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Goldenrods

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backed by a strong wind on a sunny day, and the volunteer crew of Conservation Club members and plant ecology students learned the basics of backfiring and fire safety under critical conditions. By early summer the flowering of prairie plants was unusually good and most of the woody growth was effectively controlled. A July spot treatment of sprouts with 2-4-D should make possible longer intervals between burning in the future with adequate control. The study of resprouting, however, indicates that fire alone doesn't kill the trees and shrubs in such sites and probably is not alone responsible for the treelessness of true prairies in the border region as some authors have suggested. Bur oaks over one and one half inches in diameter survive with little damage while practically all woody species resprout readily and the denser shrub thickets are damaged only at the edges.

This area has been visited regularly for several years by plant ecology classes from The University of Wisconsin–Milwaukee and The University of Wisconsin–Kenosha, as well as by Nature Conservancy groups and individuals. It has an important use as a study area and for potential research and is also valuable for its genetic reservoir of prairie species which are becoming rarer each year. Seed from this strip has been used in prairie establishment studies at the Cedar-Sauk station and at Whitnall Park in the Milwaukee County Park System (M.S. thesis by Arthur Ode, The University of Wisconsin–Milwaukee, 1968). It is also important for its natural beauty, an area which can be visited again and again with new discoveries each time, as long as the users refrain from picking or digging up plants. For all this we can thank The Nature Conservancy, the local donors, and especially Mrs. Marge Reisinger, who activated and inspired the local committee to preserve this site.

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GOLDENRODS

THE GOLDENRODS, with their abundance and diversity, produce one of the most brilliant natural wildflower displays in our area from mid-August to November. In North America there are about one hundred species of these plants occurring in such habitats as upland woods, marshes, bogs, abandoned fields, dry roadsides, prairies, railroad rights-of-way and even open cliffs and sandy beaches. Some species are wide ranging in North America, while others are restricted to smaller geographic or ecologically distinct areas. Approximately twenty-one species are found in Wisconsin. Along roadsides in many parts of northern Wisconsin, their bright yellow inflorescences contrast with the dark green of the conifer trees; in the remainder of the state their colors compete with the changing foliage of the deciduous trees and the whites and blues of the asters and some of the herbaceous weeds.

In the past these plants have been maligned by hay fever sufferers. However, investigations have shown that goldenrod pollen is transferred almost entirely by various types of insects and, unless mummified, is not transported

by the wind as are the irritating pollen grains of such plants as the ragweed and various grasses as well as fungal spores which are also dispersed in the late summer.

The Latin name for the goldenrods, *Solidago,* given by the Swedish botanist Linnaeus refers to the reputed use of these plants in the treatment of wounds and bruises. The effectiveness of these plants for medicinal purposes is questionable; however, other uses have been made of them to a limited extent. An eastern species, the Fragrant or Sweet Goldenrod *(Solidago odora* Ait.) has been used to make tea. Fishermen, most of them unknowingly, make use of the Tall Goldenrod *(Solidago altissima),* Canada Goldenrod (*Solidago canadensis)* and the Late Goldenrod (*Solidago gigantea*) because they often have galls containing insect larvae which are excellent fish bait. Dr. Blum, Mrs. Medler and Mr. Cooley have written interesting articles about these goldenrod galls and their insect parasites (see reference list at the end of this article). Although the floral attractiveness of these plants has received little attention, many persons use the dried plants in winter bouquets. Artistic arrangements may be made by combining them with dried plants of mullein, cattails (when coated to prevent the dispersal of the fluff), milkweeds (with empty pods), yarrow, Queen Anne's lace, goat's beard, burdock, teasel, and various tall grasses and composites. The individual plants of these floral arrangements may be enhanced by various spray paints.

Goldenrods are perennial plants which spread from underground rhizomes or rootstocks. Some species produce basal rosettes of leaves which may persist over winter. The flowers are small and grouped into small heads, which superficially resemble individual flowers. This characteristic inflorescence places these plants in the daisy family or *Compositae.* If one of the heads is taken apart, it will be noted that it consists of ten to twenty-two tiny flowers. A closer examination will show that two types of flowers are present: those in the center (disk flowers) have tubular corollas (like a very narrow bellflower), while those along the margin of the head have strap-shaped corollas (ray flowers) which appear to resemble a single petal. The disk flowers have both stamens and pistils, but the ray flowers are only pistillate. Pollination is effected by beetles, bees and other winged insects. Each flower can develop a single seed which, like a dandelion seed, is topped by a "parachute" that enables it to be blown great distances by the wind.

Because the individual flowers and the heads are small and variable in number and size, identification of the common species in this area may be made on the basis of the arrangement of the heads on the inflorescence branches, habitat preferences and such vegetative characters as the general forms of the plants, color and pubescence (hairiness) of the stems, types of rootstocks and the shapes, margins, venation and pubescence of the leaves. To non-professional persons as well as those researchers at the UWM Field Stations with a limited knowledge of taxonomic botany, the included silhouettes (and accompanying line drawings of the leaves) and the simplified key will be of assistance in identifying the common goldenrod species of southeastern Wisconsin. In the key, the scientific names are listed in parentheses beneath the common names;

however, no attempt is made to show the variations within any of the species. Most of the silhouettes were made from fresh specimens, complete with insect damaged leaves, by Paul Zedler, a botanist at The University of Wisconsin Arboretum in Madison. These illustrated his interesting report on the "Arboretum Goldenrods" and are reproduced in this article with his permission

To identify an unknown goldenrod, first try to match the specimen to one of the silhouettes. Next, use the key to check detailed description and habitat preferences of the plant. Finally, if you are not sure of your identification, consult a local botanist in your area. The Curators of the herbaria at Th University of Wisconsin–Milwaukee and The University of Wisconsin at Madiso are also willing to identify or verify any specimens sent to them. The only charge is that the specimens will be retained at these institutions. The specimen sent should consist of complete plants (with roots, stems, leaves and flowers), dried between sheets of newspaper and accompanied by accurate information concerning the date of collection, specific locality where collected, any pertinent habitat information (if collected in an open field, dry woods, marsh, etc.) and the name of the collector.

Persons interested in more detailed information about the Wisconsin goldenrods are referred to the more comprehensive work of the author which is cited in the reference list at the end of this article.

Key to the Common Goldenrods

A. Plants with heads and flowering branches arranged in elongated terminal clusters (Figures 3 to 12).

B. Heads arranged spirally on the branches of the inflorescence (Fig. 1); inflorescence branches erect or only slightly spreading; summits erect.

C. Leaves broad and round; plants of woodlands
(Fig. 3).....Zig-zag Goldenrod
(*Solidago flexicaulis* L.)

CC. Leaves definitely longer than broad; plants of fields and marshes.

D. All leaves with smooth margins; plants of fields and prairies
(Fig. 4).....Showy Goldenrod
(*Solidago speciosa* Nutt.)

DD. At least the lower leaves with toothed margins; plants of wet areas, sedge meadows, fens and roadside ditches
(Fig. 5).....Swamp Goldenrod
(*Solidago uliginosa* Nutt.)

BB. Heads arranged on one side of the inflorescence branches (Fig. 2); some of these branches strongly recurving; summits sometimes nodding.

E. Leaves 3-nerved, i.e. with two lateral nerves prolonged parallel to the midrib (Figures 6 to 9).

F. All stem leaves broadest at the middle and tapering to both the tips and the bases (Figures 6 and 7).

G. Stems without hairs below the inflorescence; occurring mostly in moist fields, banks of streams and edges of moist woods
(Fig. 6).....Late Goldenrod
(*Solidago gigantea* Ait.)

GG. Stems more or less hairy below the inflorescence; occurring in open fields, prairies and less commonly in moist fields (Fig. 7).

H. Heads about 3-5 mm. high
.....Canada Goldenrod
(*Solidago canadensis* L.)

HH. Heads about 5-8 mm. high
.....Tall Goldenrod
(*Solidago altissima* L.)

FF. Lower stem leaves spatula-shaped, broadest near the tips, and with long tapering bases (Figures 8 and 9).

I. Stems densely grayish-hairy; weedy plants of fallow fields, roadsides, and open shady areas
(Fig. 8).....Old Field Goldenrod
(*Solidago nemoralis* Ait.)

II. Stems without hairs; plants characteristic of native mesic prairies
(Fig. 9).....Missouri Goldenrod
(*Solidago missouriensis* Nutt.)

EE. Leaves pinnately veined, the lateral veins spreading from the midribs (Figures 10 to 12).

J. Upper surfaces of the leaves very rough; stems strongly angled; mostly occurring in bogs and marshes
(Fig. 10).....Roughleaved Goldenrod
(*Solidago patula* Muhl.)

JJ. Upper surfaces of leaves smooth or with soft hairs; stems cylindrical; occurring in fields and upland woods.

K. Basal and lower leaves with long tapering bases; inflorescences usually compact; mostly in fields and roadsides
(Fig. 11).....Early Goldenrod
(*Solidago juncea* Ait.)

KK. Basal and lower leaves abruptly tapering at the base; inflorescence often with a few long slender and spreading or arching branches; chiefly in upland woods or edges of woods
(Fig. 12).....Elm-leaved Goldenrod
(*Solidago ulmifolia* Muhl.)

AA. Plants with heads and flowering branches arranged in terminal flat-topped clusters (Figures 13 to 16)

L. Leaves narrow and grass-like.

M. Stem leaves flat; basal leaves wanting at flower time; bushy plants of fallow fields, roadsides, fencerows and along railroad rights-of-way
(Fig. 13).....Grass-leaved Goldenrod
(*Solidago graminifolia* (L.) Salisb.)

MM. Leaves slightly folded; basal leaves with long narrowed bases present at flowering time; slender plants of alkaline sedge meadows, wet prairies and edges of marshes
(Fig. 14).....Riddell's Goldenrod
(*Solidago Riddellii* Frank)

LL. Leaves broad and flat, not grass-like,

N. Coarse plants with grayish hairs on the stems and leaves; stem leaves mostly erect; in dry to mesic prairies.
(Fig. 15).....Rigid Goldenrod
(*Solidago rigida* L.)

NN. Slender plants without hairs or essentially so; all leaves more or less spreading; plants of alkaline sedge meadows, low prairies and moist depressions between beach ridges.
(Fig. 16).....Ohio Goldenrod
(*Solidago ohioensis* Riddell)

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BIRD HYBRIDS IN THE KETTLE MORAINE

SINCE HYBRIDIZATION in birds is so rare in nature, it is unusual to have the opportunity to study what happens when two species interbreed. Blue-winged Warblers *(Vermivora pinus)* and Golden-winged Warblers *(V. chrysoptera)* produce hybrids wherever they occur together. Furthermore, such hybrids are fertile and there is pairing between these hybrids and both parental species. When my husband and I learned that both species breed in the northern Kettle Moraine State Forest, we decided to see what sorts of interactions between the two species were occurring there. Our objective initially was to determine if pairing was random between the species, e.g. were Blue-wings pairing with Golden-wings as frequently as they were with members of their own species. Also, what was the frequency of hybrids in this area? In addition, we had some