

# Flora of the Methow:

## The Plants of the Methow in Their Evolutionary Context

By Dana Visalli

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An interesting aspect of evolution is that older forms of life that may have given rise to the life that we see around us today do not necessarily go extinct and disappear. Often as new forms of life appear, previously existing ones are pushed into background roles in more limited habitats. This is very much the case with plants; most of the early-evolved and in some ways more primitive plants live on in the shadows of our modern tall trees, spreading grasses

and abundant flowers. As we become familiar with the full spectrum of plants around us in the Methow we come to realize that we live right in the middle of an ancient and on-going evolutionary journey.

For example we all know what horsetails are, but without the work of paleo-botanists who have uncovered the evolutionary history of plants written in the fossil record, we would have no idea that 350 million years ago horsetails were a dominant group of plants, growing to 35 feet tall and a foot in diameter. They are in fact major components of the vast coal deposits of the Carboniferous Period, which lasted from 360 to 290 million years ago.

Some sense of the vastness of time is helpful in understanding how life changed so much through history. One way to get a feel for time is turn its passage into a story. For example, if the 4.8 billion year-old age of the Earth were condensed into a year, each month would represent 400 million years, each day would represent 13 million years, and each minute would represent 9000 years.

The oldest known biological cells are 3.5 billion years old, so they would have appeared on April 8 in our one year time frame. The first photosynthetic organisms (which were bacteria) are 2.4 billion years old and appeared on July 1. The first plants appeared 400 million years ago, on December 1, while flowering plants at 140 million years old appear on December 21. *Homo sapiens*, which is about 250,000 years old, would have appeared at about 11:30 PM on December



This may look like a conifer forest, but it is in fact an artist's concept of what a forest of 35 foot high horsetails looked like 350 million years ago.

31<sup>st</sup>. The life of an individual person would be about half a second (out of 32 billion seconds in a year). So each individual human experiences about 1/64,000,000,000<sup>th</sup> of the total time available to evolution on Earth.

The fact that 4.4 billion years of earthly history went by before plants were able to colonize land just 400 million years ago suggests that this was a difficult assignment.

Previously all of life's functions were conducted in an

aquatic environment, primarily in the ocean. In the case of plants, reproduction, acquiring nutrients and carbon dioxide for photosynthesis, retaining water inside tissues, and defenses against predators all had to find ways to adapt to existence in a desiccating environment.

Some remodeling of the Earth was necessary before plants could colonize land. To begin with life had to invent photosynthesis, which we take for granted but is a near-miraculous process. Photons of light energy, having just traveled 93 million miles from the sun, are absorbed by certain pigments in plants and utilized in a complex process to create simple sugar out of two gases in the atmosphere, carbon dioxide and water. You can try this at home but you will not succeed; only plants and photosynthetic bacteria know how to do it.

The early atmosphere had no oxygen in it. Once bacteria had learned how to photosynthesize, they began to pump oxygen into the atmosphere, because oxygen is given off as a by-product of manufacturing sugar. This oxygenation of the atmosphere was necessary before life could colonize land, because without the ozone layer (which is O<sub>3</sub>) radiation coming from the sun and interstellar space would destroy living tissue that was not protected by water.

In addition, life had to invent sexual reproduction, which seems to have appeared about one billion years ago. All life prior to this time was bacterial; most bacteria reproduce asexually by 'binary fission'; they simply split in half. In sexual reproduction not only is the genetic code of one individual combined with that of

another individual, but there is also a random reorganization of the DNA on the chromosomes as well. This leads to much greater variability in offspring than occurs in asexual reproduction.

Many of the showiest structures of plants exist to ensure successful sexual reproduction, including of course flowers. The enhanced variability of sexual recombination of genes also allowed plants to adapt more quickly and effectively to the challenges of living on land. This is because with sexual reproduction the offspring of any new generation are all different one from another, and those that best fit the environment at that particular time would be the ones most likely to survive and pass on their particular genetic traits. This 'survival of the fittest' is known as natural selection.

The Plant Kingdom is divided up into ten different groups, known as 'divisions' or 'phyla,' according to their evolutionary history (the word 'phyla' comes from a Greek word meaning 'race' as in 'racial'). Of these ten global phyla six are present in the Methow, and if we can count Methow fossils then eight phyla are present here (a ginkgo and a cycad are found in the Winthrop Sandstone Formation, 105 million years old, but have no living representatives in the watershed today).

So, who crawled out onto land first? It wasn't a redwood tree, that's for sure. The fossil evidence indicates that land plants evolved from a branching freshwater algae that had rigid walls like a true plant. We happen to have just such an algal species in the Methow; it is called *Chara*, and it is common in the shallows of many of our lakes. It strongly resembles a horsetail, and if you plucked it out of the water you would certainly think you had a plant and not an alga in your hand.



A moss, the upright sporophyte will produce spores.

**Bryophyta—Mosses, Liverworts and Hornworts** (26,000 species worldwide, 400 in the Methow)

Of the six phyla of plants present in the Methow, the earliest to evolve is thought to be the group known as the

Bryophytes—which means 'moss plants.'

Bryophytes include mosses, plus two more groups of plants known as 'liverworts' and 'hornworts.' ('Wort' is simply an Old English word for plant. The prefix comes from a document from the Middle Ages known as *The Book of Signatures*, which described how God, who was unable to speak in English to his subjects, resorted to creating plants that looked like the human organs they could heal if they were consumed. Thus 'liverworts' are

lobed like the human liver, and eating them was reputed to cure liver ailments. Presumably 'hornworts' would either cure or give you horns.)

If mosses were the early settlers of land, how did they adapt to this new, extremely desiccating environment? The answer is they simply developed the capacity to dry out complete when moisture was absent, and revive almost immediately when water again became available. Most other plants do not have this ability; if they dry out they die.

Algae living in water had no need to be able to transport water because they were constantly surrounded by it. Therefore early land plants, notably the Bryophytes, also lack internal 'plumbing.' They cannot conduct water vertically and thus never grow upwards more than a few inches. They also reproduce in the manner of algae, by having a male gamete supplied with a tail so that it could swim through water to the female egg. This technique, which surprisingly is also utilized in the club-mosses and ferns, has obvious limitations on dry land.

**Lycophyta- Clubmoss** (1200 species worldwide, 8 species in the Methow)

Lycophyta means 'wolf-plant,' and is derived from the imagined resemblance of the tiny leaves of this group to wolf tracks. If you want to develop a strategy to out-compete mosses, all that is needed is the ability to grow upright and shade the mosses out. Clubmosses seem to be the first group of plants that evolved internal plumbing in the



Clubmosses are diminutive today but formerly grew to 150 feet tall.

form of small tubes that could conduct water vertically. This allowed them to grow upwards to a surprising degree. While today's clubmosses only grow a few feet tall, 375 million years ago they reached heights of 150 feet and dominated the landscape. They also evolved a waxy covering over their epidermis called a cuticle which prevented water from evaporating through stems and leaves. The cuticle also blocked access to carbon dioxide in the atmosphere, so small openings in the underside of the leaves appeared called stomata (Gr, 'mouth') to allow gas exchange.

You can't grow upright on a windy planet without a firm foundation, and so the Lycophytes were the first plants to develop true roots, which stabilized the plants and gave them access to nutrients in the soil. The name 'clubmoss,' by-the-way, derives from the fact that their reproductive structure is somewhat club-shaped.

**Sphenophyta- Horsetails** (40 species worldwide, 7 species in the Methow)

Sphenophyta means ‘wedge-plant,’ which refers to the angled stem of horsetails. This is another phylum that back in the old days, 350 million years ago, was much larger, growing 30 feet tall and a foot in diameter. Most of the coal mined today is made up of Sphenophyta and Lycopphyta, horsetails and the large clubmosses of yesteryear. Horsetail's great evolutionary advance seems to have been to incorporate silica from the soil into the tissue of the plants, making them almost inedible for herbivores. The stems are so abrasive that they can be used as a scrubber to clean pots, a fact that gave rise to one of their common names, scouring rush.

**Pterophyta- Ferns** (12,000 species worldwide, 22 species in the Methow)

Pterophyta means ‘feather plant,’ and is an apt description of many ferns, which is the common name for this phylum. Ferns are a highly successful group, with 12,000 species worldwide. This contrasts with the horsetails, with only 40 species in existence, and with clubmosses, with 1200 species. Ferns first appear in the fossil record 360 million years ago. Their notable evolutionary advance was the development of large leaves, which gave them an advantage in the competition for sunlight. Many ferns have woody stems, and a few species grow up to 30 feet tall even today.

**Coniferophyta- Conifers** (630 species worldwide, 14 species in the Methow)

‘Conifer’ means ‘cone-bearing,’ and this phylum is comprised of all of the ‘cone-bearing’ plants, including our pines, firs, and spruce. The previous four phyla continued to rely on the primitive flagellated or ‘swimming sperm’ to effect sexual reproduction. The male gamete in all of the above phyla has to swim through accumulated water to reach the female gamete. This is an archaic trait dates back to life in an aquatic environment. Conifers developed pollen, in which the male gamete is encased in a protective outer coat and is transported on the wind. The weakness in this strategy is that most of the male gametes are wasted because wind is such a random transport vector.

Conifers took two other evolutionary leaps forward. They are among the first plants to develop lignin—also known as wood. This gave great strength to stems and allowed conifers to become the world's largest organisms. The tallest tree in the world is a redwood in northern California that is 379 feet. In competition for sunlight, it's hard to beat a redwood tree.

True seeds also first appeared in conifers and related species. All of the previous phyla reproduce with spores, tiny unicellular units of DNA that disperse on

the wind and contain no supporting nutrients for the germinating plant. Seeds on the other hand are multicellular reproductive units that contain a small embryonic plant within, and usually have a supply of nutrients to support germination. The appearance of seeds and pollen allowed conifers to free themselves of the need to live in damp environments and to colonize the uplands of the continents.

**Anthophyta- Flowering Plants** (300,000 species worldwide, 1250 species in the Methow)

Charles Darwin called flowers ‘the abominable mystery,’ because for most of the history of life on land they did not exist at all. They appear rather suddenly in the fossil record about 140 million years ago, and by 100 million years ago they had become the dominant plants in terms of species diversity. What evolutionary advantage did they develop that made them so successful?

About 150 million years ago a relationship between plants and insects began to develop, in which insects went from plant to plant foraging for food, and in the process picked up pollen at one flower and delivered it to another on a different plant. Directed transport of pollen by insects and other animals is now the dominant form of plant pollination.

Showy and fragrant flowers have evolved to attract pollinators, all in service to sexual recombination of DNA. This development of a symbiotic relationship between plants and animals was a level of complexity in ecosystems and on earth that had not previously existed. The partnership was so successful that flowering plants in a sense took over much of the terrestrial portion of the earth from the more ancient plants.

There is about one thousand times as much plant biomass on land than animal biomass. That means that of the approximately 500 billion tons of biomass on land, 499.5 billion tons are plants and only one-half billion tons is comprised of animals. The plant kingdom dominates the terrestrial landscape to a surprising degree.



A fossil branch of the Dawn Redwood, which grew in Pipestone Canyon 60 million years ago.

### Evolutionary Characteristics of Plants

Plant Division	Scientific Name	Appearance Millions of Years Ago	# of Species Worldwide	# of Species Methow	Flagellated (tailed) Gamete	Cuticle	Vascular System	Pollen	Seeds	Lignin	Flowers
Stoneworts (Green Algae)	Charophyta (Chlorophyta)	1000 mya	400	?	X						
Liverworts	Marchantiophyta (Hepaticophyta)	475 mya	9000	150 (75 IDed)	X	X					
Hornworts	Anthocerophyta	400 mya? or 100 mya?	100	?	X	X					
Mosses	Bryophyta	400 mya?	26,000	250 (200 IDed)	X	X					
Clubmosses	Lycopodiophyta (Lycophyta)	428 mya	1200	8	X	X	X				
Horsetails	Sphenophyta (Equisetopsida)	400 mya	40	7	X	X	X				
Ferns	Pteridophyta (Pterophyta)	400 mya	12,000	22	X	X	X				
Cycads	Cycadophyta	300 mya	130	0		X	X	X	X		
Conifers	Coniferophyta (Pinophyta)	300 mya	630	14		X	X	X	X	X	
Ginkgo	Ginkgophyta	200 mya	1	0		X	X	X	X	X	
Ephedra & Allies	Gnetophyta	175 mya	75	0		X	X	X	X	X	
Flowering Plants	Anthophyta (Magnoliophyta)	150 mya	300,000	1250		X	X	X	X	X	X

### Factors Determining Leaf Shape

Character	Advantage	Disadvantage
Large leaves	Increased photosynthetic capacity	Large leaf reduces air movement due to friction, thus reducing access to CO <sub>2</sub> & increasing heating of leaf
Small leaves, compound leaves	Increases air movement and cooling of leaf, increases transport of CO <sub>2</sub> .	Decreases surface area and photosynthetic capacity
Entire leaf margins (smooth edges)	Optimum solar gain	Decreases air movement and cooling of leaf
Serrate or wavy leaf margins	Increases cooling of leaf	Decreases surface area and photosynthetic capacity
Hairy leaves	Shades leaf surface, enhances cooling	Reduces solar energy reaching leaf, reduces air diffusion through stomata
Glabrous leaves	Surface receives all available solar energy	Increases heat gain & water loss, danger of over-heating
Numerous stomata	Enhances diffusion of CO <sub>2</sub> into the leaf, increases nutrient transport & biomass production	Increases evaporation and potential for desiccation
Relatively few stomata	Reduces water loss	Reduces access to CO <sub>2</sub> , reduces nutrient transport from roots

## Observing the Secret Life of Wildflowers

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Common Name	Scientific Name	What to Watch For
Arrowleaf Balsamroot	Balsamorhiza sagittata	Balsamroot is heliotropic- the flowers rotate during the day so that they are always pointing toward the sun. This makes the flowers more attractive to their pollinators and raises the temperature of the flower's stigma, so speeding up the germination of the received pollen grains- an advantage in cold and/or dry climates, where the opportunity for seed-production is brief.
Aspens Cottonwoods and Willows	Populus tremuloides, Populus trichocarpa, and Salix sp	Each individual plant is essentially male or female, as it will bear either male or female flowers, but not both (thus the plant is 'dioecious'). Curiously, <i>Populus</i> species are wind pollinated, while willows are insect pollinated. These two genera are in the same family, but have evolved different pollination strategies.
Aster Family, Carrot Family	Asteraceae, Apiaceae	Most flowers in these families engage in an 'open-house' policy. They are pollination generalists, their flower nectar and/or pollen readily available to many insects. This is why one can often find a motley crown of insects of many kinds present on one blooming plant.
Buttercup	Ranunculus sp	Buttercups have numerous stamens and produce an abundance of pollen because it is utilized as a food offering to insects. Buttercups also produce nectar; at the base of the upper side of every leaf is a small pocket (visible to the human eye) that fills with the sweet fluid.
Fairy-slipper	Calypso bulbosa	Fairy-slipper is a deception-pollinator. It is brightly colored on the dark forest floor, has nectar guides, and a pleasant scent, but it produces no nectar. It is pollinated by native bumblebees that hatch in large numbers during the orchid's flowering period. The bees eventually learn that the floral invitation is a deception, but not until several visits, by which time pollination has often been consummated.
Fireweed	Epilobium angustifolium	The inflorescence blooms from the bottom; anthers mature before stigmas. Bees visit the lower flowers first, thus delivering pollen from the previous plant to the maturing stigmas. As they ascend the raceme (flowering stalk) they encounter younger flowers and inadvertently pick up pollen from the maturing anthers.
Knapweed	Centuraea diffusa, C. maculosa	This is difficult to follow but utterly remarkable. The bloom of barnaby, like all members of the Composite or Aster Family, is made up of a composite of many tiny, individual flowers, each with a miniature corolla (the petals, here fused together). Inside, the anthers are fused into a tube around <i>and above</i> the stigma and style (which compose part of the female portion of the flower). Pollen is actually shed into the tube in the center of the flower formed by the fused anthers. When an insect visits, the filaments, which are fine threads that connect the anthers to the base of the flower, contract, pulling the anthers downward for a few seconds. This in effect forces the style up through the tube, delivering a serving of pollen to the visitor. The stigma, which when mature receives pollen, doesn't unfold and become receptive to until the following day, by which time pollen production has ceased. This prevents self-pollination from occurring.

Lady-slipper	<i>Cypripedium montanum</i>	Lady-slipper is a trap pollinator. It lures insects into the bowl formed by the lower petal with the promise of a nectar reward. The sides of the bowl are so slippery that the insect struggles for a considerable period of time before successfully escaping. In the process, pollen is both picked up from the stamens and delivered to the stigma.
Mullein	<i>Verbascum thapsus</i>	Each flower has five stamens. The lower two produce fertile pollen, the upper ones provide the insects with sterile pollen (which requires less investment of energy by the plant than fertile pollen) offered as food to draw them in.
Milkweed	<i>Asclepias speciosa</i>	In milkweeds masses of pollen called pollinia are stored away in the column of the flower formed by the fusion of the anthers and style. When an insect inserts a leg or proboscis into a slit in the column, the pollinia becomes entangled on the extremity and is carried away when the insect departs.
Penstemon	<i>Penstemon</i> sp	Some penstemons have flowers with very narrow tubes, an adaptation to exclude insects and save nectar for hummingbird pollinators. In other species the corolla (the fused petals) have a bulge beyond the opening, allowing bees and wasps to climb into the flower to reach the nectaries. The word 'penstemon' means 'five stamens', which indeed all penstemons have. But one of these is always sterile; it is called a staminode. This staminode may serve as a gatekeeper that prevents the entry of some insects and directs the travels within the corolla of those allowed past the main gate at the mouth of the corolla tube.
Plantain	<i>Plantago</i> sp (3 sp in Methow)	In the plantains, the stigmas mature before anthers (protogyny). Along the spike-like inflorescence, the upper flowers will be female, the lower male. Since plantains are usually wind-pollinated, the likelihood of pollen being carried straight up to the mature stigmas of the same plant are quite small, which effectively prevents self-pollination.
Shootingstars	<i>Dodecatheon</i> sp	Shootingstars are 'buzz pollinated'. The pollen can exit from the anther only via a small pore, or hole. This occurs when certain species of bees enter the flower and vibrate their wing muscles at up to 300 cycles per second, creating vibrations that force the pollen out of the anther like salt out of a shaker.
Violets	<i>Viola</i> sp	Violets are cleistogamous; that is, they have flowers that can fertilize themselves without ever opening. In the spring they produce normal flowers that are pollinated by insects with fairly long tongues, such as the bee fly, wild bees and butterflies. As summer progresses, small self-pollinating flowers lacking a colorful corolla appear at the base of the plant. If you scratch around at the base of the plant you will find them.
Yellowbell	<i>Fritillaria pudica</i>	Yellowbells change color as they mature; initially yellow, they turn red with age (a matter of a few days in their case). Generally insects perceive yellow well and red poorly. The color change signals the relatively few insects available in the very early blooming period of this flower which flowers to visit; they are attracted to the youthful yellow, which are the ones which probably have not yet been pollinated. The Latin species name of this flower, <i>pudica</i> , means bashful, and was inspired by the blush that appears (presumably) after the flower has been pollinated.

## Edible and Poisonous Plants of the Methow Valley

Compiled by The Methow Naturalist/Methow Biodiversity Project/[www.methownaturalist.com](http://www.methownaturalist.com)/[dana@methownet.com](mailto:dana@methownet.com) ver. 2/12

Common Name	Scientific Name as listed in The Flora of the PNW	Season	Use/Notes
Black Tree Lichen	<i>Alectoria fremontii</i>	All year	A delicacy to some native people, "starvation food" to others. Edibility may vary from place to place. Usually soaked and then steamed overnight, the resulting concentrated mass mixed with onions or berries.
Nodding & Hooker's Onions	<i>Allium cernuum</i> & <i>Allium acuminatum</i>	Before flowering	Nodding onion is relatively uncommon in the Methow. Digging the bulb kills the entire plant. The plant and bulb could be mistaken for the deadly death camas.
Serviceberry	<i>Amelanchier alnifolia</i>	June-August	Fruits are seedy by tasty; often made into jam or syrup. Can be dried for winter.
Balsamroot	<i>Balsamorhiza sagitta</i>	Spring-Fall	The smaller roots are "beaten and peeled" and then steamed or baked. The young shoots and bud-stems are edible in early spring; seeds are edible as well.
Oregon Grape	<i>Berberis aquifolium</i> & <i>Berberis nervosa</i>	July-August	Berries are seedy and tart but delicious; often made into jelly.
Springbeauty	<i>Claytonia lanceolata</i>	Spring	Each plant has a tiny tuber below ground that is edible raw or cooked; flower and leaves are edible raw. Usually dug just after flowering.
Fireweed	<i>Epilobium angustifolium</i>	Before flowering	The young shoots and leaves are edible raw or boiled.
Lilies	<i>Erythronium, Fritillaria, &amp; Lilium</i>	Before flowering	The entire plant is edible, stem, leaves, flower, bulb. Bulbs can be bitter or peppery and should be boiled in several changes of water.
Mushrooms	<i>Fungi</i>	After rain	There are a number of edible mushrooms in the Methow, notable among them morels in forest areas that have burned, puffballs, and boletes.
Cow Parsnip	<i>Heracleum lanatum</i>	Before flowering	Young stalks and leaf stems are edible raw after peeling. Best to use gloves in harvesting and peeling as the stalks contain phytotoxic compounds, making skin sensitive to sunlight.
Waterleaf	<i>Hydrophyllum capitatum</i> <i>Hydrophyllum sp.</i>	April-May	The leaves are edible raw before flowering; the long, fleshy roots are edible after boiling or steaming, probably as the plant withers
Bitterroot	<i>Lewisia rediviva</i>	Early May	The tiny root is edible after slipping off the bitter skin and cooking, usually dug when the flower is in bud stage.
Biscuitroot	<i>Lomatium macrocarpum</i>	April-May	Roots are peppery but edible.
Indian Celery	<i>Lomatium nudicaule</i> & <i>Lomatium ambiguum</i>	Before flowering	Roots were dug in early spring, peeled and cooked. The young leaves are edible raw or cooked until the flowers finish blooming; they taste rather like celery.
Yellow Monkeyflower	<i>Mimulus guttatus</i>	Before flowering & in early bloom period	The entire plant can be eaten raw; it has a slightly bitter flavor.
Sweet Cicely	<i>Osmorhiza chilensis</i> & <i>Osmorhiza occidentalis</i>	Before flowering	Roots and seeds are edible, cooked and probably raw; they are anise-flavored.
Mountain Sorrel	<i>Oxyria digina</i>	June-August	Leaves are tart but tasty, eaten raw. They are reputed to be high in vitamin C.
Whitebark Pine	<i>Pinus albicaulis</i>	August-September	Whitebark pines produce pine nuts, the trick is getting them before the Clark's nutcrackers do. Dried cones can be pounded or roasted to extract the seeds.

Cottonwood, Aspen	<i>Populus trichocarpa</i> & <i>Populus temuloides</i>	Mid-spring	The inner cambium is edible and considered a delicacy by some; can be eaten raw.
Chokecherry	<i>Prunus virginiana</i>	July-August	Fruits are astringent but tasty, can be used for jam.
Wild Rose	All <i>Rosa</i> species	August-October	Rose hips can be eaten raw or used to make tea.
Raspberry & Thimbleberry	All <i>Rubus</i> species	July-August	The ripe berries are edible and often tasty.
Blue Elderberry	<i>Sambucus cerulean</i>	August –September	Berries are tart and seedy but good tasting; used to make jam and syrup.
Brook Saxifrage & Dotted Saxifrage	<i>Saxifraga arguta</i> & <i>punctata</i>	July-August	Both species grow abundantly along streams in the high mountains; the leaves are edible raw as a salad green.
Buffaloberry	<i>Sherperdia Canadensis</i>	July-September (when berries are ripe).	Can be whipped into a froth (add ¼ c. of water to 1 c. crushed berries) and eaten, or add sugar. The bitter-sour flavor is an acquired taste. Edible raw.
Solomon's Seal	<i>Smilacina racemosa</i> & <i>Smilacina stellata</i>	July-September	The ripe berries are very seedy but extremely sweet; they are a favorite bear food.
Cattail	<i>Typha latifolia</i>	All year	The roots are edible as well, are said to resemble onions in flavor.
Stinging Nettles	<i>Urtica dioica</i>	Before flowering	Cattail has been called “the supermarket of the swamp.” The roots, shoots, pollen and the young flowers are all edible. Leaves are much like spinach when boiled; heat destroys their stinging quality.
Blueberries	All <i>Vaccinium</i> species	August-September	Berries are delicious.
Veronica	<i>Veronica americana</i> & <i>Veronica anagallis-aq</i>	Spring & Summer	Leaves and stems are edible raw or cooked.
<b>Edible Alien Plants</b>			
Lambsquarters	<i>Chenopodium album</i>	Before flowering	The leaves make a cooked green much like spinach.
Watercress	<i>Rorippa nasturtium-aquaticum</i>	All year	A tasty mustard green when cooked..
Dandelion	<i>Taraxacum officinale</i>	Before flowering	Leaves make a good raw or cooked green if gathered before flowering.
Salsify	<i>Tragopogon dubium</i>	Before flowering or in the fall	The fleshy roots are edible raw or cooked and resemble parsnip in flavor.
<b>Poisonous Plants</b>			
Baneberry	<i>Actea rubra</i>		Berries, foliage and roots are all highly poisonous.
Water Hemlock	<i>Cicuta douglasii</i>		All parts of the plant are very poisonous, the thickened roots are especially so. This may be the most poisonous plant in North America.
False Hellbore	<i>Veratrum viride</i>		All parts of the plant are toxic.
Death Camas	<i>Zigadenus venenosus</i>		The bulbs and leaves are highly poisonous.

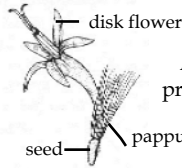
## Selected Flowering Plant Families

### **Aster (Asteraceae) Recognition: many tiny flowers (florets) crowded into a composite flower head**

The Aster Family is the second largest in the Plant Kingdom, after the Orchid Family, with 25,000 species. What appears to be a single flower in this family (a sunflower for example) is actually a composite of many very small flowers packed together in a *head*, with a series of small bracts at the base, called an *involucre*. What appear to be petals are actually tiny *ray flowers*, while packed into the center of the head are tiny *disk flowers* (aka *florets*). These are composed of a 5 tiny fused petals, a ring of 5 anthers that are fused together, and style and stigma (often with two branches) in the center of the ring. At the base of the corolla, a *pappus* of fine hairs or threads may be attached. The disk flowers are all attached to the *receptacle*.



A head composed of multiple disk florets, the involucre of scales below.



A disk floret, stigma protruding and pappus of bristles below.



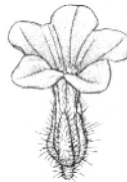
Anthers are fused together in disk flowers.

### **Borage (Boraginaceae) Recognition: hairy plants, the flowers with 5 fused petals, the inflorescence often coiling**

Plants in the Borage Family are typically covered with rough hairs. The flowers are radial with the 5 petals fused together, while the 5 sepals are separate. The stamens are attached to the petals rather than at the base of the pistil and alternate with the corolla lobes. The throat of the corolla is often narrowed or blocked by small appendages on the petals. Flowers often bloom progressively along a stem that is coiled at the tip like a scorpion's tail, this structure being known as a *scorpioid cyme*. Forget-me-nots are in this family, and many species bear a resemblance.



Flowering stem forms a coil, reminiscent of a scorpion's tail.



Flower petals are fused while sepals are free and often very hairy..



Fruits in the Borage Family typically have 4 seeds..

### **Buckwheat (Polygonaceae) Recognition: flowers tiny, leaves sheath the stem and stem joints are swollen**

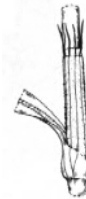
Flowers in the Buckwheat Family are very small, less than 1/2" across, and are sometimes gathered together in clusters. Although they are dicots, the flowers often have 6 tepals (sometimes 5, tepals are sepals and petals counted together, as in this family they look the same), which are free at the top and fused together at the base. There are 6 or 9 stamens. The leaves typically form a sheath around the stem where they meet it, and the stem usually has swollen joints or nodes (the Latin *Polygonum* means 'swollen knees,' referring to these joints). Rhubarb, buckwheat, and sorrel are in this family.



The small flowers may be arranged singly along the stem or clustered in loose heads.



The tepals are free at the top and fused together at the base.



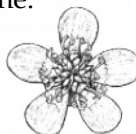
The leaves sheath the stem and join it at a swollen joint.

### **Buttercup (Ranunculaceae) Recognition: many pistils, the tip of each often hooked, stamens numerous**

The Buttercup Family is hard to characterize, containing as it does flowers with both radial and bilateral flowers. Most species have 10 or more stamens and 5 or more individual pistils with one stigma each ; petals are free (unfused), sometimes with a spur in back, and often with a nectar gland at the base. Includes such diverse flowers as larkspur, monkshood and columbine.



A columbine flower, with each petal forming a spur behind



A buttercup, with 5 free petals and multiple stamens and pistils



Side view of a buttercup, illustrating multiple pistils

**Figwort (Scrophulariaceae) Flowers bilateral and bilabiate, with 2 upper and 2-3 lower lobes, petals fused**

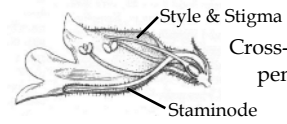
The Figwort Family usually has flowers that are strongly bilateral, with the petals fused together, and the stamens attached to the petals rather than at the base of the corolla. Most flowers have 4 stamens, the ovary produces many seeds, and the stems are round (the similar Mint Family produces 4 seeds per flower and stems are square). Species include snapdragon, foxglove, penstemon, paintbrush, and monkeyflowers.



Fused petals of a penstemon, with 2 lobes above & 3 below



View down the throat, showing 4 anthers and staminode (sterile stamen) below.



Style & Stigma  
Cross-section of a penstemon.  
Staminode

**Heather (Ericaceae) Recognition: Fused flowers usually red or white and somewhat bell-shaped**

The Heather Family has radial flowers with fused petals, often forming a bell shape. Stamens are attached at the base of the corolla, anthers open by pores or slits and often have an awn-like projection on them. There is only one stigma. Species include blueberries, bearberry, Labrador tea, heather, and Rhododendron.



A *Vaccinium* (blueberry) flower, showing fused petals and bell shape.



A *Kalmia* (swamp laurel) flower, showing fused petals, one stigma.



Cross-section of a *Vaccinium* flower, illustrating spurred anthers.

**Mint (Lamiaceae) Recognition: Flower stalk squarish, flowers bilabiate, leaves opposite, plant aromatic**

The Mint Family has strongly bilateral flowers with the petals fused together, and the stamens attached to the petals rather than at the base of the corolla. There are 4 stamens, and the ovary produces only 4 nutlets. Stems are usually square and the plants are typically aromatic. Flowers are often in whorls on stem.



A typical Mint Family flower, showing fused, bilateral petals.



A Mint Family plant, with flowers in whorls on stem.



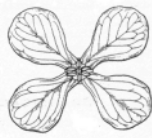
The ovary of a typical mint, showing the 4 nutlets.

**Mustard (Brassicaceae) Recognition: Flowers with 4 petals and 6 stamens, 4 of them tall and 2 short**

The Mustard Family is characterized by its radial flowers with 4 unfused petals, usually clawed (narrowed) at the base. There are 6 stamens, usually 4 long and 2 short, attached at the base of the ovary. The leaves and seeds often taste like mustard.



Mustard Family petals are often clawed, or narrowed at the base.



4 petals forming a cross is indicative of the Mustard Family.



Several Mustard Family seed pod shapes.

**Parsley (Apiaceae) Tiny flowers clumped together in a flat-topped or convex head, flower stalks hollow**

Parsley Family blooms have several clusters of tiny (less than 1/4") flowers on stalks radiating out from a common point, like an umbrella. The leaves sheath the stems. The tiny flowers have 5 even tinier sepals, 5 petals, and 5 stamens. Species in the family include parsley, carrot, parsnip, celery, and coriander (cilantro).



The compound umbel (umbrella shape) of the Parsley Family



A Parsley Family flower, with 5 petals and 5 anthers.



The stem of water-hemlock, showing sheathing leaves and hollow stem.

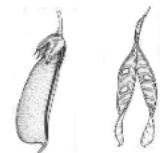
**Pea (Fabaceae)- Recognition: Flowers bilateral, leaves pinnately compound, fruit pea pod-like.**



Most members of the Pea Family have compound leaves.



Most members of the Pea Family have bilateral flowers with the upper petal the largest.



Typical fruit (pod) of the Pea Family, split open on right.

**Rose (Rosaceae)-** Flowers radial, petals free, stamens numerous (10, 15, 20), leaves often oval and serrate.

**Saxifrage (Saxifragaceae)-** Flowers radial, petals free, stamens 5 or 10, filaments often flattened, stigmas 2-3.

## 101 Plants to Know in the Methow

v	#	Common Name	Scientific Name	Abu	Family	Code	Type	Alien?
	1	Pacific silver fir	<i>Abies amabilis</i>	3	Pine	ABAM	t	
	2	subalpine fir	<i>Abies lasiocarpa</i>	3	Pine	ABLA	t	
	3	Douglas maple	<i>Acer glabrum</i> var. <i>douglasii</i>	3	Maple	ACGLD4	s	
	4	common yarrow	<i>Achillea millefolium</i>	1	Composite	ACM2	p	
	5	monkshood	<i>Aconitum columbianum</i>	3	Buttercup	ACCO4	p	
	6	quackgrass	<i>Agropyron repens</i>	3	Grass	AGRE2	g	a
	7	bluebunch w heatgrass	<i>Agropyron spicatum</i>	3	Grass	AGSP	g	
	8	Hooker onion	<i>Allium acuminatum</i>	3	Lily	ALAC4	p	
	9	mountain alder	<i>Alnus incana</i>	3	Birch	ALIN2	d	
	10	serviceberry	<i>Amelanchier alnifolia</i>	1	Rose	AMAL2	s	
	11	pearly everlasting	<i>Anaphalis margaritacea</i>	3	Composite	ANMA	p	
	12	w estern pasqueflower	<i>Anemone occidentalis</i>	3	Buttercup	ANOC6	p	
	13	rosy pussytoes	<i>Antennaria microphylla</i>	2	Composite	ANM3	p	
	14	spreading dogbane	<i>Apocynum androsaemifolium</i>	3	Dogbane	APAN2	p	
	15	red columbine	<i>Aquilegia formosa</i>	3	Buttercup	AQFO	p	
	16	Holboell's rockcress	<i>Arabis holboellii</i>	3	Mustard	ARHO2	p	
	17	kinnikinnick	<i>Arctostaphylos uva-ursi</i>	3	Heather	ARUV	p	
	18	thread-leaved sandwort	<i>Arenaria capillaris</i>	3	Pink	ARCA7	p	
	19	heartleaf arnica	<i>Arnica cordifolia</i>	3	Composite	ARCO9	p	
	20	big sagebrush	<i>Artemisia tridentata</i>	3	Composite	ARTR2	s	
	21	leafy aster	<i>Aster foliaceus</i>	3	Composite	ASFO	p	
	22	w eedy milkvetch	<i>Astragalus miser</i>	3	Pea	ASM9	p	
	23	w oolly-pod milkvetch	<i>Astragalus purshii</i>	3	Pea	ASPU9	p	
	24	arrow leaf balsamroot	<i>Balsamorhiza sagittata</i>	2	Composite	BASA3	p	
	25	Tall Oregongrape	<i>Berberis aquifolium</i>	3	Barberry	BEAQ	s	
	26	w ater birch	<i>Betula occidentalis</i>	3	Birch	BEOC2	t	
	27	cheatgrass	<i>Bromus tectorum</i>	1	Grass	BRTE	g	a
	28	Lyall's mariposa lily, hairy cat's ear	<i>Calochortus lyallii</i>	3	Lily	CALY	p	
	29	sagebrush mariposa lily	<i>Calochortus macrocarpus</i>	3	Lily	CAMA5	p	
	30	fairyslippers	<i>Calypso bulbosa</i>	3	Orchid	CABU	p	
	31	beaked sedge	<i>Carex utriculata</i>	3	Sedge	CAUT	g	
	32	w estern moss heather	<i>Cassiope mertensiana</i>	3	Heather	CAME7	s	
	33	scarlet paintbrush	<i>Castilleja miniata</i>	3	Figwort	CAMI12	p	
	34	diffuse knapweed	<i>Centaurea diffusa</i>	2	Composite	CEDI3	b	a
	35	springbeauty	<i>Claytonia lanceolata</i>	2	Purslane	CLLA2	p	
	36	blue-eyed Mary	<i>Collinsia parviflora</i>	3	Figwort	COPA3	a	
	37	redosier dogwood	<i>Cornus stolonifera</i>	3	Dogwood	COST4	s	
	38	mountain lady's-slipper	<i>Cypripedium montanum</i>	3	Orchid	CYMO2	p	
	39	fragile fern	<i>Cystopteris fragilis</i>	2	Common Fern	CYFR2	f	
	40	orchardgrass	<i>Dactylis glomerata</i>	3	Grass	DAGL	g	a
	41	upland larkspur	<i>Delphinium nuttallianum</i>	3	Buttercup	DENU2	p	
	42	few -flowered shootingstar	<i>Dodecatheon pulchellum</i>	3	Primrose	DOPU	p	
	43	great basin wild rye	<i>Elymus cinereus</i>	3	Grass	ELC2	g	
	44	fireweed	<i>Epilobium angustifolium</i>	2	Evening-primrose	EPAN2	p	
	45	desert yellow daisy	<i>Erigeron linearis</i>	3	Composite	ERLI	p	
	46	big buckwheat	<i>Eriogonum heracleoides</i>	2	Buckwheat	ERHE2	s	
	47	yellow bell	<i>Fritillaria pudica</i>	3	Lily	FRPU2	p	
	48	sticky geranium	<i>Geranium viscosissimum</i>	3	Geranium	GEV12	p	
	49	w hite bog-orchid	<i>Habenaria dilatata</i>	3	Orchid	HADI7	p	
	50	sagebrush stickseed	<i>Hackelia arida</i>	3	Borage	HAAR3	p	
	51	little sunflower	<i>Helianthella uniflora</i>	3	Composite	HEUN	p	
	52	ballhead waterleaf	<i>Hydrophyllum capitatum</i>	3	Waterleaf	HYCA4	p	
	53	dagger-leaved rush	<i>Juncus ensifolius</i>	3	Rush	JUEN	g	
	54	subalpine larch	<i>Larix lyallii</i>	3	Pine	LALY	t	

v	#	Common Name	Scientific Name	Abu	Family	Code	Type	Alien?
	54	subalpine larch	<i>Larix lyallii</i>	3	Pine	LALY	t	
	55	bitterroot	<i>Lewisia rediviva</i>	3	Purslane	LERE7	p	
	56	tiger lily	<i>Lilium columbianum</i>	3	Lily	LICO	p	
	57	tw inflow er	<i>Linnaea borealis</i>	3	Figwort	LIBO3	p	
	58	small-flow ered fincecup	<i>Lithophragma parviflora</i>	3	Saxifrage	LIPA5	p	
	59	w estern gromw ell, puccoon	<i>Lithospermum ruderale</i>	3	Borage	LIRU4	p	
	60	sw ale desert parsley	<i>Lomatium ambiguum</i>	2	Parsley	LOAM	p	
	61	w ild carrot, chocolate tips	<i>Lomatium dissectum</i>	3	Parsley	LODI	p	
	62	silky lupine	<i>Lupinus sericeus</i>	3	Pea	LUSE4	p	
	63	Canadian mint	<i>Mentha arvensis</i>	3	Mint	MEAR4	p	
	64	small bluebells	<i>Mertensia longiflora</i>	3	Borage	MELO4	p	
	65	yellow monkeyflow er	<i>Mimulus guttatus</i>	3	Figwort	MIGU	p	
	66	mountain sorrel	<i>Oxyria digyna</i>	3	Buckw heat	OXDI3	p	
	67	pachistima, mountain boxw ood	<i>Pachistima myrsinites</i>	3	Stafftree	PAMY2	s	
	68	Chelan penstemon	<i>Penstemon pruinosus</i>	3	Figwort	PEPR3	s	
	69	silverleaf phacelia	<i>Phacelia hastata</i>	2	Waterleaf	PHHA	p	
	70	red mountain heather	<i>Phylodoce empetriformis</i>	3	Heather	PHEM	s	
	71	Engelmann spruce	<i>Picea engelmannii</i>	3	Pine	PIEN	t	
	72	lodgepole pine	<i>Pinus contorta</i>	3	Pine	PICO	t	
	73	ponderosa pine	<i>Pinus ponderosa</i>	2	Pine	PIPO	t	
	74	bulbous bluegrass	<i>Poa bulbosa</i>	2	Grass	POBU	g	a
	75	Kentucky bluegrass	<i>Poa pratensis</i>	2	Grass	POPR	g	a
	76	slender cinquefoil	<i>Potentilla gracilis</i>	3	Rose	POGR9	p	
	77	Douglas fir	<i>Pseudotsuga menziesii</i>	2	Pine	PSME	t	
	78	pinedrops	<i>Pterospora andromedea</i>	3	Heather	PTAN2	p	
	79	antelope bitterbrush	<i>Purshia tridentata</i>	3	Rose	PUTR2	s	
	80	sidebells pyrola	<i>Pyrola secunda</i>	3	Heather	PYSE	p	
	81	sage buttercup	<i>Ranunculus glaberrimus</i>	3	Buttercup	RAGL	p	
	82	w ax currant	<i>Ribes cereum</i>	3	Currant	RICE	s	
	83	Woods' rose	<i>Rosa woodsii</i>	3	Rose	ROWO	s	
	84	thimbleberry	<i>Rubus parviflorus</i>	3	Rose	RUPA	s	
	85	Scouler's w illow	<i>Salix scouleriana</i>	2	Willow	SASC	t	
	86	blue elderberry	<i>Sambucus cerulea</i>	3	Honeysuckle	SACE3	s	
	87	spotted saxifrage	<i>Saxifraga bronchialis</i>	3	Saxifrage	SABR6	p	
	88	hardstem bulrush	<i>Scirpus acutus</i>	3	Sedge	SCAC	g	
	89	lance-leaved stonecrop	<i>Sedum lanceolatum</i>	2	Stonecrop	SELA	p	
	90	w estern butterw eed	<i>Senecio integerrimus</i>	2	Composite	SEIN2	p	
	91	tall tumbledustard	<i>Sisymbrium altissimum</i>	3	Mustard	SIAL2	a	a
	92	w estern Solomon-seal	<i>Smilacina racemosa</i>	3	Lily	SMRA	p	
	93	goldenrod	<i>Solidago canadensis</i>	3	Composite	SOCA6	p	
	94	w hite spiraea	<i>Spiraea betulifolia</i>	3	Rose	SPBE2	s	
	95	needle and thread grass	<i>Stipa comata</i>	3	Grass	STCO4	g	
	96	common snow berry	<i>Symphoricarpos albus</i>	2	Honeysuckle	SYAL	s	
	97	thinleaf huckleberry	<i>Vaccinium membranaceum</i>	3	Heather	VAME	s	
	98	common mullein	<i>Verbascum thapsus</i>	2	Figwort	VETH	b	a
	99	American brooklime	<i>Veronica americana</i>	3	Figwort	VEAM2	p	
	100	pioneer violet	<i>Viola glabella</i>	3	Violet	VIGL	p	
	101	meadow death-camas	<i>Zigadenus venenosus</i>	3	Lily	ZIME	p	

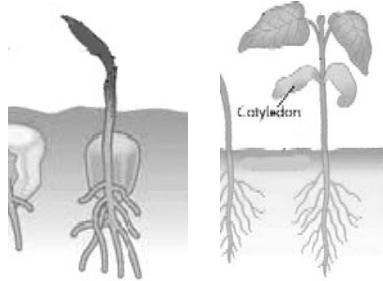
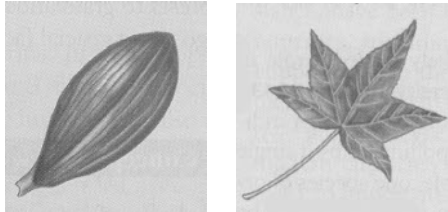
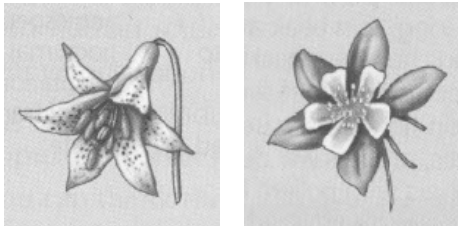
## Monocots and Dicots

One of the earliest divisions that occurred in flowering plants is into two groups known as monocots and dicots, which employ two very different growth forms. The difference between the two is often evident to the naked eye, and many keys to plant identification will begin with making this determination.

Monocots have leaves with parallel veins, and flower parts (the sepals, petals and stamens) either in 3s or in multiples of 3 (like 6 or 9).

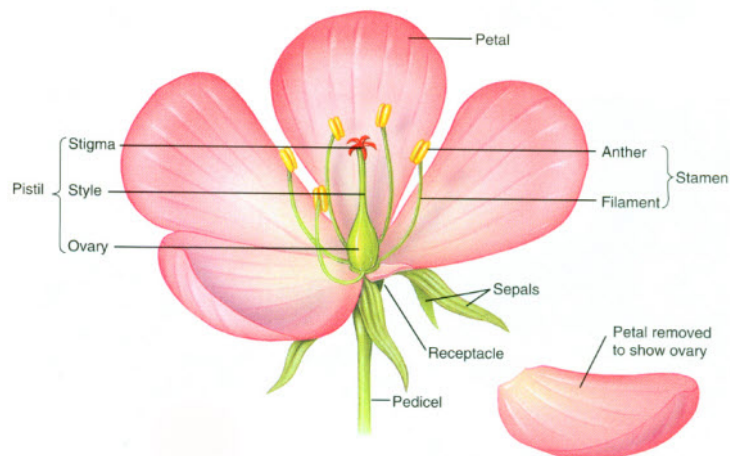
Dicots usually have leaves with branching veins, and flower parts in 4s or 5s, or multiples of these numbers.

There are other differences, but these are the most obvious. Monocots (this name is a slight abbreviation of 'monocotyledon') are so-named because within the seed and when the seed sprouts, there is only cotyledon, or seed leaf. Dicots ('dicotyledon') seeds have two seed leaves, or cotyledons. See the images below.

Monocots		Dicots
Embryo has only one seed leaf (this is corn)		Embryo has two seed leaves (e.g. beans)
Leaves are parallel-veined		Leaves are net-veined
Flower parts are in 3s		Flower parts are in 4s or 5s

Monocot examples: Grass Family, Sedge Family, Rush Family, Orchid Family, Lily Family.  
 Dicot examples: Aster Family, Borage Family, Mustard Family, Parsley Family, Pea Family.

Flower structure:



## Glossary

- Bilateral symmetry- Flower can be divided in half in only one axis, flower not round.
- Calyx- All the sepals of a flower, taken collectively.
- Connate- Grown together or attached.
- Corolla- All the petals of a flower, taken collectively.
- Cyme- A type of inflorescence in which the terminal flower blooms first.
- Disk Flower- The small flowers (or florets) in the center area of a composite flower in the Aster Family.
- Glabrous- Smooth, without hairs or glands.
- Glandular- Bearing small, rounded translucent, sticky or shiny glands.
- Glaucous- Covered with a fine, waxy, removable powder, which imparts a whitish or bluish cast to surface.
- Head- An inflorescence of small flowers crowded together at the top of a peduncle (flower stem).
- Involucre- A set of bracts beneath an inflorescence, typically subtending a head in the Aster Family.
- Ligule- The petal-like portion of a ray flower in a Aster Family flower; also the appendage on the inner side of the leaf at the junction of the blade and stem in many Grass Family members and some Sedge Family.
- Panicle- A type of inflorescence in which flowers bloom at the ends of a branching stem.
- Pappus- A series of hairs or elongate scales at the top of an ovary (or seed) in the Aster Family.
- Pedicel- The stalk of a single flower.
- Perianth- The sepals and petals of a flower, taken together.
- Petal- A member of the second set of flower structures, just internal to the sepals, usually colored.
- Raceme- A type of inflorescence in which pedicillate flowers bloom progressively up an unbranched stem.
- Radial symmetry- A flower that is round, like a wheel.
- Ray Flower- A petal-like flower on the perimeter of an Aster Family composite head.
- Receptacle- The end of the stem to which the other flower parts are attached.
- Sepal- A member of the outmost set of flower bracts (actually modified leaves), often green.
- Spike- A type of inflorescence in which stalkless flowers bloom progressively up an unbranched stem.
- Stipitate-glandular- Sticky or shiny glandular material at the tip of an upright stalk.
- Tepal- Sepals and petals together in an undifferentiated perianth (sepals and petals look the same).
- Umbel- A type of inflorescence in which multiple stalked flowers arise, umbrella-like, from a common point.

Terms associated with types of pubescence or hair:

- Ciliate- with a fringe of marginal hairs.
- Cinereous- ashy in color, generally because of short hairs.
- Hirsute- Pubescent with rather coarse or stiff but not pungent hairs.
- Hispid- Pubescent with coarse and firm, often pungent hairs.
- Lanate- Woolly.
- Pannose- With the texture of felt or closely woven wool.
- Pilose- With long, straight, rather soft, spreading hairs.
- Puberulent- Minutely pubescent.
- Pubescent- Bearing hairs of any sort.
- Retorse- Pointing backward.
- Scabrous- Rough to the touch.
- Sericeous- Silky, from the presence of long, slender, soft, appressed hairs.
- Setose- Beset with bristles.
- Stipitate- Borne on a stalk.
- Stipitate-glandular- A gland borne on a stalk.
- Tomentose- Covered with tangled or matted, woolly hairs.
- Villous- Pubescent with long, soft, often bent or curved but not matted hairs.