

Goldenrods and Asters

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HAIRY GOLDENROD



RAGGED GOLDENROD



GRAY GOLDENROD

MAN TENDS to evaluate parts of his environment in terms of their relation to his problems of food, health, economy and esthetic appreciation. In each of these categories our goldenrods and asters have significance. No attempt is made to suggest the relative importance of the different categories, although it must be recognized that a plant that may have a positive value in one category may have a negative value in another. When all is said and done, however, most of us will sacrifice mundane values for those that appeal to the soul. Your prejudices, true or false, may have set you against goldenrod because you have heard that it is of major importance in connection with hay fever. Nevertheless, you must admit, even through hay fever's tears, that a field of goldenrods and asters, framed with the autumnal color of hardwoods, has something that is bound to stimulate your pulse. Such a scene makes you glad that you are alive and can see what is close at hand.

Celia Thaxter, Bayard Taylor, Lucy Larcom and Helen Hunt Jackson have all been stimulated to write verses about these plants, but I rather think that William Cullen Bryant best presented what I have in mind. He wrote, in "Death of the Flowers,"

"The windflower and the violet
They perished long ago,
And the brier rose and orchis died
Amid the summer glow.
But on the hills, the goldenrod,
And the aster in the wood
And the yellow sunflower by the brook
In autumn beauty stood."

It seemed too much of a project to attempt to give adequate attention to the sunflowers in this insert on goldenrods and asters, so we will have to await a later number to consider them.

Alabama, Nebraska, North Carolina and Kentucky have chosen the goldenrod as their State Flower, but I know of no State that has given the aster a similar recognition. Kansas, of course, has chosen the sunflower as its favorite.

With the exception of the flowers of some asters, and the stems of some goldenrods, red is not a color associated with these plants. Instead they make a major contribution of yellows, blues and purples to our late summer and fall landscapes, adding to the technicolor of the hardwoods late in the season, and usually are closer to the ground. For the most part, goldenrods and asters offer little fragrance to man's relatively poor sense of smell, and, as a matter of fact, the experiences of our noses with the plants is often an unhappy one. No



ARROW-LEAVED ASTER



WAVY-LEAVED ASTER



WEDGE-LEAVED ASTER



GRASS-LEAVED
GOLDENROD



ZIG-ZAG GOLDENROD



WHITE GOLDENROD



WREATH GOLDENROD

music, such as that which comes to our ears from wind in the pines or from migrating geese, comes from the goldenrods and asters. Few goldenrods or asters have anything so gentle to the touch as do bursting milkweed pods or the pelts of our fur-bearing animals. It is, then, through our eyes that these plants appeal to our esthetic sense.

There is little doubt that happiness is one of the most important goals sought by man, and that the beauty of our goldenrods and asters can contribute to human happiness. Next in importance, possibly, is health and the plants have some significance here.

The genus to which the goldenrods belong is *Solidago*. This name is derived from the Greek meaning to make whole, or to unite firmly. It was used in connection with the plant because of a supposed medicinal value in hastening the healing of wounds and the growing together of severed or cut pieces of flesh. Unfortunately for this idea, modern medicine apparently does not recognize any particular merit of goldenrods in this connection, and so it is interesting to us only academically and historically.

While relatively few persons even know of this supposed medicinal value of these common plants, there are plenty who have heard that goldenrod has a definite relationship to the incidence of hay fever. Some of the best statistics we have on the matter, however, tell us that only about one percent of the pollen in the air in late summer comes from goldenrod; at least this is true for one locality from which people take expensive trips to escape hay fever discomfort. While hay fever can be caused by the pollen of goldenrod, most infection comes from the pollens of ragweeds, which take to the air at about the time the goldenrods begin to bloom. The ragweeds are relatively inconspicuous, so the blame falls too readily on the showy goldenrod. One authentic reference to this story states that it is probably "safe to say that nearly all hay fever in late summer in the East is due to plants other than goldenrod." Most hay fever patients who are affected by ragweed would probably be similarly affected by goldenrod, but the abundance of goldenrod pollen is much less than that of ragweed and similar pollens. It is true that the average hay fever patient probably may be induced to sneeze if the heads of flowers are shaken before his nose.

There seems to be little structural differences in the pollen of different species of goldenrod, but it is recognized that probably the two worst species so far as hay fever is concerned are the noble or showy goldenrod, *Solidago speciosa*, and the seaside goldenrod, *Solidago sempervirens*. The latter is not found far from salt water coast lines, but the former, which is one of the most beautiful of all goldenrods, is found from Massachusetts to Minnesota and south to North Carolina and Arkansas.

Other associations of these plants are suggested in the chart section, which deals with different species.

The health of cattle is sometimes impaired by some goldenrods and asters. For example, *Aster adsensens* and *Aster commutatus* are reported to absorb selenium from the



LATE GOLDENROD



CROOKED-STEMMED
ASTER



LARGE-LEAVED ASTER



HEATH ASTER



CANADA GOLDENROD



NEW ENGLAND ASTER

important nectar-producers in Iowa. A New England writer claims that goldenrod is the most important plant to bee culturists. Eleven species of goldenrod are rated high in honey production in the vicinity of Ottawa, Canada. Among the asters discussed in the insert *A. gigantea*, *A. novaeangliae*, *A. cordifolius*, *A. sagittifolius*, *A. ericoides* and *A. acuminatus* are recognized honey producers. Some of these are valuable because they provide forage for bees at times of the year when other sources of pollen and nectar are not available. Others are valuable because of the great volume of food they produce in a small area. This reduces the amount of work a bee must do to make a suitable harvest, and, of course, this increases production. Of the asters listed above the heath aster, *Aster ericoides*, is so valuable as bee forage that bee keepers may cultivate it as a crop for the use of their bees. Some idea of the volume of nectar produced by these plants may be found in reference to the heart-leaved aster, *Aster cordifolius*. One Canadian report indicates that in one eleven-day period in September, three hundred colonies of bees produced twelve thousand pounds of honey when this species was obviously the primary source of supply. This aster is not attractive

soil in sufficient quantities to poison cattle that feed on the plants. As a rule, goldenrods and asters provide such poor forage that they are neglected by cattle when other plants are available.

On some occasions man has used these plants as a source of food. The leaves of the large-leaved aster, *Aster macrophyllus*, have been used as pot herbs, but unless they are taken when young they are inclined to be too leathery and tough to be considered as even approaching rating as a delicacy. The Indians of New Mexico and Arizona are reported to have used *Solidago missouriensis* as a salad. A drink is sometimes brewed from the sweet-scented goldenrod, *Solidago odora*.

There is no doubt but that the closest association these plants have with man's food supply is through their relation to honey production. The numbers of species that are important in this regard varies across the country, and according to the authorities. At least nine goldenrods are considered

to the eye, but it obviously has a great appeal to the bee's sense of smell.

The honey produced by various goldenrods and asters varies in quality as well as in quantity. The chart section should give the details on this, but some of the finest-flavored and most attractive honey comes from these plants. The hairy goldenrod, *Solidago rugosa*, which may be locally abundant may sometimes produce a nectar that results in a sour-tasting honey. Sometimes this odor is so strong that it may be detected in hives some distance away. However, the same plant may produce good honey as well.

Possibly the important thing in connection with the honey production of these plants is that the plants of greatest importance frequently grow in almost pure stands. Others are of importance because of their off-season flowering. The value of some, of course, is affected by the quality of the resultant honey. A colony of bees close to a good stand of goldenrod may well yield from fifty to eighty pounds of good-quality honey of excellent flavor and fragrance and a gleaming white or amber color. Pammel of Iowa listed *Solidago gigantea*, *S. canadensis* and *S. graminifolia* as being among the best of the honey-producing goldenrods. On these we have given special help in the chart section.

During World War II there was a great possibility that the Allies would be cut off by the Japanese from their southeastern Asia rubber supply. A desperate effort was made to find alternative sources of supply. Thomas Edison, the wizard of science, gave great attention to this. Some twenty-four species of goldenrods growing naturally in the eastern United States were considered as possibilities because of basic materials found in their leaves. Of these only two were considered as having commercial possibilities. Of these the only species given real consideration was *Solidago leavenworthii*. Great hopes were held for this goldenrod, discussed in detail in the *United States Journal of Agricultural Research*, vol. 47, pages 149-153, 1933. However, the chemists, through their production of synthetic rubber, offered competition that the goldenrod (continued on page 368)



HEART-LEAVED ASTER



SMOOTH ASTER

COMMON NAME SCIENTIFIC NAME	RAGGED GOLDENROD <i>Solidago squarrosa</i>	WREATH GOLDENROD <i>Solidago ceasia</i>	ZIG-ZAG GOLDENROD <i>Solidago flexicaulis</i>	WHITE GOLDENROD <i>Solidago bicolor</i>
DESCRIPTION	Stem to 5 feet high, stout, hairy above or smooth, branched or unbranched. Roots fibrous. Leaves from base to tip of stem progressively shorter, with upper entire, or nearly so, and pointed, and the lower to 10 inches long and 3 inches wide, with sharply toothed margins, widest near tip, smooth or nearly so.	Stems to 3 feet high, branched or unbranched, bluish to purple and usually with a bloom that rubs off easily; round in cross section. Short, stout, underground system with numerous fibrous roots. Leaves stalkless, sharply toothed, narrowed at base, smooth or slightly hairy, 5 inches long and to 1¼-inch wide. Lower shed by flowering time.	Stem to 3 feet high, branched or unbranched, angled, zig-zag, smooth or nearly so, particularly below. Leaves, thin, long-pointed at tip, strongly and sharply saw-toothed, abruptly narrowed at base, to 6 inches long and to 2½ inches wide, smooth or slightly fuzzy beneath, lower shed by flowering time and smaller.	Stem to 4 feet high, branched or unbranched, stout, usually erect and relatively stiff, fuzzy or smooth. Underground parts stout branching rootstocks with many fibrous roots. Leaves to 4 inches long and 2 inches wide, with long margined petioles, but the upper without petioles, and smaller and narrower. Somewhat fuzzy.
RANGE AND RELATIONSHIP	Found in woodlands where the soil is rocky and usually poor, and in hilly regions. Found from New Brunswick to Ontario in Canada and south to North Carolina, Ohio and Indiana and in the Catskill region to elevations of at least 2000 feet. Rather uncommon in southern part of range.	Family Compositae. Subfamily Virgaurea. Found in rich, relatively open woodlands of hardwood species, or in shady glens or woodland borders from Nova Scotia to Ontario and Minnesota and south to Florida, Arkansas, Oklahoma and Texas in varying degrees of abundance through range but often abundant where established.	Family Compositae. Subfamily Virgaurea. Found in rich woodlands, in moist, shaded, hilly areas from Nova Scotia to New Brunswick and Minnesota and south along highlands to Georgia, Tennessee and Missouri, and to elevations of 2300 feet in Catskills. Most abundant in northern areas. Also called broad-leaved goldenrod.	Family Compositae. Subfamily Virgaurea. Found in dry soil, usually in shade and commonly in hilly country from Prince Edward Island to Georgia and less abundantly west to Tennessee and Minnesota. It rarely forms dense stands of the one species and often appears as isolated plants. Also called silverrod.
REPRODUCTION	Flowers in heads of 15-25 flowers, of which 10-16 may be ray flowers, which are to ¼-inch long. Heads to ½-inch high, numerous and borne in short clusters in upper areas of stem. The involucre at the base of the heads has bracts with tips that spread widely at right angles, giving ragged appearance. Fruits smooth.	Flowers borne in small heads in small clusters along the stem at the axils of the leaves, or often more crowded near tip of stem. The involucre at the base of the heads has the bracts not spreading at the tips as in ragged goldenrod and are usually under 1/5-inch long. Fruits are rather heavily hairy. Also called blue-stemmed and woodland goldenrod.	Flowers in heads of 3-4 rays and more disc flowers. Heads borne in short clusters in axils of leaves and each to ¼-inch high with an enclosing involucre at base that is smooth and with overlapping bracts. Flowers yellow. Fruits fuzzy, with the hairs short. Sometimes heads appear in a compact panicle at end of stem.	Flowers are in heads that are usually crowded into a terminal cluster that is somewhat like a compact cylinder. Heads small with involucre usually under 1/5-inch long. Rays white, yellow or straw-colored, fewer than disc flowers. Bracts of involucre whitish, blunt with widened mid-veins. Fruits smooth.
ECOLOGY	Flowers appear over relatively long period from August through October. The species does well in open wooded areas, or at or near edges of woodlands. It does not commonly form extensive pure stands of the one species, but may be reasonably abundant where well established. It is hardly beautiful, but is an interesting species.	Flowers appear in full bloom from August through October, the yellow of the blooms being replaced by the whiteness of the fruits towards the end of the flowering season. Lower leaves usually die off before flowering begins. While it often appears in relatively pure stands in small areas, it is not important to bees.	Flowers appear in late summer usually from mid-July through September. This species does not long survive removal of shade and water, and does not normally form extensive pure stands of the one species as do many of the related goldenrods. Does not make attractive bouquets, but has a beauty of its own in natural setting.	Flowers appear from August through October, but are only rarely conspicuous when compared with those of other goldenrods. To some this goldenrod may appear to be a sickly goldenrod, but it has its favorable points, too, in the fact that few other goldenrods are not golden and most have a less stiff erect over-all form.
ECONOMY	It is not listed by beekeepers as an important forage for honey bees, due in part, probably, because it does not appear in dense pure stands where bees may quickly harvest nectar and pollen in connection with their food-gathering. It probably has no significance in hay fever or in medicine. Also called stout goldenrod.	One of the most beautiful of woodland goldenrods with no apparent record as a contributor to hay fever. Its sole claim to fame apparently lies in its unique beauty, and the term unique is used here without reservation, or with fear of effective criticism. A bank of this goldenrod in a patch of sun through autumn colored leaves!	Sheds an insignificant amount of pollen and cannot be considered a hay fever factor ordinarily, and is not listed as an important forage for bees. Because of spreading underground parts and hillside habitat might be considered as important at times in anchoring soil that might otherwise erode too readily. Has some cover value.	The amount of pollen produced is insignificant so far as the individual plant is concerned and because the plants rarely form extensive masses. The plant can hardly be considered to make any contribution to the hay fever situation or to the honey-producing record of visiting honeybees. Known as bellyache weed.

HAIRY GOLDENROD <i>Solidago rugosa</i>	GRAY GOLDENROD <i>Solidago nemoralis</i>	CANADA GOLDENROD <i>Solidago canadensis</i>	LATE GOLDENROD <i>Solidago gigantea</i>	GRASS-LEAVED GOLDENROD <i>Solidago graminifolia</i>
Stem to over 7½ feet high, stout, branched or unbranched, finely hairy or rarely smooth, arising from long, creeping, underground rhizomes which may form an underground mat. Leaves roughly hairy and harsh to touch, to 4 inches long and to 1½ inches wide, roughly veined on lower side, toothed conspicuously, pointed or tapering to point.	Stem to 2 feet high, erect or sometimes prostrate or nearly so, covered with dense, ashy-white short fuzz. Underground branching rootstocks and fibrous roots. Leaves thick, rough, fuzzy like the stems, the lower blunt tipped and broader near tip, weakly 3-nerved, more or less toothed on margins with tooth curved.	Stems to over 6 feet high, erect, stiff and brittle, at least in upper areas appears to be mealy. Underground portions are extensively creeping, interlocking rhizomes. Leaves to 10 inches long and nearly 1 inch wide, 3-nerved, the lower ones dying by flowering time. Smooth or rough above with toothed or untoothed margins.	Stem to 8 feet high, smooth, with a bloom that rubs off, stout, branched near the top. Underground parts represented by long creeping rhizomes with fibrous roots. Leaves thin or thickened, 3-nerved, with sharply toothed margins, smooth on both sides or fuzzy beneath, to 6 inches long and to ¼ inches wide, the lower petioled.	Stems to 4 feet high profusely branched in the upper areas into a more or less flat-topped formation. Underground structures are creeping rhizomes that are branched. Leaves, abundant, to 5 inches long and to 1/3-inch wide, 3-5 nerved, roughly fuzzy on margins and nerves of lower surface. Lower leaves die and fall off early.
Family Compositae. Subfamily Virgaurea. Found on dry rolling hillsides, or in abundance along roadsides, usually in sun but not necessarily so. Ranges from Newfoundland to western Ontario and south to Florida and Texas. A variety, <i>S. spagnophila</i> , grows at best near bogs and wet shorelines. Also tall, rough or pyramid.	Family Compositae. Subfamily Virgaurea. Dry soil, particularly in sandy areas such as may be found in open fields exposed to the sun. Ranges from Nova Scotia to Saskatchewan and south to Florida, Texas and Arizona. In some areas it may be an important part of the flora. Found into Mexico. Also called field or dwarf goldenrod, or Dyer's weed.	Family Compositae. Subfamily Virgaurea. Ranges over open, sunny, moist soil, or even over dry fields, forming extensive pure stands. Ranges from Newfoundland to Minnesota and south to North Carolina and Tennessee. Its adaptability to wet or dry, shady or sunny areas has given it a wide local and general range.	Family Compositae. Subfamily Virgaurea. Favors open moist soil and found from New Brunswick to British Columbia and south to Georgia, Texas and Utah and southern Oregon. In Virginia, is found in mountains up to elevations of 2300 feet. May be most conspicuous plant in a late summer pasture within range.	Family Compositae. Subfamily Euthamia. Usually found on moist soil of fields and roadsides well exposed to sun where relatively pure stands may sometimes be formed. Ranges from New Brunswick to Saskatchewan and Alberta and south to Florida, Nebraska, Wyoming and New Mexico, particularly in mountains in southern areas.
Heads are to 1/6-inch high and are borne usually on one side of spreading recurved upper branches. The ray flowers are small and to 11 in a head. The bracts of the involucre are slender, blunt, overlapping. The fruits are covered with short, persistent hairs. The whole flower-bearing area is usually a panicle.	Flowers borne in heads that are to ¼-inch high and more or less crowded on one side of recurving branches from the upper part of the stem, the clusters appearing as one-sided panicles. Rays 5-9 and more numerous than disc flowers. Bracts of involucre oblong and slender. Fruits fuzzy.	Flowers in heads borne in terminal clusters that are crowded on recurved, one-sided branches that form a panicle. Rays in each head number 7-17. The involucre is to 1/8-inch high with bracts in several series, uniform, slender, pointed and yellowish with definite green tips. Fruits short-hairy or smooth.	Flowers yellow, borne in heads that are ¼-inch high and crowded on spreading recurved branches clustered at end of stem the branches appearing powdered often. Ray flowers 7-15, relatively large and surrounded by involucre whose bracts are fine, thin and oblong. Fruits are finely fuzzy.	Flowers in small narrow heads to 1/6 inches long, forming flat-topped appearance. Each head may contain from 12-20 ray flowers and from 8-12 central disc flowers. The supporting involucre is composed of yellowish, oblong, slightly sticky bracts usually without any conspicuously different tips. Fruits with short hairs. Called bushy, fragrant flat-topped goldenrod.
Flowering time is from July through November. Chromosome number is 18. In some areas, this species may form pure stands and may crowd out most other flowering plants. Because of this it is considered a weed, particularly as the plants have little or no forage value to cattle. Late, shallow plowing followed by crops controls.	Flowers appear from July through November, and sometimes on well into December, depending on the season and, of course, the locality, making the species one of the longer-seasoned forms. It may be well represented in an area but not usually forming such dense formations as Canada goldenrod and some others.	Flowers appear in late summer from August through October. Dense, tall, pure stands eliminate almost all competing plants but form an ideal cover for wildlife, even though little food may be present. The spreading root systems provide a superior soil anchorage that resists destructive erosion, which might be undesirable.	Flowers from late August through October, being most conspicuous in late season. In some areas it may be in flower as early as July. The plant appears to be rigid and stiff and the stems break relatively sharply. Lower branches of the flower-bearing top are the longer.	Flowers appear from July through September, making it a relatively early-flowering species. The relatively dense stems above ground provide good shelter but little food for wildlife, and the profusely branched underground parts provide good soil anchorage to check undesirable erosion. Of little or no forage value to livestock.
The species has some slight importance as a cause of hay fever, and the pure stands may provide abundant forage for bees. However, honey formed from the nectar may have a sour taste and even a sour smell, although this is not always necessarily so. Those who know can recognize this honey at a considerable distance.	Pellet in his book on honey-producing plants rates this species as one of high production of nectar, and therefore of great importance to industries dependent on honey production. Long flowering season adds to this value obviously. The reason for the common name Dyer's weed is obscure.	Pammel says that the species produces an abundance of nectar and one record from Louisiana shows that bees foraging on the species may produce 40 to 50 pounds of good honey per colony. Shallow plowing destroys stands where the plant is a weed, particularly if a cultivated crop is used for following year.	May sometimes be considered a weed in pasture land since forage value is low, but may be controlled easily by shallow late plowing followed by cultivated crops. Pammel lists the species as a valuable nectar producer, of value because of this to bees and, of course, through them to the honey industry.	Pammel lists the species as a good nectar producer for honey bees. Other authorities list it as an undesirable weed that easily may be controlled by shallow fall plowing followed by cultivated crops the next year. It has an interesting fragrance, is not listed as a hay fever species. Leaves may bear resinous spots.

COMMON NAME SCIENTIFIC NAME	LARGE-LEAVED ASTER <i>Aster macrophyllus</i>	NEW ENGLAND ASTER <i>Aster novaeangliae</i>	WAVY-LEAVED ASTER <i>Aster undulatus</i>	HEART-LEAVED ASTER <i>Aster cordifolius</i>
DESCRIPTION	Stems to 3 feet high, reddish, rather conspicuously angled, rough. Underground portions are long, thick, creeping rootstocks. Leaves to 9 inches long and 7 inches wide, forming large colonies of 3 to 4 per stem before flowering top appears; thick, firm with narrow petiole and broad blade, the upper with broadly winged petioles.	Stems to 8 feet high, stout, heavily leafy, usually well-branched above and with a sticky fuzz over most surfaces. Underground parts short thick rhizome with many fibrous roots. Leaves to 5 inches long and 1 inch wide, entire margined, fuzzy and soft hairy beneath with bases that usually clasp the stem. Lower shed early.	Stems to 5 feet high, stiff, rough, bushy above and covered with a pale fuzz. Flowers borne in an open formation. Leaves with heart-shaped bases, which surround stem, contract abruptly and then widen, with the margin distinctly waved. Blades relatively rigid and dark green. Plant has a generally rugged appearance.	Stems to 5 feet high, smooth or rarely sparsely fuzzy, branched above. Underground parts are represented by short rather thick rhizomes that creep and bear many fibrous roots. Leaves with heart-shaped blades, to 5 inches long, deep-toothed margins, thin, rough, fuzzy, with scattered hairs and short petioles in lower areas.
RANGE AND RELATIONSHIP	Family Compositae. Subfamily Biotia. Common in open woodlands on moderately dry shady soil, particularly in hilly country. Ranges from New Brunswick to Minnesota and south to North Carolina. At least 6 varieties recognized in the eastern part of the range. In spite of beauty is not listed as having been cultivated.	Family Compositae. Subfamily Euaster. Fields and swampy borders often forming great mats, or almost pure stands along roadsides and fence-rows. May also be found under cultivation in gardens. Ranges naturally from Quebec to Saskatchewan and south to South Carolina, Alabama, Kansas and Colorado. Chromosomes number 10.	Family Compositae. Subfamily Euaster. A relatively common plant of dry, shaded roadsides and open woodlands. Ranges from New Brunswick through Ontario to Minnesota and south to Florida, Georgia, Mississippi, and Texas. Plants are usually not crowded with others of their kind.	Family Compositae. Subfamily Euaster. Found at best in woodlands that are open and in mixed thickets. Ranges from Nova Scotia through New Brunswick and Ontario and Minnesota and south to Georgia and Missouri. Locally it may be found in great abundance, although it is not so conspicuous as many other related species. Also called blue weed aster and bee weed.
REPRODUCTION	Flowers in heads to 1/2-inch high. Ray flowers about 16 each to 1/2-inch long, usually lavender, violet or pale bluish. Bracts of the involucre varying from blunt greenish, fuzzy outer series to slender inner ones that may have rosy margins. Generally the bracts are in 3 series.	Flowers in heads to 2 inches across at the branch ends, forming great hemispherical clusters. Ray flowers from 20 to 100, narrow, to 3/4-inch long, violet, rose, red, white, or, more commonly, deep purple, but always attractive. Bracts of involucre unequal, green, spreading, often sticky. Fruits fuzzy and with reddish-white parachute.	Flowers borne in heads that are to 1/3-inch broad and are rather crowded on the upper branches. Ray flowers 10-20 and light violet to blue. Heads supported below by involucre that is narrow at base and composed of fuzzy, sometimes straw-like, bracts that are in 3-4 series and have spreading short green tips.	Flowers borne in heads that are numerous and small, each being to 1/8-inch high and to 2/5-inch broad. Ray flowers number 10-20, may be to 1/3-inch long and are violet, blue or white. The great abundance of heads makes up for their smallness in making plant attractive. Involucre bracts are tipped with short green points.
ECOLOGY	Flowering period extends from August through September, being at best earlier in the season. Plants may appear in considerable colonies, the great leaves sometimes forming an almost continuous cover of the forest floor. Leaves may be conspicuous long before the plant has a superficial resemblance to the flowering aster.	Flowering period from July through October, but under cultivation may be found flowering outside this period. May have a distinctive turpentine scent, which may be detected by walking through a mass of the plants. Under management practices the underground parts are separated every 2 to 3 years for best results.	Flowering time is from September through October, so it is a relatively short-season species. In spite of its beauty it does not seem to have attracted the attention of those who cultivate wild flowers and is not listed by many in lists of cultivated plants. Possibly its leaves with unusual margins may appeal to some.	Flowering time extends from August through October, with flowers in great profusion in middle of season. At least two eastern varieties and number of cultivated varieties. Listed by Bailey and others as a cultivated species and this is undoubtedly justified recognition for beauty, but other values exist as well.
ECONOMY	A popular plant with many Nature lovers, but the flowers are not attractive as bouquets. No reference available as to role in honey production so probably is not important in that connection. Leaves have been used as potherbs in Maine and Quebec, but with age they become brown and tough and unsuitable for such use as food.	Not listed as a hay fever factor by any authorities, and neither Pellett or Pammel consider it as important in connection with honey production or honeybee prosperity. Dense plants may provide good cover for wildlife but no food to these forms. Root system may provide excellent soil anchorage preventing erosion.	This species is not listed among the asters that have value as sources of food for honey bees, or is it listed in those species that are a factor in hay fever. These things may be due to the fact that there is a short season and the species does not grow in crowded colonies as is the case with most nectar-pollen sources.	Not listed as a factor in hay fever but given great recognition as a nectar producer valuable to bees. One Canadian report attributes a harvest of 12,000 pounds of honey from 300 bee colonies over an 11-day period in September. The resultant honey is light amber in color and most pleasantly flavored. This value is great.

ARROW-LEAVED ASTER <i>Aster sagittifolius</i>	SMOOTH ASTER <i>Aster laevis</i>	HEATH ASTER <i>Aster ericoides</i>	CROOKED-STEMMED ASTER <i>Aster prenanthoides</i>	WEDGE-LEAVED ASTER <i>Aster acuminatus</i>
Stems stiff, erect to 4½ feet high with more or less upright branches that are smooth or in upper areas slightly fuzzy. Leaves olive-green, thin, sparingly but sharply toothed, broadly lance-shaped but the lower at least with arrow-like bases or heart-shaped bases. To 6 inches long, smooth, or rough beneath.	Stems to 4 feet high, stout, branched or unbranched, often covered with a bloom but appearing smooth. Underground parts short, stout, sometimes red rhizomes. Leaves to 4 inches long and to 2 inches wide, thick, entire or slightly irregular-margined, almost greasily smooth, upper bract-like; basal narrow with winged petiole.	Stems to 7 feet high, profuse branching above, smooth, stiff and slender in most parts. Underground parts with fibrous roots that branch freely. Leaves are narrow, linear, to 1 inch long, stiff and in upper areas are light green and relatively crowded, although smaller than the lower leaves. Also called Michaelmas daisy.	Stems to 3 feet high, profusely branched above with lines of fine hairs appearing in the upper areas. Sometimes becomes brownish. Leaves are conspicuously rough above but smooth beneath, to 6 inches long and to 3 inches wide, with the lower half represented by a winged petiole and the upper conspicuously widened.	Stems to 3 feet high, distinctly zig-zagged, conspicuously branched above, fuzzy, usually leafless in lower areas. Leaves to 6 inches long and to 1½ inches wide, broadly oblong, coarsely toothed margins, wedge-shaped at base and about 20 in number below the stem branching area. Veins rather conspicuous.
Family Compositae. Subfamily Euaster. A sparingly common plant found almost wholly on dry soil usually in the shade. Ranges from Maine to North Dakota and south to North Carolina, Alabama, Mississippi, Kentucky and Kansas. Often appears to be dusty and not fresh. Does not usually grow in dense colonies of one species.	Family Compositae. Subfamily Euaster. Found in dry soil, in open or in shade or at margins of wooded areas. Ranges from Maine to Ontario and Saskatchewan and south to Virginia, Missouri, Alabama, Louisiana and Colorado. Also found to some extent as a cultivated species in gardens and hothouses.	Family Compositae. Subfamily Euaster. Found for the most part in dry open fields and pasture lands. Ranges from Maine, south through New England and New York, New Jersey and Pennsylvania and Georgia and west through Ohio, Wisconsin, Kentucky and Texas. Often one of the commonest roadside asters over great areas.	Family Compositae. Subfamily Euaster. Found sparingly common in rich open woodlands and among other plants at edges of streams and waterways. Ranges naturally from New England west to Minnesota and south to Virginia, Kentucky and Iowa. It is essentially a northern species and is at best in northern parts.	Family Compositae. Subfamily Orthomeris. Commonest in moist woodlands and at edges of wooded areas. Ranges from Labrador to Ontario and south to Georgia and Tennessee. It is not the type to form dense pure stands, ordinarily, but may be reasonably abundant where it has become established. Also called whorled and mountain aster.
Flowers borne in heads that are to 4/5-inch across, with 10-15 ray flowers that are to 1/3-inch long, relatively inconspicuous light violet or pale purple. Heads are commonly crowded. Bracts of the involucre are slender, smooth or nearly so, and with spreading green tips, these being narrower than those of <i>A. cordifolius</i> .	Heads of flowers numerous, to 1 inch broad, with 15-30 ray flowers that are blue, violet or purple and each to 3/5-inch long. Bracts of enclosing involucre rigid, sharp, with green tips closely pressed and overlapping in several series. Fruits smooth or nearly so and with reddish or whitish hairy parachute. Chromosomes number 54.	Flowers borne in abundant small heads that are to ¼-inch high and often crowded along upper side of spreading wandlike branches. Heads may be 1/3-inch across. Ray flowers are white or rarely purplish and are enclosed below in bell-shaped involucre whose bracts are nearly equal and with pointed green tips. Disc flowers yellow.	Flowers borne in heads that are to 1 inch across with 20-30 ray flowers that are pale blue to violet or lilac and to ½-inch long. Supporting involucre is hemispherical and composed of bracts that are in 3-4 series, slender, overlapping with the outer shorter, with spreading green tips. Fruit fuzzy.	Flowers in heads that are to 1½ inches broad. Ray flowers 12-18 and each to 2/3-inch long, usually white or purple. Involucre forms a hemispherical cup that is to 1/3-inch high and is composed of bracts whose tips are drawn out into points. Fruits are glandular and fuzzy, with soft, firm, nearly white parachutes.
Flowering period from August through October, and sometimes persisting after frost has killed most other species. An Iowa record shows bees feeding on the plant well into November, when other sources of supply had been killed. It probably is ordinarily inferior to the better known honey producers.	Flowering period from September through October in wild, but under cultivation may have flowering period extended or controlled. This species is relatively common under cultivation in some tropical gardens. Cultivation is due to beauty of the plant, not to its value as nectar producer.	Flowering period is from August through November, being one of the long-flowering periods for asters. It is listed by Bailey and others as a cultivated species and may have extended flowering period under managed conditions. A western variety has larger flowers and heads than those described above.	Flowering period from August through October. It is rarely abundant, not too conspicuous but certainly not unattractive when in its prime. We find no reference indicating that it has been under cultivation and it is doubtful if it is sufficiently abundant to be important in soil erosion control.	Flowering period is from July or June through October, making it a long-flowering species. An enormous form is to be found in New York and New England in which the flowers turn into conspicuous tufts of chaffy materials on or after maturity. It is not listed as having been under cultivation, although it has a unique beauty.
There is little reason to associate this plant with soil erosion, hay fever or any major role in honey production. Neither is it ordinarily an attractive flower when growing in its natural habitat. Its primary interest probably lies with botanists who are interested in finding different species.	Not listed by honey producers as important source of nectar, or is it associated with hay fever. Possibly if it were more rare its beauty would be more genuinely appreciated, but its commonness makes it less appreciated. Probably of no food value to wildlife and of comparatively little cover value. Helps control erosion.	So valuable as a producer of nectar and pollen useful to bees that the plants are sometimes cultivated by beekeepers to help in this. Bees have been noted to feed on this aster in preference to white clover, which is normally a great favorite. Is particularly popular as a nectar producer in Missouri and the middle-West.	No reference seems to be made in literature of any significance in hay fever matters, or is it listed as a plant making any contribution to honey production. The shape of its leaves makes it attractive to those interested in finding new species, and while it may seem to be just another aster it is attractive just the same.	Pammel and Pellet consider the species as important as a source of food for honey bees and in the general production of honey. This may be due in part to the long-flowering season rather than to any great production of flowers over a shorter period. It has some little value as cover for wildlife and undoubtedly some little erosion-control value.

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source was not able to meet. Potentially goldenrod might have taken a prominent place in the economic and military history of our country.

These plants have and will play an important but hardly spectacular part in what goes on about us. Almost all of the goldenrods and asters are perennial plants, with branching, well-developed underground parts. Many of them grow profusely in poor soil on hillsides. These soils might easily be eroded and lost were it not for the binding qualities of the underground parts of these plants. This alone should justify our interest, in addition to the food, rubber, and esthetic aspects already suggested. The soils that are commonly favored by these plants are rich soils, with an acidity of approximately pH 5-6.

To most farmers these plants may be considered as weeds because of their low value as forage plants. However, they may usually be kept under control by shallow plowing in the autumn, following, the next year, with a cultivated crop.

Where the plants are grown for their beauty or in order to help the bees, the common practice is to plant underground parts. When grown in flower gardens it is a common practice to dig up and separate these parts every few years.

The dried tops of goldenrods and asters may burn easily. This is recognized by campers, who frequently use the tops as tinder to start their fires. However, this inflammable quality carries with it a threat, and fall fires may get out of control and result in considerable damage.

In connection with the management of wildlife, goldenrods and asters probably contribute nothing to the food supply. They do provide valuable and effective cover for many birds and mammals, making it well nigh impossible for heavy hunting practices completely to destroy a population.

Both goldenrods and asters offer a decided appeal to the botanists. The differences are frequently small, and a few species hybridize, producing plants whose ancestry is difficult to recognize. There are some one hundred thirty species of goldenrod, of which about **sixty** are to be found in the eastern United States, thirty

in the western part of the country and the remaining ones in Mexico, South America, Europe and northern Asia. There are about two hundred fifty species of asters, most of which are North American. A few of these find cultivation foisted on them. The Mojave aster, *A. abatus*, is grown as an ornamental because of its silvery foliage. *Aster arenosus* and *Aster tanacetifolius* have been cultivated by the Hopi Indians for use as medicine. Devilweed of Mexico, *A. spinosus*, is recognized in some places as a troublesome weed, but it can grow in saline soils and it is frequently found under semi-cultivation for use as a soil anchor where such saline soils are found. Horticulturists, of course, have produced garden varieties of asters that are too numerous to mention in a general treatment such as is possible here.

According to the botanists the goldenrods and asters belong to the Family Compositae. This family includes the sunflowers, daisies, ragweeds, dandelions, thistles, lettuces, and a host of other common plants. In all of these the flowers are clustered into heads that are usually enclosed at the base by an involucre of green bracts. The flowers themselves may be in the form of tubes, or they may be "strap" shaped. Commonly the strap-shaped flowers are around the edge of the heads, appearing as rays. In the goldenrods these rays are almost invariably yellow. In the asters they may be white, pink, blue, purple, or reddish. The leaves of both goldenrods and asters are alternate. Goldenrod heads normally have less than sixteen rays while asters almost invariably have many more than this. Commonly the ray flowers bear pistils and no stamens, while the other flowers, the disc flowers, bear both stamens and pistils.

In some of the members of the Compositae, such as the dandelion, the pollen is sterile and no true fertilization takes place even though the flowers may be visited by insects that transfer pollen. In the goldenrods and asters, insects of many kinds and particularly bees, flies, beetles and butterflies may assist in pollination.

When we look at these plants from all of these angles we realize that they are worth knowing better. They are misunderstood in spite of the fact that there are few places in the United States where they are not to be found. Possibly this article will help correct this misunderstanding.



SEPTEMBER

*They lassoed summer in the fields today,
There were wheels all over and they baled the hay
And stole the evening primrose from the morning light,
But Summer has a flock of wings and some of them took flight.
Summer has a lot of feet and some of them escaped,
Some of them were quick to take a meadow mouse shape,
And some of summer got away in patent leather style,
Cricket-legged the summer leaped down the cut-grass aisle.*

Elizabeth Jane Astley