FEN BETONY	P-FORB	-4	FACW +	SCROPHULARIACEAE
PELATR	9	Pellaea atropurpurea	PURPLE CLIFF BRAKE	FERN	5	UPL	ADIANTACEAE
PELGLA	8	Pellaea glabella	PURPLE CLIFF BRAKE	FERN	5	UPL	ADIANTACEAE
PELVIR	8	Peltandra virginica	ARROW ARUM	P-FORB	-5	OBL	ARACEAE
PENALO	*	PENNISETUM ALOPECUROIDES	FOXTAIL MILLET	P-GRASS	5	UPL	POACEAE
PENALL	10	Penstemon alluviorum	LOWLAND BEARD TONGUE	P-FORB	-4	FACW +	SCROPHULARIACEAE
PENARK	10	Penstemon arkansanus	ARKANSAS BEARD TONGUE	P-FORB	5	UPL	SCROPHULARIACEAE
PENBRE	10	Penstemon brevisepalus	SHORT-SEPALLED BEARD TONGUE	P-FORB	5	UPL	SCROPHULARIACEAE
PENCAL	3	Penstemon calycosus	SMOOTH BEARD TONGUE	P-FORB	3	FACU	SCROPHULARIACEAE
PENCAN	10	Penstemon canescens v. brittonorum	HOARY BEARD TONGUE	P-FORB	5	UPL	SCROPHULARIACEAE
PENCOB	*	PENSTEMON COBAEA	SHOWY BEARD TONGUE	P-FORB	5	UPL	SCROPHULARIACEAE
PENDIG	4	Penstemon digitalis	FOXGLOVE BEARD TONGUE	P-FORB	1	FAC-	SCROPHULARIACEAE
PENGRW	*	PENSTEMON GRACILIS v. WISCONSINENIS	SLENDER BEARD TONGUE	P-FORB	5	UPL	SCROPHULARIACEAE
PENGRN	8	Penstemon grandiflorus	LARGE-FLOWERED BEARD TONGUE	P-FORB	5	UPL	SCROPHULARIACEAE
PENHIR	8	Penstemon hirsutus	HAIRY BEARD TONGUE	P-FORB	5	UPL	SCROPHULARIACEAE
PENPAL	6	Penstemon pallidus	PALE BEARD TONGUE	P-FORB	5	UPL	SCROPHULARIACEAE
PENTUB	5	Penstemon tubaeflorus	WESTERN BEARD TONGUE	P-FORB	5	UPL	SCROPHULARIACEAE
PENSED	2	Penthorum sedoides	DITCH STONECROP	P-FORB	-5	OBL	SAXIFRAGACEAE
PERAME	6	Perideridia americana	THICKET PARSLEY	P-FORB	5	UPL	APIACEAE
PERFRU	*	PERILLA FRUTESCENS	BEEFSTEAK PLANT	A-FORB	0	FAC	LAMIACEAE
PETHYU	*	PETASITES HYBRIDUS	BUTTERBUR	P-FORB	5	UPL	ASTERACEAE
PETSAX	*	PETRORHAGIA SAXIFRAGA	SAXIFRAGE PINK	P-FORB	5	UPL	CARYOPHYLLACEAE
PETAXI	*	PETUNIA AXILLARIS	WHITE PETUNIA	A-FORB	5	UPL	SOLANACEAE
PETHYA	*	PETUNIA ×HYBRIDA	GARDEN PETUNIA	A-FORB	5	UPL	SOLANACEAE
PETVIO	*	PETUNIA VIOLACEA	VIOLET PETUNIA	A-FORB	5	UPL	SOLANACEAE
PHABIP	6	Phacelia bipinnatifida	LEAFY PHACELIA	B-FORB	5	UPL	HYDROPHYLLACEAE
PHAGIL	9	Phacelia gilioides	GILIA PHACELIA	A-FORB	5	UPL	HYDROPHYLLACEAE
PHAPUR	4	Phacelia purshii	MIAMI MIST	A-FORB	4	FACU-	HYDROPHYLLACEAE

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PHARAN	8	Phacelia ranunculacea	BUTTERCUP PHACELIA	A-FORB	-3	FACW	HYDROPHYLLACEAE
PHAARU	*	PHALARIS ARUNDINACEA	REED CANARY GRASS	P-GRASS	-4	FACW +	POACEAE
PHACAN	*	PHALARIS CANARIENSIS	BIRDSEED GRASS	A-GRASS	3	FACU	POACEAE
PHAPOL	6	Phaseolus polystachios	WILD KIDNEY BEAN	P-FORB	5	UPL	FABACEAE
PHECON	10	Phegopteris connectilis	LONG BEECH FERN	FERN	5	UPL	THELYPTERIDACEAE
PHEHEX	7	Phegopteris hexagonoptera	BROAD BEECH FERN	FERN	1	FAC-	THELYPTERIDACEAE
PHEAMU	*	PHELLODENDRON AMURENSE	AMUR CORK TREE	TREE	5	UPL	RUTACEAE
PHICOR	*	PHILADELPHUS CORONARIUS	SWEET MOCK ORANGE	SHRUB	5	UPL	PHILADELPHACEAE
PHIFLO	*	PHILADELPHUS FLORIDUS	FEW-FLOWERED MOCK ORANGE	SHRUB	5	UPL	PHILADELPHACEAE
PHIINO	*	PHILADELPHUS INODORUS	SCENTLESS MOCK ORANGE	SHRUB	5	UPL	PHILADELPHACEAE
PHIPUB	*	PHILADELPHUS PUBESCENS	DOWNY MOCK ORANGE	SHRUB	5	UPL	PHILADELPHACEAE
PHLPRA	*	PHLEUM PRATENSE	TIMOTHY	P-GRASS	3	FACU	POACEAE
PHLBIF	7	Phlox bifida	CLEFF PHLOX	P-FORB	5	UPL	POLEMONIACEAE
PHLCAR	6	Phlox carolina v. angusta	CAROLINA PHLOX	P-FORB	-3	FACW	POLEMONIACEAE
PHLDIV	5	Phlox divaricata	BLUE PHLOX	P-FORB	3	FACU	POLEMONIACEAE
PHLGLA	6	Phlox glaberrima sp. interior	SMOOTH PHLOX	P-FORB	-3	FACW	POLEMONIACEAE
PHLMAC	10	Phlox maculata	WILD SWEET WILLIAM	P-FORB	-5	OBL	POLEMONIACEAE
PHLPAN	3	Phlox paniculata	GARDEN PHLOX	P-FORB	3	FACU	POLEMONIACEAE
PHLPIP	7	Phlox pilosa	SAND PRAIRIE PHLOX	P-FORB	1	FAC-	POLEMONIACEAE
PHLPIF	7	Phlox pilosa sp. fulgida	PRAIRIE PHLOX	P-FORB	-1	FAC +	POLEMONIACEAE
PHLPIS	7	Phlox pilosa sp. sangamonensis	SANGAMON PHLOX	P-FORB	1	FAC-	POLEMONIACEAE
PHLSUB	*	PHLOX SUBULATA	MOSS PHLOX	SHRUB	5	UPL	POLEMONIACEAE
PHOSER	7	Phoradendron serotinum	MISTLETOE	SHRUB	5	UPL	VISCACEAE
PHRAUS	1	Phragmites australis	COMMON REED	P-GRASS	-4	FACW +	POACEAE
PHRLEP	4	Phryma leptostachya	LOPSEED	P-FORB	5	UPL	PHRYMACEAE
PHYCUN	*	PHYLA CUNEIFOLIA	HOARY FOG FRUIT	P-FORB	-3	FACW	VERBENACEAE
PHYLAC	1	Phyla lanceolata	FOG FRUIT	P-FORB	-5	OBL	VERBENACEAE
PHYCAR	5	Phyllanthus caroliniensis	DAINTIES	A-FORB	0	FAC	EUPHORBIACEAE
PHYURI	*	PHYLLANTHUS URINARIA	BITTER WRACK	A-FORB	5	UPL	EUPHORBIACEAE
PHYALK	*	PHYSALIS ALKEKENGI	CHINESE LANTERN	P-FORB	5	UPL	SOLANACEAE
PHYANL	*	PHYSALIS ANGULATA	CUT-LEAVED GROUND CHERRY	A-FORB	0	FAC	SOLANACEAE
PHYBAR	*	PHYSALIS BARBADENSIS	BARBADOS GROUND CHERRY	A-FORB	5	UPL	SOLANACEAE
PHYHET	2	Physalis heterophylla	CLAMMY GROUND CHERRY	P-FORB	5	UPL	SOLANACEAE
PHYIXO	*	PHYSALIS IXOCARPA	TOMATILLO	A-FORB	5	UPL	SOLANACEAE
PHYLAL	*	PHYSALIS LANCEOLATA	NARROW-LEAVED GROUND CHERRY	P-FORB	5	UPL	SOLANACEAE
PHYLON	*	PHYSALIS LONGIFOLIA	TALL GROUND CHERRY	P-FORB	5	UPL	SOLANACEAE
PHYMAC	*	PHYSALIS MACROPHYSA	LARGE-FRUITED GROUND CHERRY	P-FORB	5	UPL	SOLANACEAE
PHYPEN	*	PHYSALIS PENDULA	CUT-LEAVED GROUND CHERRY	A-FORB	5	UPL	SOLANACEAE
PHYPRU	4	Physalis pruinosa	STRAWBERRY TOMATO	A-FORB	5	UPL	SOLANACEAE
PHYPUB	3	Physalis pubescens	HAIRY GROUND CHERRY	A-FORB	5	UPL	SOLANACEAE
PHYPUM	5	Physalis pumila	DWARF GROUND CHERRY	P-FORB	5	UPL	SOLANACEAE
PHYSUB	0	Physalis subglabrata	SMOOTH GROUND CHERRY	P-FORB	5	UPL	SOLANACEAE
PHYTEX	5	Physalis texana	TEXAS GROUND CHERRY	P-FORB	5	UPL	SOLANACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
PHYVIG	3	Physalis virginiana	LANCE-LEAVED GROUND CHERRY	P-FORB	5	UPL	SOLANACEAE
PHYOPU	7	Physocarpus opulifolius	COMMON NINEBARK	SHRUB	-2	FACW-	ROSACEAE
PHYSPE	7	Physostegia speciosa	SHOWY OBEDIENT PLANT	P-FORB	-3	FACW	LAMIACEAE
PHYVIN	6	Physostegia virginiana	OBEDIENT PLANT	P-FORB	-3	FACW	LAMIACEAE
PHYVIA	6	Physostegia virginiana v. arenaria	PRAIRIE OBEDIENT	P-FORB	-3	FACW	LAMIACEAE
PHYAME	1	Phytolacca americana	POKEWEED	P-FORB	1	FAC-	PHYTOLACCACEAE
PICMAR	*	PICEA MARIANA	BLACK SPRUCE	TREE	-5	OBL	PINACEAE
PICECH	*	PICRIS ECHIOIDES	BRISTLY OX TONGUE	A-FORB	5	UPL	ASTERACEAE
PICHIE	*	PICRIS HIERACIOIDES	HAWKWEED OX TONGUE	B-FORB	5	UPL	ASTERACEAE
PILFON	6	Pilea fontana	BOG CLEARWEED	A-FORB	-3	FACW	URTICACEAE
PILPUM	3	Pilea pumila	CANADA CLEARWEED	A-FORB	-3	FACW	URTICACEAE
PINBNN	10	Pinus banksiana	JACK PINE	TREE	3	FACU	PINACEAE
PINBNA	*	PINUS BANKSIANA	JACK PINE	TREE	3	FACU	PINACEAE
PINECN	10	Pinus echinata	SHORT-LEAF PINE	TREE	5	UPL	PINACEAE
PINECA	*	PINUS ECHINATA	SHORT-LEAF PINE	TREE	5	UPL	PINACEAE
PINNIG	*	PINUS NIGRA	AUSTRIAN PINE	TREE	5	UPL	PINACEAE
PINPUN	*	PINUS PUNGENS	PRICKLY PINE	TREE	5	UPL	PINACEAE
PINREN	10	Pinus resinosa	RED PINE	TREE	3	FACU	PINACEAE
PINREA	*	PINUS RESINOSA	RED PINE	TREE	3	FACU	PINACEAE
PINRIG	*	PINUS RIGIDA	PITCH PINE	TREE	5	UPL	PINACEAE
PINSTA	9	Pinus strobus	WHITE PINE	TREE	3	FACU	PINACEAE
PINSTN	*	PINUS STROBUS	WHITE PINE	TREE	3	FACU	PINACEAE
PINSYL	*	PINUS SYLVESTRIS	SCOTCH PINE	TREE	5	UPL	PINACEAE
PINTAE	*	PINUS TAEDA	LOBLOLLY PINE	TREE	5	UPL	PINACEAE
PINVIR	*	PINUS VIRGINIANA	SCRUB PINE	TREE	5	UPL	PINACEAE
PISSAT	*	PISUM SATIVUM	GARDEN PEA	A-FORB	5	UPL	FABACEAE
PLAHIR	*	PLAGIOBOTHRYS HIRTUS v. FIGURATUS	POPCORN FLOWER	A-FORB	-5	OBL	BORAGINACEAE
PLASCP	*	PLAGIOBOTHRYS SCOULERI v. PENICILLATUS	POPCORN FLOWER	A-FORB	-5	OBL	BORAGINACEAE
PLAAQU	10	Planera aquatica	PLANER TREE	TREE	-5	OBL	ULMACEAE
PLAARE	*	PLANTAGO ARENARIA	WHORLED PLANTAIN	A-FORB	5	UPL	PLANTAGINACEAE
PLAARI	1	Plantago aristata	POOR JOE	A-FORB	5	UPL	PLANTAGINACEAE
PLACOR	10	Plantago cordata	HEART-LEAVED PLANTAIN	P-FORB	-5	OBL	PLANTAGINACEAE
PLAHET	*	PLANTAGO HETEROPHYLLA	SMALL PLANTAIN	A-FORB	-2	FACW-	PLANTAGINACEAE
PLALAN	*	PLANTAGO LANCEOLATA	ENGLISH PLANTAIN	P-FORB	0	FAC	PLANTAGINACEAE
PLAMAJ	*	PLANTAGO MAJOR	COMMON PLANTAIN	P-FORB	-1	FAC+	PLANTAGINACEAE
PLAMED	*	PLANTAGO MEDIA	HOARY PLANTAIN	P-FORB	5	UPL	PLANTAGINACEAE
PLAPAT	*	PLANTAGO PATAGONICA v. BREVICARPA	WOOLLY PLANTAIN	A-FORB	5	UPL	PLANTAGINACEAE
PLAPUS	3	Plantago pusilla	SMALL PLANTAIN	A-FORB	3	FACU	PLANTAGINACEAE
PLARHO	*	PLANTAGO RHODOSPERMA	RED-SEEDED PLANTAIN	A-FORB	3	FACU	PLANTAGINACEAE
PLARUG	0	Plantago rugelii	RED-STALKED PLANTAIN	A-FORB	0	FAC	PLANTAGINACEAE
PLAVIR	3	Plantago virginica	DWARF PLANTAIN	A-FORB	4	FACU-	PLANTAGINACEAE
PLABLE	10	Platanthera blephariglottis	WHITE FRINGED ORCHID	P-FORB	-5	OBL	ORCHIDACEAE
PLACIL	10	Platanthera ciliaris	ORANGE FRINGED ORCHID	P-FORB	-3	FACW	ORCHIDACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
PLACLA	10	Platanthera clavellata	GREEN ORCHID	P-FORB	-5	OBL	ORCHIDACEAE
PLADIL	10	Platanthera dilatata	TALL WHITE ORCHID	P-FORB	-4	FACW +	ORCHIDACEAE
PLAFLF	10	Platanthera flava	TUBERCLED ORCHID	P-FORB	-3	FACW	ORCHIDACEAE
PLAFLH	10	Platanthera flava herbiola	TUBERCLED ORCHID	P-FORB	-3	FACW	ORCHIDACEAE
PLAHOO	10	Platanthera hookeri	HOOKER'S ORCHID	P-FORB	-1	FAC +	ORCHIDACEAE
PLAHYP	9	Platanthera hyperborea v. huronensis	GREEN ORCHID	P-FORB	-4	FACW +	ORCHIDACEAE
PLALAC	9	Platanthera lacera	GREEN FRINGED ORCHID	P-FORB	-3	FACW	ORCHIDACEAE
PLALEU	10	Platanthera leucophaea	PRAIRIE WHITE FRINGED ORCHID	P-FORB	-4	FACW +	ORCHIDACEAE
PLAORB	10	Platanthera orbiculata	ROUND-LEAVED ORCHID	P-FORB	0	FAC	ORCHIDACEAE
PLAPER	7	Platanthera peramoena	PURPLE FRINGELESS ORCHID	P-FORB	-3	FACW	ORCHIDACEAE
PLAPSY	10	Platanthera psycodes	PURPLE FRINGED ORCHID	P-FORB	-3	FACW	ORCHIDACEAE
PLAOCC	3	Platanus occidentalis	BUTTONWOOD	TREE	-3	FACW	PLATANACEAE
PLUCAM	7	Pluchea camphorata	CAMPHOR WEED	A-FORB	-3	FACW	ASTERACEAE
PLUODO	*	PLUCHEA ODORATA v. SUCCULENTA	CAMPHOR WEED	A-FORB	5	UPL	ASTERACEAE
POAALS	10	Poa alsodes	GROVE BLUE GRASS	P-GRASS	-3	FACW	POACEAE
POAANN	*	POA ANNUA	ANNUAL BLUE GRASS	A-GRASS	1	FAC-	POACEAE
POAARA	*	POA ARACHNIFERA	TEXAS BLUE GRASS	P-GRASS	5	UPL	POACEAE
POAARI	*	POA ARIDA	PLAINS BLUE GRASS	P-GRASS	0	FAC	POACEAE
POAAUT	10	Poa autumnalis	AUTUMN BLUE GRASS	P-GRASS	0	FAC	POACEAE
POABUL	*	POA BULBOSA	BULBOUS BLUE GRASS	P-GRASS	5	UPL	POACEAE
POACHA	1	Poa chapmaniana	SPEAR GRASS	A-GRASS	3	FACU	POACEAE
POACOM	*	POA COMPRESSA	CANADIAN BLUE GRASS	P-GRASS	2	FACU +	POACEAE
POALAN	10	Poa languida	WEAK BLUE GRASS	P-GRASS	5	UPL	POACEAE
POANEM	*	POA NEMORALIS	WOODLAND BLUE GRASS	P-GRASS	0	FAC	POACEAE
POAPAD	.10	Poa paludigena	MARSH BLUE GRASS	P-GRASS	-5	OBL	POACEAE
POAPAS	7	Poa palustris	FOWL BLUE GRASS	P-GRASS	-4	FACW +	POACEAE
POAPRA	*	POA PRATENSIS	KENTUCKY BLUE GRASS	P-GRASS	1	FAC-	POACEAE
POASYL	5	Poa sylvestris	WOODLAND BLUE GRASS	P-GRASS	0	FAC	POACEAE
POATRI	*	POA TRIVIALIS	MEADOW GRASS	P-GRASS	-3	FACW	POACEAE
POAWOL	10	Poa wolfii	MEADOW BLUE GRASS	P-GRASS	5	UPL	POACEAE
PODPEL	4	Podophyllum peltatum	MAY APPLE	P-FORB	3	FACU	BERBERIDACEAE
POGOPH	10	Pogonia ophioglossoides	ROSE POGONIA	P-FORB	-5	OBL	ORCHIDACEAE
POICYA	0	Poinsettia cyathophora	PAINTED LEAF	A-FORB	5	UPL	EUPHORBIACEAE
POIDEN	0	Poinsettia dentata	TOOTHED SPURGE	A-FORB	5	UPL	EUPHORBIACEAE
POLDDO	0	Polanisia dodecandra	CLAMMY WEED	A-FORB	5	UPL	CAPPARIDACEAE
POLDTR	0	Polanisia dodecandra v. trachysperma	CLAMMY WEED	A-FORB	5	UPL	CAPPARIDACEAE
POLJAM	5	Polanisia jamesii	JAMES' CLAMMY WEED	A-FORB	5	UPL	CAPPARIDACEAE
POLREP	5	Polemonium reptans	JACOB'S LADDER	P-FORB	0	FAC	POLEMONIACEAE
POLMAJ	*	POLYCNEMUM MAJUS	WIRY GOOSEFOOT	A-FORB	5	UPL	CHENOPODIACEAE
POLCRU	9	Polygala cruciata v. aquilonia	CROSS MILKWORT	A-FORB	-4	FACW +	POLYGALACEAE
POLINC	10	Polygala incarnata	PINK MILKWORT	A-FORB	4	FACU-	POLYGALACEAE
POLPAU	10	Polygala paucifolia	FLOWERING WINTERGREEN	P-FORB	3	FACU	POLYGALACEAE
POLPOO	7	Polygala polygama v. obtusata	PURPLE MILKWORT	B-FORB	4	FACU-	POLYGALACEAE

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POLSAN	5	Polygala sanguinea	FIELD MILKWORT	A-FORB	3	FACU	POLYGALACEAE
POLSEN	7	Polygala senega	SENECA SNAKEROOT	P-FORB	3	FACU	POLYGALACEAE
POLVER	9	Polygala verticillata	WHORLED MILKWORT	A-FORB	5	UPL	POLYGALACEAE
POLVER	5	Polygala verticillata v. ambigua	WHORLED MILKWORT	A-FORB	5	UPL	POLYGALACEAE
POLVER	5	Polygala verticillata v. isocycla	WHORLED MILKWORT	A-FORB	5	UPL	POLYGALACEAE
POLBIF	7	Polygonatum biflorum	SMALL SOLOMON SEAL	P-FORB	3	FACU	LILIACEAE
POLCOM	4	Polygonatum commutatum	GREAT SOLOMON SEAL	P-FORB	3	FACU	LILIACEAE
POLPUB	10	Polygonatum pubescens	DOWNY SOLOMAN'S SEAL	P-FORB	5	UPL	LILIACEAE
POLART	9	Polygonella articulata	JOINTWEED	A-FORB	5	UPL	POLYGONACEAE
POLACH	0	Polygonum achoreum	BEAK-SEEDED KNOTWEED	A-FORB	0	FAC	POLYGONACEAE
POLAMP	3	Polygonum amphibium	WATER KNOTWEED	P-FORB	-5	OBL	POLYGONACEAE
POLARE	*	POLYGONUM ARENASTRUM	SIDEWALK KNOTWEED	A-FORB	5	UPL	POLYGONACEAE
POLARI	10	Polygonum arifolium v. pubescens	HALBRED-LEAVED TEAR-THUMB	A-FORB	-5	OBL	POLYGONACEAE
POLAVI	*	POLYGONUM AVICULARE	COMMON KNOTWEED	A-FORB	1	FAC-	POLYGONACEAE
POLBIC	2	Polygonum bicorne	LONG-STYLED KNOTWEED	A-FORB	0	FAC	POLYGONACEAE
POLBUN	*	POLYGONUM BUNGEANUM	RICKLY SMARTWEED	A-FORB	-3	FACW	POLYGONACEAE
POLBUX	0	Polygonum buxiforme	BOXWOOD KNOTWEED	A-FORB	5	UPL	POLYGONACEAE
POLCAR	10	Polygonum careyi	CAREY'S HEARTSEASE	A-FORB	-4	FACW +	POLYGONACEAE
POLCES	*	POLYGONUM CESPITOSUM v. LONGISETUM	CREEPING SMARTWEED	A-FORB	5	UPL	POLYGONACEAE
POLCON	*	POLYGONUM CONVOLVULUS	BLACK BIRDWEED	A-FORB	1	FAC-	POLYGONACEAE
POLCRI	4	Polygonum cristatum	COPSE BINDWEED	H-VINE	0	FAC	POLYGONACEAE
POLCUS	*	POLYGONUM CUSPIDATUM	JAPANESE KNOTWEED	SHRUB	3	FACU	POLYGONACEAE
POLERE	0	Polygonum erectum	ERECT KNOTWEED	A-FORB	3	FACU	POLYGONACEAE
POLEXS	0	Polygonum exsertum	LONG-FRUITED KNOTWEED	A-FORB	0	FAC	POLYGONACEAE
POLHYR	*	POLYGONUM HYDROPIPER	WATER PEPPER	A-FORB	-5	OBL	POLYGONACEAE
POLHYO	4	Polygonum hydropiperoides	MILD WATER PEPPER	P-FORB	-5	OBL	POLYGONACEAE
POLLAP	0	Polygonum lapathifolium	CURTTOP LADY'S THUMB	A-FORB	-4	FACW +	POLYGONACEAE
POLNEG	*	POLYGONUM NEGLECTUM	LEAFY KNOTWEED	A-FORB	5	UPL	POLYGONACEAE
POLOPE	8	Polygonum opelousanum	SCALY MILD WATER PEPPER	P-FORB	-5	OBL	POLYGONACEAE
POLORI	*	POLYGONUM ORIENTALE	KISS-ME-OVER-THE-GARDEN-GATE	A-FORB	5	UPL	POLYGONACEAE
POLPEN	1	Polygonum pensylvanicum	PINKWEED	A-FORB	-4	FACW +	POLYGONACEAE
POLPER	*	POLYGONUM PERSICARIA	LADY'S THUMB	A-FORB	-3	FACW	POLYGONACEAE
POLPRL	0	Polygonum prolificum	LEAFY KNOTWEED	A-FORB	1	FAC-	POLYGONACEAE
POLPUN	3	Polygonum punctatum	SMARTWEED	A-FORB	-5	OBL	POLYGONACEAE
POLRAM	3	Polygonum ramosissimum	BUSHY KNOTWEED	A-FORB	1	FAC-	POLYGONACEAE
POLSAC	*	POLYGONUM SACHALINENSE	GIANT KNOTWEED	SHRUB	5	UPL	POLYGONACEAE
POLSAG	5	Polygonum sagittatum	ARROW-LEAVED TEARTHUMB	A-FORB	-5	OBL	POLYGONACEAE
POLSCB	*	POLYGONUM SCABRUM	HEDGE CORNBIND	A-FORB	5	UPL	POLYGONACEAE
POLSCN	2	Polygonum scandens	CLIMBING FALSE BUCKWHEAT	H-VINE	0	FAC	POLYGONACEAE
POLSET	7	Polygonum setaceum v. interjectum	BRISTLY SMARTWEED	P-FORB	-5	OBL	POLYGONACEAE
POLTEN	5	Polygonum tenue	SLENDER KNOTWEED	A-FORB	5	UPL	POLYGONACEAE
POLVIG	3	Polygonum virginianum	VIRGINIA KNOTWEED	P-FORB	0	FAC	POLYGONACEAE
POLCAN	4	Polymnia canadensis	PALE LEAFCUP	P-FORB	5	UPL	ASTERACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
POLUVE	6	Polymnia uvedalia	BEAR'S FOOT	P-FORB	4	FACU-	ASTERACEAE
POLPOM	10	Polypodium polypodioides v. michauxianum	GRAY POLYPODY	FERN	5	UPL	POLYPODIACEAE
POLVIN	8	Polypodium virginianum	COMMON POLYPODY	FERN	5	UPL	POLYPODIACEAE
POLPRC	5	Polypremum procumbens	RUST WEED	P-FORB	5	UPL	LOGANIACEAE
POLACR	5	Polystichum acrostichoides	CHRISTMAS FERN	FERN	5	UPL	ASPLENIACEAE
POLNUT	8	Polytaenia nuttallii	PRAIRIE PARSLEY	P-FORB	5	UPL	APIACEAE
PONCOR	8	Pontederia cordata	PICKEREL WEED	P-FORB	-5	OBL	PONTEDERIACEAE
POPALB	*	POPULUS ALBA	WHITE POPLAR	TREE	5	UPL	SALICACEAE
POPBAL	7	Populus balsamifera	BALSAM POPLAR	TREE	-3	FACW	SALICACEAE
POPCAN	*	POPULUS CANESCENS	GRAY POPLAR	TREE	5	UPL	SALICACEAE
POPDEL	2	Populus deltoides	EASTERN COTTONWOOD	TREE	-1	FAC+	SALICACEAE
POPGIL	*	POPULUS ×GILEADENSIS	BALM-OF-GILEAD	TREE	5	UPL	SALICACEAE
POPGRA	4	Populus grandidentata	BIG-TOOTH ASPEN	TREE	3	FACU	SALICACEAE
POPHET	8	Populus heterophylla	SWAMP COTTONWOOD	TREE	-5	OBL	SALICACEAE
POPNIG	*	POPULUS NIGRA ITALICA	LOMBARDY POPLAR	TREE	5	UPL	SALICACEAE
POPTRE	3	Populus tremuloides	QUAKING ASPEN	TREE	0	FAC	SALICACEAE
PORSTI	6	Porteranthus stipulatus	INDIAN PHYSIC	P-FORB	5	UPL	ROSACEAE
PORTRI	10	Porteranthus trifoliatus	INDIAN PHYSIC	P-FORB	5	UPL	ROSACEAE
PORGRA	*	PORTULACA GRANDIFLORA	MOSS ROSE	A-FORB	5	UPL	PORTULACACEAE
POROLE	*	PORTULACA OLERACEA	PURSLANE	A-FORB	1	FAC-	PORTULACACEAE
POTAMP	10	Potamogeton amplifolius	LARGE-LEAVED PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTCRI	*	POTAMOGETON CRISPUS	BEGINNER'S PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTDIV	6	Potamogeton diversifolius	WATER-THREAD PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTEPI	10	Potamogeton epihydrus	RIBBON-LEAVED PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTFOL	- 5	Potamogeton foliosus	LEAFY PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTFRI	10	Potamogeton friesii	FRIES'S PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTGRA	10	Potamogeton gramineus	GRASS-LEAVED PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTILL	7	Potamogeton illinoensis	ILLINOIS PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTNAT	7	Potamogeton natans	COMMON PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTNOD	7	Potamogeton nodosus	AMERICAN PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTPEC	5	Potamogeton pectinatus	COMB PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTPRA	10	Potamogeton praelongus	WHITE-STEMMED PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTPUL	10	Potamogeton pulcher	SPOTTED PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTPUS	7	Potamogeton pusillus	BABY PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTRIC	10	Potamogeton richardsonii	REDHEAD GRASS	P-FORB	-5	OBL	POTAMOGETONACEAE
POTROB	10	Potamogeton robbinsii	FERN PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTSTR	10	Potamogeton strictifolius	STIFF PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTVAS	10	Potamogeton vaseyi	VASEY'S PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTZOS	8	Potamogeton zosteriformis	FLAT-STEMMED PONDWEED	P-FORB	-5	OBL	POTAMOGETONACEAE
POTANS	6	Potentilla anserina	SILVERWEED	P-FORB	-4	FACW+	ROSACEAE
POTARE	*	POTENTILLA ARGENTEA	SILVERY CINQUEFOIL	P-FORB	3	FACU	ROSACEAE
POTARU	10	Potentilla arguta	PRAIRIE CINQUEFOIL	P-FORB	4	FACU-	ROSACEAE
POTFRU	10	Potentilla fruticosa	SHRUBBY CINQUEFOIL	SHRUB	-3	FACW	ROSACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
POTINC	*	POTENTILLA INCLINATA	HOARY CINQUEFOIL	P-FORB	5	UPL	ROSACEAE
POTINT	*	POTENTILLA INTERMEDIA	INTERMEDIATE CINQUEFOIL	P-FORB	5	UPL	ROSACEAE
POTMIL	10	Potentilla millegrana	CINQUEFOIL	A-FORB	-5	OBL	ROSACEAE
POTNOR	0	Potentilla norvegica	ROUGH CINQUEFOIL	A-FORB	0	FAC	ROSACEAE
POTPAL	10	Potentilla palustris	MARSH CINQUEFOIL	P-FORB	-5	OBL	ROSACEAE
POTPAR	8	Potentilla paradoxa	CINQUEFOIL	A-FORB	-4	FACW+	ROSACEAE
POTPEB	10	Potentilla pensylvanica v. bipinnatifida	GRAY CINQUEFOIL	P-FORB	5	UPL	ROSACEAE
POTREC	*	POTENTILLA RECTA	SULFUR CINQUEFOIL	P-FORB	5	UPL	ROSACEAE
POTREP	*	POTENTILLA REPTANS	CREEPING CINQUEFOIL	P-FORB	5	UPL	ROSACEAE
POTRIV	*	POTENTILLA RIVALIS	BROOK CINQUEFOIL	P-FORB	-4	FACW+	ROSACEAE
POTSIM	3	Potentilla simplex	COMMON CINQUEFOIL	P-FORB	4	FACU-	ROSACEAE
POTTRI	10	Potentilla tridentata	THREE-TOOTHED CINQUEFOIL	SHRUB	5	UPL	ROSACEAE
PREALB	5	Prenanthes alba	LION'S FOOT	P-FORB	3	FACU	ASTERACEAE
PREALT	5	Prenanthes altissima	TALL WHITE LETTUCE	P-FORB	3	FACU	ASTERACEAE
PREASP	8	Prenanthes aspera	ROUGH WHITE LETTUCE	P-FORB	5	UPL	ASTERACEAE
PRECRE	9	Prenanthes crepidinea	GREAT WHITE LETTUCE	P-FORB	-1	FAC+	ASTERACEAE
PRERAC	8	Prenanthes racemosa	GLAUCOUS WHITE LETTUCE	P-FORB	-3	FACW	ASTERACEAE
PRIMIS	10	Primula mistassinica	BIRD'S-EYE PRIMROSE	P-FORB	-3	FACW	PRIMULACEAE
PRICIL	*	PRIONOPSIS CILIATUS	GOLDENWEED	A-FORB	5	UPL	ASTERACEAE
PROLOU	*	PROBOSCIDEA LOUISIANICA	DEVILS CLAW	A-FORB	-1	FAC+	MARTYNIACEAE
PROPAL	5	Proserpinaca palustris	MERMAID WEED	P-FORB	-5	OBL	HALORAGIDACEAE
PRUVUV	*	PRUNELLA VULGARIS	LAWN PRUNELLA	P-FORB	0	FAC	LAMIACEAE
PRUVUE	1	Prunella vulgaris v. elongata	SELF-HEAL	P-FORB	0	FAC	LAMIACEAE
PRUAMA	3	Prunus americana	AMERICAN PLUM	TREE	5	UPL	ROSACEAE
PRUAML	3	Prunus americana v. lanata	WILD PLUM	TREE	5	UPL	ROSACEAE
PRUANG	3	Prunus angustifolia	CHICKASAW PLUM	SHRUB	5	UPL	ROSACEAE
PRUARM	*	PRUNUS ARMENIACA	APRICOT	TREE	5	UPL	ROSACEAE
PRUAVI	*	PRUNUS AVIUM	SWEET CHERRY	TREE	5	UPL	ROSACEAE
PRUCER	*	PRUNUS CERASUS	SOUR CHERRY	TREE	5	UPL	ROSACEAE
PRUHOR	3	Prunus hortulana	WILD GOOSE PLUM	TREE	5	UPL	ROSACEAE
PRUMAH	*	PRUNUS MAHALEB	PERFUMED CHERRY	TREE	5	UPL	ROSACEAE
PRUMEX	7	Prunus mexicana	BIG TREE PLUM	TREE	5	UPL	ROSACEAE
PRUMUN	6	Prunus munsoniana	WILD GOOSE PLUM	TREE	5	UPL	ROSACEAE
PRUNIG	8	Prunus nigra	CANADA PLUM	TREE	4	FACU-	ROSACEAE
PRUPAD	*	PRUNUS PADUS	EUROPEAN BIRD CHERRY	TREE	5	UPL	ROSACEAE
PRUPEN	6	Prunus pensylvanica	PIN CHERRY	TREE	4	FACU-	ROSACEAE
PRUPER	*	PRUNUS PERSICA	PEACH	TREE	5	UPL	ROSACEAE
PRUSER	1	Prunus serotina	WILD BLACK CHERRY	TREE	3	FACU	ROSACEAE
PRUSUS	8	Prunus susquehanae	SAND CHERRY	TREE	5	UPL	ROSACEAE
PRUTOM	*	PRUNUS TOMENTOSA	NANKING CHERRY	TREE	5	UPL	ROSACEAE
PRUVIR	3	Prunus virginiana	COMMON CHOKE CHERRY	SHRUB	1	FAC-	ROSACEAE
PSOARG	*	PSORALEA ARGOPHYLLA	SILVERY SURFY PEA	P-FORB	5	UPL	FABACEAE
PSOONO	6	Psoralea onobrychis	FRENCH GRASS	P-FORB	5	UPL	FABACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
PSOPSO	6	Psoralea psoralioides v. eglandulosa	SAMPSON'S SNAKEROOT	P-FORB	5	UPL	FABACEAE
PSOTEN	8	Psoralea tenuiflora	SCURFY-PEA	P-FORB	5	UPL	FABACEAE
PTETRT	4	Ptelea trifoliata	WAFER ASH	SHRUB	2	FACU+	RUTACEAE
PTETRM	6	Ptelea trifoliata v. mollis	DOWNY WAFER ASH	SHRUB	5	UPL	RUTACEAE
PTEAQU	5	Pteridium aquilinum	BRACKEN FERN	FERN	3	FACU	DENNSTAEDTIACEAE
PTICOS	10	Ptilimnium costatum	MOCK BISHOP'S WEED	A-FORB	-5	OBL	APIACEAE
PTINUT	7	Ptilimnium nuttallii	MOCK BISHOP'S WEED	A-FORB	-4	FACW+	APIACEAE
PUCDIS	*	PUCCINELLIA DISTANS	ALKALI GRASS	P-GRASS	-5	OBL	POACEAE
PUELOB	*	PUERARIA LOBATA	KUDZU	W-VINE	5	UPL	FABACEAE
PULPAT	9	Pulsatilla patens v. multifida	PASQUE FLOWER	P-FORB	5	UPL	RANUNCULACEAE
PYCALB	10	Pycnanthemum albescens	WHITE MOUNTAIN MINT	P-FORB	5	UPL	LAMIACEAE
PYCINC	8	Pycnanthemum incanum	GRAY MOUNTAIN MINT	P-FORB	5	UPL	LAMIACEAE
PYCMUT	10	Pycnanthemum muticum	BROAD-LEAVED MOUNTAIN MINT	P-FORB	0	FAC	LAMIACEAE
PYCPIL	6	Pycnanthemum pilosum	HAIRY MOUNTAIN MINT	P-FORB	5	UPL	LAMIACEAE
PYCPYC	8	Pycnanthemum pycnanthemoides	MOUNTAIN MINT	P-FORB	5	UPL	LAMIACEAE
PYCTEN	4	Pycnanthemum tenuifolium	SLENDER MOUNTAIN MINT	P-FORB	0	FAC	LAMIACEAE
PYCTOR	10	Pycnanthemum torrei	TORREY'S MOUNTAIN MINT	P-FORB	5	UPL	LAMIACEAE
PYCVIR	5	Pycnanthemum virginianum	COMMON MOUNTAIN MINT	P-FORB	-4	FACW+	LAMIACEAE
PYRAME	10	Pyrola americana	ROUND-LEAVED SHINLEAF	P-FORB	1	FAC-	PYROLACEAE
PYRELL	8	Pyrola elliptica	LARGE-LEAVED SHINLEAF	P-FORB	5	UPL	PYROLACEAE
PYRCAR	1	Pyrrhopappus carolinianus	FALSE DANDELION	A-FORB	5	UPL	ASTERACEAE
PYRCAL	*	PYRUS CALLERYANA	ORNAMENTAL PEAR	TREE	5	UPL	ROSACEAE
PYRCOM	*	PYRUS COMMUNIS	PEAR	TREE	5	UPL	ROSACEAE
PYRPYR	*	PYRUS PYRIFOLIA	CHINESE PEAR	TREE	5	UPL	ROSACEAE
QUEALB	. 5	Quercus alba	WHITE OAK	TREE	3	FACU	FAGACEAE
QUEBIC	7	Quercus bicolor	SWAMP WHITE OAK	TREE	-4	FACW+	FAGACEAE
QUECOC	7	Quercus coccinea	SCARLET OAK	TREE	5	UPL	FAGACEAE
QUEELL	5	Quercus ellipsoidalis	HILL'S OAK	TREE	5	UPL	FAGACEAE
QUEFAL	6	Quercus falcata	SOUTHERN RED OAK	TREE	3	FACU	FAGACEAE
QUEIMB	2	Quercus imbricaria	JACK OAK	TREE	1	FAC-	FAGACEAE
QUELYR	7	Quercus lyrata	OVERCUP OAK	TREE	-5	OBL	FAGACEAE
QUEMAC	5	Quercus macrocarpa	BURR OAK	TREE	1	FAC-	FAGACEAE
QUEMAR	6	Quercus marilandica	BLACKJACK OAK	TREE	5	UPL	FAGACEAE
QUEMIC	7	Quercus michauxii	BASKET OAK	TREE	-3	FACW	FAGACEAE
QUENUT	10	Quercus nuttallii	NUTTALL'S OAK	TREE	-5	OBL	FAGACEAE
QUEPAG	5	Quercus pagoda	CHERRYBARK OAK	TREE	0	FAC	FAGACEAE
QUEPAL	4	Quercus palustris	PIN OAK	TREE	-3	FACW	FAGACEAE
QUEPHE	7	Quercus phellos	WILLOW OAK	TREE	-3	FACW	FAGACEAE
QUEPRA	5	Quercus prinoides v. acuminata	CHINKAPIN OAK	TREE	4	FACU-	FAGACEAE
QUEPRN	9	Quercus prinus	BASKET OAK	TREE	4	FACU-	FAGACEAE
QUERUB	5	Quercus rubra	NORTHERN RED OAK	TREE	3	FACU	FAGACEAE
QUESHS	7	Quercus shumardii	SHUMARD'S OAK	TREE	-2	FACW-	FAGACEAE
QUESSC	7	Quercus shumardii v. schneckii	SCHNECK'S RED OAK	TREE	-2	FACW-	FAGACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
QUESTE	5	Quercus stellata	POST OAK	TREE	4	FACU-	FAGACEAE
QUEVEL	5	Quercus velutina	BLACK OAK	TREE	5	UPL	FAGACEAE
RANABO	1	Ranunculus abortivus	LITTLE-LEAF BUTTERCUP	A-FORB	-2	FACW-	RANUNCULACEAE
RANACR	*	RANUNCULUS ACRIS	TALL BUTTERCUP	P-FORB	-2	FACW-	RANUNCULACEAE
RANAMB	8	Ranunculus ambigens	SPEARWORT	P-FORB	-5	OBL	RANUNCULACEAE
RANARV	*	RANUNCULUS ARVENSIS	CORN BUTTERCUP	A-FORB	0	FAC	RANUNCULACEAE
RANBUL	*	RANUNCULUS BULBOSUS	BULBOUS BUTTERCUP	P-FORB	-3	FACW	RANUNCULACEAE
RANCAR	9	Ranunculus carolinianus	CAROLINA BUTTERCUP	P-FORB	-3	FACW	RANUNCULACEAE
RANCYM	2	Ranunculus cymbalaria	SEASIDE CROWFOOT	P-FORB	-5	OBL	RANUNCULACEAE
RANFAS	5	Ranunculus fascicularis	EARLY BUTTERCUP	P-FORB	3	FACU	RANUNCULACEAE
RANFIC	*	RANUNCULUS FICARIA	LESSER CELANDINE	P-FORB	5	UPL	RANUNCULACEAE
RANFLA	6	Ranunculus flabellaris	YELLOW WATER BUTTERCUP	P-FORB	-5	OBL	RANUNCULACEAE
RANGME	10	Ranunculus gmelinii v. hookeri	SMALL YELLOW WATER-CROWFOOT	P-FORB	-4	FACW+	RANUNCULACEAE
RANHAR	10	Ranunculus harveyi	HARVEY'S BUTTERCUP	P-FORB	4	FACU-	RANUNCULACEAE
RANHIS	5	Ranunculus hispidus	ROUGH BUTTERCUP	P-FORB	0	FAC	RANUNCULACEAE
RANLAX	6	Ranunculus laxicaulis	SPEARWORT	A-FORB	-5	OBL	RANUNCULACEAE
RANLON	6	Ranunculus longirostris	WHITE WATER CROWFOOT	P-FORB	-5	OBL	RANUNCULACEAE
RANMIC	2	Ranunculus micranthus	SMALL-FLOWERED CROWFOOT	P-FORB	1	FAC-	RANUNCULACEAE
RANPAR	*	RANUNCULUS PARVIFLORUS	SMALL-FLOWERED CROWFOOT	A-FORB	0	FAC	RANUNCULACEAE
RANPEN	5	Ranunculus pensylvanicus	BRISTLY CROWFOOT	A-FORB	-5	OBL	RANUNCULACEAE
RANPUS	6	Ranunculus pusillus	SMALL SPEARWORT	A-FORB	-5	OBL	RANUNCULACEAE
RANREC	5	Ranunculus recurvatus	HOOKED BUTTERCUP	A-FORB	-3	FACW	RANUNCULACEAE
RANREP	*	RANUNCULUS REPENS	CREEPING BUTTERCUP	P-FORB	-1	FAC+	RANUNCULACEAE
RANRHO	10	Ranunculus rhomboideus	PLAINS BUTTERCUP	P-FORB	5	UPL	RANUNCULACEAE
RANSAR	*	RANUNCULUS SARDOUS	PAPILLOSE BUTTERCUP	A-FORB	0	FAC	RANUNCULACEAE
RANSCE	3	Ranunculus sceleratus	CURSED CROWFOOT	A-FORB	-5	OBL	RANUNCULACEAE
RANSES	4	Ranunculus septentrionalis	SWAMP BUTTERCUP	P-FORB	-4	FACW+	RANUNCULACEAE
RANSEC	8	Ranunculus septentrionalis v. caricetorum	SWAMP BUTTERCUP	P-FORB	-5	OBL	RANUNCULACEAE
RANTRI	7	Ranunculus trichophyllus	WHITE WATER CROWFOOT	P-FORB	-5	OBL	RANUNCULACEAE
RAPRAP	*	RAPHANUS RAPHANISTRUM	WILD RADISH	A-FORB	5	UPL	BRASSICACEAE
RAPSAT	*	RAPHANUS SATIVUS	RADISH	A-FORB	5	UPL	BRASSICACEAE
RAPRUG	*	RAPISTRUM RUGOSUM	WILD RAPE	A-FORB	5	UPL	BRASSICACEAE
RATCOL	*	RATIBIDA COLUMNIFERA	LONG-HEADED CONEFLOWER	P-FORB	5	UPL	ASTERACEAE
RATPIN	4	Ratibida pinnata	YELLOW CONEFLOWER	P-FORB	5	UPL	ASTERACEAE
REDFLE	*	REDFIELDIA FLEXUOSA	BLOWOUT GRASS	P-GRASS	5	UPL	POACEAE
REHFLO	*	REHSONIA FLORIBUNDA	JAPANESE WISTERIA	W-VINE	5	UPL	FABACEAE
REHSIN	*	REHSONIA SINENSIS	CHINESE WISTERIA	W-VINE	5	UPL	FABACEAE
RESALB	*	RESEDA ALBA	DYER'S ROCKET	A-FORB	5	UPL	RESEDACEAE
RHAALN	10	Rhamnus alnifolia	ALDER BUCKTHORN	SHRUB	-5	OBL	RHAMNACEAE
RHACAR	7	Rhamnus caroliniana	CAROLINA BUCKTHORN	SHRUB	1	FAC-	RHAMNACEAE
RHACAT	*	RHAMNUS CATHARTICA	COMMON BUCKTHORN	SHRUB	3	FACU	RHAMNACEAE
RHADAV	*	RHAMNUS DAVURICA	DAHURIAN BUCKTHORN	SHRUB	5	UPL	RHAMNACEAE
RHAFRA	*	RHAMNUS FRANGULA	GLOSSY BUCKTHORN	SHRUB	-1	FAC+	RHAMNACEAE

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RHAJAP	*	RHAMNUS JAPONICA	JAPANESE BUCKTHORN	SHRUB	5	UPL	RHAMNACEAE
RHALAN	7	Rhamnus lanceolata	LANCE-LEAVED BUCKTHORN	SHRUB	-1	FAC+	RHAMNACEAE
RHAUTI	*	RHAMNUS UTILIS	CHINESE BUCTHORN	SHRUB	3	FACU	RHAMNACEAE
RHERHA	*	RHEUM RHAPONTICUM	RHUBARB	P-FORB	5	UPL	POLYGONACEAE
RHEMAR	10	Rhexia mariana	MEADOW BEAUTY	P-FORB	-5	OBL	MELASTOMATACEAE
RHEVIR	10	Rhexia virginica	MEADOW BEAUTY	P-FORB	-5	OBL	MELASTOMATACEAE
RHOPER	10	Rhododendron periclymenoides	PINK AZALEA	SHRUB	0	FAC	ERICACEAE
RHOPRI	10	Rhododendron prinophyllum	PINK AZALEA	SHRUB	0	FAC	ERICACEAE
RHOSCA	*	RHODOTYPOS SCANDENS	JETBEAD	SHRUB	5	UPL	ROSACEAE
RHUARM	4	Rhus aromatica	AROMATIC SUMAC	SHRUB	5	UPL	ANACARDIACEAE
RHUAAR	6	Rhus aromatica v. arenaria	BEACH SUMAC	SHRUB	5	UPL	ANACARDIACEAE
RHUARS	6	Rhus aromatica v. serotina	FRAGRANT SUMAC	SHRUB	5	UPL	ANACARDIACEAE
RHUCOP	3	Rhus copallina	DWARF SUMAC	SHRUB	5	UPL	ANACARDIACEAE
RHUGLA	1	Rhus glabra	SMOOTH SUMAC	SHRUB	5	UPL	ANACARDIACEAE
RHUTYP	2	Rhus typhina	STAGHORN SUMAC	SHRUB	5	UPL	ANACARDIACEAE
RHYALB	10	Rhynchospora alba	WHITE BEAK RUSH	P-SEDGE	-5	OBL	CYPERACEAE
RHYCAL	10	Rhynchospora capillacea	HAIR BEAK RUSH	P-SEDGE	-5	OBL	CYPERACEAE
RHYCAT	10	Rhynchospora capitellata	BROWN BEAK RUSH	P-SEDGE	-5	OBL	CYPERACEAE
RHYCOR	7	Rhynchospora corniculata	HORNED BEAK RUSH	P-SEDGE	-5	OBL	CYPERACEAE
RHYGLB	10	Rhynchospora globularis	GRASS BEAK RUSH	P-SEDGE	-3	FACW	CYPERACEAE
RHYGLM	10	Rhynchospora glomerata	ROUND-HEADED BEAK RUSH	P-SEDGE	-5	OBL	CYPERACEAE
RIBAME	5	Ribes americanum	WILD BLACK CURRENT	SHRUB	-3	FACW	GROSSULARIACEAE
RIBCYN	4	Ribes cynosbati	PRICKLY WILD GOOSEBERRY	SHRUB	5	UPL	GROSSULARIACEAE
RIBHIR	10	Ribes hirtellum	NORTHERN GOOSEBERRY	SHRUB	-3	FACW	GROSSULARIACEAE
RIBMIS	- 2	Ribes missouriense	MISSOURI GOOSEBERRY	SHRUB	5	UPL	GROSSULARIACEAE
RIBNIG	*	RIBES NIGRUM	BLACK CURRENT	SHRUB	5	UPL	GROSSULARIACEAE
RIBODO	*	RIBES ODORATUM	BUFFALO CURRENT	SHRUB	1	FAC-	GROSSULARIACEAE
RIBRUB	*	RIBES RUBRUM	RED CURRENT	SHRUB	5	UPL	GROSSULARIACEAE
RIBTRI	2	Ribes triste	SWAMP RED CURRANT	SHRUB	5	UPL	GROSSULARIACEAE
RICCOM	*	RICINUS COMMUNIS	CASTOR BEAN	A-FORB	4	FACU-	EUPHORBIACEAE
ROBHIS	*	ROBINIA HISPIDA	BRISTLY LOCUST	SHRUB	5	UPL	FABACEAE
ROBPSE	1	Robinia pseudo-acacia	BLACK LOCUST	TREE	4	FACU-	FABACEAE
ROBVIS	*	ROBINIA VISCOSA	CLAMMY LOCUST	TREE	5	UPL	FABACEAE
RORISI	4	Rorippa palustris	MARSH YELLOW CRESS	A-FORB	-5	OBL	BRASSICACEAE
RORISF	4	Rorippa palustris v. fernaldiana	MARSH YELLOW CRESS	A-FORB	-5	OBL	BRASSICACEAE
RORISH	4	Rorippa palustris v. hispida	HAIRY MARSH YELLOW CRESS	A-FORB	-5	OBL	BRASSICACEAE
RORSES	3	Rorippa sessiliflora	SESSILE-FLOWERED CRESS	A-FORB	-5	OBL	BRASSICACEAE
RORSIN	3	Rorippa sinuata	SPREADING YELLOW CRESS	P-FORB	-3	FACW	BRASSICACEAE
RORSYL	*	RORIPPA SYLVESTRIS	CREEPING YELLOW CRESS	P-FORB	-5	OBL	BRASSICACEAE
RORTRU	5	Rorippa truncata	BLUNT-LEAVED YELLOW CRESS	A-FORB	0	FAC	BRASSICACEAE
ROSACI	9	Rosa acicularis	PRICKLY ROSE	SHRUB	3	FACU	ROSACEAE
ROSBLA	4	Rosa blanda	EARLY WILD ROSE	SHRUB	3	FACU	ROSACEAE
ROSCAN	*	ROSA CANINA	DOG ROSE	SHRUB	5	UPL	ROSACEAE

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ROSCAR	4	Rosa carolina	PASTURE ROSE	SHRUB	4	FACU-	ROSACEAE
ROSEGL	*	ROSA EGLANTERIA	SWEETBRIER	SHRUB	5	UPL	ROSACEAE
ROSGAL	*	ROSA GALLICA	FRENCH ROSE	SHRUB	5	UPL	ROSACEAE
ROSMIC	*	ROSA MICRANTHA	SMALL SWEETBRIER	SHRUB	3	FACU	ROSACEAE
ROSMOS	*	ROSA MOSCHATA	MUSK ROSE	SHRUB	5	UPL	ROSACEAE
ROSMUL	*	ROSA MULTIFLORA	JAPANESE ROSE	SHRUB	3	FACU	ROSACEAE
ROSPAL	7	Rosa palustris	SWAMPY ROSE	SHRUB	-5	OBL	ROSACEAE
ROSRUB	*	ROSA RUBRIFOLIA	RED-LEAVED ROSE	SHRUB	5	UPL	ROSACEAE
ROSRUD	5	Rosa rudiuscula	ROUGH ROSE	SHRUB	5	UPL	ROSACEAE
ROSRUG	*	ROSA RUGOSA	RUGOSE ROSE	SHRUB	3	FACU	ROSACEAE
ROSSET	5	Rosa setigera	ILLINOIS ROSE	SHRUB	2	FACU+	ROSACEAE
ROSSPI	*	ROSA SPINOSISSIMA	BURNET ROSE	SHRUB	5	UPL	ROSACEAE
ROSSUF	5	Rosa suffulta	SUNSHINE ROSE	SHRUB	5	UPL	ROSACEAE
ROSVIR	*	ROSA VIRGINIANA	VIRGINIA ROSE	SHRUB	0	FAC	ROSACEAE
ROTRAM	4	Rotala ramosior	WHEELWORT	A-FORB	-5	OBL	LYTHRACEAE
RUBALL	2	Rubus allegheniensis	COMMON BLACKBERRY	SHRUB	2	FACU+	ROSACEAE
RUBARG	3	Rubus argutus	HIGHBUSH BLACKBERRY	SHRUB	1	FAC-	ROSACEAE
RUBDIS	*	RUBUS DISCOLOR	HIMALAYA BERRY	SHRUB	5	UPL	ROSACEAE
RUBENS	7	Rubus enslenii	ARCHING DEWBERRY	SHRUB	5	UPL	ROSACEAE
RUBFLA	2	Rubus flagellaris	COMMON DEWBERRY	SHRUB	4	FACU-	ROSACEAE
RUBHIS	8	Rubus hispidus	SWAMPY DEWBERRY	SHRUB	-3	FACW	ROSACEAE
RUBIDA	*	RUBUS IDAEUS	CULTIVATED RASPBERRY	SHRUB	2	FACU+	ROSACEAE
RUBLAC	*	RUBUS LACINIATUS	CUT-LEAVED BLACKBERRY	SHRUB	5	UPL	ROSACEAE
RUBOCC	2	Rubus occidentalis	BLACK RASPBERRY	SHRUB	3	FACU	ROSACEAE
RUBODO	6	Rubus odoratus	PURPLE FLOWERING RASPBERRY	SHRUB	5	UPL	ROSACEAE
RUBPEN	2	Rubus pensylvanicus	YANKEE BLACKBERRY	SHRUB	1	FAC-	ROSACEAE
RUBPHO	*	RUBUS PHOENICOLASIUS	WINEBERRY	SHRUB	5	UPL	ROSACEAE
RUBPUB	10	Rubus pubescens	DWARF RASPBERRY	P-FORB	-4	FACW+	ROSACEAE
RUBSCH	10	Rubus schneideri	BRISTLY BLACKBERRY	P-FORB	5	UPL	ROSACEAE
RUBSTR	6	Rubus strigosus	RED RASPBERRY	P-FORB	-2	FACW-	ROSACEAE
RUBTRI	5	Rubus trivialis	SOUTHERN DEWBERRY	SHRUB	2	FACU+	ROSACEAE
RUDFUF	7	Rudbeckia fulgida	ORANGE CONEFLOWER	P-FORB	-5	OBL	ASTERACEAE
RUDFUS	6	Rudbeckia fulgida v. sullivantii	SULLIVANT'S ORANGE CONEFLOWER	P-FORB	-5	OBL	ASTERACEAE
RUDGRA	*	RUDBECKIA GRANDIFLORA	LARGE BLACK-EYED SUSAN	P-FORB	5	UPL	ASTERACEAE
RUDHIR	2	Rudbeckia hirta	BLACK-EYED SUSAN	P-FORB	3	FACU	ASTERACEAE
RUDLAC	3	Rudbeckia laciniata	WILD GOLDEN GLOW	P-FORB	-4	FACW+	ASTERACEAE
RUDMIS	10	Rudbeckia missouriensis	MISSOURI BLACK-EYED SUSAN	P-FORB	4	FACU-	ASTERACEAE
RUDSUB	5	Rudbeckia subtomentosa	SWEET BLACK-EYED SUSAN	P-FORB	-3	FACW	ASTERACEAE
RUDTRI	3	Rudbeckia triloba	BROWN-EYED SUSAN	A-FORB	1	FAC-	ASTERACEAE
RUECAR	8	Ruellia caroliniensis v. dentata	WILD PETUNIA	P-FORB	5	UPL	ACANTHACEAE
RUEHUH	3	Ruellia humilis	HAIRY RUELLIA	P-FORB	4	FACU-	ACANTHACEAE
RUEHUL	3	Ruellia humilis v. longiflora	HAIRY RUELLIA	P-FORB	4	FACU-	ACANTHACEAE
RUEPED	7	Ruellia pedunculata	STALKED WILD PETUNIA	P-FORB	5	UPL	ACANTHACEAE

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RUESTR	6	Ruellia strepens	SMOOTH RUELLIA	P-FORB	-1	FAC+	ACANTHACEAE
RUMACE	*	RUMEX ACETOSELLA	FIELD SORREL	P-FORB	0	FAC	POLYGONACEAE
RUMALT	2	Rumex altissimus	PALE DOCK	P-FORB	4	FACU-	POLYGONACEAE
RUMCRP	*	RUMEX CRISPUS	CURLY DOCK	P-FORB	-1	FAC+	POLYGONACEAE
RUMCRT	*	RUMEX CRISTATUS	CRESTED DOCK	P-FORB	5	UPL	POLYGONACEAE
RUMHAS	4	Rumex hastatulus	SOUR DOCK	P-FORB	3	FACU	POLYGONACEAE
RUMLON	*	RUMEX LONGIFOLIUS	LONG-LEAVED DOCK	B-FORB	5	UPL	POLYGONACEAE
RUMMAR	2	Rumex maritimus v. fueginus	GOLDEN DOCK	A-FORB	-4	FACW+	POLYGONACEAE
RUMMEX	1	Rumex mexicanus	MEXICAN DOCK	P-FORB	-1	FAC+	POLYGONACEAE
RUMOBT	*	RUMEX OBTUSIFOLIUS	BITTER DOCK	P-FORB	-3	FACW	POLYGONACEAE
RUMORB	7	Rumex orbiculatus	GREAT WATER DOCK	P-FORB	-5	OBL	POLYGONACEAE
RUMPAT	*	RUMEX PATIENTIA	PATIENCE DOCK	P-FORB	5	UPL	POLYGONACEAE
RUMVER	5	Rumex verticillatus	SWAMP DOCK	P-FORB	-5	OBL	POLYGONACEAE
RUPMAR	10	Ruppia maritima v. rostrata	DITCH GRASS	P-FORB	-5	OBL	RUPPIACEAE
RUTGRA	*	RUTA GRAVEOLENS	RUE	SHRUB	5	UPL	RUTACEAE
SABANG	3	Sabatia angularis	ROSE GENTIAN	B-FORB	-1	FAC+	GENTIANACEAE
SABCAM	8	Sabatia campestris	PRAIRIE ROSE GENTIAN	B-FORB	3	FACU	GENTIANACEAE
SAGPRO	*	SAGINA PROCUMBENS	PEARLWORT	P-FORB	5	UPL	CARYOPHYLLACEAE
SAGBRE	5	Sagittaria brevirostra	SHORT-BEAKED ARROWLEAF	P-FORB	-5	OBL	ALISMATACEAE
SAGCAL	6	Sagittaria calycina	THICK-STALKED ARROWHEAD	P-FORB	-5	OBL	ALISMATACEAE
SAGCUN	7	Sagittaria cuneata	ARUM-LEAVED ARROWHEAD	P-FORB	-5	OBL	ALISMATACEAE
SAGGRA	7	Sagittaria graminea	GRASS-LEAVED ARROWHEAD	P-FORB	-5	OBL	ALISMATACEAE
SAGLAT	4	Sagittaria latifolia	COMMON ARROWHEAD	P-FORB	-5	OBL	ALISMATACEAE
SAGLON	10	Sagittaria longirostra	LONG-BEAKED ARROWHEAD	P-FORB	-5	OBL	ALISMATACEAE
SAGRIG	8	Sagittaria rigida	STIFF ARROWHEAD	P-FORB	-5	OBL	ALISMATACEAE
SALEUR	*	SALICORNIA EUROPAEA	GLASSWORT	A-FORB	-5	OBL	CHENOPODIACEAE
SALALA	*	SALIX ALBA	WHITE WILLOW	TREE	-3	FACW	SALICACEAE
SALALT	*	SALIX ALBA 'TRISTIS'	WEEPING WILLOW	TREE	3	FACU	SALICACEAE
SALAMY	4	Salix amygdaloides	PEACH-LEAVED WILLOW	TREE	-3	FACW	SALICACEAE
SALBEB	7	Salix bebbiana	BEAKED WILLOW	SHRUB	-4	FACW+	SALICACEAE
SALCAN	10	Salix candida	HOARY WILLOW	SHRUB	-5	OBL	SALICACEAE
SALCAP	*	SALIX CAPREA	GOAT WILLOW	SHRUB	5	UPL	SALICACEAE
SALCAR	6	Salix caroliniana	CAROLINA WILLOW	TREE	-5	OBL	SALICACEAE
SALCIN	*	SALIX CINEREA	GRAY WILLOW	SHRUB	5	UPL	SALICACEAE
SALDIS	4	Salix discolor	PUSSY WILLOW	SHRUB	-3	FACW	SALICACEAE
SALERI	8	Salix eriocephala	HEART-LEAVED WILLOW	SHRUB	-3	FACW	SALICACEAE
SALEXI	1	Salix exigua	SANDBAR WILLOW	SHRUB	-5	OBL	SALICACEAE
SALFRA	*	SALIX FRAGILIS	CRACK WILLOW	TREE	-1	FAC+	SALICACEAE
SALGLA	3	Salix ×glatfelteri	HYBRID BLACK WILLOW	TREE	-5	OBL	SALICACEAE
SALGLA	8	Salix glaucophylloides v. glaucophylla	BLUE-LEAF WILLOW	SHRUB	-3	FACW	SALICACEAE
SALHUM	5	Salix humilis	PRAIRIE WILLOW	SHRUB	3	FACU	SALICACEAE
SALLUC	10	Salix lucida	SHINING WILLOW	SHRUB	-4	FACW+	SALICACEAE
SALNIG	3	Salix nigra	BLACK WILLOW	TREE	-5	OBL	SALICACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
SALPED	10	Salix pedicellaris v. hypoglauca	BOG WILLOW	SHRUB	-5	OBL	SALICACEAE
SALPEN	*	SALIX PENTANDRA	BAY-LEAVED WILLOW	SHRUB	5	UPL	SALICACEAE
SALPET	6	Salix petiolaris	MEADOW WILLOW	SHRUB	-5	OBL	SALICACEAE
SALPUP	*	SALIX PURPUREA	BASKET WILLOW	SHRUB	-3	FACW	SALICACEAE
SALRIG	5	Salix rigida	HEART-LEAVED WILLOW	SHRUB	-4	FACW +	SALICACEAE
SALRUB	*	SALIX ×RUBENS	HYBRID CRACK WILLOW	TREE	-4	FACW +	SALICACEAE
SALSEC	8	Salix sericea	SILKY WILLOW	SHRUB	-5	OBL	SALICACEAE
SALSES	10	Salix serissima	AUTUMN WILLOW	SHRUB	-5	OBL	SALICACEAE
SALSYR	6	Salix ×subsericea	WILLOW	SHRUB	-5	OBL	SALICACEAE
SALSUB	10	Salix syrticola	DUNE WILLOW	SHRUB	-1	FAC +	SALICACEAE
SALCOL	*	SALSOLA COLLINA	SALTWORT	A-FORB	5	UPL	CHENOPODIACEAE
SALIBE	*	SALSOLA IBERICA	RUSSIAN THISTLE	A-FORB	3	FACU	CHENOPODIACEAE
SALAZN	9	Salvia azurea v. grandiflora	BLUE SAGE	P-FORB	5	UPL	LAMIACEAE
SALAZA	*	SALVIA AZUREA v. GRANDIFLORA	BLUE SAGE	P-FORB	5	UPL	LAMIACEAE
SALLYR	4	Salvia lyrata	CANCER WEED	P-FORB	-2	FACW-	LAMIACEAE
SALNEM	*	SALVIA NEMOROSA	WILD SAGE	P-FORB	5	UPL	LAMIACEAE
SALPRA	*	SALVIA PRATENSIS	MEADOW SAGE	P-FORB	5	UPL	LAMIACEAE
SALREF	*	SALVIA REFLEXA	ROCKY MOUNTAIN SAGE	A-FORB	5	UPL	LAMIACEAE
SALVER	*	SALVIA VERTICILLATA	SAGE	P-FORB	5	UPL	LAMIACEAE
SAMCAN	2	Sambucus canadensis	COMMON ELDER	SHRUB	4	FACU-	CAPRIFOLIACEAE
SAMRAC	10	Sambucus racemosa v. pubens	RED-BERRIED ELDER	SHRUB	5	UPL	CAPRIFOLIACEAE
SAMVAL	5	Samolus valerandii	BROOKWEED	P-FORB	-5	OBL	PRIMULACEAE
SANCAD	5	Sanguinaria canadensis	BLOODROOT	P-FORB	4	FACU-	PAPAVERACEAE
SANCAE	10	Sanguisorba canadensis	AMERICAN BURNET	P-FORB	-4	FACW +	ROSACEAE
SANMIN	*	SANGUISORBA MINOR	GARDEN BURNET	P-FORB	0	FAC	ROSACEAE
SANCAS	4	Sanicula canadensis	CANADIAN BLACK SNAKEROOT	B-FORB	2	FACU +	APIACEAE
SANGRE	2	Sanicula gregaria	CLUSTERED BLACK SNAKEROOT	P-FORB	-1	FAC +	APIACEAE
SANMAR	6	Sanicula marilandica	BLACK SNAKEROOT	P-FORB	5	UPL	APIACEAE
SANTRI	8	Sanicula trifoliata	BEAKED BLACK SNAKEROOT	B-FORB	5	UPL	APIACEAE
SANPRO	*	SANVITALIA PROCUMBENS	CREEPING ZINNIA	P-FORB	5	UPL	ASTERACEAE
SAPOFF	*	SAPONARIA OFFICINALIS	BOUNCING BET	P-FORB	3	FACU	CARYOPHYLLACEAE
SARPUR	10	Sarracenia purpurea	PITCHER PLANT	P-FORB	-5	OBL	SARRACENIACEAE
SASALB	2	Sassafras albidum	SASSAFRAS	TREE	3	FACU	LAURACEAE
SATHOR	*	SATUREJA HORTENSIS	SUMMER SAVORY	A-FORB	5	UPL	LAMIACEAE
SAUCER	5	Saururus cernuus	LIZARD'S TAIL	P-FORB	-5	OBL	SAURURACEAE
SAXFOR	10	Saxifraga forbesii	FORBES' SAXIFRAGE	P-FORB	-5	OBL	SAXIFRAGACEAE
SAXPEN	10	Saxifraga pensylvanica	SWAMP SAXIFRAGE	P-FORB	-5	OBL	SAXIFRAGACEAE
SAXVIR	10	Saxifraga virginiensis	EARLY SAXIFRAGE	P-FORB	1	FAC-	SAXIFRAGACEAE
SCHPAN	5	Schedonnardus paniculatus	TUMBLE GRASS	P-GRASS	5	UPL	POACEAE
SCHPAL	10	Scheuchzeria palustris v. americana	ARROW-GRASS	P-FORB	-5	OBL	JUNCAGINACEAE
SCHPUR	10	Schizachne purpurascens	FALSE MELIC GRASS	P-GRASS	2	FACU +	POACEAE
SCHSCO	5	Schizachyrium scoparium	LITTLE BLUESTEM	P-GRASS	4	FACU-	POACEAE
SCHUNC	7	Schrankia uncinata	CAT-CLAW	H-VINE	5	UPL	MIMOSACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
SCISIB	*	SCILLA SIBIRICA	SIBERIAN SQUILL	P-FORB	5	UPL	LILIACEAE
SCIACU	6	Scirpus acutus	HEARD-STEMMED BULRUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIAME	3	Scirpus americanus	CHAIRMAKER'S RUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIATC	10	Scirpus atrocinctus	DARK-COLORED RUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIATR	4	Scirpus atrovirens	DARK GREEN RUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCICES	10	Scirpus cespitosus v. callosus	TUFTED BULRUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCICYP	5	Scirpus cyperinus	WOOL GRASS	P-SEDGE	-5	OBL	CYPERACEAE
SCIFLU	3	Scirpus fluviatilis	RIVER BULRUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIGEO	4	Scirpus georgianus	BRISTLELESS DARK GREEN RUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIHAL	10	Scirpus hallii	HALL'S TUFTED BULRUSH	A-SEDGE	-5	OBL	CYPERACEAE
SCIHAT	5	Scirpus hattorianus	EARLY DARK GREEN RUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIHET	7	Scirpus heterochaetus	SLENDER BULRUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIKOI	8	Scirpus koilolepis	KEELED BULRUSH	A-SEDGE	-4	FACW+	CYPERACEAE
SCIMIM	7	Scirpus micranthus	SMALL-FLOWERED RUSH	A-SEDGE	-5	OBL	CYPERACEAE
SCIMID	7	Scirpus micranthus v. drummondii	SMALL-FLOWERED RUSH	A-SEDGE	-5	OBL	CYPERACEAE
SCIMIP	10	Scirpus microcarpus	SMALL-FRUITED RUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIMUC	*	SCIRPUS MUCRONATUS	POINTED RUSH	A-SEDGE	-5	OBL	CYPERACEAE
SCIPAL	4	Scirpus paludosus	ALKALI BULRUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIPED	10	Scirpus pedicellatus	STALKED WOOL GRASS	P-SEDGE	-5	OBL	CYPERACEAE
SCIPEN	3	Scirpus pendulus	RED BULRUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIPOL	10	Scirpus polyphyllus	LEAFY WOOL GRASS	P-SEDGE	-5	OBL	CYPERACEAE
SCIPUR	10	Scirpus purshianus	PURSH'S TUFTED BULRUSH	A-SEDGE	-5	OBL	CYPERACEAE
SCISMI	10	Scirpus smithii	SMITH'S TUFTED BULRUSH	A-SEDGE	-5	OBL	CYPERACEAE
SCISUB	10	Scirpus subterminalis	WATER BULRUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCITAB	4	Scirpus tabernaemontanii	GREAT BULRUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCITOR	9	Scirpus torreyi	TORREY'S BULRUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCIVER	10	Scirpus verecundus	BULRUSH	P-SEDGE	-5	OBL	CYPERACEAE
SCLANN	*	SCLERANTHUS ANNUUS	KNAWEL	A-FORB	3	FACU	CARYOPHYLLACEAE
SCLOLI	10	Scleria oligantha	SMOOTH-SEEDED NUT RUSH	P-SEDGE	2	FACU+	CYPERACEAE
SCLPAP	10	Scleria pauciflora	FEW-FLOWERED NUT RUSH	P-SEDGE	3	FACU	CYPERACEAE
SCLPAC	10	Scleria pauciflora v. caroliniana	FEW-FLOWERED NUT RUSH	P-SEDGE	3	FACU	CYPERACEAE
SCLRET	10	Scleria reticularis	NETTED NUT RUSH	A-SEDGE	-5	OBL	CYPERACEAE
SCLTRI	9	Scleria triglomerata	TALL NUT GRASS	P-SEDGE	0	FAC	CYPERACEAE
SCLVER	10	Scleria verticillata	LOW NUT RUSH	A-SEDGE	-5	OBL	CYPERACEAE
SCLDUR	*	SCLEROCHLOA DURA	FAIRGROUND GRASS	A-GRASS	5	UPL	POACEAE
SCRLAN	5	Scrophularia lanceolata	EARLY FIGWORT	P-FORB	2	FACU+	SCROPHULARIACEAE
SCRMAR	4	Scrophularia marilandica	LATE FIGWORT	P-FORB	4	FACU-	SCROPHULARIACEAE
SCUAUS	6	Scutellaria australis	SMALL SKULLCAP	P-FORB	3	FACU	LAMIACEAE
SCUELL	6	Scutellaria elliptica	HAIRY SKULLCAP	B-FORB	5	UPL	LAMIACEAE
SCUGAL	6	Scutellaria galericulata	MARSH SKULLCAP	P-FORB	-5	OBL	LAMIACEAE
SCUINC	5	Scutellaria incana	DOWNY SKULLCAP	P-FORB	5	UPL	LAMIACEAE
SCULAT	4	Scutellaria lateriflora	MAD-DOG SKULLCAP	P-FORB	-5	OBL	LAMIACEAE
SCULEO	5	Scutellaria leonardii	SMALL SKULLCAP	P-FORB	3	FACU	LAMIACEAE

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SCUNER	5	Scutellaria nervosa	VEINY SKULLCAP	B-FORB	0	FAC	LAMIACEAE
SCUOVA	5	Scutellaria ovata	HEART-LEAVED SKULLCAP	P-FORB	3	FACU	LAMIACEAE
SCUPAR	6	Scutellaria parvula	SMALL SKULLCAP	P-FORB	3	FACU	LAMIACEAE
SECCER	*	SECALE CEREALE	RYE	A-GRASS	5	UPL	POACEAE
SEDACR	*	SEDUM ACRE	MOSSY STONECROP	P-FORB	5	UPL	CRASSULACEAE
SEDALO	*	SEDUM ALBO-ROSEUM	GARDEN ORPINE	P-FORB	5	UPL	CRASSULACEAE
SEDALU	*	SEDUM ALBUM	WHITE STONECROP	P-FORB	5	UPL	CRASSULACEAE
SEDPUL	8	Sedum pulchellum	WIDOW'S CROSS	P-FORB	4	FACU-	CRASSULACEAE
SEDPUR	*	SEDUM PURPUREUM	LIVE-FOREVER	P-FORB	5	UPL	CRASSULACEAE
SEDRUP	*	SEDUM RUPESTRE	ROCKY STONECROP	P-FORB	5	UPL	CRASSULACEAE
SEDSAR	*	SEDUM SARMENTOSUM	YELLOW STONECROP	P-FORB	5	UPL	CRASSULACEAE
SEDSPU	*	SEDUM SPURIUM	FALSE WILD STONECROP	P-FORB	5	UPL	CRASSULACEAE
SEDTEL	10	Sedum telephioides	AMERICAN ORPINE	P-FORB	5	UPL	CRASSULACEAE
SEDTER	9	Sedum ternatum	THREE-LEAVED STONECROP	P-FORB	5	UPL	CRASSULACEAE
SELAPO	7	Selaginella apoda	MARSH CLUB MOSS	FERN	-5	OBL	SELAGINELLACEAE
SELECL	10	Selaginella eclipes	SMALL CLUBMOSS	FERN	-5	OBL	SELAGINELLACEAE
SELRUP	8	Selaginella rupestris	ROCK SELAGINELLA	FERN	5	UPL	SELAGINELLACEAE
SENAUR	4	Senecio aureus	GOLDEN RAGWORT	P-FORB	-3	FACW	ASTERACEAE
SENGLA	0	Senecio glabellus	BUTTERWEED	A-FORB	-5	OBL	ASTERACEAE
SENJAC	*	SENECIO JACOBAEA	TANSY RAGWORT	B-FORB	5	UPL	ASTERACEAE
SENOBO	8	Senecio obovatus	ROUND-LEAVED RAGWORT	P-FORB	4	FACU-	ASTERACEAE
SENPAU	3	Senecio pauperculus	BALSAM RAGWORT	P-FORB	-1	FAC+	ASTERACEAE
SENPLA	6	Senecio plattensis	PRAIRIE RAGWORT	P-FORB	4	FACU-	ASTERACEAE
SENVIS	*	SENECIO VISCOSUS	STICKY GROUNDSEL	A-FORB	5	UPL	ASTERACEAE
SENVUL	*	SENECIO VULGARIS	COMMON GROUNDSEL	A-FORB	5	UPL	ASTERACEAE
SESMAC	3	Sesbania macrocarpa	SESBANIA	A-FORB	5	UPL	FABACEAE
SETFAB	*	SETARIA FABERI	GIANT FOXTAIL	A-GRASS	2	FACU+	POACEAE
SETGEN	6	Setaria geniculata	PERENNIAL FOXTAIL	P-GRASS	0	FAC	POACEAE
SETGLA	*	SETARIA GLAUCA	PIGEON GRASS	A-GRASS	0	FAC	POACEAE
SETITA	*	SETARIA ITALICA	FOXTAIL MILLET	A-GRASS	3	FACU	POACEAE
SETVER	*	SETARIA VERTICILLATA	BRISTLY FOXTAIL	A-GRASS	0	FAC	POACEAE
SETVIV	*	SETARIA VIRIDIS	GREEN FOXTAIL	A-GRASS	5	UPL	POACEAE
SETVIM	*	SETARIA VIRIDIS v. MAJOR	GIANT GREEN FOXTAIL	A-GRASS	5	UPL	POACEAE
SHECAN	10	Shepherdia canadensis	BUFFALO BERRY	SHRUB	5	UPL	ELAEAGNACEAE
SHEARV	*	SHERARDIA ARVENSIS	FIELD MADDER	A-FORB	5	UPL	RUBIACEAE
SIBVIR	0	Sibara virginica	VIRGINIA ROCK CRESS	A FORB	4	FACU-	BRASSICACEAE
SICANG	3	Sicyos angulatus	BUR CUCUMBER	H-VINE	-2	FACW-	CUCURBITACEAE
SIDELL	5	Sida elliottii	ELLIOTT'S TEA WEED	P-FORB	5	UPL	MALVACEAE
SIDSPI	*	SIDA SPINOSA	PRICKLY SIDA	A-FORB	3	FACU	MALVACEAE
SIDHIS	5	Sidopsis hispida	FALSE MALLOW	A-FORB	5	UPL	MALVACEAE
SILANT	1	Silene antirrhina	SLEEPY CATCHFLY	A-FORB	5	UPL	CARYOPHYLLACEAE
SILARM	*	SILENE ARMERIA	SWEET WILLIAM CATCHFLY	A-FORB	5	UPL	CARYOPHYLLACEAE
SILCSE	*	SILENE CSEREI	GLAUCOUS CAMPION	B-FORB	5	UPL	CARYOPHYLLACEAE

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SILCUC	*	SILENE CUCUBALUS	BLADDER CAMPION	P-FORB	5	UPL	CARYOPHYLLACEAE
SILDIC	*	SILENE DICHOTOMA	FORKED CATCHFLY	B-FORB	5	UPL	CARYOPHYLLACEAE
SILNIV	8	Silene nivea	SNOWY CAMPION	P-FORB	-3	FACW	CARYOPHYLLACEAE
SILNOC	*	SILENE NOCTIFLORA	NIGHT-FLOWERING CATCHFLY	A-FORB	5	UPL	CARYOPHYLLACEAE
SILOVA	10	Silene ovata	WOODLAND CATCHFLY	P-FORB	5	UPL	CARYOPHYLLACEAE
SILREG	9	Silene regia	ROYAL CATCHFLY	P-FORB	5	UPL	CARYOPHYLLACEAE
SILSTE	6	Silene stellata	STARRY CAMPION	P-FORB	5	UPL	CARYOPHYLLACEAE
SILVIR	9	Silene virginica	FIRE PINK	P-FORB	5	UPL	CARYOPHYLLACEAE
SILINT	5	Silphium integrifolium	ROSIN WEED	P-FORB	5	UPL	ASTERACEAE
SILLAC	5	Silphium laciniatum	COMPASS PLANT	P-FORB	4	FACU-	ASTERACEAE
SILPER	4	Silphium perfoliatum	CUP PLANT	P-FORB	-2	FACW-	ASTERACEAE
SILSPE	*	SILPHIUM SPECIOSUM	ROSIN WEED	P-FORB	5	UPL	ASTERACEAE
SILTER	4	Silphium terebinthinaceum	PRAIRIE DOCK	P-FORB	1	FAC-	ASTERACEAE
SILTRI	10	Silphium trifoliatum	ROSIN WEED	P-FORB	5	UPL	ASTERACEAE
SISALT	*	SISYMBRIUM ALTISSIMUM	TUMBLE MUSTARD	A-FORB	3	FACU	BRASSICACEAE
SISLOE	*	SISYMBRIUM LOESELII	TALL HEDGE MUSTARD	A-FORB	5	UPL	BRASSICACEAE
SISOFF	*	SISYMBRIUM OFFICINALE	HEDGE MUSTARD	A-FORB	5	UPL	BRASSICACEAE
SISALB	4	Sisyrinchium albidum	COMMON BLUE-EYED GRASS	P-FORB	3	FACU	IRIDACEAE
SISANG	5	Sisyrinchium angustifolium	STOUT BLUE-EYED GRASS	P-FORB	-2	FACW-	IRIDACEAE
SISATL	10	Sisyrinchium atlanticum	EASTERN BLUE-EYED GRASS	P-FORB	-3	FACW	IRIDACEAE
SISCAM	6	Sisyrinchium campestre	PRAIRIE BLUE-EYED GRASS	P-FORB	5	UPL	IRIDACEAE
SISMON	9	Sisyrinchium montanum	MOUNTAIN BLUE-EYED GRASS	P-FORB	-1	FAC +	IRIDACEAE
SISMUC	9	Sisyrinchium mucronatum	BLUE-EYED GRASS	P-FORB	-2	FACW-	IRIDACEAE
SITHYS	*	SITANION HYSTRIX	BOTTLEBRUSH SQUIRREL TAIL	P-GRASS	5	UPL	POACEAE
SIUSUA	5	Sium suave	WATER PARSNIP	P-FORB	-5	OBL	APIACEAE
SMIRAC	4	Smilacina racemosa	FEATHERY FALSE SOLOMON SEAL	P-FORB	3	FACU	LILIACEAE
SMISTE	5	Smilacina stellata	STARRY FALSE SOLOMON SEAL	P-FORB	1	FAC-	LILIACEAE
SMIBON	5	Smilax bona-nox	BULL BRIER	W-VINE	2	FACU +	SMILACACEAE
SMIECI	5	Smilax ecirrhata	UPRIGHT CARRION FLOWER	P-FORB	5	UPL	SMILACACEAE
SMIGLA	6	Smilax glauca	GREEN BRIER	W-VINE	3	FACU	SMILACACEAE
SMIHER	4	Smilax herbacea	CARRION FLOWER	H-VINE	0	FAC	SMILACACEAE
SMIHIS	3	Smilax hispida	BRISTLY GREEN BRIER	W-VINE	0	FAC	SMILACACEAE
SMIILL	5	Smilax illinoensis	ILLINOIS CARRION FLOWER	P-FORB	5	UPL	SMILACACEAE
SMILAS	4	Smilax lasioneuron	COMMON CARRION FLOWER	H-VINE	5	UPL	SMILACACEAE
SMIPUL	5	Smilax pulverulenta	DARK GREEN CARRION FLOWER	H-VINE	3	FACU	SMILACACEAE
SMIROT	4	Smilax rotundifolia	CAT BRIER	W-VINE	0	FAC	SMILACACEAE
SOLCAR	0	Solanum carolinense	HORSE NETTLE	P_FORB	4	FACU-	SOLANACEAE
SOLCOR	*	SOLANUM CORNUTUM	BUFFALO BUR	A-FORB	5	UPL	SOLANACEAE
SOLDIM	*	SOLANUM DIMIDIATUM	TORREY'S HORSE NETTLE	P-FORB	5	UPL	SOLANACEAE
SOLDUL	*	SOLANUM DULCAMARA	BITTERSWEET NIGHTSHADE	W-VINE	0	FAC	SOLANACEAE
SOLELA	*	SOLANUM ELAEAGNIFOLIUM	WHITE HORSE NETTLE	P-FORB	5	UPL	SOLANACEAE
SOLHET	*	SOLANUM HETERODOXUM v. NOVOMEXICANUM	PRICKLY HORSE NETTLE	P-FORB	5	UPL	SOLANACEAE
SOLPTY	0	Solanum ptycanthum	BLACK NIGHTSHADE	A-FORB	4	FACU-	SOLANACEAE

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SOLSAR	*	SOLANUM SARACHOIDES	HAIRY NIGHTSHADE	A-FORB	5	UPL	SOLANACEAE
SOLTRI	*	SOLANUM TRIFLORUM	CUT-LEAVED NIGHTSHADE	A-FORB	5	UPL	SOLANACEAE
SOLTUB	*	SOLANUM TUBEROSUM	POTATO	P-FORB	5	UPL	SOLANACEAE
SOLARG	10	Solidago arguta	SHARP-TOOTHED GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLBIC	7	Solidago bicolor	SILVERROD	P-FORB	5	UPL	ASTERACEAE
SOLBOO	10	Solidago boottii	BOOTT'S GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLBUC	8	Solidago buckleyi	BUCKLEY'S GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLCAE	7	Solidago caesia	BLUESTEM GOLDENROD	P-FORB	3	FACU	ASTERACEAE
SOLCAN	1	Solidago canadensis	CANADA GOLDENROD	P-FORB	3	FACU	ASTERACEAE
SOLDRU	6	Solidago drummondii	DRUMMOND'S GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLFLE	6	Solidago flexicaulis	BROAD-LEAVED GOLDENROD	P-FORB	3	FACU	ASTERACEAE
SOLGIG	3	Solidago gigantea	LATE GOLDENROD	P-FORB	-3	FACW	ASTERACEAE
SOLHIS	7	Solidago hispida	WHITE GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLJUN	4	Solidago juncea	EARLY GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLLUT	10	Solidago ×lutescens	UPLAND ASTER	P-FORB	0	FAC	ASTERACEAE
SOLMIS	4	Solidago missouriensis	MISSOURI GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLNEM	3	Solidago nemoralis	OLD FIELD GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLOHI	10	Solidago ohioensis	OHIO GOLDENROD	P-FORB	-5	OBL	ASTERACEAE
SOLPAT	9	Solidago patula	ROUGH-LEAVED GOLDENRODVED	P-FORB	-5	OBL	ASTERACEAE
SOLPET	8	Solidago petiolaris	DOWNY GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLPTA	9	Solidago ptarmicoides	STIFF ASTER	P-FORB	5	UPL	ASTERACEAE
SOLRAD	7	Solidago radula	ROUGH GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLRID	7	Solidago riddellii	RIDDELL'S GOLDENROD	P-FORB	-5	OBL	ASTERACEAE
SOLRIG	4	Solidago rigida	RIGID GOLDENROD	P-FORB	4	FACU-	ASTERACEAE
SOLRUG	8	Solidago rugosa	ROUGH GOLDENROD	P-FORB	-1	FAC+	ASTERACEAE
SOLSCI	10	Solidago sciaphila	CLIFF GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLSEM	*	SOLIDAGO SEMPERVIRENS	SEASIDE GOLDENROD	P-FORB	-2	FACW-	ASTERACEAE
SOLSPE	7	Solidago speciosa	SHOWY GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLSPH	10	Solidago sphacelata	BLIGHTED GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLSTR	10	Solidago strigosa	HAIRY GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SOLULI	10	Solidago uliginosa	BOG GOLDENROD	P-FORB	-5	OBL	ASTERACEAE
SOLULM	5	Solidago ulmifolia	ELM-LEAVED GOLDENROD	P-FORB	5	UPL	ASTERACEAE
SONARA	*	SONCHUS ARVENSIS	FIELD SOW THISTLE	P-FORB	1	FAC-	ASTERACEAE
SONARG	*	SONCHUS ARVENSIS v. GLABRESCENS	FIELD SOW THISTLE	P-FORB	1	FAC-	ASTERACEAE
SONASP	*	SONCHUS ASPER	PRICKLY SOW THISTLE	A-FORB	0	FAC	ASTERACEAE
SONOLE	*	SONCHUS OLERACEUS	COMMON SOW THISTLE	A-FORB	3	FACU	ASTERACEAE
SORAUC	*	SORBUS AUCUPARIA	EUROPEAN MOUNTAIN ASH	TREE	5	UPL	ROSACEAE
SORDEC	10	Sorbus decora	AMERICAN MOUNTAIN ASH	TREE	-1	FAC+	ROSACEAE
SORNUT	4	Sorghastrum nutans	INDIAN GRASS	P-GRASS	2	FACU+	POACEAE
SORALM	*	SORGHUM ×ALMUM	SORGHUM GRASS	P-GRASS	5	UPL	POACEAE
SORBIC	*	SORGHUM BICOLOR	SORGHUM	A-GRASS	5	UPL	POACEAE
SORHAL	*	SORGHUM HALEPENSE	JOHNSON GRASS	P-GRASS	3	FACU	POACEAE
SORSUD	*	SORGHUM SUDANENSE	SUDAN GRASS	A-GRASS	5	UPL	POACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
SPAAME	10	Sparganium americanum	AMERICAN BUR REED	P-FORB	-5	OBL	SPARGANIACEAE
SPAAND	10	Sparganium androcladum	BRANCHED BUR REED	P-FORB	-5	OBL	SPARGANIACEAE
SPACHL	10	Sparganium chlorocarpum	DWARF BUR REED	P-FORB	-5	OBL	SPARGANIACEAE
SPAEUR	5	Sparganium eurycarpum	COMMON BUR REED	P-FORB	-5	OBL	SPARGANIACEAE
SPAMIN	10	Sparganium minimum	LEAST BUR REED	P-FORB	-5	OBL	SPARGANIACEAE
SPAPEC	4	Spartina pectinata	PRAIRIE CORD GRASS	P-GRASS	-4	FACW+	POACEAE
SPEARV	*	SPERGULA ARVENSIS	CORN SPURREY	A-FORB	5	UPL	CARYOPHYLLACEAE
SPEMAR	*	SPERGULARIA MARINA	LESSER SALT SPURREY	A-FORB	0	FAC	CARYOPHYLLACEAE
SPEMED	*	SPERGULARIA MEDIA	SALT SPURREY	A-FORB	3	FACU	CARYOPHYLLACEAE
SPERUB	*	SPERGULARIA RUBRA	SAND SPURREY	A-FORB	3	FACU	CARYOPHYLLACEAE
SPEGLA	4	Spermacoce glabra	SMOOTH BUTTONWEED	P-FORB	-4	FACW+	RUBIACEAE
SPEECH	0	Spermolepis echinata	SPINY SCALESEED	A-FORB	5	UPL	APIACEAE
SPEINE	4	Spermolepis inermis	SMOOTH SCALESEED	A-FORB	5	UPL	APIACEAE
SPHNIT	7	Sphenopholis nitida	SHINING WEDGE GRASS	P-GRASS	5	UPL	POACEAE
SPHOBO	5	Sphenopholis obtusata	PRAIRIE WEDGE GRASS	P-GRASS	0	FAC	POACEAE
SPHOBM	5	Sphenopholis obtusata v. major	SLENDER WEDGE GRASS	P-GRASS	0	FAC	POACEAE
SPIMAR	7	Spigelia marilandica	INDIAN PINK	P-FORB	5	UPL	LOGANIACEAE
SPIALB	6	Spiraea alba	MEADOWSWEET	SHRUB	-4	FACW+	ROSACEAE
SPIJAP	*	SPIRAEA JAPONICA	JAPANESE SPIRAEA	SHRUB	5	UPL	ROSACEAE
SPILAT	*	SPIRAEA LATIFOLIA	MEADOWSWEET	SHRUB	-2	FACW-	ROSACEAE
SPIPRU	*	SPIRAEA PRUNIFOLIA	BRIDAL WREATH	SHRUB	5	UPL	ROSACEAE
SPITOM	8	Spiraea tomentosa	HARDHACK	SHRUB	-3	FACW	ROSACEAE
SPICER	4	Spiranthes cernua	NODDING LADIES' TRESSES	P-FORB	-2	FACW-	ORCHIDACEAE
SPIGRA	7	Spiranthes gracilis	SLENDER LADIES' TRESSES	P-FORB	-1	FAC+	ORCHIDACEAE
SPILAC	8	Spiranthes lacera	SLENDER LADIES' TRESSES	P-FORB	-1	FAC+	ORCHIDACEAE
SPILUC	10	Spiranthes lucida	EARLY LADIES' TRESSES	P-FORB	-4	FACW+	ORCHIDACEAE
SPIMAG	6	Spiranthes magnicamporum	GREAT PLAINES LADIES' TRESSES	P-FORB	-3	FACW	ORCHIDACEAE
SPIOVA	8	Spiranthes ovalis	OVAL LADIES' TRESSES	P-FORB	0	FAC	ORCHIDACEAE
SPIROM	10	Spiranthes romanzoffiana	HOODED LADIES' TRESSES	P-FORB	-4	FACW+	ORCHIDACEAE
SPITUB	9	Spiranthes tuberosa	LITTLE LADIES' TRESSES	P-FORB	5	UPL	ORCHIDACEAE
SPIVER	7	Spiranthes vernalis	SPRING LADIES' TRESSES	P-FORB	0	FAC	ORCHIDACEAE
SPIPOL	5	Spirodela polyrhiza	GREAT DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
SPIPUN	5	Spirodela punctata	SPOTTED DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
SPOASP	3	Sporobolus asper	ROUGH DROPSEED	P-GRASS	5	UPL	POACEAE
SPOCLA	6	Sporobolus clandestinus	ROUGH RUSH GRASS	P-GRASS	5	UPL	POACEAE
SPOCRY	4	Sporobolus cryptandrus	SAND DROPSEED	P-GRASS	4	FACU-	POACEAE
SPOHET	9	Sporobolus heterolepis	NORTHERN DROP SEED	P-GRASS	4	FACU-	POACEAE
SPONEG	1	Sporobolus neglectus	SMALL RUSH GRASS	A-GRASS	5	UPL	POACEAE
SPOOZA	*	SPOROBOLUS OZARKANUS	SOUTHERN RUSH GRASS	A-GRASS	5	UPL	POACEAE
SPOPYR	*	SPOROBOLUS PYRIMADATUS	SEASHORE DROPSEED	P-GRASS	0	FAC	POACEAE
SPOVAG	0	Sporobolus vaginiflorus	NORTHERN RUSH GRASS	A-GRASS	5	UPL	POACEAE
STAASP	9	Stachys aspera	ROUGH HEDGE NETTLE	P-FORB	-4	FACW+	LAMIACEAE
STABYZ	*	STACHYS BYZANTINA	WOOLLY HEDGE NETTLE	P-FORB	5	UPL	LAMIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
STANUT	10	Stachys nuttallii	HEART-LEAVED HEDGE NETTLE	P-FORB	5	UPL	LAMIACEAE
STAPAL	5	Stachys palustris	WOUNDWORT	P-FORB	-5	OBL	LAMIACEAE
STATET	5	Stachys tenuifolia	SMOOTH HEDGE NETTLE	P-FORB	-5	OBL	LAMIACEAE
STATEH	5	Stachys tenuifolia v. hispida	MARSH HEDGE NETTLE	P-FORB	-5	OBL	LAMIACEAE
STATRI	5	Staphylea trifolia	BLADDERNUT	SHRUB	0	FAC	STAPHYLEACEAE
STEGRN	*	STELLARIA GRAMINEA	STARWORT	P-FORB	5	UPL	CARYOPHYLLACEAE
STELON	6	Stellaria longifolia	STITCHWORT	P-FORB	-4	FACW+	CARYOPHYLLACEAE
STEMED	*	STELLARIA MEDIA	COMMON CHICKWEED	A-FORB	3	FACU	CARYOPHYLLACEAE
STEPAL	*	STELLARIA PALLIDA	SAND CHICKWEED	A-FORB	3	FACU	CARYOPHYLLACEAE
STEPUB	10	Stellaria pubera	GREAT CHICKWEED	P-FORB	5	UPL	CARYOPHYLLACEAE
STEGRM	10	Stenanthium gramineum	FEATHERBELLS	P-FORB	0	FAC	LILIACEAE
STICOM	*	STIPA COMATA	NEEDLE-AND-THREAD	P-GRASS	5	UPL	POACEAE
STISPA	6	Stipa spartea	PORCUPINE GRASS	P-GRASS	5	UPL	POACEAE
STIVIR	*	STIPA VIRIDULA	GREEN NEEDLE GRASS	P-GRASS	5	UPL	POACEAE
STRHEL	3	Strophostyles helvola	TRAILING WILD BEAN	A-FORB	-1	FAC+	FABACEAE
STRLEI	4	Strophostyles leiosperma	SMALL WILD BEAN	A-FORB	5	UPL	FABACEAE
STRUMB	5	Strophostyles umbellata	CLUSTERED WILD BEAN	P-FORB	3	FACU	FABACEAE
STYPIC	9	Stylisma pickeringii v. pattersonii	PATTERSON BINDWEED	P-FORB	5	UPL	CONVOLVULACEAE
STYDIP	9	Stylophorum diphyllum	CELANDINE POPPY	P-FORB	5	UPL	PAPAVERACEAE
STYBIF	5	Stylosanthes biflora	PENCIL FLOWER	P-FORB	5	UPL	FABACEAE
STYAME	10	Styrax americana	AMERICAN STORAX	SHRUB	-5	OBL	STYRACACEAE
STYGRA	10	Styrax grandifolia	LARGE-LEAVED STORAX	SHRUB	5	UPL	STYRACACEAE
SUADEP	*	SUAEDA DEPRESSA	SEA BLITE	A-FORB	-3	FACW	CHENOPODIACEAE
SULREN	10	Sullivantia renifolia	SULLIVANT'S SAXIFRAGE	P-FORB	5	UPL	SAXIFRAGACEAE
SYMALA	8	Symphoricarpos albus	SNOWBERRY	SHRUB	4	FACU-	CAPRIFOLIACEAE
SYMALL	*	SYMPHORICARPOS ALBUS v. LAEVIGATUS	GARDEN SNOWBERRY	SHRUB	5	UPL	CAPRIFOLIACEAE
SYMOCC	6	Symphoricarpos occidentalis	WOLFBERRY	SHRUB	5	UPL	CAPRIFOLIACEAE
SYMORB	1	Symphoricarpos orbiculatus	CORALBERRY	SHRUB	3	FACU	CAPRIFOLIACEAE
SYMOFF	*	SYMPHYTUM OFFICINALE	COMMON COMFREY	P-FORB	5	UPL	BORAGINACEAE
SYMFOE	8	Symplocarpus foetidus	SKUNK CABBAGE	P-FORB	-5	OBL	ARACEAE
SYNHIS	10	Synandra hispidula	SYNANDRA	B-FORB	0	FAC	LAMIACEAE
SYRVUL	*	SYRINGA VULGARIS	LILAC	SHRUB	5	UPL	OLEACEAE
TAEINT	7	Taenidia integerrima	YELLOW PIMPERNEL	P-FORB	5	UPL	APIACEAE
TALCAL	10	Talinum calycinum	FAME FLOWER	P-FORB	5	UPL	PORTULACACEAE
TALPAR	10	Talinum parviflorum	PRAIRIE FAME FLOWER	P-FORB	5	UPL	PORTULACACEAE
TALRUG	9	Talinum rugospermum	FAME FLOWER	P-FORB	5	UPL	PORTULACACEAE
TAMGAL	*	TAMARIX GALLICA	FRENCH TAMARISK	SHRUB	5	UPL	TAMARICACEAE
TANPAR	*	TANACETUM PARTHENIUM	FEVERFEW	P-FORB	5	UPL	ASTERACEAE
TANVUL	*	TANACETUM VULGARE	COMMON TANSY	P-FORB	5	UPL	ASTERACEAE
TARLAE	*	TARAXACUM LAEVIGATUM	RED-SEEDED DANDELION	P-FORB	5	UPL	ASTERACEAE
TAROFF	*	TARAXACUM OFFICINALE	COMMON DANDELION	P-FORB	3	FACU	ASTERACEAE
TAXDIS	7	Taxodium distichum	BALD CYPRESS	TREE	-5	OBL	TAXODIACEAE
TAXCAN	10	Taxus canadensis	CANADA YEW	SHRUB	3	FACU	TAXACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
TEPVIR	7	Tephrosia virginiana	GOAT'S RUE	P-FORB	5	UPL	FABACEAE
TEUCAB	3	Teucrium canadense v. boreale	GRAY GERMANDER	P-FORB	-2	FACW-	LAMIACEAE
TEUCAV	3	Teucrium canadense v. virginicum	AMERICAN GERMANDER	P-FORB	-2	FACW-	LAMIACEAE
THADEA	5	Thalia dealbata	POWDERY THALIA	P-FORB	-5	OBL	MARANTACEAE
THADAD	5	Thalictrum dasycarpum	PURPLE MEADOW RUE	P-FORB	-2	FACW-	RANUNCULACEAE
THADAH	5	Thalictrum dasycarpum v. hypoglaucum	SMOOTH MEADOW RUE	P-FORB	-2	FACW-	RANUNCULACEAE
THADIO	5	Thalictrum dioicum	EARLY MEADOW RUE	P-FORB	2	FACU+	RANUNCULACEAE
THAREV	5	Thalictrum revolutum	WAXY MEADOW RUE	P-FORB	0	FAC	RANUNCULACEAE
THATHA	5	Thalictrum thalictroides	RUE ANEMONE	P-FORB	5	UPL	RANUNCULACEAE
THABAR	7	Thaspium barbinode	HAIRY MEADOW PARSNIP	P-FORB	5	UPL	APIACEAE
THATRT	6	Thaspium trifoliatum	PURPLE MEADOW PARSNIP	P-FORB	5	UPL	APIACEAE
THATRF	6	Thaspium trifoliatum v. flavum	YELLOW MEADOW PARSNIP	P-FORB	5	UPL	APIACEAE
THEGRA	*	THELESPERMA GRACILE	GREEN THREAD	P-FORB	5	UPL	ASTERACEAE
THENOV	10	Thelypteris noveboracensis	NEW YORK FERN	FERN	-1	FAC+	THELYPTERIDACEAE
THEPAL	7	Thelypteris palustris v. pubescens	MARSH SHIELD FERN	FERN	-4	FACW+	THELYPTERIDACEAE
THIAME	10	Thismia americana	THISMIA	P-FORB	-5	OBL	BURMANNIACEAE
THLARV	*	THLASPI ARVENSE	FIELD PENNY CRESS	A-FORB	5	UPL	BRASSICACEAE
THLPER	*	THLASPI PERFOLIATUM	PERFOLIATE PENNY CRESS	A-FORB	5	UPL	BRASSICACEAE
THUOCC	10	Thuja occidentalis	ARBOR VITAE	TREE	-5	OBL	CUPRESSACEAE
THYPAS	*	THYMELAEA PASSERINA	SPARROW WEED	A-FORB	5	UPL	THYMELAEACEAE
THYPRA	*	THYMUS PRAECOX	CREEPING THYME	A-FORB	5	UPL	LAMIACEAE
TIDLAN	*	TIDESTROMIA LANUGINOSA	WOOLLY TIDESTROMIA	A-FORB	5	UPL	AMARANTHACEAE
TILAME	5	Tilia americana	AMERICAN LINDEN	TREE	3	FACU	TILIACEAE
TILHET	10	Tilia heterophylla	WHITE BASSWOOD	TREE	4	FACU-	TILIACEAE
TIPDIS	7	Tipularia discolor	CRANE-FLY ORCHID	P-FORB	4	FACU-	ORCHIDACEAE
TOFGLU	10	Tofieldia glutinosa	FALSE ASPHRODEL	P-FORB	-5	OBL	LILIACEAE
TOMAUR	8	Tomanthera auriculata	EARED FALSE FOXGLOVE	A-FORB	5	UPL	SCROPHULARIACEAE
TORARV	*	TORILIS ARVENSIS	FIELD HEDGE PARSLEY	A-FORB	5	UPL	APIACEAE
TORJAP	*	TORILIS JAPONICA	JAPANESE HEDGE PARSLEY	A-FORB	5	UPL	APIACEAE
TORPAL	10	Torreyochloa pallida	PALE MANNA GRASS	P-GRASS	-5	OBL	POACEAE
TOXRAD	1	Toxicodendron radicans	POISON IVY	W-VINE	3	FACU	ANACARDIACEAE
TOXTOX	*	TOXICODENDRON TOXICARIUM	POISON OAK	SHRUB	5	UPL	ANACARDIACEAE
TOXVER	10	Toxicodendron vernix	POISON SUMAC	SHRUB	-5	OBL	ANACARDIACEAE
TRADIF	7	Trachelospermum difforme	CLIMBING DOGBANE	W-VINE	-3	FACW	APOCYNACEAE
TRABRA	7	Tradescantia bracteata	LONG-BRACTED SPIDERWORT	P-FORB	4	FACU-	COMMELINACEAE
TRAOHI	3	Tradescantia ohiensis	COMMON SPIDERWORT	P-FORB	2	FACU+	COMMELINACEAE
TRASUB	5	Tradescantia subaspera	BROAD-LEAVED SPIDERWORT	P-FORB	5	UPL	COMMELINACEAE
TRAVIR	7	Tradescantia virginiana	VIRGINIA SPIDERWORT	P-FORB	5	UPL	COMMELINACEAE
TRACOR	9	Tragia cordata	TRAGIA	P-FORB	5	UPL	EUPHORBIACEAE
TRADUB	*	TRAGOPOGON DUBIUS	SAND GOAT'S BEARD	B-FORB	5	UPL	ASTERACEAE
TRAPOR	*	TRAGOPOGON PORRIFOLIUS	OYSTER SALSIFY	B-FORB	5	UPL	ASTERACEAE
TRAPRA	*	TRAGOPOGON PRATENSIS	COMMON GOAT'S BEARD	B-FORB	5	UPL	ASTERACEAE
TRACAR	10	Trautvetteria caroliniensis	FALSE BUGBANE	P-FORB	1	FAC-	RANUNCULACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
TREAET	4	Trepocarpus aethusae	DARK GREEN CHERVIL	P-FORB	-3	FACW	APIACEAE
TRIFRS	8	Triadenum fraseri	FRASER'S ST. JOHN'S WORT	P-FORB	-5	OBL	HYPERICACEAE
TRITUB	8	Triadenum tubulosum	MARSH ST. JOHN'S WORT	P-FORB	-5	OBL	HYPERICACEAE
TRIVIG	10	Triadenum virginicum	MARSH ST. JOHN'S WORT	P-FORB	-5	OBL	HYPERICACEAE
TRIWAL	10	Triadenum walteri	MARSH ST. JOHN'S WORT	P-FORB	-5	OBL	HYPERICACEAE
TRITER	*	TRIBULUS TERRESTRIS	PUNCTURE VINE	A-FORB	5	UPL	ZYGOPHYLLACEAE
TRIINS	*	TRICHACHNE INSULARIS	SOUR GRASS	P-GRASS	5	UPL	POACEAE
TRIBOS	10	Trichomanes boschianum	FILMY FERN	FERN	-3	FACW	HYMENOPHYLLACEAE
TRIBRA	7	Trichostema brachiatum	FALSE PENNYROYAL	A-FORB	5	UPL	LAMIACEAE
TRIDIC	6	Trichostema dichotomum	BLUE CURLS	A-FORB	5	UPL	LAMIACEAE
TRIFLA	1	Tridens flavus	COMMON PURPLETOP	P-GRASS	5	UPL	POACEAE
TRISTR	4	Tridens strictus	SPIKED PURPLETOP	P-GRASS	3	FACU	POACEAE
TRIBOR	10	Trientalis borealis	STARFLOWER	P-FORB	-1	FAC+	PRIMULACEAE
TRIARV	*	TRIFOLIUM ARVENSE	RABBIT-FOOT CLOVER	A-FORB	5	UPL	FABACEAE
TRIAUM	*	TRIFOLIUM AUREUM	YELLOW HOP CLOVER	A-FORB	5	UPL	FABACEAE
TRICAM	*	TRIFOLIUM CAMPESTRE	LOW HOP CLOVER	A-FORB	5	UPL	FABACEAE
TRIDUB	*	TRIFOLIUM DUBIUM	LITTLE HOP CLOVER	A-FORB	3	FACU	FABACEAE
TRIFRG	*	TRIFOLIUM FRAGIFERUM	STRAWBERRY CLOVER	P-FORB	3	FACU	FABACEAE
TRIHYB	*	TRIFOLIUM HYBRIDUM	ALSIKE CLOVER	P-FORB	1	FAC-	FABACEAE
TRIINC	*	TRIFOLIUM INCARNATUM	CRIMSON CLOVER	A-FORB	5	UPL	FABACEAE
TRIPRA	*	TRIFOLIUM PRATENSE	RED CLOVER	P-FORB	2	FACU+	FABACEAE
TRIREF	9	Trifolium reflexum	BUFFALO CLOVER	A-FORB	5	UPL	FABACEAE
TRIREP	*	TRIFOLIUM REPENS	WHITE CLOVER	P-FORB	2	FACU+	FABACEAE
TRIRES	*	TRIFOLIUM RESUPINATUM	PERSIAN CLOVER	A-FORB	5	UPL	FABACEAE
TRIMAR	10	Triglochin maritima	COMMON BOG ARROW GRASS	P-FORB	-5	OBL	JUNCAGINACEAE
TRIPAL	10	Triglochin palustris	SLENDER BOG ARROW GRASS	P-FORB	-5	OBL	JUNCAGINACEAE
TRICER	10	Trillium cernuum v. macranthum	NODDING TRILLIUM	P-FORB	0	FAC	LILIACEAE
TRICUN	10	Trillium cuneatum	WEDGE TRILLIUM	P-FORB	5	UPL	LILIACEAE
TRIERE	10	Trillium erectum	ILL-SCENTED TRILLIUM	P-FORB	5	UPL	LILIACEAE
TRIFLE	7	Trillium flexipes	DECLINED TRILLIUM	P-FORB	1	FAC-	LILIACEAE
TRIGRA	8	Trillium grandiflorum	LARGE WHITE TRILLIUM	P-FORB	5	UPL	LILIACEAE
TRINIV	8	Trillium nivale	SNOW TRILLIUM	P-FORB	5	UPL	LILIACEAE
TRIREC	5	Trillium recurvatum	RED TRILLIUM	P-FORB	4	FACU-	LILIACEAE
TRISES	8	Trillium sessile	SESSILE TRILLIUM	P-FORB	4	FACU-	LILIACEAE
TRIVID	9	Trillium viride	GREEN TRILLIUM	P-FORB	5	UPL	LILIACEAE
TRILEP	8	Triodanis leptocarpa	VENUS'S LOOKING GLASS	A-FORB	5	UPL	CAMPANULACEAE
TRIPEP	2	Triodanis perfoliata	VENUS'S LOOKING GLASS	A-FORB	0	FAC	CAMPANULACEAE
TRIPEB	4	Triodanis perfoliata v. biflora	VENUS'S LOOKING GLASS	A-FORB	5	UPL	CAMPANULACEAE
TRIANG	7	Triosteum angustifolium	YELLOW HORSE GENTIAN	P-FORB	5	UPL	CAPRIFOLIACEAE
TRIAUT	5	Triosteum aurantiacum	EARLY HORSE GENTIAN	P-FORB	5	UPL	CAPRIFOLIACEAE
TRIILL	5	Triosteum illinoense	ILLINOIS HORSE GENTIAN	P-FORB	5	UPL	CAPRIFOLIACEAE
TRIPEF	5	Triosteum perfoliatum	LATE HORSE GENTIAN	P-FORB	5	UPL	CAPRIFOLIACEAE
TRITRI	9	Triphora trianthophora	NODDING POGONIA	P-FORB	4	FACU-	ORCHIDACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
TRIPUR	6	Triplasis purpurea	PURPLE SANDGRASS	A-GRASS	5	UPL	POACEAE
TRIDAC	4	Tripsacum dactyloides	GAMA GRASS	P-GRASS	-1	FAC+	POACEAE
TRIAES	*	TRITICUM AESTIVUM	WHEAT	A-GRASS	5	UPL	POACEAE
TRICYL	*	TRITICUM CYLINDRICUM	JOINTED GOAT GRASS	A-GRASS	5	UPL	POACEAE
TUSFAR	*	TUSSILAGO FARFARA	COLT'SFOOT	P-FORB	5	UPL	ASTERACEAE
TYPANG	*	TYPHA ANGUSTIFOLIA	NARROW-LEAVED CATTAIL	P-FORB	-5	OBL	TYPHACEAE
TYPGLA	*	TYPHA ×GLAUCA	HYBRID CATTAIL	P-FORB	-5	OBL	TYPHACEAE
TYPLAT	1	Typha latifolia	BROAD-LEAVED CATTAIL	P-FORB	-5	OBL	TYPHACEAE
ULMALA	5	Ulmus alata	WINGED ELM	TREE	3	FACU	ULMACEAE
ULMAME	5	Ulmus americana	AMERICAN ELM	TREE	-2	FACW-	ULMACEAE
ULMPRO	*	ULMUS PROCERA	ENGLISH ELM	TREE	5	UPL	ULMACEAE
ULMPUM	*	ULMUS PUMILA	SIBERIAN ELM	TREE	5	UPL	ULMACEAE
ULMRUB	3	Ulmus rubra	SLIPPERY ELM	TREE	0	FAC	ULMACEAE
ULMTHO	8	Ulmus thomasii	ROCK ELM	TREE	-1	FAC+	ULMACEAE
URTCHA	6	Urtica chamaedryoides	CLUSTERED NETTLE	A-FORB	3	FACU	URTICACEAE
URTDIO	2	Urtica dioica	TALL NETTLE	P-FORB	-1	FAC+	URTICACEAE
URTURE	*	URTICA URENS	BURNING NETTLE	A-FORB	5	UPL	URTICACEAE
UTRCOR	10	Utricularia cornuta	HORNED BLADDERWORT	A-FORB	-5	OBL	LENTIBULARIACEAE
UTRGIB	7	Utricularia gibba	HUMPED BLADDERWORT	P-FORB	-5	OBL	LENTIBULARIACEAE
UTRINT	10	Utricularia intermedia	FLAT-LEAVED BLADDERWORT	P-FORB	-5	OBL	LENTIBULARIACEAE
UTRMIN	10	Utricularia minor	SMALL BLADDERWORT	P-FORB	-5	OBL	LENTIBULARIACEAE
UTRVUL	6	Utricularia vulgaris	COMMOM BLADDERWORT	P-FORB	-5	OBL	LENTIBULARIACEAE
UVUGRA	7	Uvularia grandiflora	BELLWORT	P-FORB	5	UPL	LILIACEAE
UVUSES	8	Uvularia sessilifolia	MERRYBELLS	P-FORB	1	FAC-	LILIACEAE
VACPYR	*	VACCARIA PYRAMIDATA	COW HERB	A-FORB	5	UPL	CARYOPHYLLACEAE
VACANG	7	Vaccinium angustifolium	EARLY LOW BLUEBERRY	SHRUB	3	FACU	ERICACEAE
VACARB	6	Vaccinium arboreum	FARKLEBERRY	SHRUB	3	FACU	ERICACEAE
VACCOR	10	Vaccinium corymbosum	HIGHBUSH BLUEBERRY	SHRUB	-3	FACW	ERICACEAE
VACMAC	10	Vaccinium macrocarpon	LARGE CRANBERRY	SHRUB	-5	OBL	ERICACEAE
VACMYR	9	Vaccinium myrtilloides	CANADA BLUEBERRY	SHRUB	-2	FACW-	ERICACEAE
VACOXY	10	Vaccinium oxycoccos	SMALL CRANBERRY	SHRUB	-5	OBL	ERICACEAE
VACPAL	7	Vaccinium pallidum	LATE LOW BLUEBERRY	SHRUB	5	UPL	ERICACEAE
VACSTA	10	Vaccinium stamineum	DEERBERRY	SHRUB	4	FACU-	ERICACEAE
VALEDU	10	Valeriana edulis v. ciliata	COMMON VALERIAN	P-FORB	-5	OBL	VALERIANACEAE
VALOFF	*	VALERIANA OFFICINALIS	GARDEN HELIOTROPE	P-FORB	-4	FACW+	VALERIANACEAE
VALPAU	9	Valeriana pauciflora	PINK VALERIAN	P-FORB	-2	FACW-	VALERIANACEAE
VALSIT	10	Valeriana sitchensis v. uliginosa	MARSH VALERIAN	P-FORB	-4	FACW+	VALERIANACEAE
VALCHE	5	Valerianella chenopodifolia	GREAT LAKES CORN SALAD	A-FORB	1	FAC-	VALERIANACEAE
VALINT	5	Valerianella intermedia	CORN SALAD	A-FORB	-3	FACW	VALERIANACEAE
VALLOC	*	VALERIANELLA LOCUSTA	EUROPEAN CORN SALAD	A-FORB	5	UPL	VALERIANACEAE
VALPAT	5	Valerianella patellaria	CORN SALAD	A-FORB	5	UPL	VALERIANACEAE
VALRAD	1	Valerianella radiata	CORN SALAD	A-FORB	-1	FAC+	VALERIANACEAE
VALUMB	10	Valerianella umbilicata	NORTHERN CORN SALAD	A-FORB	-3	FACW	VALERIANACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
VALAME	7	Vallisneria americana	EEL GRASS	P-FORB	-5	OBL	HYDROCHARITACEAE
VERWOO	9	Veratrum woodii	FALSE HELLEBORE	P-FORB	5	UPL	LILIACEAE
VERBLA	*	VERBASCUM BLATTARIA	MOTH MULLEIN	B-FORB	4	FACU-	SCROPHULARIACEAE
VERPHL	*	VERBASCUM PHLOMOIDES	CLASPING MULLEIN	B-FORB	5	UPL	SCROPHULARIACEAE
VERSPE	*	VERBASCUM SPECIOSUM	SHOWY MULLEIN	B-FORB	5	UPL	SCROPHULARIACEAE
VERTHA	*	VERBASCUM THAPSUS	WOOLLY MULLEIN	B-FORB	5	UPL	SCROPHULARIACEAE
VERVIT	*	VERBASCUM VIRGATUM	PURPLE-STAMEN MULLEIN	B-FORB	5	UPL	SCROPHULARIACEAE
VERBRA	1	Verbena bracteata	CREEEPING VERVAIN	A-FORB	3	FACU	VERBENACEAE
VERHAS	3	Verbena hastata	BLUE VERVAIN	P-FORB	-4	FACW+	VERBENACEAE
VERSIM	4	Verbena simplex	NARROW-LEAVED VERVAIN	P-FORB	5	UPL	VERBENACEAE
VERSTR	2	Verbena stricta	HOARY VERVAIN	P-FORB	5	UPL	VERBENACEAE
VERURT	3	Verbena urticifolia	WHITE VERVIAN	P-FORB	-1	FAC+	VERBENACEAE
VERALT	4	Verbesina alternifolia	WINGSTEM	P-FORB	-3	FACW	ASTERACEAE
VERENC	*	VERBESINA ENCELIOIDES	GOLDEN CROWNBEARD	A-FORB	0	FAC	ASTERACEAE
VERHEL	6	Verbesina helianthoides	YELLOW CROWNBEARD	P-FORB	5	UPL	ASTERACEAE
VERVIA	6	Verbesina virginica	FROSTWEED	P-FORB	4	FACU-	ASTERACEAE
VERARK	10	Vernonia arkansana	SOUTHERN IRONWEED	P-FORB	0	FAC	ASTERACEAE
VERBAL	5	Vernonia baldwinii	BALDWIN'S IRONWEED	P-FORB	5	UPL	ASTERACEAE
VERFAS	5	Vernonia fasciculata	COMMON IRONWEED	P-FORB	-3	FACW	ASTERACEAE
VERGIG	4	Vernonia gigantea	TALL IRON WEED	P-FORB	0	FAC	ASTERACEAE
VERMIS	5	Vernonia missurica	MISSOURI IRONWEED	P-FORB	-1	FAC+	ASTERACEAE
VERAGR	*	VERONICA AGRESTIS	FIELD SPEEDWELL	A-FORB	5	UPL	SCROPHULARIACEAE
VERAME	9	Veronica americana	AMERICAN BROOKLIME	P-FORB	-5	OBL	SCROPHULARIACEAE
VERARV	*	VERONICA ARVENSIS	CORN SPEEDWELL	A-FORB	5	UPL	SCROPHULARIACEAE
VERCAT	7	Veronica catenata	WATER SPEEDWELL	P-FORB	-5	OBL	SCROPHULARIACEAE
VERCHA	*	VERONICA CHAMAEDRYS	GERMANDER SPEEDWELL	A-FORB	5	UPL	SCROPHULARIACEAE
VERHED	*	VERONICA HEDERAEFOLIA	IVY-LEAVED SPEEDWELL	A-FORB	5	UPL	SCROPHULARIACEAE
VERLON	*	VERONICA LONGIFOLIA	GARDEN SPEEDWELL	P-FORB	5	UPL	SCROPHULARIACEAE
VEROFF	*	VERONICA OFFICINALIS	COMMON SPEEDWELL	P-FORB	5	UPL	SCROPHULARIACEAE
VERPEG	0	Veronica peregrina	PURSLANE SPEEDWELL	A-FORB	-4	FACW+	SCROPHULARIACEAE
VERPES	*	VERONICA PERSICA	BIRD'S-EYE SPEEDWELL	A-FORB	5	UPL	SCROPHULARIACEAE
VERPOL	*	VERONICA POLITA	DWARF BIRD'S-EYE SPEEDWELL	A-FORB	5	UPL	SCROPHULARIACEAE
VERSCU	9	Veronica scutellata	MARSH SPEEDWELL	P-FORB	-5	OBL	SCROPHULARIACEAE
VERSER	*	VERONICA SERPYLLIFOLIA	THYME-LEAVED SPEEDWELL	P-FORB	-3	FACW	SCROPHULARIACEAE
VERTEU	*	VERONICA TEUCRIUM	WOOD SAGE SPEEDWELL	P-FORB	5	UPL	SCROPHULARIACEAE
VERVIM	6	Veronicastrum virginicum	CULVER'S ROOT	P-FORB	0	FAC	SCROPHULARIACEAE
VIBACE	9	Viburnum acerifolium	MAPLE-LEAVED ARROWWOOD	SHRUB	5	UPL	CAPRIFOLIACEAE
VIBDEN	*	VIBURNUM DENTATUM	ARROW-WOOD	SHRUB	5	UPL	CAPRIFOLIACEAE
VIBDEA	7	Viburnum dentatum v. deamii	SOUTHERN ARROWWOOD	SHRUB	0	FAC	CAPRIFOLIACEAE
VIBLAN	*	VIBURNUM LANTANA	WAYFARING TREE	SHRUB	5	UPL	CAPRIFOLIACEAE
VIBLEN	4	Viburnum lentago	NANNYBERRY	SHRUB	-1	FAC+	CAPRIFOLIACEAE
VIBMOL	10	Viburnum molle	DOWNY ARROWWOOD	SHRUB	5	UPL	CAPRIFOLIACEAE
VIBOPU	*	VIBURNUM OPULUS	EUROPEAN HIGH-BUSH CRANBERRY	SHRUB	0	FAC	CAPRIFOLIACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
VIBPRU	4	Viburnum prunifolium	BLACK HAW	SHRUB	3	FACU	CAPRIFOLIACEAE
VIBRAF	6	Viburnum rafinesquianum	DOWNY ARROWWOOD	SHRUB	5	UPL	CAPRIFOLIACEAE
VIBREC	6	Viburnum recognitum	SMOOTH ARROWWOOD	SHRUB	-2	FACW-	CAPRIFOLIACEAE
VIBRUF	6	Viburnum rufidulum	RUSTY NANNYBERRY	SHRUB	4	FACU-	CAPRIFOLIACEAE
VICAME	6	Vicia americana	AMERICAN VETCH	P-FORB	5	UPL	FABACEAE
VICCAR	9	Vicia caroliniana	WOOD VETCH	P-FORB	5	UPL	FABACEAE
VICCRA	*	VICIA CRACCA	COW VETCH	A-FORB	5	UPL	FABACEAE
VICDAS	*	VICIA DASYCARPA	WOOLLY-POD VETCH	A-FORB	5	UPL	FABACEAE
VICSAS	*	VICIA SATIVA	COMMON VETCH	A-FORB	4	FACU-	FABACEAE
VICSAN	*	VICIA SATIVA v. NIGRA	NARROW-LEAVED VETCH	A-FORB	4	FACU-	FABACEAE
VICTET	*	VICIA TETRASPERMA	FOUR-SEEDED VETCH	A-FORB	5	UPL	FABACEAE
VICVIL	*	VICIA VILLOSA	WINTER VETCH	A-FORB	5	UPL	FABACEAE
VIGUNG	*	VIGNA UNGUICULATA	COW PEA	A-FORB	5	UPL	FABACEAE
VINMAJ	*	VINCA MAJOR	LARGE PERIWINKLE	SHRUB	5	UPL	APOCYNACEAE
VINMIN	*	VINCA MINOR	COMMON PERIWINKLE	SHRUB	5	UPL	APOCYNACEAE
VIOAFF	2	Viola affinis	WOODLAND BLUE VIOLET	P-FORB	0	FAC	VIOLACEAE
VIOARV	*	VIOLA ARVENSIS	WILD PANSY	A-FORB	5	UPL	VIOLACEAE
VIOCAN	10	Viola canadensis v. corymbosum	CANADA VIOLET	P-FORB	5	UPL	VIOLACEAE
VIOCON	8	Viola conspersa	DOG VIOLET	P-FORB	-2	FACW-	VIOLACEAE
VIOFIM	6	Viola fimbriatula	SAND VIOLET	P-FORB	-2	FACW-	VIOLACEAE
VIOINC	10	Viola incognita	HAIRY WHITE VIOLET	P-FORB	-3	FACW	VIOLACEAE
VIOLAL	7	Viola lanceolata	LANCE-LEAVED VIOLET	P-FORB	-5	OBL	VIOLACEAE
VIOLAV	7	Viola lanceolata v. vittata	NARROW-LEAVED VIOLET	P-FORB	-5	OBL	VIOLACEAE
VIOMAC	10	Viola macloskeyi v. pallens	SMOOTH WHITE VIOLET	P-FORB	-5	OBL	VIOLACEAE
VIOMIS	4	Viola missouriensis	MISSOURI VIOLET	P-FORB	-3	FACW	VIOLACEAE
VIONEP	8	Viola nephrophylla	NORTHERN BLUE VIOLET	P-FORB	-5	OBL	VIOLACEAE
VIOOBL	9	Viola obliqua	MARSH BLUE VIOLET	P-FORB	-5	OBL	VIOLACEAE
VIOODO	*	VIOLA ODORATA	ENGLISH VIOLET	P-FORB	5	UPL	VIOLACEAE
VIOPET	7	Viola pedata	BIRD'S FOOT VIOLET	P-FORB	5	UPL	VIOLACEAE
VIOPEF	9	Viola pedatifida	PRAIRIE VIOLET	P-FORB	4	FACU-	VIOLACEAE
VIOPRA	1	Viola pratincola	COMMON BLUE VIOLET	P-FORB	0	FAC	VIOLACEAE
VIOPRC	1	Viola priceana	CONFEDERATE VIOLET	P-FORB	5	UPL	VIOLACEAE
VIOPRM	10	Viola primulifolia	PRIMROSE-LEAVED VIOLET	P-FORB	-4	FACW+	VIOLACEAE
VIOPUP	7	Viola pubescens	DOWNY YELLOW VIOLET	P-FORB	4	FACU-	VIOLACEAE
VIOPUE	5	Viola pubescens v. eriocarpa	SMOOTH YELLOW VIOLET	P-FORB	-2	FACW-	VIOLACEAE
VIORAF	*	VIOLA RAFINESQUII	WILD PANSY	A-FORB	5	UPL	VIOLACEAE
VIOSAG	6	Viola sagittata	ARROW-LEAVED VIOLET	P-FORB	-2	FACW-	VIOLACEAE
VIOSEP	3	Viola septentrionalis	NORTHERN BLUE VIOLET	P-FORB	0	FAC	VIOLACEAE
VIOSOR	3	Viola sororia	WOOLLY BLUE VIOLET	P-FORB	1	FAC-	VIOLACEAE
VIOSTR	4	Viola striata	COMMON WHITE VIOLET	P-FORB	-3	FACW	VIOLACEAE
VIOTRC	*	VIOLA TRICOLOR	JOHNNY-JUMP-UP	A-FORB	5	UPL	VIOLACEAE
VIOTRL	5	Viola triloba	CLEFT VIOLET	P-FORB	5	UPL	VIOLACEAE
VIOVIA	5	Viola viarum	PLAINS VIOLET	P-FORB	3	FACU	VIOLACEAE

Acronym	CC	Scientific Name	Common Name	Physiognomy	W	Wet	Family
VIOWIT	*	VIOLA × WITTROCKIANA	PANSY	A-FORB	5	UPL	VIOLACEAE
VITAES	4	Vitis aestivalis	SUMMER GRAPE	W-VINE	3	FACU	VITACEAE
VITCIN	4	Vitis cinerea	WINTER GRAPE	W-VINE	-2	FACW-	VITACEAE
VITLAB	*	VITIS LABRUSCA	FOX GRAPE	W-VINE	3	FACU	VITACEAE
VITPAL	6	Vitis palmata	CATBIRD GRAPE	W-VINE	-5	OBL	VITACEAE
VITRIP	2	Vitis riparia	RIVERVBANK GRAPE	W-VINE	-2	FACW-	VITACEAE
VITRUP	9	Vitis rupestris	SAND GRAPE	W-VINE	4	FACU-	VITACEAE
VITVUL	4	Vitis vulpina	FROST GRAPE	W-VINE	-2	FACW-	VITACEAE
VULBRO	*	VULPIA BROMOIDES	BROME FESCUE	A-GRASS	5	UPL	POACEAE
VULMYU	*	VULPIA MYUROS	MOUSETAIL FESCUE	A-GRASS	5	UPL	POACEAE
VULOCT	2	Vulpia octoflora	SIX WEEKS FESCUE	A-GRASS	-2	FACW-	POACEAE
WALFRA	10	Waldsteinia fragarioides	BARREN STRAWBERRY	P-FORB	5	UPL	ROSACEAE
WISFRU	6	Wisteria frutescens	WISTERIA	W-VINE	5	UPL	FABACEAE
WISMAC	5	Wisteria macrostachya	KENTUCKY WISTERIA	A-FORB	5	UPL	FABACEAE
WOLBRA	6	Wolffia braziliensis	NIPPLED WATER MEAL	W-VINE	-5	OBL	LEMNACEAE
WOLCOL	5	Wolffia columbiana	WATER MEAL	A-FORB	-5	OBL	LEMNACEAE
WOLPUN	5	Wolffia punctata	SPOTTED WATER MEAL	A-FORB	-5	OBL	LEMNACEAE
WOLGLA	10	Wolffiella gladiata	BLADE DUCKWEED	A-FORB	-5	OBL	LEMNACEAE
WOOILV	10	Woodsia ilvensis	RUSTY WOODSIA	FERN	5	UPL	ASPLENIACEAE
WOOOBT	6	Woodsia obtusa	COMMON WOODSIA	FERN	5	UPL	ASPLENIACEAE
WOOARE	8	Woodwardia areolata	NETTED CHAIN FERN	FERN	-5	OBL	ASPLENIACEAE
WOOVIR	10	Woodwardia virginica	VIRGINIA CHAIN FERN	FERN	-5	OBL	ASPLENIACEAE
XANSPI	*	XANTHIUM SPINOSUM	SPINY COCKELBUR	A-FORB	3	FACU	ASTERACEAE
XANSTR	0	Xanthium strumarium	COCKLEBUR	A-FORB	0	FAC	ASTERACEAE
XYRJUP	10	Xyris jupicai	YELLOW-EYED GRASS	P-FORB	-5	OBL	XYRIDACEAE
XYRTOR	10	Xyris torta	TWISTED YELLOW-EYED GRASS	P-FORB	-5	OBL	XYRIDACEAE
YUCFLA	*	YUCCA FLACCIDA	ADAM'S NEEDLE	P-FORB	5	UPL	LILIACEAE
ZANPAL	8	Zannichellia palustris	HORNED PONDWEED	P-FORB	-5	OBL	ZANNICHELLIACEAE
ZANAME	4	Zanthoxylum americanum	PRICKLY ASH	SHRUB	5	UPL	RUTACEAE
ZEAMAY	*	ZEA MAYS	CORN	A-GRASS	5	UPL	POACEAE
ZIGVEN	10	Zigadenus venenosus v. gramineus	WHITE CAMASS	A-FORB	5	UPL	LILIACEAE
ZIZAQU	9	Zizania aquatica	WILD RICE	A-GRASS	-5	OBL	POACEAE
ZIZMIL	*	ZIZANIOPSIS MILIACEA	SOUTHERN WILD RICE	P-GRASS	-5	OBL	POACEAE
ZIZAPT	9	Zizia aptera	HEART-LEAVED MEADOW PARSNIP	P-FORB	3	FACU	APIACEAE
ZIZAUR	6	Zizia aurea	GOLDEN ALEXANDERS	P-FORB	-1	FAC+	APIACEAE
ZOSDUB	7	Zosterella dubia	WATER STAR GRASS	P-FORB	-5	OBL	PONTEDERIACEAE
ZOYJAP	*	ZOYSIA JAPONICA	JAPANESE LAWN GRASS	P-GRASS	5	UPL	POACEAE

Instructions for Authors

ERIGENIA is a peer-reviewed journal published by the Illinois Native Plant Society. The journal publishes research papers, reviews, essays, and technical reports pertaining to the biota of Illinois and adjacent states.

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Abstracts

Research and technical papers should include a one-paragraph abstract of not more than 250 words. The abstract should state concisely the goals, principal results, and major conclusions of the paper.

Taxonomic Names

Either a standard taxonomic manual should be cited whose names are followed consistently, or the scientific names should be followed by their authority. Common names, if used, should be referenced to a scientific name. Thereafter, scientific names are recommended, but either may be used if done so consistently.

Tables and Illustrations

All illustrations, photographs, and special lettering should be capable of 50 to 66 percent reduction without loss of clarity or legibility. Originals should be sent only upon acceptance of the manuscript.

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Literature Citations

In Text:

Braun (1950) or Parks et al. (1968) or (Mohlenbrock 1970, 1990) or (Swink and Wilhelm 1994; Young 1994).

In Literature Cited:

Braun, E. L. 1950. Deciduous forests of eastern North America. Blakiston, Philadelphia.

Mohlenbrock, R. H. 1990. Forest trees of Illinois. 6th ed. Illinois Department of Conservation, Springfield.

Parks, W. D., J. B. Fehrenbacher, C. C. Miles, J. M. Paden and J. Weiss. 1968. Soil survey of Pulaski and Alexander counties, Illinois. U.S.D.A. Soil Report 85.

Greenberg, R. 1992. Forest migrants in nonforest habitats on the Yucatan Peninsula. Pages 273-286 *in* J. M. Hagan III and D. W. Johnson, eds. Ecology and conservation of neotropical migrant landbirds. Smithsonian Institution Press, Washington, D.C.

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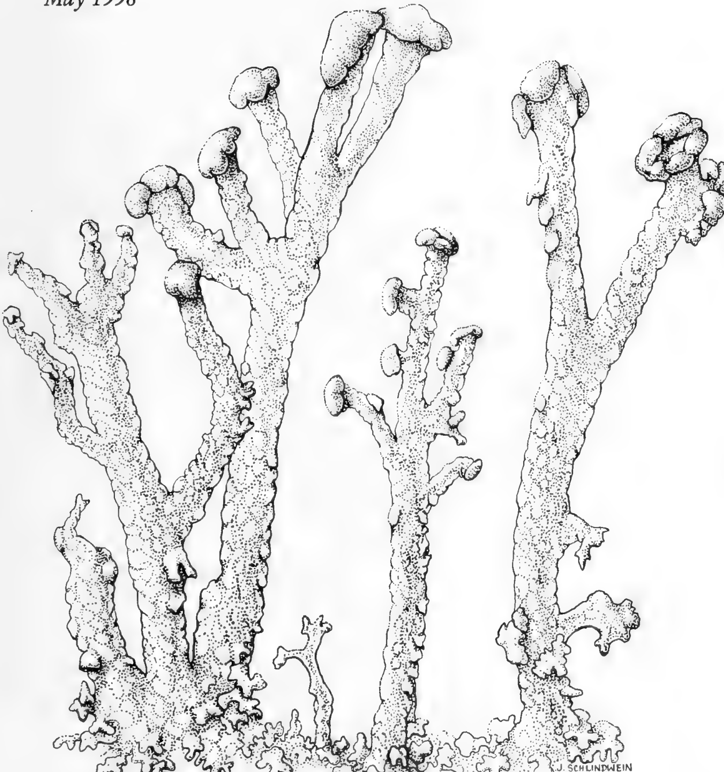
County Map of Illinois

ERIGENIA

Number 16
May 1998



Journal of the Illinois Native Plant Society

ERIGENIA

Number 16, May 1998

The Illinois Native Plant Society Journal

The Illinois Native Plant Society is dedicated to the preservation, conservation, and study of the native plants and vegetation of Illinois.

ERIGENIA is named for *Erigenia bulbosa* (Michx.) Nutt. (harbinger of spring), one of our earliest blooming woodland plants. The first issue was published in August 1982.

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COVER ILLUSTRATION

Original drawing of *Cladonia cristatella* TUCK. (British soldier lichen – due to their bright red apothecia) by Jill Schlindwein.

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THE LICHEN FLORA OF CHICAGO AND VICINITY: ONE HUNDRED YEARS OF LICHENOLOGY

Gerould S. Wilhelm[1]

ABSTRACT: One hundred years ago, William Wirt Calkins published a lichen flora of "Chicago and vicinity," including an annotated account of 125 lichen taxa, which translate nomenclaturally and taxonomically into 106 taxa recognized today. Over the last decade, 147 taxa of lichenized fungi have been seen alive in the "vicinity" of Chicago, of which 52 were recorded by Calkins in 1896; of Calkins's remaining 54 species, 34 have yet to be confirmed with a voucher specimen. Altogether, including 72 of the 106 taxa reported by Calkins, 188 lichenized fungi have been vouchered with a specimen, historic or contemporary, from "Chicago and vicinity", as delineated by Calkins. This paper accounts for 222 lichens, based upon literature reports and specimens, and compares Calkins's perception of the flora of 1896 with what we have seen in the present era. Given that there are significant difficulties in comparing names from Calkins's era to the present, the flora known today has a 41% similarity to that of a century ago. Also provided is a general description of habitat changes since settlement and a discussion of how these changes might relate to lichen inhabitancy. In addition, there are keys to the identification of species, and a bibliography of literature that cites specimens from Chicago and vicinity.

INTRODUCTION

A century ago, William Wirt Calkins (1896) prepared a report on the lichen flora of "Chicago and vicinity" in response to a request from the managers of the Geological and Natural History Survey and the Chicago Academy of Sciences. Calkins defined the vicinity of Chicago as beginning at the north line of Cook County and Lake Michigan in Illinois, thence westward, coincident with the north line of Cook County to Kane County; thence southward along the east line of Kane and Kendall counties to the southeast corner of Kendall County; thence eastward, coincident with the south line of Cook County to the east line of Lake County, Indiana; thence northward to Lake Michigan. This circumscribes about 1,700 square miles, including in Illinois all of Cook and DuPage counties, a sliver of northeastern Kane County, and the nine north townships of Will County, and in Indiana the northern third of Lake County.

From his youth, William Wirt Calkins (1842–1914) was deeply interested in all aspects of natural history, and was a lifelong member of the Sullivant Moss Society (Hasse 1914). Born in Berwyn, Illinois, he served throughout the Civil War in Company E of the 104th Regiment of the Illinois Volunteer Army, in which he served at the rank of 1st Lieutenant; he later wrote and published the history of this regiment. His career also included duty as the aide-de-camp to General John Beatty. Calkins evidently terminated his service at the rank of Colonel. An amateur mycologist and lichenologist, Calkins was a prolific collector, and the author of several important papers on natural history, including a catalogue of the lichens of LaSalle County, Illinois (Calkins and Huett 1898). Significant Calkins lichen collections are currently housed at the Chicago Academy of Sciences (CHAS), the Field Museum of Natural History (F), the University of Illinois at Champaign (ILL), the University of Michigan (MICH), the New York Botanical Garden (NY), and the United States National Herbarium (US).

Chicago and vicinity, as delineated by Calkins, is the site of one of the larger, industrial, urban, and suburban metropolitan areas of the world. Nearly the whole of the territory is encumbered either by roads, lawns, buildings, manufacturing sites, agriculture, or railroad yards, leaving little land available for living things other than humans, their pets, a few Eurasian weeds, and ornamental trees and shrubs.

This metropolitan area is located near the middle of a continent in a north-temperate climate, at the southwestern terminus of a freshwater lake that averages 50 miles in width and 300 miles in length. It lies about

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750 miles north of the Gulf of Mexico and 1,000 miles east of the Rocky Mountains. Dry winds prevail out of the west or southwest in spring and summer, and blow arctic cold from the north in winter. Rainfall is usually 35–40 inches per year, roughly equivalent to the evaporation potential. Precipitation historically remained in sodden ground and was dissipated principally through evapotranspiration. Today, precipitation is mostly flushed away through storm sewers, leaving much less for ambient humidity than was the case in 1832, when settlement at the end of the Black Hawk War exposed the landscape to drainage, row-crop agriculture, and urban development. Lichenologists who pass through the area today are not likely to get the impression that lichenose vegetation around Chicago would be at all diverse or interesting.

The Chicago area is composed of a complex of recently deposited lake plains and terminal moraines (Willman 1971), the older of which were formed about 15,000 years ago. Much of the eastern portion of Cook County, and all of the northern third of Lake County, Indiana, are in the lake plain of Glacial Lake Chicago, the last stages of which did not recede until 2,000 years ago. Most of the remainder of Cook County, all but the western edge of DuPage County, and most of northeastern Will County consist of an undulating complex of terminal moraines of various ages. The soils have a high clay content and often support a perched water table. The southwestern edges of DuPage County and adjacent Will County consist mostly of gently rolling terminal and ground moraines. Northern Will County and a small tract of southwestern Cook County are transected by a unique bedrock valley where dolomitic limestone is often found at or near the surface and even as an outcrop in a few places. Extreme western Cook and northwestern DuPage counties are dominated by end moraines admixed with complexes of outwash features.

Calkins noted that "this territory might be . . . sufficiently large to furnish an attractive field and ample material for the investigation and study of lichens," but lamented that "with the exception of the most common species, a few of which are cosmopolitan in their habits, the explorer will meet with a disappointment not to be experienced further south and west in regions where the conditions of the soil, the geological features of the country, and the climate favor a larger development of species. . . However, . . . enough varieties occur [locally] to form an excellent preliminary course of study [when the student] has become familiar with the *Parmelias* and *Physcias* which are so abundant on oaks and other trees along the lake shore and in the 'wooded islands of the prairies.'" This same general assessment could characterize the region today.

The lake plain is characterized by vast, level lacustrine and aeolian dune deposits of various ages. Throughout much of the postglacial period the lacustrine deposits were dominated by wet to mesic prairie. The dunes were characterized by groves of *Quercus alba* and *Q. velutina*, and, near Lake Michigan in Lake County, by savannas of *Betula papyrifera* and *Pinus banksiana*. Exposed bedrock in the lake plain was virtually absent; potential corticolous substrate was fairly limited, as landscape fires were conducted annually in autumn by the native people (Blane 1922; Ellsworth 1937; Ernst 1819; Featherstonhaugh 1844; Parker 1835; Shirreff 1835). There is an interesting terricolous substrate in the low, calcareous to circumneutral sand ridges near the verge of Lake Michigan, characterized by *Catapyrenium squamulosum*, a lichen that grows in open but stabilized areas. Much of the lake plain now is urban and industrial. Currently, the corticolous lichen flora of the lake plain is, at best, quite depauperate and low in diversity, consisting mostly of *Arthonia caesia, Candelaria concolor, Physcia millegrana*, and *Physcia stellaris*.

The terminal and ground moraines are characterized by undulating or gently rolling, originally loess-capped, clayey deposits. The lower topography and poorly drained areas were dominated by tallgrass prairie, where potential lichen substrate would have been very limited, consisting of the occasional glacial erratic or lone *Quercus macrocarpa*. On the better-drained rises, which are numerous and quite regular in their occurrence, there were groves of trees, consisting mainly of oaks and hickories, such as *Quercus alba, Q. bicolor, Q. coccinea, Q. macrocarpa, Q. rubra, Carya cordiformis*, and *C. ovata*, as well as *Juglans nigra* (Swink and Wilhelm 1994). Most of these trees were open grown because of the frequent ground fires that passed through these woodlands (Wilhelm 1991).

In the morainic districts, corticolous species that Calkins regarded as frequent (given the limitations of taxonomic translation) were *Anisomeridium nyssigenum, Arthonia caesia, Flavoparmelia caperata*, and *Physcia stellaris*—species that one finds regularly today. He also considered frequent to common the following species, most of which are rare or absent today: *Caloplaca* *flavorubescens, Graphis scripta, Lecanora hybocarpa, Opegrapha atra, Parmotrema perforatum, Pertusaria macounii, P. pustulata, Punctelia subrudecta,* and *Pyrenula pseudobufonia.* More common today than in Calkins's era are *Candelaria concolor, Candelariella reflexa, C. xanthostigma, Lepraria lobificans, Parmelia sulcata, Phaeophyscia pusilloides, P. rubropulchra, Physcia millegrana, Physciella chloantha, Physconia detersa, Punctelia rudecta,* and *Xanthoria fallax.*

Open-grown trees today that can support lichens are in older subdivisions and in some of the parklike areas in older sections of county forest preserves and municipal parks. Our original woodlands have become so densely populated by trees as a result of fire suppression that light levels have dropped to 1% or less of ambient light levels; the hydrologic scheme has changed also, along with the ground-layer vegetation (Wilhelm 1991). Consequently, the trunks and larger limbs of older trees are heavily shaded. In any event, most corticolous substrates in contemporary woodlands are now bereft of lichen growth.

Calkins did not list many terricolous species as common other than "*Cladonia chlorophaea*" *[conista?]*, probably because of the dense ground cover of vascular vegetation. Today, there are frequent spots of eroded, weathered clays and clayey tills that can support other species of *Cladonia,* such as *C. cristatella, C. peziziformis, C. polycarpoides,* and *C. rei.*

Calkins did not indicate that lignicolous species were particularly common locally, the more notable exceptions being *Cladonia "chlorophaea"* and *C. coniocraea.* Other than weathered fence rails, there may not have been much weathered lignum available. On those fence rails, however, a suite of species grew that, other than *Caloplaca microphyllina,* we do not see today, such as *Imshaugia aleurites, Ramalina subampliata, Teloschistes chrysophthalmus,* and *Tuckermannopsis americana.* Weathered fence rails are rare today, but our woods are full of decorticate logs and various forms of weathered lignum, inhabited regularly by *Cladonia coniocraea, C. conista, C. cristatella, C. macilenta* var. *bacillaris, Placynthiella icmalea,* and *Trapeliopsis flexuosa.*

Except for the bedrock valley of the Des Plaines River, with its gladelike exposures of dolomite, saxicolous substrates were and are fairly limited. Today, as in Calkins's time, the older, weathered dolomitic bedrock contains a suite of locally interesting species, such as *Aspicilia contorta, Caloplaca cinnabarina, Dermatocarpon miniatum, Lecanora muralis, Lecania perproxima, Placynthium nigrum,* and *Sarcogyne regularis.* More regularly occurring today on weathered concrete and flagstone are *Bacidina egenula, Caloplaca feracissima, Endocarpon pusillum, Lecanora dispersa,* and *Verrucaria calkinsiana.*

Generally, Calkins believed that "the geological conditions in most of our territory are not favorable to the growth of a great number of species owing to the absence of forests and out-cropping rocks of different formations and ages, all having an important bearing, because these are the substrates to which lichens attach themselves, and the investigator will note that certain strata and trees, or the earth, contain some species not found elsewhere."

Even as he apologized for the inherently depauperate nature of the Chicago lichen flora, he believed it to once have been notably richer: "Localities in and around Chicago formerly rich in lichenose vegetation are now destitute of it. The species were and are mostly corticolous, with a few on rocks, where exposed, and even on the boulders of the prairies. But the tidal waves of civilization have changed the conditions under which lichens grow, and to find them abundantly we must seek the country where the air on which they feed is pure and the substrates suitable."

One can only wonder of what this once rich lichen flora consisted. Calkins noted that *Ramalina americana* grew on oaks "along the lake shore and throughout our territory." This species is now very rare, and the only contemporary specimens we have seen consist of tiny fragments. Calkins made his studies of Chicago at a time of heavy smokestack industry, when sulphur dioxide concentrations may well have been as high or higher than they are today. If there truly were a time when *Ramalina americana* was regarded as growing throughout the area, one scarcely can imagine what variety of species constituted this once rich, pre-industrial flora.

The air is probably freer of sulfur dioxide and certain other pollutants now than it was during the period of heavy industry, but the influence of the internal combustion engine has increased tremendously over the last century, as has the use of aerially dispersed agricultural herbicides and pesticides. Whatever the effect of changes in air pollution levels, it is certain that other changes as well have dramatically affected lichen habitats over the last century.

Wilhelm and Lampa (1987) proposed that the tallgrass prairie biome of the Midwest, once replete with regular prairie fires and largely treeless except for scattered stands of open-grown oaks and hickories, now supports a nearly continuous growth of many different kinds of trees (native, naturalized, and cultivated), which bridge the northern forests with those to the south and east. It is possible that such a change in the distribution of corticolous substrates has allowed at least less modal species an opportunity to extend their ranges. One might wonder, for example, whether *Flavopunctelia flaventior* was native this far south, or if *Pyxine subcinerea* grew this far north prior to settlement.

Calkins's annotated flora reported 125 fungal names that translate today into 106 taxa now generally included among the lichenized genera or their immediate allies. We have seen early specimens that voucher 50 of these taxa. We have been unable to find specimens from any time period to voucher or otherwise substantiate 34 of the taxa reported by Calkins from Chicago and vicinity, although many are known from nearby counties.

Bearing in mind that he evidently believed the flora of his day to have been altered from the indigenous one, Calkins described 25 species as frequent to common in the Chicago area. Although interpretations of Calkins's assessments of abundance and frequency are not quantitative, certain loose comparisons can be made. Of the species he listed as frequent or common, or "throughout our territory", it would be reasonable to describe only 6 of them in similar terms today: *Arthonia caesia, Bacidina egenula, Endocarpon pusillum, Hyperphyscia adglutinata, Physcia stellaris,* and *Verrucaria calkinsiana.* The coefficient of similarity [$2C/(A+B)$, where C = species in both list A and B, A = species in list A, B = species in list B] between the common species in 1896 and those common in 1996 is 0.25.

Over the last decade or so we have documented the extant local occurrence of 147 taxa, of which 52 were recognized by Calkins in his flora. An additional 19 taxa, unreported by Calkins, and yet unaccounted for today, are based upon historic, turn-of-the-century specimens collected by Calkins or others. Altogether, 222 lichens have been reported or vouchered from "Chicago and vicinity." The coefficient of similarity between the total flora known today and Calkins's flora is 0.41. Calkins felt that the flora already had changed notably in his time, and it is clear that it has continued to change since then.

In the geographic area Calkins covered, we have not seen living examples of 32% of the species he considered common. These include *Anisomeridium biforme, Cladonia pyxidata, Caloplaca ferruginea, Lecanora hybocarpa, Pertusaria macounii, Punctelia subrudecta, Pyrenula pseudobufonia,* and *Verrucaria fuscella.* Several species that are now frequent to common in Chicago and vicinity apparently were unknown to Calkins. These include *Anisomeridium nyssigenum, Cladonia polycarpoides, Cladonia rei, Lepraria lobificans, Phaeophyscia rubropulchra, Physcia adscendens,* and *Trapeliopsis flexuosa.* Two species evidently unknown to Calkins, *Caloplaca feracissima* and *Lecanora dispersa,*, are both now nearly ubiquitous throughout the region on weathered concrete. The lichens with cyanobacteria as phycobionts are virtually absent today, as is the preponderance of large-foliose species.

While there is little question that the flora has changed significantly over the last 100 years, any analysis is complicated by several critical factors. The anatomy and morphology of the ascoma have received much taxonomic attention in recent years, such that major generic realignments are occurring in most groups of lichenized fungi. Generally, organizational concepts in lichen taxonomy have changed much since Calkins's time, affecting generic as well as species concepts. Further, the discovery of the taxonomic importance of lichen chemical substances has dramatically changed species concepts in many genera. For example, *Parmelia* has been split into numerous genera: *Flavoparmelia, Flavopunctelia, Hypotrachyna, Myelochroa, Parmelia, Parmotrema, Xanthoparmelia,* and many others.

On both morphological and microchemical grounds, the genus *Physcia* has been much revised; it now consists of *Heterodermia, Hyperphyscia, Phaeophyscia, Physcia, Physciella,* and *Physconia*, and others outside the region. What Calkins called *Physcia obscura* now encompasses five or six species of *Phaeophyscia.* Early concepts in pyrenocarpous lichens are all but untranslatable today.

In some groups, such as *Cladonia,* there are now more species than were recognized in 1896, mostly as a result of microchemical research. For example, most of the specimens that Calkins called *Cladonia pyxidata* are now referable either to *C. conista, C. chlorophaea, C. cryptochlorophaea,* or *C. grayi,* an accurate determination of which cannot be made without thin-layer chromatography. On the other hand, most of the specimens Calkins called *Lecanora subfusca, L. subfusca* var. *allophana, L. subfusca* var. *argentata,* and *L. subfusca* var. *distans* are now referable to one species, *L.*

hybocarpa. We have seen several Cook County specimens that Calkins named either *Sagedia oxyspora* and *Pyrenula thelaena,* all of which now are called *Julella sericea.*

There are other problems as well. Every early specimen we have seen from Illinois labeled *Arthonia lecideella,* a fairly distinct taxon in its own right, is referable to *Arthonia caesia.* Yet, there is risk in making the routine translation for literature reports where no corroborating specimen can be examined. One of the great difficulties in comparing the contemporary flora with that observed by Calkins is the lack of voucher material. Without a complete, well-curated collection to testify to one's taxonomic concepts and species interpretations, unvouchered literature reports inevitably lose meaning over time.

Many genera are still poorly understood. Our own interpretations of many of the crustose genera, such as *Caloplaca, Lecanora, Lecidea, Rinodina,* and *Verrucaria* must be regarded as extremely tentative. We have seen no type material and are relying wholly on the interpretation of contemporary literature, which is anemic with regard to midcontinental North America.

While little seems certain in lichen taxonomy, one thing does seem evident—lichens and their habitats have changed markedly in their presence and distribution over the last one hundred years in "Chicago and vicinity." Calkins discriminated 125 species in 1896; today, we recognize 147. It does not appear that species richness has declined over the last one hundred years, but there are definite indications that significant changes have occurred in composition and physiognomy.

Larger foliose and fruticose lichens, which were clearly considered common by Calkins, have been replaced by small foliose and crustose species. What is needed to track changes in lichen inhabitancy over the next decades is a system of repeatable base-line sampling transects laid out in preserved tracts such as nature preserves and forest preserves. To limit lichen community research to correlations with air quality, while important, certainly overlooks the powerful impacts of other factors, such as changes in substrate availability and vascular plant communities. Also important is the need to have better information on the effects of land use and management practices to determine their impacts on all biota, including lichenized fungi.

THE FLORA

Below is a key to the genera of fungi that are lichenized or closely allied to lichenized fungi, and are known from the Chicago area as defined by Calkins. Following that is a catalogue of the species, alphabetized by genus. Where more than one species of a genus is enumerated, there is an artificial key to each taxon. The voucher status of each species is superscripted in one of five categories:

1 = recognized by Calkins and supported by a contemporary voucher collection.
2 = recognized by Calkins and supported only by a historic voucher collection.
3 = recognized by Calkins but unsupported by a voucher collection.
4 = known only from a contemporary voucher collection.
5 = known only from literature other than Calkins or from an historic collection not included by Calkins.

After each species account is a listing of the counties from which modern specimens exist, along with a citation:

ILLINOIS: Co = Cook Co.; Du = DuPage Co.; Wi = northern Will Co.
INDIANA: La = northern third of Lake Co.

Principal collectors are coded by their last initial:

Richard Hyerczyk (H), Wayne Lampa (L), Linda Masters (M), and Gerould Wilhelm (W).

Nomenclature approximates Esslinger and Egan (1995). Unless otherwise indicated by a herbarium acronym (i.e., CHAS, F, ILL, MICH, NY, US), all references to voucher material refer to specimens housed at the Morton Arboretum herbarium (MOR).

Any local user of this flora should bear in mind that the greater Chicago region (the twenty-two counties delineated by Swink and Wilhelm [1994]), includes another 70 species or so that are as yet not known from Calkins's delineated territory. A more complete accounting of the lichens in the southern Lake Michigan region can be obtained in the forthcoming *Lichens of the Chicago Region,* by the author.

KEY TO THE GENERA

Apothecia atop slender black stalks; growing on the polyporous fungus *Trichaptum biforme* .... PHAEOCALICIUM

Apothecia sessile or immersed; not growing on *Trichaptum.*

Thallus subcrustose (with marginal lobes) to foliose, squamulose, umbilicate, or fruticose, usually with a well-defined lower cortex .... GROUP I

Thallus crustose, tightly adnate or enmeshed with the substrate, without defined lobes, podetia, or a lower cortex .... GROUP II

GROUP I

1. Thallus gelatinous when wet, dark brown to black or dark slate gray; medulla absent.
  2. Thallus either minutely fruticose or subcrustose without distinct lobes and with a blue green prothallus evident at the margins.
    Thallus subcrustose with a blue green prothallus .... PLACYNTHIUM
    Thallus minutely fruticose .... DENDRISCOCAULON
  2. Thallus appearing distinctly lobed or foliose or fruticose, without a blue green prothallus.
    3. Thallus pulvinate or umbilicate, usually attached at only a central point; phycobiont *Gleocapsa* .... LICHINELLA
    3. Thallus attached to the substrate at several locations; phycobiont *Nostoc.*
      Thallus lacking an organized cortex, the hyphae interwoven; upper surfaces dull, usually olivaceous to black .... COLLEMA
      Thallus with a layer of more or less isodiametric cortical cells; upper surfaces usually smooth to sub-lustrous, slate gray to brown .... LEPTOGIUM
1. Thallus not gelatinous, variously colored; medulla evident.
  4. Thallus fruticose, podetiate, or of adnate to suberect squamules.
    5. Thallus of adnate squamules.
      6. Thallus saxicolous; ascoma a perithecium.
        Spores nonseptate .... CATAPYRENIUM
        Spores muriform (with horizontal and longitudinal septa) .... ENDOCARPON
      6. Thallus terricolous or corticolous; ascoma an apothecium.
        Squamules brownish to olivaceous, neither pink nor sorediate; phycobiont blue-green .... HEPPIA
        Squamules pinkish, brownish, or sorediate; phycobiont green .... PSORA
    5. Thallus various, but not of adnate squamules.
      7. Thallus in part or entirely of ascending squamules.
        Squamules brown or brownish gray on both surfaces; perithecia present .... DERMATOCARPON
        Squamules greenish or grayish above, white below; perithecia absent .... CLADONIA
      7. Thallus without squamules.
        8. Thallus of flattened lobes or branches.
          Thallus gray to orange, K+ deep purple .... TELOSCHISTES
          Thallus yellowish green, K– .... RAMALINA
        8. Thallus of uniformly or irregularly rounded branches.
          9. Stalks or branches of thallus with a central medullar core, not hollow .... EVERNIA
          9. Stalks or branches of thallus hollow.
            Podetia with a fibrous, dull surface .... CLADINA
            Podetia with a corticate, smooth, lustrous surface ... . CLADONIA
  4. Thallus adnate to loosely appressed, but distinctly foliose or umbilicate.
    10. Thallus orange, yellow, yellowish green, or yellowish gray.
      11. Cortex K+ deep purple .... XANTHORIA
      11. Cortex K– or K+ yellow.
        12. Thallus esorediate.
          13. Larger lobes more than 1 mm wide .... XANTHOPARMELIA
          13. Lobes less than 1 mm wide.
            14. Apothecial disc bright yellow ... CANDELARIA
            14. Apothecial disc brown or black.
              Apothecial disc brown; spores colorless .... LECANORA
              Apothecial disc black; spores brown .... DIMELAENA
        12. Thallus sorediate.
          15. Thallus bright lemon yellow or yellow green; lobes small, less than 1 mm wide .... CANDELARIA
          15. Thallus yellow green; lobes more than 1 mm wide.
            Medulla C+ red .... FLAVOPUNCTELIA
            Medulla C– .... FLAVOPARMELIA
    10. Thallus without yellowish tints.
      16. Thallus brown or brownish gray (rarely pale gray and umbilicate); cortex K–.
        17. Lower cortex covered by a dense tomentum or matted appressed hairs .... PELTIGERA
        17. Lower cortex smooth or sparsely to densely rhizinate, but not concealed by a dense tomentum.
          18. Lobe surfaces abundantly pruinose; soralia marginal .... PHYSCONIA
          18. Lobe surfaces smooth, or if pruinose, then esorediate.
            19. Lobes erect or suffruticose, or thallus umbilicate.
              Thallus foliose; perithecia absent .... TUCKERMANNOPSIS
              Thallus umbilicate with imbedded perithecia .. .. DERMATOCARPON
            19. Lobes appressed.
              20. Medulla C+ red .... MELANELIA
              20. Medulla C–.
                21. Rhizines absent; lobes discrete or appearing to flow together, tightly adnate .... HYPERPHYSCIA
                21. Rhizines present; lobes discrete, loosely appressed but not tightly adnate.
                  Thallus light to dark tan, with numerous imbedded black dots (perithecia) .... CATAPYRENIUM
                  Thallus brownish gray to dark gray; perithecia absent ... PHAEOPHYSCIA
      16. Thallus mineral gray, whitish gray, or greenish gray, never umbilicate; cortex K+ yellow or K–.
        22. Either the upper cortex with small white pores or the medulla C+ red, or both .... PUNCTELIA
        22. Upper cortex without white pores; medulla C–.
          23. Lower cortex white, light tan, or absent.
            24. Thallus isidiate; cortex K+ deep yellow .... IMSHAUGIA
            24. Thallus without isidia; cortex K– or K+ pale yellow.
              25. Soredia in marginal soralia; medulla K+ yellow .... HETERODERMIA
              25. Soredia absent or laminal, or if marginal, then medulla and cortex K–.
                26. Cortex K– .... PHYSCIELLA
                26. Cortex K+ yellow.
                  Larger lobes 3 mm or more across; lower cortex tan .... PUNCTELIA
                  Lobes less than 3 mm across; lower cortex white .... PHYSCIA
          23. Lower cortex brown or black (occasionally pale near the margins).
            27. Medulla distinctly tinted orange or salmon .... PYXINE
            27. Medulla white or pale yellow.

28. Medulla K–.
Thallus sorediate; lobes hollow .... HYPOGYMNIA
Thallus esorediate; lobes solid ..... ANZIA
28. Medulla K+ yellow or red.
29. Lobes broad, usually 4 mm or more wide, typically with a rhizine-free zone near the margins; medulla K+ red.
Upper cortex reticulate-cracked or maculate .... RIMELIA
Upper cortex without cracks or maculae . ... PARMOTREMA
29. Lobes narrower; rhizines typically distributed throughout on the lower surface; medulla K+ yellow or red.
Upper cortex with distinct white markings, particularly toward the tips .... PARMELIA
Upper cortex without white markings ... . MYELOCHROA

GROUP II

1. Ascoma a perithecium, the spores released through a small pore.
2. Thallus saxicolous or terricolous.
3. Spores abundantly muriform.
Thallus areolate to, more typically, squamulose; spores 2 per ascus .... ENDOCARPON
Thallus areolate, continuous; spores 8 per ascus .... STAUROTHELE
3. Spores either without septa, or with only transverse septa (rarely somewhat muriform in *Thelidium*).
4. Spores nonseptate.
Thallus crustose .... VERRUCARIA
Thallus squamulose .... CATAPYRENIUM
4. Spores septate.
Spores all exceeding 20 μ long, 1–3 septate; phycobionts green .... THELIDIUM
Spores all less than 20 μ long, 1-septate; phycobionts blue-green .... PYRENOCOLLEMA
2. Thallus corticolous.
5. Thallus of thick, brown, rounded squamules .... CATAPYRENIUM
5. Thallus not of thick, rounded squamules.
6. Spore walls notably thickened .... PYRENULA
6. Spores walls not notably thickened.
7. Spores becoming brown.
Spores 1-septate .... KIRSCHSTEINIOTHELIA
Spores 3–6 septate .... EOPYRENULA
7. Spores persistently hyaline.
8. Spores muriform (with both transverse and longitudinal septa) .... JULELLA
8. Spores not muriform, with transverse septa only.
9. Thallus restricted to *Populus*; spores much elongate, nearly or quite as long as the asci .... LEPTORHAPHIS
9. Thallus of a diversity of corticolous substrates; spores oblong to oval, much shorter than the asci.
10. Spores up to 20 μ long.
Septum of spores eccentric, the cells notably unequal in volume; asci more than 3 times as long as wide, or asci polysporus asci .... ANISOMERIDIUM
Septum of spores not eccentric, the cells about equal; asci less than 3 times as long as wide; asci never polysporus .... NAETROCYMBE
10. Larger spores more than 20 μ long.
Spores more than 31 μ long and 12 μ wide .... ACROCORDIA
Spores less than 31 μ long and 12 μ wide .... ARTHOPYRENIA
1. Ascoma an exposed apothecium, without a pored enclosure, or if more or less enclosed then immersed in thalloid warts or powdery soralia, or ascomata absent (ascomata flasklike in the bright yellow genus *Thelocarpon*).
11. Apothecia chronically absent.
12. Thallus K+ deep purple .... CALOPLACA
12. Thallus K– or K+ yellow or red.
13. Thallus sorediate throughout, without corticate tissues.
Thallus bright yellow .... CANDELARIELLA
Thallus granules without yellowish tints .. LEPRARIA
13. Thallus not sorediate throughout.
14. Thallus black throughout; phycobionts usually blue-green.
15. Thallus arenicolous .... PLACYNTHIELLA
15. Thallus saxicolous.
16. Thallus well developed, with a distinctly blue green prothallus evident at the margins .... PLACYNTHIUM
16. Thallus effuse, granular, without an evident prothallus.
Gleocapsa evident .... PSOROTICHIA
Gleocapsa absent .... LICHENOTHELIA
14. Thallus not black throughout; phycobionts green.
17. Thallus C–.
18. Thallus without yellowish tints .... PLACYNTHIELLA
18. Thallus yellow or with yellowish tints.
Thallus yellow, of notable corticate granules or granular soredia .... CANDELARIELLA
Thallus yellowish green, the soredia in discrete soralia .... LECIDEA
17. Thallus C+.
19. Thallus esorediate .... PLACYNTHIELLA
19. Thallus sorediate.
Soredia erupting from verrucae or cortical warts .... TRAPELIOPSIS
Soredia not erupting from verrucae .... TRAPELIA
11. Apothecia present.
20. Apothecia irregular to elongate; thallus rudimentary, often little more than a discoloring of the substrate around the apothecia.
21. Spores muriform, with 2–5 longitudinal septa .... ARTHOTHELIUM
21. Spores septate, with 3–11 transverse septa only.
22. Exciple undeveloped; asci subglobose ... ARTHONIA
22. Exciple well developed; asci elongate.
Spores with cylindrical cells; apothecia more or less circular to oblong; hymenium IKI+; spores IKI+ blue to orange .... OPEGRAPHA
Spores with lenticular cells; apothecia irregular, often branched or elongating; hymenium IKI–; spores usually IKI+ bluish black .... GRAPHIS
20. Apothecia mostly regular, rounded, or absent; thallus rudimentary to well developed.
23. Thallus and apothecia black throughout; spores simple to 1–3 septate.
Thallus terricolous or fungicolous .... PLACYNTHIELLA
Thallus saxicolous .... PLACYNTHIUM
23. Thallus and apothecia variously colored, but not black throughout, or thallus absent; spores various.
24. Exciple thalloid, with an algal component.
25. Spores septate, muriform, or polaribilocular.

26. Spores either muriform or with 20 or more transverse septa.
    Spores muriform, with 1–3 longitudinal septa .... DIPLOSCHISTES
    Spores without longitudinal septa .... CONOTREMA
26. Spores 1–3 septate or polaribilocular.
  27. Spores polaribilocular; apothecia or thallus or both often K+ deep purple (look also for tiny black dots in the hymenium and see *Caloplaca flavovirescens*) .... CALOPLACA
  27. Spores merely septate; apothecia and thallus K– or K+ yellow or red.
    28. Spores hyaline.
        Apothecia yellow or yellowish .... CANDELARIELLA
        Apothecia black, brown, or whitish pruinose .... LECANIA
    28. Spores gray or brown.
      29. Asci disintegrating, not evident with mature spores .... CYPHELIUM
      29. Asci evident.
          Spore walls thin and evenly developed, the lumina cylindrical .... AMANDINEA
          Spore walls unevenly thickened, the lumina often angled .. RINODINA
25. Spores nonseptate.
  30. Apothecia immersed in thalloid warts or in heaps of powdery soredia; spores very large.
      Thallus areolate; discs black, pruinose, the ostiole white-bordered and often opening wide .... ASPICILIA
      Thallus continuous; ascomata not as above .... PERTUSARIA
  30 Apothecia adnate or immersed, but not as above; spores of various sizes.
    31. Thallus or apothecia or both yellow.
        Thallus usually evident, at least around the disc-shaped apothecia; spores up to 32 per ascus .... CANDELARIELLA
        Thallus absent; apothecia globose, opening by a tiny pore; spores numerous .... THELOCARPON
    31. Neither the thallus nor the apothecia yellow.
      32. Spores numerous, asci always bearing more than 32 spores .... ACAROSPORA
      32. Spores few to 16 per ascus, rarely a few asci with more than 16.
        33. Spore walls thick .... PERTUSARIA
        33. Spore walls thin.
          34. Thallus or apothecia corticolous, or if saxicolous, then spores less than 14 μ long .... LECANORA
          34. Thallus or apothecia saxicolous and the spores more than 14 μ long.
              Apothecial disc flat or concave, the surface at or below the surface of the thallus .... ASPICILIA
              Apothecial disc distinctly adnate, the surface elevated well above the surface of the thallus .... TRAPELIA
24. Exciple without algae, or exciple absent.
  35. Spores minute and numerous, more than 16 per ascus.
    36. Thallus corticolous .... BIATORELLA
    36. Thallus saxicolous.
        Disc notably beset with carbonaceous ridges and lumps .... POLYSPORINA
        Disc nearly or quite without carbonaceous intrusions .... SARCOGYNE
  35. Spores few to 16 per ascus.
    37. Spores septate.
      38. Spores brown, or muriform, or both.
        39. Spores 3–several septate ...... OPEGRAPHA
        39. Spores 1-septate.
            Thallus K+ red .... BUELLIA
            Thallus K– .... AMANDINEA
      38. Spores hyaline, never muriform.
        40. Paraphyses indistinct or absent .... ARTHONIA
        40. Paraphyses evident, distinct or intertwined.
          41. Spores 2-celled.
              Paraphyses intertwined and anastomosed .... MICAREA
              Paraphyses distinct ...... DIMERELLA
          41. Spores 4- to many-celled.
            42. Ascomata with elevated rims and deeply sunken hymenia ...... CONOTREMA
            42. Ascomata with exposed, surficial hymenia.
              43. Thallus saxicolous.
                  Epithecium green in KOH; algae aggregated in small packets .... BACIDINA
                  Epithecium not green in KOH; algae not in packets .... BACIDIA
              43. Thallus corticolous, lignicolous, terricolous, or muscicolous.
                  Spores tending to taper at one end, less than 34 μ long, 3–5 septate .... SCOLICIOSPORUM
                  Spores nearly acicular, the larger more than 34 μ long, commonly more than 5-septate .... BACIDIA
    37. Spores nonseptate, though sometimes with 2 large polar vacuoles.
      44. Thallus C+ pink, gyrophoric acid present.
        45. Thallus saxicolous .... TRAPELIA
        45. Thallus terricolous or lignicolous.
            Thallus greenish gray or grayish, soredia erupting from verrucae ... TRAPELIOPSIS
            Thallus dark brown or blackish, without verrucae and cortical tissues .... PLACYNTHIELLA
      44. Thallus C–, gyrophoric acid absent.
        46. Thallus granules often more than 0.5 mm across, diffuse, greenish to brown when dry and greener when wet, or thallus terricolous, or both .... PLACYNTHIELLA
        46. Thallus not granular, or granules up to 0.5 mm across, dense, dark brown to black when wet, never terricolous.
          47. Apothecia orange, K+ purple .... PROTOBLASTENIA
          47. Apothecia neither orange nor K+ purple.
            48. Thallus KC+ orange; apothecia to 0.25 mm across; larger spores more than 5 μ wide .... PYRRHOSPORA
            48. Thallus KC–; apothecia and spores various.
                Apothecia flesh-colored to darkening, usually irregular in shape, with a difficult-to-define margin, the larger discs often more than 0.4 mm across .... LECANORA
                Apothecia black, more or less round, the rim thick and conspicuous .... PORPIDIA

ACAROSPORA A. Massal.

Acarospora americana [4] H. Magn. Known only from an exposed granitic boulder on the grounds of the Morton Arboretum, in DuPage County. This is a C– species that in all other respects looks like the more widespread C+ rose species *A. fuscata* (Nyl.) Arnold. Du-W#19636

ACROCORDIA A. Massal.

Acrocordia megalospora [5] (Fink) R. C. Harris According to Harris (1973), this species ranges throughout Illinois and the Chicago region, though we have yet to secure a specimen locally. It evidently prefers elms and white oaks.

AMANDINEA Choisy *ex* Scheid. & H. Mayrh.

Asci polysporous . . . . A. polyspora
Asci octosporous.
  Apothecia with a thalline margin, the proper exciple evidently lacking . . . . A. dakotensis
  Apothecia not erumpent, without a thalline margin, the proper exciple, well developed . . . . A. punctata

Amandinea dakotensis [5] (H. Magn.) P. May & Sheard Our only record for this species is a Calkins specimen (#167 NY) from Cook County, which he called *Buellia alboatra*.

Amandinea polyspora [4] (Willey) E. Lay & P. May Frequent to common just to the west and south of the Chicago region, where it grows on twigs and branches of open-grown trees. Our only record of this lichen locally is from *Malus pumila* near Barrington, in Cook County. Co-H#1234

Amandinea punctata [1] (Hoffm.) Coppins & Scheid. = *Buellia schaereri* and *B. parasema* (in part) of Calkins, who reported it from Cook (#79 NY) and Grundy (F) counties, noting that it grew on weathered rails and once on an old stump. He does not mention *Buellia punctata*, the name so long used for this species. Imshaug (1951) cited Calkins (F) specimens from Cook and Grundy counties. The Field Museum has two specimens from Grundy annotated by Imshaug; Calkins had called them *B. schaereri*. *Amandinea punctata* is characteristic of weathered fence posts and rails, where it often grows with *Caloplaca microphyllina* and *Physcia millegrana*, though it grows on bark occasionally. Co-H#670; Du-W#14616; La-H#196; Wi-W#19233

ANISOMERIDIUM (Müll. Arg.) Choisy

Spores about 3 times as long as wide, sometimes becoming 4-celled; microconidia elliptical . . . . A. nyssaegenum
Spores about twice as long as wide, remaining 2-celled; microconidia globose . . . . A. biforme

Anisomeridium biforme [3] (Borrer) R.C. Harris Calkins's report of *Pyrenula gemmata* is, perhaps, referable here; several non-Chicago area specimens we have seen that he labeled *Pyrenula gemmata* are *A. biforme;* but see also *Eopyrenula intermedia* and *Kirschsteiniothelia aethiops*. He reported it from "oaks and hickories at River Forest and in all our territory." We have not seen *A. biforme* locally. It is possible Calkins was referring, at least in part, to *A. nyssigenum*, which is not infrequent today.

Anisomeridium nyssigenum [4] (Ellis & Everh.) R. C. Harris Although it is now relatively frequent, it would seem that this species was unknown to Calkins, by any name, since all of the specimens we have seen are contemporary. Our records are mostly from *Crataegus* spp., *Quercus alba, Q. macrocarpa,* and *Populus deltoides*. There are several records from *Crataegus mollis, Quercus alba,* and *Ulmus americana* that represent, according to Richard Harris (pers. comm.), the conidial state of this lichen. The macroconidia are held together by a colorless mucilage in packets that resemble polysporous asci filled with 1-septate spores. Such forms have been called *Sarcinulella banksiae* Sutton & Alcorn, an anamorphic form known originally from Australia. Co-H#683; Du-W#19994; La-H#1371; Wi-H#107

ANZIA Stizenb.

Anzia colpodes [3] (Ach.) Stizenb. = *Parmelia colpodes* Calkins reported this species from oaks near Lemont, in Cook County. We have not seen it anywhere near Chicago; in southern Missouri, it grows mostly on *Quercus velutina*. We would be tempted to disbelieve the report, but there is a correctly identified Calkins specimen (#6011 CHAS) from nearby LaSalle County, Illinois. [atranorin, divaricatic acid]

ARTHONIA Ach.

Apothecia to 0.8 mm across, round or nearly so.
  Thallus greenish yellow or greenish blue . . . . A. caesia
  Thallus ashy white or evanescent . . . . A. diffusa
Apothecia to 1.5 mm across, irregular, elongated to stellately branched.
  Apothecia reddish brown to nigrescent; thallus white . . . . A. pyrrhuliza
  Apothecia dark brown to black; thallus whitish to sordid or greenish gray . . . . A. radiata

Arthonia caesia [1] (Flotow) Körber = *A. lecideella* of Calkins (#177 NY; #504 ILL; #213 F). This species is common on a wide variety of corticolous substrates, particularly *Carya ovata, Fraxinus americana, Populus deltoides, Quercus alba, Q. velutina, Tilia americana*, and the smooth bark of young saplings. It is occasional on old wood. Calkins noted it from hickories and hawthorns throughout the area. [usnic acid] Co-H#582; Du-W#13865; La-W#14975; Wi-W#13941

Arthonia diffusa [3] Nyl. There is a Calkins specimen of this species from "Illinois, on oaks" (*s.n.* F); possibly this is from the Chicago area. There is another Calkins specimen (#307 F) from "Illinois" that has 2–4 celled spores 15–22 μ long and 6–10 μ wide, distinct paraphyses, round black apothecia that are somewhat pruinose, and a rather thick thallus; it has been annotated as *A. polymorpha* Ach. In his book Calkins noted *A. diffusa* from hickories and maples in Will County. A little farther north, in Racine County, Wisconsin, it is known from a ravine near Crestview, where it grows on *Acer saccharum*. This ravine is characterized by boreal elements such as *Betula papyrifera, Juniperus communis* var. *depressa, Populus balsamifera*, and *Shepherdia canadensis*.

Arthonia pyrrhuliza[3] Nyl. Calkins described his specimen as "thallus white, thin; apothecia reddish, slender, much divided, ramose." There is such a specimen from nearby LaSalle County, Illinois (*s.n.* F); its spores, about 15 μ long, are 4-celled, with one of the end cells notably enlarged. Fink (1935) doubts Illinois reports, but the LaSalle County specimen fits well enough his own description for this plant. Calkins noted that it was rare on oaks in Will County.

Arthonia radiata[2] (Pers.) Ach. Calkins noted this species from oaks near Elgin. There are Calkins specimens (#179, #217 F; #180 NY) of this species, although some of those he labeled *A. astroidea*. Most were collected in Glencoe, Cook County, on hickories.

ARTHOPYRENIA A. Massal.

Arthopyrenia cinchonae[2] (Ach.) Müll. Arg. Our only record of this species is a specimen (Calkins #6623, 1890 US) from "Illinois, Kane County, Elgin." Calkins had called it *Pyrenula glabrata*. In his flora he reports *P. glabrata* from "oaks near Elgin and Joliet." *Arthopyrenia cinchonae* is a species known today from the southeastern states and the Atlantic coast up to New Jersey, which casts doubt upon the validity of the label data.

ARTHOTHELIUM A. Massal.

Apothecia to 0.25 mm across, or elongated to 1 mm or more; phycobiont protococcoid .... A. taediosum
Apothecia mostly larger, to 1.5 mm across, irregular; phycobiont *Trentepohlia* .... A. spectabile

Arthothelium spectabile[2] A. Massal. = *Arthonia spectabilis* of Calkins, who noted that it grew on "maples at Glencoe, Riverside and elsewhere." There are historic Cook County specimens (#177 F; #213 NY) of this species.

Arthothelium taediosum[3] (Nyl.) Müll. Arg. = *Arthonia taediosa* of Calkins, who reported it from maples in the Des Plaines valley.

ASPICILIA A. Massal.

Thallus areolate or not, but without heavily pruinose thalline rims around sunken apothecia; on HCl– rock .... A. caesiocinerea
Thallus areolate, many areoles with deeply seated apothecia surrounded by heavily pruinose thalline rims; on dolomite.
  Thallus white, pale greenish white, or gray, the areoles more or less contiguous; spores 8 .... A. calcarea
  Thallus grayish, the areoles discontinuous or scattered; spores 4–6 .. .. A. contorta

Aspicilia caesiocinerea[4] (Nyl. *ex* Malbr.) Arnold Rare locally, this species is not uncommon just to the west of the Chicago region, where it occurs on sandstone in Lee and Ogle counties. It was collected recently on a granite boulder in the Palos Hills of southern Cook County. [aspicilin] Co-H#736

Aspicilia calcarea[3] (L.) Mudd = *Lecanora calcarea* of Calkins, who reported this species from calcareous rocks at Joliet. [aspicilin]

Aspicilia contorta[1] (Hoffm.) Kremp. = *Lecanora calcarea* var. *contorta* of Calkins. Our only contemporary specimens of this species are from dolomitic outcrops in dry prairie near Joliet, where Calkins also made his collection (#188 NY). [aspicilin] Wi-W#12649

BACIDIA De Not.

Thallus saxicolous; spores less than 23 μ long .... B. granosa
Thallus corticolous, terricolous, or muscicolous; spores more than 23 μ long.
  Thallus terricolous, saxicolous, or muscicolous. .... B. bagliettoana
  Thallus corticolous.
    Apothecia epruinose in age, with the exciple and hypothecium deep pink to red brown in KOH .... B. polychroa
    Apothecia commonly pruinose, at least along the margins, the exciple and hypothecium hyaline to yellowish in KOH .... B. suffusa

Bacidia bagliettoana[4] (A. Massal. & De Not.) Jatta Muscicolous or terricolous; the only local record is from soil over dolomite at Joliet Junior College, in Will County, with *Catapyrenium squamulosum*. Wi-H#1219

Bacidia granosa[4] (Tuck.) Zahlbr. This species is infrequent on dolomitic outcrops, HCl+ boulders, and weathered concrete. It has been called *B. trachona* (Ach.) Lettau by many North American authors. According to Richard Harris (pers. comm.), *B. trachona* is a European species, and our material is referable here. Calkins evidently was not aware of any *Bacidia* with short spores in the Chicago area; no specimens have been found, even under another name. Co-M#26; Du-W#1463; Wi-H#1132

Bacidia polychroa[3] (Th. Fr.) Körber = *Biatora fuscorubella* of Calkins, who stated that this species grew on substrates similar to those of *Bacidia rubella*. *B. rubella* is a distinct species known from elsewhere in the Midwest, but the only Calkins material (#140, #897, LaSalle Co., Illinois, on linden, F) we have seen that he called *Biatora rubella* is referable to *Bacidia polychroa*.

Bacidia suffusa [2] (Fr.) A. Schneider = *Biatora suffusa* Fr. In southern Illinois, this species is rare on *Carya* and *Liquidambar*. Calkins noted it from *Carya* in Hanover and Lemont in Cook County, and there are correctly identified specimens (#143, 1897, F) from Cook County. Ekman (1996) cites both *Bacidia rubella* and *B. suffusa* from Cook County based upon specimens collected at Canton, Illinois, which is in Fulton County.

BACIDINA Vězda

Bacidina egenula [1] (Nyl.) Vězda = *Biatora inundata* of Calkins. This species has been misidentified routinely in North America as *Bacidia inundata* (Fr.) Körb. *Bacidina egenula* differs in having a K+ green epithecium. It is a frequent species of dolomitic outcrops, glacial erratics, flagstone, and concrete; there is one specimen from rusty metal. Calkins wrote that it was "in all our territory on detached rocks or stones along streams," and that the thalli were "best shown on sandstones." Co-M#29; Du-W#14366; Wi-W#12652

BIATORELLA De Not.

Biatorella cyphalea [3] (Tuck.) Zahlbr. = *Biatora cyphalea* Tuck. Fink (1935) restricted this species to Illinois. Magnusson (1934) cited a Calkins specimen from elms, "Chicago: Fox River." Actually, Calkins reported it as "rare on elms near the Fox River," a location that is more likely in Kane County than in Chicago. We have not seen the specimens upon which these records are based.

BUELLIA De Not.

Buellia stillingiana [5] J. Steiner = *B. parasema* (in part). This species is not uncommon on corticolous substrates just south of the Chicago region, and although we have not seen it alive locally, there is a Cook County specimen (Calkins #163 F), originally called *B. parasema*. Imshaug (1951) cited a specimen from Cook County. [norstictic acid, ±atranorin]

CALOPLACA Th. Fr.

Thallus sorediate.
- Thallus saxicolous . . . . C. citrina
- Thallus lignicolous or corticolous . . . . C. microphyllina

Thallus esorediate.
- Apothecial discs black or brownish black, or buff and pruinose, K– or K+ violet.
  - Discs distinctly K+ violet red; thallus corticolous or lignicolous, usually on *Juniperus*. . . . . C. pollinii
  - Discs K– or K+ pale violet; saxicolous . . . . C. atroalba
- Apothecial discs pale yellow to orange, red orange, or brownish orange, K+ violet red.
  - Thallus corticolous or lignicolous.
    - Thallus yellowish gray to yellow, K+ red . . C. flavorubescens
    - Thallus absent or immersed, gray or blackish, or waxy white, K–.
      - Thallus waxy, pale gray, the discs bright orange and nearly or quite without a thalloid exciple . . . . C. sp. #3
      - Thallus absent, or immersed, or blackish; thalloid exciple present or absent.
        - Apothecial margins distinctly white pruinose, the discs dull tan yellow . . . . C. ulmorum
        - Apothecial margins epruinose, the discs rusty brown to orange.
          - Apothecial margins mostly yellow to orange, usually a little paler than the discs . . . . C. holocarpa
          - Apothecial margins gray to rusty red or darker.
            - Apothecial rim gray, conspicuous, and persistent . . . . C. cerina
            - Apothecial rim darkened rusty red, mostly flexuous and turning under in age . . . . C. ferruginea
  - Thallus saxicolous.
    - Thallus yellow or orange, distinctly present at least near many of the apothecia, K+ purple.
      - Thallus distinctly orange-tinged, paler than to concolorous with the apothecia.
        - Many of the apothecia more than 0.4 mm across . . . . C. squamosa
        - Apothecia all less than or equal to 0.4 mm across . . . . C. cinnabarina
      - Thallus distinctly yellow, notably paler than the orange or brownish apothecia.
        - Thallus margins usually notably lobulate and loosely appressed to the substrate; apothecia less than 0.4 mm across . . . . C. schaereri
        - Thallus scant to continuous, but without notable lobulate margins; apothecia commonly more than 0.4 mm across.
          - Thallus thin, more or less continuous, the apothecial rims essentially concolorous with the brownish or orange discs and tending to disappear in age . . . . C. flavovirescens
          - Thallus thick, more or less aggregated around the apothecia, the apothecial rims paler than the yellowish or brownish discs . . . . C. vitellinula
    - Thallus K– or absent or essentially so.
      - Apothecial margins gray; thallus abundant, gray to black . . . . C. sideritis
      - Apothecial margins yellow, orange, or red brown; thallus absent, gray, or black; substrate chemistry various.
        - Spore isthmus narrow, no more than 3.5 μ wide . . . . C. feracissima
        - Larger spore isthmi wider than 3.5 μ.
          - Thallus absent or essentially so, substrate HCl+ . . . . C. vitellinula
          - Thallus evident, thin or thick; substrate HCl– . . . . C. oxfordensis

Caloplaca atroalba [5] (Tuck.) Zahlbr. There is a Calkins specimen from Will County (#1752 NY), which he named *Lecanora aipospila*. The only local contemporary record is from southern Will County, just outside of Calkins's area, where it grows on sandstone bedrock within the zone of fluctuation along Prairie Creek north of Wilmington. Farther south we have specimens from dolomite.

Caloplaca cerina [4] (Hedwig) Th. Fr. There are at least two early Cook County specimens (*s.n.* ILL; *s.n.* F), referable here, that were named *Placodium ferrugineum* by Calkins, and another (*s.n.* F) that he called *Placodium* *aurantiacum*. There is a modern Cook County record from a wooden fence rail. Co-H#1308

Caloplaca cinnabarina [1] (Ach.) Zahlbr. = *Placodium cinnabarinum* of Calkins. As it was in Calkins's day, this is a frequent species on a variety of carbonate rocks, including concrete; it also can grow on HCl– rocks. It grows in weedy areas as well as on rocks in natural contexts. Occasional asci will be found with 1 or 2 spores that are larger than normal, but typically the 8-spored asci contain broadly ellipsoid spores 10–11 μ long, with isthmi 3–4 μ long. The apothecia rarely exceed 0.4 mm across, and mostly run about 0.2–0.3 mm across. See also comments under *C. schaereri*. Co-W#14145; Wi-W#12650

Caloplaca citrina [4] (Hoffm.) Th. Fr. This species is typically found on vertical, dolomitic cliff faces or weathered quarry walls in the Des Plaines valley. It is characterized by isidiate or sorediate granules scattered over the surface. Occasional forms in which corticate areolae are sorediate on the edges have been called *C. citrina* var. *flavocitrina* (Nyl.) A. E. Wade. Co-M#28; Du-W#13938; Wi-H#1196

Caloplaca feracissima [4] H. Magn. Evidently unknown to Calkins, this species accounts for most of the dirty yellow encrustations on sidewalks, flagstones, and weathered concrete. It grows routinely with *Endocarpon pusillum* and *Lecanora dispersa*. As understood here, this species includes specimens whose apothecia have discs that appear orange brown and have pale rims as well as those whose apothecia have definitely brownish discs and even yellower and larger rims. There are populations that at times seem so distinctly different that one is scarcely able to imagine lumping them together as one species; then, there are others in which the apothecia appear to blend insensibly from one end of the spectrum to the other. Neither group has the nearly septate spores of *C. approximata* (Lynge) H. Magn., in which the isthmus is scarcely 1 μ wide. Both groups, though distinct, are very weedy on weathered flagstone and concrete. Occasional specimens have paraphyses in which the terminal 1 or 2 cells expand to 7 or 8 μ, said to be characteristic of *C. lactea* (A. Massal.) Zahlbr., but so many of our specimens grade from 3 to 6 μ in this respect that it seems there is no discontinuous segregation. The reports of *C. arenaria* by McKnight et al. (1987) should be referred here. Co-W#13609; Du-W#13322; La-W#13775; Wi-H#1240

Caloplaca ferruginea [2] (Hudson) Th. Fr. = *Placodium ferrugineum* of Calkins, at least in part, who noted this species from "oaks along the Des Plaines river and near Elgin on hickories . . . plentiful." We have seen a Cook County specimen, properly identified (#6085 CHAS) from Oak Park. An "Illinois" specimen (#318 NY) was later annotated *C. pollinii* by Rudolph, we believe erroneously. See also comments under *C. cerina* and *C. flavovirescens*.

Caloplaca flavorubescens [2] (Hudson) J. R. Laundon = *Placodium aurantiacum* of Calkins, who listed it from "elms and poplars at Glencoe; on hickories and other trees along the Des Plaines River." Curiously, he said it grew on rocks at Lemont and elsewhere; these latter reports probably refer to what is now known as *C. flavovirescens*. Many Calkins corticolous specimens we have seen that he called *P. aurantiacum* are referable to *C. ulmorum*, which see, but at least two Cook County specimens (#6082 CHAS; #81 F) are properly identified.

Caloplaca flavovirescens [4] (Wulfen) Dalla Torre & Sarnth. Locally this species is infrequent on weathered concrete, dolomitic erratics, or quarry walls; it is much more common away from the region. A Cook County specimen (*s.n.* F) that Calkins called *Placodium ferrugineum* is referable here. Occasional specimens of this species have in their hymenia parasitic, polysporous asci with brown, septate spores mostly 4–6 μ long; according to R. C. Harris (pers. comm.) these may be *Muellerella lichenicola* (Sommerf. *ex* Fr.) D. Hawksw. Co-H#709; Du-W#14642

Caloplaca holocarpa [4] (Hoffm. *ex* Ach.) M. Wade Evidently unknown to Calkins, this is an occasional but widespread species of a wide variety of bark and lignin substrates, though generally with us it is found on the upper trunks of *Populus*. Co-H#693; La-H#350; Wi-H#269

Caloplaca microphyllina [1] (Tuck.) Hasse = *Placodium microphyllum* of Calkins (#6084 CHAS; *s.n.* F). That orange swatch that one can see from the road on farm wood and fences in agricultural districts is usually either rust leached from barbed wire or *C. microphyllina*. It often grows with *Physcia millegrana* and *Amandinea punctata*. Co-H#237; Du-W#19232; La-H#193; Wi-H#1131

Caloplaca oxfordensis [4] Hedr. Our only record of this species is from granitic boulders in an open meadow at the Morton Arboretum, in DuPage County, although is grows on granitic erratics more frequently just to the north and east of us (Wetmore 1996). Du-W#19639

Caloplaca pollinii [5] (A. Massal.) Jatta Farther south, this species grows on *Juniperus virginiana* in natural areas. Calkins's Cook County specimen (#53 MICH) was confirmed by Wetmore (1994); we have not seen the specimen, so we do not know what Calkins called it.

Caloplaca schaereri[4] (Flörke) Zahlbr. This species is uncommon locally on dolomitic cliff faces and outcrops, as well as on weathered flagstone, and known only from DuPage County. It can resemble *C. cinnabarina*, because the apothecia are tiny, rarely more than 0.4 mm across, and the thallus is cracked-areolate to continuous, even occasionally effigurate, but the thallus is notably less orange than the discs, and the spores commonly are more than 11 μ long. We are not at all certain that *C. schaereri* is the proper name for this lichen, but it appears to be the one used by Rudolph (1955) for at least a similar lichen. Du-W#14360

Caloplaca sideritis[4] (Tuck.) Zahlbr. Evidently unknown to Calkins, this species is occasional on granitic and dolomitic erratics, and on dolomitic outcrops and cliff faces. It is a variable lichen locally, particularly with respect to spore size, which is described as 11–14 μ long (Wetmore 1996); a few of our specimens have spores ranging from 16–22 μ, but are alike in all other respects. Co-H#443; Du-W#19640; Wi-H#1127

Caloplaca squamosa[4] (de Lesd.) Zahlbr. Uncommon locally on dolomitic erratics and on weathered concrete or mortar in full sun, this lichen is more common farther south. Rarely, specimens have clustered apothecia with tiny fringes of minutely lobulate thallus, evocative of descriptions we have seen for *C. irrubescens* (Nyl.) Blomb. Co-H#580, Du-W#14601

Caloplaca ulmorum[5] (Fink) Fink There are Calkins specimens of this species that he had called *Placodium aurantiacum* (#50, #1641 NY). We have a contemporary specimen from just west of the Chicago region, which grew on the trunk of *Juglans nigra* in a partly open mowed area.

Caloplaca vitellinula[4] (Nyl.) H. Olivier This species occurs occasionally in Cook and Will counties and farther south and west on weathered dolomite and concrete. It is disturbingly similar to what we are calling *C. squamosa*, which has a more orange thallus, with more distinctly lobulate squamules. Co-Horn #45; Wi-H#1322

Caloplaca sp. #3[4] *sensu* MOR Characterized by a waxy, pale gray, areolate thallus, with orange discs and proper exciples. Young apothecia appear to have a weakly developed thalloid exciple, but this is soon evanescent; spores are about 14 μ long, with isthmi about 6 μ long. Our only record for this distinctive lichen is from a wooden fence rail at Harms Woods, in Cook County. Co-H#863

CANDELARIA A. Massal.

Thallus esorediate . . . . C. fibrosa
Thallus sorediate . . . . C. concolor

Candelaria concolor[1] (Dickson) Stein Presumably including some of what Calkins called *Theloschistes concolar*, but we have seen no specimens of *C. concolor* collected by Calkins; see comments under *C. fibrosa.* This species today, with the possible exception of *Physcia millegrana*, is the most common lichen in the Chicago region. It accounts for most of the yellow swatches that are so characteristic of suburban trees such as *Populus deltoides, Fraxinus pennsylvanica* var. *subintegerrima, Acer negundo, Juglans nigra*, and *Ulmus americana*. It also grows on fence posts and rails, concrete, dolomitic erratics and outcrops, and tombstones. Occasional specimens have a very scant or concealed thallus, and have been called *C. concolor* var. *effusa* (Tuck.) G. Merr. & Burnham. Co-M#37; Du-W#12419; La-W14981; Wi-M#4

Candelaria fibrosa[5] (Fr.) Müll. Arg. Although unlisted by Calkins, there are several Cook County specimens collected by Calkins that he labeled either *Theloschistes polycarpus* (#5686 CHAS) or *Theloschistes concolor* (#5684 CHAS; #2031 NY; *s.n.* F). Still frequent on canopy branches in Missouri, it has not been collected in Illinois in this century.

CANDELARIELLA Müll. Arg.

Thallus of small squamules or areolae, or absent; apothecia usually present; corticolous or saxicolous. C. vitellina
Thallus notably sorediate or of spheroid corticate granules; apothecia commonly absent; corticolous.
  Thallus of scattered, globose, distinctly corticate, more or less evenly distributed granules . . . . C. xanthostigma
  Thallus sorediate, with ecorticate granules more or less clustered into soralia . . . . C. reflexa

Candelariella reflexa[4] (Nyl.) Lettau More than half of our local specimens are from *Quercus velutina*, though we also have it from *Q. macrocarpa, Crataegus mollis, Juglans nigra, Populus deltoides, Prunus serotina, Tilia americana*, and weathered fence rails. Harris and Buck (1978) describe a similar species (*C. efflorescens* R. C. Harris & W. R. Buck) and map it from areas all around the Chicago region, particularly north and east of us. It appears to differ principally in having 32-spored asci, as opposed to the 8-spored asci of *C. reflexa*. Our lower Midwestern plants infrequently produce apothecia, but all that we have seen have 8-spored asci. Until we see material to the contrary we are defaulting all of our sterile morphs to *C. reflexa*, and here also we are referring the reports of *C. efflorescens* by McKnight et al. (1987). Co-H#733; Du-W14363; La-H#1368; Wi-H#1124

Candelariella vitellina[1] (Hoffm.) Müll. Arg. Possibly included within *Placodium vitellinum* of Calkins, but his Cook County specimen (#6080 CHAS), from wood, is *Candelariella xanthostigma*. Most northern Illinois specimens are from sandstone exposures, but the only specimens we have seen in the broader Chicago region are from igneous boulders. It is rare on lignin, such as weathered fence rails and wood, from which substrate it is reported by Calkins. We also have specimens from *Quercus alba* and *Q. macrocarpa*. On wood or bark it could be mistaken for *C. xanthostigma*, but the thallus granules of *C. xanthostigma* are smaller and not as coalesced. Be alert for a similar species, frequent on carbonate rock all around the Chicago area, *C. aurella* (Hoffm.) Zahlbr. Du-W#19637

Candelariella xanthostigma[4] (Ach.) Lettau Occasional locally, mostly on oaks. It was here in Calkins's time, but he evidently included it with *Candelariella vitellina*, which see. Wetmore (1986) reports it from Lake County. Du-W#14158

CATAPYRENIUM Flotow

Catapyrenium squamulosum[1] (Ach.) Breuss = *Endocarpon hepaticum* and *E. rufescens* of Calkins. Thomson (1987) does not cite specimens, but appears to dot Cook County on a distribution map; there is a Calkins specimen (#30 NY) from Cook County. Our contemporary Cook and Will county specimens are from shallow soil over dolomite. It often grows with *Psora decipiens* and prairie species such as *Andropogon gerardii, A. scoparius, Artemisia caudata, Comandra umbellata, Euphorbia corollata, Liatris cylindracea, Petalostemum purpureum, Silphium terebinthinaceum,* and *Solidago nemoralis*. Near Lake Michigan at Clarke and Pine Nature Preserve, in Lake County, it grows in stabilized sand ridge prairie with *Andropogon scoparius, Arenaria stricta, Artemisia caudata, Aster azureus, A. ptarmicoides, Carex richardsonii, Liatris aspera,* and *Solidago nemoralis*. In the extreme northwestern portion of the broader Chicago region (Swink and Wilhelm 1994), which includes a small section of the kettle and kame topography of northern Illinois and southeastern Wisconsin, the gravelly hill prairies include this species along with *Heppia adglutinata* and *Psora decipiens*. Co-W#17520; La-W#13769; Wi-W#12428

CLADINA Nyl.

Ultimate branches with a strong tendency to be swept in one direction .... C. arbuscula
Ultimate branches not notably oriented in one direction . C. subtenuis

Cladina arbuscula[4] (Wallr.) Hale & Culb. Our only record for this species is on weathered clay near Palos Park in Cook County, growing with *C. cervicornis* ssp. *verticillata, Cladonia cristatella, C. peziziformis, C. polycarpoides,* and Danthonia spicata. [usnic acid, fumarprotocetraric acid] Co-H#1279

Cladina subtenuis[1] (Abbayes) Hale & Culb. Probably = *Cladonia rangiferina* var. *sylvatica* of Calkins, since he did not mention any other *Cladina*. Locally, this species is rare on eroded, well-leached clayey till or loess, typically with other terricolous lichens and *Danthonia spicata*. Calkins noted it from dead wood and sandstones in the Des Plaines River valley. [usnic acid, fumarprotocetraric acid] Du-L#79

CLADONIA P. Browne

1. Podetia forming cups.
  2. Podetia and cups esorediate.
    3. Thallus UV+ bright white (squamatic acid) .... C. squamosa
    3. Thallus UV–, podetia without or with only scattered squamules.
      4. Central portions of the cups proliferating, producing secondary and tertiary cups .. C. cervicornis ssp. verticillata
      4. Cups not proliferating, or proliferating from their margins only.
        5. Cups with membranes irregularly perforated .... C. multiformis
        5. Cups without perforations.
          Podetia tall, olive green, with the cups usually proliferating at their margins .... C. gracilis ssp. turbinata
          Podetia short, gray green, the cups not or only rarely proliferating .... C. pyxidata
  2. Podetia and or cups nearly or quite covered by fine to coarse soredia.
    6. Podetia very elongate, terminated by small cups, finely sorediate nearly or quite to the base.
      Cups usually poorly developed and on only a few podetia; grayanic acid present .... C. cylindrica
      Most or all of the podetia with well-developed cups; grayanic acid absent .... C. fimbriata
    6. Podetia stout, the cups often deep and flaring, sometimes the stalk mostly corticate.
      7. Apothecia and/or pycnidia red; thallus yellowish green; usnic acid present .... C. pleurota
      7. Apothecia and/or pycnidia brown; thallus grayish or whitish; usnic acid absent.
        8. Grayanic acid present .... C. grayi
        8. Grayanic acid absent.
          9. Cryptochlorophaeic acid present .... C. cryptochlorophaea
          9. Cryptochlorophaeic acid absent.
            Soredia coarse and granular; cups stout; bourgeanic acid absent .... C. chlorophaea
            Soredia fine; cups thin, deep, and expanded; bourgeanic acid present .... C. conista
1. Podetia not forming cups, or podetia absent.
  10. Podetia chronically absent or less than 4 mm long.
    11. Apothecia manifest, the podetia nearly or quite sessile; squamules notably incised.
      Squamules K– (fumarprotocetraric acid) ... C. caespiticia
      Squamules K+ yellow (thamnolic acid) ... C. parasitica
    11. Apothecia rare, the podetia minute and pointed or absent; squamules various.
      12. Many squamules (2)3 mm or more long.
        Squamules K+ yellow turning red (norstictic acid) .... C. polycarpoides
        Squamules K–; norstictic acid absent .... C. squamosa
      12. All squamules less than 2 mm long.
        13. Squamules P– or P+ yellow, fumarprotocetraric acid absent .... C. macilenta var. bacillaris
        13. Squamules P+ red (fumarprotocetraric acid).

Grayanic acid present .... C. cylindrica
Grayanic acid absent .... C. ramulosa

10. Podetia manifest, 4 mm or more long.
    14. Podetia esorediate.
        15. Podetia much branched and elongated; basal squamules few or absent; apothecia absent .... C. furcata
        15. Podetia simple or only sparingly branched; basal squamules well developed; apothecia conspicuous.
            16. Apothecia red (rarely black); barbatic acid present.
                Podetia wholly corticate .... C. cristatella
                Podetia with ecorticate patches that turn brown and translucent .... C. didyma
            16. Apothecia tan or brown to nigrescent; barbatic acid absent.
                17. Podetia K+ yellow turning red (norstictic acid) ... . C. polycarpoides
                17. Podetia K− or K+ yellow; norstictic acid absent.
                    18. Thallus yellowish green; usnic acid present .... C. piedmontensis
                    18. Thallus grayish green or gray; usnic acid absent.
                        19. Apothecia tan; squamules less than 1.5 mm long .... C. peziziformis
                        19. Apothecia brown; many squamules more than 1.5 mm long.
                            Podetia UV− (fumarprotocetraric acid), smooth or sparsely squamulose .... C. sobolescens
                            Podetia UV+ bright white (squamatic acid), densely squamulose or not .. C. squamosa
    14. Podetia sorediate, at least in part.
        20. Apothecia and/or pycnidia red.
            Squamules incised, esorediate; podetia scarcely sorediate, beset with granular or isidioid squamules except in ecorticate areas that turn brown and translucent .... C. didyma
            Squamules occasionally lobed but not incised, sorediate; podetia with patches of fine soredia .... C. macilenta var. bacillaris
        20. Apothecia and pycnidia brown.
            21. Podetia both P− and K−; fumarprotocetraric acid and norstictic acid absent .... C. rei
            21. Podetia either P+ red or K+ red; either fumarprotocetraric acid or norstictic acid present.
                22. Grayanic acid present .... C. cylindrica
                22. Grayanic acid absent.
                    23. Podetia K+ yellow turning red (norstictic acid), esorediate .... C. polycarpoides
                    23. Podetia K−, norstictic acid absent, usually sorediate.
                        24. Many squamules more than 2 mm long, lobed, but not much incised; basal portions of podetia with large corticate patches.
                            Podetia mostly very slender, commonly corticate for more than 2 mm above the base .... *C. ochrochlora*
                            Podetia mostly stout, sorediate throughout, or corticate to about 2 mm above the base . ... C. coniocraea
                        24. Most of the squamules less than 2 mm long, lobed or incised, but podetia essentially decorticate throughout.
                            Squamules not much incised; podetia very elongate and tapering, some of them 1.5 cm or more long .... C. subulata
                            Squamules usually incised; podetia various, but shorter than 1.5 cm ..... C. ramulosa

Cladonia caespiticia[4] (Pers.) Flörke The substrate for this species is quite variable, though it is most often found at the bases of *Quercus velutina* or *Q. palustris* in the greater Chicago region. It is rare locally, our Cook County specimen being from a decorticate log. [fumarprotocetraric acid] Co-Horn #23

Cladonia cervicornis (Ach.) Flotow ssp. *verticillata*[1] (Hoffm.) Ahti. = *C. gracilis* var. *verticillata* of Calkins. Contemporary specimens are from weathered clayey till, often with *Danthonia spicata*. [fumarprotocetraric acid] Co-H#1278; Du-L#123

Cladonia chlorophaea[4] (Flörke *ex* Sommerf.) Sprengel = *C. pyxidata* of Calkins, in part. Note that Calkins did not mention this species and, of course, was unaware of the chemical segregates. He did, however, label some of his specimens *C. pyxidata* var. *chlorophaea* (e.g. #1831, #1832, #1839 NY). Most of the local specimens we have seen are Calkins collections from Glencoe, in Cook County; there is a modern record from a forest preserve near Wheaton in DuPage County. [fumarprotocetraric acid] Du-L#134

Cladonia coniocraea[1] (Flörke) Sprengel Specimens Calkins called *Cladonia fimbriata* (#1898 NY), *C. fimbriata* var. *tubaeformis* (#251 NY), *C. fimbriata* var. *apolepta* (#1981 NY) and *C. ochrochlora* (#1848 NY), are referable here. Though yet unknown from Lake County, this species is characteristic of corticate and decorticate logs in shaded woods, often with *C. macilenta* var. *bacillaris*, but it is occasional at the bases and along the lower trunks of trees, particularly oaks. Rare specimens are difficult to distinguish from *C. ochrochlora*, which see. [fumarprotocetraric acid] Co-Horn #25; Du-L#107; Wi-H#1270

Cladonia conista[1] A. Evans = *C. pyxidata* of Calkins, in part, and one Calkins specimen labeled *C. fimbriata* var. *simplex* (#1891, in part, NY). This is the more common of the *C. chlorophaea* segregates locally, frequent on weathered clayey till or spoil, or on weathered sandy fields, sand prairies, and black oak savannas. It is occasional at the bases of trees, particularly oaks, but there are also specimens from burnt wood, decorticate logs, and stumps. In recent years, this species has been called *C. humilis* (With.) J. R. Laundon, but, according to Purvis et al. (1992) that species containes atranorin only. [fumarprotocetraric acid, bourgeanic acid] Co-H#756; Du-L#88; La-W#12963; Wi-H#1270

Cladonia cristatella[1] Tuck. This is the common "British soldiers" lichen; Calkins (#1932 NY) considered it occasional on decaying logs and stumps. Today, it grows on just about any substrate that will support *Cladonia*, though it is most frequent on decorticate logs and old wood; it is also frequent as a terricolous species in black oak savannas and in sandy prairies. Occasionally it is found on shingled roofs, fence posts, and even on weathered cinders along railroads. [barbatic acid, didymic acid, ±usnic acid] Co-W#13873; Du-L#81; La-W#16356

Cladonia cryptochlorophaea [4] Asah. = *C. pyxidata* of Calkins in part (#1833 NY). Locally, this species grows in habitats similar to those of *C. conista*, though it is less common. A Calkins specimen from Cook County (#1891, in part, NY) was originally called *C. fimbriata* var. *simplex*. [cryptochlorophaeic acid, ±fumarprotocetraric acid, ±atranorin] Co-H#608; Du-L#185

Cladonia cylindrica [4] (A. Evans) A. Evans = *C. fimbriata* of Calkins, in part. All Chicago area material is from shaded decorticate logs and stumps. Calkins's specimen from Cook County (#1849 NY) was originally called *C. fimbriata simplex*. [grayanic acid, fumar-protocetraric acid] Co-H#1109; Du-Armstrong #677; Wi-H#1129

Cladonia didyma [4] (Fée) Vainio Rare locally, this species is confined to decorticate logs. [barbatic acid, didymic acid] Co-H#1115; Du-L#87

Cladonia fimbriata [1] (L.) Fr. This species is occasional on decorticate logs and stumps, and rare on weathered till. All of the specimens we have seen named *C. fimbriata* by Calkins are referable to some other species. [fumarprotocetraric acid] Co-W#14661; Du-L#103

Cladonia furcata [1] (Hudson) Schrader This lichen if yet unknown from Lake County. Its common habitat locally is weathered till in natural areas. Calkins noted it from "calcareous earth near Joliet and elsewhere." [fumarprotocetraric acid] Co-H#190; Du-L#187; Wi-H#851

Cladonia gracilis (L.) Willd. ssp. *turbinata* [3] (Ach.) Ahti Possibly = *C. gracilis* of Calkins, who reports it from Will County, but it is likely that his report is referable to some other species. One specimen in Calkins's bound *Lichenes Exsiccati* at ILL was named *C. gracilis* var. *verticillata*. It is referable here, but his description of var. *verticillata* in his flora is accurate; see *C. cervicornis* ssp. *verticillata*. [fumarprotocetraric acid]

Cladonia grayi [4] G. Merr. *ex* Sandst. Occasional in the area today. Calkins would have included specimens of this species with *C. pyxidata*. It grows in habitats similar to *C. conista*. [grayanic acid, ±fumarprotocetraric acid] Co-Horn #37; Du-L#179

Cladonia macilenta [1] Hoffm. var. bacillaris (Genth) Schaerer = *Cladonia macilenta* of Calkins, inasmuch as he did not recognize the variety *bacillaris*, and noted that *C. macilenta* and *C. cristatella* were easily told by their scarlet apothecia. There is one specimen (#97 NY) that he labeled *C. macilenta* that is indeed var. *bacillaris*. This species is characteristic of decorticate logs, stumps, and weathered farm wood, where it often covers large areas and sometimes, especially on corticate logs, grows with mosses such as *Platygyrium repens* and *Entodon seductrix*. Lichen associates often include *Cladonia coniocraea*, *C. cylindrica*, and *C. cristatella*. There are also specimens from the bases of *Pinus*, *Quercus velutina*, and *Prunus serotina*. [barbatic acid] Co-Horn #24; Du-L#196; Wi-H#1099

Cladonia multiformis [4] G. Merr. Our only record of this northern species is from weathered till in DuPage County, where it grows with *C. peziziformis*. [fumarprotocetraric acid] Du-L#84

Cladonia ochrochlora [5] Flörke There is some controversy over the taxonomy of this species and *C. coniocraea*. The only specimen we have seen of this species locally is one from Cook County (Calkins #1897 NY) that Calkins labeled *C. fimbriata* var. *coniocraea*, collected on an exposed cedar root near Glencoe. [fumarprotocetraric acid]

Cladonia parasitica [2] (Hoffm.) Hoffm. = *C. delicata* of Calkins (#1915 NY), who noted that was "found near Elgin on old stumps, near Lemont, and elsewhere," at least in Cook County. [thamnolic acid, decarboxythamnolic acid]

Cladonia peziziformis [1] (With.) J. R. Laundon = *C. mitrula* of Calkins (#1857 NY). With the possible exception of *C. polycarpoides*, this species is the weediest of our *Cladoniae*. It is characteristic of weathered clay tills and bluffs, often along worn paths and compacted soils, particularly where *Danthonia spicata* grows. It also grows in sandy prairies and savannas, and we even have a specimen from an old rag. [fumarprotocetraric acid] Co-W#13871; Du-L#108; La-H#214; Wi-W#12431

Cladonia piedmontensis [4] G. Merr. A rare species, our few specimens are from weathered clayey till in Cook and DuPage counties. [usnic acid] Co-Horn #36; Du-L#183

Cladonia pleurota [4] (Flörke) Schaerer A rare species, our few specimens are from weathered clayey till. [usnic acid, zeorin] Co-H#610; Du-L#125

Cladonia polycarpoides [4] Nyl. Yet unknown from northern Will County, and though not quite as "weedy" as *C. peziziformis* or *C. rei*, *C. polycarpoides* is widespread and locally frequent, and will grow here on almost any terricolous substrate suitable for lichens. Given its contemporary abundance, it is curious that none of the species listed by Calkins appear able to include it within even broad interpretations of their descriptions, nor have we discovered any Calkins specimens. [norstictic acid] Co-W#13872; Du-L#131; La-W#15167

Cladonia pyxidata[5] (L.) Hoffm. This species is very rare here now, though Calkins regarded it as "formerly abundant on earth along the lake shore in woods, [and] common elsewhere in our territory, on earth and rocks." It is probable, however, that this description applies most securely to members of the *C. chlorophaea* complex, since all of the Calkins specimens we have seen that he labeled *C. pyxidata* are in that complex. The only authentic specimen we have seen is one collected by Moffatt (*s.n.*, 4 September 1897, ILL) from Lake County at "Miller Woods," where it no doubt grew in sandy black oak savanna. Without seeing some annotated material by Calkins, we cannot speculate as to what he may been referring with the name *C. pyxidata* var. *pocillum*. [fumarprotocetraric acid]

Cladonia ramulosa[4] (With.) J. R. Laundon This species is characteristic locally on corticate and decorticate fallen logs in partly shaded areas, where it often grows with *C. macilenta* var. *bacillaris*. It also grows at the bases of trees in oak woodlands. There is a common squamulose, sorediate, epodetiate, fumarprotocetraric acid-producing species that occurs at the bases of trees throughout the Midwest; it may be referable here. Calkins may well have included it simply with those lichens he was calling *C. fimbriata*. [fumarprotocetraric acid] Co-W#14146; Du-W#12404; La-W#16677; Wi-W#13943

Cladonia rei[4] Schaerer This species occupies a wide variety of substrates, in waste ground and in natural areas. It grows on such things as charcoal, burnt wood, corticate and decorticate logs, tree bases, humus, weathered till, sand, and spoil banks. Skorepa's (1970) report of *C. decorticata*. The specimen of Skorepa and Vermoch (#5225 SIU) is referable here. It is probable that Calkins was including this lichen with those that he called *C. fimbriata*. [homosekikaic acid] Co-W#13874; Du-L#218; La-W#15166; Wi-H#1157

Cladonia squamosa[3] Hoffm. Calkins reported it from "earth and rotten logs in Will County and the western part of Cook." Although we have records of this species from as nearby as Ogle County, Illinois, we must remain circumspect about the accuracy of the report until a voucher specimen is discovered. [squamatic acid]

Cladonia subulata[4] (L.) F. H. Wigg. Possibly some of those specimens Calkins called *C. fimbriata* var. *tubaeformis* would be referable here. Our few records for this species include a specimen (Clinton *s.n.*, 1890, ILL) collected in Cook County and one collected recently in Cook County at Spring Lake Nature Preserve on a decorticate log. [fumarprotocetraric acid] Co-H#1237

COLLEMA F. H. Wigg.

Thallus isidiate or warty-papillose, corticolous.
- Thallus minute, to 0.5 cm across, subcrustose, the lobes not warty; spores 2–5 septate, 1–2 muriform, 16–30 μ long, about half as wide . . . . . C. fragrans
- Thallus larger, clearly foliose, the lobes flat to much thickened and warty; spores not muriform.
  - Lobes much thickened and warty-isidiate; apothecia abundant; spores 2(4)-celled, 15–24 μ long . . . . . C. conglomeratum
  - Lobes flat, finely isidiate; apothecia rare; spores 3–6 celled, 25–80 μ long . . . . . C. subflaccidum

Thallus without isidia or warty papules, saxicolous or terricolous.
- Thallus saxicolous, gray, finely wrinkled; apothecia absent or rare; spores 3–4 septate, 1-muriform, elliptic, 26–36 μ long . C. auriforme
- Thallus terricolous, corticolous, or rarely saxicolous, dark olivaceous to brownish black, not finely wrinkled; apothecia common; spores various.
  - Spores 4 per ascus, 3–5 septate, 1–2 muriform; lichen of leached clayey soils . . . . . C. limosum
  - Spores 8 per ascus, 3-septate, 0–1 muriform; lichens of carbonate-rich soils.
    - Apothecial margin coarsely crenulate; spores more than 11 μ broad . . . . . C. bachmanianum
    - Apothecial margin more or less even; spores less than 11 μ broad . . . . . C. tenax

Collema auriforme[3] (With.) Coppins & J. R. Laundon = *C. granosum* of Calkins, who reported it from mossy rocks near the Des Plaines River in Will County.

Collema bachmanianum[4] (Fink) Degel. Known locally only from a shaded dolomite ledge at Waterfall Glen Forest Preserve and from a shaded dolomite wall at Camp Sagawau. Wilhelm and Lampa (1987) reported the DuPage County specimen as *Heppia lutosa*. Co-H#603; Du-W#12401

Collema conglomeratum[3] Hoffm. = *C. pycnocarpum* of Calkins, who noted it from "elms and shrubs in Will County," and regarded it as rare.

Collema fragrans[3] (Sm.) Ach. = *C. microphyllum* of Calkins, who recorded it from elm bark in Cook and Will counties, and regarded it as rare.

Collema limosum[3] (Ach.) Ach. Calkins reported this species as rare on clay soil in Will County.

Collema subflaccidum[3] Degel. Calkins reported *C. flaccidum* (Ach.) Ach., a saxicolous species, from oaks and elms in Cook and Will counties, so it is probable that *C. subflaccidum* is the species he had. He did state, however, that it could grow on rocks as well, but was ambiguous as to whether this was the case in the Chicago area. In any case, he regarded this lichen as rare locally. We have seen neither species in northern Illinois.

Collema tenax[3] (Sw.) Ach. The only contemporary record for this species near the Chicago area is from a dolomitic canyon at Kankakee River State Park. Calkins found it on "calcareous soil" near Joliet.

CONOTREMA Tuck.

Conotrema urceolatum[3] (Ach.) Tuck. Calkins stated that this species was found on maples and poplars in Cook and Will counties. Farther east, this species forms characteristic white patches on *Acer saccharum* in old growth forests.

CYPHELIUM Ach.

Cyphelium tigillare[4] (Ach.) Ach. Evidently unknown to Calkins, this species is occasional on old fence posts and rails, but we have one specimen from the bark of *Prunus serotina* and another from *Gleditsia triacanthos*. [rhizocarpic acid, epanorin, + two unknowns] Co-H#710; Du-W#14159; La-H#1494; Wi-H#1135

DENDRISCOCAULON Nyl.

Dendriscocaulon umhausense[5] (Auersw.) Degel. This obscure species was unknown from the Chicago area until discovered recently at the edge of a specimen of *Peltigera canina* (Calkins *s.n.* F), which was collected on mosses at Glencoe, Cook County.

DERMATOCARPON Eschw.

Dermatocarpon miniatum[1] (L.) W. Mann = *Endocarpon miniatum*, including *E. m.* var. *complicatum* and *E. m.* var. *muhlenbergii* of Calkins. This species is occasional on exposed or shaded basalt or dolomite, often in canyons or on rocky cobbles in woodland streams. Co-M#33; Du-W#12411; Wi-H#1146

DIMELAENA Norman

Dimelaena oreina[4] (Ach.) Norman Our only local record for this species is from a granite boulder near Northbrook, in Cook County. Co-H#1301

DIMERELLA Trevisan

Dimerella pineti[4] (Ach.) Vězda This is a rare species in Illinois; our only local record is from a shaded decorticate log at the Danada Forest Preserve in DuPage County. Du-L#159

DIPLOSCHISTES Norman

Diploschistes muscorum (Scop.) R. Sant. ssp. *muscorum*[3] = *Urceolaria scruposa* of Calkins, who reported it from "calcareous earth in Will County and on dead cedars along the banks of the Illinois; rare." Though we have not seen it locally, this species is frequent on mosses and lichens over sand at nearby Illinois Beach State Park, Lake County, Illinois. [lecanoric acid, diploschistesic acid]

ENDOCARPON Hedwig

Endocarpon pusillum[1] Hedwig As it was 100 years ago (#29 NY), this is a ubiquitous species throughout the area on weathered concrete, flagstone, and other rocks, now growing regularly with *Caloplaca feracissima*, *Lecanora dispersa*, and *Verrucaria calkinsiana*; there are also rare occurances on old wood, cloth, and even on Styrofoam. Co-W#13610; Du-W#14358; La-H#812; Wi-W#12652

EOPYRENULA R. C. Harris

Eopyrenula intermedia[5] Coppins Our only local record for this species is a Cook County Calkins specimen (#216 F) that he had labeled *Pyrenula gemmata*; it was collected on maple. See also *Anisomeridium biforme*.

EVERNIA Ach.

Evernia mesomorpha[4] Nyl. Most of our material appears to be adventive in that it is found on planted trees or fence rails, and usually is represented only by tiny thalli. Hale (1979) excluded it from the region. [divaricatic acid, usnic acid] Co-Horn *s.n.* 1990; Du-L#167; Wi-H#1253

FLAVOPARMELIA Hale

Flavoparmelia caperata[1] (L.) Hale = *Parmelia caperata* of Calkins. (#6003 CHAS; *s.n.* F). Although this species is nowhere near as common as it appears to have been in Calkins's day, it grows on a wide variety of corticolous substrates, including fallen logs and old stumps. It is most frequent locally on *Quercus alba* and *Q. velutina*, probably because these species are more likely to be found in open woods. As woods close in from fire suppression, most of our regional lichens disappear, so it is now rare on *Q. rubra*, *Tilia americana*, and *Fraxinus americana*. We also have specimens from *Carya ovata*, *C. cordiformis*, *Q. palustris*, *Q. macrocarpa*, and *Populus deltoides*. [protocetraric acid, usnic acid, caperatic acid] Co-Horn #30a; Du-W#12405

FLAVOPUNCTELIA (Krog) Hale

Thallus with white pores or maculae on the upper cortex	F. flaventior
Thallus without white pores	F. soredica

Flavopunctelia flaventior[4] (Stirton) Hale This is a northern species that may have extended its range southward into the Midwest with the immense increase in corticolous substrate that has occurred since settlement. It is difficult to describe a habitat for it other than to note that it grows on trees in parks and pastures throughout the area. We have specimens fairly evenly distributed among the following trees: *Acer negundo*, *Fraxinus* spp., *Juglans nigra*, *Populus deltoides*, *Quercus macrocarpa*, and *Salix* spp. Wetmore (1986) cites it from

Lake County. [lecanoric acid, usnic acid] Co-W#15667; Du-W#12423; La-H#205a; Wi-H#1335

Flavopunctelia soredica [4] (Nyl.) Hale Also unknown to Calkins, this species appears to have an autecology similar to that of *F. flaventior*, although it is less frequent. It is more or less evenly distributed among the following substrates: *Carya cordiformis*, *Fraxinus pennsylvanica* var. *subintegerrima*, *Quercus macrocarpa*, *Q. rubra*, *Q. velutina*, and *Salix nigra*. [lecanoric acid, usnic acid] Co-Horn #30; Du-L#21a

GRAPHIS Adans.

Graphis scripta [1] (L.) Ach. According to Calkins, this species was common in the region (#165, #168, #1764 NY; #6535, #6546 CHAS; #111 F), but it is now only occasional on the smooth plates of *Quercus* species in the red oak group, and on the smooth barks of hickories, maples, lindens, and hackberries. Calkins's report of *Graphis (Phaeographis) dendritica* (#147 F) is referable here, inasmuch as specimens of his at the Field Museum that he called *G. dendritica* are actually *G. scripta*. There is a *Phaeographis* specimen of Calkins's from Cook County at the New York Botanical Garden, but the associated species, *Graphina abaphoides*, on the same bark fragment suggests strongly that the specimen came from Florida. Wi-H#1126

HEPPIA Nägeli

Heppia adglutinata [1] (Kremp.) A. Massal. = *H. despreauxii* of Calkins. Our specimens are from dry gravelly hill prairies, where it grows on thin soil among carbonate pebbles, where vascular vegetation is sparse. Consistent lichen associates are *Catapyrenium squamulosum* and *Psora decipiens*. Vascular vegetation is characterized by *Andropogon gerardii*, *A. scoparius*, *Arenaria stricta*, *Artemisia caudata*, *Bouteloua curtipendula*, *Comandra umbellata*, *Euphorbia corollata*, *Liatris cylindracea*, *Lithospermum incisum*, *Petalostemum purpureum*, *Scutellaria parvula* var. *leonardii*, *Silphium terebinthinaceum*, and *Solidago nemoralis*. It was collected in Will County, in a gladelike prairie at Joliet Junior College, with *Bacidia bagliettoana*, *Placynthium nigrum*, and *Catapyrenium squamulosum*. This species was long known as *Heppia lutosa*, but Hensson (1994) restricts that species to farther west; it has I+ deep blue asci, while those of *H. adglutinata* are I–.

HETERODERMIA Trevisan

Heterodermia speciosa [3] (Wulfen) Trevisan = *Physcia speciosa* of Calkins, who reported that it occurred "at Riverside on oaks; on hickories, near Elgin and other localities." We have seen living specimens as nearby as LaFox, in Kane County, Illinois. [atranorin, zeorin]

HYPERPHYSCIA Müll. Arg.

Thallus sorediate; lobes somewhat discrete	H. adglutinata
Thallus esorediate; lobes confluent	H. syncolla

Hyperphyscia adglutinata [1] (Flörke) H. Mayrh. & Poelt = *Physcia adglutinata* of Calkins. Small and inconspicuous, this species is frequent on roadside elms and ashes, and on planted trees in parks and landscape areas throughout the area. Co-W#17524; La-H#1318; Wi-H#1246

Hyperphyscia syncolla [2] (Tuck. *ex* Nyl.) Kalb Our only local records for this species are from two Calkins specimens (#18, #100 NY), which he had labeled *Physcia stellaris* and *P. adglutinata*, respectively.

HYPOGYMNIA (Nyl.) Nyl.

Hypogymnia physodes [1] (L.) Nyl. = *Parmelia physodes* of Calkins. Rare; our few specimens of this common northern species are represented by small thalli about 2 cm in diameter or less. The DuPage County specimens are both from "bark" at the West DuPage Woods Forest Preserve. Calkins (*s.n.*, Cook Co., CHAS) reported that it grew on "oaks in Cook and DuPage counties, and elsewhere." [atranorin, physodic acid, physodalic acid, protocetraric acid] Du-L#53

IMSHAUGIA S. F. Meyer

Imshaugia aleurites [3] (Ach.) S. F. Meyer = *Cetraria aleurites* of Calkins, who reported it from "old rails near Lemont and Joliet," evidently in Cook and Will counties. We are inclined to suspect the accuracy of this report, until a specimen is located. [thamnolic acid, atranorin]

JULELLA Fabre

Julella sericea [1] (A. Massal.) Coppins Most of the specimens that Calkins labeled either *Pyrenula thelaena* (#213, #1625 NY) or *Sagedia oxyspora* (#25, #26, #198 NY; #6487 CHAS), both of which he listed as growing on birches at Glencoe, are actually *Julella sericea*. Our contemporary records are from *Acer saccharum*, *Celtis occidentalis*, and *Quercus alba*. This species and *Anisomeridium nyssigenum* are quite common locally on trees in savannas and closed woodlands. Another specimen (*s.n.*, n.d., CHAS) that Calkins labeled *Pyrenula thelaena* is a nonlichenized pyrenocarp. Co-H#1231; Du-W#19995; Wi-H#1238

KIRSCHSTEINIOTHELIA D. Hawksw.

Kirschsteiniothelia aethiops [2] (Berk. & Curtis) D. Hawksw. A Cook County specimen (#162 F) was identified by Calkins as *Pyrenula punctiformis*. This specimen has brown, 1-septate spores 21–34 μ long constricted at the septum and with the cells mostly notably unequal in the larger spores; the interthecial hyphae are massed and intertwined, but not deliquescent; spores are arranged more or less biseriately in the asci. From what we can tell, this more or less fits the description of *Microthelia micula* Körb., as per Harris (1973), which name Egan (1987) refers here. An "Illinois" specimen (*s.n.*, n.d., CHAS) that Calkins labeled *Pyrenula punctiformis* is a nonlichenized pyrenocarp with tiny, empty perithecia. Yet another nonlichenized fungus (#6562 CHAS), with 1-septate spores 17–19 μ long, was labeled *Pyrenula gemmata* by Calkins. We do not actually think that these brown-spored specimens are *Kirschsteiniothelia*, but the oversized spores take it out of any *Mycomicrothelia* described by Hawksworth (1985). Probably we should just leave these specimens out, since they are not even lichenized, as far as we can tell, but we are including them here under *K. aethiops* as a kind of "place holder" for the 1-septate, brown-spored, cylindrical-celled pyrenocarps with 8 spores per ascus and persistent pseudoparaphyses.

LECANIA A. Massal.

Lecania perproxima [1] (Nyl.) Zahlbr. = *Lecanora perproxima* of Calkins. This species is occasional in the lower Des Plaines River valley on dolomitic outcrops, and even on weathered concrete. Calkins stated that it grew on "calcareous rocks at Joliet and elsewhere." His report of the European *Lecania erysibe*, as *Lecanora erysibe*, is referable here; *Lecania erysibe* has spores no longer than 15 μ, while those of *L. perproxima* are longer. Wi-H#1197

LECANORA Ach.

Thallus or apothecia saxicolous.
- Thallus placoid, the margins distinctly lobed .... L. muralis
- Thallus granular or absent, the margins not distinctly lobed.
  - Apothecia heavily white pruinose; discs C+ yellowish red .... L. rupicola
  - Apothecia essentially epruinose; discs C− .... L. dispersa

Thallus or apothecia corticolous, or apothecia absent.
- Usnic or isousnic acid present; thallus with yellowish tints.
  - Apothecial rim well developed.
    - Apothecial rim scant, often disappearing, or apothecia absent . ... L. symmicta
    - Apothecial rims sorediate or granular; usnic acid . L. strobilina
    - Apothecial rims smooth; isousnic acid .... L. saligna
- Usnic and isousnic acids absent; thallus without distinctly yellowish tints.
  - Apothecia heavily pruinose, whitish, yellowish, or buff to light brown or roseate.
    - Apothecia darker, flesh to brown; norstictic acid and atranorin absent .... L. hagenii
    - Apothecia whitish to buff or roseate; norstictic acid and/or atranorin present. .... L. caesiorubella ssp. caesiorubella
  - Apothecia epruinose or only slightly frosted, buff, grayish, or reddish brown to nigrescent.
    - Atranorin present; thallus and rims K+ yellow . L. hybocarpa
    - Atranorin absent; thallus and rims K−.
      - Spores 12–32 per ascus .... L. sambuci
      - Spores 8 per ascus.
        - Fumarprotocetraric acid present .... L. conizaeoides
        - Fumarprotocetraric acid absent .... L. umbrina

Lecanora caesiorubella Ach. ssp. *caesiorubella* [5] A Calkins specimen of this species is cited from Illinois (Imshaug and Brodo 1966), so it likely was collected in or near the Chicago region. It is probable that Calkins's report of *Lecanora pallida* from Will County is referable here. [atranorin, physodalic and virensic acids]

Lecanora conizaeoides [4] Nyl. *ex* Crombie This species is almost certainly adventive from Europe. Our only record is from bark of *Pseudolarix kaempferi* at the Morton Arboretum, in DuPage County. [fumarprotocetraric acid] Du-W#14602

Lecanora dispersa [4] (Pers.) Sommerf. Possibly including *Lecanora privigna*, in part, of Calkins. *Lecanora dispersa* is the common associate of *Endocarpon pusillum* and *Caloplaca feracissima* on limestone, flagstone, and weathered concrete. Given its contemporary ubiquity and morphological distinctness, it is of some interest to note that Calkins did not record it in 1896, nor have we seen any local specimens referable to *L. dispersa*. See also comments under *L. umbrina* and *L. hagenii*. [β-sitosterol] Co-W#13608; Du-W#13325; La-W#13771; Wi-H#1158

Lecanora hagenii [1] (Ach.) Ach. Calkins reported this species from fence rails and calcareous rocks near Lemont, in Cook County, but it is likely that he was referring to some other species, such as *Lecanora dispersa*, to which his saxicolous specimen (#6103 CHAS) from LaSalle County, Illinois, is referable. Contemporary Lake County specimens are from a black oak in a savanna and from a planted specimen of *Ulmus pumila* in Highland. La-W#20813

Lecanora hybocarpa [2] (Tuck.) Brodo Including *L. subfusca* (#61 NY), and probably *L. s.* var. *allophana*, *L. s.* var. *argentata*, and *L. s.* var. *distans* of Calkins. Brodo (1984) mapped this species from what appears to be Cook County. Although it now is a very rare lichen in the general region on oaks, hickories, and ashes, Calkins indicated that it was a common corticolous species. [atranorin, ±roccellic acid]

Lecanora muralis [4] (Schreber) Rabenh. This species is characteristic of dolomitic exposures or outcrops and erratics in pastures and prairies; it is occasional on granitic and basaltic boulders and on weathered concrete and flagstone. Though yet unknown from Lake County, it evidently is a species native to the area, so it is interesting that Calkins did not report it. All of our material lacks gyrophoric acid. The nearest record of a thallus with a C+ cortex is LaSalle County, Illinois (W#16690). [usnic acid, murolic acid, psoromic acid, atranorin, zeorin, ±fumarprotocetraric acid] Co-H#438; Du-W#19635; Wi-W#12430

Lecanora rupicola [4] (L.) Zahlbr. Rare; one of our specimens of this species is from a shaded cliff face along the canyon at Camp Sagawau, east of Lemont, in Cook County; the other grows with *Caloplaca citrina* on shaded dolomite near Joliet in Will County. [traces of atranorin, chloratranorin, sordidone, lecanoric, norstictic, roccellic, thiophanic, and variolaric acids] Co-M#27; Wi-H#1247

Lecanora saligna [4] (Schrader) Zahlbr. Evidently unknown to Calkins, this species is now frequent throughout the area on weathered lignum. Wetmore's (1986) specimen from Lake County, Indiana, is from *Quercus rubra*. Skorepa's (1970) report of *L. symmicta*, which see, from Will County is referable here. [isousnic acid] Co-W#14145; Du-W#14356; Wi-H#1096

Lecanora sambuci [3] (Pers.) Nyl. = *L. hageni* var. *sambuci* of Calkins, who listed this species as rare on elms and poplars in Will County.

Lecanora strobilina [4] (Sprengel) Kieffer Not uncommon just outside the Chicago region on wooden fence rails and open-grown trees, it is rare locally, and evidently was unknown to Calkins. Our only local specimen is from a planted tree of *Gleditsia triacanthos*. [usnic acid, ± zeorin] Co-H#1228

Lecanora symmicta [1] (Ach.) Ach. = *L. varia* var. *symmicta* of Calkins. It may also include Calkins's *L. varia*, from Cook County, since we have yet to see that species in the Midwest. Calkins reported that there were "numerous varieties" in the region; it contains usnic acid ± psoromic or fumarprotocetraric acids. Most early Illinois specimens called *L. varia* are referable to *L. strobilina*, but that species is rare this far north in the state, and Calkins's description of the apothecial margin does not sound right for *L. strobilina*. The specimen (SIU) upon which the report of *Lecanora symmicta* from Will County (Skorepa 1970) is based is referable to *L. saligna*. According to Richard Harris (pers. comm.), *L. symmicta* is confined to the coasts and has a thallus reaction of C+ orange because of the presence of xanthones. Our entity is fairly frequent on a wide variety of corticolous and lignicolous substrates, particularly in disturbed or landscaped areas. [usnic acid, xanthone, zeorin, ±psoromic acid, ±fumarprotocetraric acid] Co-H#701; Du-W#14137; La-W#16672

Lecanora umbrina [4] (Ach.) A. Massal. Calkins appears to have lumped this species with *L. hagenii*. It is known locally only from Cook County. Our contemporary records, all from Cook County, may not be *L. umbrina*, but rather may represent lignicolous forms of *L. dispersa*. All of them are from weathered lignum, and the apothecia are quite tightly aggregated, unlike *L. dispersa*, in which the apothecia commonly are loosely aggregated to dispersed. Each of our specimens has an obscure but seemingly different chemistry in TLC. Co-H#799

LECIDEA Ach.

Lecidea sp. #4 [4] *sensu* Harris (1973) We have two specimens of this undescribed species from the Morton Arboretum, DuPage County, from *Quercus alba* and *Q. rubra*. All of the specimens we have seen are from closed forest. [usnic acid, zeorin] Du-W#16970

LEPRARIA Ach.

Thallus with stictic acid, thick, typically pale greenish gray .... L. lobificans

Thallus without stictic acid, thick or thin, but not usually pale greenish gray.

- Atranorin present; thallus typically thin, bluish gray .... L. sp. #1
- Atranorin absent; thallus thick, bluish gray or not.
  - Divaricatic acid present; thallus bluish gray .... L. incana
  - Divaricatic acid absent; thallus greenish gray .... L. lesdainii

Lepraria incana [4] (L.) Ach. Our only record for this species is from the base of a bur oak at Bluff Springs Fen, in Cook County. [divaricatic acid, ±zeorin, ±usnic acid, ±atranorin] Du-W#15666

Lepraria lesdainii [4] (Hue) R. C. Harris Our specimens are from shaded dolomitic cliff faces, as are all of our Midwestern collections. [terpene with RF value just above zeorin] Co-M#34; Du-W#14639

Lepraria lobificans [4] Nyl. This is the most common *Lepraria* in the flora. Although Calkins collected it (#237, #1700 NY) in Cook County and labeled the specimens *Pannaria lanuginosa*, he did not include it in his flora. Half of our contemporary material is from the bases of *Quercus* in partly shaded to fully shaded areas. Other local corticolous substrates include *Tilia americana* and *Acer saccharinum*. It also grows on shaded dolomite and on cliff faces, as well as on fallen logs, on soil, or among mosses in moist humid areas. [stictic acid, constictic acid, zeorin, atranorin] Co-M#32; Du-W#16500; Wi-W#13944

Lepraria sp. #1 [4] *sensu* MOR *L. incana* of McKnight et al. (1987). Nearly all of our specimens are from *Quercus*, and half of those are from *Q. velutina* in the black oak savannas of northwest Indiana. This is a fairly frequent species in the Midwest, but it has yet to be described. [zeorin, atranorin] Co-H#1235; Du-W#19629

LEPTOGIUM (Ach.) Gray

Lower surface of lobes whitish tomentose .... L. burnetiae
Lower surface without tomentum.
Thallus lobes narrow, the margins finely dissected into dense isidioid or coralloid branches; lobe surfaces longitudinally wrinkled .... L. lichenoides
Thallus without coralloid branches; lobe surfaces smooth or wrinkled.
Thallus without isidia .... L. corticola
Thallus isidiate.
Upper surface of thallus strongly wrinkled, the lobes becoming fused .... L. milligranum
Upper surface of thallus smooth, the lobes distinct.
Thallus olivaceous to blackish brown; typically of carbonate rock; apothecia frequently present .... L. dactylinum
Thallus slate gray; of various substrates; apothecia very rare .... L. cyanescens

Leptogium burnetiae[3] C. W. Dodge Presumably = *L. myochroum* of Calkins, a name that currently is synonymous with *L. saturninum* (Dickson) Nyl., which grows farther north. Calkins reported it from Will County, noting that the habitat was the same as for *L. millegranum*, which see; but also see comments under *L. dactylinum*.

Leptogium corticola[3] (Taylor) Tuck. = *L. pulchellum* of Calkins, who reported that it grew on calcareous rocks in Will County and on elms in Cook County, and noted that it was "better developed" farther south in Illinois.

Leptogium cyanescens[4] (Rabenh.) Körber Evidently unknown to Calkins, this species is rare today; all of our specimens are from shaded dolomitic cliffs and from shaded boulders in streams, although further south this species is frequently corticolous. Co-H#604; Du-W#13939; Wi-H#1187

Leptogium dactylinum[4] Tuck. There is a Calkins specimen at ILL (#175) from "Illinois" that he called *L. myochroum*, but it looks to us like *L. dactylinum*. Our specimens are from shaded dolomitic boulders and cliffs. Du-W#12398; Wi-H#1186

Leptogium lichenoides[3] (L.) Zahlbr. = *L. lacerum* of Calkins, who reported it from elms in Cook and Will counties. Elsewhere in the Midwest, this species typically occurs on mossy carbonate rocks, which casts considerable doubt on the accuracy of the report.

Leptogium milligranum[3] Sierk We are referring Calkins's report of *L. chloromelum* here inasmuch as *L. chloromelum* (Sw. *ex* Ach.) Nyl. is now considered to be confined to the outer coastal plain of the southeastern United States. His mention of apothecia is disturbing, however, inasmuch as fruiting structures are rare on *L. milligranum*. Calkins reported his plant from Cook and Will counties, and described it as follows: "Thallus small to large; orbiculate, rigid; plumbeo-virescent, lobate, plicate, rugose; apothecia medium size, lecanorine, plane, rufous, the thalline margin granulate. Spores ovoid . On elms . . . The varieties are found further south."

LEPTORHAPHIS Körber

Leptorhaphis atomaria[4] (Ach.) Szat. Our only record for this species must be considered adventive, inasmuch as it is from a planted specimen of *Populus maximowiczii* at the Morton Arboretum. Du-W#14607

LICHENOTHELIA D. Hawksw.

Lichenothelia sp.[4] Our only collections of this genus are from exposed granitic boulders in Cook County, but it is the common sterile (with us) thin black crust seen on HCl– boulders throughout our area. *Lichenothelia* is a poorly understood genus. Some have questioned its standing as a lichen, though its areolate thallus is clearly evocative of a lichen. The thallus is composed of compacted, pseudoparenchymatous brown cells 5–9 μ in diameter. Locally we have seen only green algae associated with it. Hawksworth (1981) discusses two species: *L. metzleri* (Lahm) D. Hawksw., with mainly 1-septate spores 21–24 μ long and 9–11 μ wide, and *L. scopularia* (Nyl.) D. Hawksw., with mainly 3-septate spores 14–18 μ long and mostly less than 10 μ wide. Co-W#14138; Wi-H#1128

LICHNINELLA Nyl.

Lichinella nigritella[4] (Lettau) Moreno & Egea Our only specimen is from a shaded, argillaceous, silty dolomitic bluff south of Darrien. Du-W#12397

MELANELIA Essl.

Melanelia subaurifera[4] (Nyl.) Essl. Evidently unknown to Calkins, this species is encountered rarely, mostly on oaks and hickories. [lecanoric acid, subauriferin] Co-Horn #31; Du-L#200; La-H#1496

MICAREA Fr.

Micarea prasina[4] Fr. Our only local collection for this inconspicuous species is from a moist, shaded, decorticate log at the Morton Arboretum in DuPage County, but it occurs occasionally throughout our area on moist shaded logs and tree bases. Though unknown to Calkins, this lichen may have been overlooked, as apothecia are commonly absent. Du-W#22723

MYELOCHROA (Asah.) Elix & Hale

Thallus sorediate; apothecia very rare .... M. aurulenta
Thallus esorediate; apothecia common .... M. galbina

Myelochroa aurulenta[4] (Tuck.) Elix & Hale = *Parmelina aurulenta* (Tuck.) Hale. Occasional on a variety of open-grown trees or the upper trunks of forest-grown trees; we also have a specimen from wooden roof shingles.

This species evidently was unknown to Calkins, so it must have been rare or absent in the Chicago area a century ago. [atranorin, ±zeorin] Co-W#15663; Du-W#12409; Wi-H#1312

Myelochroa galbina [2] (Ach.) Elix & Hale = *Parmelia tiliacea* and *P. t.* var. *sulphurosa* of Calkins, who reported it from Cook County. Given its contemporary rareness, one would be tempted to speculate that Calkins's report may be referable to *Myelochroa aurulenta*, which was not treated by Calkins, but all of his early specimens labeled *P. tiliacea* (#22 NY) or the var. *sulphurosa* do indeed turn out to be *M. galbina*, and several of these are labeled from Cook County. His text, in fact, implied that apothecia were present. We have seen no contemporary specimens farther north in Illinois than Warren or Vermilion counties. [galbinic acid, atranorin, zeorin]

NAETROCYMBE Körber

Naetrocymbe punctiformis [5] (Pers.) R. C. Harris The only specimen we have seen (Calkins #211 NY, det. by R. C. Harris) was originally labeled *Pyrenula analepta*, from Elgin, Illinois, where it was collected "on shrubs," but not published in Calkins's flora.

OPEGRAPHA Ach.

Thallus thin to evanescent, smooth; spores 3-septate . . . . O. atra
Thallus thin to obscurely chinky or pulverulent; spores 4–15 septate.
  Spores more than 7-septate, the larger more than 40 μ long . . . . O. viridis
  Spores 4–6 septate, less than 40 μ long . . . . O. varia

Opegrapha atra [1] Pers. According to Calkins, this species was once found "throughout our territory on oaks, hickories, cherries . . .," but now it is now quite rare. One of the specimens that Calkins labeled *O. atra* (#145 NY) is referable to *O. varia;* another (#6509 CHAS) is a nonlichenized lyrellate fungus with brownish muriform spores, which is most likely to be *Hysterium pulicare* Pers. Nevertheless, we have two contemporary specimens from Cook County and two from Will County, all of them from *Ulmus americana*. Co-H#249; Wi-H#122

Opegrapha varia [1] Pers. Calkins reported it from "various trees" in Cook and Will counties. We have recorded two contemporary specimens, one on *Populus deltoides*, the other on punky lignum. See also comments under *O. atra*. Co-H#819; Du-Johnson #195

Opegrapha viridis [4] (Pers. *ex* Ach.) Behlen & Desberger The only Chicago area record for this species was collected on *Ulmus americana* near Darrien. *O. viridis* has a distinctive K+ green exciple. Du-H#234

PARMELIA Ach.

Thallus isidiate . . . . P. squarrosa
Thallus sorediate . . . . P. sulcata

Parmelia squarrosa [1] Hale = *Parmelia saxatilis* of Calkins, who noted that it grew on trees in Cook County near Elgin and on "recent sandstones and boulders at Lemont," but see comments under *P. sulcata*. Thomson (1984) mapped *P. saxatilis* from as far south as Milwaukee, Wisconsin; at the same time he restricts *P. squarrosa* to northern Wisconsin and northern Michigan, but see Hale (1979), who maps them oppositely. Our only modern record is from bark at Elson's Hill Forest Preserve. One Calkins specimen (#6001 CHAS) labeled *Parmelia saxatilis* consists of complete thalli of *P. squarrosa*, *P. sulcata*, and *Punctelia rudecta*. [salazinic acid, atranorin] Du-L#16b

Parmelia sulcata [1] Taylor = *Parmelia saxatilis* var. *sulcata* of Calkins. This is a relatively common species, found on a variety of corticolous substrates, including cultivated trees in suburbs. In 1991 at the Morton Arboretum, in DuPage County, a blue-gray gnatcatcher built its nest in *Syringa reticulata* exclusively of *Parmelia sulcata*. *Punctelia rudecta* is a similar foliose species common at the arboretum, but it is found low on the trunks of large oaks where gnatcatchers are seldom seen. *Parmelia sulcata* grows more often on the upper surfaces of branches where gnatcatchers are more likely to forage. There are Calkins specimens from Cook County (#325 ILL; *s.n.* F; #502 NY) originally called *Parmelia saxatilis* that are actually *P. sulcata*. [salazinic acid, atranorin] Co-M#38; Du-W#12406; La-W#14974; Wi-M#7

PARMOTREMA A. Massal.

Thallus sorediate.
  Salazinic acid present; lower cortex brown to the margin . . . . P. margaritatum
  Salazinic acid absent; lower cortex white near the margin . . . . P. hypotropum
Thallus esorediate.
  Thallus isidiate . . . . P. crinitum
  Thallus without isidia . . . . P. perforatum

Parmotrema crinitum [3] (Ach.) Choisy = *Parmelia crinita* of Calkins. Most early reports of this species from Illinois are referable either to *Rimelia reticulata* or to *R. cetrata* (Ach.) Hale & Fletcher, but Calkins described isidia on the Chicago region specimens (none of which we have seen). He reported this lichen from oaks in Hanover Township and on a detached rock near Lemont, Cook County. See also comments below under *Parmotrema margaritatum*. [stictic acid, atranorin]

Parmotrema hypotropum [4] (Nyl.) Hale More common farther south, it is rare locally. Our Cook County specimen was found on *Fraxinus* at Cap Sauers Holding, and there are Will County records from *Crataegus mollis* and *Prunus serotina*. [norstictic acid, atranorin] Co-H#726; Wi-H#1230

Parmotrema margaritatum [5] (Hue) Hale There is a Calkins specimen (#254 NY) collected at Glencoe and labeled *Parmelia crinita*. It is esorediate except for one soralium. Had this soralium been overlooked, the specimen may well have been called *Parmotrema eurysacum* (Hue) Hale, which is frequent farther south. There is another specimen (Blatchford *s.n.* F) collected in 1876 in Glencoe, Cook County, that is clearly *P. margaritatum*. There is yet another specimen (Calkins #6015 CHAS) from nearby LaSalle County, Illinois, that is more decidedly sorediate, also labeled *Parmelia crinita*. If the maculae of the cortex were overlooked on *Rimelia reticulata*, which is sorediate, it would key here. [salazinic acid, atranorin]

Parmotrema perforatum [3] (Jacq.) A. Massal. = *Parmelia perforata* of Calkins. Contemporary records suggest that this species is now confined to southern Illinois, but there is a specimen (Calkins #6017 CHAS) from nearby LaSalle County, Illinois, that is true to name, and Calkins's description of the plant from the Chicago region seems to be accurate as to species; he reported it as common on "various trees in Cook and Will counties." [norstictic acid, atranorin]

PELTIGERA Willd.

Thallus usually with laminal soralia, less than 3 cm across and typically with strongly ascending lobes .... P. didactyla
Thallus without soralia, usually broader and with mostly adnate or spreading-ascending lobes.
  Upper cortex smooth to the margins .... P. elisabethae
  Upper cortex tomentose, at least near the margins.
    Thallus notably lobulate along what appear to be cracks and fissures in the upper cortex .... P. praetextata
    Thallus without lobulate cracks and fissures.
      Thallus thin, the lobes broad, round, the lobe tips typically turned downward; margins as thick as the rest of the thallus .... P. canina
      Thallus thick, with a strong tendency to split when pressed, the lobes ascending; margins typically thickened ..... P. rufescens

Peltigera canina [4] (L.) Willd. Although it was not mentioned by Calkins, there is a specimen (Blatchford *s.n.*, 1876, F), collected in Glencoe, Cook County, and his July 1888 specimen (#8 F), also from Glencoe, is accurately named *P. canina*. There is also one he called *P. rufescens* (Calkins *s.n.* F) from Glencoe. We have a contemporaty record for this species from Greene Valley Forest Preserve, DuPage County. Du-L#85

Peltigera didactyla [4] (With.) J. R. Laundon Rare, this species is confined to stable shaded or moist sands in natural areas, our only local collection being from moist stable sand near Liverpool in Lake County. La-W#12962

Peltigera elisabethae [5] Gyelnik Calkins's specimen (#6047 CHAS) from Cook County was labeled by him *P. rufescens*, and there is a later Calkins specimen (#1673 NY) of this species, which he labeled *P. canina*, collected in 1905 at Glencoe; there it grew on shaded mossy clay in a ravine. [tenuiorin, triterpenoids, zeorin, ±gyrophoric acid]

Peltigera praetextata [5] (Flörke *ex* Sommerf.) Zopf Our only local record for this species is a Calkins specimen (*s.n.* F), which he collected from Glencoe, Cook County.

Peltigera rufescens [1] (Weiss) Humb. This species is occasional on open, dry, often sandy substrates. Calkins (*s.n.* F; #1675 NY) recorded it from "throughout our territory," but see comments under *P. elizabethae* and *P. canina*. Co-H#1206; Wi-#852

PERTUSARIA DC.

Thallus saxicolous or corticolous; medulla C+ red; spores mostly more than 150 μ long .... P. velata
Thallus corticolous; medulla C–; spores mostly less than 150 μ long.
  Apothecia becoming sorediate; fumarprotocetraric acid present .... P. multipunctoides
  Apothecia not becoming sorediate; fumarprotocetraric acid absent.
    Cortex UV– or UV+ orange pink, C– or C+ weak yellow; inner spore wall strongly undulate and rayed .... P. macounii
    Cortex UV+ orange red, C+ deep yellow; inner spore wall smooth or essentially so .... P. pustulata

Pertusaria macounii [2] (Lamb) Dibben = *P. communis* of Calkins, who considered it "common on oaks everywhere in our territory." There are two specimens (#78 NY, #6177 CHAS) from Cook County that Calkins had labeled *P. communis*. We have no contemporary records from the region, indeed the genus is now quite rare locally. [stictic acid, constictic acid, 2,7-dichlorolichexanthone, un1, un2, un3]

Pertusaria multipunctoides [3] Dibben = *P. multipuncta* of Calkins, who reported it from oaks and hickories, stating that it was not rare. [fumarprotocetraric and succinprotocetraric acids, ±protocetraric acid]

Pertusaria pustulata [2] (Ach.) Duby This appears to be the most common *Pertusaria* in the general region today, but we have seen no contemporary specimens from Calkins's area. Most of our specimens are from *Carya*. Calkins also reported *P. leioplaca*, which is synonymous for *P. leucostoma* (Bernh.) A. Massal., but the only specimens we have found that Calkins labeled *P. leioplaca* are actually *P. pustulata* (#79, #1672 NY). *P. leucostoma* is known from the Great Lakes region, and differs from *P. pustulata* mainly in have 4–6 spores per ascus, rather than 2. [stictic acid, constictic acid, ±un1, ±un2, ±un3, ±un5]

Pertusaria velata [2] (Turner) Nyl. Calkins reported this species from both rocks and trees. Most of our specimens from southern Illinois are from oaks. There is a correctly identified specimen from Cook County (Calkins #80 NY). [lecanoric acid]

PHAEOCALICIUM A. F. W. Schmidt

Phaeocalicium polyporaeum [4] (Nyl.) Tibell Evidently overlooked by Calkins, this species is confined to the thallus of the polyporous fungus *Trichaptum biforme*, which grows on the lower trunks of dead and dying trees. Co-H#1386; La-W#22751; Wi-H#1385

PHAEOPHYSCIA Moberg

Thallus esorediate.
- Apothecia rare; margins of lobes dissected into lobulate fringes .... P. imbricata
- Apothecia common; margins of lobes entire .... P. ciliata

Thallus sorediate.
- Medulla red or deep orange nearly or quite throughout .... P. rubropulchra
- Medulla white.
  - Margins of apothecia and lobes beset with colorless cortical hairs .... P. cernohorskyi
  - Thallus without colorless cortical hairs, though white-tipped rhizines may project profusely along the lobe margins.
    - Soredia granular, somewhat diffused in poorly delimited soralia .... P. adiastola
    - Soredia fine, confined to rounded soralia ...... P. pusilloides

Phaeophyscia adiastola [4] (Essl.) Essl. Probably included with *Physcia obscura* of Calkins, since there is an "Illinois" collection by him (#27 NY) that he labeled *P. obscura*. This species is characteristic of shaded dolomitic erratics, cliff faces, and ledges. Co-H#659; Du-W#12400; Wi-H#1106

Phaeophyscia cernohorskyi [4] (Nádv.) Essl. Evidently unknown to Calkins, this species is now occasional on open-grown trees, usually in disturbed or cultural areas. We also have specimens from dolomitic and granitic boulders, weathered concrete, and tombstones. Co-H#1300; Du-W#12424

Phaeophyscia ciliata [1] (Hoffm.) Moberg = *Physcia obscura* of Calkins, in part. Commoner southward, this is an occasional species locally on open-grown trees, often in disturbed areas. Nearly a third of our specimens are from *Populus deltoides*, and we have three from dolomitic boulders in open areas. Co-W#15670; Du-W#14266; Wi-W#14979

Phaeophyscia imbricata [4] (Vainio) Essl. Our only record for this species is from *Ulmus americana* at Herrick Lake Forest Preserve. Du-L#223

Phaeophyscia pusilloides [4] (Zahlbr.) Essl. Either unknown to Calkins, or included with what he called *Physcia obscura*. Locally this species is frequent throughout the area on open-grown, usually fast-growing trees such as *Populus deltoides*, *Fraxinus pennsylvanica* var. *subintegerrima*, *Ulmus americana*, *Salix* spp., and *Acer negundo*. In open areas it is occasional on boulders and fallen logs. The report of *P. orbicularis* from DuPage County (Wilhelm & Lampa 1987) is referable here. Co-W#15347; Du-W#12410; La-W#14978

Phaeophyscia rubropulchra [4] (Degel.) Essl. Presumably, this species was included with what Calkins called *Physcia obscura*. It is now very common throughout the area on the bases of trees in open areas, where it often grows with associates such as *Physcia millegrana*, and in shaded woods, where it often is the only lichen. [rhodophyscin] Co-W#14139; Du-W#16624; La-W#14983; Wi-W#13321

PHYSCIA (Schreb.) Michx.

Thallus esorediate; apothecia common.
- Medulla K−; zeorin absent .... P. stellaris
- Medulla K+ yellow; zeorin present.
  - Lobes up to 1 mm wide .... P. pumilior
  - Lobes prevailingly more than 1 mm wide .... P. aipolia

Thallus sorediate.
- Thallus lobes narrow and finely branched; soredia granular.
  - Lobes notably longer than wide; saxicolous .... P. subtilis
  - Lobes about as broad as wide; corticolous, rarely saxicolous .... P. millegrana
- Thallus lobes broader, not finely divided; soredia fine and powdery.
  - Tips of lobes hooded, the soralia nearly or quite concealed; long white marginal cilia conspicuous .... P. adscendens
  - Tips of lobes not concealing the soralia; cilia absent .... P. americana

Physcia adscendens [4] (Fr.) H. Olivier Evidently unknown to Calkins, this northern species is now frequent throughout the area on a wide variety of corticolous substrates, as well as weathered concrete and dolomitic boulders. [atranorin] Co-H#439; Du-W#16622; Wi-H#1137

Physcia aipolia [1] (Ehrh. *ex* Humb.) Fürn. = *P. stellaris* var. *aipolia* of Calkins. Rare locally; we have seen contemporary specimens only from Will County. Curiously, Calkins listed the habitat as "boulders of the prairies and on stones at Lemont." Calkins's report of *Physcia granulifera* evidently is also referable here, inasmuch as the only two Illinois specimens of Calkins's that we have seen labeled *Physcia granulifera* (#179, #270 NY), though not specifically collected in the Chicago area, are referable to *P. aipolia*. We have no documented records of *Heterodermia granulifera* (Ach.) Culb., the nomenclatural cognate, from north of extreme southern Illinois. See also *Physconia detersa*. [atranorin, zeorin] Wi-H#1254

Physcia americana [4] G. Merr. Farther south, this is a common corticolous species; locally it is uncommon, known from *Fraxinus americana*, *Juglans nigra*, and a shaded dolomitic cliff face. [atranorin, unknown terpene] Co-H#1105; Du-W#12395; Wi-H#1311

Physcia millegrana [1] Degel. = *P. tribacia* of Calkins (#104 NY). This species, and *Candelaria concolor*, are the commonest lichens in the Chicago region. It grows on virtually all corticolous substrates, often without associates, but more often with *Candelaria concolor.* It also grows on weathered concrete and flagstone. [atranorin] Co-M#36; Du-W#16621; La-W#14977; Wi-M#8

Physcia pumilior [4] R. C. Harris Our only specimen is from DuPage County, where it occurs rarely on bark. This species has been called *P. alba* by Midwestern authors. [atranorin, zeorin] Du-L#63

Physcia stellaris [1] (L.) Nyl. According to Calkins (#144 F; #26 NY), this was the most common species of the genus, occurring everywhere on oaks, hickories, and other trees, as well as rocks. It is common today as well, growing on a wide variety of corticolous substrates, though nearly half of our specimens are from *Fraxinus pensylvanica* var. *subintegerrima, Populus deltoides,* and *Quercus velutina.* It is frequent on fallen branches, the source trees of which are sometimes difficult to determine. [atranorin] Co-W#14149; Du-W#12421; La-W#14928; Wi-M#14.

Physcia subtilis [4] Degel. This species is rare to occasional on granitic and basaltic erratics in pastures and old fields, our only local specimens being from Cook County. [atranorin] Co-H#1227

PHYSCIELLA Essl.

Physciella chloantha [4] (Ach.) Essl. This is a frequent species throughout the area in disturbed and landscaped areas. It grows on tombstones with *Xanthoria* spp., on concrete with *Endocarpon pusillum,* and on *Ulmus* spp. and other fast-growing trees such as *Populus alba* and *Celtis occidentalis*; we have one specimen from *Malus pumila.* In natural habitats it occurs on open-grown *Quercus alba.* Co-W#13607; Du-W#12425; Wi-H#1134

PHYSCONIA Poelt

Physconia detersa [4] (Nyl.) Poelt Though not nearly so common, this species grows on substrates similar to those of *Candelaria concolor* and *Physcia millegrana*, which are its nearly constant associates. Given its conspicuousness and distinctness it is hard to imagine that Calkins would have overlooked this species, and it is just as hard to imagine that it is not native here. His description of *Physcia granulifera* (see *Physcia aipolia*) might fit *Physconia detersa.* Co-H#235; Du-W#12413; La-W#14984; Wi-H#1100

PLACYNTHIELLA Elenkin

Thallus terricolous, C– . . . . P. uliginosa
Thallus lignicolous, C+ red . . . . P. icmalea

Placynthiella icmalea [4] (Ach.) Coppins & P. James This species is occasional on dead limbs, decorticate logs, and old wood throughout the area. Even though it contains gyrophoric acid, which typically reacts C+ pink, it is a fast-fading pink, and sometimes difficult to discern from a simple C test. Negative results should be confirmed with TLC before concluding that the specimen is not *P. icmalea.* [gyrophoric acid, ±lecanoric acid] Co-H#1233; Du-W#14621; La-Wetmore #53744; Wi-W#14728

Placynthiella uliginosa [4] (Schrader) Coppins & P. James More frequent as an arenicolous species in the sand districts just outside the Chicago area, there are two specimens collected locally. Both are from weathered till, with *Cladonia peziziformis* and *C. polycarpoides,* and with the interesting *Liatris scariosa* (L.) Willd. var. *nieuwlandii* (Lunell) E. G. Voss, which is a rare variant (Swink & Wilhelm 1994) of the southern end of Lake Michigan. [gyrophoric acid, ±lecanoric acid] Co-H#1498; Wi-H#1497

PLACYNTHIUM (Ach.) Gray

Placynthium nigrum [1] (Hudson) Gray = *Pannaria nigra* of Calkins, who reported it from calcareous rocks near Lemont. It is occasional, particularly on exposed dolomitic rocks along the Des Plaines River valley. Co-H#1203; Du-W#12394; Wi-H#1204

POLYSPORINA Vězda

Polysporina simplex [4] (Davies) Vězda Evidently unknown to Calkins, our only records of this species are from granitic boulders at the Shoe Factory Road Prairie and Camp Sagawau, both in Cook County. Co-W#13613

PORPIDIA Körber

Porpidia tahawasiana [3] Gowan = *Lecanora privigna* of Calkins. Calkins noted that this was scarcely distinguishable from what he called *L. privigna* var. *pruinosa* (see comments under *Sarcogyne regularis*), and that it grew on siliceous rocks. Two specimens of this species (Calkins *s.n.* F) from nearby LaSalle County, Illinois are from sandstone and originally labeled *Lecanora privigna* and *L. privigna* var. *revertens.*

PROTOBLASTENIA (Zahlbr.) J. Steiner

Protoblastenia rupestris [4] (Scop.) J. Steiner Possibly overlooked by Calkins, our only records of this species are from exposed dolomitic bedrock at the Cap Sauers Holding near Palos Park in Cook County, and a dolomitic boulder near Bollingbrook in Will County. Notwithstanding the K+ purple apothecium, which is evocative of *Caloplaca,* the anatomy of the ascoma and spores are more *Psora*-like. [parietin] Co-H#415

PSORA Hoffm.

Psora decipiens[4] (Hedwig) Hoffm. Evidently overlooked by Calkins, this is a conservative species of open kames and other prairies where dolomite is exposed and shallow pockets of calcareous soils have developed in cracks or among the pebbles. *Catapyrenium squamulosum* is a constant associate. Our specimens are without substances, corresponding to "strain I" of Timdal (1986); he places those specimens with norstictic acid into "strain II" and those with hyposalazinic acid into "strain III". Co-W#17522; Wi-W#12427

PUNCTELIA Krog

Thallus lacking isidia and soredia; medulla C– or C+ red.
- Medulla C– . . . . P. bolliana
- Medulla C+ red . . . . P. semansiana

Thallus with either isidia or soredia; medulla C+ red.
- Thallus isidiate . . . . P. rudecta
- Thallus sorediate . . . . P. subrudecta

Punctelia bolliana[4] (Müll. Arg.) Krog Yet unknown from northern Lake County, it could be described as occasional today, growing mostly on *Q. alba*, *Q. macrocarpa*, and *Q. rubra*, but other frequent substrates include *Carya ovata* and *Juglans nigra*. In most cases the trees are open-grown and relatively large. The specimens that we have seen that Calkins labeled *Parmelia borreri* are referable here (for example, #49 F; #11, #24 NY; #6002 CHAS), but in his flora he describes *P. borreri* as being beset with round soredia, features that describe *Punctelia subrudecta*, not *P. bolliana*. [atranorin, protolichesterinic acid] Co-W#15665; Du-W#12408; Wi-W#13945

Punctelia rudecta[1] (Ach.) Krog = *P. borreri* var. *rudecta* of Calkins. Three-fourths of our specimens are from open-grown oaks, but we do have specimens from *Juglans nigra*, *Maclura pomifera*, and *Ostrya virginiana*; there is also a specimen from a basaltic boulder in an open pasture. [lecanoric acid, atranorin] Co-W#15664; Du-W#12407; Wi-H#1125

Punctelia semansiana[5] (Culb. & C. Culb) Krog Although this species is relatively frequent farther south, particularly on rock, our only local record is an early collection (E.T. & S.A. Harper *s.n.*, 1893, F) from bark in River Forest, Cook County. [lecanoric acid, atranorin]

Punctelia subrudecta[3] (Nyl.) Krog = *Parmelia borreri*, in part, of Calkins, who noted that it was "very common everywhere in our territory, especially on oaks," and that it was sorediate. All of our regional specimens are from *Quercus alba*. We have yet to see this lichen in Calkins's area, but we have specimens from as nearby as Kane County, Illinois, and Newton County, Indiana. [lecanoric acid, atranorin]

PYRENOCOLLEMA Reinke

Pyrenocollema prospersellum[2] (Nyl.) R. C. Harris = *Verrucaria prospersella* Nyl., which was originally described in Calkins's flora (#233 NY, #6550 CHAS). Harris (1975) described this species as follows: "Thallus gray, continuous to rimose, epilithic. Phycobiont with cells blue green in color, in small groups but without an obvious sheath. Ascocarps globose, 0.2–0.25 mm in diameter. Asci slightly ovate to elliptical. Spores 17–23 $\times$ 8–11 μ. Habitat on calcareous rocks, possibly more or less aquatic. It is known from a Belgian collection in addition to the type locality." Tucker and Harris (1980) cite the type 16 km from Chicago (H-NYL 991) and list the substrate in Louisiana as "sandstone outcrops."

PYRENULA A. Massal.

Thallus UV+ yellow; spores pale yellowish brown; hymenium I+ greenish blue . . . . P. pseudobufonia

Thallus UV–; spores lavender brown; hymenium I+ or pinkish . . . . P. subelliptica

Pyrenula pseudobufonia[2] (Rehm) R. C. Harris = *P. nitida* of Calkins (#6563 CHAS; #1624 NY). Harris (1973) lists trees of mesophytic forests as the substrate for this species; it is common south and east of the Chicago region, and Calkins considered it more or less frequent throughout the area, but we have not seen any contemporary local specimens. [lichexanthone]

Pyrenula subelliptica[5] (Tuck.) R. C. Harris Harris (1973) mapped this species from just south of the Chicago region, and listed its substrates as *Carpinus*, *Fagus*, *Fraxinus*, and *Quercus*. A Calkins specimen from Cook County (*s.n.* F) listed *Quercus* as a substrate. The specimens we have seen too often have spore lumina evocative of *P. macounii* R. C. Harris, but the hymenium is usually notably, if not abundantly, inspersed with oil droplets and granules, and the white spots characteristic of *P. subelliptica* are occasionally evident.

PYRRHOSPORA Körber

Pyrrhospora varians[3] (Ach.) R. C. Harris = *Biatora varians* of Calkins, who reported it from oaks and hickories in Cook County. This species is weedy in and around St. Louis, Missouri, but we have seen no contemporary local collections.

PYXINE Fr.

Medulla yellow; cortex K– and UV+ bright yellow; lobes typically with a conspicuous patch of dense pruina just back from the tip . . . . P. subcinerea

Medulla salmon orange; cortex K+ yellow and UV–; lobes without pruina, or with a diffuse patch near the tips . . . . P. sorediata

Pyxine sorediata[4] (Ach.) Mont. Evidently unknown to Calkins, and relatively rare today, as we have only two records of it locally. At the Morton Arboretum, it grew on the surface of a limb of an open-grown *Crataegus mollis;* the Will County record is from *Populus deltoides*. [atranorin] Du-W#14609; Wi-H#1205

Pyxine subcinerea[4] Stirton = *P. caesiopruinosa* of previous North American authors, not Nylander. Commoner farther south, our only records are from a cultivated elm at the Morton Arboretum, in DuPage County, where it is presumed to be adventive, and from *Crataegus mollis* at Paw Paw Woods in Cook County. [atranorin, lichexanthone] Co-H#730; Du-W#12402

RAMALINA Ach.

Thallus lobes up to 5 mm wide	R. americana
Larger lobes greater than 5 mm wide	R. subampliata

Ramalina americana[1] Hale Including *R. calicaris* var. *fastigiata* of Calkins. Very rare today; only the DuPage County record is a well-developed thallus of this species, collected in 1997 on senescent branches of *Rhus glabra.* There is a contemporary Cook County record, from *Populus deltoides*, represented by a very small thallus, which, if imagined in full development, might more aptly be placed with *R. subampliata*. There is also a small ort of a specimen, which must be defaulted here, from a weathered fence rail at the Lockport Prairie, in Will County. An early Calkins specimen (#19 F) is clearly this species, collected "on oaks." Another Calkins specimen (#5650 CHAS) has a broad-lobed thallus that one may refer to *Ramalina subampliata.* [usnic acid] Co-W#15669; Du-W#22762; Wi-H#1268

Ramalina subampliata[2] *sensu* Fink (1935) and Howe (1914), not Nylander = *R. calicaris* var. *fraxinea* of Calkins, who reported it from oaks and old fences near Lemont. A Cook County specimen (Calkins I-2 ILL), originally called *R. calicaris* var. *fastigiata* is referable here. Riefner (1990) seemed to restrict *R. fastigiata* (Pers.) Ach. to the West Coast of the United States, and described it as having narrower lobes and evernic acid. The proper name for this species has me completely at sea. Although Egan (1987) included it, rendering the epithet "*subamplicata*," Bowler and Rundel (1973) reported that *R. subampliata* is not known from North America; the latter authors, however, do not give our material a name. Hale (1979) limits the lobe width of *R. americana (R. fastigiata* of Howe [1914]) to 5 mm. Howe separated *R. subampliata* from *R. fastigiata* by indicating that the lobes are generally wider in the former, so reports of *R. subampliata*, or the locally misapplied name *R. fraxinea* (L.) Ach., should stand alone under some other name, perhaps *R. sinensis* Jatta. But the latter species, like *R. americana,* has its apothecia mostly terminal, while our material, or at least all that we have seen, has an abundance of laminal apothecia, like *R. celastri* (Sprengel) Krog & Swinscow, which has been called *R. ecklonii* in North America. A. H. Magnusson annotated two broad-lobed Illinois specimens (MICH) as *R. confusa* H. Magn. in 1958, but Egan did not carry this name, even as a synonym; evidently it is simply a "herbarium name." Howe had annotated these specimens *R. fastigiata* var. *subampliata* in 1912. Hale (1979) pointed out that *R. sinensis* is prevailingly southwestern and has decorticate areas on older portions of the thallus, a feature that does not describe Illinois material. He also noted that there is a northern Great Lakes form with broad lobes that has been referred to as *R. subampliata*, but does not speculate as to what its valid name might be. Bowler and Rundel noted that Nylander originally described *R. fastigiata* var. *subampliata* as having lobes 6–12 mm wide, but they did not explain why there "is no question that North American reports of *R. subampliata* are incorrect," or even how it differs from similar broad-lobed North American specimens. Thomson (1990) referred some of these broad-lobed "prairie-forest" border species to *R. unifolia* J. W. Thomson, which appears fairly distinctive in that it has strong longitudinal ridges intercalated with decorticate zones; and it has curved spores. Lacking a decisively better name, we are exploiting the name *R. subampliata* for the broad-lobed species in Illinois that do not look like *R. unifolia*. One might be tempted to use the name *R. fraxinea,* but that species has curved spores, such as in Calkins's #5653 (CHAS) in which the spores are 12 μ long and half as wide, and the apothecia are terminal. Some other Illinois material we have seen have laminal apothecia, straight spores, and lack the decorticate zones and longitudinal ridges as seen in more northern or western material. [usnic acid]

RIMELIA Hale & Fletcher

Thallus sorediate	R. reticulata
Thallus without soredia	R. cetrata

Rimelia cetrata[5] (Ach.) Hale & Fletcher Occasional farther south, our only local record for this species is a specimen collected by Calkins (*s.n.* F) in Cook County, which he originally had called *Parmelia saxatilis.* Berry (1941) cited *Parmelia cetrata* Ach. from Cook County, probably based upon the Calkins specimen. [salazinic acid, atranorin]

Rimelia reticulata[1] (Taylor) Hale & Fletcher Including Calkins's report of *Parmelia perlata*. Calkins report of *P. cetrata* must also be included here inasmuch as he described his specimens as having "sorediferous" lobes. Although this lichen is very common farther south, we have only a few modern records, all from different corticolous substrates. Calkins considered this species common in the Chicago region a century ago. [salazinic acid, atranorin] Co-H#1317; Du-W#12390; Wi-H#1338

RINODINA (Ach.) Gray

Thallus corticolous
  Apothecial rims pale gray .... R. subminuta
  Apothecial rims brown .... R. archaea
Thallus saxicolous.
  Spore lumina with equally thick walls on all sides, but the septum strongly thickened and often obscured by a darkened band; substrate HCl+ or HCl– .... R. bischoffii
  Spore lumina with unequal or angular walls, the septum scarcely or not at all obscured by a darkened band; substrate HCl– .... R. cana

Rinodina archaea[4] (Ach.) Arnold Our only record of this species is from Somme Prairie Grove, in Cook County, where it was collected on *Carya ovata.* Co-H#848

Rinodina bischoffii[3] (Hepp) A. Massal. Calkins reported this species from "calcareous rocks at Joliet and Lemont" and described it as a little-known species that occurred more abundantly farther south and west. A Calkins specimen (*s.n.* NY) from LaSalle County was identified accurately by Calkins as *R. bischoffii,* and it is indeed more frequent farther south and west, where it grows in limestone glades and on outcrops.

Rinodina cana[1] (Arnold) Arnold Uncommon, there is a contemporary DuPage County record from a granitic boulder. Calkins reported a lichen he called *R. sophodes* (Ach.) A. Massal. from boulders near Lemont and stated that he had never "met with it elsewhere so far north." He described it thus: "Thallus gray or cinereo-fuscescent; apothecia small, appressed; disc flat, fuscous black; margin entire." He may well have been referring to this species. John Sheard has annotated a specimen from central Illinois at NY, originally labeled *R. sophodes,* as *R. cana.* Du-W#19638

Rinodina subminuta[4] H. Magn. Our only local record for this species is from Messenger Woods Forest Preserve, in Will County, where it was collected on *Quercus alba;* farther south and west it is occasional on poplars along streams. Wi-H#1241

SARCOGYNE Flotow

Sarcogyne regularis[1] Körber = *Lecanora privigna* var. *pruinosa* of Calkins. Occasional throughout the area on a wide variety of carbonate-rich substrates, including tufa rock, gravel, concrete, shale, and exposed dolomite. His specimen (#6093 CHAS) from LaSalle County, Illinois, that he labeled *L. cervina,* is actually *Sarcogyne regularis.* See also comments under *Lecanora dispersa* and *Porpidia tahawasiana.* Co-W#15473a; Du-W#14352; La-W#13773; Wi-#1184

SCOLICIOSPORUM A. Massal.

Scoliciosporum chlorococcum[4] (Stenh.)Vězda Our only record for this species locally is from the upper branches of a fallen tree in DuPage County. Du-Armstrong #224

STAUROTHELE Norman

Staurothele diffractella[4] (Nyl.) Tuck. Evidently unknown to Calkins. Our only local record for this species is from a sheltered dolomitic cliff face near Lemont, in Cook County. Co-M#30

TELOSCHISTES Norman

Teloschistes chrysophthalmus[2] (L.) Th. Fr. = *Theloschistes chrysophthalmus* of Calkins. There are specimens (#5687 CHAS; #34 F) collected at Lemont by Calkins. He reported it from "Lemont, on old rails in woods. Also on old oak trees near the lake shore, Lake View." We have not seen it alive anywhere near the Chicago area.

THELIDIUM A. Massal.

Thelidium microcarpum[4] (Leight.) A. L. Sm. This is a poorly understood genus in North America, so our use of the name *T. microcarpum* must be regarded as tentative. It fits the description of that species in Purvis et al. (1992). Our specimens have an olivaceous, epilithic, thin, continuous to dispersed areolate thallus, with superficial perithecia to 0.3 mm across, which we interpret as lacking an involucrellum. The spores are about 25–35 μ, mostly 4-celled. There is a specimen that was distributed by Calkins (#199 F) as *Verrucaria prospersella,* which is referable here. Our records are from shaded dolomitic cobble and HCl+ building rubble. Co-H#352; La-H#344; Wi-M#5

THELOCARPON Nyl. *ex* Hue

Thelocarpon laureri[4] (Flotow) Nyl. Not common locally, it grows occasionally on weathered lignum and rarely on granitic erratics. [pulvinic acid derivatives] Co-W#13614; Wi-W#14350

TRAPELIA Choisy

Thallus sorediate .... T. placodioides
Thallus esorediate.
  Thallus thick, distinctly effigurate with marginal lobes .. T. involuta
  Thallus thin, of dispersed or continuous areoles, without marginal lobes .... T. coarctata

Trapelia coarctata[1] (Sm.) Choisy = *Biatora coarctata.* Uncommon locally, as it probably was in 1896. Contemporary specimens are from granitic erratics or sandstone cobbles or outcrops, sometimes partly shaded. Calkins reported it from both calcareous and arenaceous rocks. [gyrophoric acid] Co-H#405; Wi-H#1229

Trapelia involuta[4] (Taylor) Hertel The only specimen of this species we have seen locally is from HCl– rock on the campus of Joliet Junior College, in Will County, along the nature trail. [gyrophoric acid] Wi-H#1224

Trapelia placodioides[4] Coppins & P. James. Our only local records are from partly shaded to exposed igneous boulders. [gyrophoric acid] Co-H#809; Du-L#223

TRAPELIOPSIS Hertel & Gotth. Schneider

Apothecia plane, with persistent margins; thallus gray green to dark green, thin .... T. flexuosa
Apothecia typically convex, the margins disappearing; thallus gray, thick and convex to granular warty .... T. granulosa

Trapeliopsis flexuosa[4] (Fr.) Coppins & P. James This species is now occasional throughout the area on decorticate logs, dead limbs, old wood, fence rails, burnt wood, and over moss; we have several records from the limbs of trees, including willows. [gyrophoric acid] Co-H#737; Du-W#14622; La-H#1373

Trapeliopsis granulosa[1] (Hoffm.) Lumbsch Without seeing the specimens, it is difficult to know where to dispose of Calkins's report of *Lecidea enteroleuca* from Will County. From his description, however, it is probable that some of the material is referable here. Egan (1987) noted that reports of *L. enteroleuca* often refer to what are now recognized as various species of *Lecidella*. There are several contemporary specimens from DuPage County, where it grows most commonly on weathered or charred wood. [gyrophoric acid] Du-W#16502

TUCKERMANNOPSIS Gyelnik

Tuckermannopsis americana[2] (Sprengel) Hale = *Cetraria ciliaris* of Calkins, who collected it from "old rails in Lemont Township; on old birch at Glencoe" (#5657 CHAS). [atranorin, alectoronic acid]

VERRUCARIA Schrader

Hypothallus thick or thin, black.
  Each areole appearing to have numerous black dots (ostioles), the black hypothallus more than 0.25 mm high .... V. fayettensis
  Areoles with only 1–few ostioles; hypothallus rarely more than 0.25 mm high.
    Perithecia less than 0.17 mm across, several per areole .... V. fuscella
    Perithecia mostly more than 0.17 mm across, 1 or rarely 2 per areole .... V. nigrescens
Hypothallus pale or not evident.
  Thallus white, thin or endolithic or absent.
    Exciple hyaline, the black involucrellum not completely encircling the perithecium .... V. muralis
    Exciple black, fused to the involucrellum above, extending around the bottom of the perithecium .... V. calkinsiana
  Thallus thin to thick, evidently epilithic and corticate, sordid to grayish or olive green, or brownish to black, or if white then areolate.
    Perithecia more than 0.23 mm across, the exciple black below .... V. calkinsiana
    Perithecia less than 0.23 mm across, the exciple hyaline below.
      Thallus pale gray .... V. illinoensis
      Thallus dark brown to olive brown .... V. sordida

Verrucaria calkinsiana[1] Servít This is our most common *Verrucaria*. Usually, early collectors called this lichen *V. muralis* or *V. rupestris*, but occasionally it was called *V. pyrenophora* or *V. nigrescens* (Calkins #203 NY), names used by Calkins, or *V. inundata*. It grows on all manner of carbonate rocks, such as dolomite, weathered concrete, calcareous pebbles and cobbles, and even tufa rock. The thallus can vary from appearing wholly endolithic to rather thick and creamy or sordid white, but a few cuts through the perithecia reveal a black, globular exciple. The spores are 14–25 μ long. Co-W#14663; Du-S#14353; La-W#13774; Wi-H#1133

Verrucaria fayettensis[1] Servít This species is uncommon locally on weathered dolomite, but we have several contemporary records from DuPage County. It was most commonly called *V. fuscella* by early collectors, although Calkins called two Cook County specimens (*s.n.* F; #199 NY) *V. viridula*. Du-W#12392; Wi-H#1245

Verrucaria fuscella[2] (Turner) Winch If we are interpreting it properly, this species has not been seen in the Chicago area in recent years. Elsewhere in Illinois it grows mostly on dolomite or limestone. Calkins considered it to be an uncommon species, which he knew only from "detached calcareous rocks near Joliet," and is more likely referable to *V. fayettensis.*

Verrucaria illinoensis[5] Servít This species was described from calcareous rocks in LaSalle County by Servít (1950). Our only local record is a Calkins specimen (#154 F) from Riverside, in Cook County. Interestingly enough, he called this specimen *Verrucaria (Pyrenocollema) prospersella,* to which it has a superficial resemblance.

Verrucaria muralis[1] Ach. This species is rare on carbonate rock, including weathered concrete, flagstone, and even small pebbles. Du-W#14265; Wi-H#1152

Verrucaria nigrescens[1] Pers. Our only contemporary record for this species, if we are interpreting it properly, is from weathered dolomite near Palos Park, in Cook County. It is otherwise uncommon in the lower Midwest. Calkins reported this species from limestone along streams, but several older specimens under this name we have referred elsewhere. Co-H#587

Verrucaria sordida[5] Servít Very rare locally, this species occurs on carbonate-rich rock. It appears to be a little-known species, and we are calling it *V. sordida,* not particularly because it closely fits Fink's description, but because it looks like specimens we have seen that Fink himself called *V. sordida*. Most of the specimens Calkins called *V. aethiobola* are referable here, although he did not use that name in his flora of the Chicago area; also referable here is a Cook County specimen (#226 NY) he called *V. nigrescens*.

XANTHOPARMELIA (Vainio) Hale

Thallus isidiate .... X. australasica
Thallus without isidia .... X. cumberlandia

Xanthoparmelia australasica[3] D. J. Galloway = *Parmelia conspersa* of Calkins, who indicated that his specimens were often isidiate, "fuscous-black" beneath, and grew on stones in Cook and Will counties. We have taken the liberty of including these reports here inasmuch as all modern records of isidiate morphs with black lower surfaces in northern Illinois are referable to *X. australasica*. Calkins's assertion that it grew on old wood near Elgin reflects a rare circumstance. [usnic acid, salazinic acid, norstictic acid]

Xanthoparmelia cumberlandia[4] (Gyelnik) Hale Possibly introduced to the area, our only record for this species is from landscape boulders at the Chicago Botanic Garden, at the north edge of Cook County. [usnic acid, stictic acid, norstictic acid] Co-W#15153

XANTHORIA (Fr.) Th. Fr.

Thallus sorediate, common.
Many lobes exceeding 0.5 mm wide, the soredia in large labriform soralia .... X. fallax
Lobes narrow, up to 0.5 mm wide, the soredia scattered to terminal, but not in regularly labriform soralia .... X. sp. #1
Thallus esorediate, rare.
Thallus saxicolous .... X. elegans
Thallus corticolous .... X. polycarpa

Xanthoria elegans[5] (Link) Th. Fr. Our only local record for this species is a Calkins specimen (*s.n.* NY), collected in 1909 at "Sag" in Cook County, on a limestone boulder. There are contemporary specimens from a little farther north and west collected on weathered concrete.

Xanthoria fallax[4] (Hepp) Arnold Probably including *Theloschistes lychneus* of Calkins, in part. This lichen occurs relatively frequently. More than half of our specimens are from fast-growing roadside trees such as *Populus deltoides*, *Fraxinus pennsylvanica*, and *Ulmus* spp. It also grows on open-grown oaks and walnuts, as well as on weathered concrete and old fence rails. Josef Poelt has seen examples of this material and confirms that they do represent *X. fallax*. See comments under *Xanthoria* sp. #1. Co-H#428; Du-W#14608; La-H#251

Xanthoria polycarpa[1] (Hoffm.) Rieber = *Theloschistes parietinus* of Calkins (#5685 CHAS; #16 NY). Calkins noted that it grew "along the lake shore, on oaks and poplars; also in Lemont and elsewhere." Today, it is infrequent, most of our specimens being from *Fraxinus* and *Populus* species and weathered lignum. Rudolph (1955) cites a specimen of *X. parietina* from Cook County, probably based upon a misidentification or a label mix-up, it being a maritime species. Co-H#806; Du-L#49; Wi-H#1154

Xanthoria sp. #1[1] *sensu* MOR Probably including *Theloschistes lychneus* of Calkins, in part (e.g., #5683 CHAS; *s.n.* F). This species is occasional on a wide variety of corticolous substrates, mostly in disturbed areas. It also grows on exposed dolomitic boulders. The identity of this species remains a problem. Most of the specimens referred here routinely have been called *X. candelaria* (L.) Th. Fr., but most contemporary students of the genus exclude that species from the interior of North America, noting only that our material is not described. Well-developed specimens have the soredia formed under the internal thallus lobes, and the soralia are minutely crescent-shaped, evocative of *X. fallax*, which has broad, appressed lobes and strongly crescent-shaped or even circular soralia. Louise Lindblom, at Lund University in Sweden, is tentatively including it with *Xanthoria fulva* (Hoffm.) Poelt & Petutschnig, acknowleging that it may well be an new species endemic to the eastern United States. Josef Poelt, who looked at our material and who named *X. fulva*, believed it to be a new species. Co-H#828; Du-W#16504; Wi-H#1148

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constant source of editorial assistance, and she currently curates the lichen herbarium at the Morton Arboretum. I am supremely grateful to these people for their involvement in the development of this flora.

SYNONYMS AND MISAPPLIED NAMES

The following names include taxonomic synonyms or misapplied names, as used by Calkins. Some may represent misidentifications; others are legitimate older names that are known now to have narrower distributions. In some cases, they are related species that appear in text where taxonomic problems are discussed. All of these names are indexed to the species under which they are mentioned.

Arthonia astroidea - Arthonia radiata
Arthonia lecideella - Arthonia caesia
Arthonia spectabilis - Arthothelium spectabile
Arthonia taediosa - Arthothelium taediosum
Bacidia inundata - Bacidina egenula
Bacidia trachona - Bacidia granosa
Biatora coarctata - Trapelia coarctata
Biatora cyphalea - Biatorella cyphalea
Biatora fusco-rubella - Bacidia polychroa
Biatora inundata - Bacidina egenula
Biatora rubella - Bacidia polychroa
Biatora suffusa - Bacidia suffusa
Biatora varians - Pyrrhospora varians
Buellia alboatra - Amandinea dakotensis
Buellia parasema - Amandinea punctata
Buellia punctata - Amandinea punctata
Buellia schaereri - Amandinea punctata
Candelariella efflorescens - Candelariella reflexa
Cetraria aleurites - Imshaugia aleurites
Cetraria ciliaris - Tuckermannopsis americana
Cladonia decorticata - Cladonia rei
Cladonia delicata - Cladonia parasitica
Cladonia fimbriata - Cladonia coniocraea, C. ramulosa, C. rei
Cladonia fimbriata v. apolepta - Cladonia coniocraea
Cladonia fimbriata var. coniocraea - Cladonia ochrochlora
Cladonia fimbriata v. simplex - C. conista, C. cryptochlorophaea, C. cylindrica
Cladonia fimbriata v. tubaeformis - Cladonia coniocraea, C. subulata
Cladonia gracilis v. verticillata - Cladonia gracilis ssp. turbinata, C. cervicornis ssp. verticillata
Cladonia humilis - Cladonia conista
Cladonia mitrula - Cladonia peziziformis
Cladonia pyxidata v. pocillum - Cladonia pyxidata
Cladonia rangiferina v. sylvatica - Cladina subtenuis
Collema flaccidum - Collema subflaccidum
Collema granosum - Collema auriforme
Collema microphyllum - Collema fragrans
Collema pycnocarpum - Collema conglomeratum
Endocarpon hepaticum - Catapyrenium squamulosum
Endocarpon miniatum - Dermatocarpon miniatum
Endocarpon miniatum v. complicatum - Dermatocarpon miniatum
Endocarpon miniatum v. muhlenbergii - Dermatocarpon miniatum
Endocarpon rufescens - Catapyrenium squamulosum
Graphis dendritica - Graphis scripta
Heppia despreauxii - Heppia adglutinata
Heppia lutosa - Collema bachmanianum, Heppia adglutinata
Lecania erysibe - Lecania perproxima
Lecanora aipospila - Caloplaca atroalba
Lecanora calcarea - Aspicilia calcarea
Lecanora calcarea v. contorta - Aspicilia contorta
Lecanora cervina - Sarcogyne regularis
Lecanora erysibe - Lecania perproxima
Lecanora hageni v. sambuci - Lecanora sambuci
Lecanora pallida - Lecanora caesiorubella
Lecanora perproxima - Lecania perproxima
Lecanora privigna - Lecanora dispersa, Porpidia tahawasiana
Lecanora privigna v. pruinosa - Sarcogyne regularis
Lecanora subfusca - Lecanora hybocarpa
Lecanora subfusca v. allophana - Lecanora hybocarpa
Lecanora subfusca v. argentata - Lecanora hybocarpa
Lecanora subfusca v. distans - Lecanora hybocarpa
Lecanora varia - Lecanora symmicta
Lecanora varia v. symmicta - Lecanora symmicta
Lecidea enteroleuca - Trapeliopsis granulosa
Leptogium chloromelum - Leptogium milligranum
Leptogium lacerum - Leptogium lichenoides
Leptogium myochroum - Leptogium burnetiae, L. dactylinum
Leptogium pulchellum - Leptogium corticola
Microthelia micula - Kirschsteiniothelia aethiops
Muellerella lichenicola - Caloplaca flavovirescens
Myrianagium duriaei - nonlichenized fungus
Pannaria lanuginosa - Lepraria lobificans
Pannaria nigra - Placynthium nigrum
Parmelia borreri - Punctelia bolliana, P. subrudecta
Parmelia borreri v. rudecta - Punctelia rudecta
Parmelia caperata - Flavoparmelia caperata
Parmelia cetrata - Rimelia cetrata
Parmelia colpodes - Anzia colpodes
Parmelia conspersa - Xanthoparmelia australasica
Parmelia crinita - Parmotrema crinitum, P. magaritatum
Parmelia perforata - Parmotrema perforatum
Parmelia perlata - Rimelia reticulata
Parmelia physodes - Hypogymnia physodes
Parmelia saxatilis - Parmelia squarrosa, P. sulcata, Rimelia cetrata
Parmelia saxatilis v. sulcata - Parmelia sulcata
Parmelia tiliacea - Myelochroa galbina
Parmelia tiliacea v. sulphurosa - Myelochroa galbina
Parmelina aurulenta - Myelochroa aurulenta
Pertusaria communis - Pertusaria macounii
Pertusaria leioplaca - Pertusaria pustulata
Pertusaria multipuncta - Pertusaria multipunctoides
Phaeographis dendritica - Graphis scripta
Phaeophyscia orbicularis - Phaeophyscia pusilloides
Physcia alba - Physcia pumilior
Physcia adglutinata - Hyperphyscia adglutinata, H. syncolla
Physcia granulifera - Physcia aipolia, Physconia detersa
Physcia obscura - Phaeophyscia adiastola, P. ciliata, P. pusilloides, P. rubropulchra
Physcia speciosa - Heterodermia speciosa
Physcia stellaris v. aipolia - Physcia aipolia
Physcia tribacia - Physcia millegrana
Placodium aurantiacum - Caloplaca flavorubescens, C. ulmorum, C. cerina
Placodium cinnabarinum - Caloplaca cinnabarina
Placodium ferrugineum - Caloplaca ferruginea, C. cerina
Placodium microphyllum - Caloplaca microphyllina
Placodium vitellinum - Candelariella vitellina
Pyrenula analepta - Naetrocymbe punctiformis
Pyrenula gemmata - Anisomeridium biforme, Eopyrenula intermedia, Kirschsteiniothelia aethiops
Pyrenula glabrata - Arthopyrenia cinchonae
Pyrenula nitida - Pyrenula pseudobufonia
Pyrenula punctiformis - Kirschsteiniothelia aethiops

Pyrenula thelaena - Julella sericea
Pyxine caesiopruinosa - Pyxine subcinerea
Ramalina calicaris v. fastigiata - Ramalina americana
Ramalina calicaris v. fraxinea - Ramalina subampliata
Ramalina celastri - Ramalina subampliata
Ramalina confusa - Ramalina subampliata
Ramalina fastigiata - Ramalina subampliata
Ramalina ecklonii - Ramalina subampliata
Ramalina fastigiata v. subampliata - Ramalina subampliata
Ramalina fraxinea - Ramalina subampliata
Ramalina sinensis - Ramalina subampliata
Ramalina subamplicata - Ramalina subampliata
Ramalina unifolia - Ramalina subampliata
Rinodina sophodes - Rinodina cana
Sagedia oxyspora - Julella sericea
Sarcinulella banksiae - Anisomeridium nyssigenum
Theloschistes chrysophthalmus - Teloschistes chrysophthalmus
Theloschistes concolar - Candelaria concolor
Theloschistes lychneus - Xanthoria fallax, X. sp. #1
Theloschistes parietinus - Xanthoria polycarpa
Urceolaria scruposa - Diploschistes muscorum
Verrucaria aethiobola - Verrucaria sordida
Verrucaria inundata - Verrucaria calkinsiana
Verrucaria prospersella - Pyrenocollema prospersellum, Thelidium microcarpum, V. illinoisensis
Verrucaria pyrenophora - V. calkinsiana
Verrucaria rupestris - Verrucaria calkinsiana, V. muralis
Verrucaria viridula - Verrucaria fayettensis

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THE LICHEN FLORA OF THE COOK COUNTY FOREST PRESERVES PART I: PALOS DIVISION

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ABSTRACT: This is the first in a projected series of papers that will document the lichenized fungi of the Cook County forest preserve system. In this initial paper, the scope of the project is delineated, and the first results of the study are presented. For the Forest Preserve District of Cook County's Palos Division, 65 species of lichens are reported, of which 33 were vouchered. An annotated species list is provided, as well as checklists for the individual preserves within this division.

INTRODUCTION

In 1914, the Forest Preserve District of Cook County, Illinois, was organized by popular vote of the citizens of the county to "hold lands containing one or more natural forests . . . for the purpose of protecting and preserving the flora, fauna and scenic beauties . . . for the purpose of the education, pleasure, and recreation of the public" (Forest Preserve District of Cook County 1921).

By 1991, the District had acquired and preserved over 27,100 hectares (67,000 acres) of land throughout Cook County (King and Zoars 1990). For administrative purposes, the entire preserve system is subdivided into 12 divisions: Calumet, Des Plaines, Indian Boundary, New, North Branch, Palos, Poplar Creek, Sag Valley, Salt Creek, Skokie, Tinley, and Thorn Creek. Detailed maps of these divisions can be obtained from the Cook County Forest Preserve District.

The preserve system is located along major stream and river systems of Cook County and roughly forms an arc parallel to the shore of Lake Michigan. According to the natural divisions of the Chicago region, as delineated by Swink and Wilhelm (1994), nearly 77% of the preserves lie in the Western Morainal Section, 21% lie in the Chicago Lake Plain Section, and 2% lie in the Bedrock Valley Section.

The Western Morainal Section is characterized by the undulating glacial deposits of the Valparaiso Moraine, which were laid down about 14,000 years ago. Glacial deposits consist mainly of clay and gravel; occasionally, granite and dolomite boulders are also found. Morainic plant communities included are mesic and dry mesic oak savannas, prairies, and mesic

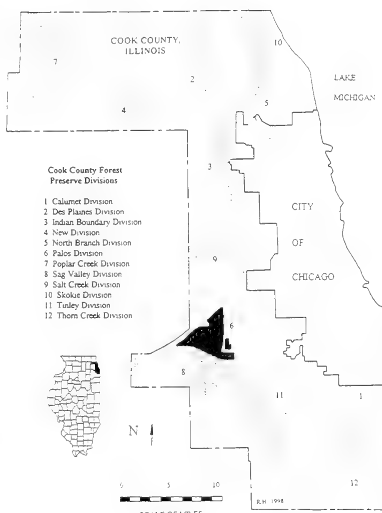

Figure 1. Palos Division

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woodlands. The Chicago Lake Plain Section is a nearly level area of land that was once covered by glacial Lake Chicago. Plant communities there include mesic prairies, marshes, and sedge meadows. The Bedrock Valley Section is represented where the dolomite bedrock has been exposed, especially along waterways, because of erosive forces that have cut through glacial deposits; plant communities represented there include fens, sedge meadows, and marshes.

Since no lichenological studies have been devoted to any of these forest preserve divisions, this project is being undertaken to document the lichen flora of each division, and to provide information on the growth forms, habitats, and relative frequency of these lichens. The 12 divisions listed above will be considered as separate study units. Voucher specimens will be collected and deposited in the herbarium at the Morton Arboretum in Lisle, Illinois. Where indicated, duplicate collections will be deposited in other herbaria. Once a species has been vouchered in one forest preserve division, the need for additional specimens will be superfluous for a number of species, particularly those that do not require chromatography or spore work.

PALOS DIVISION

The Palos Division is approximately 2,630 hectares (6,500 acres) in size and is composed of 29 individual preserves (fig. 1). It lies mainly in the Western Morainal Section of the natural divisions of the Chicago region. Elevations above mean sea level range from 182 meters (600 feet) to 220 meters (725 feet). Soils are predominantly silty, loamy clays of the Ashkum and Morley series (Mapes 1979). The Bedrock Valley Section is also represented, though to a lesser extent, along waterways, where dolomite bedrock has been exposed, or where dolomite quarries have been opened. Average elevation is about 182 meters (600 feet). Man-made features include the concrete of building foundations and road beds, wood rail fencing, and picnic tables.

MATERIALS AND METHODS

Between April 1991 and March 1996, 29 individual preserves were surveyed for their lichen flora. Spot tests for lichen chemical substances were made on collected specimens with calcium hypochlorite (C) and potassium hydroxide (KOH). Thin-layer chromatography following Culberson (1972) was used to verify secondary-product chemistry. Nomenclature follows Esslinger and Egan (1995).

Additional sets of specimens have been deposited in the herbarium at the Field Museum of Natural History in Chicago, Illinois, and at the Cook County Forest Preserve District at Camp Sagawau near Lemont, Illinois.

RESULTS

Sixty-five species of lichens in 40 genera are reported for the Palos Division forest preserves. Twenty-eight lichens are crustose in growth form, 22 are foliose, 12 are fruticose, one is gelatinous, one is squamulose, and one is umbilicate. Of the reported taxa, 17% are common, 18% are frequent, 48% are occasional, and 17% are rare. Thirty-three taxa were vouchered specifically from the Palos Division.

The exposed dolomite bedrock, granite boulders, and weathered concrete provided habitat for several lichens. Species growing on these saxicolous substrates included (on dolomite) *Caloplaca squamosa, Dermatocarpon miniatum, Placynthium nigrum, Sarcogyne regularis, Trapelia coarctata,* and *Verrucaria calkinsiana;* (on weathered concrete) *Bacidia granosa, Caloplaca feracissima, Endocarpon pusillum,* and *Lecanora dispersa;* (on granite) *Aspicilia caesiocinerea, Caloplaca sideritis,* and *Lichenothelia* sp.

In the Palos Division, many areas were farmed or grazed before inclusion in the forest preserve system. In these, the top soil has eroded down to clay, on which *Catapyrenium squamulosum, Cladonia conista, C. cristatella, C. cryptochlorophaea, C. furcata, C. peziziformis,* and *C. polycarpoides* were found, along with several vascular plants that inhabit poorer soils, such as *Antennaria plantaginifolia, Danthonia spicata, Poa compressa,* and *Potentilla simplex.*

Some lignicolous species growing on decorticate logs, weathered wood fencing, and picnic tables included *Amandinea punctata, Caloplaca holocarpa, Cladonia coniocraea, C. cylindrica, C. macilenta* var. *bacillaris, Cyphelium tigillare, Lecanora symmicta, L. umbrina,* and *Trapeliopsis flexuosa.*

Several lichens were found on trees in the woodlands. They are, however, more commonly found along sunny paths, or in open situations, where light intensities are fairly high. Some species found on the trunks and lower limbs of trees and shrubs included *Anisomeridium nyssigenum, Arthonia caesia, Candelaria concolor, Candelariella reflexa, Hyperphyscia adglutinata, Lepraria lobificans, Parmelia sulcata, Phaeophyscia pusilloides, P. rubropulchra, Physcia millegrana, P. stellaris, Punctelia rudecta,* and *Xanthoria fallax.*

An alphabetized, annotated list of the lichenized fungi found in the Palos Division follows. Generalized degree of frequency and a brief discussion of habitat is given, followed by a collection number, if applicable. All collections were made by the author, unless otherwise indicated. At the end of each entry, growth form and substrate are listed.

AMANDINEA Choisy *ex* Scheid. & H. Mayrh.

Amandinea punctata (Hoffm.) Coppins & Scheid.
Occasional; on weathered wooden picnic tables and at the bases of *Populus deltoides* and *Quercus rubra*. #370 (crustose; corticolous/lignicolous)

ANISOMERIDIUM (Müll. Arg.) Choisy

Anisomeridium nyssigenum (Ellis & Everh.) R. C. Harris
Frequent; on the trunks of *Crataegus mollis, Populus deltoides,* and *Quercus alba*. #585 (crustose; corticolous) The conidial form of this lichen, which has been called *Sarcinulella banksiae* Sutton & Alcorn, is also found here, and is occasional on the trunks of *Crataegus mollis, Quercus alba,* and *Ulmus americana*. #236 (crustose; corticolous)

ARTHONIA Ach.

Arthonia caesia (Flotow) Körber
Common; on *Cornus racemosa* and *Fraxinus americana*. #582 (crustose; corticolous)

ASPICILIA A. Massal.

Aspicilia caesiocinerea (Nyl. *ex* Malbr.) Arnold
Rare; on granite boulders along a shaded woodland creek. #736 (crustose; saxicolous)

BACIDIA De Not.

Bacidia granosa (Tuck.) Zahlbr.
Occasional; on weathered concrete. (crustose; saxicolous)

CALOPLACA Th. Fr.

Caloplaca feracissima H. Magn.
Common; on weathered concrete and dolomite, where *Endocarpon pusillum* and *Lecanora dispersa* are associates. It has even been collected from rusted metal. #657 (crustose; saxicolous)

Caloplaca holocarpa (Hoffm. *ex* Ach.) M. Wade
Occasional; on weathered wood rail fences and at the base of *Populus deltoides*. #690 (crustose; corticolous/lignicolous)

Caloplaca microphyllina (Tuck.) Hasse
Occasional; on weathered wood rail fences, wood picnic tables, and on the trunk of *Quercus rubra*. #237 (crustose; lignicolous/corticolous)

Caloplaca sideritis (Tuck.) Zahlbr.
Occasional; on granite boulders in shaded woodland ravines. #443 (crustose; saxicolous)

Caloplaca squamosa (de Lesd.) Zahlbr.
Rare; on a dolomite boulder in full sun. #580 (crustose; saxicolous)

CANDELARIA A. Massal.

Candelaria concolor (Dickson) Stein
Common; on trunks and branches of *Crataegus mollis* and *Ulmus americana,* and on weathered concrete, granite, and wood. #669 (foliose; corticolous/lignicolous/saxicolous)

Candelaria concolor var. *effusa* (Tuck.) G. Merr. & Burnham
Frequent; on trunks of *Populus deltoides* and *Ulmus americana,* and on weathered concrete. (foliose; corticolous/saxicolous)

CANDELARIELLA Müll. Arg.

Candelariella reflexa (Nyl.) Lettau
Occasional; on trunks and upper branches of *Crataegus mollis,* and on weathered wood rail fences. #733 (crustose; corticolous/lignicolous)

CATAPYRENIUM Flotow

Catapyrenium squamulosum (Ach.) Breuss
Rare; on shallow soil over dolomite with *Danthonia spicata* and *Panicum virgatum*. #583 (squamulose; terricolous)

CLADONIA P. Browne

Cladonia caespiticia (Pers.) Flörke
Rare; on a decorticate log in an oak woodland. Horn #23 (fruticose; lignicolous)

Cladonia coniocraea (Flörke) Sprengel
Occasional; on decorticate logs in shaded oak woodlands. Horn #25 (fruticose; lignicolous)

Cladonia conista A. Evans
Occasional; on weathered clay till, and at the base of *Crategus mollis*. #448 (fruticose; corticolous/terricolous)

Cladonia cristatella Tuck.
Occasional; on weathered clay in abandoned fields, on decorticate logs in oak woodlands, and on weathered wood. (fruticose; lignicolous/terricolous)

Cladonia cryptochlorophaea Asah.
Rare; on weathered clay till. #608 (fruticose; terricolous)

Cladonia cylindrica (A. Evans) A. Evans
Occasional; on decorticate logs in oak woodlands. (fruticose; lignicolous)

Cladonia furcata (Hudson) Schrader
Occasional; on sandy clay till in oak woodlands. #190 (fruticose; terricolous)

Cladonia macilenta Hoffm. var. *bacillaris* (Genth) Schaerer
Occasional; on decorticate logs in oak woodlands, often growing with *Cladonia coniocraea*. Horn #22 (fruticose; lignicolous)

Cladonia peziziformis (With.) J. R. Laundon
Occasional; on weathered clay till in abandoned farm fields, where *Danthonia spicata* is an associate. (fruticose; terricolous)

Cladonia polycarpoides Nyl.
Frequent; on weathered clay till in abandoned fields where *Danthonia spicata* is an associate. (fruticose; terricolous)

Cladonia ramulosa (With.) J. R. Laundon
Frequent, on decorticate logs in oak woodlands and at the bases of *Quercus rubra*. (fruticose; corticolous/lignicolous)

Cladonia rei Schaerer
Occasional; on decorticate logs. #630 (fruticose; lignicolous)

CYPHELIUM Ach.

Cyphelium tigillare (Ach.) Ach.
Occasional; on weathered wood rail fences. #710 (crustose; lignicolous)

DERMATOCARPON Eschw.

Dermatocarpon miniatum (L.) W. Mann
Occasional; on dolomite boulders in damp, shaded ravines and woodlands where *Leptogium cyanescens* is an associate. (umbilicate; saxicolous)

ENDOCARPON Hedwig

Endocarpon pusillum Hedwig
Common; on dolomite and weathered concrete where *Caloplaca feracissima* and *Verrucaria calkinsiana* are often associates. It has also been found growing on Styrofoam. #656 (crustose; saxicolous)

FLAVOPARMELIA Hale

Flavoparmelia caperata (L.) Hale
Occasional; on the trunk of *Ailanthus altissima* and on the upper branches of *Crataegus mollis*, *Quercus alba*, and *Q. rubra*. (foliose; corticolous)

FLAVOPUNCTELIA (Krog) Hale

Flavopunctelia flaventior (Stirton) Hale
Occasional; on the lower branches of an open grown *Crataegus mollis*. #1208 (foliose; corticolous)

Flavopunctelia soredica (Nyl.) Hale
Rare; on the trunk of *Fraxinus americana*. (foliose; corticolous)

HYPERPHYSCIA Müll. Arg.

Hyperphyscia adglutinata (Flörke) H. Mayrh. & Poelt
Frequent; on the lower branches of *Crataegus mollis* and *Ulmus americana*. #639 (foliose; corticolous)

LECANORA Ach.

Lecanora dispersa (Pers.) Sommerf.
Common; on weathered dolomite and concrete. (crustose; saxicolous)

Lecanora symmicta (Ach.) Ach.
Frequent; on the trunks of *Crataegus mollis* and *Fraxinus americana*, and on weathered wooden picnic tables. Horn #42 (crustose; corticolous/lignicolous)

Lecanora umbrina (Ach.) A. Massal.
Occasional; on weathered wood picnic tables and wood rail fences. #671 (crustose; lignicolous)

LEPRARIA Ach.

Lepraria lobificans Nyl.
Frequent; at the bases of a variety of trees including *Crataegus mollis*, *Quercus alba*, *Q. rubra*, and *Tilia americana*, and on weathered concrete and dolomite in damp woods. Horn #40 (crustose; corticolous/saxicolous)

LEPTOGIUM (Ach.) Gray

Leptogium cyanescens (Rabenh.) Körber
Occasional; on moss-covered dolomite boulders in shaded ravines, where *Dermatocarpon miniatum* is often an associate. (gelatinous; muscicolous)

LICHENOTHELIA D. Hawksw.

Lichenothelia sp. *sensu* MOR Herbarium
Frequent; on granite boulders in shaded oak woodlands. #441 (crustose; saxicolous)

MELANELIA Essl.

Melanelia subaurifera (Nyl.) Essl.
Occasional; on the lower branches of *Fraxinus americana*. (foliose; corticolous)

OPEGRAPHA Ach.

Opegrapha atra Pers.
Frequent; on the trunks of *Ulmus americana* in wooded floodplains. (crustose; corticolous)

PARMELIA Ach.

Parmelia sulcata Taylor
Common; on the trunks and branches of *Crataegus mollis* and *Rhus glabra*, and on a weathered wood rail fence. #651 (foliose; corticolous/lignicolous)

PARMOTREMA A. Massal.

Parmotrema hypotropum (Nyl.) Hale
Occasional; on the trunks of *Crataegus mollis* and *Quercus macrocarpa*. (foliose; corticolous)

PHAEOCALICIUM A. F. W. Schmidt

Phaeocalicium polyporaeum (Nyl.) Tibell
Rare; on the polyporous fungus *Trichaptum biforme*, which was growing on *Prunus serotina*. (crustose; fungicolous)

PHAEOPHYSCIA Moberg

Phaeophyscia adiastola (Essl.) Essl.
Occasional; on dolomite and mosses in shaded woodlands. (foliose; muscicolous/saxicolous)

Phaeophyscia orbicularis (Necker) Moberg
Rare; on dolomite in shaded woodlands. #660 (foliose; saxicolous)

Phaeophyscia pusilloides (Zahlbr.) Essl.
Common; on decorticate logs, and at the base of *Fraxinus americana* in moist woods.(foliose; corticolous/lignicolous)

Phaeophyscia rubropulchra (Degel.) Essl.
Common; on decorticate logs, and on the trunks of *Crataegus mollis*, *Fraxinus americana*, and *Ulmus americana*. (foliose; corticolous/lignicolous)

PHYSCIA (Schreber) Michaux

Physcia adscendens (Fr.) H. Olivier
Frequent; on the trunk of *Fraxinus americana*. (foliose; corticolous)

Physcia millegrana Degel.
Common; on the trunks and branches of *Crataegus mollis, Prunus serotina, Quercus alba, Salix nigra,* and *Ulmus americana,* and on wood rail fences. (foliose; corticolous/lignicolous)

Physcia stellaris (L.) Nyl.
Common; on the trunks and branches of *Crataegus mollis, Quercus alba, Salix nigra,* and *Ulmus americana*. (foliose; corticolous)

PHYSCIELLA Essl.

Physciella chloantha (Ach.) Essl.
Common; on the trunks of *Crataegus mollis* and *Ulmus americana,* and on weathered concrete. (foliose; corticolous/saxicolous)

PHYSCONIA Poelt

Physconia detersa (Nyl.) Poelt
Occasional; on the lower branches of *Fraxinus americana* and *Salix nigra*. (foliose; corticolous)

PLACYNTHIUM (Ach.) Gray

Placynthium nigrum (Hudson) Gray
Rare; on dolomite in an abandoned field. #1203 (crustose; saxicolous)

PROTOBLASTENIA (Zahlbr.) J. Steiner

Protoblastenia rupestris (Scop.) J. Steiner
Occasional; on dolomite rubble in open fields. (crustose; saxicolous)

PUNCTELIA Krog

Punctelia bolliana (Müll. Arg.) Krog
Occasional; on the trunk of *Quercus alba* in open woods. (foliose; corticolous)

Punctelia rudecta (Ach.) Krog
Occasional; on the trunks of *Fraxinus americana* and *Quercus alba*. (foliose; corticolous)

PYXINE Fr.

Pyxine subcinerea Stirton
Rare; on a lower branch of *Crataegus mollis*. #730 (foliose; corticolous)

SARCOGYNE Flotow

Sarcogyne regularis Körber
Occasional; on dolomite in full sun. #401 (crustose; saxicolous)

STAUROTHELE Norman

Staurothele diffractella (Nyl.) Tuck.
Occasional; on dolomite boulders in shaded ravines. (crustose; saxicolous)

THELIDIUM A. Massal.

Thelidium microcarpum (Leight.) A. L. Sm.
Occasional; on weathered limestone, concrete mortar, and on dolomite in shaded woods. #352 (crustose; saxicolous)

TRAPELIA Choisy

Trapelia coarctata (Sm.) Choisy
Occasional; on dolomite gravel in open fields with *Sarcogyne regularis* and *Verrucaria calkinsiana*. (crustose; saxicolous)

TRAPELIOPSIS Hertel & Gotth. Schneider

Trapeliopsis flexuosa (Fr.) Coppins & P. James
Occasional; on weathered wood rail fences and dry-rotted logs. (crustose; lignicolous)

VERRUCARIA Schrader

Verrucaria calkinsiana Servít
Frequent; on weathered concrete with *Caloplaca feracissima* and *Endocarpon pusillum*, and on dolomite with *Protoblastenia rupestris*, *Sarcogyne regularis,* and *Trapelia coarctata*. (crustose; saxicolous)

XANTHORIA (Fr.) Th. Fr.

Xanthoria fallax (Hepp) Arnold
Frequent; on the trunks of *Fraxinus americana* and *Ulmus americana,* and on weathered wood rail fences. (foliose; corticolous/lignicolous)

PALOS DIVISION LICHEN CHECKLIST

Belly Deep Slough
(SW S10 T37N R12E)
Amandinea punctata
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Cladonia cylindrica
Cladonia rei
Endocarpon pusillum
Lecanora dispersa
Parmelia sulcata
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Punctelia rudecta
Trapeliopsis flexuosa

Buffalo Woods East
(W S34 T38N R12E)
Arthonia caesia
Aspicilia caesiocinerea
Caloplaca feracissima
Caloplaca sideritis
Candelaria concolor
Cladonia conista
Cladonia polycarpoides
Cladonia ramulosa
Cladonia rei
Endocarpon pusillum
Lecanora dispersa
Lichenothelia sp.
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physciella chloantha
Verrucaria calkinsiana

Buffalo Woods West
(SE S33 T38N R12E and
SW S34 T38N R12E)
Anisomeridium nyssigenum
Arthonia caesia
Caloplaca sideritis
Candelaria concolor
Candelaria concolor var. effusa
Cladonia polycarpoides
Endocarpon pusillum
Lepraria lobificans
Lichenothelia sp.
Parmelia sulcata
Physcia adscendens
Physcia millegrana
Physciella chloantha
Trapeliopsis flexuosa
Verrucaria calkinsiana

Bull Frog Lake/Pulaski Woods
(E S7 T37N R12E)
Caloplaca feracissima
Candelaria concolor
Cladonia ramulosa
Endocarpon pusillum
Hyperphyscia adglutinata
Lecanora dispersa
Lepraria lobificans
Lichenothelia sp.
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Verrucaria calkinsiana
Xanthoria fallax

Buttonbush Slough
(NW S10 T37N R12E)
Anisomeridium nyssigenum
Bacidia granosa
Candelaria concolor
Candelaria concolor var. effusa
Cladonia cristatella
Cladonia furcata
Cladonia peziziformis
Cladonia polycarpoides
Hyperphyscia adglutinata
Opegrapha atra
Phaeophyscia pusilloides
Physcia millegrana
Physcia stellaris
Physconia detersa
Verrucaria calkinsiana

Columbia Woods
(NW S5 T37N R12E and
SE S32 T38N R12E)
Amandinea punctata
Bacidia granosa
Caloplaca feracissima
Candelaria concolor
Cladonia ramulosa
Endocarpon pusillum
Flavoparmelia caperata
Hyperphyscia adglutinata
Lecanora dispersa
Lecanora umbrina
Lepraria lobificans
Lichenothelia sp.
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physciella chloantha
Sarcogyne regularis

Country Lane Woods/Cranberry Slough Nature Preserve
(E S9 T37N R12E)
Anisomeridium nyssigenum
Arthonia caesia
Bacidia granosa
Caloplaca feracissima
Caloplaca sideritis
Candelaria concolor
Candelaria concolor var. effusa
Candelariella reflexa
Cladonia coniocraea
Cladonia macilenta var. bacillaris
Cladonia polycarpoides
Cladonia ramulosa
Cladonia rei
Endocarpon pusillum
Flavopunctelia flaventior
Lecanora dispersa
Lepraria lobificans
Lichenothelia sp.
Opegrapha atra
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Punctelia bolliana
Punctelia rudecta
Verrucaria calkinsiana
Xanthoria fallax

Crawdad Slough
(NW S9 T37N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelariella reflexa
Endocarpon pusillum
Flavopunctelia soredica
Hyperphyscia adglutinata
Lecanora dispersa

Lecanora symmicta
Lecanora umbrina
Parmelia sulcata
Parmotrema hypotropum
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Punctelia rudecta
Xanthoria fallax

Crooked Creek Woods
(SW S10 T37N R12E and
NW S15 T37N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Cladonia coniocraea
Cladonia conista
Cladonia peziziformis
Cladonia ramulosa
Endocarpon pusillum
Lecanora dispersa
Lecanora symmicta
Lepraria lobificans
Lichenothelia sp.
Opegrapha atra
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Xanthoria fallax

Dan McMahon Woods
(SW S16 T37N R12E)
Arthonia caesia
Caloplaca microphyllina
Candelaria concolor
Candelaria concolor var. effusa
Cyphelium tigillare
Endocarpon pusillum
Lecanora dispersa
Melanelia subaurifera
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Physconia detersa
Xanthoria fallax

Henry DeTonty Woods
(NW S7 T37N R12E)
Bacidia granosa
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Flavoparmelia caperata
Lecanora dispersa
Lichenothelia sp.
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Verrucaria calkinsiana

Hickory Hills Woods
(NW S11 T37N R12E)
Anisomeridium nyssigenum
Bacidia granosa
Caloplaca feracissima
Caloplaca microphyllina
Candelaria concolor
Cladonia polycarpoides
Cladonia ramulosa
Endocarpon pusillum
Hyperphyscia adglutinata
Lecanora dispersa
Lichenothelia sp.
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Xanthoria fallax

Hidden Pond Woods
(SW S3 T37N R12E)
Amandinea punctata
Anisomeridium nyssigenum
Arthonia caesia
Caloplaca feracissima
Caloplaca microphyllina
Candelaria concolor
Candelariella reflexa
Cladonia coniocraea
Cladonia conista
Cladonia macilenta var. bacillaris
Cladonia polycarpoides
Cladonia ramulosa
Cladonia rei
Endocarpon pusillum
Lecanora dispersa
Lecanora symmicta
Parmelia sulcata
Physcia millegrana
Physcia stellaris
Physciella chloantha

Horsecollar Slough/Tomahawk Slough
(S S7 T37N R12E)
Anisomeridium nyssigenum
Caloplaca feracissima
Candelaria concolor
Cladonia coniocraea
Cladonia cristatella
Cladonia cylindrica
Cladonia ramulosa
Endocarpon pusillum
Flavoparmelia caperata
Lecanora dispersa
Lepraria lobificans
Lichenothelia sp.
Opegrapha atra
Phaeophyscia rubropulchra
Physcia millegrana

Illinois and Michigan Canal Bike Path
(NE S5 T37N R12E and
NW S7 T37N R12E)
Caloplaca feracissima
Caloplaca squamosa
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Opegrapha atra
Phaeophyscia adiastola
Phaeophyscia pusilloides
Physcia millegrana
Physciella chloantha

Joe's Pond
(SE S8 T37N R12E and
NE S17 T37N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Hyperphyscia adglutinata
Lecanora dispersa
Parmelia sulcata
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Verrucaria calkinsiana
Xanthoria fallax

Little Red Schoolhouse/Long John Slough
(E S8 T37N R12E)
Amandinea punctata
Caloplaca feracissima
Caloplaca holocarpa
Caloplaca microphyllina
Candelaria concolor
Candelaria concolor var. effusa
Candelariella reflexa
Cladonia cristatella
Endocarpon pusillum
Hyperphyscia adglutinata
Lecanora dispersa
Lecanora symmicta
Parmelia sulcata
Phaeocalicium polyporaeum
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Physconia detersa
Punctelia rudecta
Trapeliopsis flexuosa
Xanthoria fallax

Maple Lake
(N S8 T37N R12E)
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Lecanora symmicta
Parmelia sulcata
Phaeophyscia pusilloides
Physcia millegrana
Physciella chloantha
Xanthoria fallax

Morill Meadow
(SE S16 T37N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Cyphelium tigillare
Endocarpon pusillum
Hyperphyscia adglutinata
Lecanora dispersa
Lecanora symmicta
Melanelia subaurifera
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Sarcogyne regularis
Verrucaria calkinsiana
Xanthoria fallax

Palos Fen Nature Preserve
(NE S15 T37N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Candelariella reflexa
Cladonia conista
Cladonia cristatella
Cladonia macilenta var. bacillaris
Cladonia peziziformis
Cladonia polycarpoides
Dermatocarpon miniatum
Endocarpon pusillum
Flavoparmelia caperata
Flavopunctelia flaventior
Hyperphyscia adglutinata
Lecanora symmicta
Lepraria lobificans
Lichenothelia sp.
Melanelia subaurifera
Parmelia sulcata
Parmotrema hypotropum
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Sarcogyne regularis
Trapeliopsis flexuosa
Trapelia coarctata
Verrucaria calkinsiana
Xanthoria fallax

Paw Paw Woods Nature Preserve
(SW S5 T37N R12E)
Anisomeridium nyssigenum
Arthonia caesia
Bacidia granosa
Candelaria concolor
Cladonia coniocraea
Cladonia conista
Cladonia cylindrica
Cladonia macilenta var. bacillaris
Cladonia peziziformis
Cladonia polycarpoides
Cladonia ramulosa
Dermatocarpon miniatum
Endocarpon pusillum
Flavoparmelia caperata
Hyperphyscia adglutinata
Lepraria lobificans
Leptogium cyanescens
Lichenothelia sp.
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Protoblastena rupestris
Pxyine subcinerea
Staurothele diffractella
Verrucaria calkinsiana

Pioneer Woods/Tuma Lake
(N S16 T37N R12E)
Amandinea punctata
Anisomeridium nyssigenum
Arthonia caesia
Caloplaca feracissima
Caloplaca holocarpa
Caloplaca microphyllina
Candelaria concolor
Candelariella reflexa
Cladonia cristatella
Cladonia cryptochlorophaea
Cladonia peziziformis
Cladonia polycarpoides
Endocarpon pusillum
Lecanora dispersa
Lecanora symmicta
Lecanora umbrina
Lepraria lobificans
Leptogium cyanescens
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Punctelia bolliana
Sarcogyne regularis
Trapeliopsis flexuosa
Verrucaria calkinsiana

Red Gate Woods
(NW S7 T37N R12E)
Caloplaca feracissima
Candelaria concolor
Cladonia coniocraea

Cladonia polycarpoides
Cladonia ramulosa
Endocarpon pusillum
Lecanora dispersa
Lepraria lobificans
Lichenothelia sp.
Melanelia subaurifera
Opegrapha atra
Physcia millegrana
Physciella chloantha
Punctelia rudecta
Verrucaria calkinsiana

Red Wing Slough
(NW S10 T37N R12E)
Candelaria concolor
Endocarpon pusillum
Hyperphyscia adglutinata
Opegrapha atra
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha

Saganashkee Slough
(N & SE S17 T37N R12E and
N S18 T37N R12E)
Arthonia caesia
Caloplaca feracissima
Caloplaca microphyllina
Candelaria concolor
Endocarpon pusillum
Hyperphyscia adglutinata
Lecanora dispersa
Opegrapha atra
Phaeophyscia pusilloides
Physcia millegrana
Physcia stellaris
Physciella chloantha
Xanthoria fallax

Spears Woods/Boomerang Slough/Hogwash Slough
(W S3 T37N R12E and
E S4 T37N R12E)
Amandinea punctata
Anisomeridium nyssigenum
Arthonia caesia
Bacidia granosa
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Candelariella reflexa
Cladonia caespiticia
Cladonia cylindrica
Cladonia macilenta var. bacillaris
Cladonia peziziformis
Cladonia polycarpoides
Cladonia ramulosa
Endocarpon pusillum
Flavopunctelia flaventior
Lecanora dispersa
Lepraria lobificans
Melanelia subaurifera
Opegrapha atra
Parmelia sulcata
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physconia detersa
Punctelia bolliana
Punctelia rudecta
Sarcogyne regularis
Thelidium microcarpon
Trapelia coarctata
Trapeliopsis flexuosa
Verrucaria calkinsiana

White Oak Woods
(SW S10 T37N R12E)
Anisomeridium nyssigenum
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Cladonia furcata
Cladonia polycarpoides
Endocarpon pusillum
Lecanora dispersa
Lepraria lobificans
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Xanthoria fallax

Willow Springs Woods/Katydid Prairie
(W S4 T37N R12E)
Amandinea punctata
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Cladonia cristatella
Cladonia furcata
Cladonia polycarpoides
Cladonia ramulosa
Endocarpon pusillum
Lecanora dispersa
Lepraria lobificans
Lichenothelia sp.
Parmelia sulcata
Phaeophyscia adiastola
Phaeophyscia orbicularis
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Protoblastenia rupestris
Punctelia rudecta
Thelidium microcarpon
Xanthoria fallax

Wolf Road Woods
(SW S8 T37N R12E and
SE S7 T37N R11E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Catapyrenium lachneum
Cladonia peziziformis
Cladonia ramulosa
Endocarpon pusillum
Lecanora dispersa
Lecanora symmicta
Lepraria lobificans
Lichenothelia sp.
Opegrapha atra
Parmelia sulcata
Phaeophyscia adiastola
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Placynthium nigrum
Protoblastenia rupestris
Sarcogyne regularis
Staurothele diffractella
Verrucaria calkinsiana

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THE LICHEN FLORA OF THE COOK COUNTY FOREST PRESERVES PART II: SAG VALLEY DIVISION

Richard D. Hyerczyk[1]

ABSTRACT: Seventy-seven species of lichens are reported for the Forest Preserve District of Cook County's Sag Valley Division, of which 54 were vouchered. An annotated species list is provided, as well as checklists for the individual preserves within this division.

INTRODUCTION

This is the second paper in the series that started with Hyerczyk (1998), a project to document the lichenized fungi found in the 12 divisions of the Forest Preserve District of Cook County, Illinois.

SAG VALLEY DIVISION

The Sag Valley Division is approximately 3,642 hectares (9,000 acres) in size and comprises 19 individual preserves (fig. 1). It lies mainly in the Western Morainal Section of the natural divisions of the Chicago region (Swink and Wilhelm 1994). Elevations above mean sea level range from 180 meters (600 feet) to 220 meters (725 feet). The silty, loamy, clay soils are predominantly of the Ashkum and Morley series (Mapes 1979). Morainic plant communities include oak savannas, mesic woodlands, old fields, sloughs, and prairies. The Bedrock Valley Section is represented where dolomite is exposed along waterways. Average elevation is about 182 meters (600 feet). Plant communities include fens, marshes, and sedge meadows. Man-made features include the concrete of building foundations and road beds, gravel pits and dolomite quarries, wood fencing, and picnic tables.

MATERIALS AND METHODS

Between April 1991 and March 1996, 19 individual preserves were surveyed for their lichen flora. Specimens were identified following methods described in Hyerczyk (1998). In addition to the specimens deposited at the Morton Arboretum herbarium, duplicate sets were deposited at the Field Museum of Natural History, Chicago, Illinois, and at the Cook County Forest Preserve District at Camp Sagawau near

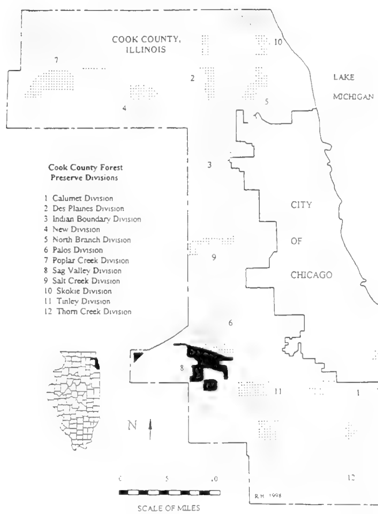

Figure 1. Sag Valley Division

[1] 5204 S. Natoma, Chicago, Illinois 60638

Lemont, Illinois. Nomenclature follows Esslinger and Egan (1995).

RESULTS

Seventy-seven species of lichens in 45 genera are reported for the Sag Valley Division. Thirty-five lichens are crustose in growth form, 21 are foliose, 16 are fruticose, 2 are gelatinous, one is squamulose, one is umbilicate, and one is veined. Of the reported taxa, 16% are common, 10% are frequent, 36% are occasional, and 38% are rare. Fifty-four taxa were vouchered specifically from the Sag Valley Division.

Several species were found on dolomite boulders and in old quarries, including *Bacidia granosa, Caloplaca flavovirescens, Dermatocarpon miniatum, Lecanora muralis, Leptogium cyanescens, Protoblastenia rupestris, Sarcogyne regularis, Thelidium microcarpum, Trapelia coarctata,* and *Verrucaria calkinsiana.* Some rarer species found in a dolomite canyon at Sagawau Nature Preserve included *Caloplaca citrina, Collema bachmanianum, Lecanora rupicola, Lepraria lesdainii,* and *Staurothele diffractella.*

Some species growing on weathered concrete in the picnic areas and parking lots included *Bacidia granosa, Caloplaca feracissima, Endocarpon pusillum, Lecanora dispersa,* and *Verrucaria calkinsiana.* As in other divisions, these species were usually found on man-made materials.

A few lignicolous species found on weathered wood rail fencing and picnic tables included *Cyphelium tigillare, Thelocarpon laureri,* and *Trapeliopsis flexuosa.* Some species growing on decorticate logs in shaded oak woodlands included *Cladonia cylindrica, C. macilenta* var. *bacillaris,* and *C. ramulosa.*

Some species were found on the trunks and lower branches of several species of trees, including *Arthonia caesia, Candelaria concolor, Flavoparmelia caperata, Lepraria lobificans, Melanelia subaurifera, Opegrapha atra, Parmelia sulcata, Phaeophyscia pusilloides, P. rubropulchra, Physcia millegrana, P. stellaris, Punctelia rudecta,* and *Xanthoria fallax.* As with other divisions, most of these lichens were found in the sunnier locations, especially along the edges of woodlands.

In old fields where the top soil has eroded to clay, some rarer taxa were found, including *Cladina arbuscula, Cladonia cervicornis* subsp. *verticillata,* and *C. pleurota.* More common species found in these same habitats included *Catapyrenium squamulosum, Cladonia cristatella, C. peziziformis,* and *C. polycarpoides.*

An alphabetized, annotated list of the lichenized fungi found in the Sag Valley Division follows. Generalized degree of frequency and a brief discussion of habitat is given, followed by a collection number, if applicable. All collections were made by the author, unless otherwise indicated. At the end of each entry, growth form and substrate are listed.

AMANDINEA Choisy *ex* Scheid. & H. Mayrh.

Amandinea punctata (Hoffm.) Coppins & Scheid.
Occasional; on weathered wooden picnic tables. (crustose; lignicolous)

ANISOMERIDIUM (Müll. Arg.) Choisy

Anisomeridium nyssigenum (Ellis & Everh.) R. C. Harris
Frequent; on the trunks of *Crataegus mollis, Populus deltoides,* and *Quercus alba.* (crustose; corticolous)
The conidial form of this lichen, which has been called *Sarcinulella banksiae* Sutton & Alcorn, is also found here, and is occasional on the trunks of *Crataegus mollis, Quercus alba,* and *Ulmus americana.* (crustose; corticolous)

ARTHONIA Ach.

Arthonia caesia (Flotow) Körber
Common; on *Cornus racemosa* and *Fraxinus americana.* (crustose; corticolous)

BACIDIA De Not.

Bacidia granosa (Tuck.) Zahlbr.
Occasional; on a shaded dolomitic canyon wall, dolomite pebbles, and on weathered concrete. Masters #26 (crustose; saxicolous)

BACIDINA Vězda

Bacidina egenula (Nyl.) Vězda
Occasional; on a shaded dolomitic canyon wall and on dolomite pebbles. Masters #29 (crustose; saxicolous)

CALOPLACA Th. Fr.

Caloplaca citrina (Hoffm.) Th. Fr.
Rare; on a shaded dolomitic canyon wall. Masters #28 (crustose; saxicolous)

Caloplaca feracissima H. Magn.
Common; on weathered concrete and dolomite where *Endocarpon pusillium* and *Lecanora dispersa* are associates. (crustose; saxicolous)

Caloplaca flavovirescens (Wulfen) Dalla Torre & Sarnth.
Rare; on weathered dolomite in a shaded ravine with *Dematocarpon miniatum.* #709 (crustose; saxicolous)

Caloplaca microphyllina (Tuck.) Hasse
Occasional; on weathered wood rail fences, wood picnic tables, and on the trunk of *Quercus rubra*. (crustose; lignicolous/corticolous)

Caloplaca sideritis (Tuck.) Zahlbr.
Rare; on a granite boulder in a shaded woodland ravine. (crustose; saxicolous)

Caloplaca vitellinula (Nyl.) H. Olivier
Rare; on weathered concrete. Horn #45 (crustose; saxicolous)

CANDELARIA A. Massal.

Candelaria concolor (Dickson) Stein
Common; on the trunks and branches of *Crataegus mollis* and *Ulmus americana*, and on weathered concrete, granite, and wood. (foliose; corticolous/lignicolous/-saxicolous)

Candelaria concolor var. *effusa* (Tuck.) G. Merr. & Burnham
Frequent; on the trunks of *Populus deltoides* and *Ulmus americana*, and on weathered concrete and wood. #414 (foliose; corticolous/lignicolous/saxicolous)

CANDELARIELLA Müll. Arg.

Candelariella reflexa (Nyl.) Lettau
Rare; on the trunks and upper branches of *Crataegus mollis*. (crustose; corticolous)

CATAPYRENIUM Flotow

Catapyrenium squamulosum (Ach.) Breuss
Rare; on shallow soil over dolomite with *Danthonia spicata* and *Panicum virgatum*. (squamulose; terricolous)

CLADINA Nyl.

Cladina arbuscula (Wallr.) Hale & Culb.
Rare; on weathered clay till in an abandoned farm field growing with *Cladonia cervicornis* subsp. *verticillata*, *C. peziziformis*, and *C. polycarpoides*. #1279 (fruticose; terricolous)

CLADONIA P. Browne

Cladonia cervicornis (Ach.) Flotow subsp. *verticillata* (Hoffm.) Ahti
Rare; on weathered clay till in an old farm field. #1278 (fruticose; terricolous)

Cladonia coniocraea (Flörke) Sprengel
Occasional; on decorticate logs in shaded oak woodlands. (fruticose; lignicolous)

Cladonia conista A. Evans
Occasional; on weathered clay till. (fruticose; terricolous)

Cladonia cristatella Tuck.
Occasional; on weathered clay in abandoned fields and on decorticate logs in oak woodlands. Horn #34 (fruticose; lignicolous/terricolous)

Cladonia cylindrica (A. Evans) A. Evans
Rare; on a decorticate log in an oak woodland. #16 (fruticose; lignicolous)

Cladonia furcata (Hudson) Schrader
Rare; on sandy clay till in an oak woodland. (fruticose; terricolous)

Cladonia grayi G. Merr. *ex* Sandst.
Rare; on weathered clay till and old wood. Horn #33 (fruticose; lignicolous/terricolous)

Cladonia macilenta Hoffm. var. *bacillaris* (Genth) Schaerer
Occasional; on decorticate logs in mesic oak woodlands. (fruticose; lignicolous)

Cladonia peziziformis (With.) J. R. Laundon
Occasional; on weathered clay till in abandoned farm fields where *Danthonia spicata* is an associate. It has also been collected from a discarded sock. #615 (fruticose; terricolous)

Cladonia piedmontensis G. Merr.
Occasional; on weathered clay till. Horn #36 (fruticose; terricolous)

Cladonia pleurota (Flörke) Schaerer
Rare; on weathered clay till. #610 (fruticose; terricolous)

Cladonia polycarpoides Nyl.
Occasional; on weathered clay till in abandoned fields where *Danthonia spicata* is an associate. Horn #28 (fruticose; terricolous)

Cladonia ramulosa (With.) J. R. Laundon
Occasional; on decorticate logs in oak woodlands and at the base of *Quercus rubra*. #16A (fruticose; corticolous/lignicolous)

Cladonia rei Schaerer
Rare; on the lower branches of *Crataegus mollis*. #630 (fruticose; corticolous)

COLLEMA F. H. Wigg.

Collema bachmanianum (Fink) Degel.
Rare; on moss-covered dolomite. #603 (gelatinous; muscicolous)

CYPHELIUM Ach.

Cyphelium tigillare (Ach.) Ach.
Rare; on an old tree branch. (crustose; lignicolous)

DERMATOCARPON Eschw.

Dermatocarpon miniatum (L.) W. Mann
Occasional; on dolomite boulders in damp, shaded ravines and woodlands where *Leptogium cyanescens* is an associate. Masters #33 (umbilicate; saxicolous)

ENDOCARPON Hedwig

Endocarpon pusillum Hedwig

Common; on dolomite and weathered concrete where *Caloplaca feracissima* and *Verrucaria calkinsiana* are often associates. (crustose; saxicolous)

EVERNIA Ach.

Evernia mesomorpha Nyl.

Rare; on a lower branch of *Carya cordiformis*. Horn *s.n.* 1990 (fruticose; corticolous)

FLAVOPARMELIA Hale

Flavoparmelia caperata (L.) Hale

Occasional; on the trunks and upper branches of *Crataegus mollis*, *Quercus alba*, and *Q. rubra*. Horn #30A (foliose; corticolous)

FLAVOPUNCTELIA (Krog) Hale

Flavopunctelia soredica (Nyl.) Hale

Rare; on a lower branch of *Carya cordiformis*. Horn #30 (foliose; corticolous)

HYPERPHYSCIA Müll. Arg.

Hyperphyscia adglutinata (Flörke) H. Mayrh. & Poelt

Frequent; on the trunks and lower branches of *Crataegus mollis* and *Ulmus americana*. (foliose; corticolous)

LECANORA Ach.

Lecanora dispersa (Pers.) Sommerf.

Common; on weathered dolomite and concrete. #436 (crustose; saxicolous)

Lecanora muralis (Schreber) Rabenh.

Rare; on dolomite in an old quarry. Horn #46 (crustose; saxicolous)

Lecanora rupicola (L.) Zahlbr.

Rare; on a dolomitic canyon wall. Masters #27 (crustose; saxicolous)

Lecanora symmicta (Ach.) Ach.

Occasional; on the trunks of *Crataegus mollis* and *Fraxinus amercana*, and on weathered wooden picnic tables. (crustose; corticolous/lignicolous)

Lecanora umbrina (Ach.) A. Massal.

Rare; on a weathered wooden picnic table. (crustose; lignicolous)

LEPRARIA Ach.

Lepraria lesdainii (Hue) R. C. Harris

Rare; on a dolomitic canyon wall. Masters #34 (crustose; saxicolous)

Lepraria lobificans Nyl.

Frequent; at the bases of a variety of trees, including *Crataegus mollis*, *Quercus alba*, *Q. rubra*, and *Tilia americana*, and on weathered concrete and dolomite in damp woods. (crustose; corticolous/ saxicolous)

Lepraria sp. #1 *sensu* MOR Herbarium

Rare; at the base of *Quercus rubra* in a closed woodland. #111 (crustose; corticolous)

LEPTOGIUM (Ach.) Gray

Leptogium cyanescens (Rabenh.) Körber

Occasional; on moss-covered dolomite boulders in shaded ravines where *Dermatocarpon miniatum* is often an associate. #604 (gelatinous; saxicolous)

LICHENOTHELIA D. Hawksw.

Lichenothelia sp. *sensu* MOR Herbarium

Occasional; on granite boulders in shaded oak woodlands. (crustose; saxicolous)

MELANELIA Essl.

Melanelia subaurifera (Nyl.) Essl.

Rare; on a lower branch of *Carya cordiformis*. Horn #31 (foliose; corticolous)

MYELOCHROA (Asah.) Elix & Hale

Myelochroa aurulenta (Tuck.) Elix & Hale

Rare; on the trunk of *Juglans nigra* in a mesic woodland. #1384 (foliose; corticolous)

OPEGRAPHA Ach.

Opegrapha atra Pers.

Occasional; on the trunk of *Ulmus americana* in wooded floodplains. #189 (crustose; corticolous)

PARMELIA Ach.

Parmelia sulcata Taylor

Common; on the trunks and branches of *Crataegus mollis* and *Rhus glabra*, and on weathered wood rail fences. (foliose; corticolous/lignicolous)

PARMOTREMA A. Massal.

Parmotrema hypotropum (Nyl.) Hale

Occasional; on the trunks of *Crataegus mollis*, *Fraxinus americana*, *Quercus macrocarpa*, and on a weathered wood rail fence. #726 (foliose; corticolous/lignicolous)

PELTIGERA Willd.

Peltigera rufescens (Weiss) Humb.

Occasional; on clay beneath *Viburnum rafinesquianum* with the moss *Thuidium delicatulum*. #1206 (veined; terricolous)

PHAEOCALICIUM A. F. W. Schmidt

Phaeocalicium polyporaeum (Nyl.) Tibell

Rare; on the polyporous fungus, *Trichaptum biforme*, which was growing on *Prunus serotina*. #1428 (crustose; fungicolous)

PHAEOPHYSCIA Moberg

Phaeophyscia adiastola (Essl.) Essl.
Occasional; on dolomite and mosses in shaded woods. #594 (foliose; muscicolous/saxicolous)

Phaeophyscia pusilloides (Zahlbr.) Essl.
Common; on decorticate logs and at the base of *Fraxinus americana* in moist woods. Horn #26 (foliose; corticolous/lignicolous)

Phaeophyscia rubropulchra (Degel.) Essl.
Common; on decorticate logs and on the trunks of *Crataegus mollis*, *Fraxinus americana*, and *Ulmus americana*. Horn #32 (foliose; corticolous/lignicolous)

PHYSCIA (Schreber) Michaux

Physcia adscendens (Fr.) H. Olivier
Frequent; on the trunk of *Salix nigra*. #439 (foliose; corticolous)

Physcia americana G. Merr.
Rare; on the trunk of *Juglans nigra* in a mesic woodland. #1105 (foliose; corticolous)

Physcia millegrana Degel.
Common; on the trunks and branches of *Crataegus mollis, Prunus serotina, Quercus alba, Salix nigra,* and *Ulmus americana,* and wood rail fences. #432 (foliose; corticolous/lignicolous)

Physcia stellaris (L.) Nyl.
Common; on the trunks and branches of *Crataegus mollis, Quercus alba, Salix nigra,* and *Ulmus americana.* #629 (foliose; corticolous)

PHYSCIELLA Essl.

Physciella chloantha (Ach.) Essl.
Common; on the trunks of *Crategus mollis* and *Ulmus americana* and on weathered concrete. #714 (foliose; corticolous/saxicolous)

PHYSCONIA Poelt

Physconia detersa (Nyl.) Poelt
Occasional; on the lower branches of *Fraxinus americana* and *Salix nigra*. Horn #43A (foliose; corticolous)

POLYSPORINA Vězda

Polysporina simplex (Davies) Vězda
Rare, on a granite monument at Sagawau Canyon Nature Preserve. #743 (crustose; saxicolous)

PROTOBLASTENIA (Zahlbr.) J. Steiner

Protoblastenia rupestris (Scop.) J. Steiner
Occasional; on dolomite rubble in open fields. #415 (crustose; saxicolous)

PUNCTELIA Krog

Punctelia bolliana (Müll. Arg.) Krog
Occasional; on the trunk of *Quercus alba* in open woods. #51 (foliose; corticolous)

Punctelia rudecta (Ach.) Krog
Frequent; on a wood rail fence and on the trunks of *Fraxinus americana* and *Quercus alba*. Horn #39 (foliose; corticolous/lignicolous)

SARCOGYNE Flotow

Sarcogyne regularis Körber
Frequent; on dolomite in full sun. (crustose; saxicolous)

STAUROTHELE Norman

Staurothele diffractella (Nyl.) Tuck.
Rare; on a dolomitic canyon wall. #600 (crustose; saxicolous)

THELIDIUM A. Massal.

Thelidium microcarpum (Leight.) A. L. Sm.
Occasional; on weathered limestone, concrete mortar, and on dolomite in shaded woods. (crustose; saxicolous)

THELOCARPON Nyl. *ex* Hue

Thelocarpon laureri (Flotow) Nyl.
Occasional; on a weathered wooden picnic table. #624 (crustose; lignicolous)

TRAPELIA Choisy

Trapelia coarctata (Sm.) Choisy
Occasional; on dolomite gravel in open fields with *Sarcogyne regularis* and *Verrucaria calkinsiana*. #405 (crustose; saxicolous)

TRAPELIOPSIS Hertel & Gotth. Schneider

Trapeliopsis flexuosa (Fr.) Coppins & P. James
Occasional; on weathered wood rail fences and dry-rotted logs. #646 (crustose; lignicolous)

VERRUCARIA Schrader

Verrucaria calkinsiana Servít
Common; on weathered concrete with *Caloplaca feracissima* and *Endocarpon pusillum*, and on dolomite with *Protoblastenia rupestris*, *Sarcogyne regularis,* and *Trapelia coarctata*. #402 (crustose; saxicolous)

Verrucaria nigrescens Pers.
Rare; on dolomite in an old quarry. #587 (crustose; saxicolous)

XANTHORIA (Fr.) Th. Fr.

Xanthoria fallax (Hepp) Arnold
Frequent; on the trunks of *Fraxinus americana, Quercus alba,* and *Ulmus americana,* and on weathered wood rail fences. #428 (foliose; corticolous/lignicolous)

SAG VALLEY DIVISION LICHEN CHECKLIST

Bergman Slough/Prairie
(S S19 T37N R12E and
N S30 T37N R12E)
Arthonia caesia
Candelaria concolor
Cladonia cristatella
Cladonia macilenta var. bacillaris
Cladonia peziziformis
Cladonia piedmontensis
Cladonia pleurota
Cladonia polycarpoides
Endocarpon pusillum
Parmelia sulcata
Physcia millegrana
Physcia stellaris
Physciella chloantha
Sarcogyne regularis
Trapelia coarctata
Verrucaria calkinsiana

Black Partridge Fen
(N S19 T37N R11E and
NW S20 T37N R11E)
Candelaria concolor
Candelaria concolor var. effusa
Endocarpon pusillum
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Thelidium microcarpum

Black Partridge Woods Nature Preserve
(NW S19 T37N R11E)
Anisomeridium nyssigenum
Arthonia caesia
Caloplaca feracissima
Caloplaca flavovirescens
Candelaria concolor
Cladonia polycarpoides
Cladonia ramulosa
Dermatocarpon miniatum
Endocarpon pusillum
Lepraria lobificans
Lepraria sp.#1
Parmelia sulcata
Peltigera rufescens
Phaeophyscia adiastola
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Physconia detersa
Protoblastenia rupestris
Thelidium microcarpum
Verrucaria calkinsiana
Xanthoria fallax

Bouncing Bet Slough/Ground Hog Slough
(SW S27 T37N R12E and
N S34 T37N R12E)
Arthonia caesia
Bacidina egenula
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Cladonia polycarpoides
Endocarpon pusillum
Hyperphyscia adglutinata
Lecanora dispersa
Phaeophyscia pusilloides
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Sarcogyne regularis
Verrucaria calkinsiana

Cap Sauers Holding Nature Preserve
(S19 T37N R12E,
S20 T37N R12E,
NE S24 T37N R11E, and
N S29 T37N R12E)
Amandinea punctata
Anisomeridium nyssigenum
Arthonia caesia
Caloplaca feracissima
Caloplaca sideritis
Candelaria concolor
Candelaria concolor var. effusa
Candelariella reflexa
Catapyrenium squamulosum
Cladonia coniocraea
Cladonia conista
Cladonia cristatella
Cladonia furcata
Cladonia macilenta var. bacillaris
Cladonia peziziformis
Cladonia polycarpoides
Cladonia ramulosa
Cladonia rei
Cyphelium tigillare
Endocarpon pusillum
Flavoparmelia caperata
Hyperphyscia adglutinata
Lecanora dispersa
Lecanora symmicta
Lepraria lobificans
Lichenothelia sp.
Opegrapha atra
Parmelia sulcata
Parmotrema hypotropum
Peltigera rufescens
Phaeocalicium polyporaeum
Phaeophyscia adiastola
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia americana
Physcia millegrana
Physcia stellaris
Physciella chloantha
Physconia detersa
Protoblastenia rupestris
Punctelia bolliana
Punctelia rudecta
Sarcogyne regularis
Thelidium microcarpum
Trapelia coarctata
Trapeliopsis flexuosa
Verrucaria calkinsiana
Xanthoria fallax

Cherry Hill Woods
(SW S21 T37N R12E and
NW S28 T37N R12E)
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Hyperphyscia adglutinata
Lecanora dispersa
Parmelia sulcata
Phaeophyscia pusilloides
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Punctelia rudecta
Xanthoria fallax

Forty Acres Woods
(NW S27 T37N R12E)
Anisomeridium nyssigenum
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Lepraria lobificans
Phaeophyscia pusilloides
Physcia millegrana
Verrucaria calkinsiana

Horsetail Lake
(NW S28 T37N R12E)
Amandinea punctata
Ansomeridium nyssigenum
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Cladonia coniocraea
Endocarpon pusillum
Hyperphyscia adglutinata
Lecanora dispersa
Lepraria lobificans
Parmelia sulcata
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physciella chloantha
Punctelia rudecta
Sarcogyne regularis
Thelocarpon laureri
Trapelia coarctata
Trapeliopsis flexuosa

McClaughry Springs
(SW S22 T37N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Dermatocarpon miniatum
Endocarpon pusillum
Lecanora dispersa
Lepraria lobificans
Lepraria sp.#1
Leptogium cyanescens
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physciella chloantha
Punctelia rudecta
Verrucaria calkinsiana

McGinnis Slough
(S4 T36N R12E and
SW S33 T37N R12E)
Arthonia caesia
Caloplaca feracissima
Caloplaca microphyllina
Candelaria concolor
Cladonia cristatella
Cladonia grayi
Cladonia piedmontensis
Evernia mesomorpha
Flavoparmelia caperata
Flavopunctelia soredica
Lecanora dispersa
Melanelia subaurifera
Parmelia sulcata
Phaeophyscia adiastola
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Thelocarpon laureri
Xanthoria fallax

Paddock Woods
(SW S23 T37N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Cladonia coniocraea
Cladonia cylindrica
Cladonia macilenta var. bacillaris
Cladonia ramulosa
Endocarpon pusillum
Lecanora dispersa
Lepraria lobificans
Lichenothelia sp.
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Punctelia rudecta

Palos Park Woods
(SE S22 T37N R12E)
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Parmelia sulcata
Physcia millegrana

Papoose Lake
(SE S28 T37N R12E)
Amandinea punctata
Arthonia caesia
Caloplaca feracissima
Caloplaca microphyllina
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Lecanora symmicta
Lecanora umbrina
Parmelia sulcata
Phaeophyscia pusilloides
Physcia millegrana
Physcia stellaris
Physciella chloantha
Trapeliopsis flexuosa
Xanthoria fallax

Quarries – along the south side of
the Sag Canal
(SE S13 T37N R11E)
Caloplaca feracissima
Candelaria concolor
Caloplaca vitellinula
Endocarpon pusillum
Lecanora dispersa
Lecanora muralis
Lecanora symmicta
Lichenothelia sp.
Opegrapha atra
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Sarcogyne regularis
Verrucaria calkinsiana
Verrucaria nigrescens
Xanthoria fallax

**Sagawau Canyon Nature
Preserve**
(SW S13 T37N R11E)
Amandinea punctata
Anisomeridium nyssigenum
Arthonia caesia
Bacidia granosa
Bacidina egenula
Caloplaca citrina
Caloplaca feracissima
Candelaria concolor
Cladonia cristatella
Collema bachmanianum
Dermatocarpon miniatum

Endocarpon pusillum
Lecanora dispersa
Lecanora rupicola
Lepraria lesdainii
Lepraria lobificans
Leptogium cyanescens
Parmelia sulcata
Parmotrema hypotropum
Phaeophyscia adiastola
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Polysporina simplex
Staurothele diffractella
Trapeliopsis flexuosa
Verrucaria calkinsiana
Xanthoria fallax

Sag Quarries
(SW S13 T37N R11E and SE S14 T37N R11E)
Anisomeridium nyssigenum
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Lichenothelia sp.
Phaeophyscia pusilloides
Physcia adscendens
Physcia millegrana
Physciella chloantha
Xanthoria fallax

Swallow Cliff Woods/ Laughing Squaw Slough
(SE S21 T37N R12E and NE S28 T37N R12E)
Amandinea punctata
Anisomeridium nyssigenum
Caloplaca feracissima
Caloplaca microphyllina
Candelaria concolor
Dermatocarpon miniatum
Endocarpon pusillum
Flavoparmelia caperata
Lecanora dispersa
Lichenothelia sp.
Myelochroa aurulenta
Parmelia sulcata
Parmotrema hypotropum
Physcia millegrana
Physcia stellaris
Physconia detersa
Punctelia bolliana
Punctelia rudecta
Verrucaria calkinsiana

Tampier Lake and Slough
(S S25 T37N R11E, SW S30 T37N R11E, S31 T37N R12E, and S36 T37N R11E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Cladina arbuscula
Cladonia cervicornis var. verticillata
Cladonia conista
Cladonia cristatella
Cladonia peziziformis
Cladonia polycarpoides
Endocarpon pusillum
Hyperphyscia adglutinata
Lecanora dispersa
Parmelia sulcata
Phaeophyscia pusilloides
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Sarcogyne regularis
Trapelia coarctata
Verrucaria calkinsiana

Teason's Woods
(NW S21 T37N R12E)
Bacidia granosa
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Endocarpon pusillum
Hyperphyscia adglutinata
Lecanora dispersa
Parmelia sulcata
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Thelidium microcarpum
Xanthoria fallax

ACKNOWLEDGMENTS

This project was done in cooperation with the Forest Preserve District of Cook County. I would like to thank the staff at Camp Sagawau for all their help, Dr. Gerould Wilhelm and Linda Masters of Conservation Design Forum, Elmhurst, Illinois, for doing thin-layer chromatography on several specimens and their assistance in identification and verification of specimens; and Dr. Dennis Nyberg, Associate Professor, University of Illinois at Chicago, for reviewing an earlier draft of this paper.

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ERIGENIA, Number 16, May 1998, pp. 55-58

THE LICHEN FLORA OF THE COOK COUNTY FOREST PRESERVES PART III: NORTH BRANCH DIVISION

Richard D. Hyerczyk[1]

ABSTRACT: Twenty-seven species of lichens are reported for the Forest Preserve District of Cook County's North Branch Division, of which three were vouchered. An annotated species list is provided, as well as checklists for the individual preserves within this division.

INTRODUCTION

This is the third paper in the series that started with Hyerczyk (1998), a project to document the lichenized fungi found in the 12 divisions of the Forest Preserve District of Cook County, Illinois.

NORTH BRANCH DIVISION

The North Branch Division is approximately 667 hectares (1,650 acres) in size and comprises 11 individual preserves (fig. 1). It is located in the Chicago Lake Plain Section of the natural divisions of the Chicago region (Swink and Wilhelm 1994), and runs about 13 kilometers (8 miles) north to south in a narrow band along both sides of the North Branch of the Chicago River. Average elevation above sea level is about 186 meters (615 feet). Plant communities include prairies, oak savannas, and floodplains. Man-made features include wood rail fencing, picnic tables, and concrete road beds.

MATERIALS AND METHODS

Between April 1993 and October 1995, 11 individual preserves were surveyed for their lichen flora. Specimens were identified following methods described in Hyerczyk (1998). In addition to the specimens deposited at the Morton Arboretum herbarium, a set of specimens was deposited in the herbarium at the Chicago Botanic Garden, Glencoe, Illinois. Nomenclature follows Esslinger and Egan (1995).

RESULTS

Twenty-seven lichen taxa in 19 genera are reported for the North Branch Division. Fifteen lichens are foliose in growth form, 11 are crustose, and one is

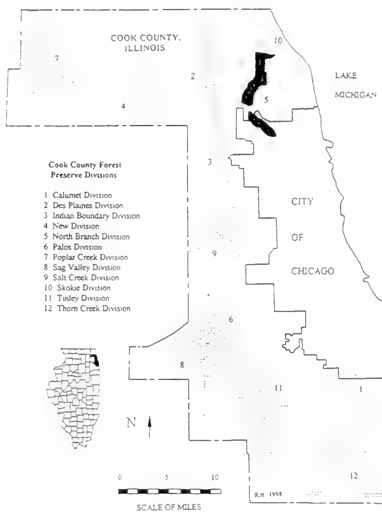

Figure 1. North Branch Division

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fruticose. Of the reported taxa, 30% are common, 26% are frequent, 22% are occasional, and 22% are rare. Three species were vouchered specifically from the North Branch Division.

This division is the smallest in acreage for the entire Cook County forest preserve system, and the low number of lichens reported here reflects this. Many substrates that are available in other divisions are lacking here, such as glacial erratics, dolomite outcroppings, and even decorticate logs. Also, most of these preserves are shaded and lack a variety of trees for substrate.

Weathered concrete provided habitat for species such as *Caloplaca feracissima, Endocarpon pusillum, Lecanora dispersa, Phaeophyscia cernohorskyi,* and *Verrucaria calkinsiana.* These species are usually found on man-made substrates. A few species were found on weathered wood fencing, such as *Amandinea punctata, Caloplaca holocarpa, Lecanora symmicta,* and *Thelocarpon laureri.* Most of these were found rarely, however, because of scarcity of substrate. On trees growing in open situations, lichens such as *Anisomeridium nyssigenum, Arthonia caesia, Candelaria concolor, Cladonia macilenta* var. *bacillaris, Parmelia sulcata, Phaeophyscia rubropulchra, Physcia millegrana, P. stellaris, Punctelia rudecta,* and *Xanthoria fallax* were found.

An alphabetized, annotated list of the lichenized fungi found in the North Branch Division follows. Generalized degree of frequency and a brief discussion of habitat is given, followed by a collection number, if applicable. All collections were made by the author. At the end of each entry, growth form and substrate are listed.

AMANDINEA Choisy *ex* Scheid. & H. Mayrh.

Amandinea punctata (Hoffm.) Coppins & Scheid.
Rare; on a weathered wood rail fence. #789 (crustose; lignicolous)

ANISOMERIDIUM (Müll. Arg.) Choisy

Anisomeridium nyssigenum (Ellis & Everh.) R. C. Harris
Occasional; on the trunk of *Quercus alba.* (crustose; corticolous)

ARTHONIA Ach.

Arthonia caesia (Flotow) Körber
Frequent; on the trunk of *Carya ovata.* (crustose; corticolous)

BACIDIA De Not.

Bacidia granosa (Tuck.) Zahlbr.
Occasional; on dolomite rubble. (crustose; saxicolous)

CALOPLACA Th. Fr.

Caloplaca feracissima H. Magn.
Common; on weathered concrete with *Endocarpon pusillum.* (crustose; saxicolous)

Caloplaca holocarpa (Hoffm. *ex* Ach.) M. Wade
Rare; on a weathered wood rail fence. (crustose; lignicolous)

CANDELARIA A. Massal.

Candelaria concolor (Dickson) Stein
Common; on the trunks and branches of *Crataegus mollis* and *Fraxinus americana,* and on a weathered wood rail fence. (foliose; corticolous/lignicolous)

Candelaria concolor var. *effusa* (Tuck.) G. Merr. & Burnham
Frequent; on the trunks and branches of *Ulmus americana.* (foliose; corticolous)

CLADONIA P. Browne

Cladonia macilenta Hoffm. var. *bacillaris* (Genth) Schaerer
Rare; on the upper branches of *Crataegus mollis.* (fruticose; corticolous)

ENDOCARPON Hedwig

Endocarpon pusillum Hedwig
Frequent; on weathered concrete. (crustose; saxicolous)

HYPERPHYSCIA Müll. Arg.

Hyperphyscia adglutinata (Flörke) H. Mayrh. & Poelt
Frequent; on the trunks and branches of *Crataegus mollis* and *Fraxinus americana.* (foliose; corticolous)

LECANORA Ach.

Lecanora dispersa (Pers.) Sommerf.
Common; on weathered concrete. (crustose; saxicolous)

Lecanora symmicta (Ach.) Ach.
Occasional; on weathered wooden fences. (crustose; lignicolous)

PARMELIA Ach.

Parmelia sulcata Taylor
Frequent; on the lower branches of *Crataegus mollis.* (foliose; corticolous)

PHAEOPHYSCIA Moberg

Phaeophyscia cernohorskyi (Nádv.) Essl.
Rare; on a weathered concrete sewer pipe along the Chicago River. #1300 (foliose; saxicolous)

Phaeophyscia ciliata (Hoffm.) Moberg
Occasional; on the lower branches of *Tilia americana* and *Fraxinus americana.* (foliose; corticolous)

Phaeophyscia pusilloides (Zahlbr.) Essl.
Common; at the bases of *Fraxinus americana* and *Quercus alba.* (foliose; corticolous)

Phaeophyscia rubropulchra (Degel.) Essl.
Common; on the trunk of *Ulmus americana.* (foliose; corticolous)

PHYSCIA (Schreber) Michaux

Physcia adscendens (Fr.) H. Olivier
Frequent; on the lower branches of *Salix* sp. (foliose; corticolous/lignicolous)

Physcia millegrana Degel.
Common; on a weathered wood rail fence and on the trunks and lower branches of *Crataegus mollis, Fraxinus americana, Quercus rubra,* and *Ulmus americana.* (foliose; corticolous/lignicolous)

Physcia stellaris (L.) Nyl.
Common; on a weathered wood rail fence and on the lower branches of *Salix* sp. (foliose; corticolous/lignicolous)

PHYSCIELLA Essl.

Physciella chloantha (Ach.) Essl.
Common; on the trunks and lower branches of *Ulmus americana.* (foliose; corticolous)

PHYSCONIA Poelt

Physconia detersa (Nyl.) Poelt
Occasional; on the lower branches of *Fraxinus americana.* (foliose; corticolous)

PUNCTELIA Krog

Punctelia rudecta (Ach.) Krog
Occasional; on *Quercus alba.* (foliose; corticolous)

THELOCARPON Nyl. *ex* Hue

Thelocarpon laureri (Flotow) Nyl.
Rare; on a weathered wooden fence post. #1276 (crustose; lignicolous)

VERRUCARIA Schrader

Verrucaria calkinsiana Servít
Rare; on concrete. (crustose; saxicolous)

XANTHORIA (Fr.) Th. Fr.

Xanthoria fallax (Hepp) Arnold
Frequent; on the trunks of *Populus deltoides* and *Ulmus americana.* (foliose; corticolous)

NORTH BRANCH DIVISION LICHEN CHECKLIST

Bunker Hill/Oxbow Prairie
(E S31 T41N R12E and
SW S32 T41N R12E)
Amandinea punctata
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var.effusa
Hyperphyscia adglutinata
Lecanora dispersa
Lecanora symmicta
Parmelia sulcata
Phaeophyscia ciliata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Punctelia rudecta
Xanthoria fallax

Caldwell Woods/Whealan Pool
(SW S32 T41N R13E)
Caloplaca feracissima
Caloplaca holocarpa
Candelaria concolor
Candelaria concolor var. effusa
Lecanora dispersa
Phaeophyscia pusilloides
Physcia millegrana
Physciella chloantha

Edgebrook Woods
(NW S4 T40N R13E)
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Phaeophyscia pusilloides
Physcia millegrana

Forest Glen Woods
(NE S9 T40N R13E)
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Parmelia sulcata
Phaeophyscia ciliata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physconia detersa

Indian Road Woods
(SW S4 T40N R13E)
Bacidia granosa
Caloplaca feracissima
Lecanora dispersa
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana

Labagh Woods East and West
(NW S10 T40N R13E)
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Hyperphyscia adglutinata
Lecanora dispersa
Parmelia sulcata
Phaeophyscia pusilloides
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Physconia detersa
Punctelia rudecta
Thelocarpon laureri
Xanthoria fallax

Linne Woods
(SW S17 T41N R12E)
Anisomeridium nyssigenum
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Lecanora dispersa
Phaeophyscia rubropulchra
Physcia millegrana
Physciella chloantha

Miami Woods/Indigo Prairie
(E S19 T41N R12E)
Anisomeridium nyssigenum
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Cladonia macilenta var. bacillaris
Endocarpon pusillum
Hyperphyscia adglutinata
Parmelia sulcata
Phaeophyscia cernohorskyi
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physciella chloantha
Verrucaria calkinsiana
Xanthoria fallax

St. Paul Woods
(E S19 T41N R12E)
Bacidia granosa
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Lecanora dispersa
Phaeophyscia pusilloides
Phaeophyscia rubropulchraPhyscia millegrana
Physcia stellaris
Physciella chloantha

Sauganash Prairie
(NW S10 T40N R13E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Parmelia sulcata
Phaeophyscia ciliata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha

Wayside Woods/Railroad Prairie
(SE S18 T41N R12E)
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Hyperphyscia adglutinata
Lecanora dispersa
Lecanora symmicta
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Xanthoria fallax

ACKNOWLEDGMENTS

This project was done in cooperation with the Forest Preserve District of Cook County. I would like to thank them for granting me permission to study the lichen flora at the North Branch Division and Skokie Division sites. I would also like to thank Dr. Gerould Wilhelm and Linda Masters of Conservation Design Forum, Inc., Elmhurst, Illinois, for doing thin-layer chromatography on several specimens, and for their assistance in identification and verification of specimens.

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Swink, F., and G. Wilhelm. 1994. Plants of the Chicago region. 4th ed. Indiana Academy of Science, Indianapolis.

ERIGENIA, Number 16, May 1998, pp. 59–64

The Lichen Flora of the Cook County Forest Preserves Part IV: Skokie Division

Richard D. Hyerczyk[1]

ABSTRACT: Fifty-five species of lichens are reported for the Forest Preserve District of Cook County's Skokie Division, of which 53 were vouchered. An annotated species list is provided, as well as checklists for the individual preserves within this division.

Introduction

This is the fourth paper in the series that started with Hyerczyk (1998), a project to document the lichenized fungi found in the 12 divisions of the Forest Preserve District of Cook County, Illinois.

Skokie Division

The Skokie Division is approximately 1,356 hectares (3,350 acres) in size and comprises 12 individual preserves (fig. 1). It runs about 8 kilometers (5 miles) north to south along the North Branch of the Chicago River and the Skokie River, on both east and west sides. According to Swink & Wilhelm (1994), it lies mainly in the Chicago Lake Plain Section of the natural divisions of the Chicago region, and, to a lesser extent, in the Western Morainal Section.

The Chicago Lake Plain Section is represented in the eastern side of the division along the Skokie River and Lagoons and the lower portion of the Chicago River. Elevations above mean sea level are about 180 meters (600 feet). Plant communities include mesic woodlands, wet prairies, and marshes. The western Morainal Section is represented along the upper portion of the Chicago River. Elevations there range from 188 meters (620 feet) to 205 meters (675 feet). Morainal plant communities include mesic wood-lands, prairies, and oak savannas. Man-made features in the Skokie Division include concrete road beds, picnic tables, and wood rail fences.

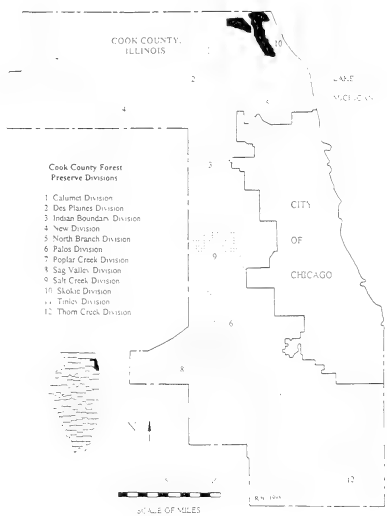

Figure 1. Skokie Division

Materials and Methods

Between April 1993 and October 1995, 12 individual preserves were surveyed for their lichen flora. Specimens were identified following methods described

[1] 5204 S. Natoma, Chicago, Illinois 60638

in Hyerczyk (1998). In addition to the specimens deposited at the Morton Arboretum herbarium, a set of specimens was deposited in the herbarium at the Chicago Botanic Garden, Glencoe, Illinois. Nomenclature approximates Esslinger and Egan (1995).

RESULTS

Fifty-five species of lichens in 33 genera are reported for the Skokie Division. Twenty-four lichens are foliose growth forms, 24 are crustose, and 7 are fruticose. Of the reported taxa, 31% are common, 13% are frequent, 18% are occasional, and 38% are rare. Fifty-three species were vouchered specifically from the North Branch Division.

In the mesic oak savannas of the preserves along the upper portions of the Chicago River, rotted and decorticate logs were more common than in other sections of this division. Some species growing on these substrates included *Cladonia coniocraea, C. cylindrica, C. didyma, C. macilenta* var. *bacillaris, C. ramulosa,* and *C. rei.*

Some species growing on weathered concrete in the picnic areas and parking lots included *Bacidia granosa, Bacidina egenula, Caloplaca feracissima, Endocarpon pusillum, Lecanora dispersa,* and *Verrucaria calkinsiana.* As in other divisions, these species are usually found on man-made materials.

In a few preserves, granite erratics or landscape boulders were found, providing habitat for some rarer species, including *Dimelaena oreina, Physcia subtilis, Xanthoparmelia cumberlandia*, and *Xanthoria* sp.#1.

Wooden picnic tables and weathered wood rail fencing along horse trails, provided habitat for *Caloplaca cerina, C. microphyllina, Candelariella reflexa, Cyphelium tigillare, Lecanora umbrina, Trapeliopsis flexuosa,* and *Xanthoria polycarpa.*

An alphabetized, annotated list of the lichenized fungi found in the Skokie Division follows. Generalized degree of frequency and a brief discussion of habitat is given, followed by a collection number, if applicable. All collections were made by the author, unless otherwise indicated. At the end of each entry, growth form and substrate are listed.

AMANDINEA Choisy *ex* Scheid. & H. Mayrh.

Amandinea punctata (Hoffm.) Coppins & Scheid.
Common; on weathered wood picnic tables and on wood rail fences. (crustose; lignicolous)

ANISOMERIDIUM (Müll. Arg.) Choisy

Anisomeridium nyssigenum (Ellis & Everh.) R. C. Harris
Frequent; on the trunk of *Quercus alba.* #1119 (crustose; corticolous).
The conidal form of this lichen, which has been called *Sarcinulella banksiae* Sutton & Alcorn, is also represented here. It is occasional on the trunks of *Crataegus mollis* and *Quercus alba.* #1376 (crustose; corticolous)

ARTHONIA Ach.

Arthonia caesia (Flotow) Körber
Common; on the smooth bark of *Carya ovata.* #825 (crustose; corticolous)

BACIDIA De Not.

Bacidia granosa (Tuck.) Zahlbr.
Occasional; on weathered concrete and dolomite rubble. #1287 (crustose; saxicolous)

BACIDINA Vězda

Bacidina egenula (Nyl.) Vězda
Rare; on weathered concrete. #1313 (crustose; saxicolous)

CALOPLACA Th. Fr.

Caloplaca cerina (Hedwig) Th. Fr.
Rare; on a weathered wood rail fence. #808 (crustose; lignicolous)

Caloplaca feracissima H. Magn.
Common; on weathered concrete with *Endocarpon pusillum.* #837 (crustose; saxicolous)

Caloplaca holocarpa (Hoffm. *ex* Ach.) M. Wade
Rare; on weathered wood rail fences. #797 (crustose; lignicolous)

Caloplaca microphyllina (Tuck.) Hasse
Occasional; on weathered wood rail fences. #796 (crustose; lignicolous)

Caloplaca sp.#3 *sensu* MOR
Rare; on a weathered wood rail fence. #863 (crustose; lignicolous)

CANDELARIA A. Massal.

Candelaria concolor (Dickson) Stein
Common; on the trunks and branches of *Crataegus mollis* and *Fraxinus americana,* and on weathered wood rail fences and wood picnic tables. #822 (foliose; corticolous/lignicolous)

Candelaria concolor var. *effusa* (Tuck.) G. Merr. & Burnham
Common; on the trunks and branches of *Fraxinus americana* and *Ulmus americana* in open woods. #820 (foliose; corticolous)

CANDELARIELLA Müll. Arg.

Candelariella reflexa (Nyl.) Lettau
Common; on weathered wood rail fences and on the lower branches of *Fraxinus americana.* #793, #832 (crustose; corticolous/lignicolous)

CLADONIA P. Browne

Cladonia coniocraea (Flörke) Sprengel
Occasional; on decorticate logs in shaded, damp woods. #1113 (fruticose; lignicolous)

Cladonia cristatella Tuck.
Occasional; on weathered wood rail fences. #831 (fruticose; lignicolous)

Cladonia cylindrica (A. Evans) A. Evans
Occasional; on decorticate logs in shaded damp woods growing with *Cladonia coniocraea*. #807 (fruticose; lignicolous)

Cladonia didyma (Fée) Vainio
Rare; on decorticate logs in a shaded woodland dominated by *Quercus alba*. #1115 (fruticose; lignicolous)

Cladonia macilenta Hoffm. var. *bacillaris* (Genth) Schaerer
Frequent; on decorticate logs and on the lower branches of *Crataegus mollis*. #1293 (fruticose; corticolous/lignicolous)

Cladonia ramulosa (With.) J. R. Laundon
Occasional; on decorticate logs in damp, shaded woods. #830 (fruticose; lignicolous)

Cladonia rei Schaerer
Rare; on a decorticate log. #1303 (fruticose; lignicolous)

CYPHELIUM Ach.

Cyphelium tigillare (Ach.) Ach.
Rare; on a weathered wood rail fence. #1378 (crustose; lignicolous)

DIMELAENA Norman

Dimelaena oreina (Ach.) Norman
Rare; on a granite boulder in a sunny, open field with *Physcia subtilis*. #1301 (crustose; saxicolous)

ENDOCARPON Hedwig

Endocarpon pusillum Hedwig
Frequent; on weathered concrete with *Caloplaca feracissima*. #1295 (crustose; saxicolous)

FLAVOPARMELIA Hale

Flavoparmelia caperata (L.) Hale
Occasional; on the upper branches of *Fraxinus americana* in open woods. #1116 (foliose; corticolous)

FLAVOPUNCTELIA (Krog) Hale

Flavopunctelia flaventior (Stirton) Hale
Rare; on the upper branches of *Fraxinus americana* in a wooded floodplain. #1292 (foliose; corticolous)

Flavopunctelia soredica (Nyl.) Hale
Rare; on the upper branches of *Fraxinus americana* in a wooded floodplain. #1117 (foliose; corticolous)

HYPERPHYSCIA Müll. Arg.

Hyperphyscia adglutinata (Flörke) H. Mayrh. & Poelt
Frequent; on the trunks and branches of *Crataegus mollis* and *Fraxinus americana*. #1314 (foliose; corticolous)

LECANORA Ach.

Lecanora dispersa (Pers.) Sommerf.
Common; on weathered concrete. #839 (crustose; saxicolous)

Lecanora strobilina (Sprengel) Kieffer
Occasional; on the trunks of *Quercus rubra*. #1377 (crustose; corticolous)

Lecanora symmicta (Ach.) Ach.
Common; on the trunks of *Fraxinus americana* and on weathered wooden picnic tables. #836 (crustose; corticolous/lignicolous)

Lecanora umbrina (Ach.) A. Massal.
Rare; on a weathered wood rail fence. #799 (crustose; lignicolous)

LEPRARIA Ach.

Lepraria lobificans Nyl.
Common; on the lower trunks of *Quercus alba* in shaded woods. #844 (crustose; corticolous)

MELANELIA Essl.

Melanelia subaurifera (Nyl.) Essl.
Rare; on the upper branches of *Fraxinus americana* in a wooded floodplain. #1289 (foliose; corticolous)

MYELOCHROA (Asah.) Elix & Hale

Myelochroa aurulenta (Tuck.) Elix & Hale
Rare; on the upper branches of *Fraxinus americana* in a wooded floodplain. #1108 (foliose; corticolous)

OPEGRAPHA Ach.

Opegrapha varia Pers.
Rare; on the trunk of *Populus deltoides*. #819 (crustose; corticolous)

PARMELIA Ach.

Parmelia sulcata Taylor
Common; on the lower branches of *Crataegus mollis* and *Fraxinus americana*. #821 (foliose; corticolous)

PHAEOPHYSCIA Moberg

Phaeophyscia ciliata (Hoffm.) Moberg
Frequent; on the lower branches of *Tilia americana* and *Fraxinus americana*. #1286 (foliose; corticolous)

Phaeophyscia pusilloides (Zahlbr.) Essl.
Common; at the base of *Quercus alba*. #826 (foliose; corticolous)

Phaeophyscia rubropulchra (Degel.) Essl.
Common; on the trunks and lower branches of *Ulmus americana*. #834 (foliose; corticolous)

PHYSCIA (Schreber) Michaux

Physcia adscendens (Fr.) H. Olivier
Common; on a weathered wood rail fence and on the lower branches of *Quercus rubra* and *Salix* sp. #798 (foliose; corticolous/lignicolous)

Physcia millegrana Degel.
Common; on a weathered wood rail fence and on the trunks and lower branches of *Crataegus mollis, Fraxinus americana, Quercus rubra,* and *Ulmus americana*. #823 (foliose; corticolous/lignicolous)

Physcia stellaris (L.) Nyl.
Common; on a weathered wood rail fence and on the lower branches of *Salix* sp. #802 (foliose; corticolous/lignicolous)

Physcia subtilis Degel.
Rare; on a granite boulder in a sunny open field with *Dimelaena oreina*. #1302 (foliose; saxicolous)

PHYSCIELLA Essl.

Physciella chloantha (Ach.) Essl.
Common; on the trunks and lower branches of *Ulmus americana*. #1315 (foliose; corticolous)

PHYSCONIA Poelt

Physconia detersa (Nyl.) Poelt
Frequent; on the lower branches of *Fraxinus americana* and *Salix* sp. #1291 (foliose; corticolous)

PUNCTELIA Krog

Punctelia rudecta (Ach.) Krog
Rare; at the base of an open grown *Quercus alba*. #847 (foliose; corticolous)

RIMELIA Hale & Fletcher

Rimelia reticulata (Taylor) Hale & Fletcher
Rare; on the lower branches of *Crataegus mollis* and *Fraxinus americana* in a wooded floodplain. #1317 (foliose; corticolous)

RINODINA (Ach.) Gray

Rinodina archaea (Ach.) Arnold
Rare; on the lower branches of *Carya ovata*. #848 (crustose; corticolous)

THELOCARPON Nyl. *ex* Hue

Thelocarpon laureri (Flotow) Nyl.
Rare; on a weathered wood rail fence. (crustose; lignicolous)

TRAPELIOPSIS Hertel & Gotth. Schneider

Trapeliopsis flexuosa (Fr.) Coppins & P. James
Frequent; on weathered wood rail fences. #795 (crustose; lignicolous)

VERRUCARIA Schrader

Verrucaria calkinsiana Servít
Occasional; on dolomite and concrete rubble. #1277 (crustose; saxicolous)

XANTHOPARMELIA (Vainio) Hale

Xanthoparmelia cumberlandia (Gyelnik) Hale
Rare; on granite landscape boulders. Wilhelm #15153 (foliose; saxicolous)

XANTHORIA (Fr.) Th. Fr.

Xanthoria fallax (Hepp) Arnold
Common; on the trunks of *Ulmus americana* and *Salix* sp. and on weathered wood rail fences. #800 (foliose; corticolous/lignicolous)

Xanthoria polycarpa (Hoffm.) Rieber
Occasional; on a weathered wood rail fence and on the lower branches of *Fraxinus americana*. #806 (foliose; corticolous/lignicolous)

Xanthoria sp. #1 *sensu* MOR
Rare; on granite landscape boulders. #828 (foliose; saxicolous)

SKOKIE DIVISION LICHEN CHECKLIST

Blue Star Memorial Woods/ Nixon Woods
(NE S36 T42N R12E)
Amandinea punctata
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Candelariella reflexa
Cladonia cristatella
Lecanora dispersa
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Trapeliopsia flexuosa
Xanthoria fallax

Chicago Botanic Garden
(W S1 T42N R12E and NE S2 T42N R12E)
Amandinea punctata
Bacidia granosa
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Hyperphyscia adglutinata

Lecanora dispersa
Lecanora symmicta
Parmelia sulcata
Phaeophyscia ciliata
Phaeophyscia pusilloides
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Physconia detersa
Xanthoparmelia cumberlandia
Xanthoria fallax
Xanthoria sp.#1
Verrucaria calkinsiana

Chipilly Woods
(NW S11 T42N R12E)
Anisomeridium nyssigenum
Amandinea punctata
Arthonia caesia
Bacidia granosa
Caloplaca feracissima
Candelaria concolor
Cladonia coniocraea
Cladonia cylindrica
Cladonia didyma
Cladonia macilenta var. bacillaris
Cladonia ramulosa
Cladonia rei
Endocarpon pusillum
Flavoparmelia caperata
Flavopunctelia soredica
Lecanora dispersa
Lecanora symmicta
Lepraria lobificans
Parmelia sulcata
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris

Erickson Woods
(NW S19 T42N R13E)
Amandinea punctata
Caloplaca feracissima
Caloplaca microphyllina
Candelaria concolor
Lecanora dispersa
Lecanora symmicta
Phaeophyscia pusilloides
Physcia millegrana
Trapeliopsis flexuosa
Xanthoria fallax

Glenview Woods/Harms Woods
(E S8 T41N R12E and
W S9 T41N R13E)
Amandinea punctata
Arthonia caesia
Bacidina egenula
Caloplaca cerina
Caloplaca feracissima
Caloplaca holocarpa
Caloplaca microphyllina
Caloplaca sp.#3
Candelaria concolor
Candelaria concolor var. effusa
Candelariella reflexa
Cladonia coniocraea
Cladonia cylindrica
Cladonia didyma
Cladonia macilenta var. bacillaris
Cyphelium tigillare
Endocarpon pusillum
Flavoparmelia caperata
Hyperphyscia adglutinata
Lecanora dispersa
Lecanora strobilina
Lecanora symmicta
Lecanora umbrina
Lepraria lobificans
Parmelia sulcata
Phaeophyscia ciliata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Physconia detersa
Verrucaria calkinsiana
Xanthoria fallax
Xanthoria polycarpa

Skokie Lagoons
(W & SE S12 T42N R12E and
E S13 T42N R12E {& R13E ??}
and W S18 T42N R13E and NW
S19 T42N R13E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Lecanora dispersa
Parmelia sulcata
Phaeophyscia pusilloides
Physcia millegrana
Physcia stellaris
Physciella chloantha
Trapeliopsis flexuosa
Xanthoria fallax

Somme Prairie Grove
(SE S4 T42N R12E)
Anisomeridium nyssigenum
Arthonia caesia
Candelaria concolor
Candelaria concolor var. effusa.
Hyperphyscia adglutinata
Lecanora symmicta
Lepraria lobificans
Opegrapha varia
Parmelia sulcata
Phaeophyscia pusilloides
Physcia adscendens
Physcia millegrana
Physciella chloantha
Xanthoria fallax

Somme Prairie Nature Preserve
(SE S4 T42N R12)
Amandinea punctata
Anisomeridium nyssigenum
Arthonia caesia
Bacidia granosa
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Candelariella reflexa
Dimelaena oreina
Flavoparmelia caperata
Flavopunctelia flaventior
Hyperphyscia adglutinata
Lecanora dispersa
Lecanora strobilina
Lecanora symmicta
Melanelia subaurifera
Myelochroa aurulenta
Parmelia sulcata
Phaeophyscia ciliata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physcia subtilis
Physciella chloantha
Physconia detersa
Rimelia reticulata
Rinodina archaea
Xanthoria fallax
Xanthoria polycarpa

Somme Woods
(S S3 T42N R12E)
Amandinea punctata
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelariella reflexa
Cladonia macilenta var. bacillaris
Lecanora dispersa
Lecanora symmicta
Lepraria lobificans
Parmelia sulcata
Physcia millegrana
Physcia stellaris

Sunset Ridge Woods
(SE S11 T42N R12E)
Anisomeridium nyssigenum
Arthonia caesia
Candelaria concolor
Candelaria concolor var. effusa
Cladonia cylindrica
Endocarpon pusillum
Lepraria lobificans
Parmelia sulcata
Phaeophyscia ciliata
Phaeophyscia rubropulchra
Physcia millegrana

Tower Road Woods
(NE S13 T42N R12E)
Amandinea punctata
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Candelariella reflexa
Cladonia cristatella
Endocarpon pusillum
Lecanora dispersa
Lecanora symmicta
Parmelia sulcata
Physcia millegrana
Physcia stellaris
Physciella chloantha
Physconia detersa
Trapeliopsis flexuosa

Turnbull Woods
(NE S1 T42N R12E)
Amandinea punctata
Arthonia caesia
Caloplaca feracissima
Caloplaca microphyllina
Candelaria concolor
Candelaria concolor var. effusa
Candelariella reflexa
Cladonia macilenta var. bacillaris
Cladonia ramulosa
Endocarpon pusillum
Lecanora dispersa
Lecanora symmicta
Lepraria lobificans
Parmelia sulcata
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Physconia detersa
Punctelia rudecta
Thelocarpon laureri
Trapeliopsis flexuosa
Xanthoria fallax
Xanthoria polycarpa

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ERIGENIA, Number 16, May 1998, p. 65

BIRD TAKES A "LICHEN" TO A NEST

Linda Masters[1] and Floyd Swink[2]

On May 9, 1991, a pair of blue-gray gnatcatchers was discovered in the Morton Arboretum, flying back and forth to their nest in a small tree. According to *A Field Guide to the Birds* (Peterson 1980) the blue-gray gnatcatcher "suggests a miniature Mockingbird. A tiny slender mite, smaller than a Chickadee, blue-gray above and whitish below, with a narrow white eye-ring and a long black-and-white tail, which is often cocked like a wren's tail and flipped about."

The gnatcatcher's nest was about 4 meters from the ground on a horizontal branch of a Japanese tree lilac [*Syringa reticulata* (Blume) Hara = *S. amurensis* Rupr. var. *japonica* (Maxim.) Franch. & Sav.]. These trees are in a row just southwest of the gatehouse on the west side; the nest was in the northeastern most tree. *The Audubon Society Field Guide to North American Birds, Eastern Region* (1977) describes the blue-gray gnatcatcher's nest and eggs as follows: "4 or 5 pale blue, brown-spotted eggs in a small, beautifully made cup of plant down and spider web, decorated with flakes of lichen and fastened to a horizontal branch at almost any height above ground."

On May 24, 1991, the nest at the Arboretum was blown out of the tree by a violent windstorm, but much of the nest was retrieved. True to the habit of this bird, the nest was built from grass, spider webs, and bits of lichen thallus. In this case, the only lichen the gnatcatchers used was *Parmelia sulcata* Taylor, a broad-lobed foliose lichen that is found in the Arboretum on the upper surfaces of tree branches, where the gnatcatchers obtained their nest-building material. Similar lichens, such as *Punctelia rudecta* (Ach.) Krog and *P. bolliana* (Müll. Arg.) Krog, are also common in the Arboretum; however, they grow on the lower trunks of large oaks, where they are less accessible to foraging gnatcatchers.

The small circular nest was about 6.5 cm in diameter and about 3.5 cm deep. It was constructed so that the bits of lichen thallus were oriented prevailingly with their upper surfaces facing outward. Kentucky blue grass (*Poa pratensis* L.) lined the nest, and intertwining the grass and the lichen thalli was spider web material. Though the gnatcatcher's nest did not last through the season, a voucher specimen of *Parmelia sulcata* in the Morton Arboretum herbarium remains as a record of this event (Masters & Swink #74).

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DESCHAMPSIA FLEXUOSA (L.) TRIN.: ADDITION TO THE FLORA OF ILLINOIS

James F. Steffen[1]

Staff at the Chicago Botanic Garden are in the process of restoring a 40-hectare oak woodland/savanna complex on the northeastern edge of the Garden, which is located in Glencoe, Cook County, Illinois. This site varies from wet savanna and upland swamp dominated by *Quercus bicolor*, through mesic woodland dominated by *Q. rubra* and *Q. alba*, to drier oak openings dominated by *Q. alba*. A baseline inventory of a 36.4-hectare section of this complex conducted by the author and Steve Lorig in 1994 resulted in a list of 223 vascular plant taxa.

During the summer of 1995, several collections of the genus *Poa* were made in the relatively well-vegetated understory of the oak openings along the moraine to see if any native blue grasses might have been missed during the preliminary inventory. One of the specimens collected in June (Chicago Botanic Garden Herbarium, #783) turned out to be in the genus *Deschampsia*, but it did not fit the description of *D. caespitosa* (L.) P. Beauv. var. *glauca* (Hartm.) Lindm., the only *Deschampsia* listed in *Plants of the Chicago Region* (Swink and Wilhelm 1994). Instead, it was *Deschampsia flexuosa* (L.) Trin., which is a northern species that was previously unrecorded from Illinois (Mohlenbrock 1986). This led to an important question: Is *Deschampsia flexuosa* a rare native confined in Illinois to this site, or is it a recent adventive?

It was found growing in an oak opening with an understory dominated by *Carex pensylvanica*. Other immediate associates were the native species *Danthonia spicata, Solidago juncea, Lonicera prolifera, Luzula multiflora, Aster lateriflorus, Potentilla simplex, Prenanthes alba,* and *Agrimonia gryposepala,* and the weeds *Poa compressa* and *Dactylis glomerata*.

Deschampsia flexuosa, often associated with woodlands, has a distribution closely allied with the Great Lakes shoreline and the Appalachian Mountains, with scattered records outside these areas (Dore and McNeill 1980, Hitchcock 1971). The populations closest to Illinois inhabit the shore of Green Bay in Wisconsin (Fassett 1951) and the southwest coast of lower Michigan (Voss 1972). The occurrence of this new population in a relatively conservative habitat close to the shore of Lake Michigan suggests that this could be a remnant native population.

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NOTES ON SOME WOODY PLANT SPECIES NATURALIZED IN ILLINOIS

John E. Ebinger[1] and William McClain[2]

ABSTRACT: Individuals of *Caragana arborescens* (Siberian pea shrub), *Cornus mas* (Cornelian cherry dogwood), *Rhodotypos scandens* (jetbead), *Sorbaria sorbifolia* (false spiraea), and *Phellodendron amurense* (Amur cork tree) have been found naturalized in Illinois. Presently Siberian pea shrub and jetbead are a problem in at least one natural area, and may become major plant problems in the future.

Exotic species constitute one of the most serious threats to natural communities (Bratton 1982, Harty 1986, McKnight 1993). Numerous articles have been written about exotics, documenting their spread from cultivation, speculating on their impact on plant communities, and describing various control measures. From 1981 to the present, over 50 articles related to the management or spread of exotic plants have been published in the *Natural Areas Journal* (Paddock 1992).

In the past few decades there has been increased concern over the introduction of non-native species into the Illinois flora. Henry and Scott (1980) reported that there has been a dramatic increase in the number of alien species in the Illinois vascular plant flora since European settlement. Exotic species presently constitute nearly 30% of the vascular plant species known to occur in the state, and each year more are reported. In some instances these "new introductions" have completely altered the plant communities in which they occur (Bratton 1982, Ebinger 1983, Nuzzo 1994). Most of the concern involves herbaceous species, but at present woody species make up about 13% of the alien flora in Illinois. Many of the woody exotics are not particularly weedy, and rarely are encountered in natural communities. A few, however, such as *Robinia pseudoacacia** (black locust) and *Lonicera maackii* (Amur honeysuckle), have become major plant pests and are expensive to control (McClain 1996).

Over the past few years the authors have been examining some species of exotic shrubs in natural communities in Illinois. Recently, *Acer ginnala* (Amur maple) was found around roadside plantations (Ebinger and McClain 1991), *Calycanthus floridus* (strawberry shrub) occurred as an understory component in a hillside forest in Jersey County (McClain et al. 1992), and *Forsythia suspensa* (Thunb.) Vahl (weeping forsythia) was found naturalized in a canyon at Matthiessen State Park in LaSalle County (McClain and Ebinger 1995). Whether these species will become problems in the future is not known, but *Acer ginnala* is rapidly expanding into open successional habitats.

Five other exotic woody species have been studied in recent years. Two of them, *Caragana arborescens* (Siberian pea shrub) and *Rhodotypos scandens* (jetbead), are becoming problems in some natural communities. It is also possible that the other three, *Cornus mas* L. (Cornelian cherry dogwood), *Sorbaria sorbifolia* (L.) A. Braun (false spiraea), and *Phellodendron amurense* Rupr. (Amur cork tree), will become management problems, although so far only a few naturalized individuals of each species have been found. Following is a detailed discussion of each of these five species.

CARAGANA ARBORESCENS (Siberian pea shrub)

This upright shrub with greenish, glabrous twigs has alternate, even-pinnately compound leaves. It is a native of Asia that is rarely encountered as an ornamental in Illinois. Being a relatively large shrub, it is not well adapted to present-day foundation plantings, and the small yellow flowers are not particularly showy. Mohlenbrock (1986) reported that this species had escaped from cultivation and was spreading, being

* Except where authorities are included with the plant name, nomenclature follows Mohlenbrock (1986).

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naturalized in Menard, Perry, Sangamon, and Winnebago counties.

One small colony of Siberian pea shrub was observed at Harlem Hills Nature Preserve in Winnebago County (NE S5 T44N R2E). This colony consisted of one large shrub 5 m tall and nearly 5 m across with more than 30 stems from the base (Ebinger #26708, EIU), along with numerous seedlings extending to 10 m from the parent plant (Ebinger #26709, EIU). Most of the seedlings were less than 50 cm tall, but some individuals up to 2 m in height were found. More than 300 pea shrub individuals were observed in this area.

The entire colony was in a shallow ravine, about 10 m wide, at the edge of a prairie remnant. The other woody plants in the ravine were mostly exotics as well, and included *Ulmus pumila* (Siberian elm), *Rhamnus cathartica* (common buckthorn), *Lonicera maackii, Lonicera tatarica* (Tartarian honeysuckle), and *Morus alba* (white mulberry). Individuals of Siberian pea shrub were not found in prairie vegetation, but were restricted to the wooded ravine. It appears that seeds were dispersed by gravity and possibly by runoff water, as all seedlings were found under the parent shrub and on the lower side of the ravine.

CORNUS MAS (Cornelian cherry dogwood)

This shrub or small tree to 7 m tall has small yellow flowers in short-stalked umbels that are subtended by an involucre of 4 yellowish bracts. It is a native of southern Europe and Asia that is commonly planted in Illinois as a specimen plant in yards and in foundation plantings around larger buildings (Flint 1983). It is also used along the interstate highway system, where large plantations are fairly common.

Mohlenbrock (1986) does not include this species in his flora, though recently DeJarnett (1993) found it naturalized at Pere Marquette State Park in Jersey County. The population covered a rectangular-shaped area about 20 m long by 15 m wide along both sides of the Dogwood Trail, on a hill just above the visitor center (SE S9 T6N R13W). The colony consisted of 31 relatively large individuals, some exceeding 5 m in height, numerous smaller shrubs, mostly about 2 m tall (Ebinger #26487, EIU), and scattered 1- to 3-year-old seedlings (Ebinger #26488, EIU). Most of the larger individuals were multiple-stemmed from the base, many stems having basal diameters of 4–15 cm. These shrubs probably represent surviving members of an original planting, and may be more than 50 years old. One of these individuals had a basal trunk 20 cm in diameter and two branches 8 and 10 cm dbh. The smaller shrubs probably represent individuals that had become established from seeds. They were extremely common near the base of the hill. The seedlings, most of which were less than 50 cm tall, were scattered under the larger plants.

According to McClain (1983) and McClain and Anderson (1990), this hillside at Pere Marquette State Park was covered with prairie vegetation and scattered large individuals of *Juniperus virginiana* (red cedar) in the 1930s. At present, a heavily disturbed, open forest covers the hillside. In the area of the Cornelian cherry dogwood population the dominant trees were *Platanus occidentalis* (sycamore), *Ulmus americana* (American elm), and *Gleditsia triacanthos* (honey locust). Individuals of *Platanus occidentalis* averaged 50 cm dbh; the other trees were between 20 and 25 cm dbh. Understory tree species included *Viburnum prunifolium* (black haw), *Cercis canadensis* (redbud), *Asimina triloba* (pawpaw), and *Cornus florida* (flowering dogwood). The shrub layer was dominated by the introduced *Lonicera maackii;* there were also scattered individuals of *Symphoricarpos orbiculatus* (coralberry) and *Rhus aromatica* (fragrant sumac).

Occasional naturalized individuals of Cornelian cherry dogwood were found associated with plantations in other parts of the state. One individual (Ebinger #26471, EIU) was in a wooded area next to a Cornelian cherry dogwood plantation along interstate highway I-57 in Marion County, about 7 miles north of Salem (S11 T3N R2E). Also, a Cornelian cherry dogwood seedling (Ebinger #26473, EIU) was found in the grassy area of the Edgewood interchange of the same interstate in Effingham County (S29 T6N R5E); again, a plantation was nearby. Seedlings and small plants were found associated with Cornelian cherry dogwood plantings on the campus of Eastern Illinois University, in Coles County. Near one plantation, numerous germinating seedlings were observed (Ebinger #26518, EIU), and near another planting a two-year-old seedling was collected (Ebinger #26519, EIU).

RHODOTYPOS SCANDENS (jetbead)

This small deciduous shrub, less than 2 m tall, has opposite, serrate leaves, with showy, 4-merous flowers and shiny, black, beadlike drupes produced in clusters of four at the twig ends (Ebinger 1993). A native of China and Japan, jetbead is occasionally planted in Illinois, probably more commonly so earlier in this century. Mohlenbrock (1986) reported it as rarely escaped from cultivation, being naturalized in DuPage County, and Swink and Wilhelm (1994) mention a collection in 1978 by Wayne Lampa at the Waterfall Glen Forest Preserve in DuPage County.

Recently, Jim Heim, a natural areas biologist from the Division of Natural Heritage, Illinois Department of Natural Resources, found jetbead growing at the Starved Rock Nature Preserve in LaSalle County (S19 and S20 T33N R2E). The population was in an upland oak-hickory forest dominated by *Quercus alba* (white oak), with *Q. velutina* (black oak), *Q. rubra* (red oak), and *Carya ovata* (shagbark hickory) as common associates. The forest had been extensively disturbed in the past, and many large individuals of *Robinia pseudoacacia* were common. *Rhamnus cathartica* was the most abundant understory tree; others were *Celtis occidentalis* (hackberry), *Ulmus rubra* (slippery elm), *Viburnum prunifolium* (black haw), and *Prunus serotina* (wild black cherry).

The jetbead population was found in an area 75 m by 500 m along the south side of the forest. Here it was the most common understory shrub, averaging 1837.5 individuals/ha, based on a random sample of eight circular plots 0.01 ha in size. Other shrub species included *Ribes missouriense* (Missouri gooseberry) and *Lonicera maackii*. Although many jetbead individuals were on the flat uplands, more individuals were encountered along the slopes of shallow ravines, where they commonly excluded all other vegetation. This species appears to be very shade tolerant, as many seedlings were found beneath and around the parent plants. The plants produce large quantities of seed. Although the species was extremely common near the south edge of the preserve, occasional individuals were observed throughout much of the uplands. Originally, jetbead was planted as an ornamental along a lane that once led to some cabins in the Starved Rock Nature Preserve.

SORBARIA SORBIFOLIA (false spiraea)

This species is an upright shrub to 2 m tall, with alternate, odd-pinnately compound leaves. A native of northern Asia from the Ural region of China to Japan, it is occasionally planted in Illinois, and was reported as adventive in Ogle County by Swink and Wilhelm (1994). During a recent vegetation survey, Mike Jones of the Natural Land Institute in Rockford found a small colony of this species at the Lowden-Miller State Forest in Ogle County (SE S32 T23N R10E). It covered an area about 30 m by 35 m in a plantation of *Pinus resinosa* (red pine), about 800 m north of the Hay Road parking lot at the southern edge of the forest. The largest false spiraea plants (Ebinger #26710, EIU) grew near a large depression in the ground, which was probably the remains of a house foundation; the original colony was likely part of the foundation planting. The colony has expanded, and an examination of many individuals indicates that all members of the present colony were root sprouts from an extensive horizontal root system of the original population. No flowering or fruiting individuals were observed. The largest individuals of the colony had basal stem diameters of 2.4 cm and 11 annual rings. Density averaged 4.9 stems/m^2.

The false spiraea colony was mainly in the shallow depression and was heavily shaded. Along with the *Pinus resinosa*, there were scattered individuals of *Fraxinus pennsylvanica* (green ash), *Acer negundo* (box elder), *Ulmus rubra*, *Celtis occidentalis*, and *Prunus serotina*. Most of these trees were 20–30 cm dbh. The woody understory was sparse except for the false spiraea and a few individuals of *Rhamnus cathartica* and *Corylus americana* (hazelnut). The herbaceous layer was dominated by *Alliaria petiolata* (garlic mustard), *Laportea canadensis* (stinging nettle), *Pilea pumila* (clearweed), *Polygonum virginianum* (woodland knotweed), and *Glechoma hederacea* (creeping Charlie).

PHELLODENDRON AMURENSE (Amur cork tree)

This small tree to 12 m tall has opposite, odd-pinnately compound leaves with 5–13 leaflets. The yellow green flowers are in long, pubescent, terminal panicles. The black drupes, which are about 1 cm across, have a strong turpentine odor (Ebinger 1993). This native of eastern Asia is occasionally planted, and it has been reported as escaped in DuPage County (Swink and Wilhelm 1994). Within the past few years individuals of this species have been occasionally found in flower beds and waste areas on the campus of Eastern Illinois University, in Coles County, and rarely at private residences (Ebinger #25199, EIU).

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ERIGENIA, Number 16, May 1998, pp. 71–72

A Family Index to the Illustrated Flora of Illinois

Joanna Turner and George Yatskievych[1]

It has been 31 years since the first volume of Robert Mohlenbrock's monumental series *The Illustrated Flora of Illinois* was published. Certainly one of the most ambitious state-level floristic projects ever conceived, this ongoing series is also one of the most comprehensive. When completed, it will include treatments of all vascular, nonvascular, and even algal groups. Each species will be keyed, described, mapped for Illinois, and illustrated with line drawings.

Thirteen volumes of the *Illustrated Flora* have been published thus far. They have been of great value not only to Illinois botanists, but to those in other Midwestern states. The treatment of angiosperm families follows a system of evolutionary classification proposed by Robert Thorne that varies significantly from the "Engler and Prantl" and "Cronquist" systems used in most other floristic manuals. For this reason, and because several volumes remain to be completed, it has not always been easy to locate the correct volume and page number for a given plant family. We have found it expedient to compile an index to published families in the flora, along with a bibliography of the parts published to date.

In the index (table 1), parts are numbered as in the bibliography. Treatments of both Cyperaceae and Poaceae are split into two parts. The second portion of Cyperaceae (the genus *Carex*) remains unpublished, but will probably appear in 1998. At that point, treatments of all monocots and pteridophytes will have appeared, as well as a selection of dicot families, with the gymnosperms and remaining dicots remaining to be published. The published portions of the flora (including *Carex*) cover 91 vascular plant familes (56% of the total families) and about 1390 species (49% of the total species).

Bibliography of Parts Published to Date

(All parts have been published by Southern Illinois University Press, Carbondale)

Part 1. Mohlenbrock, R. H. 1967. The Illustrated Flora of Illinois. Ferns. xv, 191 pp.

Part 2. Mohlenbrock, R. H. 1970a. The Illustrated Flora of Illinois. Flowering Plants. Flowering Rush to Rushes. xiii, 272 pp.

Part 3. Mohlenbrock, R. H. 1970b. The Illustrated Flora of Illinois. Flowering Plants: Lilies to Orchids. xiii, 288 pp., 1 map.

Part 4. Mohlenbrock, R. H. 1972. The Illustrated Flora of Illinois. Grasses. Bromus to Paspalum. xvii, 332 pp., 1 map.

Part 5. Mohlenbrock, R. H. 1973. The Illustrated Flora of Illinois. Grasses. Panicum to Danthonia. xix, 378 pp., 1 map.

Part 6. Mohlenbrock, R. H. 1976. The Illustrated Flora of Illinois. Sedges. Cyperus to Scleria. xiii, 192 pp., 1 map.

Part 7. Mohlenbrock, R. H. 1978. The Illustrated Flora of Illinois. Flowering Plants. Hollies to Loasas. xiii, 315 pp., 1 map.

Part 8. Mohlenbrock, R. H. 1980. The Illustrated Flora of Illinois. Flowering Plants. Willows to Mustards xiii, 286 pp., 1 map.

Part 9. Mohlenbrock, R. H. 1981. The Illustrated Flora of Illinois. Flowering Plants. Magnolias to Pitcher Plants. xiii, 261 pp., 1 map.

Part 10. Mohlenbrock, R. H. 1982. The Illustrated Flora of Illinois. Flowering Plants. Basswoods to Spurges. xii. 234 pp., 1 map.

Part 11. Mohlenbrock, R. H., and P. M. Thompson, Jr. 1987a. The Illustrated Flora of Illinois. Flowering Plants. Smartweeds to Hazelnuts. xiii, 228 pp., 1 map.

Part 12. Dodd, J. J. 1987b. The Illustrated Flora of Illinois. Diatoms. xii, 477 pp., 1 map.

Part 13. Mohlenbrock, R. H. 1990. The Illustrated Flora of Illinois. Flowering Plants. Nightshades to Mistletoe. xi, 224 pp., 1 map.

Part 14. Mohlenbrock, R. H. In press. The Illustrated Flora of Illinois. Flowering Plants. Sedges. Carex. [Expected 1998]

[1] Missouri Department of Conservation/Missouri Botanical Garden, P.O. Box 299, St. Louis, Missouri 63166

TABLE 1. An index to the families of vascular plants and diatoms published in *The Illustrated Flora of Illinois.*

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Instructions for Authors

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Research and technical papers should include a one-paragraph abstract of not more than 250 words. The abstract should state concisely the goals, principal results, and major conclusions of the paper.

Taxonomic Names

Either a standard taxonomic manual should be cited whose names are followed consistently, or the scientific names should be followed by their authority. Common names, if used, should be referenced to a scientific name. Thereafter, scientific names are recommended, but either may be used if done so consistently.

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All illustrations, photographs, and special lettering should be capable of 50 to 66 percent reduction without loss of clarity or legibility. Originals should be sent only upon acceptance of the manuscript.

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Literature Citations

In Text:

Braun (1950) or Parks et al. (1968) or (Mohlenbrock 1970, 1990) or (Swink and Wilhelm 1994; Young 1994).

In Literature Cited:

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The Illinois Native Plant Society Journal

The Illinois Native Plant Society is dedicated to the preservation, conservation, and study of the native plants and vegetation of Illinois.

ERIGENIA is named for *Erigenia bulbosa* (Michx.) Nutt. (harbinger of spring), one of our earliest blooming woodland plants. The first issue was published in August 1982.

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COVER ILLUSTRATION

Original drawing of *Apios americana* Medik. (groundnut or wild potato) by Nancy Hart Stieber.

Nancy received her art education from The Art Institute of Chicago, but much of her botanical and natural history education she attributes to her study with Ray Schulenberg, whom she accompanied on many field forays in the prairie and dune regions of Illinois and Indiana.

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In the case of groundnut, we are able to retrieve some grasp of its former significance to Native Americans by the fact that when certain tribes became acquainted with the "Irish" potato, *Solanum tuberosum* L., they applied to it the word in their language that they had previously used for groundnut. This transfer of a familiar word to a new object is an alternative to trying to incorporate a new word into the language.[2]

LINGUISTIC CONSIDERATIONS

The Siouan Languages

Specific cases of the transfer of the indigenous name for groundnut to the introduced potato are available to us in certain Siouan languages that happen to be fairly well documented. The following is from Riggs (1890):

> **mdo**, n., an esculent root eaten by the Dakotas, in appearance and taste something like sweet potatoes, the Dakota *tamdo*; potatoes, the Waśićuŋ *tamdo*.

Waśićuŋ is European man, and the prefix *ta* is the sign of third-person genitive, "his". The entry above is for the eastern or Santee Dakota. The western or Teton Dakota (Lakota) use the phoneme *l* in place of the Santee *d*, and their word for potato is *blo*. The entry for *blo* in Buechel (1983) is interesting:

> An esculent root eaten by the Dakotas, in appearance and taste like the sweet potato; potatoes. The *opers tuberosa*.

The explanation for the puzzling last two words is that Father Buechel, who knew both Lakota and plants fairly well, did not live to see his dictionary published, and the Jesuit brother who was assigned the task of editing the dictionary miscopied Buechel's handwritten *Apios* as *opers; Apios tuberosa* is, of course, a synonym of *Apios americana*, groundnut. The Santee lived in Minnesota in historic times, and although the Tetons roamed west far beyond the range of groundnut, they no doubt remained familiar with the plant through visits with their eastern relatives.

For the Siouan-speaking Winnebago (Hochank), Gilmore (1919) recorded the name of groundnut as *tdo*; the pronunciation of this is uncertain.

[2] The word "potato" itself is an English mispronunciation of a Taino Indian word that originally referred to the sweet potato, *Ipomoea batatas* (L.) Lam., which grew natively in the Taino homeland of the greater Antilles and the Bahamas. The Irish potato, of course, was domesticated by the native peoples of the South American Andes, taken to Europe by the Spanish, and introduced into North America by European settlers.

Moving south to the Siouan-speaking Osages of Missouri, we find the following in LaFlesche (1932), here quoted in full:

> **do**, potato. Before the Irish potato was introduced by traders, the Osage used a wild potato which tastes like sweet potato. When the Irish potato became known to the Osage they applied to it the name "do" (*Glycine apios*). The "do" is mentioned in one of the tribal rituals as a sacred food.

Glycine apios is, of course, another synonym of *Apios americana*.

Siouan-speaking tribes lived as far south as the Gulf of Mexico, and when their languages were finally studied, their word for potato was found to be cognate with that of the Dakota. According to Dorsey and Swanton (1912), for the Biloxi tribe we have the word *ado* (or *ato* with unaspirated *t*.) For the Ofo, a neighboring southern tribe, we have *ato*. These authors reported that the Ofo distinguished between the Irish potato and the "wild or marsh potato" by appropriate modifying words. Although they do not give us a scientific name for this wild plant, there can be little doubt that it is *Apios americana*.

The derivation of the name of Topeka, the capital of Kansas, is relevant to our discussion of groundnut. The question, argued pro and con in Rydford (1968), is whether or not Topeka means something like "groundnut good digging" in one or more Siouan languages. Vogel (1962) has an entry for Topeka, Illinois (named for Topeka, Kansas); he favors the groundnut hypothesis for the origin of the name, and I, after much sifting of evidence, agree.

The Hidatsa are a Siouan-speaking people, and it may be significant that their word for potato is not a variation of the familiar *do/to*, but rather *kaksha* (Matthews 1873). This could well be the result of the centuries-long residence of the Hidatsa well north and west of the range of groundnut. As for the Mandan, long-time good neighbors of the Hidatsa, their name for potato seems not to be in the extant literature.

The Algonquian Languages

The *Apios-Solanum* linkage runs a parallel course in the Algonquian linguistic family—a grouping originally even more extensive geographically than the Siouan. I first encountered this botanical dichotomy in 1946 while living on the reservation of the Prairie Band Potawatomi near Mayetta, Kansas. These are descendants of people who lived mostly in northern Illinois and southern Wisconsin until about 1836. At feasts in Kansas I was pleased to partake from bowlfuls of tastily cooked groundnut. At that time most of the Indian residents of the reservation still spoke the Potawatomi language. To them, this dish was *nishnabe piniak,* which they translated "Indian potatoes." The word *nishnabe* distinguished groundnuts from Irish potatoes, which by that time, to these folks, were simply *piniak.* A variation of this usage is found in Huron Smith's work on the Forest Potawatomi of Wisconsin. He reported (1933) that they distinguished *Apios americana* as *mukwopinik,* bear potato.

Central Algonquian names for potato, presumably all having referred originally to groundnut, contain the syllable *pin* or *pen.* Meeker, Elias, and Heim (1993) quite explicitly apply the Ojibwe word *opin* to *Apios americana;* most Ojibwe dictionaries translate *opin* as potato, leaving us to extrapolate groundnut as the original meaning. For the Mesquakie (Goddard 1994), we have the word *ahpenya,* and for the closely related Kickapoo (Voorhis 1988), *ohpenya;* for the Menominee, *ohpe'nyak* (plural), this from Bloomfield (1975). Erichsen-Brown (1979) quotes a 1590 description by Thomas Harriot, of what is unquestionably *Apios americana,* with the Virginia Indian name of *openask,* a clear testimony to the wide range of both groundnut and Algonquian speakers.

One is tempted to speculate as to whether the *pen/pin* syllable in proto-Algonquian was limited in meaning to groundnut, or had a general reference to, say "edible underground plant part." Smith (1933), for instance, gives *wagipin* (crooked potato) as the Forest Potawatomi name for the edible storage shoots of lotus, *Nelumbo lutea* (Willd.) Pers. Swanton (1946) quotes the linguist Truman Michelson as saying that Algonquian *penauk,* etc. meant "root"; in this Michelson was probably mistaken.

The Muskhogean Languages

As for the three Muskhogean tribes for which I have lexical material, again we see a similarity in their words for potato, which suggests familiarity of these three peoples with a potatolike plant before they separated. In the Alabama language (Sylestine, Hardy, and Montier 1993) the word *aha* means potato and sweet potato; in Choctaw (Byington 1915), *ahe* covers both Irish potato and sweet potato, and in Chickasaw (Monroe and Willmand 1994), *ahi'* is the basic word for potato.

The Iroquoian Languages

I have less access to Iroquoian linguistics, but I feel that the resemblance between *nuna,* a Cherokee name for potato (Feeling 1975) and *-none't,* meaning potato in Seneca (Chafe 1967), is no coincidence, but rather points back to a time when these two tribes, now remote, descended from a common ancestral people who knew a potatolike plant, very likely *Apios americana.*

The Caddoan Languages

Caddoan linguistic material is scarce. We know that the groundnut was important to the Pawnee of Nebraska. Their name for it was the monosyllabic *its* (also spelled *ic*). Their name for the Loup River, heart of the Skidi Pawnee homeland, was *ickari,* meaning "lots of groundnuts" (Weltfish 1965; Murie 1981). What we don't know in this case is whether the Pawnee transferred this name for groundnut to Irish potato; I have not found this information in print.

Native American words for groundnut by language group and tribe

SIOUAN	
Eastern or Santee Dakota	mdo
Western or Teton Dakota (Lakota)	blo
Winnebago	tdo
Osage	do
Biloxi	ado
Ofo	ato
Hidatsa	kaksha
ALGONQUIAN	
Prairie Band Potawatomi	nishnabe piniak
Forest Potawatomi	mukwopinik
Ojibwe	opin
Mesquakie	ahpenya
Kickapoo	ohpenya
Menominee	ohpe'nyak
Virginia	openask
MUSKHOGEAN	
Alabama	aha
Choctaw	ahe
Chickasaw	ahi'
IROQUOIAN	
Cherokee	nuna
Seneca	-none't
CADDOAN	
Pawnee	its or ic

NUTS AND OTHER TUBEROUS PLANTS

In spite of the English common name groundnut, I find no evidence that any native people conceived of *Apios americana* as a nut. For instance, Algonquian words such as *bagaan* and *pakani* (from which obviously we derive pecan), were not applied to *Apios americana*.

Although explorers, traders, missionaries, and even linguists are seldom versed in botany, it is usually possible to recognize references to groundnut because of the distinctive feature of numerous tubers strung at intervals along the rhizome (or root). Occasional observers have confused this species with prairie turnip, *Psoralea esculenta* Pursh (= *Pediomelum esculentum* (Pursh) Rydb.), also a legume. That perennial, however, does not climb, and has only a single swelling in a vertical taproot. It was even more sought after than groundnut by Indians of the prairie. I have always found it puzzling that the Dakota, upon encountering prairie turnip, did not give it a name reflecting its resemblance and relationship to *Apios americana*. Instead, they called it *tiŋpsiŋna*, which translates "prairie rice," seeming to imply that the Dakota regarded *Psoralea esculenta* as the nutritional equivalent of wild rice, *Zizania aquatica* L., which is a grass and a food staple of the Dakota in Minnesota.

A few observers have confused groundnut with Jerusalem artichoke, *Helianthus tuberosus* L., a native composite with barely palatable tubers. However, the linguistic evidence is that all the Native Americans who knew that plant had names for it quite distinct from those for groundnut, and never transferred *Helianthus* names to the Irish potato.

EVIDENCE OF CULTIVATION

Considering the food value of groundnut tubers, it may seem odd that this species was not brought into cultivation by Native Americans, and that it has not become a staple of modern agriculture. There are references to consumption of the tubers by early settlers, and attempts at cultivation. There is also mention of Indians planting tubers in suitable places; indeed, we cannot rule out the possibility that some existing populations of the plant may result from early Indian transplanting, which may well have extended its range. It is especially intriguing to speculate that some of the westernmost stations for groundnut may represent plantings by Indian tribes as they migrated west in protohistoric times. Kelly Kindscher (1987) comments on this appealing subject in his extensive and well-researched entry on this species.

As a generalization, Native Americans in what is now the eastern United States and southeast Canada regularly cultivated corn, beans, squash, and sometimes sunflowers and tobacco—all summer annuals that bear their harvestable crops above ground. Roots and tubers, perennial herbs, and the fruits and nuts of woody plants were harvested from wild populations.

There have been experiments by European man to cultivate groundnut for the edible tubers, but without notable success. At present it is available from a few nurseries as an ornamental or novelty.

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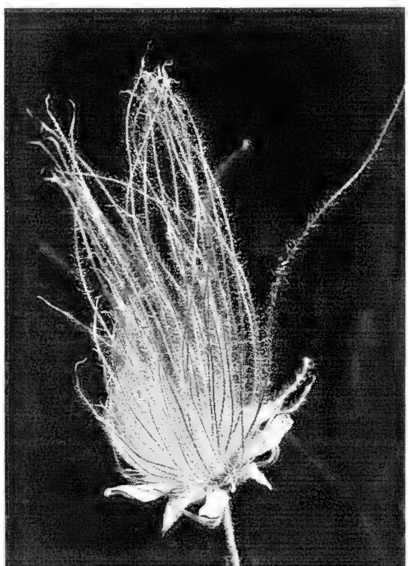
THE AVENS SPECIES (*GEUM* L., ROSACEAE) OF ILLINOIS

Michael B. Wenzel[1] and John E. Ebinger[2]

ABSTRACT: A principal-components analysis of 126 herbarium specimens representing the morphological and geographical range of the genus *Geum* L. in Illinois revealed that the 7 native species of avens are distinct. Of these taxa, *Geum canadense* Jacq. is the most common, being reported from every county. Of the remaining species, *G. vernum* (Raf.) Torrey & Gray and *G. laciniatum* Murray, are wide ranging, and found throughout most of Illinois, while *G. triflorum* Pursh and *G. aleppicum* Jacq. are restricted to the extreme northern part of the state. The very rare *G. rivale* L. is probably extirpated from Illinois. The often overlooked *G. virginianum* L. is scattered in the southern third of Illinois; its similarity to *G. canadense* probably is responsible for the few collections. A probable F_1 hybrid between *G. canadense* and *G. laciniatum* has been found in the state. A key to the native avens of Illinois is given, along with distribution maps.

INTRODUCTION

The genus *Geum* L. is represented worldwide by about 60 species, distributed primarily in the Northern Hemisphere, where species are particularly common in alpine, arctic, and boreal regions (Gajewski 1959). Approximately 17 species occur in North America; 7 of these are native to Illinois (Robertson 1974; Mohlenbrock 1986). The genus *Geum* is characterized by the following morphological features: herbaceous perennials with basal rosettes of leaves, most species also with cauline leaves; leaves pinnately compound, generally lyrate in outline, the terminal leaflet larger than the lateral ones, some lower lateral leaflets often greatly reduced in size; flowers perfect, 5-merous, the hypanthium mostly saucer shaped, the calyx usually with an epicalyx (bracts so closely placed beneath the calyx as to suggest an additional calyx), the stamens numerous, the carpels numerous on a cylindrical receptacle, the achenes with persistent, elongated, plumose or hooked styles; base chromosome number x = 7, the Illinois species hexaploids with 2n = 42 (Robertson 1974; Mohlenbrock 1986; Kalkman 1988).



Geum triflorum (prairie smoke)

The genus *Geum* is commonly placed in the tribe Dryadeae, subfamily Rosoideae, family Rosaceae. Within this tribe, the genus *Geum* and the genera *Fallugia* Endl. and *Waldsteinia* Willd. appear to be closely related, all having a base chromosome number of x = 7. Although not universally accepted, there is mounting evidence that a tribe composed of the above 3 genera might be an accurate representation of their phylogenetic relationship (Kalkman 1988; Morgan, Soltis, and Robertson 1994).

Although the *Geum* species of Illinois are quite distinct, artificially produced hybrids are common (Raynor 1952; Gajewski 1957; Robertson 1974). Many of these hybrids are fertile, but naturally occurring hybrids are rarely reported. The

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present study was undertaken to examine the relationships among the *Geum* species found in Illinois, to determine their geographic distribution in the state, to determine if hybridization occurs, and to distinguish any subspecific taxa of these species.

METHODS

Nearly 1,000 herbarium specimens were examined from many of the state herbaria (DEK, EIU, F, ILL, ILLS, MOR, MWI, SIU). Habitat observations also were made for most species, and specimens were collected. From this material, dot distribution maps were prepared. Each dot on these maps represents a specimen examined by the authors (fig. 1).

The examined specimens were sorted into groups based on similarity of morphological characters. From these groups, a total of 126 specimens representing the morphological and geographic range of each taxon in Illinois were scored for 3 vegetative and 11 floral and fruit characters (table 1). These 126 specimens comprised 20 each of *G. aleppicum, G. canadense, G. laciniatum, G. triflorum,* and *G. vernum,* 13 of *G. rivale,* 12 of *G. virginianum,* and 1 proposed hybrid specimen. For some species, out-of-state specimens were included in the analysis when few in-state specimens were available. All characters were measured (3 or more measurements or observations per character for each specimen) and plotted to confirm the existence of gaps to enable the use of scored characters. The data were then analyzed by principal-components analysis (PCA) using NTSYS-pc (Rohlf 1990).

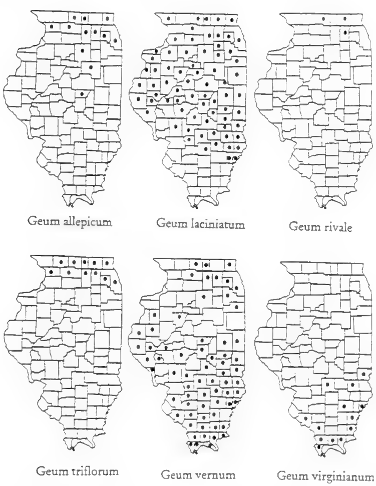

Fig. 1. Maps showing the distribution of the native species of *Geum* in Illinois

RESULTS AND DISCUSSION

When the data set containing the 126 herbarium specimens was analyzed by PCA, the first 3 principal components accounted for 47.7%, 20.0%, and 15.1%, respectively, or 82.8% of the total variance. Style pubescence, petal color, and calyx lobe length (characters 12, 8, 4) were the most important in determining the score of the first component; the presence of an obvious stipe, epicalyx presence, and fruiting pedicel width (characters 9, 6, 2) were the most important in determining the score of the second component; and achene length, receptacle pubescence, and petal length (characters 13, 10, 7) were the most important in distinguishing the third component. In the PCA plot (fig. 2), distinct clusters can be recognized that correspond to the 7 native Illinois taxa and the probable hybrid specimen. The clusters do not seem to contain recognizable subgroups, and each cluster is separated from the others. The dots representing the specimens in each group are also closely spaced, indicating that the species are fairly homogeneous.

Barriers to artificial hybridization are nearly nonexistent in the genus *Geum* (Raynor 1952; Gajewski 1957); nonetheless, no hybrids have been reported from Illinois. Potential hybrids involving native Illinois species include *G. aleppicum* × *G. rivale,* reported from northern New York (Rydberg 1913; Fernald 1950), and *G. canadense* × *G. laciniatum,* reported from an experimental garden (Raynor 1952).

During the present study, one specimen was found that is probably a hybrid involving *G. canadense* and *G. laciniatum* (R. A. Evers #34641, Clark Co., wet field, 8 miles south of Marshall, 22 July 1952, ILLS). This individual has the general habit and size of *G. canadense,* along with hirsute receptacles and narrow (less than 0.9 mm wide), puberulent fruiting pedicels. It is similar to *G. laciniatum* in having longer calyx lobes, an epicalyx more than 2 mm long, and mature achenes more than 4 mm long that are sparsely hirsute (like *G. laciniatum* var. *trichocarpum*). The achenes, however, have not developed normally, the lower half being thin walled and shriveled. This probable hybrid specimen was positioned between *G. canadense* and *G. laciniatum* in the PCA plot (fig. 2). When only those 2 species and the hybrid specimen were analyzed by PCA, similar results were obtained, the hybrid falling between the 2 species.

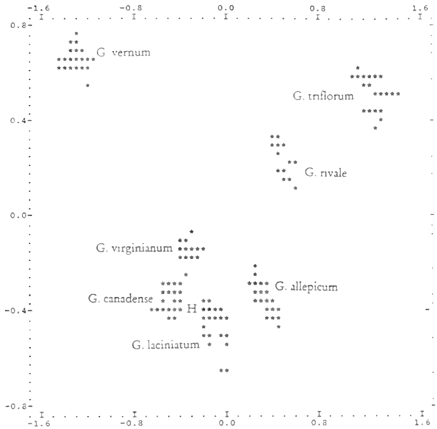

Fig. 2. Plot of axis 1 vs. 2 of a principal-components analysis, using 3 vegetative and 11 floral variables, of 125 specimens of the native *Geum* species found in Illinois and 1 probable hybrid specimen (H)

Table 1. Characters scored for the *Geum* complex in Illinois

1. Stipule margins (1 = entire or with small teeth, 2 = with 1 or 2 lobes, 3 = with 3 or more lobes, 4 = stipules absent)
2. Pedicel width 10–20 mm below fruit (mm)
3. Pedicel pubescence (1 = glabrous or nearly so, 2 = densely puberulent and commonly with a few long hairs, 3 = densely hirsute and usually also puberulent)
4. Calyx lobe length (mm)
5. Calyx lobe position in fruit (1 = reflexed, 2 = erect to ascending)
6. Epicalyx (1 = absent, 2 = present)
7. Petal length (1 = shorter than the calyx lobes, 2 = equal to or longer than the calyx lobes)
8. Petal color (1 = white, 2 = yellow, 3 = pink to purple)
9. Obvious stipe below the head of achenes (1 = absent, 2 = present)
10. Receptacle pubescence (1 = glabrous to puberulent, 2 = hirsute)
11. Fruiting style length (1 = less than 7 mm long, 2 = 7–15 mm long, 3 = more than 15 mm long)
12. Fruiting style pubescence (1 = glabrous, 2 = hirsute at the base to along the lower half, 3 = hirsute throughout)
13. Achene length (mm)
14. Achene pubescence (1 = glabrous to lightly pubescent, 2 = hirsute near the apex, 3 = hirsute along the margins and lightly pubescent on the sides, 4 = hirsute throughout)

KEY TO THE NATIVE AVENS SPECIES

1. Flowers purplish or rose pink in color; sepals erect or ascending in fruit.
   2. Mature styles more than 14 mm long, not jointed; plants subscapose . . . 1. *Geum triflorum*
   2. Mature styles less than 14 mm long, jointed above the middle; cauline leaves well developed . . . . 2. *Geum rivale*
1. Flowers with the petals white to bright yellow; calyx green to greenish; sepals reflexed in fruit.
   3. Epicalyx absent; aggregate of achenes elevated above the calyx on a stipe 2–5 mm long . . . . 3. *Geum vernum*
   3. Epicalyx present; aggregate of achenes sessile.

4. KEY TO FLOWERING MATERIAL.
   5. Petals shorter than the calyx lobes.
      6. Receptacle hirsute; pedicels densely puberulent and with a few scattered long hairs; receptacle hirsute . . . . 4. *Geum virginianum*
      6. Receptacle glabrous to puberulent; pedicels densely hirsute . . . . . . 5. *Geum laciniatum*
   5. Petals equal to longer than the calyx lobes.
      7. Petals white; stipules of the middle cauline leaves not lobed, the margins entire to shallowly toothed . . . . 6. *Geum canadense*
      7. Petals bright yellow; stipules lobed . . . . 7. *Geum aleppicum*

4. KEY TO FRUITING MATERIAL.
   8. Receptacle essentially glabrous; pedicels densely coarse-hirsute; mature achenes mostly more than 4 mm long . . . 5. *Geum laciniatum*
   8. Receptacle hirsute; pedicels densely puberulent and with a few scattered long hairs; achenes mostly less than 4 mm long.
      9. Median cauline leaves pinnately compound with 5–7 leaflets; fruiting pedicels more than 0.9 mm wide; styles hirsute near the base . . . . 7. *Geum aleppicum*
      9. Median cauline leaves simple to trifoliolate; fruiting pedicels less than 0.9 mm wide; style glabrous.
         10. Stipules less than 20 mm long, usually not lobed, the margins mostly entire to toothed . . . . 6. *Geum canadense*
         10. Stipules of the middle and lower cauline leaves mostly more than 20 mm long, lobed 4. *Geum virginianum*

1. *GEUM TRIFLORUM* Pursh (prairie avens, prairie smoke)
In Illinois, prairie smoke is limited to the northern sixth of the state, where it occurs in dry sand and gravel prairies (fig. 1). *Geum triflorum* is distinguished from the other Illinois avens by its subscapose habit and its long, plumose, persistent, unjointed styles. These characters led to its placement in the genus *Erythrocoma* (Greene 1906) and the genus *Sieversia* (Rydberg 1913). Studies indicate that *G. triflorum* is closely related to other *Geum* species, and separation is unwarranted (Raynor 1952; Robertson 1974).

2. *GEUM RIVALE* L. (purple avens)
This taxon, known from swamps, calcareous wet meadows, and bogs, has been reported from 3 counties in extreme northern Illinois (fig. 1), but is now probably extirpated from the state. Purple avens is similar to *G. triflorum*, both taxa having long prostrate stolons, pendulous flowers, erect to ascending calyx lobes, and plumose styles. These attributes also distinguish *G. rivale* from the other avens of Illinois. The jointed style with the distal portion deciduous, the hooked apex of the persistent basal portion of the style, and the aggregate of achenes on a stipe distinguish *G. rivale* from *G. triflorum*.

3. *GEUM VERNUM* (Raf.) Torrey & Gray (spring avens)
A common feature of woodland paths, this species is present in moist woods, thickets, and open disturbed sites. It is extremely common in the southern half of Illinois, becoming less common to the north (fig. 1). Spring avens is easily separated from other avens species by the early flowering period, the small yellowish petals that are shorter than the calyx lobes, the absence of an epicalyx, and the aggregate of achenes elevated on a stipe 2–5 mm above the hypanthium.

4. *GEUM VIRGINIANUM* L. (pale avens)
This taxon grows in moist woods in the southern half of Illinois, where it is uncommon to occasional (fig. 1). Similar morphologically to *G. canadense,* and commonly confused with it, *G. virginianum* differs by having cream-colored to pale yellow petals much shorter than the calyx lobes and lobed stipules more than 20 mm long. Raynor (1952) and Gajewski (1957) suggested that *G. virginianum* originated from hybridization between *G. canadense* and *G. aleppicum,* the artificial F_1 of this cross conforming to the morphology of *G. virginianum,* but being highly sterile. Plants of true *G. virginianum,* however, are fertile and show no segregation in subsequent generations (Robertson 1974). Although *G. virginianum* is always found within the geographic range of *G. canadense,* it is far south of the range of *G. aleppicum* in Illinois (fig. 1). Most examined specimens of this taxon were originally identified as *G. canadense.*

5. *GEUM LACINIATUM* Murray (rough avens)
Common in the northern three-quarters of Illinois, this taxon grows in wet meadows and other wet, open places, rarely forming large colonies (fig. 1). Rough avens is separated from other Illinois avens by white petals that are much shorter than the calyx lobes, the glabrous to puberulent cylindrical receptacles, the densely hirsute pedicels, and the large achenes, which commonly exceed 4 mm in length. Two varieties are recognized by some authors — var. *trichocarpum* Fernald (1935), with sparsely hirsute achenes, and var. *laciniatum* with glabrous achenes. Variety *laciniatum* has been reported from Illinois (Mohlenbrock and Ladd 1978; Mohlenbrock 1986), but all of the more than 160 Illinois specimens examined during the present study keyed to var. *trichocarpum.*

photo by Ken Dritz

Geum laciniatum var. *trichocarpum* (rough avens)

6. *GEUM CANADENSE* Jacq. (white avens)
This taxon is abundant in moist upland and floodplain woods, particularly in disturbed areas and along paths, and it occurs in every Illinois county (Mohlenbrock 1986). The following combination of characters easily separates *G. canadense* from other Illinois avens: small (less than 20 mm long), entire to shallowly toothed stipules, white petals that equal to slightly exceed the calyx lobes, and densely hirsute receptacles. White avens is highly variable morphologically, resulting in Fernald and Weatherby (1922) recognizing 6 subspecific entities. Mohlenbrock (1986) listed 2 of these for Illinois (var. *canadense,* and var. *grimesii* Fern. & Weath.). The numerous Illinois specimens examined do not easily segregate into these 2 varieties because of weak character correlations. Subspecific categories are probably not warranted for this taxon (Gleason 1952; Robertson 1974).

7. *GEUM ALEPPICUM* Jacq. (yellow avens)
Yellow avens is restricted to the northern quarter of Illinois where it grows in tamarack bogs, calcareous fens, disturbed areas, thickets, meadows, and forest clearings (fig. 1). It also appears to be partial to hummocks in marshy areas adjacent to bogs, where cattle have grazed. Differing only slightly from the Eurasian *G. aleppicum,* the North American plants are sometimes distinguished as var. *strictum* (Ait.) Fern. (Fernald 1950; Swink and Wilhelm 1994; Gleason and Cronquist 1991). *Geum aleppicum* is distinguished by its deep yellow to orange petals that exceed the calyx lobes, hirsute receptacles, achenes hirsute nearly throughout, and styles lightly hirsute near the base.

Of the specimens examined, a few were previously identified as *Geum macrophyllum* Willd., a northern species that is not native to Illinois (Fernald 1950; Gleason and Cronquist 1991). These were mostly sterile or poor-quality specimens that were determined to be *G. laciniatum* or *G. aleppicum,* by using the key proposed here. This taxon is distinguished by minute glandular hairs present near the base of the style, glabrous to puberulent receptacles, yellow petals that slightly exceed the calyx lobes, and a usually deciduous epicalyx.

Geum urbanum L., an introduced Eurasian taxon, was first found in Illinois in 1986 (Swink and Wilhelm 1994). It is known from DuPage County, where it occurs in disturbed habitats. It is distinguished by the yellow, 4–5 mm long petals that equal to slightly exceed the calyx lobes, a nearly glabrous terminal style segment, and very large, oval stipules.

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photo by Ken Dritz

Geum canadense white avens

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The Lichen Flora of the Cook County Forest Preserves Part V: Salt Creek Division

Richard D. Hyerczyk[1]

ABSTRACT: Forty-four taxa of lichens (43 species and one variety) are reported for the Forest Preserve District of Cook County's Salt Creek Division, of which 17 were vouchered. An annotated species list is provided, as well as checklists for the individual preserves within this division.

Introduction

This is the fifth paper in the series that started with Hyerczyk (1998)—a project to document the lichenized fungi found in the 12 divisions of the Forest Preserve District of Cook County, Illinois.

Salt Creek Division

The Salt Creek Division is approximately 1,523 hectares (3,763 acres) in size and comprises 25 individual preserves (fig. 1) in the western part of central Cook County. According to Swink and Wilhelm (1994), it lies mainly in the Western Morainal and the Chicago Lake Plain sections of the natural divisions of the Chicago region, and, to a lesser extent, in the Bedrock Valley Section. Part of it runs approximately 8 kilometers (5 miles) east to west along Salt Creek, where elevations above mean sea level range from about 198 meters (650 feet) to 189 meters (620 feet). In this morainal section, plant community types include mesic woodland, oak savanna, and prairie. The Salt Creek Division also runs approximately 7 kilometers (4.5 miles) north to south along the Des Plaines River, into the lake plain, where elevations above mean sea level average 198 meters (650 feet) along the river bluffs and 181 meters (595 feet) along the shoreline. Lake plain plant communities include maple-basswood floodplain forest, mesic woodland, and oak savanna. The southern part of the Salt Creek Division lies in the Bedrock Valley Section, where the dolomite bedrock has been exposed. Man-made features throughout the division include concrete and asphalt roadbeds, picnic tables, and wood rail fences.

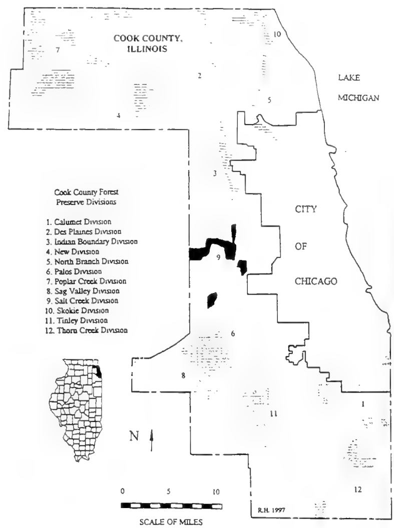

Fig. 1. Salt Creek Division

[1] 5204 S. Natoma, Chicago, Illinois 60638

MATERIALS AND METHODS

During the fall of 1998, 25 individual preserves were surveyed for their lichen flora. Specimens were identified following methods described in Hyerczyk (1998). In addition, specimens housed at the Morton Arboretum that had been collected previously from the Salt Creek Division were included in this paper. Nomenclature approximates Esslinger and Egan (1995), and concepts follow Wilhelm (1998).

RESULTS

Forty-four taxa of lichens (43 species and one variety) in 33 genera are reported for the Salt Creek Division. Twenty-one lichens are crustose growth forms, 19 are foliose, 3 are fruticose, and one is squamulose. Of the reported taxa, 23% are common, 7% are frequent, 36% are occasional, and 34% are rare. Seventeen taxa were vouchered specifically from the Salt Creek Division.

As in other forest preserve divisions, several taxa were found on the trunks and lower limbs of trees and shrubs growing along sunny paths, or in open situations, where they were more exposed to sunlight than is the case in most contemporary woodland situations. These included *Anisomeridium nyssigenum, Arthonia caesia, Candelaria concolor, Candelariella reflexa, Hyperphyscia adglutinata, Lepraria lobificans, Myelochroa aurulenta, Opegrapha atra, Parmelia sulcata, Phaeophyscia pusilloides, P. rubropulchra, Physcia adscendens, P. millegrana, P. stellaris, Punctelia rudecta,* and *Xanthoria fallax.*

Some lignicolous taxa that were found on decorticate logs, weathered wood fencing, and picnic tables included *Amandinea punctata, Caloplaca microphyllina, Cladonia cristatella, C. macilenta* var. *bacillaris, C. ramulosa, Lecanora saligna, L. symmicta, Phaeophyscia cernohorskyi, Thelocarpon laureri,* and *Trapeliopsis flexuosa.*

The exposed dolomite bedrock, granite boulders, and weathered concrete provided habitat for several crustose lichens. Those growing on dolomite or thin soil over dolomite included *Catapyrenium squamulosum, Protoblastenia rupestris, Sarcogyne regularis,* and *Verrucaria calkinsiana.* Those found on weathered concrete included *Bacidia granosa, Bacidina egenula, Caloplaca feracissima, Endocarpon pusillum,* and *Lecanora dispersa. Lichenothelia* sp. was found on granite erratics.

An alphabetized, annotated list of the lichenized fungi found in the Salt Creek Division follows. Generalized degree of frequency and a brief discussion of habitat is given, followed by a collection number in the case of vouchered specimens. All collections were made by the author, unless otherwise indicated. At the end of each entry, growth form and substrate are listed.

AMANDINEA Choisy *ex* Scheid. & H. Mayrh.

Amandinea punctata (Hoffm.) Coppins & Scheid.
Frequent; on weathered wood fences and on the lower trunks of *Carya ovata* and *Gleditsia triacanthos* f. *inermis*. (crustose; corticolous/lignicolous)

ANISOMERIDIUM (Müll. Arg.) Choisy

Anisomeridium nyssigenum (Ellis & Everh.) R. C. Harris
Occasional; on the trunks of *Crataegus mollis* and *Quercus alba*. (crustose; corticolous)

ARTHONIA Ach.

Arthonia caesia (Flotow) Körber
Frequent; on the lower trunks of *Crataegus mollis, Fraxinus pennsylvanica* var. *subintegerrima,* and *Populus deltoides*. Horn #19 (crustose; corticolous)

BACIDIA De Not.

Bacidia granosa (Tuck.) Zahlbr.
Rare; on weathered concrete. (crustose; saxicolous)

BACIDINA Vězda

Bacidina egenula (Nyl.) Vězda
Rare; on weathered concrete. Wilhelm #14142 (crustose; saxicolous)

CALOPLACA Th. Fr.

Caloplaca feracissima H. Magn.
Common; on weathered asphalt and concrete with *Endocarpon pusillum* and *Lecanora dispersa*. Horn #20 (crustose; saxicolous)

Caloplaca microphyllina (Tuck.) Hasse
Occasional; on weathered wood rail fences. (crustose; lignicolous)

CANDELARIA A. Massal.

Candelaria concolor (Dickson) Stein
Common; on the trunks and branches of *Acer saccharinum, Crataegus mollis, Fraxinus pennsylvanica* var. *subintegerrima, Quercus rubra, Tilia americana, Ulmus americana,* and *U. rubra*, and on weathered concrete and wood fencing. Horn #12; Wilhelm #14150 (foliose; corticolous/lignicolous/saxicolous)

Candelaria concolor (Dickson) Stein var. *effusa* (Tuck.) G. Merr. & Burnham
Occasional; on the trunks of *Crataegus mollis* and *Ulmus americana*. Wilhelm #14140, #14148 (foliose; corticolous)

CANDELARIELLA Müll. Arg.

Candelariella reflexa (Nyl.) Lettau
Occasional; on the lower branches of *Crataegus mollis* and on weathered wood fences. (crustose; corticolous/lignicolous)

CATAPYRENIUM Flotow

Catapyrenium squamulosum (Ach.) Breuss
Rare; on shallow soil over dolomite. #849 (squamulose; terricolous)

CLADONIA P. Browne

Cladonia cristatella Tuck.
Occasional; on a decorticate log and weathered wood fencing. (fruticose; lignicolous)

Cladonia macilenta Hoffm. var. *bacillaris* (Genth) Schaerer
Occasional; on decorticate logs. (fruticose; lignicolous)

Cladonia ramulosa (With.) J. R. Laundon
Rare; on a decorticate log. (fruticose; lignicolous)

ENDOCARPON Hedwig

Endocarpon pusillum Hedwig
Common; on weathered concrete with *Caloplaca feracissima* and *Lecanora dispersa*. Horn #21; Wilhelm #14141 (crustose; saxicolous)

FLAVOPARMELIA Hale

Flavoparmelia caperata (L.) Hale
Rare; on the lower trunk of *Fraxinus pennsylvanica* var. *subintegerrima*. (foliose; corticolous)

FLAVOPUNCTELIA (Krog) Hale

Flavopunctelia flaventior (Stirton) Hale
Rare; at the base of *Populus deltoides*. (foliose; corticolous)

HYPERPHYSCIA Müll. Arg.

Hyperphyscia adglutinata (Flörke) H. Mayrh. & Poelt
Occasional; on the lower branches of *Populus deltoides* and *Quercus macrocarpa*. Wilhelm #14143 (foliose; corticolous)

LECANORA Ach.

Lecanora dispersa (Pers.) Sommerf.
Common; on weathered asphalt and concrete with *Caloplaca feracissima* and *Endocarpon pusillum*. (crustose; saxicolous)

Lecanora saligna (Schrader) Zahlbr.
Occasional; on weathered wood fences. Wilhelm #14145 (crustose; lignicolous)

Lecanora symmicta (Ach.) Ach.
Occasional; on weathered wood fencing. (crustose; lignicolous)

LEPRARIA Ach.

Lepraria lobificans Nyl.
Occasional; at the base of *Quercus alba*. (crustose; corticolous)

LICHENOTHELIA D. Hawksw.

Lichenothelia sp. *sensu* MOR Herbarium
Occasional; on a granite boulder in a shaded oak woodland. Wilhelm #14138 (crustose; saxicolous)

MYELOCHROA (Asah.) Elix & Hale

Myelochroa aurulenta (Tuck.) Elix & Hale
Rare; on the lower branches of *Crataegus mollis*. (foliose; corticolous)

OPEGRAPHA Ach.

Opegrapha atra Pers.
Occasional; on the trunks of *Ulmus americana* in wooded floodplains. (crustose; corticolous)

PARMELIA Ach.

Parmelia sulcata Taylor
Frequent; on the trunks and branches of *Crataegus mollis* and on weathered wood rail fencing. Horn #1; Wilhelm #14147 (foliose; corticolous/lignicolous)

PHAEOCALICIUM A. F. W. Schmidt

Phaeocalicium polyporaeum (Nyl.) Tibell
Rare; on the polyporous fungus, *Trichaptum biforme*, which was growing on *Prunus serotina*. #1386 (crustose; fungicolous)

PHAEOPHYSCIA Moberg

Phaeophyscia cernohorskyi (Nádv.) Essl.
Occasional; on a weathered wood picnic table. (foliose; lignicolous)

Phaeophyscia ciliata (Hoffm.) Moberg
Rare; on the lower trunk of *Populus deltoides*. (foliose; corticolous)

Phaeophyscia pusilloides (Zahlbr.) Essl.
Common; on weathered concrete, and on the lower branches of *Acer negundo* and *Populus deltoides*. (foliose; corticolous/saxicolous)

Phaeophyscia rubropulchra (Degel.) Essl.
Common; on the lower trunks of *Crataegus mollis*, *Populus deltoides*, and *Quercus rubra*. Wilhelm #14139 (foliose; corticolous)

PHYSCIA (Schreber) Michaux

Physcia adscendens (Fr.) H. Olivier
Occasional; on the lower trunks of *Crataegus mollis* and *Fraxinus pennsylvanica* var. *subintegerrima*. Horn #14 (foliose; corticolous)

Physcia millegrana Degel.
Common; on the trunks and branches of *Acer negundo, A. saccharinum, Crataegus mollis, Gleditsia triacanthos* f. *inermis, Populus deltoides, Quercus macrocarpa*, and *Ulmus rubra*, and on weathered wood fencing. Horn #13 (foliose; corticolous/lignicolous)

Physcia stellaris (L.) Nyl.
Common; on the trunks and branches of *Acer negundo, Crataegus mollis, Fraxinus pennsylvanica* var. *subintegerrima, Gleditsia triacanthos* f. *inermis*, and *Ulmus americana*. Horn #15; Wilhelm #14149 (foliose; corticolous)

PHYSCIELLA Essl.

Physciella chloantha (Ach.) Essl.
Common; on the trunks of *Fraxinus pennsylvanica* var. *subintegerrima, Ulmus americana*, and *U. rubra*, and on weathered concrete. (foliose; corticolous/saxicolous)

PHYSCONIA Poelt

Physconia detersa (Nyl.) Poelt
Rare; on the trunk of *Populus deltoides*. (foliose; corticolous)

PROTOBLASTENIA (Zahlbr.) J. Steiner

Protoblastenia rupestris (Scop.) J. Steiner
Rare; on weathered dolomite. (crustose; saxicolous)

PUNCTELIA Krog

Punctelia rudecta (Ach.) Krog
Rare; on the trunk of *Populus deltoides*. (foliose; corticolous)

RIMELIA Hale & Fletcher

Rimelia reticulata (Taylor) Hale & Fletcher
Rare; on the lower trunk of *Fraxinus pennsylvanica* var. *subintegerrima*. (foliose; corticolous)

SARCOGYNE Flotow

Sarcogyne regularis Körber
Rare; on weathered dolomite. (crustose; saxicolous)

THELOCARPON Nyl. *ex* Hue

Thelocarpon laureri (Flotow) Nyl.
Rare; on a weathered wood rail fence. (crustose; lignicolous)

TRAPELIOPSIS Hertel & Gotth. Schneider

Trapeliopsis flexuosa (Fr.) Coppins & P. James
Occasional; on weathered wood rail fences. (crustose; lignicolous)

VERRUCARIA Schrader

Verrucaria calkinsiana Servít.
Occasional; on weathered concrete. (crustose; saxicolous)

XANTHORIA (Fr.) Th. Fr.

Xanthoria fallax (Hepp) Arnold
Common; on the trunks of *Crataegus mollis, Prunus serotina*, and *Ulmus rubra*, and on weathered wood rail fences. Horn #17 (foliose; corticolous)

SALT CREEK DIVISION LICHEN CHECKLIST

Bemis Woods
(NE S31 T39N R12E and
S S31 T39N R12E)
Anisomeridium nyssigenum
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Endocarpon pusillum
Lecanora dispersa
Lepraria lobificans
Lichenothelia sp.
Parmelia sulcata
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Xanthoria fallax

Brezina Woods
(N S28 T39N R12E)
Anisomeridium nyssigenum
Caloplaca feracissima
Candelaria concolor
Lecanora dispersa
Opegrapha atra
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris

Brookfield Woods
(SW S26 T39N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Endocarpon pusillum
Parmelia sulcata
Phaeophyscia cernohorskyi
Physcia adscendens
Physcia millegrana
Physcia stellaris
Xanthoria fallax

Brookfield Zoo
(NW S35 T39N R12E)
Amandinea punctata
Caloplaca feracissima
Candelaria concolor
Lecanora dispersa
Lecanora saligna
Physcia millegrana
Physcia stellaris
Physciella chloantha
Xanthoria fallax

Callahan Grove
(NE S26 T39N R12E)
Amandinea punctata
Caloplaca microphyllina
Candelaria concolor
Candelariella reflexa
Hyperphyscia adglutinata
Lecanora symmicta
Phaeophyscia pusilloides
Physcia millegrana
Physcia stellaris
Xanthoria fallax

Cermak Woods
(NE S1 T38N R12E)
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Phaeophyscia pusilloides
Physcia millegrana
Physciella chloantha
Xanthoria fallax

Chicago Portage
(NE S12 T38N R12E)
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Physcia millegrana
Verrucaria calkinsiana

LaGrange Park Woods
(NW S33 T39N R12E)
Amandinea punctata
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Lecanora saligna
Lepraria lobificans
Phaeophyscia rubropulchra
Physcia millegrana
Xanthoria fallax

McCormick Woods
(SE S26 T39N R12E)
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Hyperphyscia adglutinata
Lecanora dispersa
Phaeophyscia rubropulchra
Physcia millegrana

Meadowlark Golf Course
(NW S31 T39N R12E)
Anisomeridium nyssigenum
Caloplaca feracissima
Candelaria concolor
Lecanora dispersa
Parmelia sulcata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Xanthoria fallax

Miller Meadow
(E S23 T39N R12E)
Amandinea punctata
Caloplaca feracissima
Candelaria concolor
Flavoparmelia caperata
Hyperphyscia adglutinata
Lecanora dispersa
Phaeophyscia pusilloides
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Rimelia reticulata
Thelocarpon laureri
Trapeliopsis flexuosa
Xanthoria fallax

National Grove
(SE S26 T39N R12E)
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris

Ottawa Trail Woods
(E S1 T38N R12E)
Anisomeridium nyssigenum
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physciella chloantha

Plank Road Meadow
(NE S2 T38N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Hyperphyscia adglutinata
Lecanora dispersa
Phaeophyscia pusilloides
Physcia millegrana
Physcia stellaris
Xanthoria fallax

Possum Hollow Woods
(W S29 T39N R12E and
SE S29 T39N R12E)
Amandinea punctata
Anisomeridium nyssigenum
Caloplaca feracissima
Caloplaca microphyllina
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Lepraria lobificans
Phaeophyscia rubropulchra
Physcia millegrana

Salt Creek Woods Nature
Preserve
(N S32 T39N R12E)
Amandinea punctata
Arthonia caesia
Candelaria concolor
Cladonia cristatella
Cladonia ramulosa
Lecanora saligna
Lecanora symmicta
Myelochroa aurulenta
Parmelia sulcata
Physcia millegrana
Physcia stellaris
Trapeliopsis flexuosa

Schuth's Grove
(SE S23 T39N R12E)
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Lecanora dispersa
Phaeophyscia pusilloides
Physcia millegrana
Physcia stellaris
Physciella chloantha

Stony Ford
(SE S1 T38N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Lecanora dispersa
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha

Sundown Meadow/Arie Crown Forest
(W S21 T38N R12E)
Amandinea punctata
Caloplaca feracissima
Caloplaca microphyllina
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Parmelia sulcata
Phaeophyscia pusilloides
Physcia adscendens
Physcia millegrana
Physciella chloantha
Trapeliopsis flexuosa

Theodore Stone Forest
(NE S21 T38N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Catapyrenium squamulosum
Endocarpon pusillum
Lecanora dispersa
Opegrapha atra
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Protoblastenia rupestris
Sarcogyne regularis
Verrucaria calkinsiana
Xanthoria fallax

Twenty-Sixth Street Woods
(N S27 T39N R12E)
Caloplaca feracissima
Candelaria concolor
Candelariella reflexa
Endocarpon pusillum
Lecanora dispersa
Opegrapha atra
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Physciella chloantha
Xanthoria fallax

Westchester Woods
(N S28 T39N R12E)
Caloplaca feracissima
Candelaria concolor
Hyperphyscia adglutinata
Lecanora dispersa
Opegrapha atra
Phaeophyscia pusilloides
Physcia millegrana
Physcia stellaris
Xanthoria fallax

White Eagle Woods
(NE S1 T38N R12E)
Caloplaca feracissima
Candelaria concolor
Lecanora dispersa
Phaeophyscia pusilloides
Physcia millegrana
Physciella chloantha

Wolf Road Prairie Nature Preserve
(SE S30 T39N R12E)
Amandinea punctata
Arthonia caesia
Bacidia granosa
Bacidina egenula
Caloplaca feracissima
Candelaria concolor
Candelaria concolor var. effusa
Cladonia cristatella
Cladonia macilenta var. bacillaris
Endocarpon pusillum
Flavopunctelia flaventior
Hyperphyscia adglutinata
Lecanora dispersa
Lecanora symmicta
Parmelia sulcata
Phaeocalicium polyporaeum
Phaeophyscia cernohorskyi
Phaeophyscia ciliata
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia adscendens
Physcia millegrana
Physcia stellaris
Physciella chloantha
Physconia detersa
Punctelia rudecta
Trapeliopsis flexuosa
Verrucaria calkinsiana
Xanthoria fallax

Zoo Woods
(NW S35 T39N R12E)
Arthonia caesia
Caloplaca feracissima
Candelaria concolor
Endocarpon pusillum
Lecanora dispersa
Phaeophyscia pusilloides
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris

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ERIGENIA, Number 17, May 1999, pp. 21–25

THE LICHEN FLORA OF FORD COUNTY, ILLINOIS

Richard D. Hyerczyk[1]

ABSTRACT: Forty-two taxa of lichenized fungi (41 species and one variety) in 25 genera are reported for Ford County, Illinois. Twenty-one are of the foliose growth form, 20 are crustose, and one is fruticose. An annotated species list and information on the distribution and habitats for each taxon are provided. Although none of these represents a new addition to the lichen flora of Illinois, only one taxon was previously reported for Ford County.

INTRODUCTION

Ford County is located in the northern part of central Illinois, approximately 160 km (100 miles) south-southwest of the city of Chicago (fig. 1). It has an area of 125,900 ha (311,000 acres), with nearly 96% of the county lands devoted to agriculture. According to Schwegman (1973), the entire county lies in the Grand Prairie Section of the Grand Prairie Division of the natural divisions of Illinois. Topography is flat to gently rolling with elevations above mean sea level ranging from 200 meters (656 feet) in the northern part of the county to 250 meters (820 feet) in the southern part.

Ford County has a temperate climate, with January temperatures averaging −0.85° C (30.5° F) maximum and −10.2° C (13.7° F) minimum. July temperatures average 30.3° C (86.4° F) maximum and 17.2° C (62.9° F) minimum. About 90.2 cm (35.5 inches) of precipitation fall in one year, including 67.3 cm (26.5 inches) of snow.

Ladd and Wilhelm (1998) reported one taxon from Ford County. Hyerczyk (1997) reported 61 taxa from adjacent Livingston County. Nothing else, however, could be found in the literature on Ford County lichens. Since no other studies of the lichen flora of Ford County are known, this paper was written to document and provide information on the distribution and habits of these lichenized fungi.

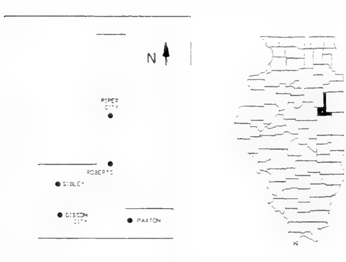

Fig. 1. Ford County, Illinois

MATERIALS AND METHODS

Cemeteries and lands bordering railroad lines, as well as populated areas, were the main collecting sites; plowed farmlands were excluded. In addition, two privately owned preserves and one Illinois nature preserve were surveyed. Specimens were identified using keys by Hale (1979) and Wilhelm (1998), and have been deposited at the Morton Arboretum herbarium (MOR), Lisle, Illinois. Specimens previously collected by others, and housed at MOR, were also included in this paper. Nomenclature approximates Esslinger and Egan (1995).

RESULTS

Forty-two taxa of lichens (41 species and one variety) in 25 genera are reported for Ford County, Illinois (Appendix 1). Twenty-one are of the foliose growth form, 20 are crustose, and one is fruticose. Nearly 62% were found on corticolous substrates, including (in decreasing order of importance) *Quercus macrocarpa, Q. velutina, Acer saccharum, Gleditsia triacanthos, Juglans nigra, Fraxinus americana,* and *F. pennsylvanica* var. *subintegerrima*. Of the remainder, 24% were saxicolous (on weathered concrete, and on dolomite or marble headstones), 12% were lignicolous (on weathered wood fencing or railroad ties), and 2% were fungicolous (on the polyporous fungus *Trichaptum biforme*).

Land uses in Ford County are similar to those in Livingston County; these counties devote an average of 97% of their lands to farming and agriculture, with very little remaining in the way of natural areas. Nearly 80% of the taxa reported for Ford County were also found in Livingston County (Hyerczyk 1997). Taxa reported from Ford County but absent from Livingston County include *Caloplaca ulmorum, Candelariella vitellina, Flavopunctelia*

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flaventior, Lecanora symmicta, L. umbrina, Parmelia sulcata, Parmotrema hypotropum, Phaeocalicium polyporaeum, and *Trapeliopsis flexuosa.*

Hale's (1979) range maps exclude nearly 40% of the macrolichens (foliose and fruticose) currently known from Ford County. Crustose lichens are not included in Hale (1979).

Sixteen taxa of lichens in 13 genera are reported from the Bur Oak Grove (S35 and S36 T25N R7E), a 38-acre presettlement bur oak grove owned by the Nature Conservancy near Sibley (Appendix 2). Nearly all of the taxa reported were found on *Quercus macrocarpa,* with a few on *Crataegus mollis, Prunus serotina,* and *Juglans nigra;* one was fungicolous. Ten taxa were foliose and 6 were crustose.

Nineteen taxa of lichens in 13 genera are reported from Prospect Cemetery Nature Preserve (S17 T23N R10E), a 5-acre cemetery with a remnant mesic black soil prairie, near Paxton (Appendix 3). The majority of the lichens were found on *Quercus velutina* and a few on marble or dolomite headstones. Thirteen species were foliose and 7 were crustose. Nearly 65% were found on corticolous substrates, 30% were saxicolous, and 5% were lignicolous.

Twenty-three taxa of lichens (22 species and one variety) in 16 genera are reported from Howard Thomas Memorial Woods (S14 T23N R9E), a presettlement oak grove near Paxton (Appendix 4). Fourteen taxa were foliose and 9 were crustose. Nearly 66% were found on corticolous substrates, 21% were saxicolous, and 13% were lignicolous.

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APPENDIX 1

An alphabetized, annotated list of the lichenized fungi reported follows. Names used by Hale (1979) are included as synonyms where appropriate. A brief discussion of habitat is followed by the growth form and substrate(s) of each taxon. Collectors are indicated as follows: W&W = Wilhelm & Wetstein, W&S = Wilhelm & Shimp, W = Wilhelm, H = Hyerczyk.

ANISOMERIDIUM (Müll. Arg.) Choisy

Anisomeridium nyssigenum (Ellis & Everh.) R. C. Harris
Near Paxton on *Ulmus americana* (H #1442); also on *Quercus alba* and *Q. macrocarpa.* (crustose, corticolous)

ARTHONIA Ach.

Arthonia caesia (Flotow) Körber
Near Sibley, on *Quercus palustris* (W&S #17564); also on *Quercus macrocarpa.* (crustose; corticolous)

CALOPLACA Th. Fr.

Caloplaca feracissima H. Magn.
Near Piper City, on limestone railroad ballast (H #1059); also on weathered concrete. (crustose; saxicolous).

Caloplaca holocarpa (Hoffm. ex Ach.) M. Wade
Near Piper City, on a weathered railroad tie (H #1063); also on the exposed root of *Acer saccharum.* (crustose; lignicolous)

Caloplaca microphyllina (Tuck.) Hasse
Near Piper City, on a weathered wood fence post (H #1055); also on *Quercus macrocarpa.* (crustose; corticolous/lignicolous)

Caloplaca ulmorum (Fink) Fink
Near Paxton at Prospect Cemetery Nature Preserve on a weathered dolomite headstone (H #1440). (crustose; saxicolous)

CANDELARIA A. Massal.

Candelaria concolor (Dickson) Stein

Near Sibley, on *Ulmus americana* (W&S #17567); also on weathered concrete and wood and on *Carya ovata, Fraxinus americana, Juglans nigra,* and *Quercus macrocarpa.* (foliose; corticolous/lignicolous/saxicolous)

Candelaria concolor var. *effusa* (Tuck.) G. Merr. & Burnham

Near Sibley, on *Fraxinus pennsylvanica* var. *subintegerrima* (W&S #17575); also on *Acer saccharum.* (foliose; corticolous)

CANDELARIELLA Müll. Arg.

Candelariella vitellina (Hoffm.) Müll. Arg.

Near Sibley, on *Gleditsia triacanthos* (W #17571). (crustose; corticolous)

Candelariella xanthostigma (Ach.) Lettau

Near Paxton, on *Quercus rubra* (H #1085); also on *Acer saccharum, Juglans nigra, Quercus alba, Q. macrocarpa,* and *Q. velutina.* (crustose; corticolous)

CLADONIA P. Browne

Cladonia coniocraea (Flörke) Sprengel

Near Roberts, on *Quercus marcocarpa* (H #1072). (fruticose; corticolous)

CYPHELIUM Ach.

Cyphelium tigillare (Ach.) Ach.

Near Piper City, on a wood rail fence (H #1053). (crustose; lignicolous)

ENDOCARPON Hedwig

Endocarpon pusillum Hedwig

Near Piper City, on pebbles and limestone railroad ballast (H #1058); also on weathered concrete and dolomite. (crustose; saxicolous)

FLAVOPARMELIA Hale

Flavoparmelia caperata (L.) Hale = *Pseudoparmelia caperata* (L.) Hale

Near Gibson City, on *Quercus palustris* (W&W #20124); also on *Quercus velutina.* (foliose; corticolous)

FLAVOPUNCTELIA (Krog) Hale

Flavopunctelia flaventior (Stirton) Hale = *Parmelia flaventior* Stirt.

Near Sibley, on *Gleditsia triacanthos* (W&S #17568). (foliose; corticolous)

Flavopunctelia soredica (Nyl.) Hale = *Parmelia ulophylloides* (Vain.) Sav.

Near Paxton, at the Prospect Cemetery Nature Preserve, on *Quercus velutina* (H #1439). (foliose; corticolous)

GRAPHIS Adans.

Graphis scripta (L.) Ach.

Near Roberts, on *Carya ovata* (H #1071); near Paxton, on *Quercus rubra* (H #1084). Also on *Quercus alba* and *Q. velutina.* (crustose; corticolous)

HYPERPHYSCIA Müll. Arg.

Hyperphyscia adglutinata (Flörke) Mayrh. & Poelt = *Physciopsis adglutinata* (Flk.) Choisy

Near Sibley, on *Fraxinus pennsylvanica* var. *subintegerrima* (W&S #17572); also on *Juglans nigra* and *Ulmus americana.* (foliose; corticolous)

LECANORA Ach.

Lecanora dispersa (Pers.) Sommerf.

Near Sibley on railroad ballast (H #1438); also on weathered concrete and dolomite. (crustose; saxicolous)

Lecanora strobilina (Sprengel) Kieffer

Near Roberts, on *Carya ovata* (H #1074). (crustose; corticolous)

Lecanora symmicta (Ach.) Ach.

Near Sibley, on *Quercus palustris* (W&S #17565). (crustose; corticolous)

Lecanora umbrina (Ach.) A. Massal.

Near Piper City, on a weathered railroad tie (H #1062); near Piper City, again on a weathered railroad tie (H #1064). (crustose; lignicolous)

LEPRARIA Ach.

Lepraria lobificans Nyl.

Near Paxton, on *Quercus rubra* (H #1083); also on *Quercus macrocarpa* and *Q. velutina.* (crustose; corticolous)

OPEGRAPHA Ach.

Opegrapha atra Pers.

Near Paxton, at the Howard Thomas Memorial Woods, on the trunk of *Ulmus americana* (H #1595). (crustose; corticolous)

PARMELIA Ach.

Parmelia sulcata Taylor

Near Sibley, on *Gleditsia triacanthos* (W&S #17569). (foliose; corticolous)

PARMOTREMA A. Massal.

Parmotrema hypotropum (Nyl.) Hale

Near Paxton, at the Howard Thomas Memorial Woods, on a dead tree (H #1589). (foliose; corticolous)

PERTUSARIA DC.

Pertusaria pustulata (Ach.) Duby

Near Roberts, on *Carya ovata* (H #1075). This species was first reported by Ladd and Wilhelm (1998). (crustose; corticolous)

PHAEOCALICIUM A. F. W. Schmidt

Phaeocalicium polyporaeum (Nyl.) Tibell

Near Sibley, at the Bur Oak Grove, on the polyporous fungus, *Trichaptum biforme,* which was growing on *Prunus serotina* (H #1601). (crustose; fungicolous)

PHAEOPHYSCIA Moberg

Phaeophyscia cernohorskyi (Nádv.) Essl.

Near Roberts, on granite headstones in a cemetery (H #1080); also on weathered concrete and dolomite. (foliose; saxicolous)

Phaeophyscia ciliata (Hoffm.) Moberg
Near Roberts, on marble headstones in a cemetery (H #1070); also on *Carya ovata* and on weathered concrete and dolomite. (foliose; corticolous/saxicolous)

Phaeophyscia pusilloides (Zahlbr.) Essl.
Near Piper City, on marble headstones in a cemetery (H #1057); near Roberts, on marble headstones in a cemetery (H #1069). (foliose; saxicolous)

Phaeophyscia rubropulchra (Degel.) Essl.
Near Roberts, on *Quercus macrocarpa* (H #1066); also on the lower trunks of *Crataegus mollis, Fraxinus americana, Quercus alba,* and *Q. macrocarpa*. (foliose; corticolous)

PHYSCIA (Schreber) Michaux

Physcia adscendens (Fr.) H. Olivier
Near Roberts, on granite headstones in a cemetery (H #1068). (foliose; saxicolous)

Physcia millegrana Degel.
Near Sibley, on *Quercus palustris*. (W&S #17566); also on weathered wood fencing and on *Acer saccharum, Crataegus mollis, Fraxinus americana, Juglans nigra, Prunus serotina, Quercus alba,* and *Q. macrocarpa*. (foliose; corticolous/lignicolous)

Physcia stellaris (L.) Nyl.
Near Sibley, on *Fraxinus pennsylvanica* var. *subintegerrima* (W&S #17574); also on *Quercus macrocarpa*. (foliose; corticolous)

PHYSCONIA Poelt

Physconia detersa (Nyl.) Poelt
Near Roberts, on weathered concrete (H #1081). (foliose; saxicolous)

PUNCTELIA Krog

Punctelia bolliana (Müll. Arg.) Krog
Near Roberts, on *Carya ovata* (H #1077); near Gibson City, on *Quercus palustris* (W&W #20123). (foliose; corticolous)

Punctelia missouriensis Wilhelm & Ladd
Near Paxton, at the Howard Thomas Memorial Woods, on the trunk of *Quercus rubra* (H #1589). (foliose; corticolous)

Punctelia rudecta (Ach.) Krog
Near Roberts, on *Quercus macrocarpa* (H #1076); near Paxton, on *Quercus rubra* (H #1082). (foliose; corticolous)

TRAPELIOPSIS Hertel & Gotth. Schneider

Trapeliopsis flexuosa (Fr.) Coppins & P. James
Near Paxton, on a weathered telephone pole (H #1482). (crustose; lignicolous)

XANTHORIA (Fr.) Th. Fr.

Xanthoria fallax (Hepp) Arnold
Near Sibley, on *Fraxinus pennsylvanica* var. *subintegerrima* (W&S #17573). (foliose; corticolous)

Xanthoria sp. #1, *sensu* MOR
Near Roberts, on a limestone tombstone in a cemetery (H #1067). (foliose; saxicolous)

APPENDIX 2: Bur Oak Grove

Anisomeridium nyssigenum
Arthonia caesia
Caloplaca microphyllina
Candelaria concolor
Candelariella xanthostigma
Hyperphyscia adglutinata
Lepraria lobificans
Parmelia sulcata
Phaeocalicium polyporaeum
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Punctelia bolliana
Punctelia missouriensis
Punctelia rudecta
Xanthoria sp. #1

APPENDIX 3: Prospect Cemetery Nature Preserve

Arthonia caesia
Caloplaca ulmorum
Candelaria concolor
Candelariella xanthostigma
Endocarpon pusillum
Flavoparmelia caperata
Flavopunctelia flaventior
Flavopunctelia soredica
Lecanora dispersa
Lecanora symmicta
Lecanora umbrina
Parmelia sulcata
Phaeophyscia cernohorskyi
Phaeophyscia ciliata
Phaeophyscia rubropulchra
Physcia millegrana
Physcia stellaris
Punctelia bolliana
Xanthoria sp. #1

APPENDIX 4: Howard Thomas Memorial Woods

Anisomeridium nyssigenum
Caloplaca feracissima
Caloplaca holocarpa
Candelaria concolor
Candelaria concolor var. effusa
Candelariella xanthostigma
Endocarpon pusillum
Flavoparmelia caperata
Graphis scripta
Hyperphyscia adglutinata
Lecanora dispersa

Lepraria lobificans
Opegrapha atra
Parmotrema hypotropum
Phaeophyscia cernohorskyi
Phaeophyscia ciliata
Phaeophyscia rubropulchra
Physcia millegrana
Punctelia bolliana
Punctelia missouriensis
Punctelia rudecta
Xanthoria fallax
Xanthoria sp. #1

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Vegetation of Badger *(Taxidea taxus)* and Plains Pocket Gopher *(Geomys bursarius)* Mounds in the Sand Areas of West-Central Illinois

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ABSTRACT: Plant species richness on badger and pocket gopher mounds was studied at the Henry Allan Gleason Nature Preserve, Mason County, Illinois. Within the sand prairie at the preserve, 27 species were found on badger mounds, 24 on pocket gopher mounds, and 21 on adjacent areas without mounds, resulting in 1.31, 1.21, and 1.23 diversity index values, respectively. The mean area of a badger mound (2.57 m^2) was significantly greater than a pocket gopher mound (0.39 m^2).

Introduction

The American badger *(Taxidea taxus)* and the plains pocket gopher *(Geomys bursarius)* are common species in the sand prairies near Havana, Mason County, Illinois (Hoffmeister 1989). Badger burrows are excavated for dens and in the quest for prey (Errington 1937; Lampe 1982). These excavations leave considerable volumes of disturbed soil, forming 2–3 m^2 mounds (Platt 1975). Plains pocket gophers, in contrast, create smaller mounds, mostly less than 0.5 m^2, which are formed during tunnel construction while foraging (Gibson 1989; Grant, French, and Folse 1980).

The impact on vegetation is significant where pocket gophers and badgers are abundant (Reichman and Smith 1985). In areas occupied by badgers, burrows are more abundant in dry areas on slopes or along hilltops (Platt 1975). Disturbances by pocket gophers are located in areas of high vegetation densities (Grant, French, and Folse 1980). These disturbances have been viewed as uncommon, irregular events that cause abrupt structural changes in a plant community (Sousa 1984).

Disturbances due to mound formation appear to play a significant role in shaping the structure of plant communities, although the impact on species richness depends largely on the nature of the dominant plants, the rate of succession, and seasonal changes (Armesto and Pickett 1985). The objective of this study was to determine the plant species composition on badger and pocket gopher mounds on a sand prairie remnant in Mason County, Illinois.

Location of Study Site

The study site is located in the Illinois River Section of the Illinois and Mississippi Rivers Sand Areas Natural Division (Schwegman 1973). This section is characterized by sandy soil, known as the Parkland Sand, that was deposited during the melting of the Wisconsinan glacier and later reworked by wind (Willman and Frye 1970). All study plots were located within a 30 ha field on the southern half of the Henry Allan Gleason Nature Preserve (SE S6 and NE S7 T22N R7W). In this field is reestablished sand prairie vegetation that still contains many successional species. Prior to dedication as a nature preserve in 1970, this field was cultivated. Management practices include prescribed burning and the cutting of trees and exotic shrubs (McFall and Karnes 1995).

Methods

During February and March of 1991, the site was searched for badger and pocket gopher mounds that had been excavated after the growing season of 1990. Each badger mound was marked with a survey flag and plotted. Areas having high pocket gopher mound densities were marked by placing 4 flags in a square around 10 to 20 mounds.

In late June the study site was surveyed to determine plant species composition, dominant species, and total plant cover on the badger and pocket gopher mounds and on adjacent areas undisturbed by burrowing activity. A 0.25 m^2 circular plot was employed. The plots were placed near the center of each mound, and in the areas adjacent to the mounds, they were placed randomly. All

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badger mounds found were sampled; in the case of pocket gopher mounds, each square marked earlier in the year represented a sample area. Within each area, 4 to 7 pocket gopher mounds were randomly selected for sampling. Adjacent to each pocket gopher sampling area, 4 plots were sampled in vegetation that lacked mounds. On the prairie, 12 plots on badger mounds, 28 plots on pocket gopher mounds, and 16 plots adjacent to the mounds were sampled. Percent total plant cover was estimated for each plot using the 6 classes described by Daubenmire (1959): 1 = 0–5%, 2 = 5–25%, 3 = 25–50%, 4 = 50–75%, 5 = 75–95%, 6 = 95–100%, and the percent frequency of occurrence was calculated for each species sampled on each site. The plant species with the highest cover was considered the dominant on the plot. The Shannon-Wiener measurement (Krebs 1972) was used to compare species diversity. Plant nomenclature follows Mohlenbrock (1986).

RESULTS

The most frequent species found on badger mounds were *Cassia fasciculata* (58.3%), *Commelina erecta* (50.0%), *Opuntia humifusa* (50.0%), *Ambrosia psilostachya* (41.0%), and *Aristida tuberculosa* (41.0%). *Cassia fasciculata* (71.4%), *Opuntia humifusa* (66.7%), *Conyza canadensis* (57.1%), and *Lepidium virginicum* (57.1%) were the most important on pocket gopher mounds (table 1). In most instances, individuals of *Opuntia humifusa* had grown through the mounds from specimens covered when the mounds were excavated. In the adjacent areas that lack mounds, the most frequent species were *Conyza canadensis* (75.0%), *Opuntia humifusa* (56.3%), *Paspalum bushii* (56.3%), *Cassia fasciculata* (43.8%), and *Ambrosia psilostachya, Bouteloua hirsuta, Diodia teres,* and *Leptoloma cognatum* (each at 37.5%). Mean cover was nearly equal on badger (36% cover) and pocket gopher mounds (35% cover), and was 88% on the adjacent plots that lacked mounds. Also, badger mounds had a higher diversity index (1.31) than pocket gopher mounds (1.21) and the adjacent areas that lacked mounds (1.23).

Badger mounds averaged 6.5 times larger than pocket gopher mounds. The mean area covered by badger mounds ($n = 12$, $\overline{X} = 2.57$ m^2, SE = 5,130.06) and pocket gopher mounds ($n = 25$, $\overline{X} = 0.39$ m^2, SE = 338.05) were significantly different ($t = -5.903$, $P < 0.001$).

DISCUSSION

Vegetation responses to disturbance depend on the physical nature of the disturbance, the vegetational composition of the community, and the rate, intensity, and duration of disturbance. Both badger and pocket gopher activity created openings for colonizing species and opportunities for increased plant species richness. In the sand prairie 27 species were identified on badger mounds and 24 species on pocket gopher mounds, compared with 21 species in the adjacent areas lacking mounds (table 1).

These disturbances ensure the presence of "colonizer" species on the study sites. Species recognized as competitors are typically dominants of later seral stages that will occupy disturbed sites via dispersal and growth of propagules as microclimatic variation decreases (Platt and Weis 1977). Colonizing species, in contrast, are characterized by high rates of reproduction, widely dispersed propagules, and the ability to thrive on disturbance sites where microclimatic factors are less stable. Studies suggest that species diversity is maximized at intermediate levels of disturbance within communities (Abugov 1982; Miller 1982; Sousa 1984). If disturbance rates are maintained at low levels, or are absent completely, competitive species may eliminate colonizing species through growth and dispersal. If disturbance rates are high, colonizing species with high growth and reproductive capabilities may persist through rapid colonization, while competitive dominants are excluded (Miller 1982).

In general, the animal mounds support an increased diversity of species compared with plots lacking mounds. Also, the number of dominant plant species showed an increase from 4 in adjacent areas lacking mounds to 8 on pocket gopher mounds, and to 7 on badger mounds (table 1). Many of the colonizer plants of the mounds were also common species throughout the sand prairie. Although most were annuals, some perennial species were associated with mound disturbances. Some of these had low frequencies *(Dichanthelium villosissimum, Eragrostis trichodes, Monarda punctata, Solanum carolinense,* and *Tradescantia ohiensis),* while some were extremely common mound components *(Agrostis hyemalis, Bouteloua hirsuta, Commelina erecta, Opuntia humifusa,* and *Paspalum bushii).* Most of these perennials, particularly *Opuntia humifusa,* were regrowths of individuals covered during mound excavation. The perennial *Commelina erecta* was more common on disturbance mounds, probably because of decreased competition. In contrast, 9 annual and biennial species were recorded for the mounds, but were not found in the adjacent plots lacking mounds (table 1). These species were found in other disturbed areas, such as blowouts, but were not present in the area studied. It appears that the intermediate levels of disturbance allow both perennial and successional annual species to recolonize the disturbed areas but prevent dominance by one or a few of them. This results in a nonequilibrium state with high species richness (Sousa 1984). Burrowing activity by mammals is causing continuous disturbance, resulting in various successional stages and increased plant species diversity.

Table 1. Frequency, dominance, diversity index, mean cover, and total species present on badger and pocket gopher mounds and in undisturbed habitat of a sand prairie at the Henry Allan Gleason Prairie Nature Preserve

Species	Badger (n=12) freq./dom.	Pocket gopher (n=28) freq./dom.	Adjacent areas (n=16) freq./dom.
Agrostis hyemalis *	——	28.6 / 4	——
Ambrosia artemisiifolia	16.7 / 1	21.4 / 1	12.5 / -
Ambrosia psilostachya *	41.0 / -	14.3 / -	37.5 / -
Aristida desmantha	8.3 / -	14.3 / -	25.0 / 4
Aristida tuberculosa	41.0 / -	17.9 / -	——
Bouteloua hirsuta *	16.7 / -	17.9 / 1	37.5 / 5
Bromus tectorum +	25.0 / -	——	——
Cassia fasciculata	58.3 / 3	71.4 / 9	43.8 / -
Cenchrus longispinus	——	3.6 / -	——
Chenopodium album	8.3 / -	10.7 / 1	——
Commelina erecta *	50.0 / 1	39.3 / -	12.5 / -
Conyza canadensis	16.7 / -	57.1 / 1	75.0 / -
Croton glandulosus	33.3 / -	32.1 / -	18.8 / -
Cycloloma atriplicifolium	8.3 / -	——	——
Cyperus filiculmis *	——	17.9 / -	12.5 / -
Dichanthelium villosissimum	8.3 / -	——	6.3 / -
Diodia teres	8.3 / 1	32.1 / 6	37.5 / -
Eragrostis trichodes *	8.3 / -	——	——
Froelichia floridana	8.3 / -	21.4 / -	——
Gnaphalium obtusifolium	——	——	12.5 / -
Helianthus petiolaris +	8.3 / 1	3.6 / -	——
Heterotheca camporum *	——	——	25.0 / -
Ipomoea hederacea +	8.3 / -	——	——
Lepidium virginicum	33.3 / -	57.1 / -	31.3 / -
Leptoloma cognatum *	——	——	37.5 / 5
Monarda punctata *	——	3.6 / -	12.5 / -
Oenothera rhombipetala	8.3 / -	7.1 / -	——
Opuntia humifusa *	50.0 / 2	66.7 / 4	56.3 / 1
Paspalum bushii *	16.7 / -	39.3 / -	56.3 / -
Plantago pusilla	8.3 / -	7.1 / -	25.0 / -
Poinsettia dentata	16.7 / 1	35.7 / -	6.3 / -
Solanum carolinense * +	8.3 / -	——	——
Strophostyles helvola	16.7 / -	14.3 / -	12.5 / -
Tradescantia ohiensis *	8.3 / -	——	——
Diversity Index	1.31	1.21	1.23
Mean Cover Class (% cover)	2.92 (36%)	2.86 (35%)	5.38 (88%)
Total Species	27	24	21

*perennial, +adventive

Note: Dominance number indicates the number of times a species was the obvious dominant taxon in a plot.

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Restoration of Aspects of Native Soil Quality Through Conversion of Agricultural Lands to Cultivated Hayfields

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ABSTRACT: In the Midwestern United States, degraded agricultural lands are often cultivated as hayfields. This practice reduces soil erosion and improves soil quality, though such improvements can be modest compared with the original condition before row crop production. We compared several physical, biological, and chemical properties of soils underlying 3 mesic tallgrass prairie sites and 3 long-term (7 to 25 years) cultivated hayfields in central Illinois to determine the degree to which converting degraded agricultural lands into hayfields restores soil quality. We found that soils underlying cultivated hayfields were more compacted and had lower organic matter content levels, cation exchange capacities, and water-holding capacities than prairie soils. Soil aggregate structure and nutrient contents were similar in cultivated hayfield and prairie soils. Thus, hayfield cultivation can restore some, but not all, aspects of soil health. Programs that promote soil conservation and restoration by encouraging hayfield plantings may not adequately lead to key improvements in soil health.

Introduction

Throughout the Midwestern United States, there are a great number of acres of agricultural land that have been in continuous or near-continuous cultivation in major cash crops since the mid 1800s. Long-term cultivation results in depleted levels of organic matter in soils, a result of removing more of the primary production from a plot of land than is returned (Buyanovsky, Kucera, and Wagner 1987; Beauchamp and Voroney 1994; Eghball et al. 1994; Dodds et al. 1996; Paul et al. 1997). Soils depleted of organic matter have greater bulk densities and are more easily compacted, have reduced soil aggregate structure and increased erodibility, and have reduced water, air, and nutrient-holding capacities (Kohnke 1968; Weaver 1968; Elliott 1986; Jastrow 1987; Stern 1991; Cihacek and Swan 1994; Hudson 1994; Loch and Pocknee 1995; Lowery et al. 1995; Dodds et al. 1996; Rao, Singh, and Gupta 1997). Further, the composition and activity of key soil microbial communities often change dramatically, altering mineralization rates and the availability of various macronutrients (Farrell et al. 1994; Dodds et al. 1996; Rao, Singh, and Gupta 1997; Sotomayor and Rice 1996). Recent research has focused on developing agricultural practices that reduce soil erosion and provide sustainable soil health by maintaining soil organic matter content and aggregate structure (Reicosky et al. 1995; Warkentin 1995; Wolkomir 1995).

One method for restoring the health of degraded agricultural soils is to put the land into use as cultivated pastureland or hayfield (Lee 1996). Putting degraded agricultural lands into cultivated grasses, either for grazing or for commercial haying, reduces soil erosion and improves soil quality, while providing the farmer with some economic return (Rao, Singh, and Gupta 1997). In 1980, and again in 1995, Illinois passed legislation to provide funding for a variety of programs that promote the development and use of sustainable agricultural practices to preserve the long-term productivity of Illinois soils. Under that legislation, pastureland and hayfield plantings are eligible for cost-sharing on an estimated 2–3 million acres of farmland throughout the state (Illinois Department of Agriculture 1995, 1996). These programs are likely to become more popular than set-aside programs that preclude any commercial use of set-aside acres (e.g., the Conservation Reserve Program, established by federal legislation in the 1985 Food Security Act, which had enrolled a total of 35.4 million acres within the first 6 years [Zobeck et al. 1995]). Improvements in the quality of soils underlying cultivated grasslands can be modest, however, even when the grasses are not baled off or grazed (Dormaar et al. 1995; Zobeck et al. 1995), and such alternative agricultural uses can present an economic burden, particularly to smaller-scale individual farmers, who often can afford only marginally arable lands to begin with (Tweeten 1995). The efficacy of state-wide legislative programs that encourage pastureland and hayfield plantings depends on the degree to which soil health can be restored by converting degraded cropland into

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pastureland or hayfield. Unfortunately, there is at present little data available on soil quality improvements associated with these programs.

Here we present data on several physical and chemical properties of soils underlying mesic tallgrass prairie sites and cultivated hayfields in central Illinois. Specifically, we examined the degree to which converting degraded agricultural lands into hayfields restores soil quality to levels seen in uncultivated soils. We compared several physical and chemical properties of soils underlying 3 mesic tallgrass prairie sites and 3 cultivated hayfields in central Illinois. Soil parameters measured were chosen to reflect a wide range of attributes strongly related to soil health (Romig et al. 1995), including soil compaction; aggregate structure; organic matter content; pH; cation exchange capacity; free nitrate, phosphate, and cation contents; and water-holding capacity.

MATERIALS AND METHODS

Site Descriptions and Cultivation Histories

We selected 3 local mesic tallgrass prairie sites and 3 cultivated legume hayfield sites. A descriptive summary of these sites is presented in table 1. All sites were within the published range of the former tallgrass prairie: 4 sites were located in the Galesburg Section of the Western Forest-Prairie Division, and 2 (Brucker plot and Root plot) were located in the Grand Prairie Section of the Grand Prairie Division (McClain 1997). All sites were located within a 27 km radius, in Peoria (5 sites) and Marshall (Root plot) counties in Illinois. Care was taken to ensure that the underlying soils were as similar as possible and were representative of agricultural fields in the Peoria County area. Soil type determinations were obtained from published soil maps (Walker 1992; Marshall-Putnam Soil and Water Conservation District). Four of the sites (2 prairie and 2 hayfield) were located on predominantly Rozetta Silt Loam (1–5% slope, no erosion) with minor soils in the Rozetta-Keomah-Sylvan association. Soils in the Rozetta-Keomah-Sylvan association account for 35% of soils within Peoria County and are representative of nearly level to very steep, well-drained to poorly drained upland soils (Walker 1992). The remaining 2 sites were located on Jules Silt Loam (Wheeler farm) and Warsaw Silt Loam (Root plot). These soils are the major representatives of the nearly level to strongly sloping, well-drained to poorly drained soils on stream terraces and flood plains that make up approximately 9% of soils in Peoria County. They differ from the upland Rozetta Silt Loams

Table 1. Description of cultivated hayfield and prairie sites studied

Site	Cover	Primary herbaceous species	Soil type[a]	Years in present cover	Cultivation history
Wheeler farm	legume hayfield	alfalfa, orchard grass, timothy, brome	Jules Silt Loam	7	20+ years row crops
Sandall farm	legume hayfield	alfalfa, red clover, orchard grass	Rozetta Silt Loam	12 of 14[b]	20+ years row crops
Isaac farm	legume hayfield	alfalfa, orchard grass, timothy, brome	Rozetta Silt Loam	22 of 25[c]	20+ years row crops
Root prairie	tallgrass prairie/savanna	big bluestem, Indian grass, goldenrods, asters, blazing star	Warsaw Silt Loam	na	none
Jubilee prairie	restored tallgrass prairie	big bluestem, little bluestem, Indian grass, asters, prairie dock, compass plant	Rozetta Silt Loam	at least 5	20+ years grazed pasture[d]
Brucker prairie	tallgrass prairie/savanna	little bluestem, lead plant, goldenrods, blazing star, indigo, purple coneflower	Rozetta Silt Loam	na	none

[a] Based on soil survey maps (Walker 1992). Jules and Warsaw Silt Loams are located on floodplains and stream terraces; Rozetta Silt Loams are upland soils.

[b] Field was cultivated in oats and beans for 1 year each before returning to hayfield for 2 years preceding study.

[c] Field was cultivated in corn for 3 years before returning to hayfield for 2 years preceding study.

[d] Pasture was uncultivated native grasses; plot abandoned for approximately 30 years before restoration began.

in that they have calcareous underlying material and are subject to periodic flooding (Walker 1992). Primary uses and management strategies for both upland Rozetta and the floodplain soils are similar; these soils are predominantly used in cultivated crops, pastures, or hayfields, and they require management to control erosion and maintain tilth and fertility (Walker 1992).

The 3 hayfields were chosen to reflect similar crop composition and harvest schedules. Two of the sites (Wheeler and Isaac farms) were seeded to alfalfa *(Medicago sativa)* and non-native grasses: orchard grass *(Dactylis glomerata)*, timothy *(Phleum pratense)*, and brome *(Bromus inermis)*. The third site (Sandall farm) was seeded to alfalfa, with substantial amounts of red clover *(Trifolium pratense)* and orchard grass present. All 3 sites were hayed once yearly in the fall, between July and October, and all 3 sites had annual fertilizer additions. During the first week of August, the Wheeler and Isaac farm sites received commercial fertilizer applications at a rate of 39.3 kg N, 78.6 P, and 224.6 kg K ha^{-1}. The Sandall farm site received an unmeasured organic (manure) fertilizer application. Each of the 3 hayfields had been cultivated as such for a minimum of 7 years; 2 had been in near-continuous cultivation as legume hayfields for 14 and 25 years, respectively. Although the exact cultivation history of these sites prior to seeding as legume hayfields is not known, it is generally believed that these sites were all in continuous or near-continuous cultivation in row crops, probably corn, for the previous 20–30 years or more (C. Wheeler and L. Sandall, pers. comm.).

The 3 prairie sites also were chosen to reflect similar species composition. The dominant grass and forb species on these sites are typical of mesic tallgrass prairies, and include big bluestem *(Andropogon gerardii)*, little bluestem *(Schizachyrium scoparium)*, Indian grass *(Sorghastrum nutans)*, blazing star *(Liatris spicata)*, lead plant *(Amorpha canescens)*, compass plant *(Silphium laciniatum)*, purple coneflower *(Echinacea purpurea)*, indigo (*Baptisia* spp.), and various asters (*Aster* spp.) and goldenrods (*Solidago* spp.). The prairie sites had been actively maintained and/or restored through burning regimes (all 3 sites) and intensive alien removal and native seeding regimes (Brucker and Jubilee plots) for a minimum of 5 years. Two of the sites (Root and Brucker plots) are thought to be remnant communities of virgin mesic tallgrass prairie savanna that had been degraded extensively before active management began 10–20 years before the present study (A. Frye and M. Brucker, land stewards, pers. comm.). The exact history of the restored prairie site is unknown, but it had once been grazed, cultivated pastureland that had been left abandoned for approximately 30 years before restoration efforts began (H. Gardner, land steward, pers. comm.). The major species from each prairie site are listed in table 1.

Soil Sampling and Analysis

Three soil samples were collected randomly from each site in 1994 during the weeks of July 1–July 16 (growing season) and October 15–October 22 (post-growing season). The samples were frozen to maintain nutrient levels until further testing could be done. Each sample was tested for organic matter content, pH, cation exchange capacity (determined via summation method), and levels of free nitrate, phosphorus, potassium, calcium, and magnesium (Mower's Soil Testing Laboratory, Toulon, Ill.). Levels of soil compaction were measured during the first sampling period using a penetrometer (Lang Penetrometer, Gulf Shores, Ala.). A total of 9 soil penetrometer readings were taken at each location, 3 readings per soil-sampling site.

Two additional soil cores were collected during the first sampling period (growing season) to examine soil aggregate structure and water-holding characteristics. One core was subjected to direct dry sieving to determine the size distribution of soil aggregates (Baver, Gardner, and Gardner 1972). The sieving was standardized to 4 minutes of vigorous, manual shaking in a series of 6 sieves to obtain 7 aggregate size fractions: >3.5 mm, 1–3.5 mm, 0.75–1 mm, 0.42–0.75 mm, 0.25–0.42 mm, 0.11–0.25 mm, and <0.11 mm. The second soil core was used to determine the maximum water-holding capacity of each soil (Gates 1949), water potential at field capacity, and moisture content and water potential during a 4-hour dry-down period. To determine maximum water-holding capacity, the intact core was placed in a plastic pot that was open on one end and closed at the other, with perforations in the closed end. The pot was set upright with the open end up. Water was added to the core from the open end in a wet/pause/wet technique until the soil was moistened. Water was then added slowly to the core from the open end until it began to drip from the bottom perforations. When dripping ceased, a small sample from the center of the core was weighed, and a second small sample was removed for water-potential determination. The sample was weighed again and placed in a drying oven, set at 130° C, for one hour. The sample was weighed, a small sample was again removed for water-potential determination, and the original sample was weighed again and placed back in the drying oven for an additional hour. This process was repeated over a 4-hour period. After each of the 5 dry-down readings, the water-potential determination was obtained using a thermocouple psychrometer (NT-3, Decagon Devices, Pullman, Wash.), and the sample was allowed to dry to a constant weight and weighed a final time. The difference between the original weight (while wet, before drying) and final dry weight divided by the dry weight is equal to the percent water content based on the dry weight (Kohnke 1968). For each location, this method gave a maximum water-holding capacity, a dry-down curve, and water potential based on percent water content.

Statistical Analysis

Organic matter content, soil pH, CEC, and nutrient contents were analyzed, using a two-way analysis-of-variance to determine the main effects of site and sampling date and their interaction (Data Desk 5.01, Data Description, Inc., Ithaca, N.Y.). Site and date were designated as fixed effects, and type III sums of squares were employed. Orthogonal contrasts were constructed (e.g., within the main effect of site and the interaction between site and sampling date) to examine the effects of vegetative cover (prairie vs. hayfield) and soil type (upland vs. floodplain), and their interactions with sampling date. All main effects, interactions, and contrasts were tested over the residual mean square (error) term. Whenever a specific contrast was significant, the contribution of that contrast to the sums of squares (SS) of the overall term (site, or site*sampling date) was computed as 100*(SS contrast/SS term).

RESULTS AND DISCUSSION

Mesic tallgrass prairie sites were significantly less compacted than cultivated legume hayfield soils (tables 2 and 3). In fact, prairie vs. hayfield cover accounted for 86% of the variation in soil compaction values across sites, while soil type (upland vs. floodplain) accounted for only 6% of the total variation (table 3). Values ranged from 291.9–737.6 kPA in prairie sites compared with 747.27–1517.3 kPA in hayfield sites. Although absolute values obtained in penetrometer studies may not be well standardized (making cross-study comparisons difficult),

Table 2. Physical, biological, and chemical properties of soils under cultivated hayfields vs. tallgrass prairies during the growing season and following the growing season

	Cultivated hayfields			Tallgrass prairies		
	Wheeler farm	Sandall farm	Isaac farm	Root prairie	Jubilee prairie	Brucker prairie
Growing season (July 5)						
Soil compaction (kPA)	951.5 ± 171.1	1297.9 ± 302.9	1021.2 ± 269.1	360.9 ± 67.6	430.6 ± 60.7	587.2 ± 222.9
Organic matter (% mass)	1.9 ± 0.1	2.0 ± 0.3	1.6 ± 0.4	4.5 ± 0.9	1.4 ± 0.1	2.0 ± 0.8
Soil pH	7.5 ± 0.1	5.7 ± 0.7	6.2 ± 0.1	7.2 ± 0.0	5.3 ± 0.6	5.3 ± 0.4
CEC (cmol(p)/kg)	12.0 ± 1.1	14.9 ± 8.1	11.8 ± 1.8	13.7 ± 1.9	18.2 ± 5.8	22.7 ± 5.5
NO3– (cmol(e)/kg)	0.046 ± 0.009	0.039 ± 0.002	0.038 ± 0.002	0.046 ± 0.013	0.034 ± 0.002	0.033 ± 0.006
PO4– (cmol(e)/kg)	0.044 ± 0.011	0.028 ± 0.022	0.007 ± 0.004	0.054 ± 0.009	0.003 ± 0.001	0.008 ± 0.004
Mg++ (cmol(p)/kg)	3.43 ± 0.31	1.42 ± 0.36	1.15 ± 0.10	3.35 ± 0.47	1.24 ± 0.12	2.19 ±1.12
Ca++ (cmol(p)/kg)	8.26 ± 1.32	3.68 ± 0.64	6.51 ± 0.11	9.76 ± 1.27	2.78 ± 1.06	5.72 ± 1.58
K+ (cmol(p)/kg)	0.315 ± 0.043	0.167 ± 0.035	0.160 ± 0.034	0.561 ± 0.381	0.154 ± 0.037	0.352 ± 0.040
Post-growing season (October 15)						
Organic matter (% mass)	2.0 ± 0.2	2.2 ± 0.2	2.0 ± 0.3	2.8 ± 0.3	2.6 ± 0.2	2.6 ± 0.5
Soil pH	7.6 ± 0.1	5.5 ± 0.4	6.3 ±0.1	7.3 ± 0.2	5.8 ± 0.4	5.5 ± 0.5
CEC (cmol(p)/kg)	13.5 ± 0.9	17.0 ± 4.2	11.0 ± 0.2	11.7 ± 3.1	13.8 ± 4.1	20.1 ± 8.1
NO3– (cmol(e)/kg)	0.155 ± 0.001	0.154 ± 0.006	0.154 ± 0.001	0.157 ± 0.003	0.158 ± 0.002	0.156 ± 0.001
PO4– (cmol(e)/kg)	0.094 ± 0.070	0.017 ± 0.004	0.006 ± 0.002	0.058 ± 0.036	0.004 ± 0.002	0.014 ± 0.012
Mg++ (cmol(p)/kg)	3.47 ± 0.23	1.08 ± 0.08	1.31 ± 0.18	2.89 ± 0.69	0.78 ± 0.19	1.93 ± 1.45
Ca++ (cmol(p)/kg)	9.53 ± 0.74	4.21 ± 0.14	6.74 ± 0.55	8.42 ± 2.30	4.09 ± 0.88	5.43 ± 1.04
K+ (cmol(p)/kg)	0.445 ± 0.188	0.171 ± 0.033	0.162 ± 0.037	0.364 ± 0.131	0.129 ± 0.033	0.329 ± 0.081

Note: Values are averages of 3 samples ± 95% confidence intervals.

Table 3. Results of analysis-of-variance for physical, biological, and chemical properties of soils under cultivated hayfields vs. tallgrass prairies

	Soil compaction (kPa)	Organic matter (%)	Soil pH	CEC (cmol(p) /kg)	NO3− (cmol(e) /kg)	PO4− (cmol(e) /kg)	Mg++ (cmol(p) /kg)	Ca++ (cmol(p) /kg)	K+ (cmol(p) /kg)
SITE	***	***	***	***	NS	***	***	***	***
Cover	*** (86)	*** (31)	** (6)	* (25)	NS	NS	NS	NS	(*) (10)
Soil type	(*) (6)	*** (32)	*** (90)	* (25)	** (92)	*** (92)	*** (87)	*** (77)	*** (69)
SAMPLING DATE		NS	NS	NS	***	NS	NS	NS	NS
SITE*SAMPLING DATE		***	NS	NS	NS	NS	NS	NS	NS
Cover*date		NS	NS	NS	(*) (32)	NS	NS	NS	NS
Soil type*date		***(57)	NS	NS	* (62)	(*) (92)	NS	NS	NS

Note: Values are probabilities associated with F-tests of main effects of site, sampling date, and their interaction, and contrasts within site and site*sampling date for cover (hayfield vs. tallgrass prairie) and soil type (upland vs. floodplain). Probability values associated with F-tests are as follows: (*) $0.10 > p > 0.05$; * $0.05 > p > 0.01$; ** $0.01 > p > 0.001$; *** $p < 0.001$; blank = not estimable. Contributions (percent) of significant contrast terms sums of squares to overall terms sums of squares are provided in parentheses.

compaction values for hayfield sites in the present study were in the same range as those reported elsewhere for cultivated fields on silt loam soils in west central Illinois counties (Friend 1994). Previous research has indicated that cultivation practices (i.e., tillage) can contribute to soil compaction through increased erosion (Lowery et al. 1995). Tillage practice and erosion history might account in part for the more highly compacted soils in the hayfield sites, though previous studies have found that tillage only modestly increased soil compaction rates for cultivated fields on silt loam soils in west central Illinois counties (Friend 1994), or actually reduced soil compaction in clays and clay loam soil (Hubbard et al. 1994). The higher organic matter content found in the prairie sites (see below) may have also contributed to reduced soil density and compaction rates in those sites (Brady and Weil 1996).

In addition to being less compacted, soils from prairie sites had significantly higher levels of organic matter, lower pHs, and higher cation exchange capacities than soils from cultivated hayfield sites, accounting for 31%, 6%, and 25%, respectively, of the observed variation in these soil parameters across sites (tables 2 and 3). Crop removal (harvesting hay) from the hayfield sites between July and October did limit the amount of organic matter eventually incorporated into the cultivated soils (Beauchamp and Voroney 1994), and even conservative tillage practice on the hayfield sites would have further reduced soil organic matter (Eghball et al. 1994; Reicosky et al. 1995). The increased organic matter content in the prairie sites is consistent with results reported for cultivated grassland vs. native prairie sites in central Missouri (Buyanovsky, Kucera, and Wagner 1987) and is consistent with generally high levels of organic matter reported for native grassland soils (Elliott 1986). Prairie sites with higher levels of organic matter had slightly lower soil pHs, consistent with higher organic acid content on humic soils (Brady and Weil 1996). Organic matter content, soil pH, and cation exchange capacity also differed significantly between upland and floodplain soils, accounting for an additional 32%, 90%, and 25%, respectively, of the observed variation in these soil parameters across sites (tables 2 and 3). Specifically, floodplain soils had lower levels of organic matter, lower cation exchange capacities, and higher soil pHs than upland soil sites (table 2). Soil pH values for the floodplain soils were all in the "healthy" range of pH 6.0 (Romig et al. 1995); for the upland Rozetta Silt Loam soils, pH values were lower (5.3–6.3), but were either higher or within the range of values reported for moderately or severely eroded Rozetta soils for the North Central United States (Cihacek and Swan 1994). Finally, there were higher nutrient content levels in floodplain soils than in the upland soils (tables 2 and 3).

Overall, nutrient content levels were similar in the prairie and the hayfield sites, despite chemical fertilizer applications to 2 of the 3 hayfield sites and organic fertilizer (unmeasured manure) additions to the third (tables 2 and 3). In July, all sites had a similar nitrate content level of approximately 24 $mgkg^{-1}$; by October, the nitrate content of all the sites was raised by approximately 70 $mgkg^{-1}$, possibly due to in situ mineralization. Only one crop was harvested from the hayfield sites after the application of the fertilizer, removing an estimated 28.1 kg N $ha^{-1}yr^{-1}$. Therefore, approximately 11.2 more kg N were added to those sites (through a commercial fertilizer application of 39.3 kg N ha^{-1}; see Materials and Methods) than was removed. This should have given the hayfield sites an advantage over the prairie sites, but the nitrate levels were roughly similar. There was a trend toward lower nitrogen levels in prairie vs. hayfield sites at the early sampling date and higher nitrogen levels in prairie vs. hayfield sites at the later sampling date, but the differences were modest (ANOVA cover*sampling date contrast $0.10 > p > 0.05$), as shown in tables 2 and 3. The prairie sites likely experienced significant nitrogen additions through the activities of nitrogen-fixing leguminous prairie forbs (Lichtenberg et al. 1994; Wolkomir 1995).

Soil aggregate structure did not vary widely among these sites (table 4). All soils had a large proportion of macroaggregates (>0.25 mm), ranging from a minimum of 93% to a high of 99% of total aggregates in the macroaggregate size classes. Very large macroaggregates (>1 mm) were also well represented in all soils. Other studies have shown that prairie remnant soils and cultivated hayfield soils have similar aggregate structure (Elliott 1986), but native prairie soils were found to have a greater proportion of water-stable soil macroaggregates (Elliott 1986; Jastrow 1987).

Two of the 3 prairie sites had higher maximum water-holding capacities and less negative water potentials at field capacity, and dried less rapidly than their cultivated hayfield soil counterparts (table 5). The higher levels of organic matter likely contributed to the greater water-holding capacities of the prairie-cover soils (Hudson 1994).

SUMMARY

Farmers in the twenty-first century will be increasingly faced with the challenge of retaining fertile and productive topsoil, and doing so with minimal expenditure on costly soil emendation programs (Tweeten 1995; Hoag and Skold 1996). The key to long-term sustainable agriculture is maintaining soil quality, particularly soil structure and function (Warkentin 1995). This study suggests that the health of degraded agricultural soils throughout central Illinois may be only partially restored through long-term hayfield cultivation (7–25 years). Hayfield cultivation can restore some aspects of soil health, including aggregate structure and nutrient content. Soil compaction rates remain appreciably higher, and organic matter content levels, cation exchange capacities, and water-holding capacities remain appreciably lower in agricultural soils that have been rested as hayfields relative to values in intact prairie soils. Further, prairie soils have nutrient content levels comparable to those found in the cultivated hayfields, despite a lack of applied fertilizers. Thus, state-wide programs that promote soil conservation and restoration by encouraging hayfield plantings may not adequately lead to key improvements in soil health.

The prairies created the rich soils of the Midwest that are so productive today. Prairie plants have evolved and

Table 4. Distribution of soil aggregates of soils under cultivated hayfields vs. tallgrass prairies

	Cultivated hayfields			Tallgrass prairies		
Size class	Wheeler	Sandall	Isaac	Root	Jubilee	Brucker
>3.5 mm	35.0	13.2	39.0	22.6	30.7	26.4
1–3.5 mm	39.4	29.8	33.5	27.5	36.4	49.3
0.75–1 mm	13.8	20.6	13.2	17.0	18.1	15.0
0.42–0.75 mm	6.2	30.3	5.7	11.2	7.4	4.4
0.25–0.42 mm	2.5	4.9	3.1	14.7	2.8	2.2
0.11–0.25 mm	1.8	0.4	2.3	5.4	2.8	1.8
< 0.11 mm	2.4	0.8	3.2	1.6	2.5	0.9

Note: values represent percent of soil aggregates of each class size.

Table 5. Soil water-holding characteristics (% soil moisture and soil water potential in J/kg) during a 4-hour dry-down period

	Cultivated hayfields						Tallgrass prairies					
	Wheeler farm		Sandall farm		Isaac farm		Root prairie		Jubilee prairie		Brucker prairie	
Hours dried	% soil moisture	Water potential	% soil moisture	Water potential	% soil moisture	Water potential	% soil moisture	Water potential	% soil moisture	Water potential	% soil moisture	Water potential
0	41.24	−0.018	36.53	−0.013	46.04	−0.020	56.63	−0.011	49.68	−0.015	42.96	−0.022
1	38.96	−0.081	33.52	−0.085	44.30	−0.068	53.57	−0.057	46.82	−0.057	39.17	−0.079
2	33.41	−0.112	27.23	−0.127	39.29	−0.083	45.81	−0.123	38.96	−0.129	31.19	−0.129
3	29.61	−0.136	22.20	−0.134	35.46	−0.120	41.01	−0.092	34.37	−0.092	26.59	−0.114
4	25.47	−0.123	17.32	−0.109	31.72	−0.083	34.81	−0.103	28.99	−0.099	19.87	−0.116

Note: Soils were at field capacity at the onset of the dry-down period (at zero hours) and were dried in a 55°C oven.

adapted to these soils and have been instrumental in creating their chemical, physical, and biological properties. Encouraging prairie species may provide an alternative to cultivating more traditional forage crops; such species could preserve and even increase the quality and quantity of topsoil with low economic burden to smaller-scale farmers.

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BUFFALOGRASS (*BUCHLOË DACTYLOIDES* (NUTT.) ENGELM.) IN ILLINOIS

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ABSTRACT: Buffalograss (*Buchloë dactyloides* (Nutt.) Engelm.) is a warm-season grass species, possibly native in Illinois. Because of its superior adaptation to low-maintenance settings and the degree of variation that exists within the species, identifying the most appropriate types for landscape applications is of interest. A study conducted in Urbana, Illinois, at the University of Illinois Landscape Horticulture Research Center evaluated 22 buffalograss cultivars 21 times over four growing seasons. The objectives of this study were to identify differences among turfgrass quality and determine which buffalograss cultivars perform best in Illinois, in order to make cultivar recommendations. Of the 22 cultivars in the study, the commercially available '315' buffalograss performed in the upper half of all cultivars at each evaluation. 'NTDG 3,' 'NTDG 4,' and 'NTDG 5' buffalograsses also performed in the upper half of all cultivars at each evaluation, but they are not commercially available. The commercially available '609' and 'Sharps Improved' buffalograsses performed in the upper half in 20 and 19 of the 21 evaluations, respectively. Performance varied based on weather conditions during the growing seasons: hot, dry conditions favored buffalograss performance, while cool, moist conditions favored invading cool-season broad-leaved weeds and grasses. The cultivar '315' can be recommended, with reservation, for use in Illinois as a low-maintenance turf for full sun. Chemical weed controls, applied in cool, wet growing seasons, may be necessary to enhance the quality of the stand.

INTRODUCTION

Interest in low-maintenance turfgrasses suitable for Illinois has increased over the past few years. Moreover, as a result of the severe growing conditions during the 1988, 1991, and 1995 growing seasons, turfgrasses tolerant of hot and dry conditions are also of interest. Many warm-season grasses exhibit great tolerance for hot and dry conditions and limited management inputs. Not all warm-season grasses, however, tolerate the winter conditions of Illinois. Buffalograss (*Buchloë dactyloides* (Nutt.) Engelm.) is a warm-season species receiving attention from turfgrass researchers and managers because it is tolerant of temperature and moisture extremes, is adapted to many sites, requires limited maintenance, and has few pest problems. This article will describe *Buchloë dactyloides* and also review research that evaluated the performance of 22 buffalograss cultivars grown in the Illinois study during the 1992 through 1995 growing seasons.

Native Range and Occurrence in Illinois

Edna Mosher (1918), in *The Grasses of Illinois*, does not list *Buchloë dactyloides* among Illinois native grasses. Hitchcock (1951) concurred, stating that the native range of buffalograss is generally from northwestern Iowa in the east, western Louisiana and Arizona in the south, and north to Minnesota and Montana; he does not include Illinois.

More recent writings, however, do include buffalograss in the Illinois flora. Jones (1971) wrote that *Buchloë dactyloides* was discovered in Peoria in 1956 by V. H. Chase, and states that it is "apparently a relic on soil never in cultivation." Two years later, Mohlenbrock (1973) wrote that buffalograss was "known only from a cemetery in Peoria County, . . . and from a gravel bluff prairie in Winnebago County." Here Mohlenbrock also states that "Chase, who collected the first Illinois specimen, believes it is native since it grows in an undisturbed prairie remnant in a cemetery." Five years later, Mohlenbrock and Ladd (1978) added Crawford, Kane, and Kendall counties to Peoria and Winnebago counties as settings in which buffalograss has been collected. Mohlenbrock (1986) states that in Illinois, buffalograss occurs in prairies, is rare, and is confined to the northern two-thirds of the state.

Young (1994), in *Kane County Wild Plants and Natural Areas*, writes that buffalograss is a western grass that "finds a home on the edges of highways and railroads." Finally, Swink and Wilhelm (1994) indicate it was introduced from farther west and show its occurrence in Cook, DuPage, Grundy, Kane, and Will counties. They go on to state that "while it may not be a native species locally [the Chicago area], it certainly is 'more native' than *Poa pratensis!*"

Three possible explanations may clarify its rare occurrence in Illinois. It may occur as a relic of natural populations, it could be adventive (having moved in out of its natural range), or it could have been planted many years before being collected for herbaria. It remains to be determined which explanation is most accurate.

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The Plant

Buchloë dactyloides grows to a height of 10 to 15 cm and spreads by stolons, forming a dense, matted sod. Stolons grow rapidly under moist conditions and can reach 70 cm (Weaver and Albertson 1956). Its curly leaves are finely textured, usually less than 3 mm wide, slightly hairy and gray-green during the growing season (Beede 1950; Beard 1973; Turgeon 1985). When dormant, the leaves turn light tan-brown. Other vegetative features include a hairy ligule (long at the margins, short in the center), a broad, hairy collar, no auricles, rolled vernation, and short, flattened sheaths (Beede 1950; Hitchcock 1951; Beard 1973; Turgeon 1985).

Buffalograss is usually dioecious, having separate male and female plants. However, both monoecious and hermaphroditic plants have been reported (Plank 1892; Hitchcock 1895; Schaffner 1920; Anderson and Aldous 1937; Gernert 1937; Hensel 1938; Wenger 1940; Harlan 1946). The orange-tinged male flowers are visible in April through October, standing above the leaves (Beede 1950; Pohl 1978). The female flowers are borne near the leaf sheaths, often very close to the ground. Sixty to 70 days following spring green-up, seeds can be produced (Weaver and Hansen 1941). Seeds occur in burs, each bur containing from 1 to 5 caryopses, with an average of 2 to 3 (Pladeck 1940; Weaver and Albertson 1956). There are approximately 36,000 burs per pound (Wenger 1943; USDA 1948; Ahring 1964), and a bushel of fresh burs weighs approximately 15 pounds (Wheeler and Hill 1957). Upon ripening, burs and plants disarticulate (Ahring 1964). When cleaned, bur purity can reach 95%, with germination greater than 50%. The average seed purity in one test, however, was 65% (Wheeler and Hill 1957), and occasionally, the germination percentage can drop below 10% for some untreated seeds (Wheeler and Hill 1957). The seeds are long lived under proper storage conditions (Lowe 1940; USDA 1948).

Fig. 1. *Buchloë dactyloides*. Pistillate and staminate plants, × ½; pistillate spike and floret, ×5: staminate spikelet, ×5. (reprinted from Hitchcock, 1951)

Landscape Uses

Current interest in buffalograss is due to its performance as a low-maintenance turf species.

Buffalograss tolerates a wide range of environmental conditions, beginning growth in May and going dormant after the first freeze (Nuland, Reece, and Kinbacher 1981). It survives the extreme heat and cold common in its native range, and it grows in very dry loam or clay-loam soil (Beard 1973; Turgeon 1985). It does not do well, however, in shade or in sandy or highly alkaline soils. Reports indicate that under very dry conditions, one summer watering is usually adequate to keep it from going dormant. The root system of buffalograss is rather shallow, and the grass normally occurs in areas receiving 25 to 50 cm of precipitation per year (Beard 1973).

Buffalograss is considered to be a low-maintenance turfgrass species, and it can be maintained at mowing heights of 1 to 5.1 cm in lawns that require frequent cuttings (Turgeon 1985; Fermanian et al. 1997). In areas of low management, the grass survives without mowing, with one mowing per season, or with monthly mowing at 5.1 cm. Fertilizer requirements are minimal, usually 0.8–3.2 kg N/ha/month of growing season (Beard 1973; Nuland, Reece, and Kinbacher 1981; Turgeon 1985; Fermanian et al. 1997). It requires minimal irrigation because of an extremely low water-use rate (Chamrad and Box 1965; Beard 1973; Nuland, Reece, and Kinbacher 1981; Turgeon 1985). Conversely, during unusually wet periods, buffalograss tolerates long-term submersion (Porterfield 1945). Thatch management is usually unnecessary because little thatch is produced (Beard 1973).

Buffalograss has been reported to be damaged by several diseases, including *Bipolaris buchloes, Cercospora serninalis*, and *Puccinia kansensis* (Wenger 1943; Ahring 1964; Fermanian et al. 1997). Several insects have been reported to attack buffalograss. They include the buffalograss webworm *(Parapediasia teterrella)* and the May or June beetle, *(Phyllophaga crinita)*, as well as grasshoppers, leafhoppers, and the prairie ant (Ahring 1964). Southern chinch bugs (Busey and Snyder 1993) and mealy bugs (Heng-Moss et al. 1997) can also attack this grass. Weeds can be controlled in buffalograss through safe applications of several preemergence and postemergence herbicides (Meenen and Timmons 1949; Ahring 1964; Huffman and Jacoby 1984; Fry and Upham 1994; Dotray and McKenney 1996; Fry et al. 1997). At present, none of these diseases or insect pests has been reported to affect buffalograss growing in Illinois. Weed invasions into buffalograss, on the other hand, can reduce buffalograss quality (Haley and Voigt 1993).

National Turfgrass Evaluation Program

An opportunity to evaluate different strains of buffalograss in Illinois arose in 1991, when the National Turfgrass Evaluation Program (NTEP) announced that a national buffalograss evaluation would be established. The University of Illinois was among the 28 sites chosen to house the evaluation.

NTEP was established in 1980 as a nonprofit, self-supporting program jointly sponsored by the National Turfgrass Federation, Inc. (NTF) and the United States Department of Agriculture (USDA) Agriculture Research Service (ARS), Beltsville, Maryland (Morris and Murray 1993). NTEP's main function is to standardize the evaluation of turfgrass cultivars. Prior to 1980, many turfgrass researchers carried out cultivar evaluations, but these tests were not coordinated from location to location (Morris and Murray 1993).

NTEP collects and statistically analyzes cultivar performance data from university testing sites. Each year, NTEP issues a publication that reports the year's results of each national test (Morris 1996).

The Study and Its Importance

Because *Buchloë dactyloides* requires limited mowing and irrigation, precious petroleum and water resources can be conserved when it is planted. The low maintenance requirements of buffalograss, in combination with its tolerance of heat and drought and its limited pest problems, make it a turfgrass worthy of study. There were questions as to which types of the many buffalograss cultivars available would be best suited to Illinois.

The opportunity to employ NTEP evaluation methodology on buffalograss cultivars occurred in 1991. The primary objective of this study was to determine whether buffalograss is a suitable turf species for Illinois. More specifically, the 1991 study was designed to determine

a. if there are differences among the performance of 22 buffalograss cultivars,
b. which buffalograss cultivars perform best in central Illinois,
c. which buffalograss cultivars could be recommended for planting in Illinois.

METHODS

Twenty-two buffalograss cultivars were planted on June 28, 1991, at the Landscape Horticulture Research Center in Urbana, Illinois. Each cultivar was planted into the 152 cm x 152 cm center areas of plots measuring 213 cm x 213 cm. The experiment was planted into a randomized complete block design with three replications.

The plants used in the plots were produced at the University of Nebraska. They originated as vegetatively produced clones of a single genotype or as plants selected from a seeded population. Each plot was planted with 6 to 24 plugs, depending on the total quantity of plugs available for each cultivar. Table 1 lists the cultivars planted in the study, sources of the cultivars, and their vegetative or seed origins.

Prior to planting, the area was rotary tilled and supplied with 8 kg N/ha. Following planting, the plots were watered as needed to ensure establishment and mowed at 5.1 cm as needed.

Table 1. Source and origin of 22 buffalograss cultivars included in the 1992–95 NTEP evaluation in Urbana, Illinois

Cultivar	Source	Origin
AZ143	University of Arizona	vegetative
BAM101	Bamert Seed Company	seeded
BAM202	Bamert Seed Company	seeded
Bison	Native Turf Development Group	seeded
Bufflawn	Quality Turfgrass Houston, Tex.	vegetative
Highlight 15	River City Turf Farm Sacramento, Calif.	vegetative
Highlight 25	The Grass Farm Morgan Hill, Calif.	vegetative
Highlight 4	University of California Davis, Calif.	vegetative
NE 84-315	University of Nebraska	vegetative
NE 84-436	Crenshaw/Douget Turfgrass Austin, Tex.	vegetative
NE 84-45-3	University of Nebraska	vegetative
NE 84-609	University of Nebraska	vegetative
NE 85-378	University of Nebraska	vegetative
NTDG-1	Native Turf Development Group	seeded
NTDG-2	Native Turf Development Group	seeded
NTDG-3	Native Turf Development Group	seeded
NTDG-4	Native Turf Development Group	seeded
NTDG-5	Native Turf Development Group	seeded
Prairie	Texas A & M University	vegetative
Rutgers	Rutgers University	vegetative
Sharps Improved	Sharp Brothers Seed Healy, Kans.	seeded
Texoka	original source unknown	seeded

Over the duration of the study, the plots were maintained at 5.1 cm and were not irrigated. To control weeds, a postemergence broadleaf herbicide was applied in 1992, and a preemergence herbicide was applied twice in 1993. In 1993, the study received 16 kg N/ha, and in each of 1994 and 1995, the study received 8 kg N/ha.

Overall turf quality was measured during the 1992 through 1995 growing seasons. Turf quality is a subjective rating that combines several turfgrass characteristics, including uniformity, rate of spread, and the occurrence of weeds, insects, and diseases. Uniformity involves turfgrass color, leaf width (texture), density (the number of aerial shoots per unit area), and growth habit. Each plot was rated on a 1 through 9 scale in which 1 = dead turf, 5 = minimally acceptable turf quality, and 9 = perfect turf. From 1992 through 1995, buffalograss cultivar quality was evaluated 21 times (table 2).

Table 2. Evaluation months for buffalograss quality evaluations (1992–1995)

Year	Evaluation months
1992	May, June, July, August, September, October
1993	May, June, July, August, September
1994	May, June, July, August, September
1995	May, June, July, August, September

RESULTS AND DISCUSSION

Buffalograss Cultivar Quality Performance

After four growing seasons of evaluation, performance differences among the 22 buffalograss cultivars emerged. The combined performance data was analyzed in two ways. In the first analysis method, the mean performance of each buffalograss cultivar was determined over all 21 evaluations (table 3). Thus, the mean performance is an average of the turf quality of three replications and 21 evaluations over four years.

Lost in this analysis method are any outstanding or extremely poor evaluation periods. For example, poor performance evaluations during the cooler months of May and September may be masked by outstanding evaluations in July or August. There are obvious shortcomings to using means as a method of identifying a turfgrass that has acceptable, long-term performance.

When making quality evaluations, it is important to remember that a rating of 5 indicates minimally acceptable turf quality. Based on the overall quality means (table 3), none of the grasses performed at minimal quality. The study-long performance of cultivars 'NE 84-315,' 'NTDG-3,' and 'NTDG-5' most closely approached minimal quality, but each cultivar had several evaluations of unacceptable performance.

In the second analysis method, the mean for each monthly evaluation was determined. For each cultivar, the number of times its monthly rating was greater than the monthly mean was determined. Thus, there were 21 opportunities for each buffalograss cultivar to rate above the mean for the group. Results of this analysis method appear in table 4.

This second method produces results that are more useful for making recommendations. For example, poor evaluations are readily apparent, preventing cultivars from being recommended on the basis of their exceptional performance during only part of the growing season. Using this analysis method to evaluate long-term outcomes allows identification of grasses that offer relatively consistent performance throughout the growing season. Above-average turf quality throughout the growing season is more desirable than quality that oscillates between exceptional and unacceptable.

Table 3. 1992–1995 mean buffalograss cultivar quality ratings

Cultivar	Mean performance
NE 84-315	4.7
NTDG-3	4.6
NTDG-5	4.6
NE 84-609	4.4
NTDG-4	4.4
NTDG-1	4.3
NE 85-378	4.2
NE 84-436	4.1
NTDG-2	4.1
AZ143	4.0
Prairie	4.0
Sharps Improved	4.0
BAM101	3.9
BAM202	3.9
Bison	3.4
Texoka	3.4
NE 84-45-3	3.1
Bufflawn	2.3
Rutgers	2.3
Highlight 15	2.0
Highlight 25	2.0
Highlight 4	2.0

The source of the cultivars in the trial may account for some of differences in their performance ratings in Illinois. Most of the better performers in the trial originated from breeding programs or producers in the Great Plains. Cultivars from the Native Turf Development Group (based in the Great Plains) and the University of Nebraska (table 1) were among the highest-performing types. Cultivars from programs in California and Texas generally performed more poorly. The growing environment in Illinois is probably more similar to conditions in the Great Plains than to conditions in California and Texas; grasses originally selected and tested in Great Plains programs will usually perform better than those originally tested and selected in more moderate growing conditions.

Based on this analysis, 'NE 84-315,' 'NTDG-3,' 'NTDG-4,' 'NTDG-5,' 'NE 84-436,' 'NE 84-609,' 'NE

Table 4. Number of monthly evaluations in which buffalograss cultivar performance was above mean for group (1992–95)

Buffalograss cultivar	Number of evaluations above monthly mean
NE 84-315	21
NTDG-3	21
NTDG-4	21
NTDG-5	21
NE 84-436	20
NE 84-609	20
NE 85-378	19
NTDG-1	19
NTDG-2	19
Sharps Improved	19
AZ143	17
BAM202	17
Prairie	15
BAM101	13
Bison	8
Texoka	5
NE 84-45-3	3
Rutgers	1
Bufflawn	0
Highlight 15	0
Highlight 25	0
Highlight 4	0

85-378,' 'NTDG-1,' 'NTDG-2,' and 'Sharps Improved' performed in the upper half in 19 (or more) of the 21 evaluations. While not spectacular performers, any of these buffalograss cultivars might be useful for turfgrass planting in Illinois.

Additional Observations

Buffalograss quality performance was, to a great degree, controlled by weather conditions during the evaluations. For example, during warm summer periods in 1988, 1991, 1995, and 1998, buffalograss, a warm-season species, held an ecological advantage and thrived in Illinois areas where it was growing. During these same periods, cool-season broadleaf weeds and grasses were at a disadvantage and rarely invaded areas where buffalograss was growing. During normal Urbana summers, hot, dry periods are common, and buffalograss normally thrives during these periods.

In 1992 and 1993, while this study was ongoing, however, the growing seasons were wet in Urbana, and the 1992 season was also particularly cool. Under these conditions, cool-season grasses and weeds were able to invade the warm-season buffalograss, and buffalograss turf quality was reduced. Chemical weed controls are available for controlling the invaders, but the question arises as to whether chemical controls should be a required component of a low-maintenance turfgrass management.

Beyond weed invasions, the greatest stumbling block to increased buffalograss planting is probably its appearance. All of the grasses in this study were dull gray-green when actively growing and formed a less dense canopy than most turfgrasses (this may also account for some of the weed invasions into the plantings). When dormant, usually from mid October through late April in central Illinois, the study area was a dirty tan-brown.

CONCLUSIONS

All of the cultivars survived the growing conditions at the study site, but the results of quality evaluations in 1992 through 1995 show obvious differences among the 22 buffalograsses included in the study. The cultivars that had above-average monthly quality ratings for each of the 21 evaluations were 'NE 84-315,' 'NTDG 3,' 'NTDG 4,' and 'NTDG 5.' These produced a low-quality turf, based on the evaluation criteria, and would be recommended, with reservation, for planting in Illinois. Unfortunately, only one of these cultivars, 'NE 84-315' (sold as '315' buffalograss) is commercially available in the trade. Cultivars 'NE 84-609' (available as '609' buffalograss) and 'Sharps Improved' performed above the mean in 20 and 19, respectively, of the 21 evaluations and should also be considered, with reservations, for planting in Illinois.

Additional research is needed to evaluate further the buffalograsses in this study, as well as newly available buffalograss cultivars. To produce a complete package of buffalograss selection, use, and culture guides, evaluations in varied environmental and management conditions will be necessary. These continued studies will refine and enhance our knowledge of buffalograss and its appropriate use in Illinois.

Buffalograss is not the perfect grass for most applications. Its appearance, its vulnerability to invasion by cool-season weeds and grasses, and its lack of shade tolerance will keep it from replacing popular cool-season grasses in sites requiring high-quality turf. It may, however, prove to be useful in low-management sites, especially when new cultivars have been selected and optimum management regimes are defined.

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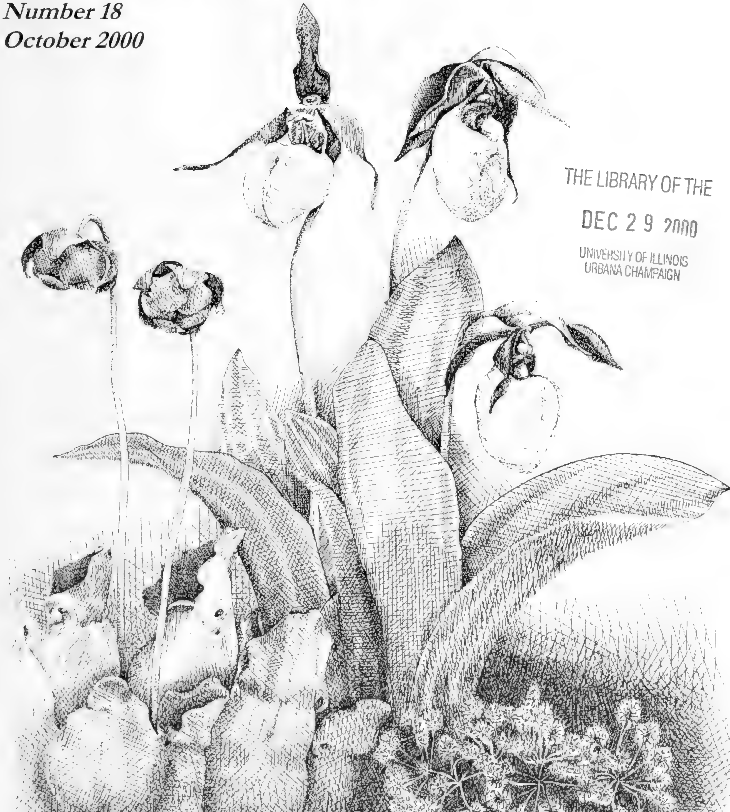

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Illinois Native Plant Society

ERIGENIA

Number 18, October 2000

The Illinois Native Plant Society Journal

The Illinois Native Plant Society is dedicated to the preservation, conservation, and study of the native plants and vegetation of Illinois.

ERIGENIA is named for *Erigenia bulbosa* (Michx.) Nutt. (harbinger of spring), one of our earliest blooming woodland plants. The first issue was published in August 1982.

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ERIGENIA STAFF

COVER ILLUSTRATION

Original drawing by Nancy Hart Steiber of the Morton Arboretum, Lisle, Illinois.

Nancy crossed the border to visit our neighbor to the east when she visited Pinhook Bog to draw these plants:

Cypripedium acaule moccasin flower
Sarracenia purpurea pitcher plant
Drosera intermedia narrow-leaved sundew

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This issue of Erigenia is dedicated to the memory of Floyd Swink (May 18, 1921 to August 2, 2000), beloved teacher and colleague of many INPS members, and a staff member of this journal. Editors, authors, and readers alike were the beneficiaries of Floyd's tireless verification of bibliographic material, nomenclature, and plant record documentation. All who knew him were infected by his generous spirit and love of life. Our deep sense of loss at Floyd's passing is accompanied by the knowledge that his inspiration and influence will continue to be felt as long as there is a natural world to engage our minds, delight our senses, and awaken our wonder.

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THE CORRESPONDENCE OF SOIL TYPES WITH PLANT COMMUNITY TYPES IN NATURAL AREAS OF COOK COUNTY, ILLINOIS

Thomas B. Simpson[1] and Christiane Rey [1]

ABSTRACT: Soil surveys often are used by ecological restoration managers to infer the nature of pre-European vegetation. This study examined the correlation of current vegetation types with soil series at 145 locations in 32 forest preserves and other natural areas in Cook County, Illinois. The objectives of the study were to establish the association of soil series types with plant community types and to evaluate the accuracy of NRCS soil survey mapping in natural areas. Mapped series were judged to be incorrect if there were major differences between the type profile in the soil survey and the field description based on (1) A horizon depth, (2) presence or absence of the E horizon, (3) texture, (4) pH of the upper 50 cm, and (5) soil drainage class. The mapped soil series assignment was judged incorrect for 50.5% of the plots. The criteria that were most commonly in "error" were presence/absence of an E horizon (30.0% of plots) and depth of the A horizon (19.6%). Dry-mesic woodland (6 soil series), mesic woodland (8 soil series), dry-mesic savanna (5 soil series), and mesic savanna (6 soil series) have the most diverse soil associates. The ability to predict community type from a knowledge of mapped soil series is very limited.

INTRODUCTION

The importance of vegetation as a soil-forming factor long has been recognized, and modern soil classification (USDA 1975; Buol, Hole, and McCracken 1973) associates certain soil orders with particular vegetation types, including the two most common soil orders of upland areas in the Chicago region: Mollisol (grassland) and Alfisol (forest). Birkeland (1984) noted that the distinction between forest and prairie vegetation is reflected in changes in pH, the depth and content of soil organic matter, and translocation of clay. "Forest" soils are more acid and lower in clay content in the upper solum and have thinner A horizons than do "prairie soils." Miles (1985) reviewed the effects on soil development of coniferous forest, deciduous forest, and herbaceous species in Europe, noting that podzolization (acidification and leaching of carbonates, iron, aluminum, and organic matter from the surface to lower soil zones) was most rapid beneath coniferous forest, and least likely to occur in association with herbaceous-dominated vegetation. The effects of broadleaf forests on podzolization were variable, depending on the dominant tree species.

In the descriptions of soil series included within county soil survey publications of the Natural Resource Conservation Service (formerly the Soil Conservation Service), broad categories of native vegetation may be associated with each series, e.g., swamp grass, deciduous forest, or prairie grass (USDA 1970). In other cases (USDA 1979), associations of soil and natural vegetation are not stated (e.g., Lorenzo, Harpster, Watseka, Milford, Sawmill) or only indirectly implied:

Morley: ". . . most areas are wooded or pastured . . ."; and "A few areas of this soil are in native hardwoods, mainly northern red oak, bitternut hickory, and sugar maple."
Blount: "The areas that remain in trees contain northern hardwoods, chiefly oak and hickory."
Miami: "Many areas are idle or in trees."

Knowledge of pre–European settlement vegetation is important in evaluating the goals of ecological restoration management. In a state (Illinois) where only 0.45% of the land remains in a relatively undisturbed natural state, often extant vegetation has little floristic similarity to the pre–European settlement vegetation of the site. In such cases, the use of soil as an aid in determining pre-European vegetation takes on a special importance, especially where restorationists seek to reestablish or restore presettlement vegetation types.

Studies of soil-vegetation associations at a large scale have often found soil or surficial geologic mapping to be a good predictor of vegetation. Iverson (1988) found that soil and site-attribute data derived from a statewide map of soil associations were highly correlated with the historic vegetation of Illinois. Whitney (1986) studied the presettlement distribution of pine forests in relation to substrate, as depicted on surficial geologic maps, in Roscommon and Crawford counties in lower Michigan, and reported that coarse-textured soils derived from outwash and ice-contact deposits promoted a fire-dependent vegetation of Jack pine *(Pinus banksiana),* red pine *(Pinus resinosa)* and white pine *(Pinus strobus).* Grimm (1984) found that soil drainage as depicted on soil maps

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was the most important factor controlling vegetation within areas of similar fire probability in the Big Woods of Minnesota.

Field studies of soil-vegetation association have found soil properties rather than soil map units the better predictor of vegetation type. For instance, Neiman (1988) noted little relationship among habitat types (plant associations) in northern Idaho and soil taxonomic map units. Using information from 89 sites for which vegetation and soils data were recorded, however, Neiman (1988) found 14 soil variables, most related to texture and pH, that were useful in discriminating among the soils of habitat types.

Several studies have examined the accuracy of soil mapping. Powell and Springer (1965) found that between 10% and 40% of the soil map units of Cecil, Appling, and Lloyd soil series on the Georgia Piedmont were soils (inclusions) other than the stated map-unit type. McCormack and Wilding (1969) found that 63% of the field observations of two-storied (coarse- to medium-textured lake sediments over fine-textured glacial till) soils on the lake plain of northwestern Ohio were outside of the concepts of the soil series for that soil map unit. Grigal (1984) noted that soil mappers must rely on visual criteria—landscape boundaries obvious to visual inspection. Major problems arise when the ability to view terrain decreases in forested landscapes, and this problem is compounded by ambitious production schedules. Grigal (1984) felt that with so many problems in achieving accuracy in map unit delineation in forested landscapes, soil surveys should be conducted at 1:50,000 or 1:75,000 rather than the customary 1:15,840. At this scale, managers "will treat it [the soil survey] with the degree of uncertainty it merits" (Grigal 1984).

Classification of soil or plant communities is useful to people because it *reduces* the complexity of nature. Dozens to hundreds of species or characteristics are reduced to a few classes, which can more easily be remembered and manipulated in the mind. However, this reduction of complexity comes with an attendant *loss* of information. Because the soils and plant communities of a region are subject to endless variation in dozens to hundreds of characteristics, often with only loose functional relationships among them, any attempt to classify the plant communities and soils of a county into a manageably small number of classes can meet with only limited success. The choice of technique for reducing complexity, whether qualitative judgment or mathematical algorithm, is ultimately subjective.

For instance, plant communities contain exotic species, native adventives, and native species commonly thought to represent the area's presettlement composition. The last group are often weighted disproportionately in classifying the community (and are in this study), but the choice to do so is subjective, based on a knowledge of recent historical influences and a desire to erase such influences in our conception of native plant communities. If two researchers differ in their models of presettlement vegetation or postsettlement vegetative change, they may classify the vegetation of a given area differently. The decision to weight all extant species equally eliminates these errors of historical judgment, but creates a taxonomy of disturbances confounded with underlying ecological and historical (presettlement) influences, which may be worth little for most management purposes.

Soil classification also works with many variables, and weights them according to the expert's knowledge of soil genesis and the intended use of the classification. Guthrie (1982) and Gibbons (1961) make the point that, prior to classification and mapping, the soil surveyor must determine what it is that the intended users of the survey need to know about the distribution of soils. A general purpose survey—one equally serviceable for all users of soil information—is not possible, because the criteria appropriate to one set of uses differs from those appropriate to another set of uses (Gibbons 1961). Grigal (1984) pointed out that the criteria for soil classification often are not those of greatest significance to the growth of vegetation. Soil classification has seen its most important economic use in agriculture, and the accurate classification of soil productivity and management potential were important purposes. For instance, the difference between 7.5 cm and 15 cm A horizon depth or the presence of an E horizon may be very significant in making judgments about pre–European settlement vegetation. Yet if the soil is plowed, planted, and fertilized for decades, the difference in soil morphology and productivity disappears. A soil classification intended for agriculture will weight soil factors differently than one devised for ecological restoration.

This discussion of the difficulties of classification should not obscure the fact that classification is both universal and necessary as humans conceive of a complex natural world. These conceptions guide our judgments and actions. To present and discuss openly our classifications or to look for relationships among them is a necessary step to improving them.

Critics of ecological restoration activities (such as cutting "overstocked" small trees and shrubs, using prescribed fire, and reintroducing native herbaceous plants) at certain Cook County forest preserves have cited soil types as evidence that restoration management goals were inappropriate (Mendelson, Aultz, and Mendelson 1992). At the present time, no research exists to confirm or reject such statements. The objectives of this study were to establish the correlation of soil series types with plant community types (both the nature of this association and its predictive potential), to evaluate the accuracy of NRCS soil survey mapping in natural areas, and to describe quantitatively the associations.

METHODS

Soil Types and Community Types

Soil types used here follow the soil series classification recognized by the NRCS (USDA 1979). Plant community types follow those of Thomas (1998). Thomas presents a classification of natural plant communities based on relatively high quality remnant examples. It represents a modification of White (1978) and Curtis (1959). Thomas uses the physical environment of vegetation to describe plant communities. The classification of uplands is structured along gradients in plant community physiognomy (prairie, savanna, woodland, forest) and hydrology (xeric, dry-mesic, mesic, wet-mesic, wet). Communities were further differentiated by variation in soil parent material (sand, gravel, glacial till, bedrock). The classification of wetlands is based largely on hydrology (water source, seasonality, and chemistry), e.g., panné, streamside marsh, seep, sand seep, calcareous seep; vegetation, e.g., sedge meadow, shrub swamp; or a combination, e.g., graminoid fen, basin marsh (the word marsh implying dominance of herbaceous vegetation). In addition, the classification has "cultural area" units defined by recent human management or mismanagement (reforestation, unassociated woody growth, and Eurasian meadow). Thomas produced descriptions of community types by matching field plot data to the appropriate community types. The resulting descriptions are detailed, but are examples of extant vegetation in that type, rather than a definition of class boundaries.

Collection of Field Data

The purpose of data collection was to represent as many examples of as many different types of plant communities and soil series as was practical. Study sites in forest preserves and other natural areas were selected using three criteria: (1) good geographic coverage of Cook County, (2) good representation of the soil associations common to Cook County, and (3) a wide range of vegetation types. These criteria were assessed from existing maps and other information. A total of 145 plots at 32 forest preserves and other natural areas were sampled (table 1).

In areas of forest, woodland, or savanna vegetation, the presence of large (>50 cm dbh) individuals of oak or sugar maple was used as a criterion to identify areas whose present overstory dominants are likely related to pre-European settlement overstory composition. In prairies, the abundance of native plants with a coefficient of conservatism (Swink and Wilhelm 1994) of ≥4 was used to exclude sites in which excessive postsettlement disturbance has produced a ground flora unrelated to its presettlement character. In addition, evidence in the soil profile of former plowing, grading, or filling was used to exclude the site. Any method of site exclusion or acceptance based on examination of the vegetation is subject to errors stemming from biases in one's conception of the nature of presettlement vegetation. By staying within the commonly accepted definitions of vegetative quality and disturbance, we sought to minimize these errors. Old trees of species similar to those commonly reported in General Land Office Surveys of the early nineteenth century, the presence of plant species known to disappear with severe postsettlement disturbance, and lack of evidence for extreme soil disturbance were reasonable criteria for site selection.

Sample plots were located randomly within areas of relatively uniform vegetation and topography. An effort was made to sample within all common soil series (as depicted on the soil survey map) in an area, wherever suitable vegetation was found. The following data were collected: GPS lat/long, location, mapped soil series, complete soil description to a depth of 75 cm, soil samples for pH, texture, and organic matter analysis (A horizon at 5 cm, E horizon at 15–25 cm, B horizon at 50 cm), landform class, and landscape position. Percent slope was measured in four directions—downslope, upslope, and to the right and left, the four measurements at right angles to one another. Slopes below the horizontal were recorded as negative (−), and slopes above the horizontal were recorded as positive (+). The sum of the four slope readings measured slope shape. According to this method, a planar slope, regardless of inclination, has a slope shape of zero. A concave site has a positive slope shape, and a convex site has a negative slope shape. The average of the absolute values of the upslope and downslope readings measured slope steepness.

Overstory trees (≥10 cm dbh) were sampled using a 3 m^2/ha prism. Counts by species in 100 m^2 plots were recorded for understory trees and shrubs (woody plants <10 cm dbh and >1 m tall). Cover of ground flora (woody plants less than 1 m tall and all herbs) were recorded in the same 100 m^2 plot. Cover classes used were dominant (>50% cover), subdominant (5–50%), associate (0.1–5%), or rare (<0.1%).

Understory and ground flora were recorded in the above manner only for prairie and wetland community types. The present ground flora communities in most

Table 1. Location, total number of plots, and plant communities sampled for Cook County forest preserves (FP), nature preserves (NP), and other natural areas

Site	Location	No. of plots	Plant community types
Bemis Woods FPs, N & S	Sec 31, T39N, R12E	10	savanna (mesic), woodland (dry-mesic, mesic, wet-mesic), open vernal pond
Black Partridge Woods NP	Sec 19, T37N, R11E	3	woodland (dry-mesic, mesic)
Bluff Springs Fen NP	Sec 19 & 30, T41N, R9E	10	savanna (dry-mesic), prairie (dry gravel), graminoid fen, calcareous seep
Brookfield Woods Prairie FP	Sec 26, T39N, R12E	2	prairie (wet), sedge meadow
Busse Forest NP	Sec 16 & 17, T41N, R11E	10	forest (mesic upland), woodland (dry-mesic, mesic, wooded vernal pond), savanna (mesic), shrub swamp
Chipilly FP	Sec 11, T42N, R12E	8	forest (wet-mesic floodplain, woodland (dry-mesic, mesic), savanna (dry-mesic)
Clayton Smith FP	T41N, R13E*	2	woodland (wet-mesic sand)
Cranberry Slough NP	Sec 9, T37N, R12E	1	sedge meadow
Edgebrook Flatwoods FP	T41N/ R13E1*	5	forest (wet floodplain), woodland (dry-mesic, mesic, wet-mesic sand)
Elizabeth A. Conkey FP	Sec 5, T36N, R13E & Sec 32, T37N, R13E	10	woodland (dry-mesic, mesic), savanna (dry-mesic, mesic)
Harms Woods and H. Flatwoods FPs	Sec 8 & 9, T41N, R13E	8	forest (mesic), woodland (mesic, wet-mesic)
Hidden Pond FP	Sec 3, T37N, R12E	6	woodland (dry-mesic, mesic), prairie (dry-mesic, mesic)
Jurgensen Woods NP	Sec 2, T35N, R14E	1	prairie (wet-mesic acid sand)
McCormick Woods FP	Sec 26, T39N, R12E	1	woodland (dry-mesic)
McMahon Woods FP	Sec 16, T37N, R12E	2	sedge meadow, seep
National Grove FP	Sec 26, T39N, R12E	1	forest (mesic)
Oakton Community College Woods	Sec 9, T41N, R12E	2	forest (mesic)
Paw Paw Woods NP	Sec 5, T37N, R12E	7	forest (mesic, wet-mesic floodplain), woodland (dry-mesic)
Poplar Creek FP	Sec 9 & 10, T41N, R9E	4	woodland (dry-mesic), savanna (dry-mesic, mesic)
Potawatomie Woods FP	Sec 18, T36N, R15E	3	woodland (dry-mesic, mesic), savanna (wet-mesic)
Sand Ridge NP	Sec 18, T36N/R15E	7	savanna (mesic, wet-mesic), prairie (mesic sand, wet-mesic sand, wet acid sand)
Schiller Woods FP	Sec 14, T40N, R12E	1	prairie (mesic gravel)
Shoe Factory Road Prairie NP	Sec 10, T41N, R9E	3	savanna (dry-mesic), prairie (dry gravel)
Somme Prairie NP	Sec 4, T42N, R12E	3	prairie (mesic, wet-mesic), sedge meadow
Spears Woods FP	Sec 4, T37N, R12E	2	basin marsh, streamside marsh
Spring Lake NP	Sec 5 & 6, T42N, R9E	4	savanna (dry-mesic)
Swallow Cliff Woods FP	Sec 21 & 28, T37N, R12E	6	woodland (dry-mesic, mesic), savanna (mesic)
Theodore Stone FP	Sec 21, T38N, R12E	5	savanna (dry-mesic), prairie (dry dolomite, mesic dolomite, wet-mesic dolomite)
Thatcher Woods FP	Sec 2, T39N, R12E	1	forest (wet-mesic floodplain)
Thomas Jefferson Woods FP	Sec 11, T39N, R12E	5	forest (wet floodplain), woodland (mesic)
Thornton-Lansing NP	Sec 35, T36N, R14E	7	woodland (wet-mesic sand), savanna (dry-mesic acid sand), prairie (dry sand, mesic sand, wet acid sand)
Wolf Road Prairie NP	Sec 30, T39 R, R12E	5	prairie (dry-mesic, mesic, wet), sedge meadow, streamside marsh

* Indian Boundary Exclusion, no section number.
Note: All township and range locations are associated with the 3rd Principal Meridian.

wooded ecosystems are largely a product of farm era and recent influences. The warm-season flora in these communities is usually absent because of the shade caused by an understory of native and exotic trees and shrubs that have filled in below and among the oaks. Usually (except for the few remaining high quality oak woodlands or savannas), the present flora is not reliably indicative of presettlement community composition. By contrast, the majority of larger oaks and hickories are 140–170 years old and represent the first-generation progeny of the presettlement overstory. Therefore, we felt that performing a ground flora sample in each woodland site was not time well spent. The time saved resulted in more plots sampled in the total study.

Laboratory Analyses

Texture analysis in the laboratory was conducted using the hydrometer method (McKeague 1978). Soil pH was determined in deionized water (Soil and Plant Analysis Council 1992) , equal parts air-dried soil and deionized water. Organic matter content was determined by the loss-on-ignition method (Soil and Plant Analysis Council 1992). All analyses were conducted in the Department of Earth Science laboratory at Northeastern Illinois University.

DATA ANALYSIS

All sample plots were placed in a given plant community type by comparing the common species of that observation and its vegetative context to descriptive data provided by Thomas (1998). The name of the mapped soil series was recorded for all sample locations that occurred within the area of Cook County for which local soil maps exist. Much of the more urbanized portion of Cook County and many natural areas in the immediate vicinity were never mapped to the soil series level. To evaluate the accuracy of soil mapping, field profile descriptions and lab results were compared to the type description in the soil survey. Five criteria were used, and the soil series was judged incorrect for any of the following reasons.

1. The A horizon depth was more than 10 cm different from that of the type profile description given in USDA (1979), or 50% deeper or shallower than the type profile if the A horizon depth (of the type profile) was greater than 20 cm.
2. The field profile description differed from the type profile in terms of the presence or absence of the E horizon.
3. The texture classes of the upper 50 cm of the field profile description were markedly different from the type profile description. This difference was arbitrarily defined as the failure to differentiate accurately soils with silty and clayey textures (silty clay loam, silt loam, silty clay) from those with sandy textures (sandy loam, loamy sand, sand).
4. The pH of the upper 50 cm of the field profile description was markedly different from the type description. The type profile of the soil series was judged to be in error if it failed to accurately differentiate between field profiles with alkaline pHs (>7.0) and those with slightly acid to extremely acid upper solums. Either alkaline or acid pH measurements were considered to be not in disagreement with a type profile description that noted neutral pHs for the upper horizons.
5. The soil drainage class assigned to the field profile description was two or more soil drainage classes different from the type description.

These five criteria are important features of soil formation and important limiting environmental factors governing the distribution of plants. The dominant vegetation of an area—grassland or forest—influences soil properties of A horizon depth, presence or absence of the E horizon, and soil reaction (acid vs. alkaline). From the viewpoint of ecological restoration, these criteria have meaning in terms of the vegetative history of the site and its management potential. If the field soil profile description differed from the type profile description of the map unit (USDA 1979) and more closely resembled the type profile description of another series, it was assigned by the authors to the series it most closely resembled.

RESULTS

Soil Classification and Mapping

Data were recorded on a total of 105 plots in areas that had been mapped by the USDA soil survey and for 40 plots that were placed in unmapped areas. Eighty-two (79%) of the 105 plots were assigned by the authors to a soil other than the series of the map unit, in order to fit the field profile description more accurately. By contrast, the five criteria represented a more conservative method. Only 53 (50.5%) of the plots were judged to be incorrect, based on at least one of the five criteria. Criteria that were most commonly in "error" were presence or absence of an E horizon (30.0% error) and depth of the A horizon (19.6% error). Soil texture (13.1% error), pH (8.4% error), and drainage class (7.5% error) were less often in error.

Both A horizon depth and presence or absence of an E horizon are strongly influenced by historic vegetation. The depth of the A horizon (19.6% error rate) is strongly influenced by vegetation and, in particular, the difference between the more fibrous root systems of grasses and the coarser root systems of trees. The presence of an E horizon is a function of leaching, the rate of leaching being strongly influenced by the cycling of cations and organic acid deposition by vegetation.

In soil mapping, the mapper recognizes soil classes, determines the key properties associated with the classes, and looks for landscape boundaries that coincide with class limits (Guthrie 1982). Information from a small number of field samples must be extrapolated to infer the relationship between landscape boundaries and soil classes. The occurrence of soil type X on landscape position Y provides the basis for mapping soil type X on all other "similar" landscape positions. Aerial photography and topographic and geologic mapping provide evidence for locating landscape boundaries related to landform, parent material, and (in the case where local relief is pronounced) soil drainage. Maps and remotely sensed images, however, would seem to provide less information for evaluating spatial variation in A horizon depth and presence or absence of an E horizon.

Plant Communities Encountered

Thirty-three plant community types are represented among the 145 plots. Of these, 101 plots belong to forest-woodland-savanna community types, 28 to prairie communities, and 15 to wetland communities. There are marked differences in the composition of savanna, woodland, and forest community types, yet little difference in basal area stocking in the present day (table 2). Mesic forest is dominated by sugar maple (*Acer saccharum*) and red oak (*Quercus rubra*), whereas the dominance shifts to red oak and white oak (*Quercus alba*) in mesic woodland, and to bur oak (*Quercus macrocarpa*) and scarlet oak (*Quercus coccinea*) in mesic savanna. In basal area stocking, mesic forest (28.08 m^2/ha), mesic woodland (29.68 m^2/ha), and mesic savanna (31.89 m^2/ha) are not greatly different. Over 150 years of fire suppression, grazing, logging, and neglect have allowed what formerly were savannas and woodlands to fill in with a more dense stocking of trees.

Even though most of Cook County was prairie prior to European settlement (Hanson 1981), wooded vegetation predominates in forest preserves and protected natural areas. Most prairies and wetlands in Cook County disappeared because plowing, grazing, lack of fire, and drainage altered the land. The preservation bias in both wooded and prairie communities is toward dry to mesic communities as opposed to wet-mesic and wet community types. Eighty-one percent of plots in forest, woodland, and savanna communities were dry to mesic community types, and 68% of plots in prairie were in dry to mesic prairie. Artificial drainage by ditching and tiling allowed areas of flat, wet silt loam, and silty clay loam to be converted to profitable agriculture, whereas areas of steeply rolling morainal terrain, gravelly ice-contact hills, and sandy soils have been preserved in "natural" vegetation out of proportion to their original spatial extent.

Soil Series and Plant Community Types

Table 3 summarizes important soil and site characteristics by plant community type. The table confirms the "conventional wisdom" concerning the influence of vegetation on soil. For instance, E horizons are most frequent in dry-mesic savanna, mesic savanna, dry-mesic acid sand savanna, dry-mesic woodland, and mesic woodland. Two processes lead to lower pH and E horizon formation in these oak-dominated communities as compared with prairie vegetation: (1) the addition of organic acids from oak litter, and (2) the reduction (in comparison to grassland) in the recycling of cations, resulting from a reduction in the biomass of grass-sedge cover relative to prairie. Calcium, the most abundant cation in soil, functions as a binding agent, causing clay particles to adhere to one another. Only when free calcium is removed from the soil by acid leaching do the clay particles become mobile, subject to translocation by water (Birkeland 1984). Only one of seven examples of the sugar maple–dominated mesic forest community type had an E horizon. Sugar maple litter has a higher nutrient content than oak litter, and this may have produced the higher soil pH in mesic forest (A horizon 5.6, B horizon 6.1) as opposed to mesic woodland (A horizon 5.1, B horizon 5.2). Acidification is a prerequisite to E horizon formation, and occurs most rapidly beneath oak trees.

The frequency of E horizon occurrence in wet-mesic woodland (33%), wet-mesic sand woodland (0%), and wet-mesic savanna (0%) is less than for drier woodlands and savannas. A horizons are deeper in wet-mesic woodlands and savannas in comparison with mesic and dry-mesic savanna and woodland communities. Therefore, the depth zone in which E horizons usually form is dominated by organic matter addition and mixing. Also, through rainy periods, these soils have a high standing-water table, inhibiting the vertical movement of water necessary for translocation of clay.

In general, prairie vegetation features higher rates of basic nutrient recycling than does woodland vegetation, buffering the acidification of surface soils. Therefore, one does not typically associate the formation of an E horizon with prairie vegetation. Dry-mesic prairie had an E horizon for one out of three plots. Whether this represents an exception to the rule in terms of soil formation, or a result of a shift from savanna-woodland vegetation to prairie vegetation in the relatively recent past is not known.

Note also that the conventional model of prairie versus forest influences on soil formation is consistent, but only in a relative sense. Mesic and dry-mesic prairie are slightly to very strongly acid through the upper 50 cm, as are all four sand prairie types (types 19 to 24). In comparison with the soils of roughly equivalent woodland vegetation on similar parent material, however, prairie soils are slightly less acid, e.g., dry-mesic prairie (A horizon 5.1, B horizon 4.8) compared with dry-mesic woodland (A horizon 4.8, B horizon 4.3), or mesic prairie (A horizon 5.5, B horizon 5.8) compared with mesic woodland (A horizon 5.1, B horizon 5.2). The neutral and alkaline pHs of wet floodplain forest soil (A horizon 7.0, B horizon 7.3) would,seem to be the exception, though no corresponding floodplain prairie community was sampled. The soils of low terraces in floodplain soils are enriched by the addition of alkaline alluvial muds each year.

Table 2. Comparisons of mean basal area (m^2/ha) of tree species for forest, woodland, and savanna community types (Thomas 1998)

Plant community type*	1	2	3	4	5	6	7	8	9	10	11	12
Number in sample	7	7	3	22	26	3	4	1	13	9	1	5
Acer negundo	0	0	0	0	0	0	0	0	0.47	0	0	0
Acer rubrum	0	0	0	0	0.12	3.07	0	0	0	0	0	0
Acer saccharinum	0	0	6.14	0	0	1.02	0	0	0	0	0	0
Acer saccharum	13.16	1.32	0	0.42	3.84	0	0.77	0	0	0	2.30	0
Carya cordiformis	0	0	0	0.42	0.12	0	0	0	0	0.26	0	0
Carya ovata	0.44	0	0	0.45	0.12	0	0	3.07	0.24	1.79	0	0
Celtis occidentalis	0	0	0	0	0.24	0	0	0	0	0	0	0
Crataegus species	0	0	4.09	0	0	0	0	0	0	0	0	0
Fraxinus americana	1.75	3.73	0	0.84	1.06	3.07	0	0	0	0.34	0	0
Fraxinus pennsylvanica	0	2.85	13.30	0	0.12	0	0	3.07	0.24	0.26	0	0
Juglans nigra	0.44	0.44	0	0	0.12	0	0	0	0	0	0	0
Morus alba	0	0	0	0	0	0	0	0	0.77	0	0	0
Nyssa sylvatica	0	0	0	0	0	0	1.54	0	0	0	0	1.23
Ostrya virginiana	0	0	0	0.14	0.83	0	0	0	0.71	0.34	0	0
Populus deltoides	0	0	1.02	0	0.35	2.06	3.84	0	0	0	0	0
Prunus americana	0	0	0	0	0.24	0	0	0	0	0	0	0
Prunus serotina	0	0	0	2.55	0.56	0	0	0	1.42	3.24	0	2.46
Quercus macrocarpa × Q. alba	0	0	0	0.11	0	0	0	0	0	0	0	0
Quercus alba	0	0.44	0	17.06	8.41	0	0	0	2.18	1.28	0	4.91
Quercus bicolor	0	2.37	0	0	0	2.05	5.37	15.35	0	0	0	0
Quercus coccinea	0	0.33	0	0.52	0.12	0	0	0	0	3.84	0	8.60
Quercus macrocarpa	0.44	6.91	2.05	0.42	0.44	7.16	2.30	3.07	16.52	17.82	6.90	0
Quercus palusrtris	0	0	0	0	0	0	17.65	0	0	0	0	0.61
Quercus rubra	8.34	1.32	0	5.30	10.18	4.86	0.77	0	0.24	1.02	2.30	0
Quercus velutina	0	0	0	0.42	0	0	0	0	0.18	0.68	0	7.37
Rhamnus cathartica	0	0.66	0	0	0	0	0	0	0.18	0	0	0
Sassafras albidum	0	2.30	0	0	0	0	0	0	0	0	0	2.46
Tilia americana	1.32	0.99	0	0.56	1.65	0	0	0	0	0	0	0
Ulmus americana	2.19	1.97	0	0.38	0.92	2.30	1.54	3.07	0	1.02	0	0
Ulmus rubra	0	1.32	5.12	0.14	0.24	0	0	0	0	0	2.30	0
Total	28.08	26.95	31.72	29.73	29.68	25.59	33.78	27.63	23.15	31.89	13.80	27.64

* Plant community types after Thomas (1998):

1. Mesic forest
2. Wet-mesic floodplain forest
3. Wet floodplain forest
4. Dry-mesic woodland
5. Mesic woodland
6. Wet-mesic woodland
7. Wet-mesic sand woodland
8. Wooded vernal pond
9. Dry-mesic savanna
10. Mesic savanna
11. Wet-mesic savanna
12. Dry-mesic acid sand savanna

The A horizon depth for dry-mesic prairie (20 cm) is too shallow to qualify the soil for mollisol status (>25 cm), but it is almost twice as deep as the A horizon of dry-mesic woodland (12 cm). There is a general, though not consistent, trend for A horizons to be deeper and organic matter contents to be higher for wetter drainage classes as opposed to drier drainage classes, for instance, dry-mesic woodland (12 cm, 7.7%), mesic woodland (11 cm, 8.3%), and wet-mesic woodland (22 cm, 11.7%); or dry-mesic savanna (19 cm, 9.4%), mesic savanna (14 cm, 7.7%), and wet-mesic savanna (33 cm, 10%).

A study of the correspondence of soil series and community types (table 4) revealed that the community types are associated with a more diverse group of soil series than indicated by Thomas (1998). Community types having the most diverse soil series are dry-mesic woodland(6 soil series), mesic woodland (8 soil series), dry-mesic savanna (5 soil series), and mesic savanna (6 soil

Table 3. Comparisons of mean soil and site conditions in plant community types for 145 plots in remnant natural areas in Cook County, Illinois

	n	A-dep	E-freq	E-thk	Clay50	Sand50	Silt50	OM	ApH	EpH	BpH	Slope	SS
Mesic forest	7	16	14	3	26	28	46	8.7	5.6	4.9	6.1	3.4	-5.5
Wet-mesic floodplain forest	7	27	0	.	35	24	42	9.0	6.0	.	6.4	1.3	-3.5
Wet floodplain forest	3	18	0	.	34	16	51	13.0	7.0	.	7.3	1.4	+2.8
Dry-mesic woodland	22	12	75	15	40	21	39	7.7	4.8	3.9	4.3	7.1	-3.5
Mesic woodland	26	11	58	15	41	17	42	8.3	5.1	4.0	5.2	7.4	-5.6
Wet-mesic woodland	3	22	33	10	40	16	44	11.7	5.0	3.9	5.5	1.3	-3.5
Wet-mesic sand woodland	4	26	0	.	19	47	34	10.5	5.2	.	5.8	0.4	+1.6
Wooded vernal pond	1	20	0	.	42	18	40	10.8	6.2	.	6.2	1.5	+2.0
Dry-mesic savanna	13	19	46	15	33	26	41	9.4	6.5	5.6	6.6	15.9	-2.6
Mesic savanna	9	14	78	13	16	26	36	7.7	4.8	3.8	4.2	3.3	-4.4
Wet-mesic savanna	1	33	0	.	16	50	34	10.0	7.1	.	7.4	2.5	-9.0
Dry-mesic acid sand savanna	5	10	80	12	3	86	12	8.5	4.5	4.1	4.2	0.8	-1.1
Shrub swamp	1	64	0	.	51	11	38	22.6	4.8	.	6.1	1.0	+0.0
Dry-mesic prairie	3	20	33	12	52	14	34	7.7	5.1	3.6	4.8	5.2	-6.0
Mesic prairie	4	30	0	.	42	21	37	12.5	5.5	.	5.8	2.1	-5.0
Wet-mesic prairie	1	15	0	.	44	16	40	23.1	7.1	.	7.5	1.25	-5.5
Wet prairie	2	31	0	.	46	16	38	14.8	6.7	.	7.5	0.4	+1.2
Dry sand prairie	1	10	0	.	2	92	6	5.9	6.3	.	5.5	0.5	+0.0
Mesic sand prairie	2	26	0	.	3	86	11	6.4	5.5	.	4.5	1.1	-5.7
Wet-mesic sand prairie	2	23	0	.	2	84	14	15.4	4.3	.	4.0	2.0	+2.5
Wet acid sand prairie	3	31	0	.	7	70	23	11.4	4.7	.	5.9	1.6	+3.3
Dry gravel prairie	5	21	0	.	19	52	28	9.5	7.2	.	7.7	17.7	-25.0
Mesic gravel prairie	1	15	0	.	20	28	58	9.3	7.4	.	8.3	1.0	-5.0
Dry dolomite prairie	1	9	0	.	.	.	.	7.7	.	.	.	0.5	-2.5
Dry-mesic dolomite prairie	2	17	0	.	53	11	36	10.3	7.0	.	7.2	0.6	-1.5
Wet-mesic dolomite prairie	1	23	0	.	54	11	35	12.3	6.9	.	8.0	1.5	-1.0
Sedge meadow	5	29	0	.	41	20	39	17.6	6.8	.	7.2	1.3	+3.0
Basin marsh	1	25	0	.	43	11	46	13.1	3.9	.	4.7	3.0	+2.0
Streamside marsh	2	39	0	.	43	21	36	16.2	5.2	.	6.2	0.9	-0.25
Open vernal pond	2	40	0	.	54	15	32	12.8	4.3	.	5.0	1.0	+2.0
Graminoid fen	2	52	0	.	.	.	.	38.2	7.2	.	8.0	4.0	+5.3
Calcareous seep	2	11	0	.	13	43	44	21.6	7.8	.	8.1	1.7	+1.0
Seep	1	21	0	.	29	18	53	20.8	6.6	.	7.5	0.0	+1.0

n=number of samples in the community type, A-dep=depth of the A horizon or organic soil layer (cm), E-freq=frequency of occurrence of an E horizon (%), E-thk=thickness of the E horizon (when present, cm), Clay50=clay content at 50 cm (%), Sand50=sand content at 50 cm (%), Silt50=silt content at 50 cm (%), OM=organic matter content (%) of the surface horizon (0–10 cm), ApH=A horizon pH, EpH=E horizon pH (when present), BpH=B horizon pH at 50 cm, Slope=slope steepness (%), SS=slope shape (sum of % slope in 4 directions measured from plot center: upslope [+], down slope [-], right, and left)

series). Based on our analysis, there is limited ability to predict the community type on the basis of the mapped soil series.

Because there were so many soil series and plant communities sampled, sample size for most soil series and community types was small. For the Morley series, however, 26 plots were sampled, allowing closer examination of this series. If we assume that Morley soils are randomly distributed among four physiognomic categories (i.e., community types of forest, woodland, savanna, prairie), the percentage of Morley plots in each physiognomic type will be approximately equal to the percentage of the total sample in each physiognomic type. The ratio of these two percentages can be used as an index of representation (IR). For example, if one-half of all plots occurred in the woodland physiognomic category, then a random distribution of Morley soils would result in one-half of the Morley soils occurring in the woodland physiognomic category. If only one-quarter of the Morley soils occur in the woodland physiognomic category, then the index of representation is one-half (0.5), and the Morley is underrepresented in this category. Thus, indices of less than one imply less representation than likely by random chance. Indices of greater than one imply more representation in that physiognomic type than likely by random chance. The Morley soil series as mapped in forest ,(IR 0.67), savanna (IR 0.49), and prairie (IR 0.56) physiognomic types has indices of representation of less than 1. Only in the woodland physiognomic category is Morley overrepresented (IR 1.86). If soil series assigned by

Table 4. Comparison of the occurrence of soil series as mapped in USDA (1979) with plant community types (Thomas 1998) for 145 plots in remnant natural areas in Cook County, Illinois

		Community Type*																												
	Soil Series	1	2	3	4	5	6	7	8	9	10	11	12	14	15	16	17	18	19	21	22	24	27	35	36	37	38	39	40	41
23	Blount					4																								
27	Miami				1	1																								
49	Watseka												2						1	2	1	1								
93	Rodman									1													1							
107	Sawmill			2																										
125	Selma											1																		
146	Elliot				1																									
152	Drummer					1																								
192	Del Ray		1		1																									
194	Morley	1			12	6				2	1				2	1										1				
201	Gilford							1														2								
232	Ashkum													1		1	1							1						
290	Warsaw									1																				
298	Beecher										1					1														
318	Lorenzo									2													4							
327	Fox					2																								
329	Will																							1						1
330	Peotone																								1					
494	Kankakee	2																												
531	Markham									2																				
696	Zurich	1			1	2					1																			
697	Wauconda		3		1	3					1																			
698	Grays					1					1																			
741	Oakville	2									1		3								1									
904	Muskego-Peotone																							1						
1330	Peotone, wet							1																						
1903	Muskego-Houghton, wet																										2	2		

* List of plant community types after Thomas (1998):

1. Mesic forest
2. Wet-mesic floodplain forest
3. Wet floodplain forest
4. Dry-mesic woodland
5. Mesic woodland
6. Wet-mesic woodland
7. Wet-mesic sand woodland
8. Wooded vernal pond
9. Dry-mesic savanna
10. Mesic savanna
11. Wet-mesic savanna
12. Dry-mesic acid sand savanna
14. Shrub swamp
15. Dry-mesic prairie
16. Mesic prairie
17. Wet-mesic prairie
18. Wet prairie
19. Dry sand prairie
21. Mesic sand prairie
22. Wet prairie
24. Wet acid sand prairie
27. Dry gravel prairie
29. Mesic gravel prairie
30. Dry dolomite prairie
32. Mesic gravel prairie
33. Wet dolomite prairie
35. Sedge meadow
36. Basin marsh
37 Streamside marsh
38. Open vernal pond
39. Graminoid fen
40. Calcareous fen
41. Sand seep

the authors to the Morley series based on the field profile description are used, the degree of overrepresentation is more pronounced. Twenty-one of 27 samples assigned to the Morley series occurred in woodland communities (IR 2.01). Of the 27 plots assigned to the Morley soil series, none was in a forest community. The most common vegetation associated with the Morley soil series is dry-mesic woodland, making up 46% of the plots mapped as Morley, and 59% of the plots assigned to the Morley series. These data do not suggest that a land manager or restorationist is wrong in predicting prairie, savanna, or forest vegetation on a site where Morley soil is mapped, only that such vegetation is less common than woodland in areas of Morley soil.

DISCUSSION

Soil survey maps and soil series classifications and descriptions are excellent resources for any land manager. Soil surveys provide descriptions of spatial variation in soil properties, such as soil drainage, soil reaction, and soil texture, that may have an important relationship to management objectives. As long as the scale of one's interpretations is broad—*not* judgments on an acre-by-acre basis—the patterns depicted in county soil surveys are usually reliable. For those doing soil-related research, soil surveys provide examples of soil profile descriptions prepared by experts. The problem is both in the level of detail depicted in survey maps, and in the manner in which the survey is interpreted by land managers.

Survey maps are inadequate for characterizing spatial variation in soil properties to a degree of precision sufficient for ecological restoration management purposes such as inferring pre–European settlement vegetation or setting specific goals for species reintroduction on an acre-by-acre basis. The problems fall into two categories: inadequate level of detail and inadequate concepts. Inadequate or incorrect detail is a product of insufficient sampling within the local landscape in question, leading to the need to extrapolate a small base of information beyond its usefulness. Given the enormous scope of a single survey—an entire county or several counties—such shortcomings are understandable. Improving the detail of the map is relatively straightforward, if difficult in practice, requiring additional field sampling by qualified personnel.

Inadequacy of concepts is more serious. The problem lies not with the concept of soil series in and of itself, but rather, the ways in which soil series are defined by soil scientists, and how they are used to infer the character of pre–European settlement vegetation by plant ecologists and managers. It is commonplace to use the terms "prairie soil" and "forest soil." As restorationists have rediscovered the oak savanna, it is not uncommon to hear of "savanna" soils. The search within county soil surveys, however, for "forest, woodland, prairie, or savanna" soils as predictive categories for interpreting local variation in soil and vegetation represents an overinterpretation of the survey, which was created for other purposes. If savannas existed, so must the soils of savannas, yet there may be no savanna soil series—that is, a currently recognized soil series that developed exclusively under savannas.

Rodman, Warsaw, Blount, Beecher, Markham, Zurich, Wauconda, Grays, and Oakville series all occur in association with savanna vegetation, but they are all relatively rare in occurrence overall (one or three plots for each series). Such data can be used only to pose a hypothesis about their association with savanna. It seems more likely that there is no current soil series indicative of savanna, but rather that many soil series occur often or occasionally in association with savanna vegetation. Savanna soils may be only slightly different from soils developed in adjacent grasslands, and, because their function for agriculture and development is not greatly different, they are mapped together with adjacent grassland soils. In other cases, they may be only slightly different from soils commonly developed under more continuous tree cover, and are then mapped along with these "forest" soils in such cases.

Thirteen soil series are mapped in association with savanna plant community types. However, only for Oakville and Rodman were the majority of plots mapped in savanna communities. Mendelson, Aultz, and Mendelson (1992) state that the Markham and Beecher series are indicative of savanna vegetation. In the Cook County forest preserve system, areas of Markham and Beecher soil series under remnant vegetation are rare. Of the two plots mapped as Markham series in this study, both occur under dry-mesic savanna. Both of these plots, however, after examination of the field profile description and lab results, were reclassified (by the authors) to other series. Three (different) plots were assigned (by the authors) to the Markham series, two in the mesic woodland community type and one in mesic savanna. Of the two plots mapped as Beecher, one occcurred in the mesic savanna community type and one with the mesic prairie community type. The soil profile of the savanna plot, however, was reclassified (by the authors) to another soil series. The remaining plot classified as Beecher and another plot assigned to the Beecher series both occurred with the mesic prairie community type. This is an insufficient sample from which to accept or deny the relationship of Markham or Beecher soils and savanna vegetation. Even if areas of Markham and Beecher soil often developed under savanna vegetation, it remains an open question as to what other soils developed in savannas and whether or not the Markham and Beecher series occur more commonly under other community types.

Only three soil series (as assigned by the authors) occur under both wooded community types (forest, woodland, and savanna) and prairie community types: Milford, Morley, and Oakville. These three series however, make up 25% of the study. Also, sample size for most series is small, therefore the ability to make predictive statements about soil series and community type associates, even to the level of major physiognomic categories of wooded versus prairie, is limited.

In this discussion, the assumption is made that the classification of vegetation in Thomas (1998) accurately represents ecological differences among native plant communities. In addition, although most sample plots were unambiguously placed in a community type, there were borderline instances in which the decision was more arbitrary. Had the study been restricted to ecosystems with a relatively undisturbed ground flora and the composition of all vegetative strata used to characterize the community type, the placement of sample plots in community types would have been less problematic. Results may have shown a higher degree of correlation between plant community type and soil series.

The purposes of the study, however, were to apply currently used classifications of vegetation and soil, to test the accuracy of soil mapping, and to examine the association of soil series types and plant community types – and to do so in a wide variety of sites across the county. Restoration management is not restricted to undisturbed sites, and managers must apply readily available resources such as existing plant community classifications and soil surveys. This study accurately represents the results of such application.

The Classification and Mapping of Soils and Plant Communities

Classifications ideally should provide both the power to generalize, i.e., to link the individual to a class of other similar individuals, and the precision and accuracy needed to make statements about objects treated by the classification. Thus, the statement that a segment of oak woods is a mesic woodland should inform the user about this oak wood's fundamental similarity to other mesic woodlands, and it should provide the user with the power to infer specifics concerning biotic composition prior to disturbance and the levels of important environmental factors. A very general classification that divides communities into wooded, open, and wetland areas may accurately group together extant examples into the three types, but would have little usefulness in terms of specifying details about the communities. A classification that identified a separate unit for each plot of natural area in the Chicago region could provide great specificity of description, but no power of generalization.

Plant communities and soils are creations of their local surroundings and histories, and can be treated only approximately by large-scale approaches that seek to find "universal" types across broad areas. Instead, plant communities, soil types, and the associations among them are probably best treated by local mapping and classification efforts, which seek first to partition spatial variation in local phenomena. Secondarily, these local map-based classifications may be merged according to similarities of process, function, structure, and composition. At higher (hierarchical) levels, in which local types are described for a large region, the power of generalization is high, but the level of precision is low. At the local level, the precision of description is high, though the power of universal generalization is low. It would seem that these are inherent limitations in the classification of complex ecological phenomena, for which (unlike organisms) there is no genetic code and evolutionary history to create inherently similar types.

The two classifications used in this study are similar in that they place phenomena of local origin, map units of soil, or small segments of vegetation into a relatively small number of classes that are generalized countywide. Both systems sacrifice precision and accuracy of local interpretation for the power to make regionwide generalizations. Not surprisingly, the power to predict plant community type from soil type on a point-by-point basis is poor. The power even to predict general physiognomic categories is limited. A more reliable interpretation might result from a change in the scale of the analysis from point or plot samples to 100-hectare blocks. Within these blocks, one could relate the frequency of occurrence of a soil series to frequency of occurrence of community type or physiognomic category. Restoration management activities, however, are differentiated on a much finer spatial scale, creating a problem for the use of existing soil survey maps in restoration.

Soil properties and soil types are too often used in restoration management and science to predict pre–European settlement vegetation on an acre-by-acre basis, and too seldom used to understand the structure and function of ecosystems. Predicting vegetation from soil or predicting soil from vegetation implies an independence of the relationship that does not exist in nature. The two are related in a milieu of other influences, such as frequency, intensity, and seasonality of fire, and variation in microclimates. More importantly, they relate to one another in the context of a local landscape. Soil takes on its greatest usefulness for understanding the structure and function of local ecosystems when it is integrated with landform, parent material, vegetation, estimated fire regime, hydrology, microclimate, historical information, and immediate ecological context. To know that a site has a Morley soil may tell you little about its vegetation, other than, for example, it probably never supported a bog, fen, or marsh. To know that the Morley soil sits on a 3–6% slope of a glacial moraine, near the western edge of an oak grove reported in the original PLS notes, and that the current overstory dominant is bur oak, on the other hand, tells you a great deal about what other plants and animals might have used the site in the past. The study of soil and its usefulness to restoration science and management should move in the direction of such integrative studies, in particular, to integrative ecosystem approaches to the study of land.

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THE GENUS *AGRIMONIA* (ROSACEAE) IN ILLINOIS

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ABSTRACT: *Agrimonia parviflora, A. striata, A. pubescens, A. gryposepala,* and *A. rostellata* are the five species of *Agrimonia* native to Illinois. Plants of *A. parviflora* are usually correctly identified, inasmuch as the number and shape of its leaflets are distinctive. The other four cannot be consistently distinguished by these easily observed characters, but must be identified by suites of less readily apparent characters. Sixteen of the 47 characters examined during our study of the genus *Agrimonia* in North America were found to be most useful in describing and distinguishing the species in Illinois. These 16 characters describe the dispersion and types of hairs; leaflet number, shape, and size; stipule shape; flower position; mature fruiting hypanthium shape and size; and the presence or absence of tuberous roots. A key for identification of the Illinois agrimonies is presented here along with a detailed description of each species. *Agrimonia striata,* reported here from three counties, was heretofore unknown in the Illinois flora; on the other hand, the previous report of *Agrimonia microcarpa* was based upon a misidentification.

INTRODUCTION

The *Agrimonia* (Rosaceae) species of North America are readily confused with each other, especially in the field. All are herbaceous perennials with a similar habit and with similar flowers and fruits. The plants occur along margins and in open spaces of mesic deciduous or mixed deciduous woods, in thickets, and in meadows. A combination of somewhat variable morphological characters distinguishes each species. We have undertaken an examination of the patterns of morphological variation within the genus across North America to circumscribe species limits, to accurately apply the names described in the literature, and to develop a key that will facilitate identification in both vegetative and reproductive conditions.

METHODS

After preliminary field and herbarium studies and an examination of the literature, 47 morphological characters were chosen as potentially informative. These characters were measured or scored for about 600 herbarium specimens from across the range of the genus in North America. Sixteen characters (table 1) of the 47 measured were found most useful in delimiting and distinguishing the *Agrimonia* species. They describe the dispersion and types of hairs; leaflet number, shape, and size; stipule shape; flower position; mature fruiting hypanthium shape and size; and the presence or absence of tuberous roots. The utility of our set of 16 distinguishing characters was further tested in the field, during the examination of more than 1,000 additional collections, and in the construction of species descriptions and keys for identification. After examining specimens from the major regional herbaria during this study, we recognize the following five species as native in Illinois: *Agrimonia parviflora, A. pubescens, A. striata, A. gryposepala,* and *A. rostellata.*

Table 1. Morphological characters that best discriminate among species

1.	Number of major leaflets on a mid-cauline leaf
2.	Number of minor leaflets between major ones
3.	Size of the largest terminal leaflet
4.	Shape of the major leaflets
5.	Shape of the major leaflet apex
6.	Vestiture of the leaflet abaxial surface
7.	Shape of the stipule
8.	Vestiture of the stem
9.	Vestiture of the inflorescence raceme rachis
10.	Arrangement of the flowers along the inflorescence raceme rachis
11.	Vestiture of the mature fruiting hypanthium
12.	Shape of the mature fruiting hypanthium
13.	Size of the mature fruiting hypanthium
14.	Number of rows of hooked bristles
15.	Position of the lowermost row of hooked bristles on mature fruit
16.	Presence or absence of tuberous roots

Collection sites recorded on the species distribution maps are taken from the labels of specimens we have examined and identified. The counties for which we document the presence of each *Agrimonia* species differ somewhat from those presented in Mohlenbrock and Ladd (1978).

The North American species of *Agrimonia* share a large number of characteristics synthesized in the following generic description:

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Agrimonia Linnaeus, Sp. pl. 1: 448. 1753. Gen. pl. ed. 5: 206. 1754.

Type species: *Agrimonia eupatoria* L.

Herbaceous perennials, rhizomatous, the rhizome internodes very short. Roots fibrous, sometimes also with slender fusiform tubers. Stems 1–several, frequently branched in the flowering portion. Leaves alternate, stipulate, pinnately compound, the major leaflets interspersed with 1–several pairs of minor leaflets, the number of minor pairs between each pair of major leaflets usually increasing distally along the rachis (see fig. 1). Inflorescence a raceme, terminal and often also axillary, simple or compound, each axis with 9–100 flowers, branched below from the primary peduncle, flexible; bract subtending each pedicel ± ovate, usually 3-toothed with acuminate lobes; pedicels ascending; bracteoles usually a 3-toothed pair, connate at the base. Flowers 10 mm or less in diameter; hypanthium becoming indurate in fruit, enclosing an achene, sulcate, stipitate; stipe reflexed at maturity, throat occluded by means of an annular disk; bristles in 2–5 circumferential rows from the rim, hooked, erect to reflexed in fruit; sepals 5, persistent, connivent in fruit; petals 5, yellow; stamens 5–15; ovaries separate, 2, rarely more, styles exserted. Fruit top-shaped, consisting of the indurated hypanthium enclosing the achene and topped by the connivent sepals with hooked bristles spreading from the rim; achene 1, rarely 2.

Ascertaining the kinds of hairs and their location on the plant surfaces is necessary for accurate determination of the species. Nonglandular hairs are of two types: (1) soft and either straight or wavy, described as pilose, pubescent, or villous, and (2) stiff and straight, described as hirsute. Glandular hairs are either short stalked or glistening and appearing as sessile dots.

KEY TO THE ILLINOIS *AGRIMONIA* SPECIES

1. Major leaflets 5–9 on mid-cauline leaves; obovate to ± rhombic; apex ± obtuse to acute to acuminate
   2. Stem hairs hirsute and pubescent to villous, glandular hairs glistening dots or not conspicuous
      3. Abaxial leaflet surface with glistening-glandular dotlike hairs; stipule outer margin only proximally incised or nearly entire; major leaflets ± rhombic to elliptic, apex usually acuminate . . . . 2. *Agrimonia striata*
      3. Abaxial leaflet surface without glistening-glandular dotlike hairs; stipule outer margin incised along entire length; major leaflets ± obovate to elliptic, apex ± obtuse to acute, rarely acuminate . . . . 3. *Agrimonia pubescens*
   2. Stem hairs hirsute with conspicuous short-stalked glandular hairs
      4. Lower portion of the floral axis with hirsute hairs more than 1.0 mm long, usually ±2.0 mm long, and perpendicular to the axis . . . . 4. *Agrimonia gryposepala*
      4. Lower portion of the floral axis with hirsute hairs less than 1.0 mm long and ± ascending . . . . 5. *Agrimonia rostellata*
1. Major leaflets 9–13 on mid-cauline leaves, ± lanceolate to narrowly elliptic, apex acuminate . . . . 1. *Agrimonia parviflora*

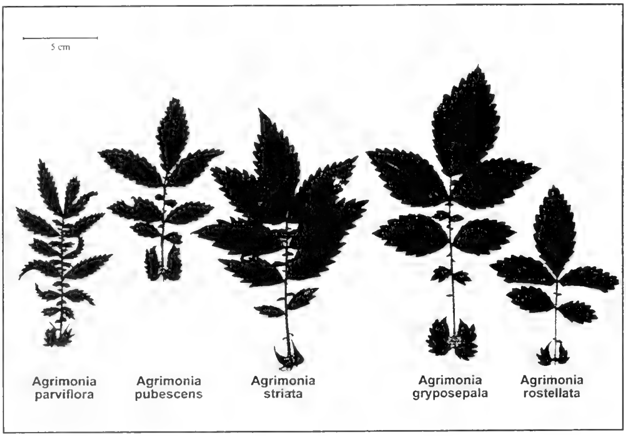

Fig. 1. Mid-cauline leaves

DESCRIPTION OF THE ILLINOIS SPECIES

1. ***Agrimonia parviflora*** Sol. in Aiton. Hortus Kew. 130, 1789.
   Agrimonia polyphylla Urban, Symb. Antill. 7: 227, 1912.
   Agrimonia sauveolens Pursh, Fl. Amer. Sept. 1: 336, 1814.
   Agrimonia serrifolia Wallr., Beitr. Bot. 1: 40, 1842.

Herbaceous perennial 5–16 dm. Roots fibrous, tubers absent. Stems with glistening-glandular dots, often only in the upper portion, pubescent to villous and hirsute, the stiff hairs scattered, perpendicular, 2.0–3.0 mm long. Stipules falcate, the apical lobe long attenuate. Major leaflets 3–19 (mid-cauline 9–13), lanceolate to narrowly elliptic to rarely narrowly rhombic, the apex acuminate to long acuminate to infrequently acute; abaxial surface pubescent to villous and hirsute along the veins, the stiff hairs ± scattered, 1.0–3.0 mm long, nonglandular hairs most densely disposed along major veins, and usually with glistening-glandular dots; terminal leaflets the largest, the largest of these 3.4–8.5 × 1.0–2.4 cm; minor leaflets 1–4 pairs. Raceme with most flowers ± subopposite in the middle and upper portions; rachis with glistening-glandular dots, pubescent to villous and hirsute, the stiff hairs scattered, ± perpendicular, 1.0–2.0 mm long, usually disappearing upwards. Mature fruiting hypanthium broadly campanulate to broadly turbinate to rarely obconic or hemispherical, moderately to shallowly sulcate, with hooked bristles in 3–4 circumferential rows, the lowermost row spread at ± right angles to reflexed; hypanthium surfaces usually with glistening-glandular dots, the ridges sometimes sparingly hirsute. Mature reflexed fruit with hypanthiums 1.3–3.0 × 1.7–3.8 mm. Flowering mid-July to early September.

Agrimonia parviflora occurs most frequently in meadows, wetlands, and along margins of lakes, streams, and sloughs throughout Illinois (fig. 2). The species is reported for Lake County by Swink and Wilhelm (1994), but they indicate that no voucher specimen has been seen by them. Joyce Proper, steward at Grant Woods Forest Preserve, Lake County, confirms the presence of *A. parviflora* in this county (pers. comm.).

Of the five Illinois species, *A. parviflora* is the one that is seldom misidentified. In addition to its distinctive morphology, especially its foliage (see fig. 1), it occupies habitat that is markedly more moist than the habitat in which the remaining four are likely to occur.

2. ***Agrimonia striata*** Michx., Fl. Bor.-Amer. 1:287, 1803.
   Holotype: Canada: in Canada. *Flores albidi*, ?, Michaux, Andre, *s.n.* (P).
   Agrimonia brittoniana E. P. Bicknell, Bull. Torrey Bot. Club 23: 517, 1896.
   Agrimonia striata var. *campanulata* Fernald, Rhodora 40: 333, 1938.

Herbaceous perennial, 4–19 dm. Roots fibrous, tubers absent. Stems with glistening-glandular dots, at least above, pubescent to pilose and hirsute, the stiff hairs scattered, perpendicular, ±2.0 mm long. Stipules ± falcate, the outer margin proximally incised or sometimes ± entire. Major leaflets 3–11 (mid-cauline 5–7), blades elliptic to rhombic, the apex acute to acuminate to long acuminate; abaxial surface with glistening-glandular dots, pubescent to pilose and hirsute, the stiff hairs scattered, 1.0–2.0 mm long, nonglandular hairs most densely disposed along the major veins; terminal leaflets the largest, the largest of these 4.3–10.7 × 1.9–4.2 cm; minor leaflets 1–4 pairs. Raceme with most flowers in the middle and upper portions ± subopposite; rachis with glistening dotlike glandular hairs, pubescent to pilose and hirsute, the stiff hairs scattered, ± perpendicular and 1.0–2.0 mm long below to ± ascending and ±1.0 mm above. Mature fruiting hypanthium obconic to ± campanulate to rarely turbinate, deeply sulcate, with hooked bristles in 3–4 circumferential rows, the lowermost spreading at ± right angles (pressed upward on dried specimens); hypanthium surfaces with both stalked and glistening dotlike glandular hairs, grooves strigose, the

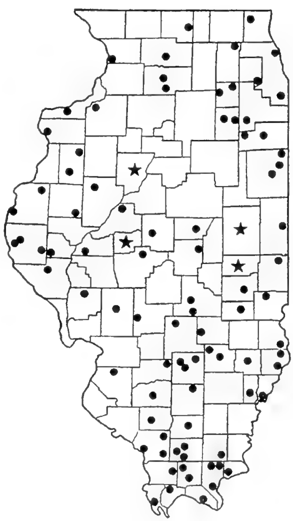

Fig. 2. Distribution of *Agrimonia parviflora* in Illinois
A dot indicates a collection site; a star indicates a collection identified by county only.

ridges usually sparingly hirsute. Mature reflexed fruit with hypanthiums 2.1–6.6 × 2.4–5.2 mm. Flowering late June to early August.

Known only from Boone, Cook, and DeKalb counties (fig. 3): Boone Co., north of Hunter, roadside; Evers, R. A. 96823, 17 Jul 1968 (ILLS); Cook Co.: Evanston; Blatchford, P. 2516, 15 Aug 1873 (ISM); DeKalb Co., CMStP&P RR east of Route 72 overpass; Hutson, Thomas 17, 15 Jul 1972 (DEK).

Stipules with margins nearly entire or incised only along the lower portion and the ± subopposite arrangement of flowers along the raceme rachis distinguish this species from both *A. gryposepala* and *A. pubescens,* with which it might occur and for which it may be mistaken. *A. striata* is also separated from *A. pubescens* by the glistening-glandular dots on stem, abaxial leaflet, and raceme rachis surfaces.

3. ***Agrimonia pubescens*** Wallr., Beitr. Bot. 1:45-46, 1842.

Agrimonia bicknellii (Kearney) Rydb., N. Amer. Fl. 22(5): 394, 1913.

Agrimonia eupatoria γ. *mollis* Torrey & A. Gray, Fl. N. Amer. 1: 431, 1840.

Fig. 3. Distribution of *Agrimonia striata* in Illinois
A dot indicates a collection site; a star indicates a collection identified by county only.

Agrimonia mollis (Torrey & A. Gray) Britton, Bull. Torrey Bot. Club 19: 221, 1892.

Agrimonia mollis γ. *bicknellii* Kearney, Bull. Torrey Bot. Club 24: 565, 1870.

Agrimonia platycarpa Wallr., Beitr. Bot. 1: 38, 1842.

Agrimonia microcarpa Wallr., Beitr. Bot. 1: 39-40, 1842, *pro parte.*

Herbaceous perennial 5–16 dm. Roots fibrous and with slender fusiform tubers. Stems pubescent to villous and hirsute, the stiff hairs scattered, perpendicular, 2.0–3.0 mm long. Stipules ± broadly half-ovate, the outer margin shallowly incised, the apical lobe sometimes long acuminate. Major leaflets 3–13 (mid-cauline 5–9); blades elliptic to lanceolate to sometimes ± obovate, lateral leaflets sometimes ± falcate, the apex obtuse to acute to acuminate; abaxial surface pubescent to pilose and sparingly hirsute with the stiff hairs 1.0–2.0 mm long, all hairs usually most densely disposed along the major veins; terminal leaflets the largest, the largest of these 3.3–9.8 × 1.4–5.5 cm; minor leaflets 1–3 pairs. Raceme with most flowers alternate; rachis pubescent to villous and hirsute, the stiff hairs ± scattered, usually perpendicular and 1.0–2.0 mm long below to ± ascending and ±1.0 mm long above. Mature fruiting hypanthium turbinate to campanulate, sometimes broadly so, to ± obconic, deeply to shallowly sulcate two-thirds to the entire hypanthium length, with hooked bristles in 3–4 circumferential rows, the lowermost row spreading at ± right angles (pressed upward on dried specimens); hypanthium surfaces with short-stalked glandular hairs, grooves strigose, the ridges sparingly hirsute. Mature reflexed fruit with hypanthiums 1.9–4.5 × 2.0–4.6 mm. Flowering mid-July to August (–September).

The specimen (Eggert *s.n.,* 1875) at MO, on which Mohlenbrock (1986) based his report of *Agrimonia microcarpa* in St. Clair County, is a misidentification of *A. pubescens.* These species sometimes differ only in mature fruit shape and size, stipule shape, and the length of hirsute hairs on the stem. Without mature reflexed fruit, which is lacking on the Eggert specimen, accurate discrimination between *A. microcarpa* and *A. pubescens* can be difficult. *Agrimonia pubescens* occurs throughout most of Illinois (fig. 4). It should be sought in those counties from which no collections are presently known.

Agrimonia pubescens is a polymorphic species with 3 recognizable morphs and their various intermediates. All 3 of these principal patterns are found in Illinois: (1) leaves with major leaflets broadly obovate to ± elliptic, with 5–7 leaflets on mid-cauline leaves and 1 minor pair; (2) leaves with major leaflets ± narrowly obovate to elliptic, with 7 leaflets on mid-cauline leaves and only 1 or 1–3 minor pairs (fig. 1); and (3) leaves with major leaflets elliptic to lanceolate, with 7–9 leaflets on mid-cauline leaves and only 1 or 1–3 minor pairs. Lateral leaflets are frequently falcate in morphs 2 and 3. Stipules with long-acuminate apical lobes prevail in morph 3 and are frequent in morph 2. More than one morph may sometimes occur in a population. Although all 3 morphs and intermediates are found across the state, the geographic distribution of morphs among the herbarium specimens examined suggests that morphs 2 and 3 are more frequent in the northern and central portions and morphs 1 and 2 in the southern part.

4. ***Agrimonia gryposepala*** Wallr., Beitr. Bot. 1:49, 1842. Lectotype: United States: Pennsylvania: *In graminosis Pensylvaniae,* Aug 1824, Poeppig *s.n.* (W, acq. 1889, No. 342339. [Kline and Sørensen 1990]).
Agrimonia hirsuta sensu E. P. Bicknell *non* Bong. *auct. non* Muhl., Bull. Torrey Bot. Club 23: 508-512, 1891.
Agrimonia macrocarpa (Focke) Rydb., N. Amer. Fl. 22(5): 392, 1913.
Agrimonia parviflora Sol. in Aiton var. *macrocarpa* Focke in J. D. Smith, Bot. Gaz. 16: 3, 1891.

Herbaceous perennial 3.5–15 dm. Roots fibrous, tubers absent. Stems with short-stalked glandular hairs and hirsute, the stiff hairs scattered, perpendicular, ±2.0 mm long. Stipules ± half-ovate, incised. Major leaflets 3–13 (mid-cauline 5–7); blades obovate to elliptic to rhombic, sometimes broadly so, the apex ± obtuse to acute to rarely acuminate; abaxial surface with short-stalked glandular hairs and often also with scattered glistening-glandular dots, very sparsely to moderately hirsute along the veins, the stiff hairs 0.5–2.0 mm long; terminal leaflets the largest, the largest of these 3.2–10.5 × 1.4–5.6 cm; minor leaflets 1–3 pairs. Raceme with ± alternate flowers, the rachis with short-stalked to glistening dotlike glandular hairs and sparsely to scattered hirsute, with the stiff hairs perpendicular, ±2.0 mm long. Mature fruiting hypanthium ± obconic to turbinate to campanulate, deeply to shallowly sulcate two-thirds to almost the entire length, the rim often expanded, with hooked bristles in 4–5 circumferential rows, the lowermost reflexed; hypanthium surfaces with short-stalked to glistening dotlike glandular hairs, the ridges and base often sparsely hirsute. Mature reflexed fruit with hypanthiums 2.3–5.8 × 2.8–6.2 mm. Flowering July to mid-August (–September).

Widely distributed in northern Illinois, becoming less frequent in the central part of the state; the southernmost occurrences in Fayette and Macoupin counties (fig. 5).

Its large size and lowermost row of fully reflexed bristles make the fruit of *Agrimonia gryposepala* the most distinctive and recognizable. The presence of nonglandular hairs that are only hirsute, perpendicular and ±2.0 mm long on the inflorescence rachis also distinguishes this species from any other in Illinois or North America. Leaflets of *A. gryposepala* (fig. 1) often differ only in vestiture from those of *A. pubescens* or *A. striata* and only in size from those of *A. rostellata.*

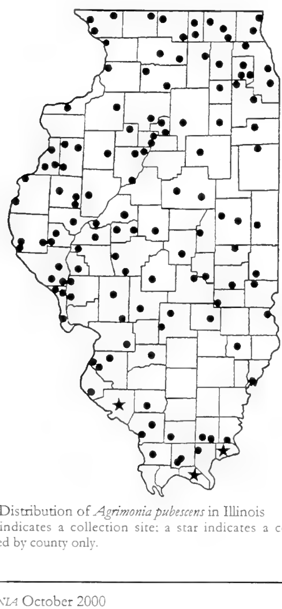

Fig. 4. Distribution of *Agrimonia pubescens* in Illinois
A dot indicates a collection site; a star indicates a collection identified by county only.

5. ***Agrimonia rostellata*** Wallr., Beitr. Bot. 1:42-43, 1842.

Herbaceous perennial 4–14 dm. Roots fibrous and with slender fusiform tubers. Stems with short-stalked glandular hairs and hirsute, the stiff hairs very sparse to scattered, perpendicular, 1.0–2.0 mm long. Stipules ± falcate to ± half-ovate, often deeply incised. Major leaflets 3–11 (mid-cauline 5–7), blades obovate to broadly elliptic to elliptic, the apex obtuse to acute; abaxial surface sparingly hirsute, the hairs 1.0–2.0 mm long, and with short-stalked glandular hairs, usually also with glistening-glandular dots; terminal leaflets the largest, the largest of these 4.0–10.5 × 2.4–5.6 cm; minor leaflets 1 pair. Raceme with ± alternate flowers; rachis ± ascending hirsute, the hairs scattered, sometimes very sparsely so, ±1.0 mm long, and with both short-stalked and glistening dotlike glandular hairs. Mature fruiting hypanthium hemispherical, rarely ± turbinate, obscurely sulcate, with hooked bristles in 2–3 circumferential rows, the lowermost spreading at right angles to reflexed, with short-stalked and glistening dotlike glandular hairs. Mature reflexed fruit with hypanthiums 1.0–3.1 × 1.8–3.9 mm. Flowering July to mid-September.

Agrimonia rostellata occurs in Illinois northward to Cook, DuPage, Ford, LaSalle, Peoria, and McDonough counties (fig. 6). The report by Jones (1994) of *Agrimonia rostellata* in Winnebago County is based upon a misidentification of *A. pubescens.*

A terminal raceme with multiple, usually 2, branches in the primary peduncle gives *Agrimonia rostellata* a distinctive look in the field, which can be recognized with practice. Some morphs of *A. pubescens* and occasional plants of *A. gryposepala* have only 1 pair of minor leaflets, and major leaflets resembling those of *A. rostellata* (fig. 1), so the presence of only stiff, hirsute hairs on the plant surfaces and ascending hirsute hairs ±1.0 mm long on the raceme rachis is critical in distinguishing this species. The hemispherical, glistening-glandular fruiting hypanthium can only rarely be confused with that of *A. parviflora,* but the foliage of the two species is quite different.

DISCUSSION

The habitat in which *Agrimonia* can occur, mesic woodland and thickets, is fragmented and found most frequently along waterways and within protected areas in our state. Within this habitat *Agrimonia* species occur in open, often disturbed, areas or along the margin. We encourage field workers to look diligently for agrimonies and to collect specimens if found in those counties without documented populations. *Agrimonia pubescens* and *A. gryposepala* are the most frequent species in the state; *A. pubescens* and *A. parviflora* have the most extensive ranges. *A. parviflora* occurs most often in mesic sites or along river, stream, or lake edges. *A. rostellata* occurs with *A. pubescens* most commonly in the southern portion of the state, particularly in the Shawnee Hills. The three northern Illinois populations of *A. striata* are disjunct from the range of the species, which extends northward from northern Iowa, central Wisconsin, and northern Michigan.

From our field experience, we suggest that fruiting specimens, i.e., those with at least some fully reflexed fruit, make the most informative herbarium specimens both for

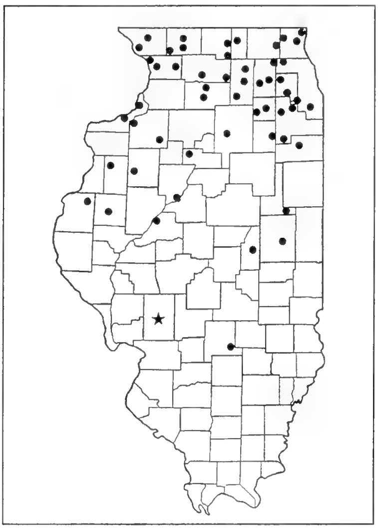

Fig. 5. Distribution of *Agrimonia gryposepala* in Illinois
A dot indicates a collection site; a star indicates a collection identified by county only

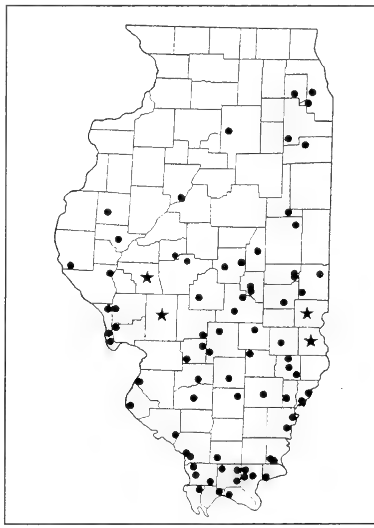

Fig. 6. Distribution of *Agrimonia rostellata* in Illinois
A dot indicates a collection site; a star indicates a collection identified by county only.

documentation and sometimes for identification, e.g., *Agrimonia microcarpa*. When collecting, it is worthwhile to cut the stem at ground level and press the whole plant, using a second sheet if necessary. In sites where the plants are abundant, however, it is desirable to excavate the roots and include them with the specimen even though the presence or absence of root tubers is not essential for the identification of the Illinois species.

ACKNOWLEDGMENTS

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EFFECTS OF ANNUAL BURNING ON POPULATIONS OF *CASSIA FASCICULATA* (FABACEAE: CAESALPINIOIDEAE) WITH A REVIEW OF ITS SYSTEMATICS AND BIOLOGY

Don C. Gardner[1] and Kenneth R. Robertson[2]

ABSTRACT: This report summarizes data collected during 18 years of observing plant populations of *Cassia fasciculata* (partridge pea). Populations varied greatly from year to year. Following burning, however, populations consistently increased compared with those populations in areas that were not burned. There was a mean population ratio of 5.2:1 for burned to unburned areas. This was further demonstrated by reversing the burned and unburned quadrats, which resulted in a reversal of population counts. Observations of changes in the abundance of other plant species during the study are noted. Included are reviews of morphological and ecological characteristics of *C. fasciculata*, and of earlier reports of fire effects on the species.

INTRODUCTION

Many people frequently encounter *Cassia fasciculata* Michaux (partridge pea), but have never taken the time to look at it closely and are unaware of its many fascinating aspects. The biology and systematics of *C. fasciculata* are well studied, at least compared with other species native to Illinois, but this information is widely scattered in the scientific literature. To make this information more widely available, the first section of this paper presents a summary of the systematics, morphology, pollination, seed dispersal, and other interesting biological features of *C. fasciculata.*

The behavior of *Cassia fasciculata* in remnant and restored habitats is less well documented. Some years ago, the senior author noted an apparent increase in population density of *C. fasciculata* during about five growing seasons following annual burning on a small, high quality relict railroad prairie in Livingston County, Illinois, southwest of Kempton. A nearby old field with a population of *C. fasciculata* was selected in 1982 for the purpose of evaluating the long-term effects of annual burning on the fecundity of *C. fasciculata* and its tendency to usurp other species. This paper reports on new observations of demography in burned and unburned systems.

SYSTEMATICS AND ECOLOGY

Cassia fasciculata is a member of the bean family (Fabaceae) and the Caesalpinia subfamily (Caesalpinioideae). Some taxonomists prefer to divide the bean family into three separate families, in which case *Cassia* is placed in the family Caesalpiniaceae. The genus *Cassia,* in the broad sense, is one of the largest genera of legumes and indeed of flowering plants. Bentham (1871) recognized 338 species, and about 350 additional species worldwide have been described since then (Irwin 1964). The genus exhibits greatest diversity in the tropics and subtropics, especially in the Western Hemisphere (Robertson and Lee 1976).

There are five species of *Cassia* native to Illinois (Mohlenbrock 1986). Today, some botanists, such as Irwin and Barneby (1982), divide *Cassia* into several segregate genera, in which case partridge pea is called *Chamaecrista fasciculata* (Michaux) Greene. Two recent papers with detailed studies of floral development (Tucker 1996a,b) support the recognition of segregate genera. According to Irwin and Barneby (1976), if this species is retained in *Cassia,* then the correct name is *Cassia chamaecrista* L., which is also used by Bentham (1871), instead of *Cassia fasciculata* Michaux. The latter name is so well established in common use, however, that a strong case could be made for its conservation.

Like nearly all plant species that occur in tallgrass prairie, the geographical range of *Cassia fasciculata* is much more expansive than the tallgrass prairie region. The general distribution of this species is from Florida to Texas northward to Massachusetts, New York, Ontario, Ohio, Indiana, Illinois, Wisconsin, Minnesota, and South Dakota (Fernald 1950; Steyermark 1963; Great Plains Flora Association 1986). In Illinois, it is known from nearly all counties, except for Lake, McHenry, and a few other scattered counties (Mohlenbrock and Ladd 1978; Swink and Wilhelm 1994). *Cassia fasciculata* is most often associated with sandy soils, such as sand prairies and sand savannas. Disturbances in sand habitats by small mammals can lead to an abundance of *C. fasciculata* (Fulk and

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Ebinger 1999). Other habitats for *C. fasciculata* include blacksoil prairies, woodland borders, and open alluvial soils. It also is found along roadsides and railroads and in other weedy places.

MORPHOLOGY

Cassia fasciculata is quite variable morphologically, and a number of varieties are sometimes recognized (Fernald 1950; Pullen 1963; Steyermark 1963; Isely 1975). However, Irwin and Barneby (1982) and Isely (1998) concluded that there was so much intergrading variation within the species that it was futile to recognize infraspecific taxa. Variation in *C. fasciculata* from Illinois has not been studied, but if varieties are recognized, var. *fasciculata* and var. *robusta* occur in the state.

This species is an upright, herbaceous summer annual that is usually 25–50 cm tall (rarely exceeding 1 m in height). Normally, the stem is unbranched or sparsely branched, though damage by browsing or mowing can result in numerous branches from the base. In an established prairie habitat dominated by native perennials, the persistence of a native annual seems incongruous. While most annual pioneering species are displaced by expanding populations of perennials, partridge pea persists and often thrives in relict native prairies, though abundance certainly seems related to disturbance, except perhaps in sand prairies.

The leaves are alternately arranged along the stem and are evenly pinnately compound; two linear, persistent stipules are found at the base of each leaf. Toward the base of the petiole is a short-stalked, cup-shaped nectariferous disk that is about 1 mm in diameter. This disk, a secretory gland, functions as an extrafloral nectary that attracts insects (Barton 1986; Boecklen 1984; Durkee et al. 1999; Kelly 1986). Each leaf has 6–15 pairs of leaflets that are narrowly elliptic, 2–5 mm wide and 6–20 mm long, with rounded, mucronate apices and oblique bases.

A small pulvinus is found at the base of each leaflet. This pulvinus is responsible for the movement of leaflets, which draw upwards at night and cause the leaves to appear "closed"; hence, another common name for this species is "sleeping plant." The leaflets are also somewhat sensitive when touched, although not to the degree of *Mimosa pudica*, sensitive plant. Pulling a leaf from a plant will also cause the leaflets to close, as will pulling a plant from the ground. Herbarium specimens nearly always have "closed" leaflets. The physiology of leaflet movement has been studied extensively (see Bourbouloux, Fleurat-Lessard, and Roblin 1994; Everat-Bourbouloux, Fleurat-Lessard, and Roblin 1990). There are various ideas on the functionality of leaf movements, but none have been specifically investigated in *Cassia fasciculata*. It is generally thought that this phenomenon reduces water loss through transpiration. Leaves sensitive to touch may also reduce browsing by animals.

The flowers are borne in short axillary racemes, with only one flower per raceme opening each day. They are rather large (25–35 mm in diameter), perfect, zygomorphic, and yellow in color, although a white form is known from Missouri. They do not produce nectar. Each individual flower is open only for one day, opening before dawn and closing in the evening. The five sepals are yellow green, lanceolate, long acuminate, and 6–10 mm long. There are five yellow petals 12–20 mm long; the upper two often have a purple spot inside at the base. One of the lateral petals, called the "cucullus" by Thorp and Estes (1975) and Wolfe and Estes (1992), is stiff and erect with incurved margins that partially enclose the tips of eight or nine of the ten anthers. The other petals are softer and more pliable, and have a crumpled appearance. The lowest petal is somewhat larger than the others.

The androecium is composed of ten anthers, each with a short, straight, yellow filament. The anthers are yellow, reddish purple, or bicolored (usually reddish purple in Illinois), and are elongate and tubular, opening by terminal pores; they are unequal in length, varying from 7 to 9 mm. The stamens are divided into two sets. The first, arising between the bases of the carpel and the cucullus, comprises eight or nine stamens whose anthers are upright, with their tips curved into the cucullus. The second set consists of one or two stamens that arise from the opposite side of the carpel and bend away from the other anthers, becoming more or less parallel to the curved style. Hardin et al. (1972) noted that this differentiation into two types of anthers is similar to the "feeding" and "pollination" anthers described for some other species of *Cassia* by Faegri and van der Pijl (1966). As is characteristic of legumes, there is only one carpel (simple pistil). The ovary is green, laterally compressed, covered with hairs, and only a bit wider than the style. Four to 16 ovules are contained within the ovary (Martin and Lee 1993). The style is slender and strongly curved upward, and at its tip is a stigmatic orifice, which is obscured by numerous beak-forming papillar hairs (Dulberger, Smith, and Bawa 1994).

POLLINATION BIOLOGY

The pollination biology of *Cassia fasciculata* has been studied by several investigators over the past hundred plus years (Todd 1882; Robertson 1890, 1928; Harris and Kuchs 1902; Hardin et al. 1972; Thorp and Estes 1975;

Wolfe and Estes 1992). The more recent papers have added to work reported in earlier papers with new observations, some corrections, and various hypotheses on pollination mechanisms in this species. The flowers of *C. fasciculata* exhibit the characteristic of enantiostyly — the presence of left- and right-handed flowers. The flowers differ in the direction in which the style and a lateral hooded petal are bent in relation to the floral axis (Todd 1882; Thorp and Estes 1975; Robertson and Lee 1976). When they are turned to the left, a bee receives pollen on its right side. When the insect moves to a right-handed flower, the left side of the bee contacts the stigma (Robertson 1890).

The probable principal bee pollinators of *Cassia fasciculata* are female *Xylocopa, Bombus,* and *Svastra* (Robertson 1890; Thorp and Estes 1975). The pollinating behavior of the bees was described by Thorp and Estes (1975). Bees alight directly on the stamens and curve their abdomens around or reflex them beneath the terminal pores of the anthers. Most bees then strip the anthers by extending their heads, grasping a single anther near its base with their mandibles and pulling toward the apex of the anther with a series of stroking movements that cause the pollen to be extruded through the pores. Alternatively, and sometimes simultaneously, the anthers are vibrated in an activity known as buzz pollination (Buchmann 1983; Michener 1962). One or more groups of anthers are grasped with the legs and mandibles. This is followed by a shivering of the indirect flight muscles of the thorax while the wings remain still. Both methods release pollen on the venter of the bee. These activities attracted attention long ago (Robertson 1890).

Although flowers of *Cassia fasciculata* are insect pollinated, the plants can be self-compatible (Hardin et al. 1972; Lee and Bazzaz 1982a,b; Sork and Schemske 1992; Martin and Lee 1993). The flowers are perfect, but male sterile plants (plants that produce little, if any, functional pollen) occur at low frequencies in populations of *C. fasciculata* (Williams and Fenster 1998). Male sterility is sometimes considered to be the first step in the development of dioecy.

FRUITS AND DISPERSAL BIOLOGY

The leguminous fruit is 2.5–5 cm long, 4–4.5 mm broad, and strongly flattened; each fruit contains 4–16 seeds. The seeds are 3.5–5 mm long and 2.5–4 mm wide, rhomboid in shape, dark brown to black, and flattened, with the upper and lower surfaces covered with parallel rows of tiny pits (Bragg and Bridges 1984). The seed coat is extremely hard and impermeable, and scarification of some kind is required to break dormancy (Everitt and Heizer 1984).

Another notable feature of *C. fasciculata* is the method of seed dispersal. When dry, the two valves of the mature pods suddenly separate and ballistically eject seeds to a distance of up to several meters (Ridley 1930). More recent observations of this dramatic event (Lee 1984) recorded a mean distance of 140 cm for seed dispersal for five-seeded fruit and 201 cm for four-seeded fruit. The greatest dispersal distance recorded was 478 cm. As the common name "partridge pea" implies, the seeds are relished by various species of ground-dwelling birds, such as quail and wild turkey.

Ants can often be seen moving along stems and then seeking out the extrafloral nectaries. In a Florida study (Barton 1986), more than 50 insect species were observed visiting the nectaries, ants being the most numerous. Ants occupied more than 50% of the *C. fasciculata* plants, while their presence was recorded on less than 10% of the nonnectiferous background plants. The ants did not appear aggressive to most other nectary visitors, but they did remove eggs and small larvae of Lepidoptera from the plants. Among *C. fasciculata* plants in natural populations, there were greater numbers of pods set, more seeds per plant, and fewer damaged pods compared with populations from which ants were excluded. This research supports the hypothesis that extrafloral nectaries can function to increase reproduction of *C. fasciculata* by diminishing flower predation.

PHYSIOLOGY

Cultivated legumes are a source of protein in livestock feed and contribute to soil fertility through nitrogen enhancement (Stewart 1966). While less is known about native legumes, data show that most mimosoid and papilionaceous legumes have root nodules, but only about one-third of caesalpinioid species have them (Stewart 1966). One rapid and effective method used to determine the nitrogen-fixation capacity of different organisms is the acetylene-ethylene assay (Hardy et al. 1968). Becker and Crockett (1976) used this tool with several native grassland legumes from relict prairie sites in southeastern Nebraska. Among the species studied were *Amorpha canescens* (lead plant), *Psoralea argophylla* (silvery-leaved scurf-pea), *Lespedeza capitata* (round-headed bush clover), and *Cassia fasciculata,* the only annual species. *Cassia fasciculata* had significantly more root nodules and greater fresh nodular weight than any other species in the study. It had the greatest nitrogen-fixing potential. The results implied that species associated with pioneering through intermediate stages of grassland succession have greater nitrogen-fixing capacity than species restricted to mature or climax prairie, or that annuals may have younger, more active nodules.

The foliage of *Cassia fasciculata* is palatable to domestic livestock, and the plant is considered a nutritious legume. The leaves and seeds, however, contain a cathartic substance that is effective in both fresh plant material and dry hay. Although deer are not affected by it, this substance is potentially dangerous to cattle (Gates 1930; Voigt and Mohlenbrock 1985; Stubbendiek and Conrad 1989). Russell et al. (1997) report that the cathartic compound anthraquinone is found in the seeds and is responsible for diarrhea, but only if large quantities of seeds are eaten. Some studies have been done using partridge pea in a crop rotation system to control nematodes in agricultural crop fields (McSorley, Dickson, and Brito 1994; Rodriguez-Kabana et al. 1988; Rodriguez-Kabana and Canullo 1992; Rodriguez-Kabana et al. 1989; Rodriguez-Kabana et al. 1991).

Cassia fasciculata has also proved to be a useful species for researching the degree to which selection acts on life history and morphological traits. For details, the interested reader is encouraged to see the papers by Farnsworth and Bazzaz (1995); Fenster (1991a,b); Fenster and Sork (1988); Garrish and Lee (1989); Kelly (1992, 1993); Lee (1984); Lee and Bazzaz (1982a,b); Martin and Lee (1993); Sork and Schemske (1992); and Williams and Fenster (1998).

EFFECTS OF FIRE ON *CASSIA* DEMOGRAPHY IN ILLINOIS

There have been some previous reports of fire and its effect on populations of *Cassia fasciculata*. In one study (Cull 1978), prairie reconstruction plots were planted at three Illinois highway right-of-way sites in 1966, 1971, and 1973; *C. fasciculata* was one species in the seed mix. Two of the plots were managed with burning, and one was mowed; *C. fasciculata* became established on all plots. In another study, a 0.2 ha barrens in Pope County, Illinois, was selected as a study site to observe vegetational change (Anderson and Schwegman 1991). Before burning in 1968, the quadrat frequency of *C. fasciculata* was 16. Following burns in 1969 and 1970, the quadrat frequency rose successively to 43 and 64. In 1971, when there was no burn, the number dropped to 27. There were burns again in 1972 and 1973, for which no population numbers were recorded. In following years there was no burning, and by 1988 the quadrat frequency of *C. fasciculata* had fallen to 2. The observation was that *C. fasciculata* became prominent after two fires, but decreased in abundance in the absence of fire. The senior author of this paper observed similar changes on a prairie remnant. He then started a long-term controlled study of the effects of annual burning on populations of *C. fasciculata*.

METHODS

The study area was part of a former pasture with no history of tillage during the twentieth century. Before initiation of the study in 1982, the site had not been grazed for 17 years. Although it usually had been mowed annually, it had not been burned for four years. Cool-season grasses, such as *Poa pratensis* (Kentucky bluegrass), *Phleum pratense* (timothy), and *Agrostis alba* (redtop), were present throughout and were the predominant cover (Gardner 1995a). Nomenclature of plant names follows Mohlenbrock (1986). The soil type is Bryce, a poorly drained, firm, silty clay loam formed in loess and lacustrine sediments or glacial outwash and in the underlying glacial till (Fehrenbacher 1990).

Four 1 m^2 quadrats were centrally located and permanently marked within a 0.466-acre plot. This plot was serving as a control for other studies within a 7.3-acre prairie restoration (Gardner 1995a). The control area received no interventional seeding or disturbance except for burning. The quadrats were arranged as the corners of a square, with 4 meters separating each quadrat. The number of individuals of *Cassia fasciculata* was recorded in each quadrat to establish a baseline. Mowing ceased on the quadrats and adjacent areas, except for firebreaks. In March 1983, all quadrats were burned. After burning, *Schizachyrium scoparium* (little bluestem) seed was sown in each quadrat for the purpose of introducing a native grass into the largely Eurasian plant community. There was no soil disturbance accompanying the seeding.

Annually, from 1984 through 1991 (except for 1987, when all plots were inadvertently burned), two quadrats (A and B) were burned in late winter and two quadrats (C and D) remained as controls, with no burning or mowing. The control plots were invaded over time by the woody species *Fraxinus pennsylvanica* var. *subintegerrima* (green ash) and *Morus alba* (white mulberry). These were removed by cutting at soil level to prevent them from dominating and changing the grassland aspect of the quadrats. There was no other intervention with existing plant species. From 1992 through 1995, there was a reversal of the quadrats that were burned (now C and D) and those left unburned (now A and B). From 1996 through 1999, all quadrats were burned. Annual population counts of *C. fasciculata* were made in late July or early August. Other species present in each quadrat were identified.

RESULTS AND DISCUSSION

There were greater numbers of *Cassia fasciculata* on the burned quadrats than on the unburned quadrats every year following 1983 (table 1). Population numbers of *Cassia fasciculata* in all plots varied greatly from year to year. Growing conditions may have been a major factor in these variations. However, precipitation records from the Pontiac, Illinois, recording station (about 25 miles from the study site) do not show a consistent correlation between May–July rainfall and stem numbers of *C. fasciculata* (table 1). This lack of correlation could have been due to differences in precipitation at the site and at the recording station, the greater importance of timely rainfall over total rainfall for the period, or the effects of other factors not identified.

When quadrats A and B were left unburned, and quadrats C and D were burned, starting in March of 1992, there was an immediate reversal of population numbers that year. Numbers of *Cassia fasciculata* in the burned quadrats exceeded those in the unburned areas by 2.4:1. This increased annually to an 8.0:1 ratio in 1995 (table 2).

Table 1. Average population counts 1982–1999 of *Cassia fasciculata* under different burning regimes in quadrats A and B versus quadrats C and D, including total precipitation for months May–July

Year	A, B	C, D	Precipitation May–July
Average populations counts			
1982	6.0	4.0	12.7"
1983	**12.0**	**21.5**	8.6"
Burning starts for half of quadrats			
1984	**23.5**	9.5	no data
1985	**9.5**	7.0	13.3"
1986	**131.0**	54.0	17.9"
1987*	**318.0**	**173.0**	7.8"
1988	**54.0**	1.5	2.2"
1989	**135.5**	20.5	7.6"
1990	**221.0**	9.5	15.9"
1991	**211.5**	4.0	6.9"
Reversal of burned and unburned quadrats			
1992	15.0	**36.5**	11.5"
1993	18.0	**73.5**	17.0"
1994	41.5	**215.0**	7.4"
1995	11.0	**88.0**	16.2"
All quadrats burned			
1996	**44.0**	**37.0**	17.3"
1997	**49.5**	**34.5**	5.3"
1998	**46.5**	**26.5**	17.3"
1999	**28.5**	**15.0**	12.7"

* all plots burned inadvertently

Notes: Population counts are in **bold** for quadrats burned that year. Precipitation was recorded at station 116190 in Pontiac, Illinois.

In all years when control quadrats were maintained, *Cassia fasciculata* numbers in burned quadrats exceeded those in unburned quadrats by a mean of 5.2:1 (table 2). Toward the end of the study, when all quadrats were burned in 1996 and 1997, the observed numbers of *C. fasciculata* became similar in all quadrats (table 1).

The average number of stems of *Cassia fasciculata* was 5/m^2 in 1982, before burning. It was 211.5/m^2 in burned quadrats in 1991, the last year before the burning treatment was reversed. Although *C. fasciculata* became a prominent forb in those quadrats, other native taxa also became established. *Andropogon gerardii* (big bluestem), *Sorghastrum nutans* (Indian grass), and *Liatris aspera* (rough blazing star) appeared. These were apparently introduced by windblown seed from a prairie restoration initiated in 1974 and located about 25 meters to the west (Gardner 1995a).

By 1986, *Schizachyrium scoparium* was well established in all quadrats, but by 1991, its observed numbers diminished in the unburned quadrats. This may have been due to the increasing accumulation of thatch covering the soil surface. By 1991, the predominant cool-season grasses observed at the beginning of the study had greatly reduced populations in the unburned plots. *Poa pratensis* and *Phleum pratense* were not observed in the unburned plots, and only scattered *Agrostis alba* culms were noted. This appeared to be due to thatch accumulation. In the burned quadrats, the alien grass populations were reduced, but to a lesser extent. They remained as thinly scattered stands in those quadrats. Heavy thatch accumulation

Table 2. Ratios of *Cassia fasiculatus* populations in burned to unburned quadrats in years when contolled burns were maintained

Year	Ratio
1982	none burned
1983	all burned
1984	2.5:1
1985	1.4:1
1986	2.4:1
1987	all burned
1988	36.0:1
1989	6.6:1
1990	23.3:1
1991	52.9:1
1992 *	2.1:1
1993	4.1:1
1994	5.2:1
1995	8.0:1
1996	all burned
1997	all burned
1998	all burned
1999	all burned

* start reversal of burned sites

appeared to inhibit the growth of certain alien cool-season grasses to a greater extent than burning.

During the last two years of the study (1998–1999), the average population numbers of *Cassia fasciculata* decreased for all quadrats, even though they were all burned. It appears that another factor emerged. During the years of the study, greater populations of warm-season prairie grasses became established. A vegetation analysis conducted in 1993 (Gardner 1995b) revealed that the 0.466-acre plot, which included the quadrats, was dominated by alien species such as *Poa pratensis*, *Daucus carota*, and *Phleum pratense*. The vegetation analysis was repeated in 1998 (Gardner, unpublished data), and by then the dominant species was *Andropogon gerardii*.

A comparison of the relative density (RD), relative frequency (RF), and importance value (IV) of grasses from these vegetation analyses is presented in table 3. Importance value is expressed as RD+RF. In 1993, the combined IV of the cool-season non-native grasses was 54.2. In 1998, that IV had fallen to 15.9. Over the same period the combined IV for the major warm-season native grasses rose from 8.1 to 79.8. These results are consistent with those obtained by Anderson and Schwegman (1991).

Table 3. Relative changes in populations of cool-season and warm-season grasses

	1993			1998		
	RD	RF	IV_{200}	RD	RF	IV_{200}
Cool-season alien grasses						
Agropyron repens	2.1	1.7	3.8	0.5	0.4	0.9
Phleum pratense	8.6	8.4	17.0	1.6	2.4	4.0
Poa pratensis	16.6	16.8	33.4	5.0	6.0	11.0
TOTAL			54.2			15.9
Warm-season native grasses						
Andropogon gerardii	2.1	2.2	4.3	35.8	28.2	64.0
Sorghastum nutans	2.1	1.7	3.8	8.9	6.9	15.8
TOTAL			8.1			79.8

RD = relative density, RF = relative frequency,
IV = importance value

CONCLUSIONS

Long-term monitoring of the effects of fire provides a strong indication that *Cassia fasciculata* populations respond favorably to annual late winter burning, until warm-season native grasses become established. There were increases in populations of *C. fasciculata* in burned areas. Reversal of burned and unburned quadrats provided further verification of these observations. The data also suggest that populations of *C. fasciculata* are suppressed at the stage of prairie succession when tall native grasses are dominant.

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STRUCTURAL COMPOSITION AND SPECIES RICHNESS INDICES FOR UPLAND FORESTS OF THE CHICAGO REGION

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Abstract: Few baseline data have been published on the composition and structure of high quality upland forests in the Chicago region of northeastern Illinois. This information is needed for forest classification, monitoring, and management. In 1976, the Illinois Natural Areas Inventory (INAI) identified and sampled 26 high quality dry-mesic and mesic forest stands in the Chicago region. In this paper, we describe and classify these forests using the original INAI data and supplementary canopy cover and ground layer plot data collected in 1996. We compare differences in woody and herbaceous vegetation composition and canopy cover among forest types, and compare stands with and without fire management histories. An unbiased Native Richness Index, which incorporates plot species richness and total sample richness, was developed to measure differences among stands and forest types.

The INAI data classified into 3 distinct forest-stand types dominated by either maple, red oak, or white oak. There was an inverse relationship between sapling and shrub abundance across these stand types. Maple-dominated stands had comparatively high percent canopy cover and low shrub layer stem densities dominated by maple saplings. White oak stands had high shrub layer stem densities dominated by shrub species, whereas red oak stands had intermediate composition. Ground layer species composition was highly heterogeneous within and among stands, but several differences occurred among stand types. In pairwise comparisons, greater percent similarity occurred within maple stands than among comparisons with other stand types, while red and white oak–dominated stands were similar. Spring ephemerals tended to be more important in maple stands, while other ground layer species functional groups tended to be more important in oak-stand types. The Native Richness Index was significantly lower for maple than for oak stands, and was higher in fire-managed than in unmanaged stands. Fire management also significantly reduced the numbers of live maple stems. However, the invasive alien garlic mustard had higher frequencies in fire-managed stands.

INTRODUCTION

Few quantitative data have been published on the structural composition of upland forests of the Chicago region of northeastern Illinois, yet such data are needed to compare with other Midwestern forest types and to provide a context for regional forest classification. The Illinois Natural Areas Inventory (INAI) defined forests as having > 80% canopy cover, classified them based on soil-moisture classes, and used primarily woody vegetation sampling data to describe dominant and characteristic species of each community (White and Madany 1978). For example, the INAI identified and then sampled 28 high quality upland forest stands in 1976, classifying them as dry-mesic and mesic. Until now, sampling data from these sites have not been published or analyzed. In this paper we describe and classify 26 of the upland forest stands (2 have been destroyed) using the original INAI data and supplementary canopy cover and ground layer plot data collected in 1996. Nomenclature follows Swink and Wilhelm (1994), except where noted.

Data on these forests are also needed to provide a baseline that will facilitate monitoring and restoration in the face of fragmentation and other human impacts. Conservationists are concerned that oak-forest species are declining due to change in forest structure as shade-intolerant fire-resistant oaks (*Quercus* spp.) are replaced by shade-tolerant fire-intolerant species such as sugar maple (*Acer saccharum*). This well-known process is attributed to fire protection in Midwestern forests (e.g., Curtis 1959; McIntosh 1957; Lorimer 1985; Anderson 1991; Burger, Ebinger, and Wilhelm 1991; Abrams 1992; Leach and Ross 1995). Change in forest understory composition and structure is also related to other factors, such as overgrazing by white-tailed deer (Anderson 1994; Strole and Anderson 1992), and invasion by the alien buckthorns *Rhamnus cathartica* and *R. frangula* (Apfelbaum and Haney 1991), and garlic mustard, *Alliaria petiolata* (Anderson, Dhillion, and Kelley 1996).

Our objectives were to (1) provide baseline descriptions of the original woody composition and structure of 26 high quality dry-mesic and mesic forest

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stands identified and sampled by the INAI in northeastern Illinois in 1976, (2) reclassify the stands using multivariate analysis of the stand data, (3) quantify ground layer vegetation, fire effects, and forest canopy cover of these stands based on data collected from them in 1996, and (4) develop an unbiased species richness index that will quantify ground layer differences among stand types and management effects on this vegetation.

STUDY AREAS

The study areas include 14 dry-mesic and 12 mesic forest stands located in 22 forests (table 1). All sites are on fine-textured glacial tills in the Morainal Natural Division or the Grand Prairie Natural Division (fig. 1). The INAI described dry-mesic sites as well drained and dominated by *Quercus alba* (white oak), *Q. rubra* (red oak), and *Q. velutina* (black oak), while mesic sites were moderately well drained and dominated by sugar maple and red oak (White and Madany 1978). Mesic sites are in landscape positions, such as ravines or east of rivers, that would have provided for greater fire protection and survivorship of maples than would have dry-mesic sites (Leitner et al. 1991; Bowles, Hutchison, and McBride 1994).

To evaluate stand quality, the INAI relied initially on canopy structure, using ground layer composition as an important secondary criterion. Ten sites were described as grade A (old growth) and 16 as grade B (old second growth or selectively logged). Eight of the sites have been managed with prescription burns as part of restoration programs (table 1). Eastern white-tailed deer are present throughout most of the study areas and have damaged the woody and herbaceous ground layer of some sites by overbrowsing (e.g., Witham and Jones 1990; Anderson 1994).

Table 1. Community classification, quality, and size of Chicago-region forest stands sampled by the INAI

Site no.	Site name	County	Dry-mesic	Mesic	Size in hectares
1.	Meacham Grove F. P.	DuPage Co.	B*		17
2.	Busse Woods F. P.	Cook Co.	B	A	262
3.	Crabtree Farm Woods	Lake Co.	A		15
4.	Elburn F. P.	Kane Co.	B*		23
5.	Glen A. Lloyd Woods N. P.	Lake Co.		B	54
6.	Helm's Woods F. P.	Kane Co.	B		28
7.	Herrman's Woods	Lake Co.	A		15
8.	Johnson's Mound F. P.	Kane Co.	B	B	43
9.	Maple Grove F. P.	DuPage Co.		B*	21
10.	MacArthur Woods F. P.	Lake Co.		B	157
11.	McCormick Ravine Preserve	Lake Co.	A*	A	45
12.	Messenger Woods F. P.	Will Co.	B	A	68
13.	Mooseheart Ravine	Kane Co.	B*		17
14.	Morton Arboretum	DuPage Co.		B	50
15.	Norris (Jones) Woods	Kane Co.	B*		33
16.	Paw Paw Woods F. P.	Cook Co.	B		55
17.	Pilcher Park	Will Co.		A	120
18.	Raccoon Grove F. P.	Will Co.	B*		38
19.	River Road Woods F. P.	Lake Co.		A	8
20.	Ryerson Conservation Area	Lake Co.		B*	133
21.	St. Francis Boy's Camp F. P.	Lake Co.	A		27
22.	Thorn Creek Woods N. P.	Will Co.	B		33

Notes: Site numbers refer to fig. 1. Stands with an asterisk (*) have been fire managed. Letter codes: A = old growth, B = old second growth or selectively logged.

METHODS

Data collection

In 1976, the INAI sampled a total of 20 points along transects in each stand. Tree species basal area (BA) was determined from each point using a 3 Basal Area Factor metric wedge prism. Trees > 10 cm dbh (diameter at 1.4 m) were also tallied by size class in 0.025 ha circular plots (radius = 8.92 m) at each sample point, while stem densities of shrub layer species (stems ≤ 10 cm dbh and > 1 m high) were recorded in 0.001 ha circular plots (radius = 1.78 m) at 10 of the sample points. To sample ground layer vegetation in 1996, we relocated the original sampling areas by using community transect maps prepared by the

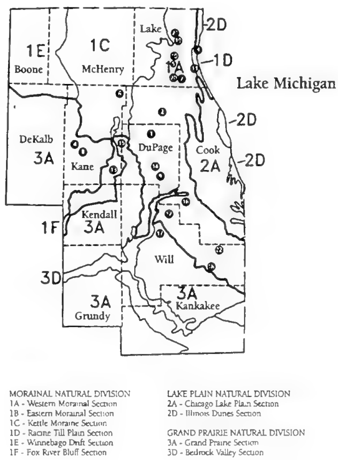


Fig. 1. Study site locations in relation to the Natural Divisions of the Chicago Region (Swink and Wilhelm 1994)
Map numbers refer to table 1.

INAI, and marked our new transects with permanent stakes. We were confident that we sampled within the original communities, although precise location of original transect lines was not possible. Along the 1976 transects, we sampled ground layer species presence per 1 m^2 in 20 plots. Part of the mesic forest stand at the Ryerson Conservation Area was prescribe-burned in spring 1996, prior to ground layer sampling. At this site, we sampled live and dead ground layer (stems < 1 m high) sugar maple densities in n = 40 circular 0.01 ha (radius = 5.64 m) plots along 2 transects that crossed the burned and unburned habitat, yielding 15 burned and 25 unburned plots. In all stands, the tree canopy cover over each sampling plot was photographed on color transparency film with a 35 mm camera equipped with a 180° fish-eye lens. For each photograph, the camera was positioned above the shrub layer with its lens axis oriented vertically.

Woody vegetation – 1976 data analysis

To quantify canopy tree composition, we calculated BA and dominance (relative basal area) from the 1976 wedge-prism sampling data for each tree species, where BA = no. of trees tallied/no. points × 3. Because the probability of prism sampling a tree is proportional to its diameter, small trees are sampled only if close to the observer, and prism sampling data are biased toward larger size-class trees. We also estimated BA from the 0.025 ha size-class data by using size-class midpoints as an estimate of the dbh of each tree in each class. Thus, BA = total no. of stems/size-class × πr^2, summed across all size classes, and r = each size-class midpoint/2. To classify the forest stands, we analyzed their 1976 species BA in a Flexible Beta cluster analysis using PCORD (McCune and Mefford 1999). This analysis clustered 3 stand groups dominated by either sugar maple (n = 10 stands), red oak (n = 8 stands), or white oak (n = 8 stands). With PCORD, we ordinated the 26 upland stands using species BA as a metric with Non-Metric Multidimensional Scaling (NMS) and a Euclidian Distance measure on PCORD software. To assess size-class structure of these stand types, we compiled the INAI 0.025 ha plot data into stems/ha at 10 cm size-class intervals, and plotted the data for 4 groups: all species combined, maples, oaks, and all other species.

To compare shrub layer species among stand cluster groups, we partitioned them into (1) tree saplings, which also represent potential canopy trees, (2) understory tree species, which do not enter the tree canopy, and (3) true shrubs. For each species, we calculated stem density per ha from the shrub plots sampled in 1976 from each stand, where density = no. of stems sampled × total plot area sampled × 100. These species stem densities were then averaged across each cluster group, producing mean (± std. err.) species stem densities/ha for each stand type. We used PCORD to calculate the Simpson's diversity index (D) for shrub layer data from each stand. PCORD calculates this index as $D = 1-\sum p_i^2$, where p_i is the relative stem density of each species. D is the probability that 2 randomly chosen individuals will be different species and is maximal when all species are present in equal abundance (McCune and Mefford 1999). We used a one-way ANOVA to test whether the mean value of this index differed among stand types.

Each tree canopy transparency photo was projected through a video camera to a Delta-T Area Meter, which measured canopy cover as a percentage of transmittable light. A dark magenta filter was used to increase contrast and reduce color bandwidth, and the meter was calibrated for 66% area cover. We tested for differences in mean percent canopy cover among the sugar maple, red oak, and white oak stands in a single factor ANOVA, using arcsine-transformed percentage values.

Ground layer vegetation – 1996 data analysis

Native ground layer species were organized into 5 native functional groups (e.g., Mahall and Bormann 1978; Rogers 1982): (1) spring ephemerals, (2) persistent spring-flowering herbs, (3) summer-flowering herbs, (4) graminoid species, and (5) woody plants. Alien species were treated as a sixth functional group. We used these groups to examine species abundance within and among stands. Relative frequency of each species was calculated from its average stand frequencies and summed within functional groups. Thus, the relative frequencies of all 6 groups sum to 100 within each stand type. To compare species functional group abundance at the stand-type level, we calculated the total number of species stand occurrences within functional groups for each stand type, and expressed this as a percentage of the potential total stand occurrences (i.e., the total number of species per functional group × total number of stands).

To assess whether ground layer species composition differed among stand types, we tested for significant differences among the 3 stand types with Multi-Response Permutation Procedures (MRPP) using a Bray-Curtis distance measure (Bray and Curtis 1957) of species frequencies on PCORD software. MRPP is a nonparametric test appropriate for plant distributional data that do not meet assumptions of normality (McCune and Mefford 1999). To further determine which stands might differ, we calculated Bray-Curtis dissimilarity indices for all pairwise stand combinations on PCORD. This index is calculated as $1-2W/(A+B)$, where W = the sum of shared species abundances (frequencies), and A and B are the sums of abundances in the individual sample units. We converted these to similarity indices by subtracting each value from 1, and then calculated mean % similarities for each within and among stand-type comparisons. ANOVA was used with a Fisher Protected Least Significant Difference (PLSD) *post hoc* test to determine whether comparisons within stand type (i.e., maple–maple, red oak–red oak, and white oak–white oak) were on average higher than comparisons among stand types.

Species Richness Index

A Species Richness Index (SRI) was developed to provide an unbiased testable measure of ground layer vegetation (Bowles and Jones 1999). This index combines small- and large-scale measures of species richness, using mean plot richness of ground layer species ($\bar{x}R$), which is the small-scale measure, and the natural log (Ln) of total species sampled (S), which is the large-scale measure. Its basic formula is $SRI = \bar{x}R \times LnS$. Using LnS normalizes skewed S distributions and dampens the area effect on S when different sample sizes are compared. The Native Richness Index (NRI) uses the mean plot richness of native ground layer species ($\bar{x}R_N$) and the total number of native species sampled (S_N), where $NRI = \bar{x}R_N \times LnS_N$. The difference between SRI and NRI reflects the Alien Component (AC) of species richness, and NRI/SRI (which ranges from 0 to 1) reflects the relative abundance of native richness. To evaluate the index, we used ANOVA to test hypotheses of no significant differences among maple–, red oak–, and white oak–dominated stands for this index of species richness. To better understand the effectiveness and meaning of the index, we compared it against stand plot values for the mean Coefficient of Conservatism ($\bar{x}C$) and Floristic Quality Index (FQI), using native species C values and calculations following Wilhelm and Masters (1994).

Fire management

We used a 2 × 3 factorial ANOVA to compare species richness indices and abundance of *Alliaria petiolata* in fire-managed vs. unmanaged stands across the 3 stand types. The results of these tests must be interpreted with caution, as specific information is not always available on the nature, timing, or exact location of these burns, nor on the condition of stands prior to burns. To determine effects of burning on ground layer maple stems at the Ryerson Conservation Area, we compared the mean % survivorship of these stems in burned and unburned plots in replicated transects, using the nonparametric Mann-Whitney test.

RESULTS

Forest canopy vegetation in 1976

Wedge-prism sampling recorded 23 canopy tree species and 2 subcanopy trees among the 26 stands (table 2). Basal area based on prism sampling averaged about 25 m^2/ha for all stand types, but was > 30 m^2/ha based on calculations from size-class midpoints (table 2). INAI quality grades also corresponded to size-class distribution of BA. For example, grade A white oak stands had > 20% of their basal area in size classes above 60 cm dbh and > 5% above 80 cm, while grade B white oak stands stands had < 20% basal area above 60 cm, and none above 80 cm.

Cluster analysis produced 3 groups in which sugar maple, red oak, or white oak attained > 40% mean dominance (fig. 2). All but 2 of the stands classified by the INAI as mesic clustered as maple stands, while all but one of the original dry-mesic stands clustered as red oak or white oak stands. There was also a strong ordination gradient among dominant and subdominant tree species across the stand types (fig. 2). Sugar maple had < 10% dominance in oak-dominated stands, while red oak had < 20% dominance in white oak and maple stands, and white oak had < 30% dominance in red oak stands and < 10% dominance in maple stands. Among subdominant species, *Fraxinus americana* was least important in white oak stands, while *Tilia americana* was most important in maple stands, and red elm had little variation among stands. Although infrequent, *Quercus velutina, Q. macrocarpa*, and *Carya ovata* were also most abundant in white oak stands. In one white oak cluster stand, on the west slope of Johnson's Mound, both *Ulmus rubra* and *Juglans nigra* dominance exceeded that of white oak.

In all stand types, size-class distributions for all species combined followed negative exponential curves, with about 100 stems/ha in the smallest size class and < 40 stems/ha for trees > 50 cm dbh (fig. 3). However, species and species groups differed between the maple- and oak-stand types. In maple stands, lower and mid size classes were dominated by maple, which shared dominance with oaks and other species (primarily *Fraxinus americana* and *Juglans nigra*) in upper size classes. In oak stands, maples were less than half as abundant as in maple stands and were represented primarily in the 2 smallest size classes. Oaks had unimodal size-class distributions in all stands and were least abundant in maple stands. These distributions were due primarily to red oak in red oak stands and white oak in white oak stands. *Fraxinus americana, Tilia americana, Ulmus rubra, Prunus serotina,* and (to a lesser extent) *Ostrya virginiana*, were primarily responsible for the negative exponential distributions of all species in oak stands.

Table 2. Mean (±se) dominance (Dom), and basal area (BA) of tree species prism sampled by the INAI in Chicago-region maple, red oak, and white oak stands in 1976

	Maple stands			Red oak stands			White oak stands		
Species	Dom	±se	BA	Dom	±se	BA	Dom	±se	BA
Quercus alba	0.074	0.022	1.89	0.249	0.037	6.07	0.472	0.073	11.96
Quercus rubra	0.157	0.042	3.99	0.413	0.062	10.06	0.168	0.053	4.25
Acer saccharum	0.451	0.048	11.44	0.053	0.029	1.29	0.038	0.025	0.97
Fraxinus americana	0.080	0.021	2.03	0.081	0.014	1.96	0.035	0.021	0.89
Tilia americana	0.101	0.022	2.57	0.032	0.010	0.77	0.009	0.007	0.22
Ulmus rubra	0.038	0.013	0.97	0.047	0.014	1.14	0.038	0.023	0.96
Quercus velutina	0.001	0.001	0.02	0.020	0.012	0.48	0.052	0.034	1.32
Prunus serotina	0.003	0.001	0.07	0.019	0.008	0.46	0.042	0.021	1.07
Ostrya virginiana	0.029	0.017	0.73	0.014	0.004	0.35	0.019	0.016	0.49
Quercus macrocarpa	0.013	0.007	0.33	0.014	0.011	0.33	0.027	0.021	0.69
Quercus bicolor	0.010	0.008	0.25	0.022	0.018	0.53	0.018	0.011	0.47
Juglans nigra	0.019	0.011	0.49	0.008	0.003	0.19	0.019	0.011	0.48
Carya ovata	0.002	0.001	0.05	0.009	0.007	0.22	0.020	0.008	0.52
Ulmus americana	0.005	0.005	0.12	0.007	0.007	0.18	0.013	0.010	0.33
Quercus coccinea	0.001	0.001	0.03	0.001	0.001	0.02	0.015	0.011	0.38
Carya cordiformis	0.001	0.001	0.03	0.004	0.002	0.10	0.007	0.007	0.18
Populus deltoides	0.005	0.004	0.14	0.003	0.002	0.06			
Fraxinus quadrangulata	0.002	0.002	0.06				0.004	0.004	0.11
Juglans cinerea	0.001	0.001	0.03	0.004	0.002	0.11			
Betula papyrifera	0.003	0.003	0.08						
Populus grandidentata	0.002	0.002	0.05				0.001	0.001	0.03
Fraxinus pennsylvanica	0.001	0.001	0.03				0.001	0.001	0.02
Carpinus caroliniana v. *virginiana*	0.001	0.001	0.03	0.001	0.001	0.02			
Acer rubrum							0.001	0.001	0.02
Prunus virginiana	0.001	0.001	0.02						
Crataegus pruinosa				0.001	0.001	0.02			
Total prism BA			25.40			24.40			25.40
Total size-class BA			35.40			33.94			30.27

Notes: *Quercus bicolor* includes hybrids with *Q. macrocarpa*. Total size-class BA is based on size-class midpoints (see text for methods).

The range in percent canopy cover measured by canopy photographs was narrow, extending from 70% in white and red oak stands to > 71% in maple stands (fig. 4). However, percent cover was significantly higher in maple than in oak stands, which corresponded to lower shrub layer and ground layer species richness (see below).

Shrub layer vegetation in 1976

Shrub layer composition and structure differed among stand types (fig. 5). Maple stands had a significantly lower Simpson's Diversity Index (F = 8.54, P = .0017) and averaged 5.4 (±0.93 std. err.) species/stand in comparison to 10.25 (±1.10 std. err.) species in red oak stands and 10.375 (±1.35 std. err.) species in white oak stands. Overall, maple stands averaged almost 6,000 stems/ha, red oak stands 7,400 stems/ha, and white oak stands > 11,000 stems/ha, and there was an inverse relationship between sapling and shrub density across stand types (fig. 5). Saplings constituted 80% of all stems in maple stands, 50% of all stems in red oak stands, and only 15% of all white oak–stand stems, while native shrubs accounted for 18% of all stems in maple stands, 43% of all red oak–stand stems, and 75% of white oak–stand stems. Understory trees were rare in maple stands, but densities exceeded 2,500 stems/ha in red oak stands and 1,000 stems/ha in white oak stands.

Maple was by far the dominant sapling in maple stands, but was less abundant than *Prunus serotina* and *Fraxinus americana* in oak stands. The oaks *Quercus alba, Q. coccinea,* and *Q. macrocarpa* had lowest sapling densities. *Crataegus pruinosa* and *Ostrya virginiana* were the predominant understory trees, especially in oak stands, while *Carpinus caroliniana* var. *virginiana, Malus ioensis,* and 4 other *Crataegus* species were less abundant. The alien buckthorns *Rhamnus cathartica* and *R. frangula* occurred at relatively low stem densities, constituting < 1% of the shrub layer. *Viburnum prunifolium, Viburnum rafinesquianum, Cornus racemosa,* and *Prunus virginiana* were the most abundant shrubs in oak stands, while *Hamamelis virginiana* and *Viburnum acerifolium* were more characteristic of maple stands. *Cornus alternifolia* and *C. rugosa* were sampled only in maple stands.

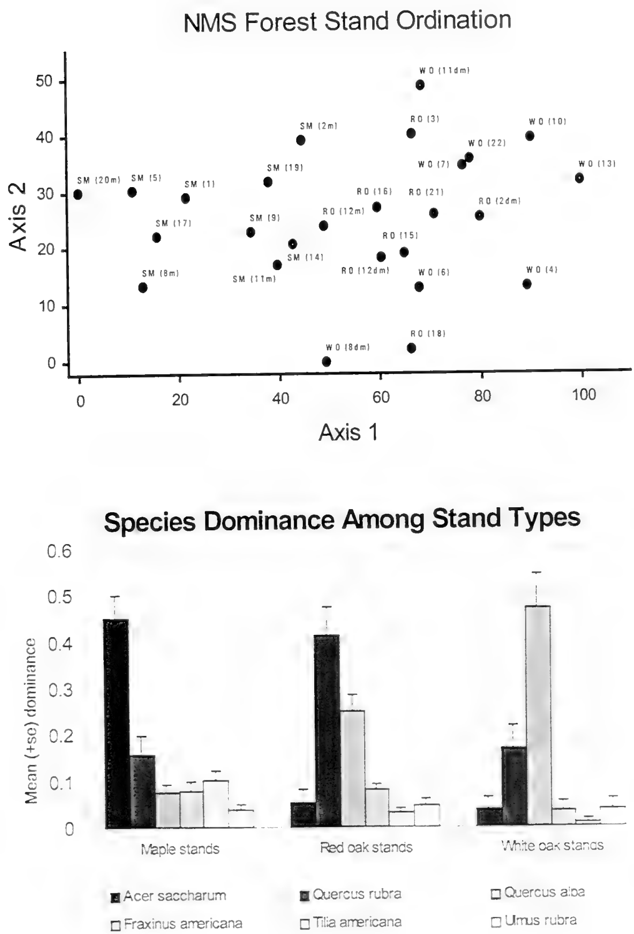


Fig. 2. Non-metric Multidimensional Scaling (NMS) forest stand ordination (upper graph) and species dominance among forest stand cluster groups (lower graph)
Ordination codes: SM = sugar maple stands, RO = red oak stands, WO = white oak stands. Numbers in parentheses are site numbers from table 1; for sites with multiple INAI stands, dm = dry-mesic, m = mesic.

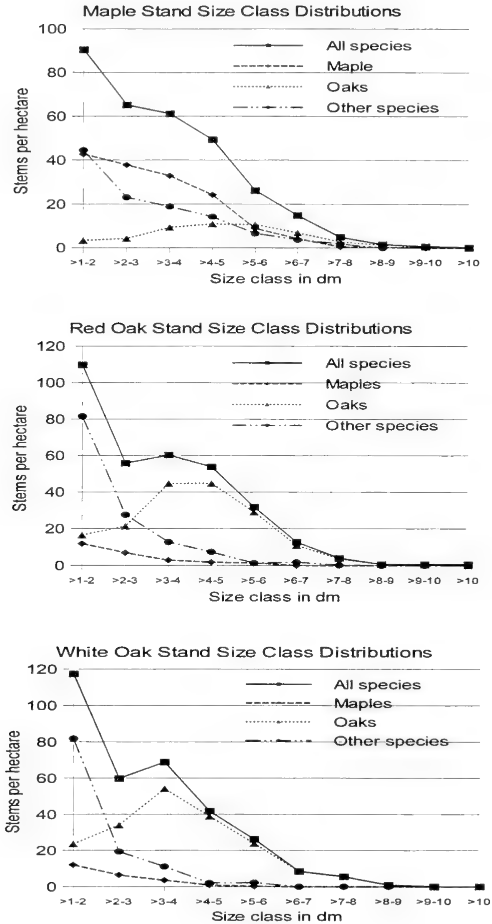


Fig. 3. Size-class distribution curves in stems/ha for all species (—■—), maples (- -♦- -), oaks (···▲···), and other species (···—•···—) sampled by the INAI in Chicago-region maple, red oak, and white oak stands in 1976

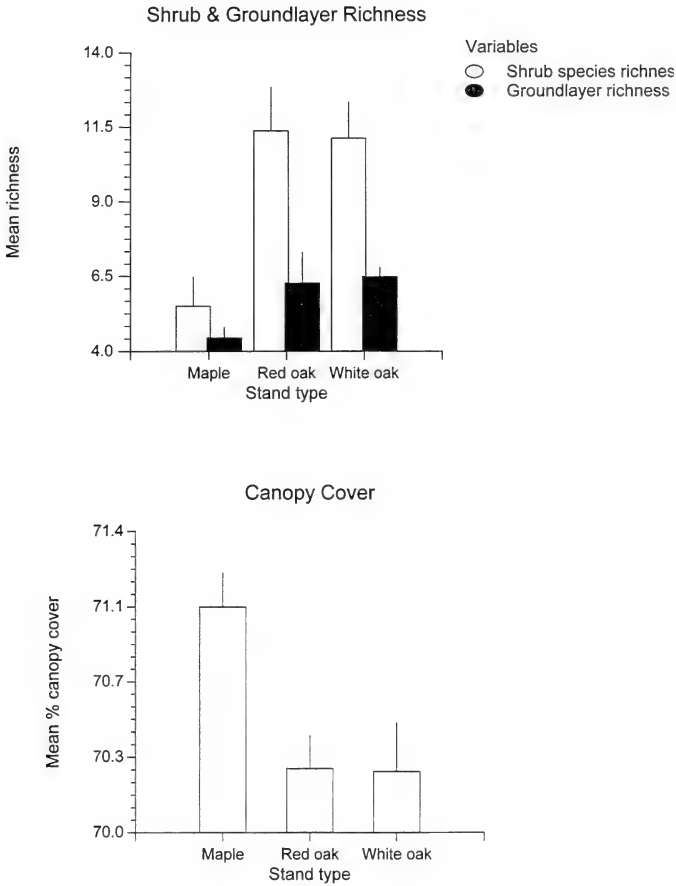


Fig. 4. Relationship between stand type, native shrub species richness, and native ground layer plot species richness (upper graph), and percent canopy cover (lower graph)
ANOVA: shrub species richness (F = 6.21, P = .007), ground layer richness (F = 3.45, P = .049), and percent canopy cover (F = 6.37, P = .002).

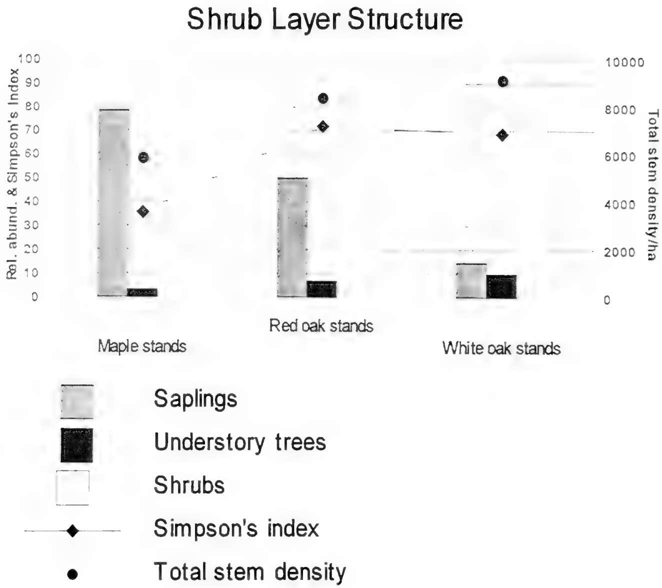


Fig. 5. Inverse relationship in shrub layer structure among Chicago-region upland forest stand types
Relative abundance is percent of total stem density of sapling, understory tree, and shrub species (left axis). Simpson's Index (left axis) is the average for all stands in each stand type. See text for calculations and all species stem densities.

Ground layer vegetation in 1996

Ground layer sampling encountered 181 species, including 105 native herbs, 44 native woody species, 19 native grasses, and 14 alien species. Herbs included 15 spring ephemerals, 29 spring-flowering herbs, and 61 summer-flowering herbs. Most species were rare, with more than 90% averaging less than 10% plot frequency across all stands, and > 90% of all species restricted to < 30% of all stands. The 29 most abundant species averaged > 5% frequency across all stands, and the 4 most abundant species (*Smilacina racemosa, Circaea lutetiana* var. *canadensis, Dentaria laciniata,* and *Erythronium albidum*) were native herbs (fig. 6). Sugar maple seedlings were fifth most abundant, and this was the only species with > 50% average stand frequency (in maple stands). The alien *Alliaria petiolata* was the seventh most abundant species, with > 40% frequency in white oak stands. Maple stands had 86 native species sampled, with greater abundance, for example, of *Erythronium albidum, Acer saccharum, Allium tricoccum* var. *burdickii* and *Isopyrum biternatum* than in oak stands. *Mertensia virginica, Hydrophyllum appendiculatum,* and *Dicentra canadensis* were sampled only in maple stands. Red oak stands had 111 native species sampled, and white oak stands had 120 native species. Oak stands also differed from maple stands by greater frequencies of most common species. Although some species sampled were unique to red and white oak stands, their frequencies were so low as to be unreliable as oak-stand indicators.

Among functional groups, spring ephemerals tended to be more frequent in maple stands, and spring herbs more frequent in red oak stands; however, these trends were not significant (fig. 7). Summer herbs, woody plants, and graminoid species had significantly fewer occurrences in maple stands than in red or white oak stands, and white oak stands had more stand occurrences of alien species. Patterns of species relative abundance also differed by functional group among stand types (fig. 7). Within maple stands, spring ephemerals and woody plants (maple seedlings) were most abundant. Summer herbs were slightly more abundant in red oak stands, and summer herbs and woody species more abundant in white oak stands. Graminoid and alien species were the least important groups in all stand types. The MRPP test indicated a highly significant difference in ground layer vegetation composition among stand types, and pair-wise comparison of mean Bray-Curtis similarity indices indicated that this was due to significantly different composition of maple stands in comparison with oak stands (fig. 8). Red and white oak stands were not significantly different from each other.

Measures of ground layer vegetation species richness differed significantly among stand types (table 3). Mean native richness (S_N), native plot species richness ($\bar{x}R_N$), and Native Richness Index (NRI) values were lower in maple stands, intermediate in red oak stands, and higher in white oak stands. White oak stands had higher alien richness. Although the NRI and FQI were highly correlated (r^2 = 0.645, P < 0.000), $\bar{x}R_N$ and $\bar{x}C$ were not (r^2 = 0.003, P = 0.784), and $\bar{x}C$ and FQI values did not differ significantly among stand types.

Comparisons among fire-managed and unmanaged stands

Fire-managed and unmanaged stands differed significantly in their abundance of native and alien species. For example, across all stand types, $\bar{x}R_N$ and NRI values, but not $\bar{x}C$ or FQI values, were higher for stands with fire management histories (fig. 9). The alien *Alliaria petiolata* was more abundant in stands with management fire histories (fig. 10). Dormant-season fire significantly reduced survivorship of maple seedlings at the Ryerson Conservation Area (fig. 11). Mean survivorship was 100% in unburned sections of 2 transects, but was reduced to 26.15% and 16.67% in burned sections of these transects. Despite the significantly lower maple survivorship in burned plots, their stem numbers still reached 4000 stems/ha (fig. 11).

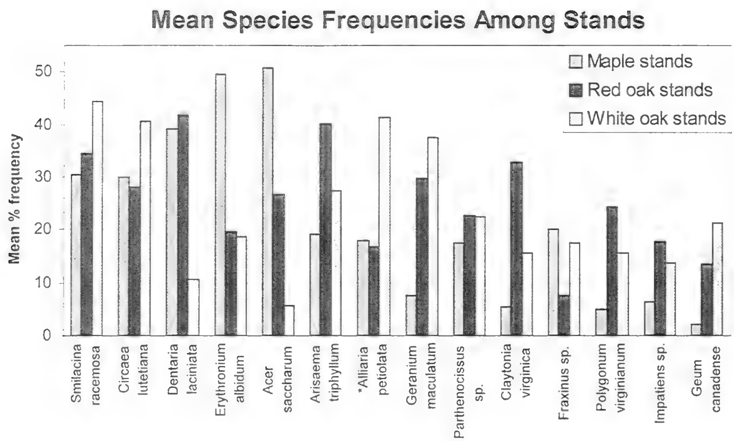
DISCUSSION

Woody vegetation composition and classification

In the Chicago region of Illinois, dry-mesic and mesic forests differ along a species gradient, in which either sugar maple, red oak, or white oak is the dominant overstory species. This species gradient is similar to the upland forest continuum identified in Wisconsin (Curtis and McIntosh 1951). It is also part of a much broader landscape forest continuum that includes wet to wet-mesic lowland *Acer saccharinum*–dominated forest, mesic *A. saccharum* forest, dry-mesic *Quercus velutina*–*Q. alba* forest, and dry upland (on sand) *Q. marilandica* Münchh. forest (White and Madany 1978; Adams and Anderson 1980; Anderson 1991). Further, this gradient corresponds to a presettlement landscape fire gradient characteristic of the prairie peninsula region. Greater fire frequency and oak dominance occur in forests on drier sites that received little landscape fire protection, while less fire frequency and greater tree density and maple abundance occur in forests afforded protection by landscape firebreaks such as rivers or ravines (Anderson 1991; Leitner et al. 1991; Bowles, Hutchison, and McBride 1994; Bowles, McBride, and Bell 1999). Fire in these prairie peninsula forests apparently promoted oak dominance, or codominance with maple, even in mesic sites. More eastern "climax" mesophytic maple forests differ because of codominance of beech *(Fagus grandifolia),* while mesophytic maple forests west of the "beech border" in Minnesota tend to have codominance of *Tilia americana* (e.g., Rogers 1981). The low *T. americana* importance in Chicago-region mesic sites indicates different composition from "climax" mesophytic central hardwood mesic forests, possibly because of the early stage of succession from oak dominance.

The continuum nature of a species-environmental gradient complicates moisture gradient classification. The INAI resolved this in part by describing a bimodal distribution of red oak, placing it as codominant in both dry-mesic and mesic forest stands (White and Madany 1978). Dominant species, such as oaks and maple, however, tend to occupy narrow portions of the environmental gradient (Adams and Anderson 1980), and our analysis indicates that red oak–dominated stands should be given a "dry-mesic *Q. rubra*" classification intermediate between what might be better described as "mesic *A. saccharum*" stands and "mesic-dry *Q. alba*" stands. As expected with a species continuum, red oak stands share some species characteristics with maple stands and others with white oak stands. For example, red and white oak stands have lower *Tilia americana* dominance than maple stands, but red oak and maple stands have greater *Fraxinus americana* dominance than white oak stands (fig. 2).

Shrub layer structure and composition also differ among stand types, with an inverse relationship between sapling and shrub densities across stand types, and lower diversity in maple stands (table 3). Many ecological factors, such as canopy cover, moisture, fire history, and grazing or browsing may affect these gradients (e.g., Loucks and



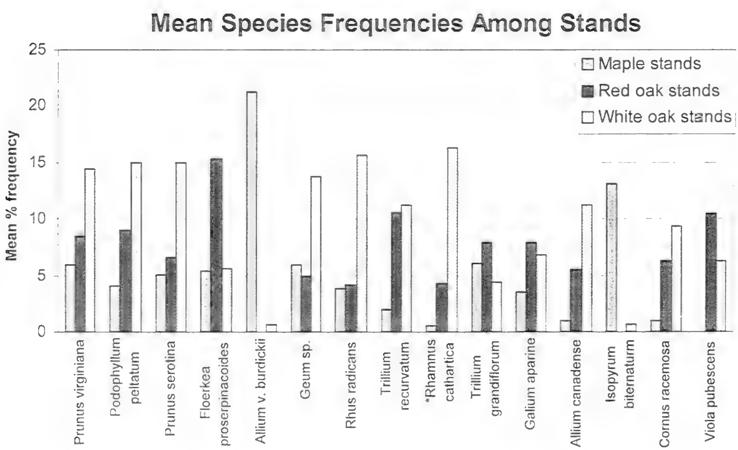
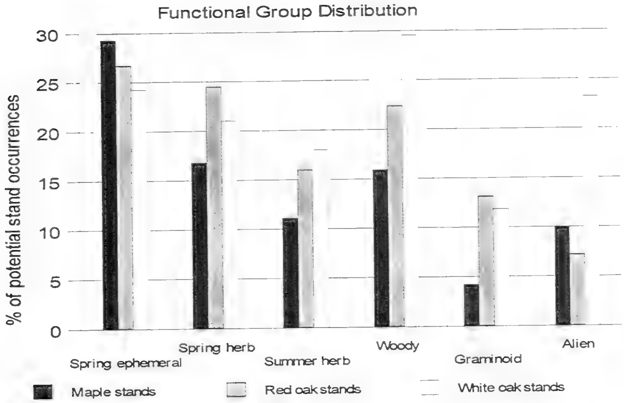


Fig. 6. Mean % frequencies of dominant ground layer species sampled in maple, red oak, and white oak stands in 1996 See Appendix II for means and standard errors of all species sampled. Asterisk (*) indicates alien species.



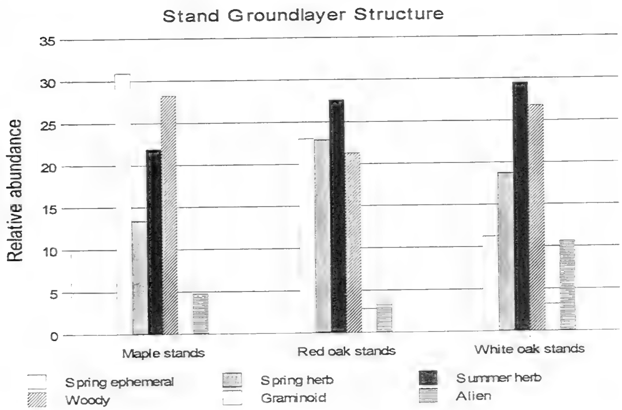


Fig. 7. Stand-type distribution of species functional groups as a percentage of potential occurrences (upper), and relative abundance of functional groups by percent species occurrence within stand types (lower)
Distributions are significantly different ($p < 0.05$) for summer herb, graminoid, woody, and alien groups (upper graph).

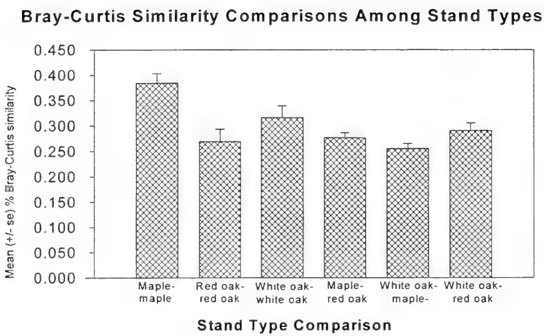


Fig. 8. Among vs. within stand comparisons of Bray-Curtis similarity indices using ground layer vegetation frequencies sampled in 1976
MRPP for maple = red oak = white oak: $t = -4.78$, $P < 0.001$.
ANOVA for all comparisons: $F = 9.245$, $P < 0.0001$; with Fisher's PLSD test at $P < 0.05$, maple-maple similarity is significantly higher than maple–white oak or maple–red oak similarity, and white oak–white oak similarity is significantly higher than white oak–maple similarity, but is not different from white oak–red oak similarity.

Table 3. Comparison of ground layer Species Richness and Floristic Quality indices among high quality maple, red oak, and white oak stands sampled in 1996 along original INAI woody vegetation transects

Maple–dominated site	S_N	S_A	$\bar{x}R$	$\bar{x}R_N$	SRI	NRI	NRI/SRI	$\bar{x}C$	FQI
Maple Grove	39.00	1.00	5.38	5.24	19.85	19.20	0.97	4.23	26.42
Pilcher Park	29.00	2.00	6.00	5.70	20.60	19.19	0.93	4.17	22.46
G. L. Lloyd Woods	29.00	1.00	5.65	5.60	19.22	18.86	0.98	4.34	23.37
Ryerson mesic	29.00	1.00	5.00	4.95	17.01	16.67	0.98	3.68	19.82
Johnson's Mound (mesic)	26.00	4.00	5.10	4.75	17.35	15.48	0.89	4.60	23.46
Bloomingdale Grove	23.00	4.00	5.60	4.85	18.46	15.21	0.82	3.54	16.98
Morton Arboretum	22.00	1.00	4.70	4.20	14.74	12.98	0.88	3.77	17.68
McCormick (mesic)	19.00	1.00	4.00	3.90	11.98	11.48	0.96	5.10	22.23
Busse Woods (mesic)	10.00	0.00	3.00	3.00	6.91	6.91	1.00	4.90	15.50
River Road	11.00	1.00	2.50	2.35	6.21	5.64	0.91	3.82	12.67
Average	23.70	1.60	4.69	4.45	15.23	14.16	0.93	4.22	20.06
Std. Error	2.64	0.40	0.35	0.33	1.57	1.47	0.02	0.16	1.28
Red oak–dominated site	S_N	S_A	$\bar{x}R$	$\bar{x}R_N$	SRI	NRI	NRI/SRI	$\bar{x}C$	FQI
Raccoon Grove	38.00	0.00	10.39	10.39	37.79	37.79	1.00	4.16	25.64
Messenger (dry-mesic)	41.00	0.00	9.50	9.50	35.28	35.28	1.00	4.49	28.75
Norris Woods	46.00	2.00	7.50	6.45	29.03	24.69	0.85	3.47	23.53
Crabtree	40.00	1.00	6.45	6.25	23.95	23.06	0.96	3.92	24.79
Messenger (mesic)	30.00	1.00	6.76	6.71	23.21	22.82	0.98	4.33	23.72
St. Francis Boys Camp	31.00	2.00	5.82	5.73	20.35	19.68	0.97	4.13	22.99
Busse Woods (dry-mesic)	38.00	1.00	4.15	4.10	15.20	14.91	0.98	3.86	23.79
Paw Paw Woods	10.00	1.00	1.23	1.04	2.95	2.39	0.81	3.60	11.38
Average	34.25	1.00	6.48	6.27	23.47	22.58	0.94	4.00	23.08
Std. Error	3.67	0.25	0.96	0.97	3.70	3.69	0.02	0.12	1.68
White oak–dominated site	S_N	S_A	$\bar{x}R$	$\bar{x}R_N$	SRI	NRI	NRI/SRI	$\bar{x}C$	FQI
Elburn	37.00	3.00	9.25	8.15	34.12	29.43	0.86	3.76	22.87
Johnson's Mound (dry-mesic)	39.00	3.00	7.70	7.25	28.78	26.56	0.92	4.06	25.35
McCormick (dry-mesic)	44.00	4.00	7.50	6.70	29.03	25.35	0.87	4.08	27.06
Thorn Creek Woods	43.00	0.00	6.45	6.45	24.26	24.26	1.00	3.77	24.72
MacArthur Woods	41.00	4.00	6.85	5.85	26.08	21.72	0.83	4.28	27.41
Mooseheart Ravine	29.00	4.00	7.25	6.20	25.35	20.88	0.82	3.82	20.57
Herrmann's Woods	30.00	1.00	6.00	5.80	20.60	19.73	0.96	3.73	20.43
Helms Woods	32.00	4.00	6.85	5.45	24.55	18.89	0.77	3.61	20.42
Average	36.88	2.88	7.23	6.48	26.60	23.35	0.88	3.89	23.60
Std. Error	1.95	0.51	0.33	0.29	1.34	1.21	0.03	0.07	0.97
ANOVA F ratio			4.57	3.45	5.9	4.67	2.31	1.55	1.92
P value			0.0214	0.0488	0.0085	0.0199	0.1219	0.296	0.357

S_N = total native richness, S_A = total alien richness, $\bar{x}R$ = plot species richness, $\bar{x}R_N$ = native plot species richness, SRI = species richness index, NRI = native richness index, $\bar{x}C$ = mean coefficient of conservatism, FQI = floristic quality index.

Notes: ANOVA tests hypotheses of no significant difference among stands for each column variable. Mean C and FQI calculations are based on native species, and their sample sizes may differ slightly from NRI values because species identified only to the genus level cannot be assigned C values.

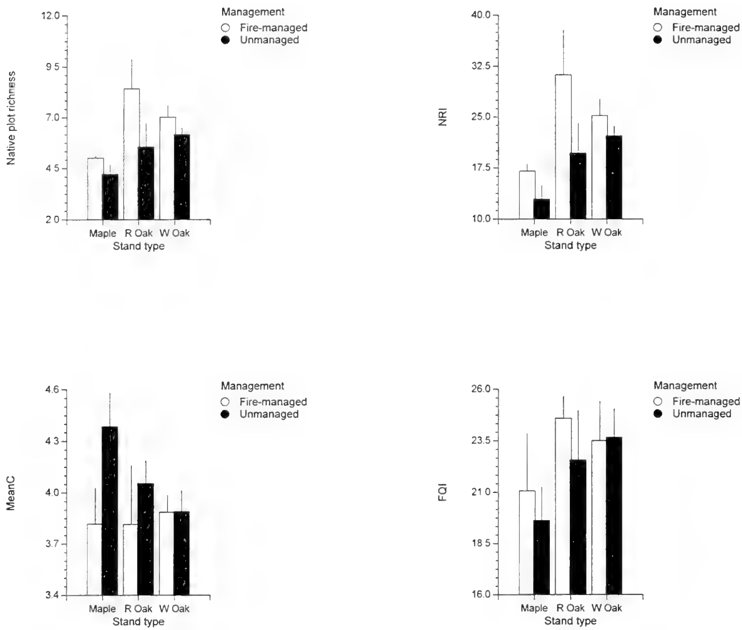


Fig. 9. Mean (±se) Native Plot Richness (upper left), Native Richness Index (upper right), Mean Coefficient of Conservatism (lower left), and Floristic Quality Index (lower right) of fire-managed and unmanaged maple, red oak, and white oak forest stands sampled in 1996

ANOVA:

Response variable	Management	Stand type	Management × Stand type
Mean Native Plot Richness ($\bar{x}R_N$)	$F = 3.98, P = 0.059$	$F = 4.00, P = 0.035$	$F = 0.74, P = 0.490$
Native Richness Index (NRI)	$F = 4.46, P = 0.048$	$F = 5.16, P = 0.016$	$F = 0.76, P = 0.481$
Mean Coefficent of Conservatism	$F = 2.66, P = 0.119$	$F = 0.67, P = 0.513$	$F = 1.08, P = 0.193$
Floristic Quality Index	$F = 0.33, P = 0.572$	$F = 1.38, P = 0.275$	$F = 0.11, P = 0.063$

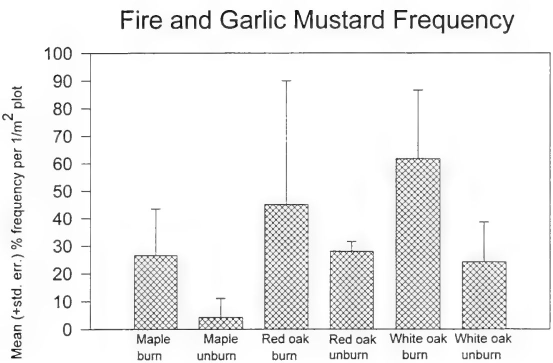


Fig. 10. *Alliaria petiolata* abundance in burned and unburned maple, red oak, and white oak stands sampled in 1996 ANOVA: fire ($F = 5.69$, $P = 0.026$), stands ($F = 1.22$, $P = 0.3134$), fire × stands ($F = 0.46$, $P = 0.6375$).

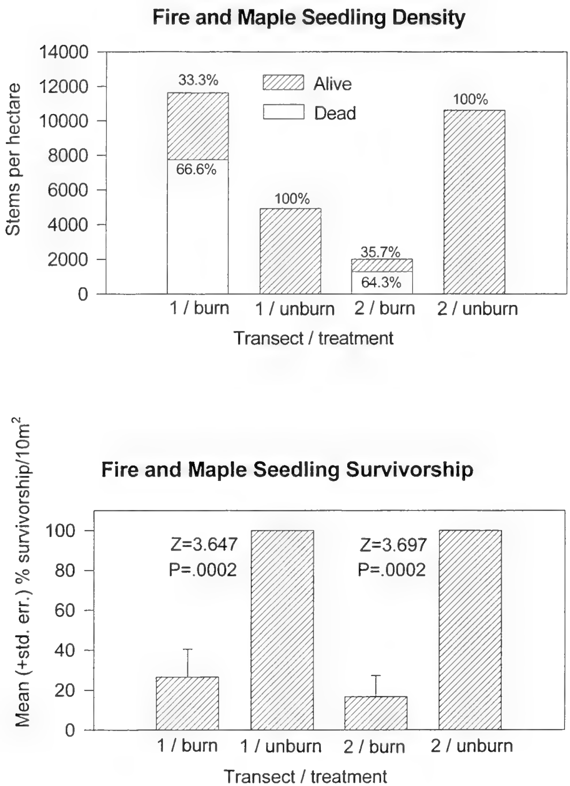


Fig. 11. Response of ground layer maples to prescribed fire in 2 transects in maple forest at Ryerson Conservation Area in 1996
Upper graph: stem density per ha and proportions of alive and dead maple stems in burned and unburned plots. Lower graph: transect Z statistics and probabilities that mean survivorship differs between burned and unburned plots. Transect 1 = 8 burned and 12 unburned 0.01 ha plots, Transect 2 = 7 burned and 13 unburned 0.01 ha plots.

Schnur 1976). We measured an extremely small but significant difference in percent canopy cover between maple (> 71%) and oak forests (70%). Whether or not > 71% represents a threshold for negatively affecting shrub layer (and ground layer) vegetation is not clear. However, Pubanz and Lorimer (1992) and Lorimer, Chapman, and Lambert (1994) found that a reduction from about 95% to 85% canopy cover, measured as a % of total Photosynthetically Active Radiation (PAR), enhanced oak seedling survivorship in oak forests. This indicates that change in a narrow range of canopy cover can significantly affect shade-intolerant understory vegetation. Our measures used different instrumentation with a fixed calibration point, and may not be linear or directly comparable to measures of PAR.

Greater canopy cover and a large maple seed source are the most likely causes of higher maple sapling densities in maple stands. The lower densities of true shrub species in maple stands may result from low shade intolerance of most shrubs, and competition from maple seedlings and saplings (Bray 1956; Curtis 1959). Many shrubs decline with increasing canopy cover and thus prefer the more open canopy conditions of white oak stands (e.g., McIntosh 1957). The shade-intolerant shrub *Corylus americana* was the most frequent species of woody undergrowth recorded in presettlement DuPage County forests (Bowles, Hutchison, and McBride 1994; Bowles, McBride, and Bell 1999), but it now occurs at relatively low densities. The shade-tolerant shrub *Lindera benzoin* (Luken et al. 1997) is characteristic of mesic sites such as beech-maple forests (Davidson and Buell 1967; Rogers 1981; Foré, Vankat, and Schaefer 1997), but it is absent from most Chicago-region maple stands.

Deer browsing is an additional factor affecting shrub layer structure and composition, as deer winter-browse many shrubs and tree saplings, but tend to avoid maple (Strole and Anderson 1992). In 1996, we noted a browsing preference for *Carpinus caroliniana* var. *virginiana* at many sites, including the Ryerson Conservation Area and Busse Woods. At Thorn Creek Woods we also found higher frequencies of deer-browsed *Viburnum acerifolium* stems in ground layer plots than in shrub plots, whereas the INAI found higher shrub layer stem densities for this shrub in 1976. *Crataegus mollis* is also not preferred by deer (Strole and Anderson 1992), which may have enhanced its density in oak stands. However, the greater abundance of this and other *Crataegus* species in oak stands, as opposed to maple stands, may be related to former open canopy conditions and possibly a history of more pasturing in upland sites.

Ground layer vegetation distribution, composition, and structure

As with woody vegetation, the structure and composition of ground layer vegetation separates maple and oak stands, with red oak stands usually intermediate between maple and white oak stands. The primary differences are low species richness, greater relative abundance of spring ephemerals, and high abundance of maple seedlings in maple stands, and greater species richness and greater representation of different functional groups in oak stands. The alignment of these stands along a moisture gradient presumably has a strong effect on differences in species composition among stand types, and may result in differences in species richness. The correlation of these features with higher % canopy cover in maple stands also fits an expected model of reduced species richness associated with greater maple dominance and low available light (McIntosh 1957; Curtis 1959). As with shrubs, low diversity of ground layer species in some maple stands is also a direct effect of past overbrowsing by eastern white-tailed deer, which have eliminated many herbaceous species from the Ryerson Conservation Area (Anderson 1994) and Busse Woods (M. L. Bowles, pers. obs.), and are impacting ground layer vegetation at other sites (e.g., Bowles, Bell, and McBride 1995, 1996).

Chicago-region forests represent most of the ground layer vegetation expected for central hardwood mesophytic upland forest communities (Rogers 1981, 1982). It is possible that ground layer vegetation sampled in 1996 still represents the 1976 ground layer of most stands, as spring and summer herbs tend to have little temporal variability, except for differences in cover (Rogers 1983; Moore and Vankat 1986). Such spatially stable "light-flexible herbs" (Collins, Dunne, and Pickett 1985) tolerate shade, use light flecks, and flower and fruit more frequently in relation to their inherent size, or canopy gap and edge development (e.g., Zangerl and Bazzaz 1983; Lee et al. 1986; Dahlem and Boerner 1987; Piper 1989). However, these species require soil-disturbance gaps for regeneration (Thompson 1980), and some studies suggest that they may decline with increasing time since canopy disturbance (Brewer 1980; Olivero and Hix 1998).

A large array of summer herbs with high light requirements may be poorly represented in upland oak forests that lack fire disturbance (Wilhelm 1991), but few data document the former occurrence or composition of this species group in Illinois forests. Suites of species occupy a light gradient across savanna and woodland (Bowles et al. 1996; Bowles and McBride 1998), and many may have been more important in oak forests that had dynamic fire processes and more open canopies. The measures of species richness and floristic quality in this paper apparently omit such species, and may under represent the potential species diversity of oak forests.

FOREST CONSERVATION AND MANAGEMENT ISSUES

Species distribution and conservation needs

Although our data represent stand samples rather than total species inventories, they indicate strong heterogeneity within and among stand types. These localized species distribution patterns have important implications for conservation of biodiversity within the Chicago region. The occurrence of most species in < 30% of all stands indicates that protection is needed for as many sites as possible to preserve landscape diversity, and that no single stand can completely represent a forest type. The low frequency of species within stands also suggests that larger sites are more likely to contain more individuals of most species, which should enhance population viability.

Management implications of forest structure

The size-class structure of northeastern Illinois forests is similar to other central hardwood oak forests. All species usually combine to produce size-class curves resembling a negative exponential distribution, but species groups have different distributions because they have different adaptations (Johnson and Bell 1975). In oak stands, workers have found that shade-tolerant maples are most abundant in small size classes, indicating recurring reproduction, while shade-intolerant oaks are usually restricted to larger size classes, indicating lack of reproduction under their own canopy shade. These observations have led to almost universal conclusions that in the absence of fire, formerly more open oak forests are shifting toward canopy closure and gap-phase reproduction processes, in which oaks will not reproduce in the face of increasing understory maple dominance (e.g., Bray 1956; Boggess 1964; Boggess and Bailey 1964; Boggess and Geis 1966; McClain and Ebinger 1968; Schlesinger 1976; Christensen 1977; Miceli et al. 1977; Anderson and Adams 1978; Adams and Anderson 1980; McGee 1986; Abrams and Downs 1990; Pallardy, Night, and Garrett 1991; Abrams 1992; Roovers and Shifley 1997). As indicated above, change or decline in ground layer vegetation should be expected in association with this change in canopy structure.

Stand histories are also important in structuring species size-class distributions and the overall condition of stands, and in understanding management or restoration needs. For example, the Ryerson Conservation Area had a large component of old growth *Ulmus americana* that was destroyed by Dutch elm disease in the 1960s (Bowles et al. 1998). This disease reduced elms to small size classes in central Illinois (Johnson and Bell 1975), and allowed increased shrub growth in Wisconsin (Dunn 1986, 1987). At Ryerson, recent elm mortality may have been more important than absence of fire in promoting establishment of the large cohorts of 1– <2 dm size-class of maples that are now present. Thus the current structure of this stand is not necessarily directly related to fire history.

Postsettlement fire was replaced by human disturbances such as occasional burning, tree cutting, and pasturing in many forests through the early 1900s (e.g., Nowacki and Abrams 1997). When these disturbances were moderate, they may have been important in preserving ground layer diversity that would have been lost with total fire protection. More severe disturbances may have decoupled some forest stands from presettlement conditions, resulting in different successional trajectories that require different management goals (Mendelson 1998). However, such disturbances may have had less effect on the structure of old growth oak stands in this study. For example, excluding basswood, trees up to 50 cm dbh probably originated soon after settlement, trees > 60–70 cm dbh originated prior to settlement, and larger oaks appear to date back to the late 1700s (M. L. Bowles and M. Jones, unpublished tree ring data). Thus, these stands have direct linkage with presettlement conditions.

Given the evidence of former landscape-scale fire processes in northeastern Illinois forests, the lack of oak regeneration in most stands, and concerns for ground layer diversity, application of fire is a critically important management need. However, few experimental data are available to guide the implementation of this process, and there are many questions and concerns. For example, Luken and Shea (2000) found that burning an upland maple-forest stand did not significantly affect ground layer richness, and our lack of preburn data prevents a conclusion that fire management resulted in higher native species richness. However, the significant reduction of ground layer maples after one dormant-season fire suggests that fire management can reduce maple stem densities, as found by Luken and Shea (2000). Despite this reduction, the density of surviving maples in our burned plots remained in the 1000–4000 stems/ha range. Because maple seedling mortality is initially density dependent and decreases with age (Hett 1971), high levels of sapling recruitment might still occur. Repeated experimental burns are needed to determine if further maple recruitment can be controlled. Also, high maple seedling densities are natural in maple stands, and fire management to reduce maples may be more important where they are invading oak forests.

Historic landscape-scale fire effects on forest canopy structure and ground layer composition may be difficult to replicate with modern management fires in forest fragments, and there are also potential damaging or conflicting effects of fire management. For example, although we lack controls and precise fire histories, our data suggest that garlic mustard may persist in fire-managed tracts, a conclusion supported by Luken and Shea (2000). This species is a disturbance-adapted biennial, and fires expose seed beds that enhance its establishment and spread (Anderson, Dhillion, and Kelley 1996). Although repeated annual burns may deplete seed banks and reduce its population sizes, they may negatively affect other plants or animals. Shrub layer management is of particular concern, because this forest structural component provides the nesting substrate for forest interior birds, and alien shrubs enhance nest predation (Whelan and Dilger 1992, 1995; Schmidt and Whelan 1999). However, the frequency and intensity of fires needed to maintain shrub layer diversity while managing for herbaceous ground layer vegetation is unknown and may vary among sites. For example, Luken and Shea (2000) found a 116% increase in shrub layer stems after 2 consecutive burns in lowland forest, but a 97% decline after 3 burns in upland habitat. Finally, almost no information is available on the status of forest invertebrate species and the potential effects of fire on their populations (although see Wolf [1992], and Newman and Wolf [1992]).

MONITORING ISSUES

Woody vegetation monitoring

The woody vegetation data in this paper represent a structural composition profile of high quality forests in the Chicago region of northeastern Illinois. These data also constitute a structural baseline against which temporal forest change can be compared. Important monitoring objectives should be to detect temporal and spatial changes in size-class distribution of different canopy species groups, especially in relation to management. For example, an increase in maple stem numbers in small size classes in oak stands would indicate maple invasion, while their decline in response to fire would indicate a positive management effect. Changes in smaller size classes of oaks could indicate whether reproduction is occurring, and loss of larger size-class trees would indicate that the oak canopy structure is deteriorating. Clearly, shrub layer monitoring is critical, as it examines an important component of structural diversity that may be vulnerable to changing canopy conditions, deer browsing, or management fires. Measures of relative abundance of sapling, small tree, and true shrub species densities will reveal structural shifts, while species richness or diversity measures will help monitor changes in biodiversity.

Ground layer vegetation monitoring

Although using single indices to monitor vegetation and assess effects of management treatments is attractive, such metrics often fail to quantify complex vegetational features and may obscure important information (Magurran 1988; Kremen 1992). Indices intended to be useful for vegetation monitoring should be statistically sound and capable of detecting responses to factors that affect structural composition of vegetation. Our analysis and testing of the Native Richness Index (NRI) indicates that its components, mean plot species richness($\bar{x}R_N$) and total native richness (S_N), are highly sensitive to differences among forest stand types and to differences among fire-managed and unmanaged stand sites. Plot species richness is also an unbiased measure that is amenable to statistical analysis. As a component of NRI, $\bar{x}R_N$ provides a useful small-scale measure that is sensitive to minor compositional changes in vegetation that may be linked to important causal factors. When coupled with measures of abundance of different species by functional group, this can be a highly effective monitoring tool.

The significant correlation (r^2 = 0.645, P < 0.001) between NRI and FQI occurred because total sample richness (S) is used in both formulations ($NRI = LnS_N \times \bar{x}R_N$, and $FQI = \sqrt{S} \times \bar{x}C$). However, these indices differed because of the poor correlation (r^2 = 0.003, P = 0.784) between $\bar{x}R_N$ and $\bar{x}C$. The failure of FQI to find differences among stand types and management effects was thus due to the subjective assignments of C values to plant species. Likewise, Francis et al. (2000) found that FQI obscured patterns among its components because $\sqrt{S}$ and $\bar{x}C$ are not similar measures. When using the FQI or $\bar{x}C$, one might conclude that there were no significant differences in quality among the stand types compared in this study. However, the NRI indicates that significant differences occur among stand types, and that these differences are due to factors affecting small- and large-scale measures of species richness. In this case, these factors may be related to differences in % canopy cover or in fire management.

More research is needed to determine how the NRI applies to other plant communities and to *a priori* assessments of their condition or quality. In an analysis of 1976 INAI graminoid plant community data, the NRI corroborated *a priori* A and B quality assignments with higher quality sites having higher species richness (Bowles and Jones 1999). In savanna analysis, native and alien plot species richness was also highly sensitive to ground layer differences along a light gradient (Bowles et al. 1996; Bowles and McBride 1998). This suggests that fire-caused changes in forest structure that increase canopy light (an important management objective) should be detectable by the NRI.

CONCLUSIONS

Analysis of the structural composition of upland dry-mesic and mesic forests surveyed by the INAI in northeastern Illinois allowed classification of maple, red oak, and white oak forest types. Maple-dominated stands are structurally and compositionally less diverse than oak stands, with higher canopy cover, lower shrub layer diversity and stem densities, and lower ground layer species richness. Although ground layer richness was higher in oak stands, it was also highly heterogeneous within and among stands, with > 90% of all species sampled in < 30% of all stands. Thus, few, if any, single stands can represent stand types. Spring ephemerals and maple seedlings tended to be most important in maple stands, while other ground layer species functional groups tended to be more important in oak-stand types. These profiles provide a hierarchical baseline against which temporal change and management effects can be monitored. The Native Richness Index (NRI) appears to be a highly sensitive monitoring tool, as it was significantly higher for oak stands than for maple stands, and was higher in fire-managed than in unmanaged stands. Fire management also significantly reduced numbers of live maple stems. However, the invasive alien garlic mustard had higher frequencies in fire-managed stands.

Monitoring of canopy, shrub layer, and ground layer composition and structure can help identify important temporal changes or responses to management in forest systems. Monitoring of forest vegetation also should be kept in context with hypotheses that vegetation change is natural and expected (Pickett, Parker, and Fiedler 1992), and that data sets represent conditions at a point in time, and not necessarily important restoration or management goals. For example, the structural composition of oak forests in 1976 may or may not represent a more realistic restoration goal than conditions in 1820 or 1996. However, the earliest detailed record of vegetation structure and composition will be helpful in developing the profile of a reference system against which future change can be monitored (Aronson, Dhillion, and Le Floc'h 1995).

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APPENDIX I

Mean (± std. err.) stem density/ha of saplings, understory trees, and shrubs sampled by the INAI in maple, red oak, and white oak stand shrub layer plots in 1976. Simpson's diversity index ANOVA (F = 8.54, P = .0017). Asterisks (*) indicate alien species.

	Maple stands		Red oak stands		White oak stands	
Saplings	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.
Acer saccharum	4080.00	623.21	1862.50	876.67	175.00	109.79
Fraxinus americana	70.00	39.58	387.50	187.50	337.50	175.19
Prunus serotina	100.00	80.28	562.50	239.74	237.50	159.17
Ulmus rubra	230.00	137.48	475.00	180.03	162.50	92.46
Tilia americana	90.00	37.86	150.00	100.00	50.00	32.73
Carya ovata			43.75	29.03	112.50	47.95
Carya cordiformis	10.00	10.00	18.75	13.15	137.50	84.38
Fraxinus pennsylvanica			112.50	112.50	162.50	162.50
Quercus rubra	30.00	30.00	62.50	41.99	112.50	87.50
Fraxinus quadrangulata	20.00	20.00			162.50	162.50
Ulmus americana	50.00	40.14			25.00	25.00
Fraxinus nigra	30.00	30.00			12.50	12.50
Quercus alba	10.00	10.00	12.50	12.50	12.50	12.50
Quercus ellipsoidalis					12.50	12.50
Quercus macrocarpa					12.50	12.50
Sapling density	4720.00		3687.50		1725.00	
Small trees	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.
Crataegus pruinosa			56.25	56.25	537.50	386.81
Ostrya virginiana	80.00	15.49	212.50	87.50	312.50	174.68
Carpinus caroliana v. *virginiana*	70.00	16.36	12.50	12.50	125.00	111.40
Crataegus sp.			18.75	13.15	87.50	51.54
Cartaegus mollis			137.50	101.66	87.50	39.81
Malus ioensis	10.00	3.16	25.00	25.00	12.50	12.50
Crataegus punctata			12.50	12.50	12.50	12.50
Crataegus succulenta	10.00	3.16				
**Rhamnus cathartica*	31.25	21.00	50	26.73		
**Rhamnus frangula*	12.50	12.50				
Small tree density	213.75		525		1175	
Shrubs	Mean	Std. err.	Mean	Std. err.	Mean	Std. err.
Viburnum prunifolium			43.75	37.13	3775.00	3746.55
Prunus virginiana	90.00	11.00	787.50	345.60	450.00	153.53
Viburnum rafinesquianum			737.50	631.03	2187.50	1504.11
Cornus racemosa			693.75	549.71	1362.50	582.47
Hamamelis virginiana	510.00	124.76	62.50	62.50	250.00	236.04
Viburnum acerifolium	280.00	70.05	137.50	111.70	437.50	437.50
Corylus americana	10.00	3.16	375.00	153.24	137.50	82.24
Rubus strigosus			75.00	75.00	100.00	100.00
Viburnum lentago			87.50	74.25	25.00	16.37
Cornus rugosa	60.00	18.97				
Rubus occidentalis			50.00	50.00	12.50	12.50
**Viburnum opulus*	10.00	3.16			37.50	37.50
Cornus alternifolia	30.00	9.49				
Euonymus atropurpureus			12.50	12.50		
Rhus radicans			12.50	12.50		
Ribes americanum					12.50	12.50
Ribes sp.	10.00	3.16				
Rubus pensilvanicus			12.50	12.50		
Xanthoxylum americanum			12.50	12.50		
**Lonicera* sp.	62.5	62.50	87.50	74.25		
Shrub density	1062.5		3187.50		8787.5	
Total stand density	5996.25		7400.00		11687.50	
Simpsons Index (D)	0.3557		0.7187		0.6858	

Appendix II

Mean (± std err.) stand frequencies for groundlayer species sampled in 1996 in maple, red oak, and white oak stands along transect lines established by the INAI. Species are ranked by overall stand means. Asterisks (*) indicate alien species.

	Maple stands		Red oak stands		White oak stands	
Species	Mean	std. err.	Mean	std. err.	Mean	std. err.
Smilacina racemosa	30.34	7.47	27.33	10.68	44.38	11.47
Circaea lutetiana v. *canadensis*	29.92	7.11	28.13	10.05	40.63	10.41
Erythronium albidum	49.50	8.95	19.51	7.73	18.75	5.88
Arisaema triphyllum	19.03	5.32	40.12	9.99	27.50	5.26
Dentaria laciniata	39.24	10.19	29.21	12.11	10.63	10.63
Acer saccharum	50.73	8.99	14.10	9.68	5.63	2.74
**Alliaria petiolata*	17.96	6.67	16.15	11.01	41.25	14.17
Geranium maculatum	7.56	4.97	23.28	10.53	37.50	9.21
Parthenocissus sp.	17.50	5.69	22.16	9.82	22.50	8.45
Fraxinus sp.	20.11	7.16	7.67	2.41	17.50	5.09
Claytonia virginica	5.43	2.26	25.56	15.67	15.63	8.73
Polygonum virginianum	5.00	1.97	23.82	8.99	15.63	8.84
Impatiens sp.	6.48	2.35	17.64	8.96	13.75	5.73
Geum canadense	2.03	1.53	12.18	7.02	21.25	8.33
Prunus virginiana	6.00	4.40	8.52	3.89	14.38	4.86
Prunus serotina	5.08	2.69	6.63	2.43	15.00	6.88
Podophyllum peltatum	4.08	2.67	7.86	4.04	15.00	5.90
Allium tricoccum v. *burdickii*	21.26	11.08	--	--	0.63	0.63
Geum sp.	5.98	3.92	4.38	3.20	13.75	9.67
Trillium recurvatum	3.93	1.86	8.21	3.55	11.25	2.80
**Rhamnus cathartica*	0.50	0.50	4.26	2.54	16.25	8.60
Floerkea proserpinacoides	5.36	2.90	8.75	8.75	5.63	5.63
Rhus radicans	0.50	0.50	4.18	1.75	13.75	4.89
Trillium grandiflorum	6.08	3.58	6.08	3.82	4.37	4.37
Allium canadense	1.03	0.68	5.49	4.81	11.25	3.87
Galium aparine	3.50	2.48	6.76	4.31	6.88	4.90
Isopyrum biternaturm	13.06	6.16	--	--	0.63	0.63
Cornus racemosa	0.98	0.65	6.26	4.20	9.38	2.58
Viola pubescens	--	--	10.49	5.44	6.25	2.46
Ribes missouriense	4.58	2.08	2.50	2.50	6.25	2.46
Hackelia virginiana	2.00	2.00	4.38	2.90	5.63	3.59
Viburnum rafinesquianum	1.50	1.07	0.63	0.63	10.00	8.66
Dicentra cucullaria	1.00	0.67	5.56	5.56	5.63	3.33
Viburnum prunifolium	--	--	8.01	3.88	4.38	3.20
Sanicula gregaria	--	--	10.07	7.20	1.88	1.87
Potentilla simplex	--	--	3.75	1.83	8.13	4.81
Rubus allegheniensis	--	--	--	--	11.25	5.24
Thalictrum dioicum	4.50	3.98	3.64	1.78	1.88	1.32
Anemone quinquefolia	4.00	1.25	1.95	0.95	3.13	1.87
Ulmus sp.	4.56	2.08	1.88	1.32	2.50	1.89
Vitis riparia	6.00	2.56	1.25	1.25	1.25	1.25
Carya cordiformis	1.98	1.52	3.07	1.30	4.38	2.90
Allium tricoccum	3.93	2.30	3.40	2.76	1.25	1.25
Carex pensylvanica	--	--	0.63	0.63	8.75	5.73
Carpinus caroliniana v. *virginiana*	3.50	2.59	--	--	4.38	3.71
Rubus pensilvanicus	--	--	5.00	4.33	3.75	2.06
Osmorhiza sp.	--	--	8.06	5.76	0.63	0.63
Hydrophyllum virginianum	0.50	0.50	0.63	0.63	6.88	4.72
Lonicera prolifera	--	--	1.88	0.92	6.25	3.24
Viburnum acerifolium	1.00	1.00	4.38	3.20	2.50	1.89

Species	Maple stands		Red oak stands		White oak stands	
	Mean	std. err.	Mean	std. err.	Mean	std. err.
Tilia americana	3.00	1.11	4.03	3.38	--	--
Prenanthes altissima	--	--	--	--	7.50	7.50
Quercus alba	--	--	--	--	7.50	4.12
Rubus occidentalis	0.50	0.50	0.63	0.63	6.25	2.46
Solidago flexicaulis	4.48	3.98	--	--	1.88	1.87
Quercus rubra	--	--	3.01	1.55	3.75	2.46
Viola sororia	0.50	0.50	2.08	2.08	3.75	1.83
Sanguinaria canadensis	1.00	0.67	2.44	1.32	1.88	1.32
Carex sp.	1.03	0.68	2.69	1.50	1.25	1.25
Carex rosea	0.50	0.50	1.32	0.87	3.13	1.62
Phlox divaricata	--	--	2.57	1.90	2.50	1.89
Arisaema dracontium	--	--	1.19	0.78	3.75	2.63
Ostrya virginiana	0.50	0.50	1.82	0.89	2.50	1.34
**Rhamnus frangula*	1.00	1.00	0.57	0.57	3.13	2.49
Ranunculus septentrionalis	--	--	3.76	1.26	0.63	0.63
Aster macrophyllus	--	--	--	--	4.38	4.37
Bidens sp.	--	--	3.13	3.13	1.25	1.25
Cardamine sp.	1.00	1.00	0.63	0.63	2.50	1.64
Glyceria striata	--	--	1.88	1.32	2.50	1.34
**Taraxacum officinale*	1.00	0.67	--	--	3.13	2.49
Uvularia grandiflora	2.50	2.01	--	--	1.25	1.25
Maianthemum canadense	--	--	--	--	4.38	4.38
Smilacina stellata	1.95	1.07	--	--	1.88	1.87
Hepatica acutiloba	2.50	1.71	--	--	0.63	0.63
**Poa nemoralis*	--	--	--	--	3.75	3.75
Aster lateriflorus	0.48	0.48	--	--	3.13	3.13
Solidago caesia	--	--	3.47	3.47	--	--
Laportea canadensis	1.00	1.00	2.01	1.44	--	--
Cinna arundinacea	--	--	2.57	1.36	0.63	0.63
Leersia virginica	0.53	0.53	1.25	1.25	1.25	1.25
Acer rubrum	--	--	--	--	3.13	3.13
Cardamine douglassii	1.50	1.50	--	--	1.25	1.25
Sambucus canadensis	--	--	0.63	0.63	2.50	2.50
Polygonatum canaliculatum	0.98	0.65	0.63	0.63	1.25	1.25
Prenanthes sp.	1.48	1.06	1.25	1.25	--	--
Prenanthes crepidinea	0.56	0.56			1.88	0.63
Agrimonia gryposepala	--	--	--	--	2.50	1.89
Anemonella thalictroides	0.50	0.50	--	--	1.88	0.92
Aster sp.	1.00	1.00	1.25	0.82	--	--
Carex grayi	--	--	--	--	2.50	1.64
Elymus villosus	--	--	1.25	1.25	1.25	1.25
Polygonum hydropiperoides	--	--	2.50	2.50	--	--
Polygonum sp.	--	--	--	--	2.50	2.50
**Chelidonium majus*	1.50	1.50	--	--	0.63	0.63
Potentilla sp.	--	--	--	--	2.50	2.50
Prunella vulgaris v. *lanceolata*	--	--	1.88	1.32	0.63	0.63
Smilax ecirrhata	1.00	1.00	--	--	1.25	1.25
**Viburnum opulus*	--	--	--	--	2.50	1.89
Hystrix patula	0.50	0.50	1.39	1.39	--	--
Smilax sp.	--	--	2.01	1.44	--	--
Eupatorium purpureum	--	--	1.95	1.34	--	--
Urtica procera	1.00	1.00	0.70	0.70	--	--
Cirsium sp.	1.05	1.05	--	--	0.63	0.63
Calamagrostis canadensis	--	--	1.88	1.87	--	--
Carya ovata	--	--	--	--	1.88	1.32

Species	Maple stands		Red oak stands		White oak stands	
	Mean	std. err.	Mean	std. err.	Mean	std. err.
Caulophyllum thalictroides	--	--	1.25	1.25	0.63	0.63
Osmunda claytoniana	--	--	--	--	1.88	1.32
Ribes americanum	--	--	1.25	1.25	0.63	0.63
Smilax tamnoides v. *hispida*	--	--	1.25	0.82	0.63	0.63
**Solanum dulcamara*	--	--	--	--	1.88	1.87
Trillium sessile	1.50	1.07	--	--	--	--
Oxalis sp.	0.48	0.48	1.25	0.82	--	--
Dioscorea villosa	--	--	1.19	0.78	0.63	0.63
Solidago ulmifolia	0.95	0.95	--	--	0.63	0.63
Menispermum canadense	1.45	1.03	0.57	0.57	4.38	4.38
Proserpinaca palustris	--	--	1.39	1.39	--	--
Acer negundo	--	--	1.25	1.25	--	--
Amphicarpaea bracteata	--	--	1.25	1.25	--	--
Carex hirsutella	--	--	1.26	0.83	--	--
**Arctium minus*	0.50	0.50	--	--	0.63	0.63
Aster schreberi	--	--	--	--	1.25	1.25
Carex blanda	0.50	0.50	0.63	0.63	--	--
Corylus americana	--	--	0.63	0.63	0.63	0.63
Cystopteris fragilis v. *protrusa*	--	--	1.25	1.25	--	--
Equisetum arvense	1.00	1.00	--	--	--	--
Hamamelis virginiana	--	--	--	--	1.25	1.25
Lactuca sp.	1.00	1.00	--	--	--	--
Pilea pumila	1.43	0.01	1.25	1.25	1.25	0.01
Ranunculus abortivus	--	--	0.63	0.63	0.63	0.63
Smilax lasioneura	--	--	1.25	1.25	--	--
Solidago canadensis	--	--	0.63	0.63	0.63	0.63
Asarum canadense	0.48	0.48	--	--	0.63	0.63
Trillium flexipes	0.48	0.48	0.63	0.63	--	--
Cryptotaenia canadensis	--	--	0.70	0.70	--	--
Erigenia bulbosa	--	--	0.70	0.70	--	--
Actaea pachypoda	--	--	--	--	0.63	0.63
Aesculus sp.	--	--	--	--	0.63	0.63
Agrimonia pubescens	--	--	--	--	0.63	0.63
Agrostis perennans	--	--	--	--	0.63	0.63
Aster shortii	0.50	0.50	--	--	--	--
Athyrium filix-femina	--	--	--	--	0.63	0.63
Botrychium dissectum	--	--	0.63	0.63	--	--
Brachyelytrum erectum	0.50	0.50	--	--	--	--
Carex grisea	0.50	0.50	--	--	--	--
Carex scoparia	--	--	0.63	0.63	--	--
Carex tenera	--	--	--	--	0.63	0.63
**Cirsium arvense*	--	--	--	--	0.63	0.63
Cirsium discolor	--	--	0.63	0.63	--	--
Cornus alternifolia	--	--	--	--	0.63	0.63
Crataegus sp.	--	--	--	--	0.63	0.63
**Daucus carota*	--	--	--	--	0.63	0.63
Desmodium sp.	--	--	--	--	0.63	0.63
Dicentra canadensis	0.50	0.50	--	--	--	--
Dryopteris spinulosa	--	--	--	--	0.63	0.63
**Euonymus* sp.	--	--	--	--	0.63	0.63
Euonymus atropurpureus	0.50	0.50	--	--	--	--
Eupatorium rugosum	--	--	0.63	0.63	--	--
Festuca obtusa	--	--	--	--	0.63	0.63
Fragaria virginiana	--	--	--	--	0.63	0.63
Fraxinus quadrangulata	--	--	--	--	0.63	0.63

Species	Maple stands		Red oak stands		White oak stands	
	Mean	std. err.	Mean	std. err.	Mean	std. err.
Galium sp.	--	--	0.63	0.63	--	--
Galium triflorum	--	--	--	--	0.63	0.63
Hydrophyllum appendiculatum	0.50	0.50	--	--	--	--
Lonicera dioica	--	--	--	--	0.63	0.63
Mertensia virginiana	0.50	0.50	--	--	--	--
Morus alba	0.50	0.50	--	--	--	--
Onoclea sensibilis	--	--	--	--	0.63	0.63
Osmunda cinnamomea	0.50	0.50	--	--	--	--
Penthorum sedoides	--	--	0.63	0.63	--	--
Phryma leptostachya	--	--	--	--	0.63	0.63
Poa sp.	--	--	0.63	0.63	--	--
Quercus macrocarpa	--	--	0.63	0.63	--	--
Ranunculus recurvatus	--	--	--	--	0.63	0.63
Rubus idaeus v. *strigosus*	--	--	--	--	0.63	0.63
**Rumex obtusifolius*	--	--	--	--	0.63	0.63
Scrophularia marilandica	--	--	--	--	0.63	0.63
Symplocarpus foetidus	0.50	0.50	--	--	--	--
**Viburnum recognitum*	--	--	--	--	0.63	0.63
Viburnum lentago	--	--	0.63	0.63	--	--
Viola affinis	--	--	0.63	0.63	--	--
Erythronium americanum	--	--	0.48	0.48	--	--

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NATIVE MIDWESTERN PLANTS FOR GOLF COURSE LANDSCAPES

Tom Voigt[1]

ABSTRACT: Native prairie grasses, sedges, and forbs are frequently planted in out-of-play areas of Illinois golf courses. Compared with mowed out-of-play portions of courses, areas planted to native species require reduced management inputs, create wildlife habitat, and enhance the golfing experience. A study was designed to improve golf course superintendents' knowledge and understanding of more than 50 native species. Native grasses, sedges, and forbs were planted at three Chicago-area golf courses in full-sun and partial-shade settings. The objectives of this work were (1) to evaluate these plants to determine their aesthetic value in unmowed areas of Midwestern golf courses and (2) to explore the long-term performance of native plants following different planting-bed preparation options. In the full-sun plantings, *Allium cernuum, Heliopsis helianthoides, Vernonia fasciculata, Veronicastrum virginicum, Andropogon hallii* cv. U. of I., *Eryngium yuccifolium, Ratibida pinnata, Penstemon digitalis, Pycnanthemum virginianum*, and *Solidago rigida* produced the highest aesthetic ratings. In the partial-shade settings, *Allium cernuum, Lobelia siphilitica*, and *Uniola latifolia* were the most preferred. Applications of glyphosate prior to planting appeared to reduce competition from existing vegetation in both the full-sun and partial-shade settings.

INTRODUCTION

Using native plants in managed landscapes is not a new idea. Wilhelm Miller (1915) of the University of Illinois wrote that "every Illinois city should have in at least one park a 'prairie border'—with the grasses, composites, and other flowers labeled." Landscape designer Jens Jensen, a devotee of natural landscaping, planned the noted Lincoln Memorial Gardens in Springfield, Illinois, in 1934, and used only native Illinois trees, shrubs, flowers, and grasses (Ottesen 1989). As early as 1917, Texas recognized the wildflower as a roadside asset for controlling soil erosion (Shirley 1994).

Recently, this idea has received renewed attention. Blake (1990) stated that ". . . gardeners and landscape professionals . . . more and more, . . . are planting and cultivating the wildflowers, native grasses, native shrubs, and native trees of their specific region." Recommendations for cultivating natives in managed areas abound (Anderson 1988; Smith 1980; Favretti 1990).

The trend toward planting natives has even spread into the managed world of Illinois golf courses. Native plantings have been designed into recent golf course constructions in Galena, Libertyville, Bloomington, and many other areas in Illinois. Moreover, many long-established golf courses have taken previously mowed out-of-play areas and replaced them with native plantings (Voigt 1996; Voigt 1998b; Voigt 1999a; Voigt 1999b).

Superintendents at many Illinois golf courses have taken far-rough areas out of mowing. In a 1997 survey to which 110 Chicagoland golf course superintendents responded, more than 8.5% of the 18,608 golf course acres represented in the survey were covered by unmowed grasslands, meadows, or prairies (Voigt 1998a). The superintendents recognized several benefits of native and naturalized areas; 89.8% of survey respondents agreed or strongly agreed with the statement, "Reducing golf course maintenance by not mowing out-of-play areas is a good idea." (Voigt 1998a).

Golf course managers are not routinely trained in the selection and management of native species. With the burgeoning interest in native plants, golf course superintendents have asked questions regarding the use of these species. Specifically, what native plants will perform well in unmowed rough areas, how should these plants be established, and how should these areas be maintained?

With these questions in mind, a study was designed to evaluate native grasses, sedges, and forbs at three Chicago-area golf courses. The research had two objectives: (1) to evaluate native grasses, sedges, and forbs to determine their aesthetic value in unmowed areas of Midwestern golf courses, and (2) to explore the effects of different planting-bed preparation options on native plant performance

METHODS

This project took place at three suburban golf courses in the Chicago area. The courses were Olympia Fields Country Club, in the south suburbs; Cantigny Golf Club, in the western suburbs; and Skokie Country Club, in the

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north suburbs. At each golf course, the superintendent enthusiastically cooperated with the project.

During the summer of 1997, full-sun and partial-shade test areas were planted and established at each golf course. Thirty species were planted in the full-sun areas (table 1) and 28 species were planted in the partial-shade areas (table 2). Plants for this study were selected to represent a wide range of native grasses, sedges, and forbs. In previous work, many common native grass species were evaluated (Voigt 1993; Voigt 1996).

For all but 2 species, plugs measuring 2.25 in. by 2.25 in. were purchased and planted. In the full-sun installations at each course, plots 2 ft. by 3 ft. were planted with 3 plants each of the 30 species of native plants. The exceptions were *Andropogon hallii* cv. U. of I., in which case only one plant was planted per plot, and *Hierochloe odorata,* in which case 2 plants were planted per plot. The plots were replicated 3 times. In the partial shade, 3 to 5 plugs of each species were grouped and planted. The partial-shade plots were not replicated. Plantings at each site were irrigated as necessary to ensure establishment. Each site was visited in August, September, and October.

At each site, plantings were handled differently. At Cantigny Golf Club, the full-sun area was planted into the far rough on July 2 and 3. Site preparations included removal of the existing vegetation (mostly cool-season grasses) to 1 in. using a string trimmer. In the partial shade, an area was treated with glyphosate, and 3 plugs of each species were planted on July 18.

At Olympia Fields Country Club, both the full-sun and partial-shade test areas were planted on July 11. The full-sun site was mowed to 2 inches, rotary tilled to an approximate depth of 5 in., and planted. Following planting, the site was broadcast with Preen at the labeled rate to deter invasion of annual grasses and broad-leaved weeds. In the partial shade, 5 plugs of each species were grouped and planted into the existing vegetation.

At Skokie Country Club, both the full-sun and partial-shade sites were planted on July 23. Both the full-sun and partial-shade settings were treated with glyphosate and mowed to less than 2 in. prior to planting.

During the 1998 growing season, each location was visited monthly from May through September. During the 1999 growing season, Skokie Country Club was visited monthly from May through September, and Cantigny Golf Club and Olympia Fields Country Club were visited in May, June, July, and September. At each site visit, plant information was recorded (flowering period, aesthetic value, height, and shape).

At the conclusion of the 1998 growing season, the collected data were compiled, and a rating scale was developed. This rating scale is based on the collected data and the horticultural judgment of the principal investigator. Here, aesthetic value (AV) was ranked using a 3-point scale in which 3 = an extremely attractive plant, 2 = a plant with desirable, but less showy, aesthetic characteristics, and 1 = a plant not worth establishing, based on its appearance. The rating scale developed in 1998 was similarly applied to the collected evaluations in 1999. The 1998 and 1999 ratings were averaged to produce a list of desirable native plants. A mean AV of 2 or 3 indicates that a plant may have great enough aesthetic value for recommendation for use at other Chicago-area sites.

It is important to note that the aesthetic values assigned to these species are both plant- and context-related. Plant performance is certainly related to the specific growing conditions at each golf course, as well as management, deer browse, exotic weed competition, or other episodic factors. Some of these plants that were assigned an AV of 1 in this study may recieve an AV of 2 or 3 when grown elsewhere. Thus, the aesthetic values in tables 1 and 2 should be regarded as provisional and circumstance specific.

Plants of the Chicago Region by Swink and Wilhelm (1994) was used as the taxonomic guide for this article.

RESULTS AND DISCUSSION

Aesthetic value was recorded during visits to each site during the second and third years of this study. Observations and results from the full-sun and partial-shade areas are presented in tables 1 and 2. Each table lists the scientific and common names of the planted species, plant heights, comments about each plant, 1998 and 1999 ratings of aesthetic appeal, and a mean aesthetic value (AV) rating. A differential trend in plant aesthetic value and establishment and management methods became obvious during 1998 and continued into 1999.

First, differences in AV among plants were identified. Generally, plants receiving a 3 performed well in both years at all three sites. In the full-sun plots, *Allium cernuum*, *Heliopsis helianthoides*, *Vernonia fasciculata*, and *Veronicastrum virginicum* were highly rated because of their colorful, long-lasting flowers.

Those plants receiving a mean AV of 2.5 in the full-sun plots also performed well. This group included *Andropogon hallii* cv. U. of I., *Eryngium yuccifolium, Ratibida pinnata*, *Penstemon digitalis*, *Pycnanthemum virginianum*, and *Solidago rigida.* Most of these plants also were found to produce colorful, long-lasting flowers. The fall color of *Andropogon hallii* cv. U. of I. and *Penstemon digitalis* enabled them to be rated highly.

Finally, several additional plants received a mean AV of 2 in the full-sun plots. *Asclepias incarnata*, *Deschampsia caespitosa*, *Liatris aspera*, *Lythrum alatum*, and *Monarda fistulosa* all produced attractive flowers and/or foliage, but were less uniformly reliable at all sites than those rated more highly.

Plants receiving an AV rating of 1.5 or 1 presented little aesthetic value for flowers or foliage. While these plants may lack aesthetic appeal, they may provide useful growth in difficult sites: *Hierochloe odorata* and *Carex atherodes* are both very competitive in damp or wet settings.

In the partial-shade plots, *Allium cernuum* and *Lobelia siphilitica* were the only plants that had an average AV of 3. These plants produced attractive flowers at all three sites in both years. The only plant receiving a mean AV rating of 2.5 in the partial shade was *Uniola latifolia*.

Plants receiving an aesthetic value of 2 in the partial-shade were *Aster novae-angliae*, *Carex pensylvanica*, *C. radiata*, *Deschampsia caespitosa*, *Hystrix patula*, *Iris virginica* var. *shrevei*, *Phlox divaricata*, *Rudbeckia triloba*, *Solidago flexicaulis*, *S. ulmifolia*, and *Zizia aurea*. An average AV rating of 2 indicates attractive flowers or foliage. Plants in this group may not have performed equally well at each site.

As in the full-sun plots, plants receiving an average AV rating of 1.5 or 1 presented little aesthetic value for flowers or foliage. Some of these plants, particularly the sedges (*Carex* spp.), survived the shaded settings acceptably. Unfortunately, these plants were generally viewed as unattractive.

Establishment methods appeared to be related to plant performance, as was regrowth of existing species and invasion of weeds. In the full-sun plantings, plant performance was superior at Olympia Fields when compared with the plots at Cantigny or Skokie, and there was less weed invasion into the plots. Because the existing vegetation was only trimmed to 1 in. prior to the planting of the natives in the full-sun plots at Cantigny, competition resulting from regrowth of the existing plants was expected. Natives at Olympia Fields were generally larger and more robust than those at Cantigny, where competition from existing plants was greater. In 1999, for example, *Andropogon hallii* cv. U. of I. at Olympia Fields reached nearly 7 ft. in height and was many-stemmed. The same species at Cantigny was shorter (approximately 5 ft.) and developed a much smaller clump diameter. By the end of the 1999 growing season, many of the full-sun plots at Cantigny were taken over by the European field thistle *Cirsium arvense*.

The herbicide-treated cool-season grasses appeared as though they were only damaged to the ground in 1997; regrowth occurred from underground portions of the grasses in 1998 and 1999 at Skokie. Following treatment with glyphosate in 1997, the full-sun natives at Skokie performed similarly to those planted at Olympia Fields, where the site was rotary tilled and treated with Preen after planting. Regrowth of many cool-season perennial grasses (particularly *Agrostis* spp.) at Skokie occurred during 1998 and continued during 1999, and it can be speculated that competition reduced the size and attractiveness of the plants in the evaluation.

These site differences may point to differences in soil or weather conditions, or to differences in preexisting vegetation. It appears that soils at Olympia Fields and Skokie were disturbed less recently than those at Cantigny. Also, precipitation and temperature differences over the Chicago region can vary greatly. These differences may also account for some of the variation that prevailed among locations. The existing vegetation at both Cantigny and Skokie appears to be composed primarily of cool-season turfgrasses (*Festuca* spp. and *Agrostis* spp.). At Olympia Fields, the existing vegetation is a combination of *Phleum pratense, Agrostis alba,* and several natives. The plants growing in this area appear to be more easily controlled.

During 1998 and 1999 at Skokie, it was apparent that another form of pest was invading the full-sun and partial-shade settings. In both years, in the sun plots, it appeared as though deer had "bedded down" in the center of the experimental area. Plants in this area were broken and matted in a large, nestlike fashion. In the partial shade, the tops of several plants, particularly *Eupatorium purpureum* and *Lobella siphilitica,* had been eaten, most likely by deer.

In both years, the partial-shade plantings at Cantigny and Skokie performed better than those at Olympia Fields. Again, this is not surprising given the establishment methods. Competition from existing vegetation at Olympia Fields reduced the aesthetic value and size of the study plants. Even at Olympia Fields, however, *Lobelia siphilitica* and *Rudbeckia triloba* performed well in 1998. Cantigny and Skokie plantings performed similarly. The wood-chip mulch used at Cantigny did not seem to provide conditions superior to the unmulched plots at Skokie. The effects of the mulch, however, may have been offset by the thick layer of tree leaves (primarily *Quercus* spp.) that covered the Skokie site during winter and early spring. The shaded planting area at Cantigny was expanded in late 1999. Native species that performed well in this trial will be established in the newly prepared, enlarged setting.

Invasion of exotic weed species into the full-sun test sites continues to be the greatest threat to success with unmowed native plantings on golf courses. Broadleaf weeds, including *Cichorium intybus*, *Cirsium arvense*, and *Daucus carota*, and grassy weeds such as *Setaria* spp., *Agrostis* *alba* var. *palustris*, *Festuca elatior*, *Agropyron repens*, and *Phalaris arundinacea* have appeared in unmowed areas at these courses and at others in the Chicago area. Future studies should be designed to evaluate chemical, mechanical, and other weed control methods in native plantings (for example, fallow and plowing treatments prior to planting, or annual burns).

CONCLUSIONS

Golf course managers have identified several benefits that accrue from planting and cultivating unmowed naturalized areas. First, replacing maintained areas with unmowed native vegetation can reduce golf course fertilizer and pesticide use and require less labor. While the costs of preparing and planting areas with native plants can be substantial initially, management savings are often realized once the areas are established. The costs of fertilizers, insect- and disease-control chemicals, labor, and equipment are often far less for out-of-play native plantings than when the same areas are planted to turfgrasses and mowed regularly. At one Chicago-area golf course, for example, management expenses for native and naturalized areas were approximately $400 per acre per year less than the cost of routinely mowing similar areas (O. Miles, pers. comm.). Most of the management costs in the native areas were for weed control.

Another benefit from planting natives in unmowed areas is the creation of biologically diverse areas, which are necessary for attracting wildlife. Many Illinois golf courses are involved in the Audubon Cooperative Sanctuary Program sponsored by Audubon International, Inc., of Selkirk, New York. The Audubon Cooperative Sanctuary Program for Golf Courses promotes ecologically sound land management and conservation of natural resources. For full certification, golf courses must complete and manage tasks in six "Achievement Categories." These include Environmental Planning, Wildlife and Habitat Management, Integrated Pest Management, Water Conservation, Water Quality Management, and Outreach and Education. In 1999, 11 Chicago-area golf courses and 130 courses in the U.S. were fully certified sanctuaries. In addition, of the 110 superintendents who responded to the previously mentioned survey, 99 are currently participating in, or plan future involvement in, the program (Voigt 1998a).

An enhanced golfing experience is a final benefit from having native plants in unmowed areas. Many golfers enjoy playing in an environmentally diverse setting where native plants provide a natural experience. Again, in the survey of Chicago-area superintendents, 104 of 108 respondents agreed or strongly agreed with the statement, "The presence of wildlife enhances the golfing experience." (Voigt 1998a). When appropriately placed, natural areas can certainly benefit a golf course.

Native plantings, however, are not without some drawbacks. Some golfers, for example, have complained that unmowed areas appear unkempt and wild (Voigt 1996). Another concern is that of nuisance insect and exotic weed invasions. These pests can proliferate in natural areas and result in management concerns. A final problem often occurs when planted native areas are located too close to in-play areas. In these settings, golfers may slow the play on the course as they search for errant shots in unmowed plantings.

While the initial field trial is now complete, work with golf course native plant revegetation and naturalization will continue. A list of natives suited for golf course planting is being compiled for distribution starting in 2000. In addition, weed-control studies are scheduled for the year 2000.

Planting information and management data derived from this study are already being used. Several Chicago-area golf courses planted areas with native grasses and forbs during 1999. These courses have been provided with guidelines for plant selection and establishment. Many of these guidelines originated from information garnered while conducting this study.

Future studies should evaluate additional plant species, and more importantly, establishment and management options, so that tools and methods to ensure success can be identified.

Table 1. 1998 and 1999 aesthetic values (AV) of native plants established in full sun at three Chicago-area golf courses

Entry (height in feet)	Comments	1998 AV	1999 AV	Mean AV
Allium cernuum (2–3) nodding wild onion	drooping white-pink flowers on upright stems in mid- to late summer; spreading habit	3	3	3
Andropogon hallii cv. U. I. (2–3) sand bluestem	upright warm-season grass with rusty bronze fall color; late summer turkey-foot shaped inflorescences	2	3	2.5
Asclepias incarnata (4) swamp milkweed	attractive pink flowers in mid-summer; upright, shrublike growth	3	1	2
Aster azureus (2) sky-blue aster	inconspicuous small pale blue flowers in late summer to early autumn	1	1	1
Bouteloua curtipendula (3) side-oats grama	bunch-type, warm-season grass; blue-green medium-textured foliage; did not compete well with taller plants	2	1	1.5
Bromus kalmii (2)	cool-season grass; drooping seed heads; pale blue-green foliage; not competitive with other plants in study	1	1	1
Carex atherodes (1–3) hairy-leaved lake sedge	spreading coarse-textured sedge; yellow-green flowers in late spring; yellow-green foliage; invasive in moist areas by rhizomes; not showy, but can cover a great deal of ground	1	1	1
Carex bicknellii (1–2) copper-shouldered oval sedge	subtly attractive yellow-gold inflorescences in early summer; medium-green foliage; sprawling habit	1	1	1
Carex crus-corvi (1) crowfoot fox sedge	yellowish golden brown inflorescences in early summer; generally unattractive	1	1	1
Coreopsis palmata (2) prairie coreopsis	moderately showy yellow flowers in early to mid-summer; bright green fine-textured foliage	1	1	1
Coreopsis tripteris (4–6) tall coreopsis	small yellow flowers in late summer of modest appeal; upright growth habit; dull medium-green foliage	1	2	1.5
Deschampsia caespitosa (1.5–4) tufted hair grass	cool-season grass; attractive dark green tufted foliage; silver-green panicles fade to golden brown and persist through summer	2	2	2
Desmodium canadense (1–3) showy tick trefoil	showy, pale pink-purple pea-shaped flowers in mid-summer; upright growth habit	2	1	1.5
Elymus canadensis (4) Canada wild rye	cool-season grass with large, nodding, foxtail-like seedheads; turns brown in mid-summer; can be invasive because of self-seeding into open areas; a pioneer species suitable for use in prairie restoration	1	1	1
Eryngium yuccifolium (4–6) rattlesnake master	interesting silvery greenish white ball-shaped inflorescences in mid-summer; foliage gray-green and yuccalike; upright growth habit	2	3	2.5
Heliopsis helianthoides (3–4) false sunflower	showy butter yellow disk and ray flowers in early to mid-summer; upright habit; reliable performer	3	3	3
Hierochloë odorata (0.5–1.5) vanilla grass	unattractive, spreading cool-season grass; panicles formed in early to mid-spring; suited to cool, moist to wet sites	1	1	1
Iris virginica var. *shrevei* (2–3) blue flag	pale blue flowers in spring; spreading upright fans of dull gray-green foliage; not competitive	2	1	1.5

Entry (height in feet)	Comments	1998 AV	1999 AV	Mean AV
Koeleria cristata (1–2.5) June grass	cool-season upright-growing grass; spikes emerge silver-green in late spring, becoming golden and then dirty brown; disappeared from most plots	1	1	1
Liatris aspera (2–4) rough blazing star	purple flowers on upright stems in late summer; plants are upright, but may topple over	3	1	2
Lythrum alatum (1–2) winged loosestrife	small purple flowers in mid-summer; upright grower; fine-textured foliage; too short to be showy	2	2	2
Monarda fistulosa (3–4) wild bergamot	pale purple flowers in early to mid-summer; upright growing; bright green hairy foliage	2	2	2
Penstemon digitalis (3) foxglove beard tongue	attractive white flowers in late spring and early summer; spreading plant; glossy green foliage sometimes becomes reddish in autumn	2	3	2.5
Pycnanthemum virginianum (3) common mountain mint	masses of dense white inflorescences in early to mid-summer; upright bushy plant with fine-textured medium-green foliage	2	3	2.5
Ratibida pinnata (3–5) yellow coneflower	yellow ray flowers with green-gold cone in mid-summer; medium-green foliage	3	2	2.5
Sanguisorba canadensis (2) American burnet	interesting white spikes in late summer on low-growing, spreading plants; inconspicuous	2	1	1.5
Siphium terebinthinaceum (1–6) prairie dock	yellow disk and ray flowers sit atop long stems above large, oval foliage rosettes; foliage is unattractive	1	1	1
Solidago rigida (3–6) stiff goldenrod	upright growth habit; bright yellow inflorescences in late summer	3	2	2.5
Vernonia fasciculata (3–4) common ironweed	dark purple inflorescences; shrublike upright growth habit	3	3	3
Veronicastrum virginicum (3) Culver's root	spirelike white inflorescences in early to mid-summer; upright growth habit	3	3	3

Table 2. 1998 and 1999 aesthetic value (AV) of native plants established in partial shade at three Chicago-area golf courses

Entry (height in feet)	Comments	1998 AV	1999 AV	Mean AV
Allium cernuum (1.5–2.5) nodding wild onion	drooping white-pink flowers on upright stems in mid- to late summer, spreading habit; flowered acceptably in both sun and shade	3	3	3
Aster macrophyllus (1–2) big-leaved aster	medium-green foliage; upright growth habit; inconspicuous white ray flowers with yellow disk flowers; clump enlarging	1	1	1
Aster novae-angliae (1–4) New England aster	purple ray flowers with golden disk flowers; generally more attractive in full sun than in filtered shade; clump enlarging	2	2	2
Carex crinita (1–2) fringed sedge	yellow-green branched foliage; unattractive	1	1	1
Carex frankii (1–2) bristly cattail sedge	vase-shaped habit; medium-textured, dull yellow-green foliage; yellow-green flowers	1	1	1
Carex grayi (1–2.5) common bur sedge	tufted habit; coarse yellow-green foliage; burlike inflorescence; unattractive	1	1	1

Entry (height in feet)	Comments	1998 AV	1999 AV	Mean AV
Carex muskingumensis (1–2) swamp oval sedge	medium-textured, yellow-green foliage of little appeal; uninteresting flowers in early summer; unattractive overall	1	1	1
Carex pensylvanica (0.5–1) common oak sedge	low-growing, fine-textured sedge; may be useful when massed as ground cover in light shade; copper brown flowers	2	2	2
Carex radiata (0.5–1) straight-styed wood sedge	tufted; fine-textured; inconspicuous yellow-green flowers in early summer; can be used in masses as attractive ground cover	2	2	2
Deschampsia caespitosa (1.5–3) tufted hair grass	cool-season grass; dark green tufted foliage; silver-green panicles fade to golden brown	2	2	2
Diarrhena americana (1.5–3) beak grass	coarse-textured, dark yellow-green foliage; interesting beak-shaped flowers in late summer; has leaf spot early in season	1	1	1
Dodecatheon meadia (1–1.5) shooting star	attractive, drooping white flowers in mid-spring; rosette-shaped foliage disappears in early summer	2	1	1.5
Elymus riparius (2–4) riverbank wild rye	upright growing; foxtail-like green flowers in mid-summer becoming tan-brown by early autumn; spreading growth; tolerates shade well	1	1	1
Elymus villosus (2–3) silky wild rye	upright growing; foxtail-like green flowers in mid-summer that become tan-brown by early autumn; spreading growth	1	1	1
Elymus virginicus (2–3) Virginia wild rye	upright growth habit; foxtail-like green flowers in mid-summer that become brown by early autumn	1	1	1
Eupatorium purpureum (1–4) purple Joe Pye weed	pale, dirty purple flowers in late summer; upright growth habit; yellow-green foliage	1	2	1.5
Festuca obtusa (1–1.5) nodding fescue	ephemeral grass flowering in spring and disappearing by early summer; disappeared from all sites after first growing season	1	1	1
Hystrix patula (2–3) bottlebrush grass	long-awned florets clustered at culm apex in mid-summer becoming tan at maturity; upright growth habit; tolerates shade well	2	2	2
Iris virginica var. *shrevei* (2–3) blue flag	pale blue flowers in spring; spreading upright fans of dull gray-green foliage	2	2	2
Juncus tenuis (0.5–1) path rush	fine-textured upright tufts of yellow-green leaves; yellow-green flowers in early summer; declined by late summer	1	2	1.5
Lobelia siphilitica (2–3) great blue lobelia	attractive medium-blue flowers on spikes; yellow-green foliage; upright grower; self-seeded into other plot areas	3	3	3
Phlox divaricata (0.5–1) blue phlox	spring-blooming blue-purple flowers; foliage disappears during summer, reappears as temperatures cool in autumn; most attractive when viewed from a short distance	2	2	2
Rudbeckia triloba (3) brown-eyed Susan	vigorous late summer blooms of golden ray flowers and brown disk flowers; upright growth habit, biennial life cycle; seedlings present in 1999	3	1	2

Entry (height in feet)	Comments	1998 AV	1999 AV	Mean AV
Solidago flexicaulis (1.5–3) broad-leaved goldenrod	small yellow flowers in late summer and early autumn; upright growing; attractive foliage	2	2	2
Solidago ulmifolia (2) elm-leaved goldenrod	interesting small yellow flowers on arching spikes in late summer and early autumn; short, upright grower; seeded itself into adjacent plot areas	2	2	2
Thalictrum dioicum (0.5–2) early meadowrue	attractive foliage; low growing; flowers inconspicuous and of little aesthetic value	1	1	1
Uniola latifolia (2–3) spike grass	flattened oatlike seed clusters turning copper brown in late summer; medium-green foliage; upright growth habit	2	3	2.5
Zizia aurea (2–3) golden alexanders	small yellow spring flowers; yellow-green foliage	2	2	2

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THE ILLINOIS POPULATIONS OF *PHAEOPHYSCIA LEANA*, ONE OF THE WORLD'S RAREST LICHENS

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ABSTRACT: New discoveries of several populations of the lichenized fungus *Phaeophyscia leana* in Illinois, Kentucky, Indiana, and Tennessee are reported, and its habitat and floristic status in Illinois are described. The Tower Rock, Illinois, population and habitat of *P. leana* are described in detail. At Tower Rock, 380 individual trees on a bottomland terrace along the Ohio River were sampled for *P. leana,* and 1,540 thalli were noted on 109 individual trees (29% of those sampled) of 11 different species. The habitat is in an area where the spring flood crests average 8 m above the normal pool level. As distance from the river increases, thalli are progressively fewer up an elevation gradient, displaying preferences for certain tree species and forming a discrete elevation band below the level of the spring flood crest. Other lichen associates were scant in this band, but were progressively more frequent immediately above the lower spring flood crest elevations. In an intensive survey of the populations in Illinois along the Ohio River, 5 additional populations that can be described as large and 11 smaller populations were discovered, all of which are vulnerable to the threat of changes in contemporary river hydrology.

INTRODUCTION

Worldwide, *Phaeophyscia leana* (Tuck.) Essl. is about as limited in its known distribution as any rare lichen. Until recently, it was known only from its type locality and believed to be extinct (Thomson 1963; Taylor 1967), until it was discovered 400 km farther west along the Ohio River at Tower Rock, Hardin County, Illinois, in 1978 (Skorepa 1984). Since Skorepa's discovery, several new locations have been determined, mostly in the lower Ohio River valley near the confluences of the Wabash and Cumberland rivers.

In 1994, appreciating the rareness of this species, the Illinois Department of Natural Resources commissioned the authors to research the status of populations in Illinois and to report on any and all known sites, which included a regionwide survey. We already had been doing demographic and habitat research on the species under the sponsorship of the U.S. Forest Service, Harrisburg, Illinois, which was also interested in the extent to which the Shawnee National Forest provided habitat (Wilhelm and Wetstein 1991).

The purpose of this paper is severalfold. *Phaeophyscia leana* is fairly specific in its habitat requirements, and it is highly unusual among lichenized fungi in that its substrate is in a zone of regular inundation by vernal freshwater flooding. Given the changing nature of Midwestern river hydrology today (Patchett and Wilhelm 1999), the population demography is recorded in great detail. This will allow future studies to easily track population changes. Also, given the unique and limited geographic range of the species, the current extent of the known inhabitancy of *Phaeophyscia leana* is provided so that comparisons may be made in the future.

TAXONOMY

The genus *Phaeophyscia*, an ascocarpous lichenized fungus with a lobed foliose thallus, resembles *Physcia* in that it has a lower cortex, a lecanorine exciple, and 1-septate spores with *Physcia*-type lumina. It is distinguished from *Physcia* and other allied genera, however, by the lack of atranorin in the cortex, a generally dark gray to brownish upper cortex, and a usually paraplectenchymatous and black lower cortex (Esslinger 1978). As currently delineated, the genus has 20 species in North America (Esslinger and Egan 1995). *Phaeophyscia leana* is characterized by an adnate, corticolous thallus with a white paraplectenchymatous lower cortex, a white medulla, elongate lobes mostly less than 2 mm wide, and an absence of specialized diaspores. The thalli have a mean diameter of 3.1 ± 1.9 cm (n = 1,530), ranging from 1 to 13 cm across. When dry, the thalli are a light gray-green (Royal Horticultural Society #196A) with a tinge of brown. With wetting, the thalli turn a bright apple green (R.H.S. #143C), which is easily visible on tree trunks from 25 m or more. *Phaeophyscia leana* was first described from the Thomas Lea collections that were made near Cincinnati, Ohio, from 1834 to 1844.

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[2] Division of Natural Heritage, Illinois Department of Natural Resources
Dixon Springs State Park, RR 2, Golconda, Illinois 62938

DISTRIBUTION

Skorepa (1984) reported that at the Tower Rock site, *Phaeophyscia leana* was restricted to trees within 70 m of the Ohio River, and occurred from the tree base to about 2.5 m up the trunk. He also noted that it tended to grow almost without other lichen associates on bark flooded by the spring high water, and that several other lichens grew on bark above the spring crest level. Skorepa described the Tower Rock site as parklike and estimated that the population was confined to an area of about 0.4 ha.

Since then, eight large populations have been identified, as well as seventeen additional locations at which one to several thalli have been noted. One of the larger populations is the Skorepa study site at Tower Rock in Hardin County. Five other large populations are known in Illinois, one along Bell Island north of Old Shawneetown, one north of Old Shawneetown at Round Pond, and three south of New Haven, all in Gallatin County. Another large population is 10.5 km north of Birdsville, Livingston County, Kentucky, and one other was discovered recently by Loy R. Phillippe, of the Illinois Natural History Survey, along the Caney Fork River, a tributary of the Cumberland River near Carthage, Smith County, Tennessee.

The largest known Illinois populations, those comprising thousands of thalli, are principally on *Quercus palustris, Q. pagodaefolia,* and associated trees that grow in the bottomland areas of old backwaters of the Wabash and Little Wabash rivers. The other large populations are along the Ohio River, one at Tower Rock, where it grows on a variety of trees along the river bank, mostly on *Populus deltoides* and *Carya illinoensis.* In all cases, this lichen grows below the more recent high-water marks, where other lichen species are essentially absent.

Of the Kentucky populations, the largest was found north of Birdsville in a bottomland swamp off of the Ohio River, where thousands of thalli were noted, mostly on the numerous trees of *Taxodium distichum.* Many of these trees have groups of coalesced thalli covering large portions of their trunks in what appears to be the zone just below the high-water mark. Just above the high-water mark, where *P. leana* is not found, several other species of lichens were evident. As the swamp changes to higher ground, numerous *P. leana* thalli are on several tree species, including *Acer negundo* and *Carya laciniosa,* which grow along the border of the swamp.

According to Phillippe (pers. comm.), the Tennessee population includes "thousands" of thalli on many different tree species along the Caney Fork River, just north of Bluff Creek. It was his impression that thallus occurrence was proportional to the number of individuals of trees rather than to a particular tree species. The only exception was a perceived rareness on *Platanus occidentalis.* He noted it from *Acer negundo, A. saccharinum, Celtis occidentalis, Fraxinus pennsylvanica* var. *subintegerrima, Populus deltoides, Ulmus americana,* and even on the vine *Aristolochia tomentosa.*

Eleven other locations in Illinois, mostly in Gallatin County, are known to support smaller populations of *Phaeophyscia leana.* In Gallatin County, there are 2 thalli at the base of a *Fraxinus pennsylvanica* var. *subintegerrima,* near the high-water mark at the Department of Natural Resources boat launch in New Haven, along the Little Wabash River; notwithstanding the type location in Cincinnati, Ohio, this location marks the northernmost known population. Just southeast of New Haven, southwest of Horseshoe Pond and Clark Pond, in old oxbows of the Little Wabash River, there is at each *Phaeophysica leana* location at least one tree of *Quercus pagodaefolia* that contains numerous thalli at or near the base. In Hardin County, the cottonwood trees (*Populus deltoides*) in the park east of the ferry landing at Cave-in-Rock support a small population, and another very small population was noted on *Carya cordiformis* and *Populus deltoides* at a defunct ferry landing near Elizabethtown, just west of the mouth of Big Creek. It is also scattered locally on trees along the Ohio River north of Sturgeon Island, near Finneyville. In Pope County, there are a few thalli on only one of several cottonwood trees at the south end of the fishing village just south of Golconda. Only a few thalli were seen in 1990 in the whole of Fort Massac State Park, Massac County, but none were seen after extensive surveys of the park bottomlands in 1994.

ADDITIONAL POPULATION SURVEYS

In 1994, an extensive survey of the Ohio and lower Wabash rivers included seventeen days of field work. Given the frequency of *Phaeophyscia leana* thalli encountered in Gallatin County, south of New Haven, it was postulated that they might be found in White County, north of New Haven. The Wabash River and its backwaters, where access was possible, were surveyed by automobile from Wabash to White counties. Extensive searches, however, including the large bottomland complex at Beall Woods, yielded neither populations nor individual thalli.

During a five-day reconnaissance by boat along the lower Ohio River, from New Haven to Cairo and its confluences with the Wabash, Tennessee, and Cumberland rivers, the portions of the river inaccessible by automobile were explored for *Phaeophyscia leana.* The survey was conducted in August, when the water levels were a little above the "normal pool level." Including the population at

Tower Rock, 7 populations, mostly small, were detected from the confluence of the Wabash River to the mouth of the Ohio River. The following notes summarize the course taken and observations made.

At the boat landing and parking lot at Cave-In-Rock, Illinois, there were a few thalli noted on large trees of *Populus deltoides* (Sighting 1). A search east of the village, where *Populus deltoides* populations were present, yielded no thalli; then we proceeded eastward from Grove Pits to Battery Rock, where there were mostly trees of *Acer saccharinum* and *Salix nigra.* The shores of Battery Rock are bedrock, and there was no *P. leana.* From Battery Rock to Sturgeon Island the trees were mostly *Acer saccharinum* and *Salix nigra*; no thalli were found.

From there, we explored the Saline River for about 2 km but found no thalli or suitable substrate. From the Saline River to Old Shawneetown, the land is nearly all in corn and soybeans up to the bank, which is slumping into the river. All along Bell Island, however, there were trees of *Populus deltoides* thinly inhabited by steadily occurring thalli of *P. leana*, mostly at elevations 3 to 5 m above the water line (Sighting 2); thalli were not noted on *Salix nigra* or *Acer saccharinum.*

We then turned up into the Wabash River for about 3 km, where there was mostly *Salix nigra* on the Illinois side and very little forest on the Indiana side. We returned to the Ohio River and encountered along the Kentucky side a few thalli among several trees of *Populus deltoides* in Union County, just opposite a creek that enters on the Illinois side, at the northeast corner of Section 12 T10S R9E (Sighting 3). We then followed the Kentucky shore to just south of Battery Rock, and returned to Cave-in-Rock along the Illinois side, noting scattered habitat throughout, but no *P. leana.*

We then put in at Elizabethtown, Illinois, heading upstream, but encountered no thalli of *P. leana* until Tower Rock (Sighting 4–studied population); although scattered potential habitat occurred, much of it was shaded by undergrowth. From Tower Rock to Cave-In-Rock there are mostly high bluffs to the water's edge. We crossed the river and searched along the Kentucky shore down to Elizabethtown; we encountered a few thalli on *Ulmus americana* at the southeast end of Hurricane Island, but none on *Populus deltoides,* which were present (Sighting 5).

From Elizabethtown to Rosiclare there are mostly high bluffs and rock to the water's edge, and mostly *Acer saccharinum* and *Salix nigra* from Rosiclare to Pierre Creek on larger sandbars. We noted no *Phaeophyscia leana* thalli. We diverted to the Kentucky side and explored Buck Creek for about 1 km, then back across the river to Grand Pierre Creek, where we explored up into Little Grand Pierre. There was very little cottonwood and some bald cypress, but no *P. leana.* There are high bluffs from Grand Pierre to Golconda; we noted a few thalli on one tree of *Populus deltoides* at south end of a fishing camp in Section 31 T13S R7E (Sighting 6).

The river banks from the fishing camp to the Bay Creek area are mostly in agriculture. We explored Bay Creek for about ½ km, but not much potential habitat was discovered. The landscape was mostly agriculture and young trees from Bay City to the Smithland Lock and Dam. We explored extensively the area at Fort Massac State Park, where *P. leana* had been recorded in a survey in 1990. There was good potential habitat along Massac Creek, insofar as we could discern, but no thalli were found. There was fairly plentiful potential habitat from Fort Massac State Park to Brookport, but no thalli were seen. From east of Brookport to Smithland Lock and Dam there are mostly young trees of *Acer saccharinum* and *Salix nigra,* but no thalli were seen. We headed upstream along the Kentucky shore and noted 3 thalli along the right bank of the Cumberland River about 3 km from its mouth, but many suitable cottonwoods were devoid of this lichen (Sighting 7).

There are large cottonwoods on Cumberland Island, but no thalli of *P. leana.* Cottonwoods are scattered along the Kentucky shore to the mouth of the Tennessee River, but *P. leana* was absent. There is also suitable habitat, it would seem, across from Brookport, but no thalli. There are frequent lines of old cottonwoods from Metropolis to Joppa, which we searched intensively, but to no avail. We went a short way up Post Creek Cutoff, but discovered no potential habitat. From Post Creek Cutoff to Lock and Dam 53, we noted little suitable habitat, and several intensive searches revealed no thalli.[3] We then searched the area up and downstream from Mound City, but the riverbanks from Olmsted to Cairo are increasingly dominated by industrial land uses. No thalli were seen.

DEMOGRAPHY OF *PHAEOPHYSCIA LEANA* AT TOWER ROCK

In a study of the population at Tower Rock, which was done over the winter of 1989–1990, we studied certain aspects of the demography of *Phaeophyscia leana,* the findings from which have been useful in locating other populations. Tower Rock is a 10 ha recreation area located on a bottomland terrace along the north side of the Ohio

[3] Ron Hall, U. S. Army Corps of Engineers Lock and Dam 53 director, informed us that water levels below Smithland Lock and Dam are much more erratic than above the dam, in part because of the confluences of the Cumberland and Tennessee rivers with the Ohio at Paducah. He noted also that the water levels are higher and laden with coarse sediments.

River, 6.5 km east of Elizabethtown, Illinois. The north side of the river is characterized by high, dissected bluffs that rise abruptly to nearly 40 m. The river is about 1 km wide in this area and is bordered by extensive bottomland along the south bank. The north bank of the Ohio River is eroding, and most of the trees that now are at the edge of the bank have exposed root systems, many of which support large colonies of *P. leana*. There are stumps along the water's edge from trees that had been drowned by a rise in normal (low-water) pool levels several years ago. Most of the *P. leana* population is confined to a 1.2 ha area on the terrace, mostly along the riverbank and around the mouth of an unnamed creek.

METHODS

A reconnaissance of the Tower Rock population of *P. leana* was conducted to determine its limits. Within those limits, all trees were identified and their positions relative to each other and the river were mapped. The trunks of coppiced trees were counted as individuals if the trunks started at or near the base. The diameter at breast height of each tree was also recorded.

We investigated the location of the thalli relative to the spring flood crest levels and the extent to which the recent raising of the normal pool level altered annual flood crests. In addition, we evaluated corticolous substrate preferences, noted distances from the river; and measured thallus diameter, aspect on the tree, elevation above the normal pool level, and elevation above the tree base. A general survey of corticolous lichens in the immediate area was conducted to determine lichen associates. Nomenclature follows Esslinger and Egan (1995); vascular plant nomenclature follows Mohlenbrock (1986).

The diameter of each thallus was measured to the nearest centimeter. When the thallus was oblong in shape, a visual estimate was made as to its average diameter. When a thallus was eroded at the center and only portions of the perimeter remained, the perimeter became the default diameter. Where tree girth had expanded sufficiently to separate an original thallus into 2 isolated portions, each portion was counted as a thallus. In some instances, small thalli appeared to be next to or commingled with eroded older thalli; these were measured as separate thalli. Thallus color for both wet and dry states was compared with the shades on the Royal Horticultural Society (1986) color chart. Information on annual flood crest data from 1937 to 1990 was obtained from the U.S. Army Corps of Engineers, Louisville, Kentucky, which also provided information on dam removal and replacement, as well as distances from the dam — to gauge locations along the river.

The available corticolous surface area, that is, potential substrate for *Phaeophyscia leana,* was calculated for each tree species sampled. Because no thallus was observed to grow higher than 3.7 m up the trunk, the height limit for each tree was either 3.7 m or the difference between the base elevation of the tree and the elevation of the spring crest in 1989, whichever was shorter. The height datum was combined with the DBH datum to arrive at the available surface area for each tree.

The base elevation of the normal pool stage was determined to be 98.8 m above mean sea level (MSL). The elevation of each tree above normal pool stage was then calculated at the base of its northern aspect. For many trees along the interface with the river, the southern aspect was so eroded as to render the ground elevation as much as 2 m below the northern aspect. Where trees grew on natural slopes, the southern aspect was as much as several centimeters below the northern aspect.

Thallus elevation was measured using the base of the northern aspect of the tree as the starting point. The elevation of each thallus was measured from the base of the tree to the thallus center. The elevation of the thallus was then added to the elevation of the tree base to determine the position of the thallus above the normal pool level. In some instances, elevation measurements were difficult to determine and have some degree of error, probably $\pm$ 5 cm, primarily due to the position of the tree either on a slope or on the eroded river bank.

RESULTS AND DISCUSSION

From 1937 to 1981, the normal pool level at Tower Rock, about 94.5 m above mean sea level (MSL), was controlled by the Golconda Dam, which was located 29 km downriver. During the first 6 months of each year, however, meltwaters and spring rains brought floodwaters as high as 14.5 m above the normal pool level at Golconda. The river, under such conditions, was sloped, and the head loss from Tower Rock to Golconda was 2.7 m. Peak annual flood waters had averaged 106.1 $\pm$ 2.0 m above MSL since 1937. The month before Skorepa made his observations on the *P. leana* population in April of 1978, the river at Tower Rock had risen to 106.7 m above MSL.

In 1981, the Golconda Dam was replaced by a higher dam at Smithland, 53 km downriver from Tower Rock. Since then, the normal pool level has been 98.8 m above MSL, an increase of 4.3 m. For much of the year, the head loss from dam to dam is negligible, rendering the pool slope virtually flat. Because of the increase in the normal pool level, trees were inundated and killed, and presumably the *P. leana* population has had to adjust. The flood crest in February 1989 was 106.9 m above MSL, and the average over the decade prior to our observations had been 105.5 ± 1.3 m. Interestingly, because of the immense storage volume of the floodplain and negligible volume of the main channel, annual water level fluctuations along the Ohio River have dampened, and mean annual crest elevations seem not to have been much affected.

Of the 17 species of trees sampled at Tower Rock, including 380 individuals within the general population limits of *P. leana,* 11 supported nearly all of the 1,530 thalli of *P. leana* that were noted during the study. Potential available substrate area below the average spring flood crest elevation (106 m) was 452.6 m^2; lichen thalli covered a total of 1.6 m^2 (0.35%).

There was an obvious avoidance of the northern quadrant of the trees, regardless of tree species or individual tree location. Although aspect preferences varied substantially with individual tree species, 41% of the thalli occurred on the south aspect of the trunk, facing the river, and 35% were on the east. Sixteen percent of the thalli were on the west side, and only 8% were on the north. Thalli were progressively fewer on trees as distance increased from the river's edge and up the elevation gradient.

Thallus position on the trees ranged from ground level, where *P. leana* sometimes grew on the upper surfaces of exposed roots, to as high as 3.7 m up the trunk. The average elevation of thalli above the base of the tree diminished progressively up the elevation gradient. Ninety-five percent of all the thalli were within a vertical zone 4.3 – 8.4 m above the normal pool level. Ninety-eight percent were found below the level of the 1989 spring crest (106.9 m above MSL) and within the standard deviation range of the average annual crest over the last 9 years. Eighty-four percent of all thalli were on 3 tree species, and 60% of those thalli were on 9 individual trees: 5 individuals of *Populus deltoides* and 2 each of *Carya illinoensis* and *Liquidambar styraciflua* (table 1).

The tree most remote from the river within the population limit was 126 m from the bank; base elevations of trees ranged from 0.4 to 8.5 m above the normal pool level. Six taxa of trees were represented by only one or 2 individuals: *Cercis canadensis, Crataegus* sp., *Gleditsia triacanthos, Juglans nigra, Quercus prinoides* var. *acuminata,* and *Robinia pseudoacacia.* None of these 6 trees had thalli of *P. leana.* The 11 other tree species, totaling 109 individuals (29% of those sampled), had from 2 to 649 thalli.

The most common of the tree species was *Acer saccharinum,* which had a relative abundance of 30%. Other species, in order of their relative abundance, were *Celtis occidentalis* (14), *Carya illinoensis* (11), *Ulmus americana* (9), *Platanus occidentalis* (8), *Populus deltoides* (8), *Acer negundo* (5), *Liquidambar styraciflua* (5), *Diospyros virginiana* (4), *Maclura pomifera* (3), and *Fraxinus pennsylvanica* var. *subintegerrima* (1). Two individuals of *Maclura pomifera* had only one thallus each of *P. leana,* which are not included in the following analyses. The other 10 tree species and their inhabitancy by *P. leana* are shown in table 2. The average distance of lichen-inhabited trees from the river was 44 ± 24 m, though nearly half of all thalli were on trees 24 ± 18 m from the river.

The 10 tree species (107 individuals) that provided suitable substrate for *P. leana* formed 4 population cohorts, which are describable generally in accordance with trunk diameter, elevation above the normal pool level, and distance from the river's edge (table 2).

Cohort 1. *Populus deltoides, Platanus occidentalis,* and *Acer saccharinum* made up a group of large-diameter trees (49 ± 20 cm DBH) that grew 35 ± 26 m from the river, in a zone that has been inundated annually since 1937. These

Table 1. Measurements and lichen data from 9 trees along the Ohio River at Tower Rock, each with 48 or more thalli of *Phaeophyscia leana,* arranged by distance from the river

Tree species	Distance from river (m)	DBH (cm)	Tree base elevation above river (m)	Range thalli elevation (m)	Thalli by aspect				Thalli per tree
					S	W	N	E	
Populus deltoides	10	67	2.8	3.1–6.0	51	3	7	25	86
Populus deltoides	10	91	3.6	4.0–7.2	7	20	7	78	112
Populus deltoides	12	90	3.6	3.8–6.6	87	1	3	64	155
Populus deltoides	18	103	4.1	4.3–6.4	44	5	1	21	71
Populus deltoides	25	81	4.6	4.7–6.3	5	29	2	17	53
Carya illinoensis	48	39	5.4	5.5–7.3	108	73	8	29	218
Liquidambar styraciflua	48	24	5.5	5.9–7.0	46	19	13	35	113
Liquidambar styraciflua	54	18	5.9	6.1–6.4	19	10	7	12	48
Carya illinoensis	87	30	7.7	7.8–8.8	40	0	1	19	60

trees constituted 46% of all measured trunks and had an average base elevation of 4.4 ± 1.1 m above the normal pool level. Eighty percent of the thalli were on 12 out of 13 trees that were within 20 m of the river. Only 9 out of 17 more remote trees had the lichen. Forty-eight percent of all *P. leana* thalli were on these trees; all of them were below the level of the spring crest elevation of 1989.

Cohort 2. *Carya illinoensis* and *Ulmus americana* formed a group of small to medium-sized trees (31.4 ± 10.7 cm DBH) on the bottomland terrace, a zone that has received floodwaters 7 to 8 years out of 10 since 1937. These tree species accounted for 20% of all the trees in the study area. Their average base elevation was 5.1 ± 1.7 m above the normal pool level, and they averaged 48.8 ± 32.6 m from the river. Thirty-one percent of all thalli were on these trees. Ninety-two percent of the thalli were below the level of the spring crest of 1989.

Cohort 3. *Acer negundo, Diospyros virginiana,* and *Liquidambar styraciflua* formed a group of small trees (27.9 ± 10.1 cm DBH) situated a little higher on the terrace, about 50 m from the river's edge. This area of the floodplain has received floodwaters 6 out of 10 years. These trees constituted 14% of all trees sampled, with an average base elevation of 5.5 m above the level of the normal pool. Nineteen percent of all thalli were in this cohort, and all of these were below the level of the spring crest of 1989.

Cohort 4. *Celtis occidentalis* and *Fraxinus pennsylvanica* var. *subintegerrima* constituted a group of small trees (21.9 ± 9.0 cm DBH) that were high on the terrace and relatively remote from the river, 75 ± 23 m. The bases of these trees have been inundated 2 to 3 out of 10 years since 1937. They had average base elevations 6.9 ± 1.3 m above the normal pool level. Only 3% of all thalli were on these trees. No more than 10% of these thalli grew above the level of the spring crest of 1989. In this cohort, *Phaeophyscia leana* grew in a narrow elevation range averaging 7.2 ± 0.5 m above the normal pool level.

Phaeophyscia leana appeared to exhibit a preference for individual tree species (table 2), but variations in tree diameters and relative abundance in the study area complicate a preference analysis. *Populus deltoides* had 14 times more thalli than *Acer negundo,* but only slightly more of its potential available bark surface was covered. *Liquidambar styraciflua* had one-third the number of thalli that *Populus deltoides* had, but nearly two-thirds more of its potential available surface was covered. *Carya illinoensis* was the next most inhabited, but 90% of its thalli were on trees outside of the zone occupied by *P. deltoides* (Cohort 1), even though half of the individuals of *C. illinoensis* grew within Cohort 1.

It would appear that at Tower Rock *Phaeophyscia leana* exhibits predilections for certain tree species and individuals within the floodplain community, depending upon the tree's context. There was, however, an inexplicable absence or paucity of thalli in apparently similar habitat at Tower Rock and at numerous other locations along the river. The largest populations of *P. leana* in Illinois are on *Quercus palustris* in the backwater oxbows of the Little Wabash River; in Kentucky, the largest population is on *Taxodium distichum* in an old oxbow of the Ohio River. The

Table 2. Demography and size of *Phaeophyscia leana* thalli on 107 trees along the Ohio River at Tower Rock, arranged by total thallus area within each of 4 cohorts

Tree species	% trees w/thalli	% of all thalli	Total thallus area (cm^2)	% of bark area	Average thallus diameter (cm)	Distance above tree base (m)	Average thallus elevation	
							Low	High
Cohort 1								
Populus deltoides	70	42	6677	0.37	3.1 ± 1.9	1.9 ± 0.9	4.8 ± 0.9	6.1 ± 0.7
Acer saccharinum	18	5	921	0.10	3.3 ± 2.3	0.8 ± 0.6	5.4 ± 0.7	5.8 ± 0.4
Platanus occidentalis	20	1	101	0.03	3.0 ± 2.3	0.8 ± 0.7	5.8 ± 0.5	6.0 ± 0.4
Cohort 2								
Carya illinoensis	43	27	4032	0.79	3.0 ± 1.8	0.9 ± 0.8	5.8 ± 1.0	6.5 ± 1.1
Ulmus americana	24	4	663	0.28	3.4 ± 1.9	0.6 ± 0.6	5.7 ± 1.3	6.1 ± 1.4
Cohort 3								
Liquidambar styraciflua	63	15	2370	0.95	3.1 ± 1.8	0.3 ± 0.6	6.5 ± 0.3	6.8 ± 0.5
Acer negundo	37	3	726	0.33	3.8 ± 2.5	0.6 ± 0.6	6.5 ± 0.3	6.8 ± 0.2
Diospyros virginiana	40	1	111	0.12	2.7 ± 1.4	0.6 ± 0.5	6.2 ± 0.5	6.6 ± 0.5
Cohort 4								
Celtis occidentalis	11	1	185	0.23	3.3 ± 1.3	0.0 ± 0.0	7.0 ± 1.0	7.8 ± 0.7
Fraxinus pennsylvanica	60	2	121	0.30	2.2 ± 1.1	0.1 ± 0.1	7.1 ±0.4	7.2 ± 0.4

parameters and statistics noted for the Tower Rock location are site specific, but the study does show that the inhabitancy of *P. leana* in the Ohio bottoms is complex and evidently responding to factors beyond our ability to discern. There have been no demographic studies on any of the other populations, but each of them demonstrates a site-specific character that enlarges our understanding of the contemporary floristics of this globally rare lichen.

Generally, all of the known Illinois populations of *Phaeophyscia leana* are along or near the floodplain of the Ohio River, above the lock and dam at Smithland, Kentucky, and below the dam at Uniontown, Kentucky. The lichen grows in an elevation zone where the spring flood crests average 8 m above the "normal" pool level of the Smithland dam. As distance from the river increases, thalli become progressively fewer in number up the elevation gradient, displaying preferences for certain tree species and forming a discrete elevation band below the level of the spring flood crest. Other lichen associates are scant in this band, but are progressively more frequent at higher elevations.

LICHEN ASSOCIATES

In a survey of other corticolous lichens in the Tower Rock area, 48 additional species of lichenized fungi were noted (table 3). One of these was the unknown *Rinodina* species mentioned by Skorepa (1984), which still remains without an epithet as far as we know. The *Rinodina* thalli are well developed; their spores are about 16 microns long with globose lumina. This lichen appears to be a regular associate of *Phaeophyscia leana*, particularly along the Ohio River.

In addition to the *Rinodina,* 13 other lichen species were noted at the Tower Rock location as associates of *P. leana* below the spring high-water level (table 4). In most cases, the thalli were small and present at scattered locations. Of the 107 trees that bore thalli of *P. leana*, 29 supported one or more associate lichen species. Nineteen of these trees (66%) had thalli of *Physcia millegrana,* and 18 had *Candelaria concolor;* together, these lichens constituted 47% of all lichen associate occurrences. *Punctelia rudecta* occurred on 12 of the trees and accounted for 15% of all the occurrences. Lichen associate frequency increased up the elevation gradient. At the level of the 1989 spring crest, about 8.1 m above the level of the normal pool, other species of lichens became important and covered some of the tree trunks in the prolific manner characteristic of southern Illinois.

HABITAT THREATS AND POPULATION VULNERABILITY

Virtually all of the populations discovered along the shores of the Ohio River itself appear to have little possibility of persisting indefinitely. The irregular, high-volume floods, combined with the large wakes of river traffic, are eroding the shorelines at a rate much faster

Table 3. Additional lichenized fungus species at the Tower Rock study site that grow on corticolous substrates

Amandinea punctata (Hoffm.) Coppins & Scheid.
Anisomeridium biforme (Borrer) R. C. Harris
Buellia stillingiana J. Steiner
Caloplaca cerina (Hedwig) Th.Fr.
Candelaria concolor (Dickson) Stein
Candelariella reflexa (Nyl.) Lettau
Candelariella xanthostigma (Ach.) Lettau
Canoparmelia crozalsiana (B. de Lesd. *ex* Harm.) Elix & Hale
Cladonia sp. [squamules with fumarprotocetraric acid]
Flavoparmelia caperata (L.) Hale
Graphis scripta (L.) Ach.
Heterodermia albicans (Pers.) Swinscow & Krog
Heterodermia granulifera (Ach.) Culb.
Heterodermia speciosa (Wulfen) Trev.
Hyperphyscia syncolla (Tuck. *ex* Nyl.) Kalb
Hypotrachyna livida (Taylor) Hale
Lecanora hybocarpa (Tuck.) Brodo
Lecanora strobilina (Sprengel) Kieffer
Lepraria lobificans Nyl.
Lepraria sp. #1 (*sensu* Wilhelm 1998)
Loxospora pustulata (Brodo & Culb.) R. C. Harris
Myelochroa aurulenta (Tuck.) Elix & Hale
Myelochroa galbina (Ach.) Elix & Hale
Opegrapha vulgata Ach.
Parmotrema hypotropum (Nyl.) Hale
Phaeophyscia cernohorskyi (Nádv.) Essl.
Phaeophyscia ciliata (Hoffm.) Moberg
Phaeophyscia hirtella Essl.
Phaeophyscia pusilloides (Zahlbr.) Essl.
Phaeophyscia rubropulchra (Degel.) Moberg
Physcia americana G. K. Merr.
Physcia millegrana Degel.
Physciella chloantha (Ach.) Essl.
Physconia detersa (Nyl.) Poelt
Physconia kurokawae Kashiw.
"*Porina pulla* (Ach.) Müll. Arg."
Punctelia missouriensis Wilhelm & Ladd
Punctelia rudecta (Ach.) Krog
Pyxine sorediata (Ach.) Mont.
Pyxine subcinerea Stirton
Ramalina unifolia J. W. Thompson
Rimelia reticulata (Taylor) Hale & Fletcher
Rinodina ascociscana Tuck.
Rinodina subminuta Magn.
Rinodina sp.
Scoliciosporum chlorococcum (Stenh.) Vězda
Usnea mutabilis Stirton
Xanthoria sp. #1 (*sensu* Wilhelm 1998)

than trees of suitable size are being replaced. Another critical aspect of the habitat of *P. leana* is the fact that it grows on the lower trunks and bases of trees that are not shaded by understory or heavy growth of ground-cover vegetation. All the major Illinois populations are in areas such as boat landings or parklike areas where a maximum amount of light coincides with old-growth trees. Such areas are maintained by mowing or regular brush removal. If such activity were to cease, there is a likelihood that those large populations would disappear. One *P. leana* site, situated in a large tract of bottomland forest, is confined to the well-lit margins, which at the time of the study were free of significant edge shrubbery.

Given the rareness of this lichen in Illinois, and the tenuous ecological contexts in which its populations persist, it would seem that the long-term existence of *P. leana* is endangered. At the federal level, further study is needed to determine its range and habitat parameters outside of the lower Ohio River region.

Table 4. Lichen associates of *Phaeophyscia leana* at Tower Rock at elevations below spring flood crests, in descending order of importance

Occurrences	%	Species
19	24	*Physcia millegrana*
18	23	*Candelaria concolor*
12	15	*Punctelia rudecta*
6	8	*Candelariella xanthostigma*
6	8	*Phaeophyscia rubropulchra*
4	5	*Physcia americana*
4	5	*Rinodina* sp.
3	4	*Physciella chloantha*
1	1	*Heterodermia speciosa*
1	1	*Lepraria lobificans*
1	1	*Lepraria* sp. #1
1	1	*Phaeophyscia cernohorskyi*
1	1	*Physconia detersa*
1	1	*Pyxine subcinerea*

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REPRESENTATIVE HERBARIUM SPECIMENS

The following specimens are provided to document the known locations of populations of *Phaeophyscia leana*. They all have been examined by the authors and include the complete label data. All specimens are at the Morton Arboretum herbarium (MOR) unless otherwise indicated as housed in the following herbaria:

BALT Towson State University, Baltimore, Md.
ILLS Illinois Natural History Survey, Champaign, Ill.
US The United States National Herbarium, Washington, D.C.
WIS University of Wisconsin, Madison, Wis.

ILLINOIS

Gallatin County

Wilhelm & J. Shimp 22326, 22 AUG 1994; about 3 miles north of Old Shawneetown, along edge of Bell Island, mostly 3–5 m above water, which is not at normal pool elev.; thin but steady population on *Populus deltoides* for more than a mile.

Wilhelm & Masters 22336, 30 AUG 1994; 10 miles east of Ridgway, 10 miles south-southeast of New Haven, at the south end of Hulda Lake, an old oxbow of the Little Wabash River.

Wilhelm & Masters 22339, 30 AUG 1994; 10 miles east of Ridgway, 9 miles south-southeast of New Haven, east of Hulda Lake, an old oxbow of the Little Wabash River, off east side of county road, along south edge of woodland; on *Quercus palustris.*

Wilhelm & Masters 22343, 30 AUG 1994; about 3 miles southeast of New Haven, at the north end of Beaver Pond, an old oxbow lake of the Little Wabash River, east of country road; on *Quercus palustris.*

Wilhelm & Masters 22346, 30 AUG 1994; in New Haven, at the Department of Conservation boat launch into the Little Wabash River, at base of *Fraxinus pennsylvanica* var. *subintegerrima* near high-water mark.

Shimp 5269, 5 SEP 1994; south end of Big Lake, 2.5 miles northeast of Old Shawneetown, SW SW Sec. 21 T9S R10E; on *Carya illinoensis* in seasonally flooded bottomland hardwood forest.

Shimp 5270, 5 SEP 1994; west side of Long Pond 5 miles northeast of Old Shawneetown, SE SE Sec. 9 T9S R10E; on *Populus deltoides* in hardwood forest dominated by *Acer saccharinum, Fraxinus pennsylvanica subintegerrima,* and *Populus deltoides.*

Shimp 5271, 5 SEP 1994; southwest of Cow Pond slough, 5.25 miles north of Old Shawneetown, growing on *Acer rubrum* in bottomland forest dominated by *Acer rubrum.*

Shimp 5272, 5 SEP 1994; south of Hulda Lake, 9 miles east of Ridgway, growing on *Quercus pagodaefolia,* at an old home site with other open-grown bottomland species; *Quercus palustris, Q. macrocarpa, Carya laciniosa,* and *Fraxinus tomentosa.*

Shimp 5273, 5 SEP 1994; southwest of Horseshoe Pond, 2.5 miles southeast of New Haven, growing along the road on *Quercus pagodaefolia* in disturbed floodplain forest.

Shimp 5274, 5 SEP 1994; southwest of Clark Pond, 1.75 miles southeast of New Haven, growing along road on *Quercus pagodaefolia* in disturbed bottomland hardwood forest.

Hardin County

Skorepa 11975, APR 1978; near Elizabethtown, at Tower Rock, on *Populus deltoides.* (BALT, US, WIS)

Wilhelm & Masters 17802, 16 OCT 1989; about 5 miles east of Elizabethtown, at Tower Rock Recreation Area, at picnic area; SE Sec. 20 T12S R9E; on *Liquidambar styraciflua.*

Wilhelm & Masters 18770, 16 DEC 1990; at Elizabethtown, west of the mouth of Big Creek, at old ferry landing; in SW Sec. 27 T12S R8E; on *Carya cordiformis.*

Wilhelm & Masters 18802, 17 DEC 1990; in Cave In Rock, in park area just east of the ferry landing, occasional on cottonwoods near the river.

Shimp & Basinger 5386, 18 SEP 1994; R10E T11S Sec. 21, NE, SE, NE, Dekoven 7.5' topo, growing on *Liquidambar styraciflua* in flood plain forest adjacent to the Ohio River; also growing on *Quercus palustris, Carya laciniosa,* and *Populus deltoides.*

Shimp & Basinger 5387, 18 SEP 1994; R10E T11S Sec. 21, SE, NE, Dekoven 7.5' topo, growing on a isolated tree of *Populus deltoides* on sandy bank of Ohio River.

Massac County

Wilhelm & Masters 18772, 17 DEC 1990; near Metropolis, at Fort Massac State Park; rare on *Populus deltoides* near the river, west of where Massac Creek empties into the Ohio River.

Pope County

Wilhelm & J. Shimp 22332, 23 AUG 1994; about 1 mile south of Golconda, along Ohio River, at south end of fishing village, on one of several trees of *Populus deltoides;* SW Sec. 31 T13S R7E.

INDIANA

Posey County

Shimp & Shimp 5391, 18 SEP 1994; 5.5 miles southeast of New Haven, Illinois, growing on *Populus deltoides* in floodplain forest along the Wabash River.

KENTUCKY

Crittenden County

Wilhelm & Masters 18801, 17 DEC 1990; at Tolu, west of the mouth of Hurricane Creek, west of the boat landing; rare on *Populus deltoides.*

Wilhelm & J. Shimp 22331, 23 AUG 1994; north of Tolu, at SE end of Hurricane Island, on *Ulmus americana;* not on several neighboring trees of *Populus deltoides.*

Livingston County

Wilhelm & Masters 18800, 17 DEC 1990; about 4 miles west of Joy, at the west end of Rte. 133, east of the boat landing opposite Golconda, Illinois; rare on *Populus deltoides.*

Wilhelm & Masters 18797, 17 DEC 1990; about 6.3 miles north of Birdsville, west of Rte. 137 in Cypress swamp; frequent on *Carya laciniosa* near the swamp.

Wilhelm & J. Shimp 22333, 24 AUG 1994; northeast of Smithland, along west bank of Cumberland River, about 2.5 miles above its mouth; only 3 thalli noted on about 100 trees.

Wilhelm & J. Shimp 22334, 24 AUG 1994; about 1 mile north of Bayou, west of Rte. 137, along east edge of long slough; on *Taxodium distichum.*

Union County

Wilhelm & J. Shimp 22329, 22 AUG 1994; along Ohio River, on *Populus deltoides,* about 1.5 miles downstream from bridge to Old Shawneetown, Illinois.

OHIO

Hamilton County

Lea s.n., 14 MAY 1839; on the bark of a large tree in Riddley's Bog toward Barnet's. (PH)

Lea s.n., 19 JUL 1849; growing among moss on trunk of a large tree. (US)

Lea s.n., 1839; near Cincinnati. (MICH)

Lea s.n., 1839; Burnet Woods, Cincinnati. (MICH)

Lea s.n., 1839; Ohio. (MINN)

TENNESSEE

Smith County

Phillippe L40, 19 NOV 1990; south of Carthage, 2–3 miles up the Caney Fork River from the Cumberland River, along the south bank; on *Acer negundo.* The lichen grows below the level of highwater on *Acer saccharinum, Fraxinus pennsylvanica* var. *subintegerrima, Acer negundo, Celtis occidentalis, Populus deltoides, Ulmus americana, Aristolochia serpentaria,* and *Salix nigra.*

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Some Notable Plant Records From East-Central and Southern Illinois

Gordon C. Tucker[1]

Introduction

The purpose of this paper is to document the occurrence of several species new to the Illinois state flora. Also included are county records for some species new to east-central and southern Illinois (roughly, but not exclusively, the area from Vermilion, Champaign, and Piatt counties southward). In general, specimens were collected by the author or some of his students at Eastern Illinois University. Subsequent searches of collections at EIU, ILL, ILLS, and ISM turned up several additional collections of these same species noted below as new state, regional, or county records.

Nomenclature generally follows Gleason and Cronquist (1991) or other recent works individually noted. Distribution information within Illinois follows Mohlenbrock and Ladd (1978) or Swink and Wilhelm (1994). Distribution information for other states comes from Gleason and Cronquist (1991) or USDA, NRCS (1999).

Fern Allies

Lycopodium digitatum A. Braun [*Diphasiastrum digitatum* (A. Br.) Holub] (Lycopodiaceae)

Clark Co., Westfield, Clarksville Rd., SE S27 T12N R14W, ash and sugar maple woods, 11 June 1999, *Tucker 11706* (EIU, GH, ILLS, NYS); N of Martinsville, first terrace W of N Fork of Embarras River, SE S24 T11N R14W, 19 May 1988, *Phillippe 13180* (EIU, ILLS).

This clubmoss has not previously been reported from Clark County.

Gymnosperms

Taxodium distichum (L.) Rich. (Cupressaceae)

Vermilion Co., Kickapoo State Park, Clear Lake near boat launch, 6 September 1997, *Tucker 11436* (EIU) and Inland Sea boat launch near Emerald Pond, *Tucker 11440* (EIU, ILLS).

Coles Co., EIU Campus, near Tarble Art Center, volunteers in flower beds near planted trees, 14 October 1996, *Tucker 11253* (EIU).

Bald cypress has not previously been reported north of Lawrence County. The collections from Kickapoo State Park were made about 1 mile apart. The collection from Clear Lake represents saplings up to 2 m tall, located about 100 m from several planted mature trees. The collection from Inland Sea, however, had no planted trees anywhere in the vicinity.

Dicotyledons

Celosia argentea L. (Amaranthaceae)

Coles Co., Charleston, EIU Campus, S of softball field, abundant in area where compost and topsoil are dumped, 13 September 1998, *Tucker 11583* (BKL, EIU, GH, ILLS). Also observed as weed at electric substation on west edge of campus.

Celosia argentea (cockscomb) is a new state record. It has been reported from the adjacent states of Kentucky and Indiana (USDA, NRCS 1999). Several specimens at ILL and ILLS represent cultivated plants.

Apium leptophyllum (Pers.) F. Muell. (Apiaceae)

Effingham Co., Effingham, Rte. 32 N of I-70, weed in landscape planting, 27 September 1997, *Tucker 11456* (EIU).

Apium leptophyllum is a new state record. This tropical and warm temperate species is widely distributed in the mid-Atlantic, southeastern, and southwestern U.S. It was mentioned in passing by Gleason and Cronquist (1991) without attribution to any states in their manual's range. It was not attributed to any Midwestern state by USDA, NRCS (1999).

Cardamine flexuosa Withering (Brassicaceae)

Coles Co., Charleston, Madison Ave. and 9th St., St. Charles Borromeo Roman Catholic Church, weed in planters, 24 June 1999, *Tucker 11783A* (EIU); Lerna, CR 1200E, SE S24 T12N R8E, weed in garden, 19 March 2000, *Tucker 12002* (EIU).

Cardamine flexuosa is a new state record. A native of Eurasia, this species is widely distributed in the southeastern and mid-Atlantic states, ranging from Florida and North Carolina (Al-Shehbaz 1988) as far north as New York (Mitchell and Tucker 1997). In the Midwest, it has been reported from Indiana, Michigan, and Ohio (USDA, NRCS 1999). This species is easily confused with the common *C. hirsuta* L. Both have ciliate petioles and the lowermost leaves with suborbicular lobes, which distinguishes them from other biennial or annual species of *Cardamine* (Al-Shehbaz 1988). They can be distinguished as follows (key based on Fernald, 1950):

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1. Stem flexuous, hirsute especially above; cauline and basal leaves similar; leaflets 4–20 mm wide; stamens 6. . . . . *C. flexuosa*
1. Stem stiffly erect, glabrous; cauline and basal leaves dissimilar; leaflets 0.5–4 mm wide; stamens usually 4. . . . . *C. hirsuta*

LOBULARIA MARITIMA (L.) Desv. (Brassicaceae)

Coles Co., Charleston, EIU Campus, weed in gravelly edge of parking lot near 7th St., 4 November 1996, *Tucker 11257A* (EIU).

Sweet alyssum has been reported previously from the Chicago area, Champaign County, Hancock County, and McDonough County (Mohlenbrock and Ladd 1978; Swink and Wilhelm 1994; Mohlenbrock 1985).

CASSIA TORA L. [*Senna tora* (L.) Roxb.] (Caesalpiniaceae)

Coles Co., Charleston, Reasor Ave. near Rte. 130 on N edge of city, NW S2 T12N R9E, railroad cinders, 9 September 1996, *Tucker 11237* (EIU).

There are few records of this legume in Illinois: Mohlenbrock and Ladd (1978) listed Wabash, Jackson, Pulaski, and Lake counties; Swink and Wilhelm (1994) also listed Cook County; Mohlenbrock (1985) added Clinton County.

SAGINA JAPONICA (Sw.) Ohwi (Caryophyllaceae)

Coles Co., Charleston, 1049 11th St., 28 May 1997, *Tucker 11273* (EIU); 1400 Block of 7th St., 14 June 1997, *Tucker 11275* (EIU, ILLS, ISM) ; 7th St. and Buchanan Ave., 24 June 1999, *Tucker 11731* (EIU).

A new record for the state, Japanese pearlwort is widely distributed in the Northeast (Mitchell and Tucker 1991). This east Asian species has also been reported from northwestern Ohio (Rabeler 1996). Japanese pearlwort can be distinguished from the other Illinois species of *Sagina* as follows (key derived from Mitchell and Tucker, 1992):

1. Flower parts in 4s (rarely 5s on the same plant); sepals reflexed in fruit; matted wiry perennials, spreading by offshoots. . . . . *S. procumbens*
1. Flower parts primarily in 5s (rarely 4s on the same plant); sepals erect or appressed in fruit; annuals with erect-ascending (or decumbent), often capillary stems and slender taproots, not strongly tufted, not spreading by offshoots.
   2. Leaves with cilia at base. . . . . *S. apetala*
   2. Leaves glabrous at base.
      3. Seeds pale brown, triangular, with a dorsal groove; capsules longer than broad; pedicels and sepals glabrous (occasionally sparsely glandular); leaves not succulent. . . . . *S. decumbens*
      3. Seeds dark brown to black, plump, ellipsoid-ovoid, lacking a dorsal groove; capsules globose; pedicels and sepals glandular; leaves succulent. . . . . *S. japonica*

CELASTRUS ORBICULATA Thunb. (Celastraceae)

Effingham Co., Summit Township, S23 T8N R5E, *Matthew E. Brooks 85* (EIU).

Hardin Co., 1/8 mi. N of Elizabethtown on Watson Lane, S27 T12S R8E, 29 September 1997, *Garrison Gross 84* (EIU). An earlier collection was apparently not seen by Mohlenbrock and Ladd (1978): Hardin Co., Peters Creek Fire Tower, 19 June 1962, *Evers 74244* (ILLS), originally identified as *C. scandens*, reidentified by Evers in 1973.

Asiatic bittersweet has been reported previously from Piatt County in eastern and east-central Illinois and from Jackson and Union counties in southern Illinois. It is cited from several counties in northeastern Illinois (Swink and Wilhelm 1994).

EUONYMUS FORTUNEI (Turcz.) Hand.-Mazz. var. *radicans* (Sieb. ex Miq.) Rehd. (Celastraceae)

Coles Co., EIU Campus near football stadium, 10 July 1996, *Tucker 11192* (EIU); Charleston, Eastgate Dr., weed in vegetable garden, 1 January 2000, *Tucker 11997* (EIU).

Lawrence Co., Red Hills State Park, 19 July 1998, *B. Edgin 984* (EIU); Chauncey Marsh, 15 June 1995, *L. R. Phillippe et al. 26406* (ILLS).

Richland Co., W of Olney, 30 July 1998, *M. A. Feist 100* (ILLS).

There are relatively few collections of *Euonymus fortunei* (winter-creeper) from Illinois, aside from several county records provided by Swink and Wilhelm (1994). Vegetative plants have been seen by the author at the Rocky Branch Nature Preserve in Clark County in November of 1999.

SEDUM SARMENTOSUM Bunge (Crassulaceae)

Coles Co., Charleston, Lincoln Ave. and 10th St., on lower trunk of sugar maple at corner of parking lot; no garden or plantings nearby, 1 July 1998, *Tucker 11477* (EIU).

This commonly cultivated stonecrop has been reported previously only from northeastern Illinois (Swink and Wilhelm 1994) and western and southwestern Illinois (Mohlenbrock and Ladd 1978).

CUCURBITA PEPO L. (Cucurbitaceae)

Coles Co., Charleston, Edgar Dr. on EIU Campus, growing on heaps of soil, 3 October 1996, *Tucker 11242* (EIU); Walnut Grove, weed in cornfield, 21 September 1997, *Tucker 11452* (EIU).

In eastern and central Illinois, pumpkin has been recorded as a noncultivated plant from Piatt, Douglas, and Lawrence counties (Mohlenbrock and Ladd 1978; Mohlenbrock 1985).

RICINUS COMMUNIS L. (Euphorbiaceae)

Coles Co., Charleston, EIU Campus, S of baseball field, disturbed area where soil, compost, and clippings are stored, 28 August 1997, *Beth Storm 1* (EIU).

Lawrence Co., NE of St. Francisville, refuse heap, 24 August 1956, *Evers 51966* (ILLS).

Castor bean plant has been recorded only from Jackson County (Mohlenbrock and Ladd 1978) and Union County (Mohlenbrock 1985). The population on the EIU campus has maintained itself since first documented in 1997.

BUDDLEIA DAVIDII Franchet (Loganiaceae)

Coles Co., Charleston, EIU Campus, around loading dock and steps of university Union, weed in cracks and crevices, 14 October 1998, *Tucker 11593* (EIU, ILLS).

Butterfly-bush is not recorded for Illinois by Mohlenbrock and Ladd (1978). This species is widely naturalized in the southeastern states and potentially a problem exotic there (Reichard 1996). In the Midwest, butterfly-bush is attributed to Kentucky, Michigan, and Ohio (USDA, NRCS 1999). The name of this genus is sometimes spelled "Buddleja," and it is sometimes placed in a segregate family, Buddleiaceae.

ILIAMNA REMOTA Greene (Malvaceae)

Coles Co., Charleston, EIU Campus, near Life Science Bldg., weeds among irises and spirea, planted in flower bed nearby, 12 July 1999, *Tucker 11783* (EIU, ILLS).

Well known as Illinois's only surviving endemic, *Iliamna remota* is often cultivated for its attractive purple flowers. The lack of collections from other areas of the state suggests this Kankakee Mallow has a limited ability to colonize, even in the region where it is native.

DUCHESNEA INDICA (Andrews) Focke (Rosaceae)

Coles Co., Charleston, Wesley Whiteside's Garden, CR 1820E and SR 16, 2 July 1997, *Tucker s.n.* (EIU); Charleston, EIU Campus, near Science Bldg., 14 May 1995, *Ebinger 26522* (EIU).

Edgar Co., Paris, Carnegie Library, shaded lawn, 13 June 1997, *Tucker 11274* (EIU).

Macon Co., Decatur, Scovill Zoo, S19 T16N R3E, 19 June 1999, *Tucker 11729* (EIU).

The preceding are new county records. In central and eastern Illinois, it has been recorded from only Sangamon and Christian counties. Swink and Wilhelm (1994) mapped four counties in northeastern Illinois.

FRAGARIA × ANANASSA Dcne. (Rosaceae)

Coles Co., NE of Loxa, S30 T13N R9E, gravelly roadside bordering fields, hundreds of plants, 13 June 1999, *Tucker 11724* (EIU, ILLS).

The cultivated strawberry is recorded from only Lawrence and Jackson counties by Mohlenbrock and Ladd (1978).

SALIX MATSUDANA Koidz. 'Tortuosa' [*S. babylonica* L. 'Tortuosa'] (Salicaceae)

Coles Co., Charleston, Elmira Street just N of Eastgate Dr., two shrubs 2–3 m tall, in ditch at edge of field, 8 May 1999, *Tucker 11641* (CAN, EIU, ILLS); dupl. det. G. Argus, Canadian Museum of Nature, Ottawa.

Not previously recorded from Illinois, this distinctive cultivated willow with contorted yellow twigs has been recorded from Ohio, New York, and Virginia (USDA, NRCS 1999; Mitchell and Tucker 1997).

TILIA CORDATA Mill. (Tiliaceae)

Coles Co., Charleston, EIU Campus, near Life Science Bldg., weed in hedge and flower bed, 8 May 1997, *Tucker 11269* (EIU).

Little-leaf linden has not previously been recorded from Illinois, or any Midwestern state. This European native has been reported from Maine to New York and Maryland (USDA, NRCS 1999). In the collections at EIU and ILL are several cultivated specimens from eastern Illinois, but no specimens of escaped plants.

VERBENA BONARIENSIS L. (Verbenaceae)

Coles Co., Charleston, EIU Campus, Carman Pond, weeds among cattails, 26 August 1999, *Tucker 11873* (EIU).

This tropical species of vervain is occasionally cultivated, but has not previously been recorded as an escape in Illinois or any other Midwestern state. It is known from several states in the mid-Atlantic, Southeast, and Pacific regions (USDA, NRCS 1999), where it is often weedy.

PARTHENOCISSUS VITACEA (Knerr) A. Hitchc. [*P. inserta* of authors] (Vitaceae)

Coles Co., Charleston, near Charleston High School, along fence with *Toxicodendron radicans* and *Lonicera japonica*, 23 June 1999, *Tucker 11730* (BKL, EIU, ILLS, MOR).

There are few records of this native vine in eastern and central Illinois: Mohlenbrock and Ladd (1978) have only Champaign and Ford counties marked. Mohlenbrock (1986) used the name *P. inserta* for this species.

MONOCOTYLEDONS

SCIRPUS ATROVIRENS Willd. × ***S. GEORGIANUS*** Harper (Cyperaceae)

Effingham Co., Fremington Cemetery, between Keptown and Altamont, S7 T7N R5E, 12 September 1978, *Shildneck C-10366* (ILLS), originally identified as *S. atrovirens*.

Both of the parental species of this hybrid are widespread in Illinois, but the hybrid is scarce, as it is throughout much of the overlapping ranges of the two parental species. *Scirpus atrovirens* (common throughout Illinois) has perianth bristles about as long as the achenes; *S. georgianus* (common in central and southern Illinois) generally lacks bristles (Tucker 1987). The hybrid, apparently unnamed, has bristles about half as long as the achenes, which are generally undeveloped and lack endosperm. Also, the hybrid is often proliferous, with viviparous plantlets developing in the inflorescence (Tucker 1992); this is the case with the specimen cited here. This hybrid could be described as a leafy-stemmed bulrush found late in summer with scales falling from the spikelets, empty or shriveled achenes, and perianth bristles about half as long as the achenes and proliferous plantlets in the inflorescence. The following key should provide a means to distinguish the hybrid from its immediate relatives.

1. Perianth bristles absent (or rudimentary, at most ⅓ as long as mature achene); in damp shaded or sunny wet places; statewide, but scarce in the north. . . . . *S. georgianus* Harper

1. Perianth bristles 5–6 (about ½ as long as to equaling the mature achene).
   2. Scales ± persistent, brown; bristles as long as to slightly longer than achenes; plants of marshes, streambanks, pools; usually in standing water well into summer; statewide. . . . . *S. atrovirens* Muhl.
   2. Scales ± deciduous, gray, black, or brown; bristles about ½–⅔ as long as achene.
      3. Scales brownish; bristles about ½ as long as achene; achenes empty or shriveled; spikelets often proliferous; plants of ditches in full sun; to be expected anywhere in the state. . . . . *S. atrovirens* × *S. georgianus*
      3. Scales gray to black; bristles about ⅔ as long as achene; achenes well developed, with endosperm; spikelets seldom proliferous; plants of damp upland soils, typically in light shade; rare; northeastern Illinois. . . . . . *S. hattorianus* Makino

SCIRPUS MUCRONATUS L. [*Schoenoplectus mucronatus* (L.) Palla] (Cyperaceae)

Jasper Co., Prairie Ridge State Natural Area, artificial wetland W of IDNR office, S27 T6N R9E, 14 September 1999, *M. Bowyer s.n.* (EIU, GH).

Alexander Co., Horseshoe Lake, S10 R2W T16 N, 6 June 1993, *M. A. Basinger 5363* (ILLS), S22 R2W T16 N, 3 July 1993, *M. A. Basinger 6016* (ILLS), and S20 R2W T16 N, 8 July 1996, *M. A. Basinger 10890* (ILLS).

The 1993 collections were identified by S. Galen Smith in 1998. *Scirpus mucronatus* was first reported from Illinois in 1984 (Schwegman 1984) from Mason County. This annual European bulrush has begun to spread, albeit slowly. Although superficially similar to the native *S. pungens* Vahl, *S. mucronatus* is an annual, with fibrous roots and tufted stems. Numerous recent taxonomic works place *S. mucronatus* in the segregate genus *Schoenoplectus*, e.g., Yatskievych (1999). He provides a key to *Schoenoplectus mucronatus* and related species that will work well for Illinois as well as Missouri specimens.

LIPOCARPHA DRUMMONDII (Nees) G. Tucker [*Hemicarpha drummondii* Nees in Mart., *H. micrantha* var. *drummondii* (Nees) Friedland] (Cyperaceae)

Iroquois Co., Iroquois County Conservation Area, S24 T29N R11W, edge of road, 5 July 1983, *Ebinger 22309* (EIU).

This minute native sedge was recorded from only Lake and Cook counties by Swink and Wilhelm (1994), and by Mohlenbrock (1986), as *Scirpus micranthus* Vahl var. *drummondii* (Nees) Mohlenbrock. Although this taxon has been treated as a synonym or variety of *L. micrantha*, recent studies have demonstrated its distinctness at the species level (Goetghebeur and Van den Borre 1989; Tucker 1987). In *L. drummondii,* each achene is subtended by an acuminate outer scale, as well as an inner hyaline scale; in *L. micrantha,* only the outer scale is present, which is subacute.

Because of its rarity, I believe *L. drummondii* is an appropriate candidate for state listing as an endangered species. I have examined all Illinois collections of *Lipocarpha* at ILL, ILLS, ISM, and EIU. Ebinger's collection from Vermilion County, originally identified as *Scirpus micranthus*, is only the third report from the state. Swink and Wilhelm reported it from Lake and Cook counties, based on collections made in 1967 and 1867, respectively.

ALLIUM CEPA L. (Liliaceae)

Coles Co., Charleston, EIU Campus, W of stadium on fitness trail in thickets with *Sanicula gregaria*, 28 May 1997, *Tucker 11271* (EIU); Charleston, alley between 1st and 2nd streets N of Grant Ave., abundantly escaped, hundreds of plants, 15 June 1998, *Tucker 11469* (EIU, ILL).

Cumberland Co., 10 mi. W of Toledo, S33 T10N R7E, 14 June 1972, *Ebinger 11455* (EIU).

Allium cepa, the common garden onion, has been reported previously only from Union County (Mohlenbrock and Ladd 1978), and from DuPage, Grundy, Kankakee, and Will counties by Swink and Wilhelm (1994).

CHIONODOXA FORBESII Baker [*C. luciliae* of authors] (Liliaceae)

Coles Co., Charleston, EIU Campus, lawn near H. F. Thut Greenhouse, naturalized in lawn and around hedges, 10 April 1998, *Tucker 11478* (EIU).

Glory-of-the-snow has not been recorded from Illinois (Mohlenbrock and Ladd 1978) or from any Midwestern state. It has been reported only from Massachusetts, Michigan, and Utah (USDA, NRCS 1999).

SCILLA SIBIRICA Haw. ex Andr. (Liliaceae)

Coles Co., Charleston, EIU Campus, lawn near H. F. Thut Greenhouse, naturalized in lawn and around hedges, 10 April 1998, *Tucker 11479* (EIU).

Piatt Co., near Allerton House, disturbed roadside, now multiplying, 25 March 1995, *S. R. Hill 26244* (ILLS).

Scilla sibirica has been noted from only DuPage, Moultrie, and McDonough counties by Mohlenbrock and Ladd (1978), and from Cook, DuPage, and Kane counties by Swink and Wilhelm (1994).

BRIZA MINOR L. (Poaceae)

Coles Co., E of Charleston, Stone Quarry, 28 September 1996, *Matthew E. Brooks 69* (EIU).

In Illinois, quake-grass has been reported previously only from St. Clair County (Mohlenbrock 1986). This attractive annual, a native of Europe, is sometimes included in packets of "ornamental grass" seeds and might be expected to turn up more often than records indicate.

CHLORIS VERTICILLATA Nutt. (Poaceae)

Coles Co., Charleston, 18th Street near Circle Dr., 1 September 1996, *Tucker 11232* (EIU, ILLS, ISM).

Windmill grass was noted previously from Crawford and Douglas counties (Mohlenbrock and Ladd 1978); the above is a new county record. Swink and Wilhelm (1994) report it from Cook and Will counties.

ELYMUS × EBINGERI G. Tucker (Poaceae)

Cumberland Co., Greenup, fall 1997, *Cris Thomas 88* (EIU).

Douglas Co., Walnut Point State Park, Twin Points Picnic Area, 6 October 1996, *Tucker 11244* (EIU, ILLS).

Vermilion Co., Horseshoe Bottom Nature Preserve, SE S36 T21N R13W, edge of swamp, 9 December 1998, *Ebinger 27702* (ILLS).

The hybrid of *Elymus hystrix* L. and *Elymus virginicus* L. was originally studied and characterized by Ebinger (1987), based on populations in Shelby and Coles counties. Recently, the formal name, *Elymus × ebingeri,* was provided (Tucker 1996).

POA BULBOSA L. (Poaceae)

Coles Co., Charleston, EIU Campus, S side of Doudna Bldg. on 7th St., 24 March 1997, *Tucker 11258* (EIU, GH); Charleston, 10th St. and Van Buren Ave., 20 April 1997, *Tucker 11260* (EIU, ILLS).

Shelby Co., Wolf Creek State Park, S6 T12N R5E, 11 May 1989, *Ebinger 24274* (EIU). Vermilion Co., 3 mi. N of Fairmount, Larimore Farm, 16 May 1997, *Richard Larimore s.n.* (EIU).

Bulbous bluegrass, a native of the Mediterranean region, was noted from Champaign and DuPage counties by Mohlenbrock and Ladd (1978); from Kane, DuPage, Cook, Will, and Grundy counties by Swink and Wilhelm (1994); and from Hardin County by Mohlenbrock (1985).

SCLEROCHLOA DURA (L.) Beauv. (Poaceae)

Coles Co., Mattoon, Patterson Park, 26 April 1997, *Tucker 11260* (EIU, ILLS); Charleston, EIU Campus, near soccer field, common weed on fitness trail, 28 April 1997, *Tucker 11262* (EIU).

Douglas Co., Arthur, high school baseball field, 18 May 1997, *Tucker 11270* (EIU).

Hardgrass, a native of Europe, was not reported from Illinois by Mohlenbrock and Ladd (1978), although it was recently documented from the Chicago region by Swink and Wilhelm (1994).

EICHHORNIA CRASSIPES (Mart.) Solms (Pontederiaceae)

Hardin Co., Cave in Rock, in the Ohio River, aquatic, persisting here for 2 years, 1 October 1997, *Les Frankland s.n.* (EIU).

Water-hyacinth has not been previously recorded from Illinois. This tropical species is widely distributed and a notorious pest in the Gulf Coast states (Rosatti 1987), but it has not been previously reported farther north than Missouri and Kentucky (USDA, NRCS 1999). Yatskievych (1999) noted that the few populations in Missouri had not persisted for more than a few years.

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