

GOLDEN HILLS RC&D presents
GOLDENROD IDENTIFICATION



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>

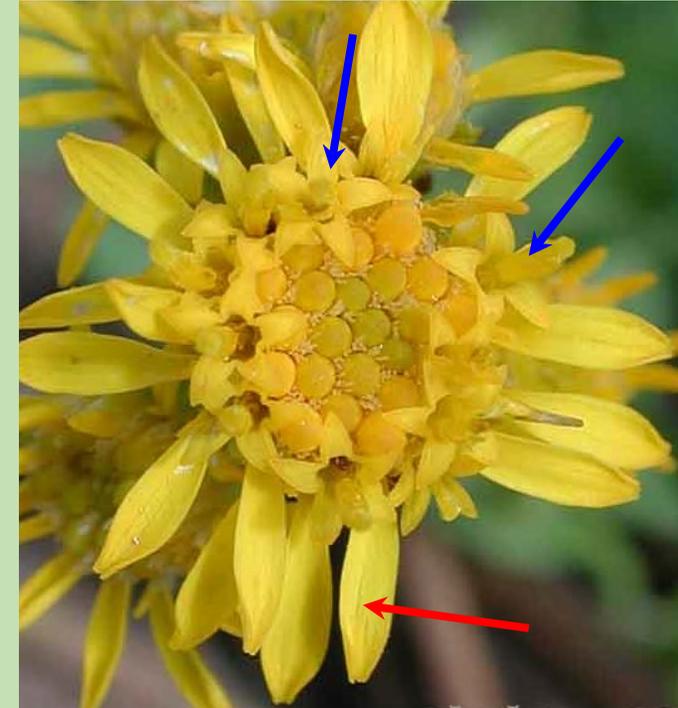
What Makes it a *Solidago*?

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 \pm 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

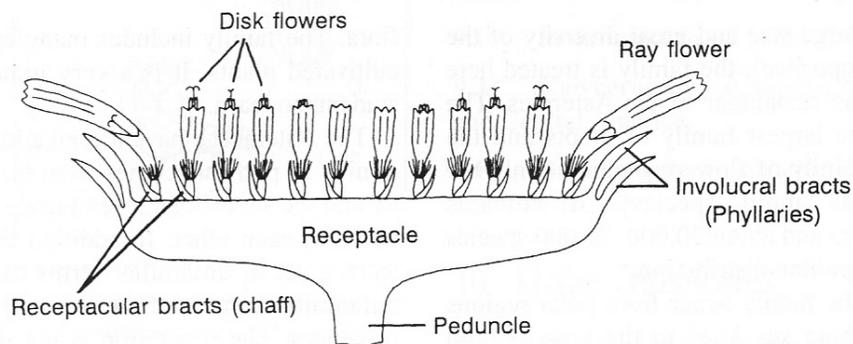


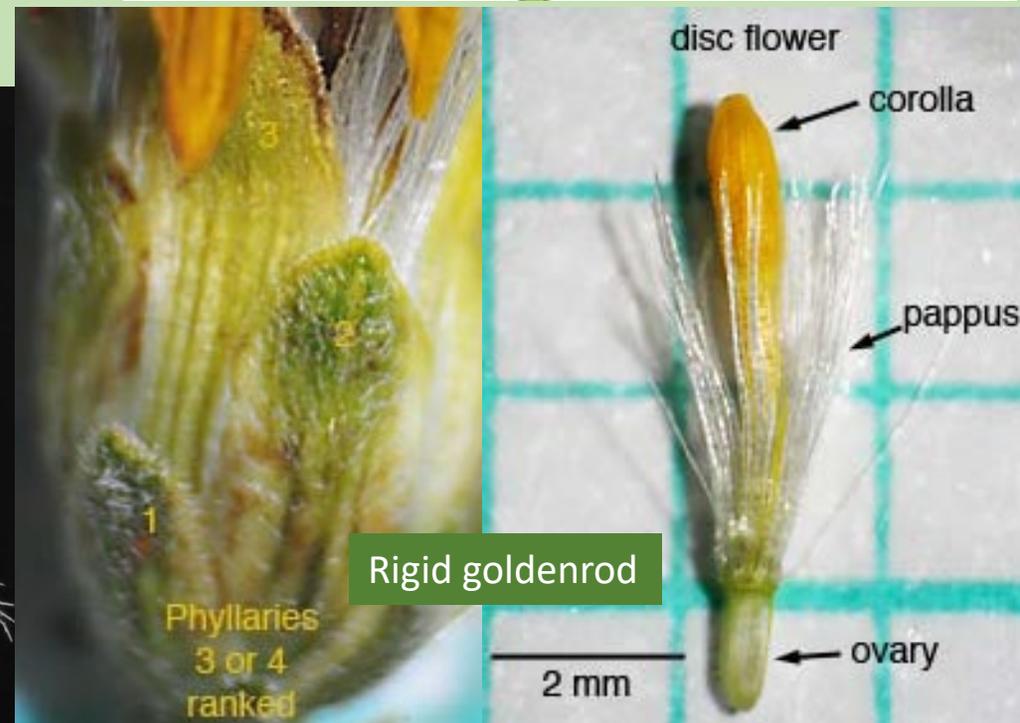
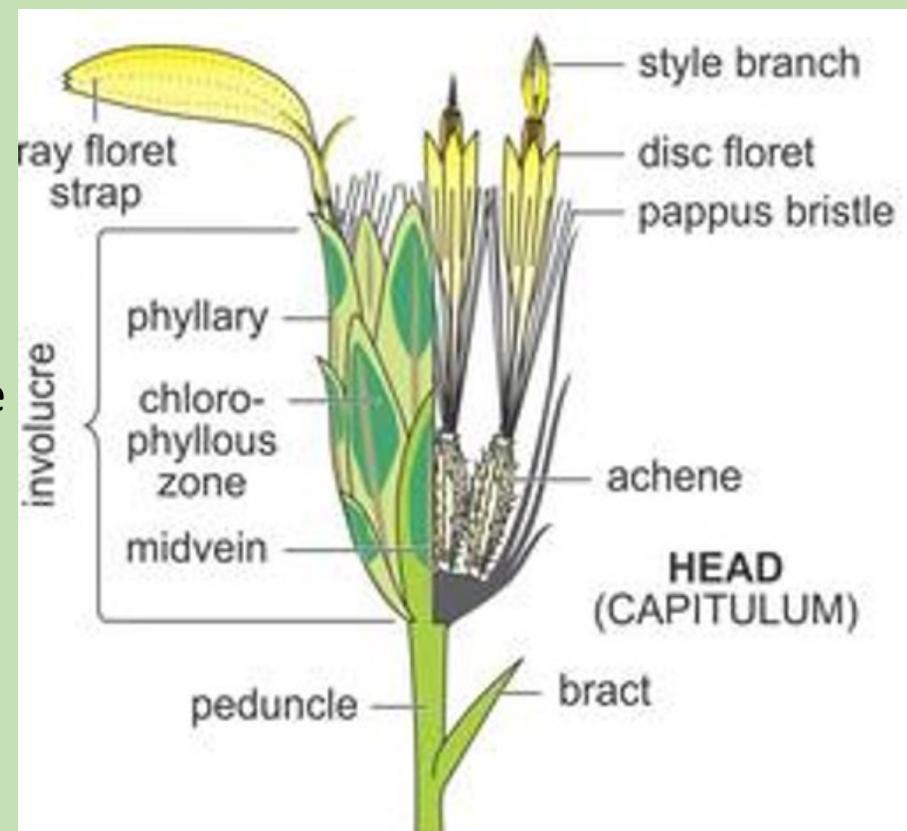
Figure Parts of a radiate head. Note that receptacular bracts are often absent.



What Makes it a *Solidago*?

Member of *Solidago*

- capitula radiate
- receptacle slightly convex, low ridges surrounding the attachment point of florets, \$ few marginal paleae
- involucre 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. Species with shading are most likely to be encountered and included in further discussion. Green = forest, woodland species, yellow = grassland species, blue = wetland species.

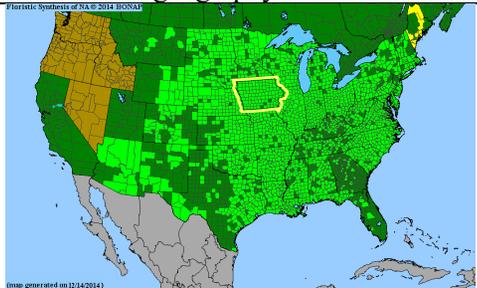
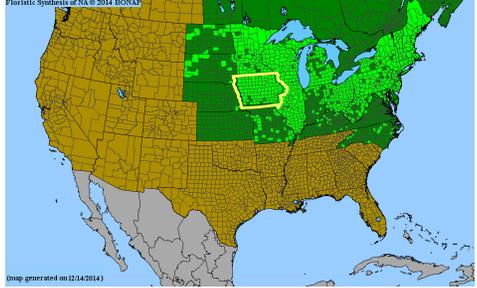
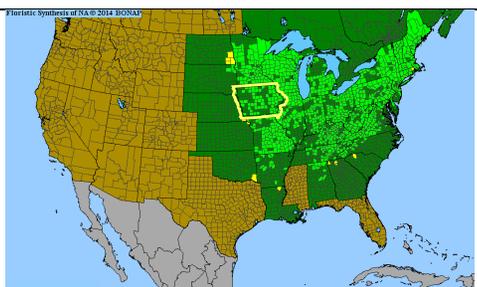
2-Nomenclature and synonyms in Eilers and Roosa 1994. Key identification characteristics.

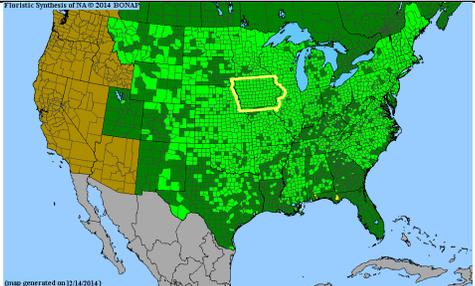
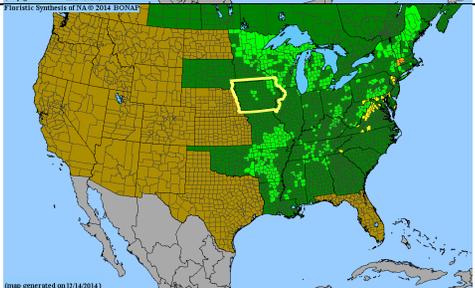
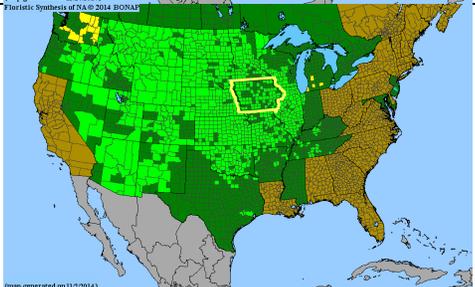
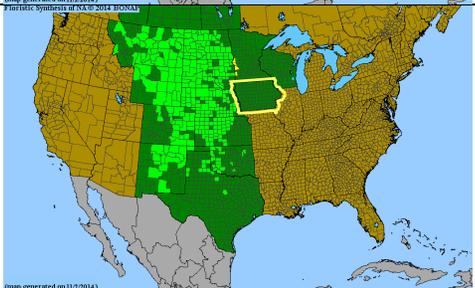
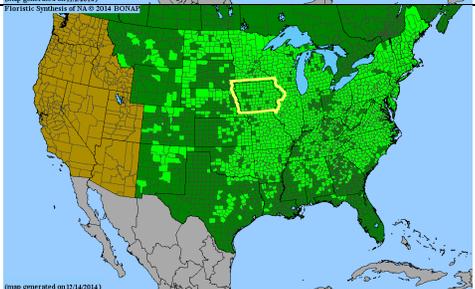
3-Common names indicated by Eilers and Roosa 1994 or observed in general use.

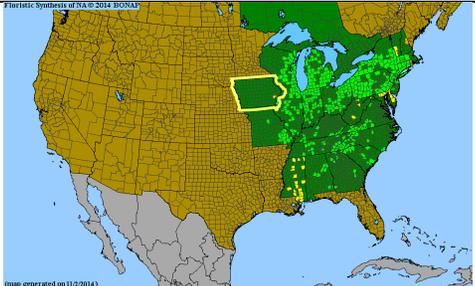
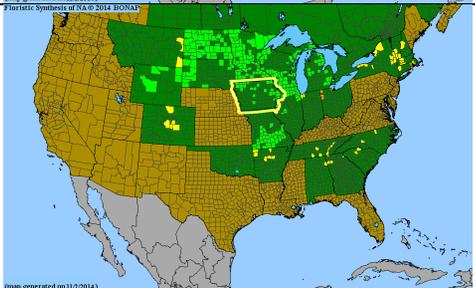
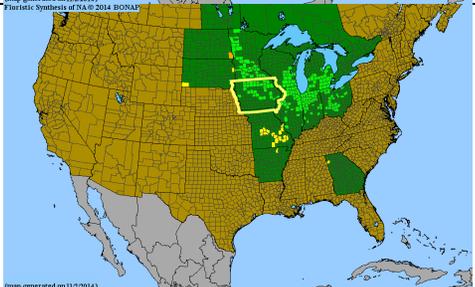
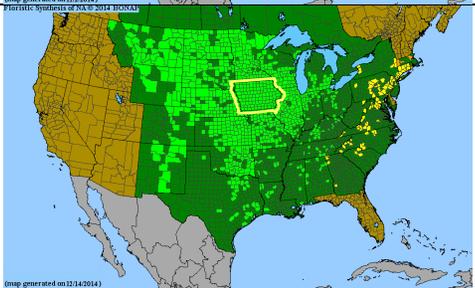
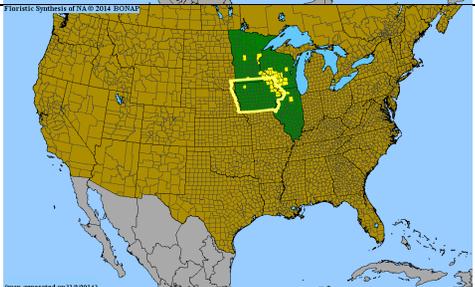
4-General habitat description

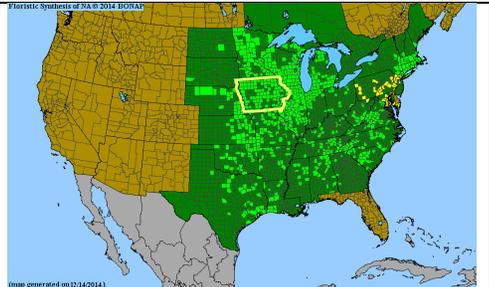
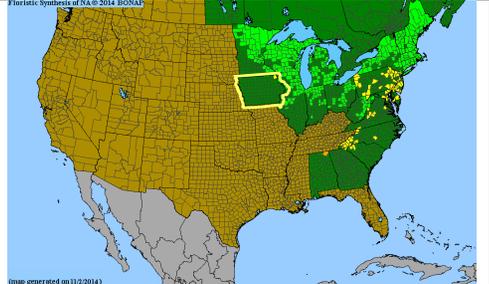
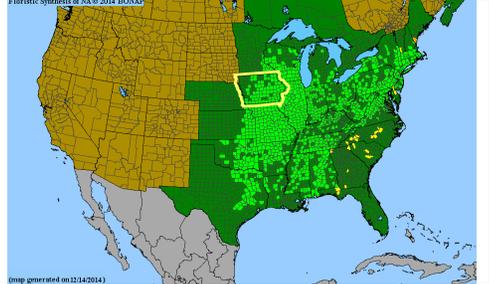
5-Biogeographical range according to BONAP **NOTE: USE RANGE MAPS IN IOWA PRAIRIE PLANTS FOR DESIGNING SEED MIXES**

Digital version available at: <http://uipress.lib.uiowa.edu/ppi/>

Flora of North America	Eilers and Roosa 1994	Common Names	Habitat	BONAP Biogeography
<p><i>Solidago altissima</i> subsp. <i>altissima</i> * subsp. <i>gilvocanescens</i> *</p> <p>Iowa CC: 0 to 2 H</p>	<p>NEW SPECIES</p> <p>leaves triple-veined; stems & inflorescence pubescent; leaf margins serrulate to subentire</p>	<p>tall goldenrod late goldenrod</p> <p><u>similar species:</u> Canada goldenrod giant goldenrod</p>	<p>dry to mesic soils, in prairies, grasslands, fields, thickets, roadsides, riparian and disturbed areas</p>	
<p><i>Solidago canadensis</i> var. <i>hageri</i> * var. <i>canadensis</i></p> <p>Iowa CC: 0 to 2 H</p>	<p><i>Solidago canadensis</i> var. <i>gilvocanescens</i> var. <i>hageri</i> var. <i>scabra</i> = <i>Solidago altissima</i> leaves triple-veined; stems & inflorescence pubescent; leaf margins serrate</p>	<p>Canada goldenrod</p> <p><u>similar species:</u> tall goldenrod giant goldenrod</p>	<p>dry to mesic soils in prairie, pastures, open woodlands, roadsides, old fields</p>	
<p><i>Solidago flexicaulis</i></p> <p>Iowa CC: 6 to 7 H</p>	<p><i>Solidago flexicaulis</i> = <i>S. latifolia</i></p> <p>zigzag upper stem; leaves broadly ovate, coarsely serrate with a rounded base and winged petiole</p>	<p>zig-zag goldenrod</p> <p><u>similar species:</u> cliff goldenrod rough-leaved goldenrod</p>	<p>mesic soils in forest and woodland; shaded streambanks and riparian soils</p>	

<p><i>Solidago gigantea</i></p> <p>Iowa CC: 3 to 3 H</p>	<p><i>Solidago gigantea</i> var. <i>serotina</i></p> <p>leaves triple-veined; stems glabrous, glaucous; inflorescence pubescent</p>	<p>giant goldenrod smooth goldenrod</p> <p><u>similar species:</u> Canada goldenrod tall goldenrod early goldenrod</p>	<p>seasonally wet-mesic to mesic soils, in prairie, open woodland, wet meadows or swales, ditches or roadsides, and thickets; flood plains and riparian areas</p>	 <p><small>(map generated on 12/14/2014) Floristic Synthesis of NCA © 2014 BONAP</small></p>
<p><i>Solidago hispida</i></p> <p>Iowa CC: 10 to 10 M</p>	<p><i>Solidago hispida</i> = <i>S. bicolor</i> var. <i>concolor</i></p> <p>basal and lower cauline leaves much larger than mid cauline leaves; softly pubescent leaves and stems</p>	<p>hairy goldenrod</p> <p><u>similar species:</u> cliff goldenrod soft goldenrod</p>	<p>dry sandy, gravelly or rocky soils in forests and woodlands; sand dunes, sandy fields and shorelines, disturbed areas</p>	 <p><small>(map generated on 12/14/2014) Floristic Synthesis of NCA © 2014 BONAP</small></p>
<p><i>Solidago missouriensis</i></p> <p>Iowa CC: 5 to 6 H</p>	<p><i>Solidago missouriensis</i> var. <i>fasciculata</i></p> <p>leaves triple-veined; stems & inflorescence glabrous, stems sometimes red; short, leafy branches in upper leaf axils</p>	<p>Missouri goldenrod prairie goldenrod</p> <p><u>similar species:</u> giant goldenrod early goldenrod</p>	<p>sandy and rocky soils, clay and loam soils in prairies, grasslands, pastures, savanna, open woodland, rock ledges, limestone glades, disturbed soils, roadsides</p>	 <p><small>(map generated on 12/14/2014) Floristic Synthesis of NCA © 2014 BONAP</small></p>
<p><i>Solidago mollis</i></p> <p>Iowa CC: pending</p>	<p>NEW SPECIES (treated as a variety of <i>Solidago nemoralis</i>)</p> <p>leaves triple-veined, grayish green, densely strigulose to puberulent basal leaves withering</p>	<p>soft goldenrod</p> <p><u>similar species:</u> rigid goldenrod gray goldenrod</p>	<p>dry sandy, loam to clay soils in prairies, savanna, and open woodland;</p>	 <p><small>(map generated on 12/14/2014) Floristic Synthesis of NCA © 2014 BONAP</small></p>
<p><i>Solidago nemoralis</i> subsp. <i>nemoralis</i> * subsp. <i>decemflora</i> *</p> <p>Iowa CC: 4 to 5 H</p>	<p><i>Solidago nemoralis</i> var. <i>longipetiolata</i> = <i>S. decemflora</i> = <i>S. longipetiolata</i></p> <p>leaves single-veined, grayish green; stems < 60 cm</p>	<p>gray goldenrod old-field goldenrod</p> <p><u>similar species:</u> soft goldenrod hairy goldenrod</p>	<p>dry sandy, gravelly or clay soils in prairies, grasslands, pastures, open deciduous and conifer woodlands, disturbed sites, old fields, roadsides</p>	 <p><small>(map generated on 12/14/2014) Floristic Synthesis of NCA © 2014 BONAP</small></p>

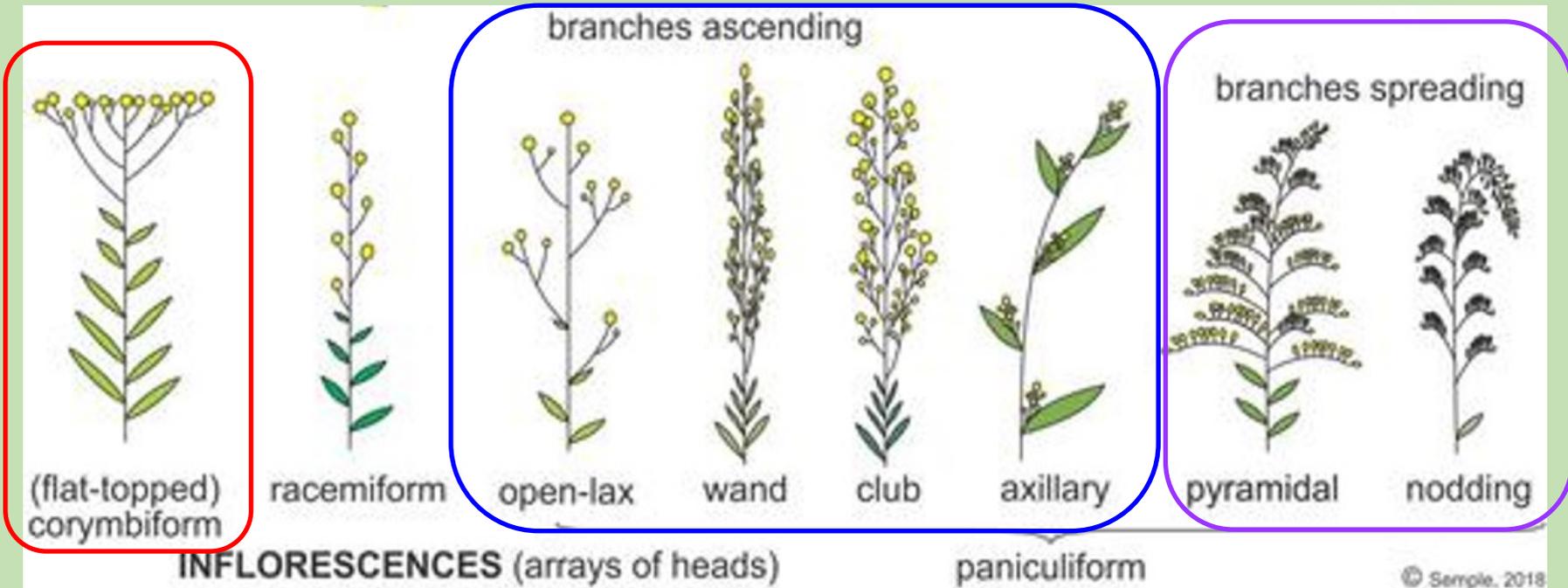
<p><i>Solidago patula</i> var. <i>patula</i> * var. <i>strictula</i></p> <p>Endangered 3 observations (1 site) last observation 2001 Iowa CC: 10 to 10 M</p>	<p><i>Solidago patula</i></p> <p>leaves scabrous, basal leaves up to 30 cm long and 10 cm wide with winged petioles; stems striate, 2 or 3 angled</p>	<p>rough-leaved goldenrod swamp goldenrod</p> <p><u>similar species:</u> elm-leaf goldenrod</p>	<p>wet to mesic soils in swamps and wet woodlands, wet meadows and seeps, fens, roadside ditches</p>	
<p><i>Solidago ptarmicoides</i></p> <p>Iowa CC: 9 to 9 M</p>	<p><i>Solidago ptarmicoides</i> = <i>Aster ptarmicoides</i></p> <p>leaves linear, more than 10X longer than wide; margins with a narrow cartilaginous strip</p>	<p>upland white goldenrod white flat top goldenrod</p> <p><u>similar species:</u> most likely confused with a <i>Symphotrichum</i> species</p>	<p>dry, sandy, usually calcareous soils, rocky outcrops and rock ledges in prairies, savanna and open woodland</p>	
<p><i>Solidago riddellii</i></p> <p>Iowa CC: 8 to 9 H</p>	<p><i>Solidago riddellii</i></p> <p>leaves linear, more than 10X longer than wide, blades recurved and V-shaped with sheathing bases</p>	<p>Riddell's goldenrod</p> <p><u>similar species:</u> some resemblance to <i>Helianthus maximiliani</i></p>	<p>shallow marshes, wet prairies, sedge meadows, fens, wet seeps</p>	
<p><i>Solidago rigida</i> subsp. <i>rigida</i> * subsp. <i>humilis</i> * subsp. <i>glabrata</i></p> <p>Iowa CC: 4 to 4 H</p>	<p><i>Solidago rigida</i> var. <i>humilis</i></p> <p>stems stout, leafy, hairy leaves broadly ovate to lanceolate, upper smaller & sessile, lower larger & long petiolate</p>	<p>rigid goldenrod stiff goldenrod</p> <p><u>similar species:</u> soft goldenrod</p>	<p>prairies, glades, oak savannas, open woodlands, pastures, dry calcareous soils, utilizes disturbances</p>	
<p><i>Solidago sciaphila</i></p> <p>Iowa CC: 10 to 10 H</p>	<p><i>Solidago sciaphila</i></p> <p>basal and lower cauline leaves the largest and serrate, becoming smaller and entire distally</p>	<p>cliff goldenrod</p> <p><u>similar species:</u> showy goldenrod hairy goldenrod</p>	<p>sandstone and limestone bluffs and ledges along the upper Mississippi River</p>	

<p><i>Solidago speciosa</i> subsp. <i>pallida</i> subsp. <i>speciosa</i> * var. <i>rigidiuscula</i> * var. <i>speciosa</i> *</p> <p>Iowa CC: 7 to 7 H</p>	<p><i>Solidago speciosa</i> var. <i>jejunifolia</i> var. <i>rigidiuscula</i></p> <p>leaves single-veined, glabrous, lanceolate to ovate-elliptic, usually entire, lower withering</p>	<p>showy goldenrod</p> <p><u>similar species:</u> cliff goldenrod</p>	<p>sandy, silty, gravelly soils in grasslands and prairie, pasture, savannas, open woodlands, on road embankments</p>	
<p><i>Solidago uliginosa</i></p> <p>Endangered 1 observation, 1 county last observation 1989 Iowa CC: 10 to 10 H</p>	<p><i>Solidago uliginosa</i></p> <p>stems glabrous, often reddish; leaves linear, glabrous, lower leaves with sheathing and clasping bases</p>	<p>swamp goldenrod bog goldenrod</p> <p><u>similar species:</u> Riddell's goldenrod</p>	<p>fens, bogs, marshes, swamps, wet meadows</p>	
<p><i>Solidago ulmifolia</i> var. <i>ulmifolia</i> * var. <i>palmeri</i></p> <p>Iowa CC: 6 to 6 H</p>	<p><i>Solidago ulmifolia</i></p> <p>stems glabrous below the inflorescence; leaves elliptic to narrowly lanceolate, ± scabrous, lower serrate, upper entire margins</p>	<p>elm-leaf goldenrod</p> <p><u>similar species:</u> rough-leaved goldenrod</p>	<p>dry to mesic upland forest and woodland</p>	

Solidago species unknown for Iowa, but which occur in adjacent states

- Solidago sphacelata* (IL)
- Solidago arguta* (IL, MO)
- Solidago ohioensis* (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 odora* (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 **upland white**

* disc and ray 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 **rigid**



3-upland white



1-upland white



2-upland white



4-Riddell's



5-Riddell's



8-rigid



9-rigid



7-Riddell's



6-Riddell's



10-rigid

GROUP B – cylindrical wand or rod

B1

stem below the inflorescence hairy; upper surface of leaf blade hairy **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 **showy**

* 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 **zigzag or cliff**



8-showy

9-showy

11-showy

10-showy

1-hairy

2-hairy

6-showy

7-showy

4-hairy (lower leaf)

5-hairy

hairy

showy

zigzag or cliff

→ basal and lower cauline leaves the largest and longest, the leaves progressively reduced in size distally; stem ± straight **cliff**

→ 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 **zigzag**



GROUP C – pyramidal



C1

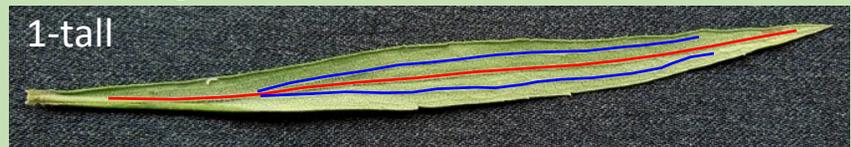
cauline leaves with a distinct midrib, the other weaker veins ± pinnate, NOT **triple-nerved**

* 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 **gray**

* 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 **elm-leaf**

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



GROUP C2 – pyramidal

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

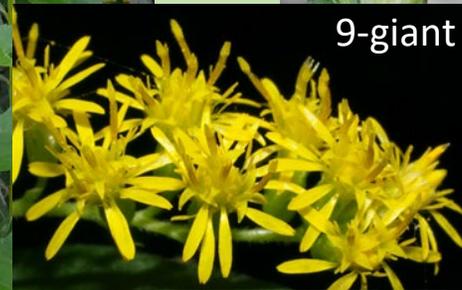
* axis, branches and pedicels of the secondary inflorescence glabrous **Missouri**

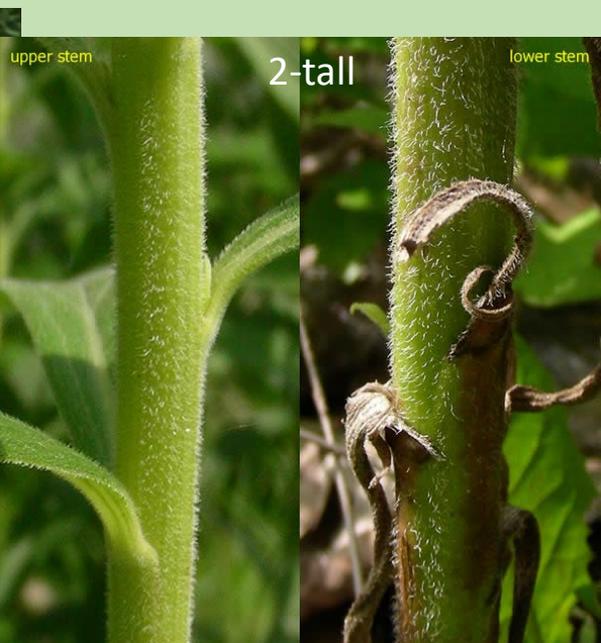
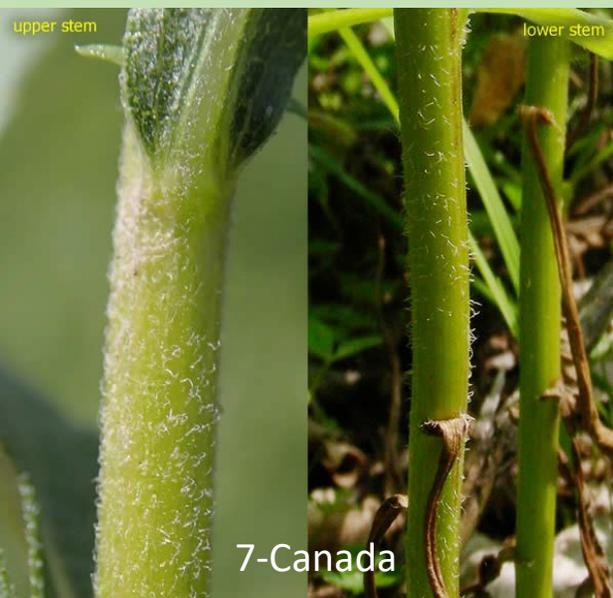
* axis, branches and pedicels of the secondary inflorescence sparsely to moderately and distinctly pubescent **giant**

stem pubescent all or most of its length

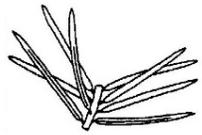
* involucre mostly 3.1-4.6 mm long; ray florets 10-16, ray corollas 3.0-4.0 mm, disc corollas 3.0-3.5 mm; mid to distal cauline leaves minutely serrate to entire **tall**

* involucre 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 **Canada**





Glossary



A. Needlelike



B. Scalelike



C. Linear



D. Oblong



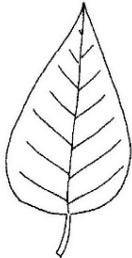
E. Lanceolate



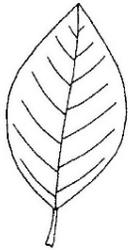
F. Elliptic



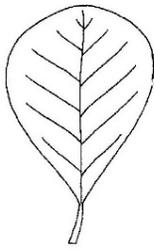
G. Oblanceolate



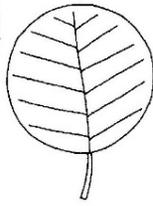
H. Ovate



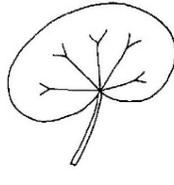
I. Broadly elliptic



J. Obovate



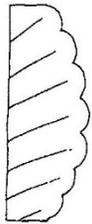
K. Orbicular



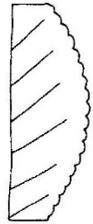
L. Reniform



A. Entire



B. Crenate



C. Crenulate



D. Serrate



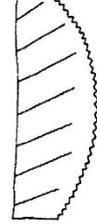
E. Serrulate



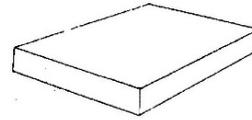
F. Doubly serrate



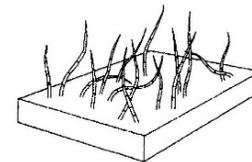
G. Dentate



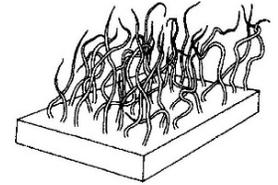
H. Denticulate



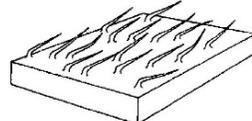
A. Glabrous



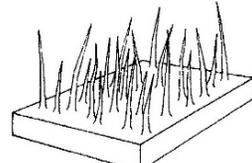
B. Pilose



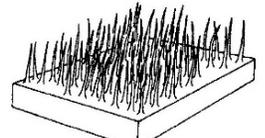
C. Villous



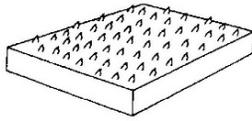
D. Strigose



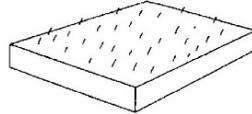
E. Hispid



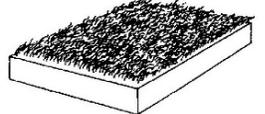
F. Hirsute



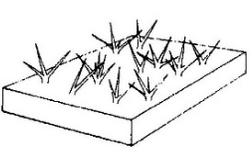
G. Scabrous



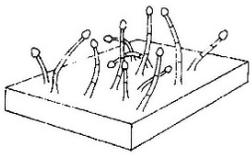
H. Puberulent



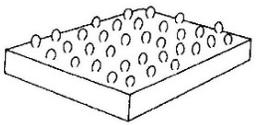
I. Tomentose



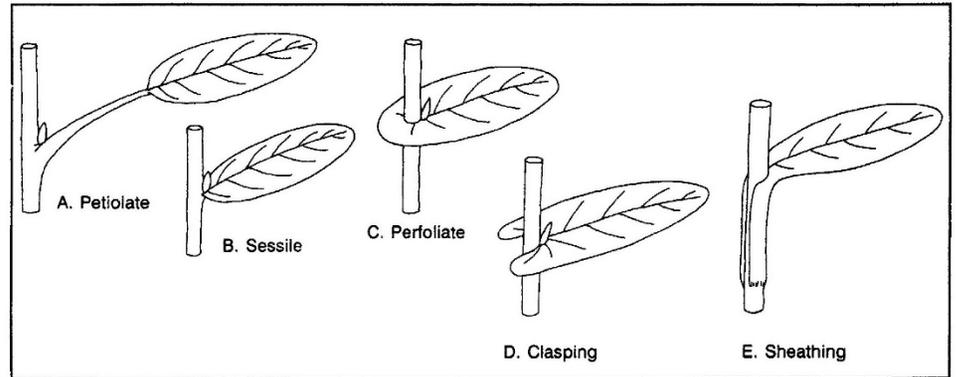
J. Stellate



K. Stipitate Glandular



L. Sessile Glandular



A. Petiolate

B. Sessile

C. Perfoliate

D. Clasping

E. Sheathing

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

Cypsella – 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 involucre 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

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

Cauliscent – 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)

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Iowa *Solidago*

Adapted from keys in Yatskievych, G. 2006. Steyermark's Flora of Missouri Volume 2. Missouri Botanical Garden Press; Voss, E.G. and A.A. Reznicek 2012. Field Manual of Michigan Flora. University of Michigan; Kaul, R.B., D.M. Sutherland, and S.B. Rolfsmeier. 2006. The Flora of Nebraska. School of Natural Resources, University of Nebraska-Lioncoln; Semple, J.C, and R.E. Cook. 2006. *Solidago*. In: Flora of North America Editorial Committee, eds. 1993+. Flora of North America North of Mexico. 21+ vols. New York and Oxford. Vol. 20; by Thomas R. Rosburg (January 2021).

- 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, \pm 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 \pm 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)