Golden rods. 1966

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Golden Rods

The University of Wisconsin Arboretum

This field book is dedicated to Mrs. Jean Otto who loved the Arboretum and visited it often.

Mrs. Otto had a deep appreciation and understanding for the natural world and readily transmitted it to those who knew her. For her each season brought its own delights; migrating birds, colors of fall, the stark beauty of bare branches against the winter sky, the tender wild flowers poking through soft earth in spring, and lush green of summer—all were part of the rhythm of her life.

We hope that those who use this booklet will gain a deeper feeling and understanding of the natural world thereby making this a suitable memorial for Jean Wilson Otto.

Leach

ARBORETUM GOLDENRODS

We live in a world which prizes rarity in wildflowers as in jewels. It is not surprising, therefore, that goldenrods, which bloom so profusely in our region, should find their greatest popularity as a source of fishing bait rather than floral beauty. In England, where there is only a single native goldenrod, American species are popular garden plants, while in the land of their greatest abundance and diversity they scarcely receive a second glance.

They deserve more consideration. Goldenrods of one sort or another are to be found in almost every plant community of Wisconsin, from dry hillside prairies to woods and low, wet marshes. Some kinds of goldenrods are restricted to certain specialized habitats. Cliff goldenrod *(Solidago sciaphila)* for example, is found only on cliffs in the "driftless" area of southwestern Wisconsin and adjoining states. Others are wide ranging and highly adaptable to many ecological situations. Tall goldenrod *(Solidago altissima)* is found in both wet and dry places and from open fields to forest edges. Evidently some species have been used for drugs, since the Latin name for goldenrods, *Solidago,* given by the great Swedish botanist Linnaeus, refers to the healing qualities of some species. An eastern species, *Solidago odora,* has been used to make tea.

The geography of goldenrods is also interesting. Sixty-five of the approximately one hundred species in the world are found in eastern North America, and only a few are found outside the North American continent. Of the twenty-one species listed for Wisconsin in Salamun's article, some have large ranges covering much of the United States, while others are near the edge of their range here.

To a large extent the continent-wide distribution of the goldenrods is a clue to their behavior within the state. For example, the Missouri goldenrod *(Solidago missouriensis)*, which is a species of the Great Plains at the eastern edge of its range in Wisconsin, is confined to the drier southwestern part of the state which was formerly prairie and dry oak woods. The smooth stem goldenrod *(Solidago gigantea)*, which is wide ranging in the continent as a whole, is found throughout Wisconsin in many different communities. Zig-zag goldenrod *(Solidago flexicaulis)*, a plant of the deciduous forest region of the eastern United States, is rarely found outside that community here.

Goldenrods are also interesting for their great variability. As a group they are evidently still in an active state of evolution. This means, among other things, that they vary greatly even within a species. For example, in Figure 1, all of the

Figure 1

flowering tops shown are from a single species, tall goldenrod. This is not readily apparent until mere size is disregarded and attention focused on the pattern of

branching and the arrangement of heads. Similar extremes of variation are to be found in other species, and in other characteristics. In many cases these differences are caused by different habitats, but often it is probably the result of diverse heredity.

The flowers of goldenrod place it in the daisy or "composite" family. As in daisies, goldenrods bear their flowers tightly together in "heads" which superficially resemble individual flowers. The small stalked "flowers" evident in Figure 2 are actually heads. If one of these heads is broken apart, it can be seen to consist of a few to several dozen tiny flowers surrounded by greenish bracts. Closer examination reveals that two kinds of flowers are present: those in the center (disk flowers) are symmetrical, something like minute yellow bellflowers, while the ones along the perimeter of the head (ray flowers) are irregular (bilaterally symmetrical) with one large lobe. The disk flowers have both male and female parts, but the ray flowers have only female parts. Pollination is aided by beetles and many other winged insects who find the densely flowering goldenrod heads a preferred source of nectar.

Figure 2

The number of individual flowers in a head varies considerably, but it is commonly more than ten. In Figure 2, for example, each of the heads on the showy goldenrod branch had about 17 flowers within each head. Since there are about 19 heads on the branch, this means that the total number of individual flowers on the branch is about 323. The number of individual flowers making up an entire flowering top of goldenrod is even more surprising. The flowering top from which this branch was taken had 227 individual heads, which means it probably bore over 3500 flowers. Each flower can potentially develop a single seed which, like that of a dandelion, is topped by a "parachute" and can be blown many miles by the wind.

While the structure of the heads is fairly constant, the heads themselves can be arranged on the branches in two different ways, as shown in Figures 2 and 3. In Figure 2 the flowering branch from showy goldenrod shows the spiral arrangement in which the heads are borne all the way around the branch. In Figure 3 the branch from the elm-leaved goldenrod shows the one-sided arrangement called "secund" by the botanists.

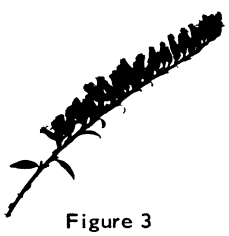


Figure 3

The way in which goldenrods spread and the nature of their groupings can be an aid in identification. As perennials, goldenrods produce one or more underground shoots in the fall and late summer, which give rise the following spring to a new stalk. Thus a dead-looking goldenrod in October is very often actively growing underground. Some species send out relatively long underground shoots, and as a result form large colonies of many individual stems. Such colonies may be as much as 30-40 feet across and consist of many hundreds of individuals. In some cases at least, such large colonies may have originated from a single seed. Other species of goldenrods produce shorter underground shoots and therefore are in small clumps. Where a tendency in either direction is marked, it can be a useful characteristic in identification.

Because goldenrods are such interesting and abundant plants, one's enjoyment of his natural surroundings can be increased if he learns to recognize the species, and the habitats in which they are found. Since the 1200 acres of the Arboretum contain thirteen species, it is an ideal place to begin learning goldenrods. In the following pages all these species are described, and ten of them are illustrated with silhouettes. Since it is general appearance as much as anything else that differentiates most goldenrods, the silhouettes of the entire plant often show as much detail as is necessary to make an identification. These silhouettes were made from fresh specimens gathered in or near the Arboretum this fall, and they picture goldenrods as they are to be found in the field, complete with insect-damaged leaves.

To identify an unknown goldenrod, first try to match it to a picture and then compare it to the description. Remember, however, that because of the variability from plant to plant, rarely, if ever, will a given individual specimen *perfectly* match the illustration. Using the illustrations in this way, numbers 1, 2, 3, 4, 5, and 8 should be very easy to identify. However, the rest of the species may be a problem to match, or it may be that you have an unusual specimen. In this case it will be necessary to examine the characteristics in more detail and check these against the descriptions. In addition, the plants are divided into the following three groups on the basis of less obvious characteristics:

Group I. Plants without hairs on the stem below the flowering branches, *and* with the flowering heads spirally arranged (Figure 2). Nos. 1 and 2.

Group II. Plants with the flowering branches and heads arranged in flat or slightly rounded flowering tops, the stems either essentially hairless or with dense uniform gray hairs. Nos. 3, 4, 5.

Group III. Plants with the flowering tops not flat and with the heads arranged on one side of the branches (not spiral). Nos. 6, 7, 8, 9, 10.

Subgroup 1. Plants with hairs on the stem below the flowering branches. Nos. 6 and 7.

Subgroup 2. Plants with smooth, hairless stems below the flowering branches. Nos. 8, 9, and 10.

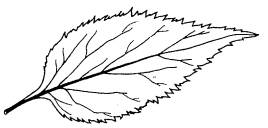
The descriptions for each species which follow are intentionally brief to eliminate much of the detail which often confuses those not familiar with botanical nomenclature. If you are interested in goldenrods and desire a more complete treatment, consult the most recent publication on Wisconsin goldenrods, by P. J. Salamun of The University of Wisconsin–Milwaukee (Transactions of the Wisconsin Academy of Sciences, Arts, and Letters, 52:353-82, 1963). This paper is one in the series of "Preliminary Reports" on the flora of Wisconsin, and is the authoritative publication on Wisconsin goldenrods. Much of the material presented here was drawn from this useful report. Also of interest is the article on goldenrod galls by J. T. Medler in the *Arboretum News* for October, 1965.


1. S. flexicaulis
2. S. speciosa
3. S. riddellii
4. S. graminifolia
5. S. rigida


6. S. altissima
9. S. gigantea
8. S. ulmifolia
10. S. juncea
7. S. nemoralis

SPECIES DESCRIPTIONS

GROUP I



1. **Zig-zag goldenrod** *(Solidago flexicaulis)*. These plants are without hairs on the stem, and flowering branches are usually present between the upper leaves and the stem. Because of its broad leaves, this is probably the most distinctive goldenrod. It grows in rich woods, and is not too often found in open places. It is one of the few plants of maple woods which flowers in late summer. It is found in Wingra and Gallistel Woods.

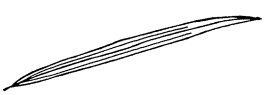
2. There are two possible species:
   a. Illustrated: upland sites, often quite dry.
   b. Not illustrated: marshes and other wet places.

2a. **Showy goldenrod** *(Solidago speciosa)*. This plant is essentially hairless, and the leaves are without, or nearly without, teeth and without large prominent veins other than the main one. This goldenrod grows in bush-like clumps of several to many stalks, which are usually about a foot and a half to three feet tall. It is primarily a species of prairies, former prairie areas, and thin oak woods. It is one of the most beautiful of the goldenrods, and because of its bushy habitat, it should be well adapted for garden use. It has been planted in both of the Arboretum prairies, where it is moderately abundant.

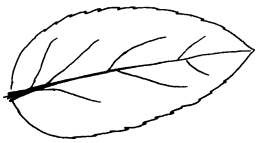
2b. **Marsh goldenrod** *(Solidago uliginosa)*. This plant is somewhat similar to showy goldenrod, especially in the arrangement of the flowering heads, but it can be distinguished by its preference for moist places, by its leaves which are often toothed, and the leaf bases which follow the stem for some distance. This is a very common goldenrod of marshy places in northern Wisconsin, but it is rather rare in the Arboretum. It is found in the fen next to Wingra Woods and possibly in some of the other marshy areas.

GROUP II

3. **Fen-goldenrod, Riddell's goldenrod** *(Solidago riddellii)*. These plants are hairless, with the leaves somewhat folded and tending to follow the stem at their bases. The stalks are usually about a foot to a foot and one-half tall. This goldenrod is found in moist, usually alkaline places. In Wisconsin it is native only to the southeastern quarter of the state, and though not very common elsewhere, it is quite abundant in the Arboretum, especially on the Grady Prairie. The grass-like leaves illustrated next to the flowering shoot are the sterile shoots. These are generally found scattered among flowering plants.



4. **Grass-leaved goldenrod** *(Solidago graminifolia)*. These plants are usually hairless and often in very large colonies. The very narrow leaves are three-nerved (see illustration). The range of this plant covers much of the United States, except for parts of the South and Southeast, and it is one of the most common goldenrods of Wisconsin. It is quite common in the Arboretum, mostly on the prairies. An especially large colony can be found on the Grady Prairie.

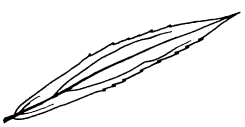


5. **Stiff-goldenrod** *(Solidago rigida)*. The stem and leaves of this goldenrod are densely and evenly grayish-hairy, and its flowering heads are larger than any other Wisconsin goldenrod (c. 3/16 to 3/8 inches high). The leaves are quite thick, and usually there will be some basal leaves at or near the base, as illustrated. The leaf shown here is from the middle of the stem. Often it is quite tall, up to three feet or more, but specimens a foot high are not uncommon. It is a highly distinctive goldenrod which is typical of dry to medium dry prairies and is often found in dry pastures. It is distributed only in the southern half of the state. This goldenrod ranges far to the west and is common, for example, in and around the Black Hills of South Dakota. In the Arboretum it is quite abundant on both prairies.

GROUP III

Subgroup I. Plants with hairs on the stem below the flowering branches. Nos. 6 and 7.

6. There are two possible species matching this illustration.
   a. Illustrated, flowering heads 3-5 millimeters high.
   b. Not illustrated, flowering heads 2-3 millimeters high.



6a. **Tall goldenrod** *(Solidago altissima)*. The stem and leaves are hairy with relatively short, somewhat grayish hairs. The leaves are often distinctly rough to the touch, may or may not have teeth, and are three-nerved (see illustration). At the time of flowering, the lowermost leaves are either much smaller than the middle ones, dried up and dead, or absent entirely. This is an abundant and wide-ranging species which is found in a great variety of habitats. It is the most common goldenrod of the Arboretum and of the Madison area in general. It is also found in nearly the entire state. Tall goldenrod and the Canada goldenrod (6b) are evidently quite closely related, and they cannot always be distinguished. The size of the heads, as given by Salamun, is the best way to separate them. It may be best, at least initially, to consider them as one highly variable species.

6b. **Canada goldenrod** *(Solidago canadensis)*. This is very similar to 6a except for the smaller heads (one variety found in northern Wisconsin does have larger heads) and the usually sharply toothed leaves.

7. **Old-field goldenrod** *(Solidago nemoralis)*. The stems are evenly short and grayish-hairy, the leaves hairy and often somewhat rough to the touch. The lower leaves are larger than the upper and usually there is a conspicuous tuft of leaves at the base of the plant, often much larger than those illustrated. The flowering top usually has a one-sided appearance.

This is one of the commonest goldenrods of dry places, and it is found throughout Wisconsin. It is comparatively small, usually being about a foot in height and rarely being over about 18 inches. Old-field goldenrod is very abundant on the Arboretum prairies.

Subgroup 2. Plants are hairless on the stem below the flowering branches. Nos. 8, 9, and 10. Note: Separate the following species by means of the leaf illustrations or silhouettes.

8. **Elm-leaved goldenrod** *(Solidago ulmifolia)*. The stems are hairless except on the flowering branches, and the leaves generally rough to the touch. An important characteristic of this goldenrod is its tendency toward long, arching flowering branches, a feature often more pronounced than in the illustration. Elm-leaved goldenrod is a plant of woods and the edges of woods. Plants are usually in small clumps about 2-3 feet high. It can be found in the Arboretum in Noe, Wingra, and Gallistel Woods.

9. **Smooth-stem goldenrod** *(Solidago gigantea)*. This plant resembles tall goldenrod and Canada goldenrod in its general shape, but it differs from them by having smooth and hairless leaves and stems. The stems may have some hairs in and near the flowering branches. The leaves are three-nerved and generally have sharp, distinct teeth. Usually it will be found in large colonies, and the plants are generally about two to three feet tall though they can be much taller. Though wide ranging, smooth-stem goldenrod prefers moist places. It is abundant in the Arboretum and the state as a whole.

10. There are two possible species matching the illustration.

a. Illustrated. Leaves not three-nerved, basal leaves from 1/2 to 3-1/4 inches wide.

b. Not illustrated. Leaves three-nerved, basal leaves smaller 3/16 to 3-1/3 inches wide, less common.

10a. **Early goldenrod** *(Solidago juncea)*. The plants frequently have large basal shoots in the manner of stiff goldenrod and old-field goldenrod. This is the earliest blooming of the goldenrods, which tends to prefer somewhat disturbed situations, such as roadsides and railroad rights-of-way. It can be quite tall, but is usually of medium height, 12 to 18 inches. It often grows in large, well-marked colonies with a great number of sterile shoots of the kind illustrated. Unlike smooth-stem goldenrod, the lowermost leaves in early goldenrod are present at the time of flowering and are larger than the upper ones.

10b. **Missouri goldenrod** *(Solidago missouriensis)*. The leaves are usually three-nerved and narrower than early goldenrod (see illustration). The growth form and tendency to produce short, leafy, nonflowering shoots is similar to early goldenrod. This is a plant mostly of prairies and former prairie areas. It is generally smaller and less coarse than early goldenrod.

Paul H. Zedler
1966