Online class via Zoom
Monday, January 18
7:00-8:00pm
Learn how to identify common flowers in the genus Solidago (goldenrods) with Dr. Tom Rosburg
re-registration required. $5 registration fee. Learn more and sign up
goldenhillsrcd.org/plantID
Open to the public. Project made possible through a grant from Gilchrist Foundation

Photo credits:
Dr. Thomas Rosburg (border lines)  
Astereae Lab (JC Semple) -- https://uwaterloo.ca/astereae-lab/  
Minnesota Wildflowers -- https://www.minnesotawildflowers.info/  
CalPhotos -- https://calphotos.berkeley.edu/  
Missouri Plants -- http://www.missouriplants.com/  
Michigan Flora Online -- https://michiganflora.net/home.aspx  
Iowa Plants (RW Lutz) -- http://iowaplants.com/index.html
What Makes it a *Solidago*?

**Member of the Asteraceae**
- inflorescence a head or capitulum
- involucre subtending the florets
- calyx (sepals) modified to form a pappus

**Member of the Tribe Astereae**
- receptacle ± naked, chaffy bracts are NOT present (= receptacular bracts, or paleae)
- ray florets pistillate, $ corolla short
- disc florets perfect, corolla yellow, 5-lobed
- pappus of many capillary, barbellate bristles

*Northern goldenrod (Solidago multiradiata)* Paul Slichter

*Figure* Parts of a radiate head. Note that receptacular bracts are often absent.
What Makes it a *Solidago*?

**Member of *Solidago***

-- capitula radiate

-- receptacle slightly convex, low ridges surrounding the attachment point of florets, $ few marginal paleae

-- involucres 3-10 mm, phyllaries lanceolate, ovate or oblong, in 3-5 series, with translucent midrib

-- ray florets pistillate, corollas yellow (rarely white)

-- disc florets perfect, corollas yellow (rarely white), 5-lobed

-- pappus in 2 series of 25-45 barbellate bristles
### Solidago Reference Table

Data compiled by Dr. Thomas Rosburg from Semple and Cook 2006, Eilers and Roosa 1994, Kartesz 2015, Voss and Reznicek 2012, Yatskievych 2006, Iowa Natural Areas Inventory

**Fields**
1. Currently accepted scientific name in Flora of North America. Iowa status (if listed) and data concerning occurrence in Iowa. Iowa Coefficient of Conservatism.
2. Species with shading are most likely to be encountered and included in further discussion. Green = forest, woodland species, yellow = grassland species, blue = wetland species.
4. Common names indicated by Eilers and Roosa 1994 or observed in general use.
5. General habitat description

**NOTE: USE RANGE MAPS IN IOWA PRAIRIE PLANTS FOR DESIGNING SEED MIXES**

**Digital version available at:** [http://uipress.lib.uiowa.edu/mpi/](http://uipress.lib.uiowa.edu/mpi/)

<table>
<thead>
<tr>
<th>Flora of North America</th>
<th>Eilers and Roosa 1994</th>
<th>Common Names</th>
<th>Habitat</th>
<th>BONAP Biogeography</th>
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<tbody>
<tr>
<td><strong>Solidago altissima</strong></td>
<td>NEW SPECIES</td>
<td>tall goldenrod</td>
<td>dry to mesic soils, in prairies, grasslands, fields, thickets, roadsides, riparian and disturbed areas</td>
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<tr>
<td>subsp. altissima</td>
<td>leaves triple-veined; stems &amp; inflorescence pubescent; leaf margins serrulate to subentire</td>
<td>late goldenrod</td>
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<td>subsp. gilvocanescens</td>
<td>Canada goldenrod</td>
<td>giant goldenrod</td>
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<tr>
<td>Iowa CC: 0 to 2 H</td>
<td>similar species:</td>
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<td><strong>Solidago canadensis</strong></td>
<td>Solidago canadensis</td>
<td>Canada goldenrod</td>
<td>dry to mesic soils in prairie, pastures, open woodlands, roadsides, old fields</td>
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<tr>
<td>var. hargeri</td>
<td>var. canadensis</td>
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<tr>
<td>var. gilvocanescens</td>
<td>leaves triple-veined; stems &amp; inflorescence pubescent; leaf margins serrate</td>
<td>tall goldenrod</td>
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<tr>
<td>var. scabra</td>
<td>similar species:</td>
<td>giant goldenrod</td>
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<td>var. altissima</td>
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<tr>
<td>Iowa CC: 0 to 2 H</td>
<td>solidago altissima</td>
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<tr>
<td></td>
<td>leaves triple-veined; stems &amp; inflorescence pubescent; leaf margins serrate</td>
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<td>similar species:</td>
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<tr>
<td><strong>Solidago flexicaulis</strong></td>
<td>Solidago flexicaulis = S. latifolia</td>
<td>zig-zag goldenrod</td>
<td>mesic soils in forest and woodland; shaded streambanks and riparian soils</td>
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<td>Iowa CC: 6 to 7 H</td>
<td>zigzag upper stem; leaves broadly ovate, coarsely serrate with a rounded base and winged petiole</td>
<td>similar species: cliff goldenrod</td>
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<td></td>
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<td>rough-leaved goldenrod</td>
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<tr>
<td>Solidago gigantea</td>
<td>Iowa CC: 3 to 3 H</td>
<td>Solidago gigantea var. serotina</td>
<td>giant goldenrod</td>
<td>smooth goldenrod</td>
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<tr>
<td>Solidago hispida</td>
<td>Iowa CC: 10 to 10 M</td>
<td>Solidago hispida = S. bicolor var. concolor</td>
<td>hairy goldenrod</td>
<td>smooth goldenrod</td>
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<tr>
<td>Solidago missouriensis</td>
<td>Iowa CC: 5 to 6 H</td>
<td>Solidago missouriensis var. fasciculata</td>
<td>Missouri goldenrod</td>
<td>prairie goldenrod</td>
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<tr>
<td>Solidago mollis</td>
<td>Iowa CC: pending</td>
<td>NEW SPECIES (treated as a variety of Solidago nemoralis)</td>
<td>soft goldenrod</td>
<td>rigid goldenrod</td>
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<tr>
<td>Solidago nemoralis subsp. nemoralis *</td>
<td>Iowa CC: 4 to 5 H</td>
<td>Solidago nemoralis var. longipetiolata = S. decemflora = S. longipetiolata</td>
<td>gray goldenrod</td>
<td>old-field goldenrod</td>
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<td>Species</td>
<td>Common Name</td>
<td>Iowa CC</td>
<td>Distribution</td>
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<tr>
<td>Solidago patula var. patula * var. strictula</td>
<td>rough-leaved goldenrod, swamp goldenrod</td>
<td>10 to 10 M</td>
<td>wet to mesic soils in swamps and wet woodlands, wet meadows and seeps, fens, roadside ditches</td>
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<tr>
<td>Solidago ptarmicoides</td>
<td>leaves scabrous, basal leaves up to 30 cm long and 10 cm wide with winged petioles; stems striate, 2 or 3 angled</td>
<td>9 to 9 M</td>
<td>dry, sandy, usually calcareous soils, rocky outcrops and rock ledges in prairies, savanna and open woodland</td>
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<tr>
<td>Solidago riddellii</td>
<td>leaves linear, more than 10X longer than wide; margins with a narrow cartilaginous strip</td>
<td>8 to 9 H</td>
<td>shallow marshes, wet prairies, sedge meadows, fens, wet seeps</td>
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<tr>
<td>Solidago rigida subsp. rigida * subsp. humilis * subsp. glabrata</td>
<td>stems stout, leafy, hairy leaves broadly ovate to lanceolate, upper smaller &amp; sessile, lower larger &amp; long petiolate</td>
<td>4 to 4 H</td>
<td>prairies, glades, oak savannas, open woodlands, pastures, dry calcareous soils, utilizes disturbances</td>
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<tr>
<td>Solidago sciaphila</td>
<td>basal and lower cauline leaves the largest and serrate, becoming smaller and entire distally</td>
<td>10 to 10 H</td>
<td>sandstone and limestone bluffs and ledges along the upper Mississippi River</td>
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<tr>
<td>Solidago speciosa</td>
<td>Solidago speciosa var. jejunifolia var. rigidiuscula</td>
<td>showy goldenrod</td>
<td>sandy, silty, gravelly soils in grasslands and prairie, pasture, savannas, open woodlands, on road embankments</td>
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<tr>
<td>subsp. pallida</td>
<td>leaves single-veined, glabrous, lanceolate to ovate-elliptic, usually entire, lower withering</td>
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<tr>
<td>subsp. speciosa *</td>
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<tr>
<td>var. rigidiuscula *</td>
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<tr>
<td>var. speciosa *</td>
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<td>Iowa CC: 7 to 7 H</td>
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<thead>
<tr>
<th>Solidago uliginosa</th>
<th>Solidago uliginosa</th>
<th>swamp goldenrod</th>
<th>bog goldenrod</th>
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<tr>
<td>Endangered</td>
<td>stems glabrous, often reddish; leaves linear, glabrous, lower leaves with sheathing and clasping bases</td>
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<td>1 observation, 1 county</td>
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<td>last observation 1989</td>
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<thead>
<tr>
<th>Solidago ulmifolia</th>
<th>Solidago ulmifolia</th>
<th>elm-leaf goldenrod</th>
<th>dry to mesic upland forest and woodland</th>
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<tbody>
<tr>
<td>var. ulmifolia *</td>
<td>stems glabrous below the inflorescence; leaves elliptic to narrowly lanceolate, ± scabrous, lower serrate, upper entire margins</td>
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<td>var. palmeri</td>
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<tr>
<td>Iowa CC: 6 to 6 H</td>
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</table>

**Solidago species unknown for Iowa, but which occur in adjacent states**
- Solidago sphacelata (IL)
- Solidago arguta (IL, MO)
- Solidago ohiensis (IL, WI)
- Solidago drummondii (IL, MO)
- Solidago caesia (WI, IL, MO)
- Solidago simplex (SD, MN, WI)
- Solidago gattingeri (MO)
- Solidago juncea (MN, WI, IL, MO)
- Solidago sempervirens (IL)
- Solidago radula (IL, MO)
- Solidago bicolor (WI, IL, MO)
- Solidago buckleyi (IL, MO)
- Solidago petiolaris (NE, MO, IL)
- Solidago odorata (MO)
Splitting up 13 Iowa *Solidago* species

**Group A** - dome-like (convex) to flat outline across the top, the outer (lower) branches longer than the central (upper) branches
- upland white
- rigid
- Riddell’s

**Group B** - elongate ± cylindrical, a terminal “wand” or “rod”
- showy
- zigzag
- hairy
- cliff

**Group C** – pyramidal, broadest at or near the base and tapering to the apex, which may nod; lower branches in some species are ± recurved with the heads one-sided (oriented on top of the branches)
- gray
- elm-leaf
- Missouri
- giant
- tall
- Canada
GROUP A – flat-topped

* disc and ray corollas white or less commonly pale cream-color
* disc and rat corollas yellow

→ leaves narrow, blades linear, narrowly lanceolate or oblanceolate, more than 10X longer than wide, glabrous, margins entire; stems glabrous below the inflorescence

Riddell’s

→ leaves broad, blades broadly oblanceolate to elliptic-obovate, or oblong-elliptic, less than 3X longer than wide, densely hairy, margins crenate or serrulate (subentire); stems densely short hairy
GROUP B – cylindrical wand or rod

B1
- stem below the inflorescence hairy;
- upper surface of leaf blade hairy

B2
- stem below the inflorescence glabrous;
- upper surface of leaf blade glabrous to sparsely hairy

* leaf margins entire to shallowly serrulate or crenulate, leaves mostly 4-5 times longer than wide; cypselae (fruit) glabrous; secondary inflorescence typically dense, compact

* leaf margins sharply and distinctly serrate, leaves mostly 1.5-3.5 times longer than wide; cypselae (fruit) moderately to strongly strigose; secondary inflorescence open, diffuse
basal and lower cauline leaves the largest and longest, the leaves progressively reduced in size distally; stem ± straight
basal and lower cauline leaves smaller than the longest ones, which occur a third to a half of the way up the stem; stem tending to zigzag between upper nodes
GROUP C – pyramidal

C1
cauline leaves with a distinct midrib, the other weaker veins ± pinnate, NOT triple-nerved

* stems and leaves densely pubescent with minute (0.1-0.3 mm) mostly curved hairs; leaves surfaces dull green; plants of dry grassland, prairie, open woodland

C2
cauline leaves (at least the main ones) triple-nerved, with a pair of elongate, lateral veins arising below the middle of the midrib that are distinctly stronger than other lateral veins, ± parallel with the leaf margins, and present for over half the length of the blade

* stems and leaves moderately pubescent with longer (0.5-1.5 mm) mostly spreading hairs; leaf surfaces clear green; plants of upland savanna, woodland or forest
GROUP C2 – pyramidal

- Stem pubescent all or most of its length below the inflorescence, rarely with a few scattered, spreading, short hairs
- Axis, branches and pedicels of the secondary inflorescence glabrous
- Axis, branches and pedicels of the secondary inflorescence sparsely to moderately and distinctly pubescent

Missouri

* involucres mostly 3.1-4.6 mm long; ray florets 10-16, ray corollas 3.0-4.0 mm, disc corollas 3.0-3.5 mm; mid to distal cauline leaves minutely serrate to entire

Canada

* involucres mostly 2.0-3.0 mm long; ray florets 6-12, ray corollas 2.0-3.0 mm, disc corollas 2.3-2.7 mm; mid to distal cauline leaves evidently serrate
Glossary

A. Needlelike

B. Scalelike

C. Linear
D. Oblong
E. Lanceolate
F. Elliptic
G. Oblanceolate

H. Oval
I. Broadly elliptic
J. Oblate
K. Orbicular
L. Reniform

A. Glabrous
B. Pilose
C. Villous
D. Strigose
E. Hispid
F. Hirsute
G. Scabrous
H. Puberulent
I. Tomentose
J. Stellate
K. Stipitate Glandular
L. Sessile Glandular

A. Petiolate
B. Sessile
C. Perfoliate
D. Clasping
E. Sheathing

A. Entire
B. Crenate
C. Cronulate
D. Serrate
E. Serrulate
F. Doubly serrate
G. Dentate
H. Denticulate
Reproductive Terms

Achene – a single seeded indehiscent dry fruit with the seed free from the pericarp except at the funicule (the stalk of an ovule attaching it to the placenta of the ovary)

Calyx – collective term for the sepals of a flower, the lower and outermost (or first) whorl of flower parts

Corolla – collective term for the petals of a flower, the second whorl of flower parts

Cypselia – a certain type of achene characteristic of the Asteraceae, developed from an inferior ovary and usually bearing a pappus

Inflorescence – the part of a shoot above the uppermost node with foliage leaves that bears flowers, also, the groupings or arrangements in which these flowers are borne

Involucre – one or more whorls of bracts immediately subtending a flower or inflorescence, often forming a cup-like structure

Pappus – specialized and modified calyx consisting of scales, bristles, or awns characteristic of the Asteraceae

Phyllary – one of the involucral bracts present in the involucre of a head (or capitulum) inflorescence in Asteraceae

Primary inflorescence – the arrangement of individual flowers or florets

Radial head – inflorescence in the Asteraceae bearing disk flowers in the center and ray florets around the periphery

Secondary inflorescence – the arrangement of the primary inflorescences

Vegetative Terms

Areole – the non-vascularized spaces or tissue between the veins and veinlets of a net-veined leaf

Cauleine – describing leaves borne on an aerial stem, usually separated by elongated internodes

Caulescent – possessing a stem visible above the ground

Clasping – a sessile leaf with lobes of blade tissue projecting around either side of the stem

Crenate – margin with regular rounded teeth making a scalloped margin

Crenulate – minutely crenate, with very small rounded teeth

Entire – margin that is smooth or of unbroken outline, without teeth

Glabrous – surface smooth or lacking trichomes (plant hairs, or epidermal outgrowths)

Glaucous – a bluish-green, pale gray/whitish waxy surface covering

Hispid – pubescent with stiff bristle-like hairs

Involute – the margins of a flat surface rolled inward toward the upper surface

Node – the joint (or transverse plane) of a stem at which one or more leaves and associated axillary buds arise

Petiolate – a leaf possessing a stalk or petiole, attached by a leaf stalk

Puberulent – pubescent with very short hairs, minutely pubescent

Pubescent – surface with trichomes present

Scabrous – pubescent with short, stout hairs making the surface feel like sandpaper

Serrate – sawtooth margin with sharp teeth bent toward the leaf apex

Serrulate – minutely serrate, with very small teeth bent toward the leaf apex

Sessile – a leaf blade attached directly to a node, lacking a petiole

Sheathing – a modified petiole that is prolonged into a tube that partially or completely surrounds the stem above the node to which the leaf is attached

Striate – with several parallel longitudinal lines or ridges, often rather fine and close, usually separated by grooves

Strigose – pubescent with short hairs that lie flat against the surface

Subentire – nearly or almost entire

Subsessile – a leaf with a very short, or barely perceptible petiole

Proximal – near to the point of origin or attachment (e.g., in regard to leaves, near the base of the stem)

Distal – remote from the point of origin or attachment (e.g., in regard to leaves, near the top of the stem)
References
Kaul, R.B., D.M. Sutherland, and S.B. Rolfsmeier. 2006. The Flora of Nebraska. School of Natural Resources, University of Nebraska-Lincoln, Lincoln, NE, 966 pages

1a. Secondary inflorescences a terminal ± flat-topped (or somewhat domed to convex) corymbiform inflorescence; heads solitary or in small clusters at the branch tips
   2a. Disc and ray corollas white or less commonly pale cream-color………S. ptarmicoides (upland white goldenrod)
   2b. Disc and ray corollas yellow
      3a. Leaves relatively narrow, blades linear, narrowly lanceolate, or narrowly oblanceolate, more than 10 times as long as wide, glabrous, margins entire; stems glabrous below the inflorescence ..............................S. riddellii (Riddell’s goldenrod)
      3b. Leaves relatively broad, blades broadly oblanceolate to elliptic-obovate, ovate or oblong-elliptic, less than 3 times as long as wide, densely hairy, margins crenate or serrulate (subentire); stems densely short hairy…………………………………………………………………………………………………………………………..S. rigida (rigid goldenrod)

1b. Secondary inflorescences either consisting of axillary clusters, or if terminal then elongate and racemose or pyramidal panicles; heads usually oriented upward and singly or in small clusters along the branches
   4a. Secondary inflorescences consisting of axillary clusters, or if terminal then the inflorescence narrow with small clusters of heads or spikelike branches in leaf axils along the main stem, the branches not arching with heads oriented in several directions
      5a. Stem glabrous below the inflorescence; upper leaf blade surfaces glabrous or sparsely puberulent
      6a. Basal and proximal cauline leaves tapering to a long petiole with a sheathing and clasping base, blades oblanceolate, 5 to 15 times longer than wide; plants in wetlands......................S. uliginosa (swamp goldenrod)
      6b. Basal and proximal cauline leaves tapered to a petiole, leaf bases not clasping, blades broadly ovate, broadly elliptic-ovate, oblanceolate, elliptic to obovate, 1.5 to 6 times longer than wide; plants in prairie, woodland or forest, clearly not a wetland
      7a. Leaf margins of basal and lower leaves entire to shallowly serrulate or crenulate, leaves mostly 4-5 times longer than wide; cypselae glabrous; secondary inflorescence typically dense, compact, broadly cylindrical, and paniculiform, consisting of axillary clusters or more commonly strongly ascending and racemiform branches..............................................................S. speciosa (showy goldenrod)
      7b. Leaf margins of basal and lower leaves sharply and distinctly serrate, leaves mostly 1.5-3.5 times longer than wide; cypselae moderately to strongly strigose; secondary inflorescence open, diffuse, narrowly cylindrical and paniculiform, consisting of short axillary clusters, short axillary racemiform branches that do not exceed the subtending leaf bracts, and terminal racemiform clusters
         8a. Basal and lower cauline leaves the largest and longest, the leaves progressively reduced in size distally; stem ± straight...........................................................S. sciaphila (cliff goldenrod)
         8b. Basal and lower cauline leaves smaller than the longest ones, which occur a third to a half of the way up the stem; stem tending to zigzag between upper nodes...........S. flexicaulis (zigzag goldenrod)

5b. Stem pubescent below the inflorescence (strigulose, puberulent, hispid, or villous); upper leaf blade surfaces pubescent (scabrous, strigulose, hispid, or villous)
   9a. Basal and lowermost cauline leaves usually withered by flowering, middle and upper leaves clearly 3-veined; disc florets 3-8; cypselae sparsely strigillose;.................................S. mollis (soft goldenrod)
   9b. Basal and lowermost leaves persistent and present at flowering, middle and upper leaves 1-veined; disc florets 6-12; cypselae glabrous.........................................................S. hispida (hairy goldenrod)

4b. Secondary inflorescences ± a terminal pyramidal panicle, the lower branches arching with heads mostly oriented upward
Iowa Solidago

10a. Cauline leaves (at least the main ones) “triple-nerved,” i.e., with a pair of elongate, lateral veins arising below the middle of the midrib that are distinctly stronger than other lateral veins, ± parallel with the leaf margins, and present for over half the length of the blade

11a. Axis, branches and pedicels of the secondary inflorescence glabrous….S. missouriensis (Missouri goldenrod)

11b. Axis, branches and pedicels of the secondary inflorescence sparsely to moderately and distinctly pubescent

12a. Stem glabrous all of its length below the inflorescence, rarely with a few scattered, spreading, short hairs

……………………………………………………………………………………………………………………………………………………………………………………………S. gigantea (giant goldenrod)

12b. Stem pubescent all or most of its length

13a. Involucres mostly 3.1-4.6 (-5) mm long; ray florets 10-16, ray corollas 3.0-4.0 mm, disc corollas 3.0-3.5 mm; mid to distal cauline leaves minutely serrate to entire …………………S. altissima (tall goldenrod)

13b. Involucres mostly 2.0-3.0 mm long; ray florets 6-12, ray corollas 2.0-3.0 mm, disc corollas 2.3-2.7 mm; mid to distal cauline leaves evidently serrate……………………………S. canadensis (Canada goldenrod)

10b. Cauline leaves with a distinct midrib but the other weaker veins ± pinnate, not triple-nerved

14a. Stems moderately to densely pubescent with curved to spreading hairs, sometimes becoming less dense toward the stem base; plants in upland, non-wetland habitats

15a. Stems and leaves densely pubescent with minute (0.1-0.3 mm) mostly curved hairs; leaves surfaces dull green (grayish); plants of dry grassland, prairie, open woodland …………S. nemoralis (gray goldenrod)

15b. Stems and leaves moderately pubescent with longer (0.5-1.5 mm) mostly spreading hairs; leaf surfaces clear green; plants of upland savanna, woodland or forest…………………S. ulmifolia (elm-leaf goldenrod)

14b. Stems below the inflorescence glabrous or sparsely pubescent with mostly spreading hairs; plants in wetland habitats…………………………………………………………………………………S. patula (rough-leaf goldenrod)