

The Woody Artemisias: The Species and their Propagation

Part 3 of a Series

By Jim Borland

This concludes our multi-part series of articles on the Artemisia genus and its species. Common names include sagebrush, wormwood, and mugwort. This article describes individual Artemisia species and their methods of propagation.

The Species

The complex of woody *Artemisia* species is currently in a dynamic state of evolution and hybrids among species and subspecies are common. The more common species and their description and habitats follows.

***Artemisia arbuscula* ssp. *arbuscula* (low sagebrush)**

An irregularly shaped, dwarf shrub with stiff branches 15–20 inches tall and a crown spread of 15–30 inches. The slender and erect twigs are covered with dense, fine, grayish-white hairs that in late summer are lost, thus making the twigs appear darker in color at that time.

The narrowly wedge-shaped, not very persistent leaves are 0.2–0.6 inches long, 0.13–0.4 inches wide and deeply 3– (or 4– or 5–) toothed, or cleft, at the apex. Leaves on the upper portions of the flowering shoots may be entire.

Initiated in August, flowering continues into September, with seed ripening in October to November and averaging 980,000 per pound. Natural layering of the stems is seldom reported.

Commonly found at elevations 5,000–7,000 feet, or to 9,800 feet in the warmer and drier parts of Nevada, the species inhabits harsh, shallow, bedrock sites; rock ridges; and infertile and frequently alkaline soils over 39,100 square miles of the West. These soils usually possess either a dense B horizon, which restricts drainage, or they contain a high volume of gravel throughout the entire profile. These sites can be either snow covered or swept clear during the entire winter. This species has the rather unusual ability to withstand prolonged spring flooding on sites that later in the summer become extremely dry.

Its natural range is from southern Colorado to western Montana and west throughout Utah, Idaho, northern California, Oregon, and Washington. It is reported to live at least 50 years.

***Artemisia arbuscula* ssp. *longiloba* (early or alkali sagebrush)**

With precipitation patterns a key factor in where sagebrush grows, the species are listed below in order of the increasing aridity of their habitats.

Moist

Artemisia cana ssp. *cana*

Semi-dry

Artemisia cana ssp. *viscidula*

A. cana ssp. *bolanderi*

A. tridentata var. *vaseyana*

A. tripartita var. *tripartita*

A. tridentata var. *tridentata*

A. tripartita var. *rupicola*

A. spiciformis

A. arbuscula ssp. *longiloba*

A. arbuscula ssp. *thermopola*

A. tridentata var. *parishii*

Dry

Artemisia rothrockii

A. arbuscula ssp. *arbuscula*

A. rigida

A. tridentata var. *wyomingensis*

A. nova

A. filifolia

Very Dry

Artemisia pygmaea

Experience indicates that *A. spinescens* is similar to *A. nova* or *A. pygmaea* and that *A. frigida* is adaptable to a wide range of aridity.

A dwarf species only 6–9 (18) inches tall, this shrub has little or no trunk and lax to spreading stems with dark brown to black bark on older stems. Its shape and size are similar to that of *A. arbuscula*.

Its overall dark gray-green appearance is due to the not very persistent leaves, which, on vegetative stems, are up to 0.8 inches long and deeply three-lobed. Those on the flowering stalk are similar but smaller, especially on the upper portions. Leaves crushed in the spring emit a pungent camphor odor, turning to a hydraulic-fluid smell in the fall.

This taxon is early to begin growth and to mature, with its mid-June to mid-July blooming time effectively separating it reproductively from other, later-blooming sagebrushes. Larger flowering heads also distinguish it from most other *Artemisias*.

Seeds mature in August and average 2,655,000 to the pound.

Reproduction through natural layering is frequent, and it is said to transplant easily.

It is generally found in clay basins and in the mountains on heavy, finely textured, impermeable soils derived from alkaline shales, and also on lighter, limey, or even saline soils. Its range includes elevations of 5,900–8,000 feet along the foothills of mountain ranges on both sides of the Continental Divide and west to southwest Montana, Utah, Idaho, Nevada, and Oregon.

***Artemisia arbuscula* ssp. *thermopola* (cleftleaf or hot springs sagebrush; not a Colorado native)**

A very dwarf, lax, and spreading shrub with a crown 12–16 inches in diameter but only 6–9 (12) inches tall. Its leaves are more finely divided than ssp. *arbuscula*, almost filiform in shape.

When *Artemisia* is restricted to higher, cooler, and snow-covered areas where soils are often flooded during spring but dry during the summer, its habitats are similar to those of ssp. *arbuscula* and the soils are similarly often alkaline, sterile, rocky, shallow, and likely of volcanic origin. It is not known to naturally layer.

In every case of natural occurrence, it occupies areas adjacent to those occupied by *A. tripartita*, with which it may hybridize to form this genetically stable subspecies.

***Artemisia argillosa* (coaltown sagebrush; not a Colorado native).** Now considered to be the same as *A. cana* ssp. *viscidula* or *A. tripartita* var. *tripartita*.

An erect shrub 20–32 inches tall this species has deeply trifid leaves that are 1.6 inches long and resemble those of *A. tripartita*, except for the lobes being both longer and wider. Flowers appear in July, with the major bloom occurring in August. Seeds ripen in October.

It is found only on alkaline spoil material in Jackson County, Colorado.

***Artemisia bigelovii* (Bigelow sagebrush)**

A low, very drought tolerant shrub 8–16 inches tall with numerous spreading branches. Twigs are less woody than that of *A. tridentata* var. *tridentata* and are normally free of the insect galls and rust diseases more common in other *Artemisia* species.

New growth is covered with dense, fine, grayish-white hairs and bark is gray-brown, shredding with age on larger branches.

The leaves of the vegetative branches are similar to those of *A. tridentata* var. *tridentata* but show many

abnormal tips, which are shallower and more sharply dentate. These leaves are narrowly fan-shaped, 0.4–0.8 inches long, 0.08–0.2 inches wide, and dull, silvery canescent. The odor of the crushed leaves is mild, like that of *A. tridentata* var. *vaseyana*. Upper leaves are deciduous.

Flowering occurs in August to October on erect and long stems. All-natural propagation is through seeds, averaging 2,710,000 per pound, since natural layering is rarely observed.

It is normally found in rocky or sandy soils in canyons, gravelly draws, and dry flats through western Texas, southern Colorado, New Mexico, Arizona, Utah, Nevada, and California at elevations of 3,000–7,900 feet.

***Artemisia californica* (California sagebrush; not a Colorado native)**

A densely bushy, nonsprouting shrub 2–5 feet tall with brown shredding old bark and white to yellowish young stems, becoming gray with age. At least 7 other common names are used to describe the species.

Its evergreen 0.75–3-inch-long leaves are commonly once or twice divided into linear or threadlike lobes or segments, while the upper leaves may be only linear or entire. Each is covered with minute gray hairs and emits a pungent sagelike odor when crushed. Smaller leaves are often bundled in the axis of the larger leaves.

It is found on exposed slopes and dry hills in California from the north and east sides of San Francisco Bay and southward in the coast ranges. Its elevation range is from near sea level to 2,500 feet, up to the Tehachapi Mountains, where it associates with *A. tridentata* and in the mountains of coastal southern California, then eastward to the borders of the Colorado desert. Flowering is from July to September.

***Artemisia cana* ssp. *bolanderi* (Bolander silver sagebrush; not a Colorado native)**

An erect or spreading, much-branched, and rounded shrub growing 8–24 inches tall, this species is found on soils that are clayey, more poorly drained, and usually more alkaline than those suiting ssp. *viscidula*. These soils usually have standing water on them for several weeks in the spring.

Leaves of this subspecies are linear, 0.4–1.2 inches long, 0.04–0.1 inches wide, entire to divided at the tip, and more gray-white and hairy than ssp. *viscidula*. Its range includes central Oregon, extreme western Nevada, and eastern California, where it occupies the 7,500–9,000-foot elevations.

Reproduction is via seed, layering stems, and root sprouting.

There are no reports for seed numbers per pound for this subspecies, but those for the genus *A. cana* range between 846,000 and 2,200,000 seeds per pound.

***Artemisia cana* ssp. *cana* (silver or plains sagebrush)**

An erect, rounded, and freely branched shrub 3–5 feet tall with densely hairy white to yellowish young bark, which becomes brown with age. Leaves of the vegetative branches are large, linear, and entire or, rarely, with one or two irregular teeth or lobes. They are only 0.06–0.4 inches wide and 0.75–3.25 inches long. They are densely covered with a silky pubescence and emit a pungent turpentine odor when crushed.

Flowering heads are usually arranged into dense, leafy panicles, which bloom in September, with seed ripening during October and November. In addition to seeds, of which there are 2,200,000 per pound, natural propagation is from layering, root sprouting, and extensive spreading by rhizomes. It is said to be easily transplanted.

It is dominant over 34 million acres of its range, which includes the Missouri Plateau, from southern Alberta and Saskatchewan, Canada, southward, mostly east of the Continental Divide, through Montana, the western and central portions of the Dakotas, Wyoming, northwestern Nebraska, and northern Colorado.

It is found in both sparse and dense stands on well-watered, well-drained-to-imperfectly-drained, deep-loamy, or sandy soils of prairies, streamside locations, drainage ways, alluvial flats, and terraces of valley bottoms and upland soils in valleys east of the Continental Divide. These soils are usually lower in nitrogen, phosphorus, potassium, cation exchange capacity, and organic matter than those associated with *A. tridentata* var. *tridentata*.

Its mostly shallow root system finds an optimum environment in soils where the upper six inches are moist or where coarse materials are found throughout the soil profile. This species was first collected by Lewis and Clark on the banks of the Missouri River.

***Artemisia cana* ssp. *viscidula* (mountain silver sagebrush)**

This erect, thickly branched shrub is generally not more than 3.3 feet tall and, inconsistent with its common name, is hardly silver in appearance. Leaves are not persistent, dark green at times, simple and entire, linear, and often with prominent unequal lobes. On the vegetative branches they are

0.06–0.2 inches wide, up to 2.75 inches long, and often crowded in dark-green clusters. These are smaller and darker green than those of ssp. *cana* and darker green than *A. tridentata* var. *vaseyana*, with which it often grows.

Flowering occurs from August to September with seed ripening in October and November. Natural propagation is by layering, extensive root sprouting, and by seed, which averages 2,200,000 per pound.

Its natural habitat is in moist meadows and along streams in areas of lingering snowpack and seasonal high-water tables. These areas are usually found along edges of aspen and conifer forests in the mountainous regions throughout the Rocky Mountains and east of the Sierra Nevadas at elevations above 7,000 feet. Occupied rich loam soils are usually derived from limestone, deep and with slower draining characteristics than those common for *A. tridentata*. Its range includes southwest Montana, south along the Continental Divide to New Mexico, and west to Arizona, Nevada, Utah, and Idaho.

Its lower stature and more western distribution distinguish it from ssp. *cana*.

***Artemisia filifolia* (sand sagebrush)**

This sagebrush with six other common names is the most widely distributed shrub species found on sand hills and sand dunes in the West. It is a nanophanerophyte (a shrub less than 6 feet tall) which typically grows 2–4 feet tall. It is freely branched, rounded in form, and has young branches covered in a dense, silvery-white pubescence, while the older branches are covered with a dark-gray or blackish bark.

Leaves are filiform or threadlike, silvery white, 1.2–3.1 inches long and less than 0.03 inches wide, entire or divided three times into threadlike divisions. These are often bundled in alternately arranged axils.



Sand sagebrush (*Artemisia filifolia*). © Jen Toews

This species is an indicator of sandy soil with significant low levels of essential elements and has the ability to grow in areas with as little as eight inches of annual precipitation. Possible explanations for its survival on very sandy soils include its reduced essential element requirements for growth, the high ion exchange capacity of its roots, and its ability to concentrate elements to levels acceptable for growth. Its extensively branched root system has been noted to extend 9 feet deep and 3–5 feet wide within 10 years after planting.

Its native range is from the southern parts of the Black Hills of South Dakota, to Wyoming, Colorado, Nebraska, Kansas, Texas, Utah, Nevada, New Mexico, Oklahoma, and south to Chihuahua, Mexico.

Flowers appear in August to September. Seed ripens October to December and averages 3,135,000 per pound.

***Artemisia frigida* (fringed sagebrush)**

This mat-forming half-shrub with at least 30 other common names has numerous spreading stems from a woody base and erect, leafy, annual herbaceous stems; it grows up to 24 inches tall. The whole plant, including the leaves, is densely covered with a layer of fine, silvery hairs. Leaves are finely divided like a feather two or three times and are fragrantly aromatic upon crushing. They measure 0.5–1 inch wide.

Found in western North America, Siberia, northern Asia, and Europe, this species is yet another widely distributed and abundant sagebrush. Possessing qualities of both a cool- and warm-season plant, it is not surprising that it occupies a wider range of elevations than any other *Artemisia* species, from low semidesert valleys to 11,000 feet.

A perennial taproot growing 6–8 feet deep with numerous extensive laterals extending 3 feet wide assists in its ability to inhabit dry, porous, shallow,



Fringed sagebrush (*Artemisia frigida*). © Jen Toews

gravelly, sandy, or coarse loamy soils in zones receiving precipitation of 8–20 inches annually. Reportedly, the species is tolerant of weakly acid, weakly basic, and weakly saline soils.

Blooming can occur from July in higher elevations to November at lower elevations, with seed maturing in September to December. Natural propagation is from seed, which averages 4,000,000 to the pound; root stalks; and adventitious rooting of stems. Seed can remain viable in soil for several years, a factor that allows this species to spread rapidly on disturbed sites. It is a rapid grower that transplants well, and, although many ecotypes have been reported, only the diploid form is known.

***Artemisia nova* (black sagebrush)**

A small shrub, this species grows 6–18 inches tall, with erect branches from a spreading base and a less-hedged appearance compared to *A. tridentata* var. *wyomingensis* due to its unpalatability to wildlife. At least six other common names are known for the species.

Dull, grayish sticky hairs cover the evergreen, broadly fan-shaped leaves, which are 0.2–0.8 inches wide and 0.1–0.8 inches long with a three-toothed apex. The sharply pungent-smelling leaves, especially upper ones on the flowering stems, may be entire. The species is generally darker in color than *A. tridentata* var. *tridentata* or *A. arbuscula*, and oilier than the latter, but both gray-green and glossy-green forms are known.

Flowering occurs in August to mid-September, with seeds ripening in October to November and averaging 907,000 per pound. Its red-brown flowering stalks are numerous on erect branches, much denser and darker than *A. arbuscula*, and persistent. It is not known to layer or stump sprout.

It shows some affinity for calcareous soils covered with a surface rock or desert pavement and is also found on dry, shallow lithosoils overlying bedrock in desert valleys and on mountain slopes. Weakly tolerant of saline soils, it prefers soils with a pH between 6.5 and 7.5 and thrives in the 6–20 inch precipitation zone. Roots are known to be deep, wide-spreading, and of a generalized type, a factor that allows it to be transplanted easily.

It is most abundant at elevations of 7,000 feet on south and west exposures on wind swept ridges, but also is found at 4,900–7,900 feet, primarily in the Great Basin and scattered in other parts of the West. It is more closely associated with salt-desert habitats than other sagebrushes, except *A. spinescens*. Although it occupies nearly the same range as does *A. tridentata* var. *wyomingensis*, it

occupies shallower soils. Reports list it living for at least 50 years.

***Artemisia papposa* (fuzzy sagebrush; not a Colorado native)**

This tiny shrub is 4–8 inch tall, with small, once- or twice-trifid or palmately parted leaves. The leaves measure 0.4–1.2 inches wide and are thickly covered with short, tangled hairs.

It occupies dry, open sites on sometimes alkaline flats or at the edge of mountain meadows in thin, stony, mineral soils that are moist early in the season but become dry later.

This rare species is known from only a few spots in Idaho, Nevada, and Oregon, where it is protected on federal lands due to its threatened status.

***Artemisia pedatifida* (birdfoot sagebrush)**

A low, 2- to 6-inch tall perennial subshrub with branching, woody bases and leaves 0.4–0.8 inches long, each palmately divided once or twice and covered with fine, dense hairs.

Distribution is limited to dry, clay plateaus and ridges in Wyoming and Idaho and possibly in Montana at elevations between 5,500 and 6,800 feet.

***Artemisia pygmaea* (pygmy sagebrush)**

This dwarf, evergreen, cushion-like shrub is less than 8–10 inches tall, with bark on young branches nearly white or straw-colored and that on older stems becoming dark brown and fibrous.

Its leaves possess a most xeromorphic leaf structure, with those on vegetative branches green, nearly smooth, somewhat sticky, and 0.08–0.16 inches wide by 0.08–0.32 inches long. On the vegetative branches, they are feather-shaped with 3–11 lobes, while those on the flowering stems are usually reduced and occasionally entire.

The species is restricted to raw, desert, calcareous shale barrens and igneous gravels with clay as the matrix at low elevations within the Great Basin of Nevada and Utah to northern Arizona and the Uinta Basin of Utah and Colorado. This species is often associated with rare plants.

Flowering occurs from August to September, with its rather large seed ripening in October and averaging 440,000 per pound. No sprouting is reported from soil disturbance. It establishes quickly from transplanted divided plants even though it is reported to have a stout taproot.

***Artemisia rigida* (scabland or stiff sagebrush; not a Colorado native)**

A low, spreading shrub up to 16 inches tall with thick, brittle branches and large, leafy bracts and

deciduous leaves. The pungently aromatic leaves are silvery from a pubescence, spoon-shaped, 0.4–1.6 inches long and deeply lobed into 3–5 linear lobes or entire. Bark is brown, dark gray to black and shredding on old stems.

It is found at elevations of 3,000–5,000 feet on rocky, shallow soils of dry, rocky, basaltic scablands of the Columbia River and Snake River basins of eastern Washington, Oregon, and extreme western Idaho. It is thought by some researchers that its range of adaptability is much wider than its current natural range.

Flowering occurs in September and October, with seed ripening in November and averaging 550,000 seeds per pound. It is not known to root sprout or layer.

It resembles *A. tripartita* somewhat, but differs in its spikelike inflorescence, large leafy bracts, and deciduous leaves.

***Artemisia rothrockii* (timberline or Rothrock sagebrush; not a Colorado native)**

The habit of this low-growing evergreen shrub (4–32 inches tall, 1–2 feet wide) is sometimes rounded or uniformly flat-topped and similar in appearance to *A. tridentata* var. *vaseyana*. Bark on young stems is light gray or straw-colored, and on older stems darkish gray-brown and fibrous.

The pungent-smelling to mildly aromatic persistent leaves are relatively large and more deeply and variously lobed than var. *vaseyana* and noticeably less hairy than other sagebrushes, giving it a dark green to gray-green appearance. They are 0.4–1.2 inches long and 0.06–0.4 inches wide, broadly fan-shaped and 3-toothed or lobed. Upper leaves may be entire and linear to oblanceolate.

The species is restricted in its distribution to southern California in the southern Sierra Nevada and San Bernardino Mountains, according to some authors. It is found on well-watered, fine- to coarse-textured soils with no organic matter at elevations of 8,500–11,000 feet in silt basins and on rocky slopes in areas often snow-covered in winter. Recent extensions of this narrow range may reflect the familiarity researchers are gaining in recognizing it in the field. All new sightings in Wyoming, Colorado, Nevada, and Utah are in similar habitats, suggesting that this primitive species is seeking refuge from the continual drying of the Great Basin.

Roots are reported to be deep and spreading, with a preference for soils with a pH between 6.5 and 7.5. It readily transplants and is noted by one researcher as having some potential for use as a low hedge in landscaping. Its flower season is from

August to September, with seeds ripening from September to October. It has a strong tendency to naturally layer and root sprout.

***Artemisia spiciformis* (subalpine big sagebrush)**

Similar to var. *vaseyana*, this shrub is 2–4.5 feet tall and has some of the largest leaves of all sagebrushes, measuring 2.5 inches long and 0.8 inches wide. These are gray-green in color and have a pungent smell when crushed.

It inhabits shallow, slightly granitic soils between the elevations of 8,000–10,500 feet in the mountains of Colorado, north-central Wyoming, southeast Idaho, and central and north-central Utah, where it is found occupying openings in aspen and conifer stands. Its affinity for moist but well-drained soils and for the cooler environments of higher elevations is similar to that of var. *vaseyana*.

It has a strong tendency to layer naturally and is distinguished from var. *vaseyana* by its larger flower heads and leaves. It is often listed as a form of *A. tridentata* var. *vaseyana*.

***Artemisia spinescens* (bud sagebrush)**

At least 12 other common names are used to identify this species, a profusely branched, drought-resistant shrub 4–20 inches tall with spreading branches. The spinescent nature of its branches is unique among the *Artemisias* in that the branches are derived from flower axes that remain after the flowering heads fall.

Leaves are gray-green, pungently aromatic, and less than one inch long, including the petiole. Crowded onto short stems, they are 3–5 palmately parted, with each division again divided into 3 linear, spoon-shaped lobes, with those near the apex being smaller and more entire. Green-up is earliest among the deciduous species, occurring as early as February and March.

The species is found on dry saline, clay loams, sandy clay loams, sandy, and loamy soils of plains and hills. These soils are often covered with an erosion pavement of gravel or rock of uniform size, which is usually in dark contrast to the light-grey soil beneath.

Plants are relatively shallow-rooted, with most of the roots found in the upper 3–7 inches of soil, but with some found as deep as 3–7 feet and spreading horizontally to 3 feet wide. The vertical taproot is short and thick, with many horizontal branches that more thoroughly penetrate the soil profile than many of those of its associated salt-desert shrub species. The moisture-holding capacity of the first two feet of these soils is less

than 10%. Tolerances for soil pH are higher than most, ranging from pH 7.0 to 8.5.

Annual growth is usually completed by June 1, and flowering and seeding are completed by July 1. It evades summer drought and heat by becoming deciduous and dormant early, but often breaks dormancy and produces considerable root and leaf growth in response to late-summer rains.

Some natural propagation is through the occasional layering when stems become covered with soil, but most is through dispersed seeds which number between 1,000,000 and 2,200,000 per pound. It is reported to be easy to transplant.

The extent of its range is from Montana to Oregon, south to California and New Mexico, at elevations between 2,000 and 8,000 feet.

It is cold hardy to at least -26°F and is found growing in areas normally experiencing 100°F and higher temperatures during the summer. It possesses excellent drought tolerance, enabling it to exist where as little as six inches of precipitation fall each year.

Growers might be disappointed in its growth from seed since the seedling normally grows only 0.4–0.8 inches tall the first year, but its roots extend 5–8 inches deep.

The average lifespan for individuals is difficult to determine due to its habit of splitting trunks as it grows, but it has been proven to live at least as long as 29 years.

***Artemisia tridentata* var. *tridentata* (basin big sagebrush)**

This is the species currently in vogue and the one that everyone hopes they will get when growing sagebrush from seed. It is an erect, spreading, heavily branched, unevenly topped shrub 3–6 (15) feet tall and 5–8 feet wide. In protected sites, its trunk can reach 10 inches in diameter. Bark on older stems is gray-brown to black and, with age, shredding.

Its gray-green evergreen leaves are narrowly lance-shaped, gray-canescens, and 2 inches long by 0.2 inches wide. Typically, they are 3-toothed at apex, often deeply incised or entire, with a bitterly pungent aroma. These may persist through two growing seasons, while the more variably shaped spring-flush leaves are shed usually by mid-summer. The leaves of the flowering stems gradually become smaller toward the ends of the branches and may be linear or oblanceolate and entire.

Flowering stems arise unevenly throughout the crown and produce flowers in late August to

October, with the seeds maturing October to November. Seeds usually average 2,500,000 to the pound and retain good viability in open storage for at least two years.

This the most abundant shrub in western North America; it is found in lowland sites below 7,000 feet, and is an indicator of deep, well-drained, sandy or gravelly, fertile soils. Occupied soils have a pH between 6.5 and 7.5, and, although not noted for having any significant organic matter, they are higher in this regard and in nitrogen, potassium, phosphorus, and cation exchange capacity than that found associated with var. *wyomingensis*.

Although it is generally regarded as intolerant of alkali soils, tolerant ecotypes are known to exist. It is the predominate sagebrush type of the Great Basin, where it inhabits low ranges, usually between 3,000 and 5,000 feet in elevation, receiving 8–16 inches of moisture per year.

Moisture from all precipitation events is captured through a deep and extensive root system, thus enabling it to support rapid growth and survive through drought periods, even though its physiology is not a particularly drought-enduring one. Diploids of the species are usually taller and are said to be better able to endure drought than the tetraploids often found growing beside them.

While it is not known to layer in the field, it does transplant easily.

At least one specimen has been found be 120 years old, but 100 years is often the age assigned to most old specimens.

An additional form or subspecies with hairy achenes and a drooping, flowering branch habit has been designated *parishii* and is known from the coastal ranges and cismontane regions of California.

A seed selection from Dove Creek, Colorado, and named Dove Creek is currently available. It is characterized by an especially fast growth rate, large stature, and a single- to few-stemmed habit. There is an excellent stand of this species on the west end of Inspiration Point Park, Denver.

***Artemisia tridentata* var. *vaseyana* (mountain big sagebrush)**

This variety also vies for the honor of being the most common and abundant sagebrush in the western United States, where it often forms extensive stands of uniform size as well as a bewildering array of morphological forms on low benches into the alpine zone. Throughout the Rocky Mountains, it generally occupies foothill and mountain sites above 7,000 feet but below 10,000 feet in the 12- to 30-inch precipitation zone.

Ecotypes at lower elevations may reach 6 feet tall, but it usually is known as a spreading shrub only 2–4 feet tall, with the main stem divided near the ground and forming an even-topped crown. Bark on young stems is dark brown to black, and on older stems always black and shredding.

Its persistent gray-green leaves, grown over two seasons, are broadly fan- to spoon-shaped and characteristically wider than those of var. *tridentata* and var. *wyomingensis*. Normally, they are 0.8 inches long and 0.2 inches wide, usually 3-toothed and with a more pleasant mintlike smell than other varieties.

Blooming can begin as early as early July for some, six weeks earlier than the other varieties. Seeds ripen in September to October and average between 1,760,000 and 2,500,000 per pound. Natural layering has been noted, but it is rare. Tissue-culture techniques have been successful in its propagation.

Its deep root system inhabits soils that are deep, well-watered, well-drained, and slightly alkaline to slightly acid. These can be found in swales and pockets of deep soil or on rocky sites with available summer moisture.

The species is known to live to 100 years or more.

On drier sites similar to those occupied by var. *tridentata* and var. *wyomingensis*, an additional form, *xericensis* or simply "X," has been described. This one has an uneven top and has been described in Idaho to occupy elevations of 2,600–4,600 feet. It is particularly resistant to the herbicide 2,4-D.

'Hobble Creek', a selection from an area with the same name in Utah, is particularly suited to a 14-inch precipitation zone, to deep (minimum of 4 feet), well-drained soils no finer than clay loam (40% or less clay) with a pH of 6.6–8.6 and to a growing season of 90 days or longer. Planting in soils with excessive clays results in a predisposition to root rots and vascular wilt type diseases.

***Artemisia tridentata* var. *wyomingensis* (Wyoming big sagebrush)**

This may be the most difficult variety to identify. It is a shrub 4–38 inches tall, with branches from the base forming rounded, uneven-topped clumps. This rounded and cushion-like appearance has been attributed to wind, cold, draughty soils, and its palatability to wildlife and livestock. Its leaves are bitterly pungent-smelling and shallowly three-lobed. They are normally very small, fan-shaped to narrowly fan-shaped, and 0.4–0.8 inches in length for those that are persistent. Many persist through two growing seasons.

One of the most xeric species, it is found on moderately deep, well-drained, dry, gravelly, poor, or shallow soils often underlain with a layer of caliche or silica and unusually low in water-holding capacity. By comparison, however, these soils are generally deeper than those that *A. nova* occupies, and its leaves are grayer and less fan-shaped, with flower heads that are less persistent.

It is common across the Wyoming Basin and parts east of the Continental Divide to Montana, Wyoming, parts of Colorado, and the Black Hills at elevations between 5,000 and 7,000 feet, and between 2,600 and 6,500 feet in the hotter and drier parts of Idaho. Its distribution, ecology, and morphology is intermediate between that of var. *tridentata* and var. *vaseyana*. Flowering and seeding are earlier than the former and later than the latter. It is not known to naturally layer and its seeds average between 1,215,000 and 3,000,000 per pound.

Its ability to inhabit drier sites than var. *tridentata* may be due to the fact that only tetraploid (4N) forms are known and, perhaps, due to the one-month head start its root growth has on vegetative growth, even though the soil is still quite cold. It is particularly adaptable to environments that receive most of the precipitation in the form of winter snows and in which the growing season is warm and dry. The mean annual precipitation of the species' adaptive range is 7–15 inches.

***Artemisia tripartita* var. *rupicola* (Wyoming three-tip sagebrush)**

A dwarf shrub rarely taller than 6 inches with decumbent branches forming a crown 12–20 inches in diameter. Young bark is brown and older is dark brown to black.

Its leaves are reported to be early deciduous, but plants in the author's garden still retain their pungently scented leaves late into the winter season. On vegetative branches they are often 1.2 inches long and deeply divided into linear lobes, each at least 0.04 inches wide.

It is found on moderate to deep, well-drained soils on dry sites and rocky knolls usually surrounded by well-developed grasslands. Flowering begins in late August through September, and the seeds, which average 2,490,000 to the pound, ripen in October.

It frequently layers and readily sprouts from stumps.

Its limited range is restricted to lands east of the Continental Divide in central and southeast Wyoming at elevations between 7,000 and 9,000 feet on sites adjacent to those of *A. tridentata* var. *vaseyana*.

***Artemisia tripartita* var. *tripartita* (three-tip or tall three-tip sagebrush)**

An erect, freely branching shrub up to 6 feet tall with early deciduous leaves and brown young bark, later turning dark brown or black. These leaves, pungent when crushed, are normally 0.6–1.6 inches long and deeply divided into 3 linear lobes less than 0.06 inch wide. These may be again further divided.

It inhabits dry, moderate to deep, well-drained, loamy, sandy, or fertile volcanic soils above 3,000 but below 7,500 feet elevation, especially along river drainages from British Columbia south through Washington to Nevada and eastward to northern Utah and western Montana. The Continental Divide effectively separates this subspecies from subspecies *rupicola*.

This species resprouts from roots, naturally layers, and rapidly regrows after clipping. Flowering is in late August to September, with seeds ripening in October. Seed numbers for this subspecies are not reported, but those for *A. tripartita* average 2,490,000 per pound.

Propagation

By Seed

Documentation of artificial propagation efforts with the woody sagebrushes is scanty, indicating either the simplicity with which it is accomplished, or the relative unimportance this activity has for the majority of sagebrush researchers.

Personal experience with several of the species, coupled with documented information, indicates that propagation from seed is both the most efficient and easiest method of reproducing plants.



White sagebrush (*Artemisia ludoviciana*) seeds
<https://commons.wikimedia.org/wiki/File:Artemisialudoviciana1.jpg> Inset: *A. ludoviciana* shrub. © Jen Toews

Editor's note: *White sagebrush* (not covered in this article) is widely available and is a valuable landscaping plant.

Artemisia seed is small, indicating that it should not be sown deeply. Sowings no deeper than 0.25 inch deep will help ensure that light will have its potentially beneficial effect on germination. In most cases reported to date, the presence of light either is necessary or acts as an aid to germination, or, rarely, has no effect. Normal daylight is sufficient for this, or the sown seed may be placed beneath artificial lamps for the duration of germination. The germination requirement for light for *A. frigida* can be substituted with a soak first in gibberellic acid. Although a rather narrow optimum germination temperature has been found for a few species, other reports and personal experience indicate that seed of the woody sagebrushes germinates over a wide range of temperatures. These can range from just above freezing to above 86°F, with the former condition resulting in slow germination and the latter in faster germination.

Temperatures in the range of 60–70°F during the night hours and up to 86°F during the day should result in the seed of most species germinating in 2–14 days. Temperatures much above 86°F, however, can seriously depress germination.

Since *Artemisia* seed is difficult to clean, the grower often is presented with a quantity of unbroken flower heads containing an indeterminate number of seeds. These flower heads can be rolled between finger and thumb to loosen the contents and then the whole mass may be sowed thinly across the top of the sowing mix. Although germination percentages of pure seed can be extremely high, individual flower heads of certain species may not contain many, if any, viable seeds.

Except for a few species, no seed pretreatment is necessary to obtain high germination percentages from clean and viable seed. Upon contact with water, the seed of many sagebrush species will form a gelatinous mass around the seed, a phenomenon that has been reported to enhance the ability of the seed to germinate in what may be a low-water environment. Germination for *A. pygmaea* is often reported to be slow, indicating either the normal production of nonviable seed or some germination inhibitor not yet discovered.

Gleaned Information on the Germination of *Artemisia* Species:

Species

A. arbuscula: moist-chill seed propagation at 36°F for 10 days; sow 0.25 inch deep; germinate at 86°F during the day and 68°F at night; better germination in light; expect 68–70% germination in 10 days.

A. cana: germinate at constant temperatures between 50 and 86°F; light during germination beneficial; expect 50% germination in 2–6 days and 90% total germination.

A. cana ssp. *cana*: sow only 0.08 inch deep; one optimum germination temperature report at 57°F, another at 68°F; light may play a positive role in germination.

A. filifolia: 4–56% germination capacity.

A. frigida: one report of optimum germination temperature at 63°F, another at 55–63°F for 8 hours and then 74°F for 16 hours; 73% germination at 50°F; 50% germination in 5–12 days, then more slowly over next 30 days.

A. nova: moist-chill at 36°F for 10 days or germinate at 38°F; sow 0.25 inch deep; light has positive effect; 90% germination in 60 days; some seed germinates rapidly, others in 90–100 days.

A. pygmaea: no pretreatment necessary; poor (20–40%) germination.

A. rigida: excellent germination observed.

A. spinescens: low germination observed.

A. tridentata: sow 0.25 inch deep; germinate at constant 68°F, or var. *tridentata* 62–64°F or 42–64°F, or 68°F with light for 16 hours and 36°F during the night for 8 hours; light beneficial; germination of 80% in 4 days.

A. tridentata var. *vaseyana*: moist-chill at 34–37°F for 40–50 days; sow 0.25 inches deep; germinate at constant 68°F or 68°F during the day and 36°F at night; light has limited positive effect; 11–23% germination without moist-chill; expect 94% germination in 30 days with moist-chilling.

A. tridentata var. *vaseyana* 'Hobble Creek': germinate at 72°F during the day and 58°F at night, with 14 hours of light during the days.

A. tridentata var. *Wyomingensis*: germinate at 68°F for 8 hours during the day; light is beneficial; expect 60–80% germination.

It should be firmly stated that most of the woody sagebrushes have an inordinate need for high percentages of soil oxygen when compared with most plants from more moist climates. Most growers know that if potting soils are kept on the dry side, there will be, by default, more air in that soil. However, it is better to pay attention to the soil structure before sowing or transplanting, rather than to attempt to control the oxygen content of the soil through water management. It is not excessive water, but rather the lack of sufficient soil air, that kills roots or hampers their growth and creates

conditions conducive to diseases. Paying attention to soil structure and oxygen needs will help prevent loss of seedlings or older plants to one or more of the all-too-common damp-off diseases.

Before sowing, ensure that the soil mix is physically incapable of holding too much moisture. Most of these sagebrushes have been successfully grown continuously moist in a commercial lite mix amended with extra perlite and fed constantly with a light fertilizer solution. Adding solid particles such as sand to a mix does not necessarily guarantee good drainage. The incorporation of perlite or other highly aerated, noncrushable substitute is preferable.

Germinated seedlings of all species require a strong light source during the daylight hours. Lighting may be extended artificially several hours (to 14 hours or more) beyond the 8 hours of daylight usually reported in most tests, and seedlings so lighted will generally respond by growing much faster. Optimum growing temperatures have not been determined, but temperatures of 72°F during the day and 58°F at night work well.

Growers should also be aware that many of these woody species exhibit strong tendencies to sending roots deep quickly. *A. spinescens*, for example, will send roots 5–7 inches deep in 10 days from germination when the top has grown only 0.8 inches tall. This can result in a pot-grown plant with most of the water- and nutrient-absorbing roots at the bottom of the pot, where oxygen is always most limited. This phenomenon emphasizes the absolute need for the utilization of a highly aerated soil mix for these species.

Culture after germination is rather easy when light levels and soil aeration are attended to properly. While actively growing, the larger species will utilize a large amount of fertilizer, but little or none is needed when they are summer or winter dormant. Although the woody species of *Artemisia* are masters at thriving under nearly sterile soil conditions, growth in the greenhouse or nursery will definitely be enhanced by a constant feed from a balanced fertilizer that provides the seedlings at first with 100 ppm nitrogen, later increased to 200 ppm. (A tablespoon of soluble houseplant fertilizer in a gallon of water provides approximately 200 ppm nitrogen.)

Aside from the need for extra aeration, particularly for the dryland species, potting soils of all types and pH levels will probably grow fine specimens.

By Cuttings

Information regarding vegetative propagation is scantier than that for germination. Most evidence and experience indicates that the most appropriate time to take cuttings is from mid-winter to late spring or during the early growth phase before flowering is initiated.

Cuttings about 3–5 inches long can be taken and treated with an IBA rooting hormone ranging in concentrations from 0.1–2.0%. The usual applications of mist and bottom heat (65–75°F) should result in rooted cuttings in 4–6 weeks. Due to the hairiness of the various species, mist control can sometimes be tricky, especially for cuttings taken late in the season. If these species behave anything like *Artemisia schmidtiana*, a cousin from Japan, then a shortening of the photoperiod can prolong the time window for taking cuttings. Root cuttings should also be successful for those species known to root sprout in nature.

Landscape Activities

Clues to landscape maintenance activities for nearly all native western U.S. shrubs will have to be initially taken from their performance in the wild. We are lucky in that many species have been studied extensively for their reaction to fires, clipping by herbivores, predation of all types, weather, and soils. Although these studies have been designed to assist wildland managers, they also can be of great assistance to landscape managers.

Clues to pruning practices, for instance, are found in the discovery that many of the woody sagebrush species do not stump sprout. Severe cuts into the main stems, then, would probably not recover with renewed growth. On the other hand, those species that either stump sprout, layer, or regenerate from roots or rhizomes probably would produce a new flush of growth after pruning.

Currently, there only two or three species of American woody sagebrushes being commercially produced. Undoubtedly, this situation reflects both the current availability and inexpensive cost of water for landscape irrigation and the general reluctance to try new plants, even those that nature has proven worthy through the test of time. When, and not if, this situation changes, the woody sagebrushes will surely command a premier spot on the list of plants able to withstand, without help, conditions anywhere humans wish to live in the western United States, and to look good while doing so.

Suggested References

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Jim has been fooling around with native plants for more than 40 years in private, commercial, and public venues. His home garden contains 1000s of native plants, most grown from seed at home and now not supplementally watered for 20 years. Jim has written hundreds of articles, given talks too numerous to count, and continues to grow and plant the two or three native plants not yet in his garden. ☺

More on Wormwood

CoNPS Newsletter 1977. Vol 1.6

After the article on dyeing with *Artemisia* in the September October issue of the CoNPS Newsletter, the following note was received from Dr. William A. Weber (University of Colorado) which is both interesting and informative.

Wormwood is a word-trap. The word has nothing at all to do with worms or wood, but is certainly a good example of how the English show how little facility they had (have?) with foreign languages. The source of this word is an Anglo-Saxon word "wermod" that is believed to mean something like "keeper of the mind," from a supposed belief in the medicinal virtues of the plant bearing this name. Our vermouth, a wine flavored slightly with wormwood, comes from the same source. Wormwood is a British corruption.

Also, people seem to have a bad tendency to spell *Artemisia* with an E – *Artemisia*, which shows that they don't know that is genus commemorates Artemis, the majestic Greek goddess who carried a bow and arrows.