

Native Orchids in Southeast Alaska *with an Emphasis on Juneau*



Marlin Bowles & Bob Armstrong
2019

Acknowledgements

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About the Authors

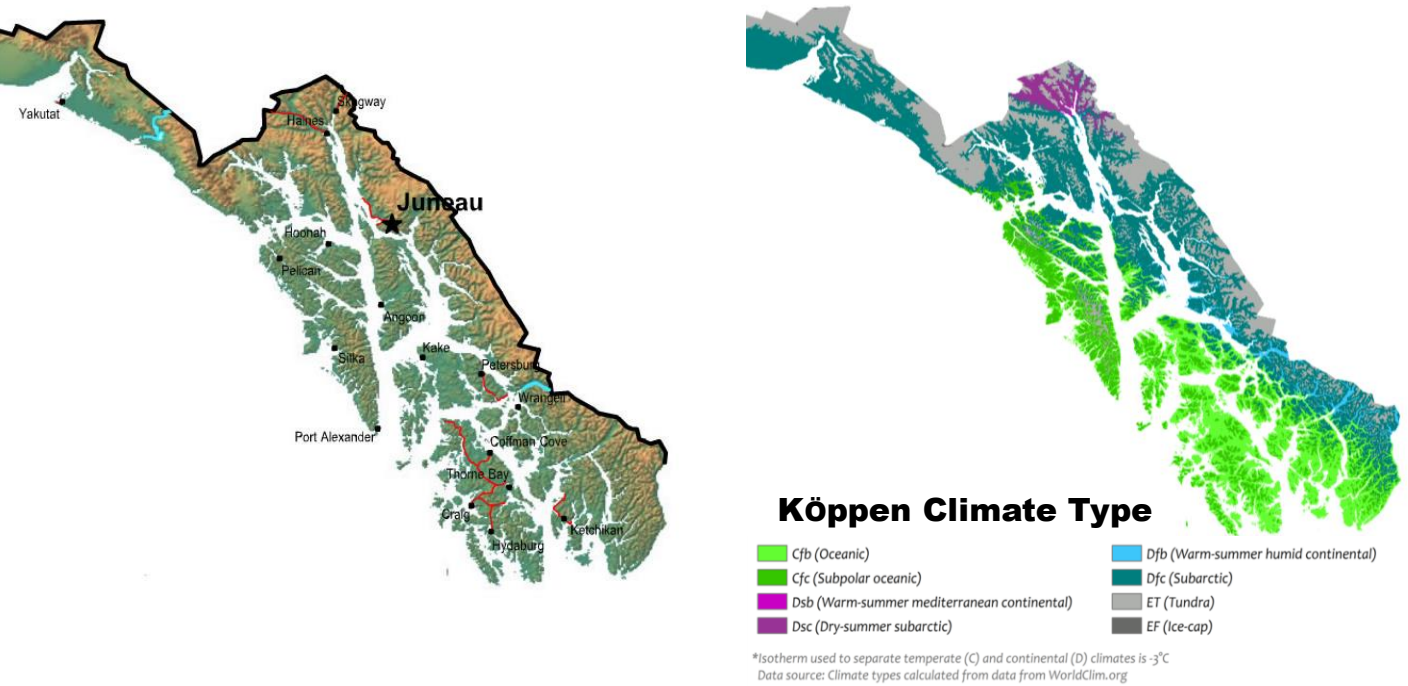
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The Southeast Alaska Archipelago



Landmass: Southeast Alaska consists of an archipelago of near shore islands and a narrow border of coastline and adjacent mountains that reach over 8,000 ft (2,500 m) above sea level. Many of these mountains, especially in the north, are capped by glacial ice fields.

Climate : Based on Köppen Climate Types, the southeast Alaska climate is subarctic-subpolar. It is moderated by an oceanic effect in outer and southern islands, and by a warmer drier continental effect in the north, especially in upper Lynn Canal. Annual precipitation averages 50 inches (1,270 mm) in Juneau.

Soils: Soils are primarily acidic and derived from glacial material or partially decomposed plant material of forests or peatlands. They are often complex due to variation in underlying bedrock that may range from granite to limestone.

Plant life: Vegetation changes across both elevational and latitudinal gradients. Northern rainforest of Sitka spruce and western hemlock, or muskeg peatland with shore pine and mountain hemlock predominate at lower elevations. This vegetation transitions to spruce and mountain hemlock and then alpine at higher elevations. Black cottonwood forest or lowland fens and marshes occur along rivers throughout the area. In the north, lodgepole pine forest may establish early after glaciation, or after disturbance such as fire. High plant diversity occurs in upper Lynn Canal. In the southern third of southeast Alaska, western red cedar is abundant below 1000 ft (300 m) elevation in forests and muskeg. These southern habitats are also diverse, and include many plant species that do not range farther north.

The Orchid Plant Family

The orchid plant family is the largest in the world. It contains about 25,000 species, which includes about 8 % of all plant species. Orchids are most abundant in the tropics, where the majority are arboreal epiphytes, growing on trees. New orchid species are still being discovered in the tropics. However, orchids also occur northward in temperate areas of North America, Europe and Asia, where they are terrestrial, rooting in soil. Some even occur north beyond the arctic circle. About 33 species and varieties occur in Alaska, with 27 species or varieties in the southeast.

Orchids belong to the monocot group of plants, which includes lily and iris species. Orchids differ by having specialized flowers that are highly adapted to attract and manipulate insects for cross-pollination. One petal (the lip) is extremely modified, and often showy, to attract specific insect pollinators. When in bud the lip is uppermost but usually the flower stalk twists 180 degrees to place the lip lowermost. The lowermost lip position is termed resupinate. A nectar reward is often provided to attract insect pollinators; it may be stored in a recessed nectary that determines insect tongue length required to access the nectar. Some species use food deception or more bizarre methods to attract pollinators.

Pollen are usually consolidated into a mass or pollinium (pollinia is plural) that is attached to pollinators by a glue or by an extended caudicle that holds an adhesive disk, or viscidium. The pollinium, caudicle and viscidium are termed a pollinarium. Insects carry the pollinarium to a different plant in search of nectar, where the pollinium comes in contact with the plant's stigma and deposits pollen grains, completing cross-pollination. Some orchid species retain pollinia, and insects remove pollen grains for cross-pollination. Other orchids may self-pollinate, which has been thought to enhance reproduction in extreme environments that lack insect diversity.

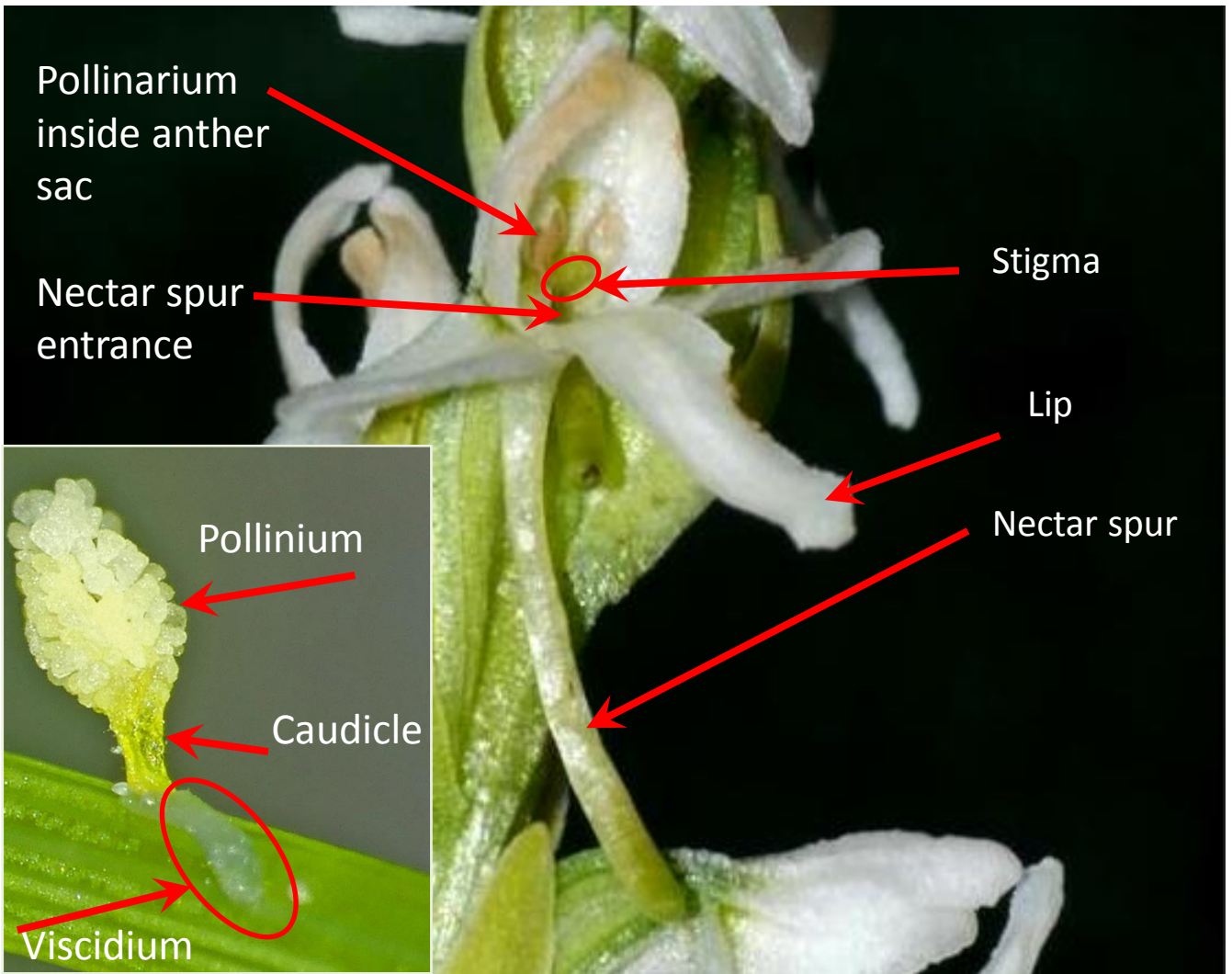
Characteristics of Orchids

All orchid species are perennial, though some may not flower annually and others may enter dormancy and absence from an above-ground state for a year or more.

Orchids produce thousands of microscopic seeds that have no food supply (endosperm). A soil fungus provides nutrients to the developing seedling through a mycorrhiza. They tend to have a slow rate of growth from seed, and a long juvenile period before reaching flowering size. Adult leaf-bearing plants have a poorly developed root system, and usually continue to supplement products of photosynthesis through mycorrhizae. Some species lack chlorophyll and depend entirely upon mycorrhizae for nutrients.

The presence of orchids often indicates lack of human disturbance. Many terrestrial species also occupy specific and predictable habitats. They may be sensitive to soil characteristics such as the range from acidic to alkaline soil reaction (measured by pH), and usually require specific fungi for development of mycorrhizae. The large number of orchid species, their habitats, pollinators, and fungal partners are important components of biodiversity and are thus valuable subjects for conservation. They are also valuable for evolutionary and ornamental research, and make up a large component of ornamental plant trade.

Orchid Floral Anatomy



Anatomy of a white bog orchid flower showing organization of reproductive parts. Pollinaria are enclosed in anther sacs positioned on either side of the stigma, which is located above the entrance to the nectar spur. Insects contact a viscidium and remove a pollinarium while probing for nectar. Inset shows a pollinarium removed from the anther sac and adhered by its viscidium.

Roots of our Knowledge: Historical Plant Collecting

In southeast Alaska, botanical collecting that included orchids occurred as early as the late 1800s. In 1891, Grace E. Cooley, from Wellesley College, Mass., collected about 250 plant species during a 5-week trip across southeast Alaska and adjacent British Columbia. Included in this collection were seven orchid species.

Beginning in the late 1930s, the Juneau Botanical Club and its mentor, J. P. Anderson, collected extensively in southeast Alaska. Anderson's collections were the basis for his 1959 book, *Flora of Alaska and Adjacent Parts of Canada*, and many of his specimens are now housed in the University of Alaska herbarium, Fairbanks. Eric Hulten also collected in southeast



Dr. J.P. Anderson (Swedell, 1999).

Alaska as he worked on his 1968 book *Flora of Alaska and neighboring territories*. This book included distribution maps and modern nomenclature, which was lacking in Anderson's book.

The Juneau Botanical Club continued for 40 years, and its collection of about 5000 specimens is now housed in the Alaska State Museum. This collection includes almost 20 orchid species representing over 50 different localities, primarily in the Juneau and Haines areas. More recently, botanical collections from the Tongass National Forest, Glacier Bay National Park, and surrounding areas have increased our knowledge of the number of orchid species and their distributions in southeast Alaska. These specimens are housed primarily in the herbariums of the U.S. Forest Service, National Park Service and the University of Alaska, Fairbanks and have provided valuable information for this project.

Orchid species groups in southeast Alaska

Fairy slipper and lady's slippers (4 species)

Includes one fairy slipper (*Calypso*) with two varieties, and three lady's slippers (*Cypripedium*). One to several large flowers with inflated showy lips (resembling a slipper) are on each plant. Food deception is used to attract pollinators (one lady's slipper self-pollinates). Pollen are dispersed in pollinia in the fairy slipper. In *Cypripedium* species the pollinia remain on the flower and insects remove granular clumps of pollen. Lady's slipper species tend to be rare, and may not occur in the immediate Juneau area.



Rein orchids, bracted (frog) orchids and piperias (11 species)

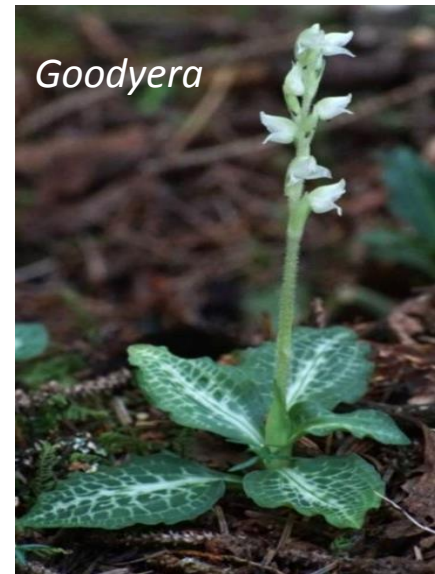
Includes two varieties of bracted orchids (*Coeloglossum*), two *Piperia* orchids, and at least eight rein orchids (*Platanthera*), two of which are varieties of one species. Many flowers are arranged in an elongated inflorescence above a leafy stalk. In *Piperia* the leaves are basal. Flowers are insect pollinated, and nectar is provided in an elongated spur. Length of the nectar spur often matches pollinator tongue length. *Coeloglossum* may self-pollinate. *Piperia* species are infrequent and may not occur in the Juneau area.



Orchid species groups (continued)

Plantain orchid and ladies tresses (2 species)

This group includes two closely related species, rattlesnake plantain (*Goodyera*) and ladies tresses (*Spiranthes*). Both species have basal leaves, small white flowers in a spike, provide a nectar reward and are bee pollinated.



Twayblades and Adder's mouths (4 species)

Though not closely related, four (*Listera*) species and two adder's mouth (*Malaxis*) species are included for convenience in this group due to their small size and similar pollinators.

Listera has two leaves paired on either side of the stem. *Malaxis* has leaves only at the stem base. Both species have small greenish flowers in a short spike, and provide a nectar reward on the lip. They are pollinated by gnats and small flies. Their pollinia lack viscidia and are attached to insects by a glue that is produced separately from the pollinum. One *Malaxis* also produces bulbets on its leaf tip, which fall to the ground and form new plants.



Coralroots (2 species)

Two species of *Corallorhiza* are represented. These species lack leaves and depend on mycorrhizae for nutrients. They are primarily self-pollinated, but also insect-visited.



Orchid habitat groups in southeast Alaska

Forest species (11 species)

Forest habitats support shade-tolerant species that avoid full sun; this habitat represents almost all species groups. These species occur principally near sea-level in coastal forests on soils of partially decomposed conifer needles. A few species extend inland at low elevations along rivers.



Non-forest species (9 species)

These are shade-intolerant species adapted to full sun and include all species groups except coralroots and twayblades. They occupy saturated peat soils of muskeg, bog, & fen, and glacial meadows from sea level to alpine.



Light-flexible species (5 species)

This group includes the lady's slippers and piperia species. They occupy a range of light across a variety of habitats ranging from open forest to full sun.

Fairy Slipper (*Calypso bulbosa*)

The fairy slipper orchid is the most captivating of our native orchids. John Muir called it the “Hider-of-the-North”, and had a spiritual awakening after seeing it. A single leaf appears in fall and remains green through the winter and spring, and disappears by early summer. Flowering occurs in early spring, with inflorescences of 1-2 flowers reaching up to 22 cm in height. Flowers are showy, with pink to lavender sepals and petals and a white to lavender lip that extends into a solid colored or spotted apron. Lips are less than 2 cm long, and with yellow or white beard. Pollinators (bees) are attracted by food deception, and seed pods are rarely produced. Two varieties occur in North America.



The eastern Fairy-slipper, var. *americana*, has a spotted lip with a yellow beard, and a solid white to lavender apron.



The western fairy-slipper, var. *occidentalis*, has a spotted lip with a white beard, and a lavender spotted apron.

Distribution of *Calypso bulbosa* varieties

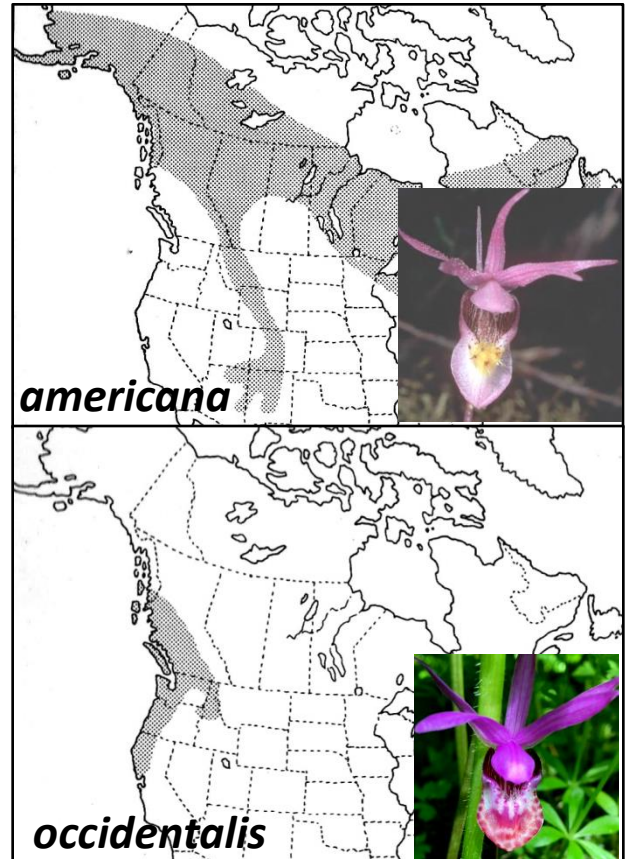
Var. *americana* occurs across northern North America west to Alaska. It ranges south in Alaska to Glacier Bay and the Chilkat Valley, where it has been found under lodgepole pine and at forest edges. It also extends south into Lynn Canal.

Var. *occidentalis* occurs along the Pacific Northwest coast. It ranges north into Southeast Alaska as far as Lynn Canal, where it occurs on small islands under Sitka spruce. These habitats may be moderated by the marine environment, and are also free of deer, which might eat the winter-green leaves of *Calypso*.

The ranges of these varieties overlap in Lynn Canal. One of a few places where they are known to occur together. The hybrid between var. *americana* and var. *occidentalis* (*Calypso bulbosa* x *kostiukiae*) could occur in this area.

Color forms and hybrids

Color variation is common in *Calypso*. Var. *americana* forma *rosea* has a solid lavender lip, and forma *albiflora* has a white lip. Var. *occidentalis* forma *nivea* has a white flower.



Distribution maps from Luer (1975)



Calypso bulbosa var. *americana* forma *rosea*.

Lady's Slippers (*Cypripedium*)



C. montanum

Mountain Lady's slipper

C. parviflorum

Yellow Lady's slipper

C. passerinum

Sparrow's egg Lady's slipper

Lady's slippers tend to be rare in southeast Alaska. They have been found near Glacier Bay, in the Chilkat Valley, and on Prince of Wales Island. The mountain lady's slipper occupies the widest range of habitats and light conditions, including forests, bogs, and alpine meadows. The yellow lady's slipper occurs in beach meadows and bogs. The sparrow's egg lady's slipper occurs in river gravel bars and beach meadows. Some of their habitats are threatened by human impacts.

These orchids are conspicuous and showy. Their flowering stems range from 15 to 70 cm high, and have 1-3 flowers with lips from 1.5-3 cm long. The sparrow's egg lady's slipper has smaller flowers. Food deception is used to attract pollinators, which tend to be wasps or bees; however, the sparrow's egg lady's slipper is self-pollinated. Unlike other native Alaskan orchids, the pollinia are not transported by insects. Rather, individual pollen grains, or masses of pollen, are removed.

Bracted (frog) Orchis (*Coeloglossum viride*)



The frog orchid has been segregated into two varieties that differ in size and habitat. However, some authorities have suggested that these varieties represent extremes of gradual variation across morphological and habitat gradients.

The northern bracted orchis (var. *viride*) tends to be smaller and restricted to alpine or tundra habitats of North America and Europe. It may be somewhat widespread in Glacier Bay. In the Juneau area it occurs in alpine above about 2000 ft (600 m).

The long-bracted orchis tends to be larger and to occur in shaded forest habitat. It occurs across North America south to the Midwest, and also in Asia, but not Europe. It occurs in riparian spruce-cottonwood forest in the Chilkat Valley and in Juneau.

Bracted (frog) Orchids



The **northern bracted** variety flowers in late spring in alpine habitat. The compact inflorescence has short bracts and reaches 6-15 cm high. The **long-bracted** variety flowers in late spring at low elevations. The elongated inflorescence has longer bracts and reaches 20-80 cm high.



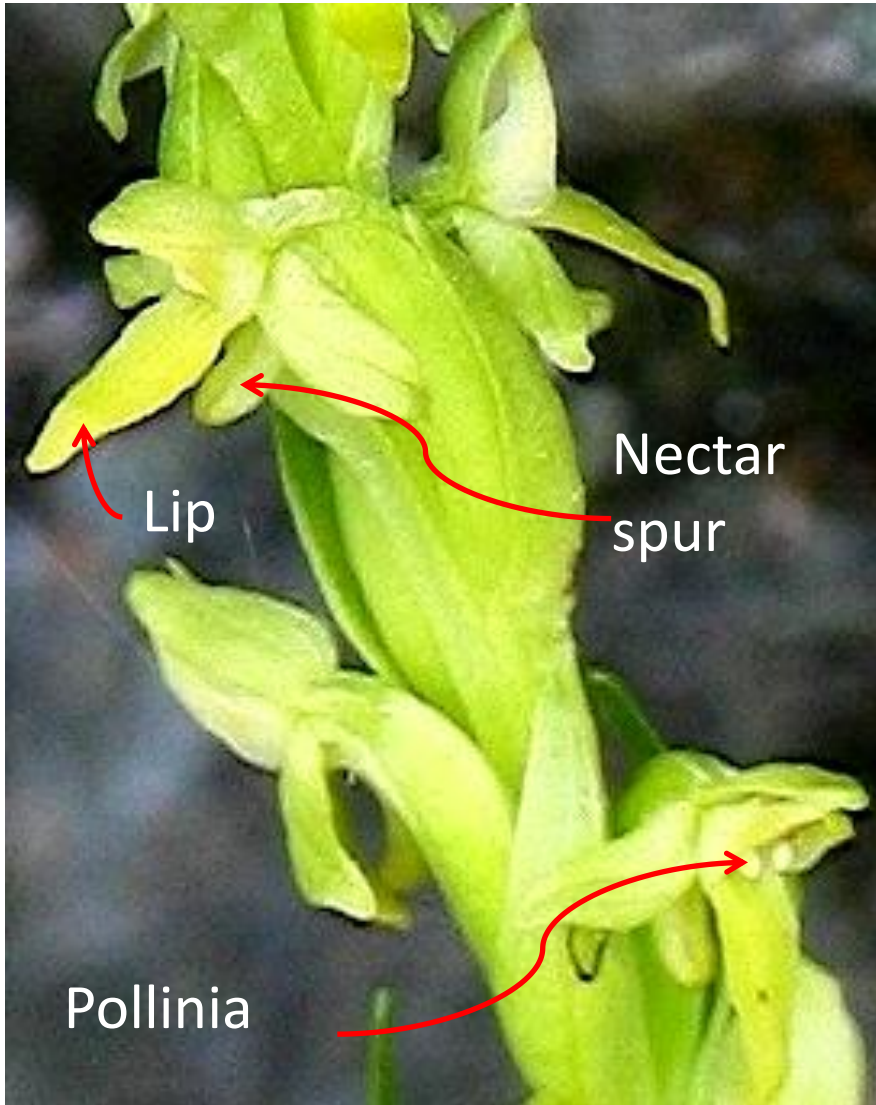
Both varieties have similar green flowers with 6-7.5 mm long lips and short (2-3 mm) nectar spurs. A secondary nectary is located at the base of the lip. Darwin suggested that the sequence of nectar sources acted to slow the process of pollinators. No field studies of pollinators are reported for N. America, where it is also thought to self-pollinate.

Northern Green Bog Orchis (*Platanthera aquilonis*)



The northern green bog orchis occurs across much of northern North America. It is found on beaches and in meadows at Glacier Bay and along the Chilkat River. It is rare in the Juneau area, where it has been seen on wet cliffs near the Herbert Glacier. It flowers in early summer, producing a spike that may reach 60 cm, with up to 45 yellow-green flowers. It differs from the usually smaller common slender bog orchis (*P. stricta*) by having a slightly longer lip (about 4.25 mm) that is more narrow at the tip and wider at the base, resembling a spear tip.

Northern Green Bog Orchis



Although this species has a nectar spur, which is usually about 3.5 mm long and shorter than the lip, it normally self pollinates. However, occasionally insect-pollinated populations are encountered.

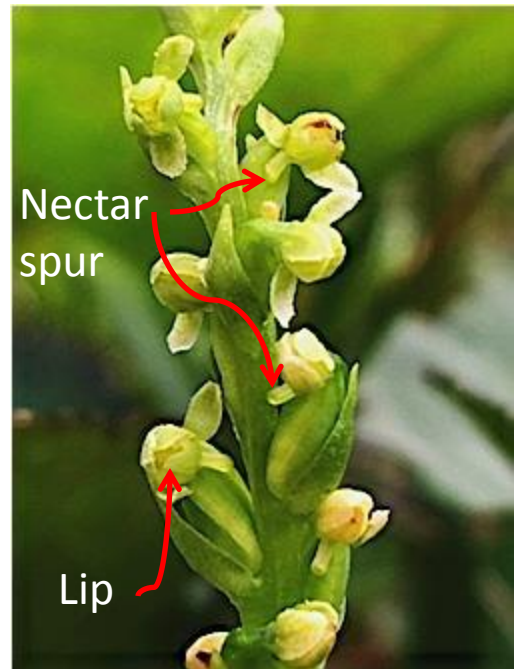
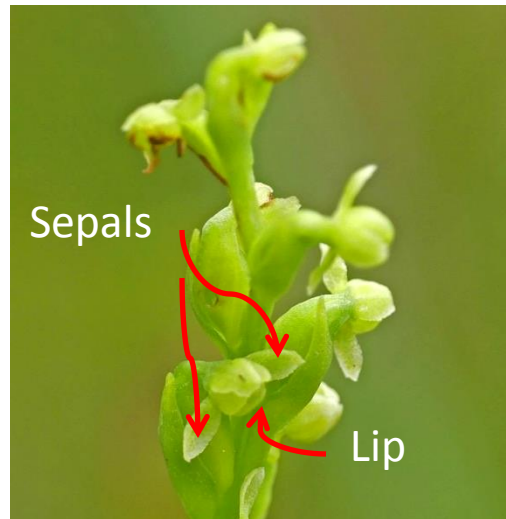
Crossing between this species and the white bog orchid (*P. dilatata*) is thought to have produced a species of hybrid origin commonly known as the green bog orchis (*Platanthera huronensis*).

Chamisso's Orchid (*Platanthera chorisiana*)



This obscure orchid occurs from Japan across the Aleutian Islands to southeast Alaska and British Columbia. It was first collected in Alaska on Douglas Island in 1891 by Grace Cooley. We observed only a single plant, in a muskeg. It is reported from high-elevation bogs to the south. Flowers appear in early summer, with an inflorescence of 5-20 small light green flowers reaching up to 20cm high.

Chamisso's Orchid



This is the smallest native rein orchid in southeast Alaska. The lip is about 2 mm long, and the spur about 1 mm. Flowers are often partially rotated and appear closed except for the flared lateral sepals. It is pollinated by beetles in Japan, which may correspond to its short nectar spur. It was found to be self-pollinating in Canada, and no insect pollination has been reported for North America.

White Bog Orchid (Bog Candles) (*Platanthera dilatata*)



This orchid is widespread across northern North America. It is probably southeast Alaska's most highly visible orchid, occurring from sea level to alpine in meadows and muskeg. It also colonizes roadsides and ditches. Flowering occurs in early summer, with an inflorescence of showy white flowers that may reach 1 m high. It has been segregated into three varieties with short, intermediate, and long nectar spurs that may correspond to pollinators with different tongue lengths. The short-spurred var. *albiflora* does not appear to be present in southeast Alaska.

White Bog Orchid varieties

var. *leucostachys* has larger flowers, with a nectar spur about 14 mm long. It usually occurs in lower elevation meadows and fens. Pollination is by hawk-moths and owlet moths. Moths or bees whose tongues cannot access nectar may be ineffective pollinators.



Hawkmoth (*Sphinx gallii*) with pollinia on proboscis



var. *dilatata* has smaller flowers, with a nectar spur about 8 mm long. It usually occurs in higher elevation muskeg bogs. Moths or bees with tongues as long as nectar spurs may be able to access nectar and would be effective pollinators.



Bumble bee (*Bombus* sp.)



Green Bog Orchid (*Platanthera huronensis*)

This robust orchid is believed to have arisen from hybridization between two other *Platanthera* species (*P. aquilonis* x *P. dilatata*). It occurs across Alaska and northern North America. In southeast Alaska it occurs on beach ridge meadows in the Glacier Bay area, and in muskeg further south. We have not seen it in the mediate Juneau area. Plants may reach up to a meter high, with 20-75 flowers. Lips and spurs are about 8 mm long. Although fragrant, this species often is self-pollinating.

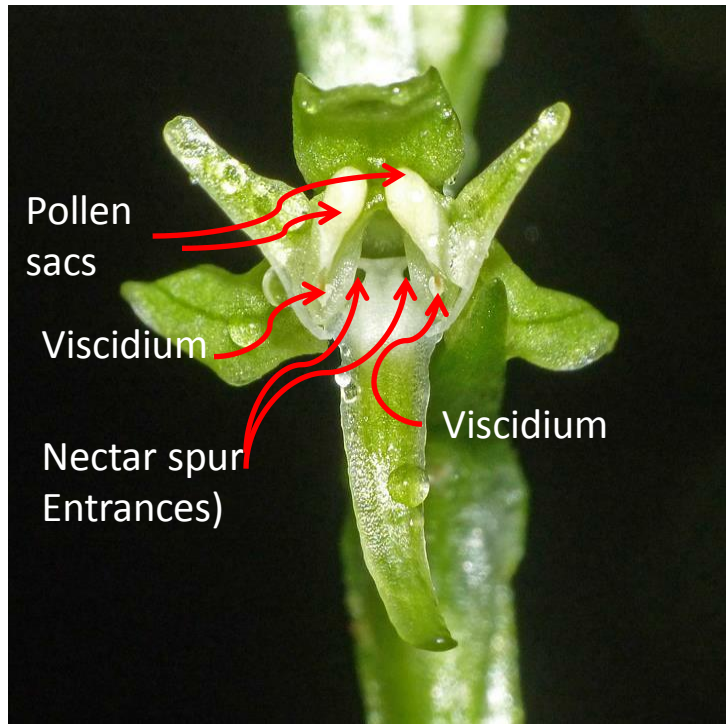
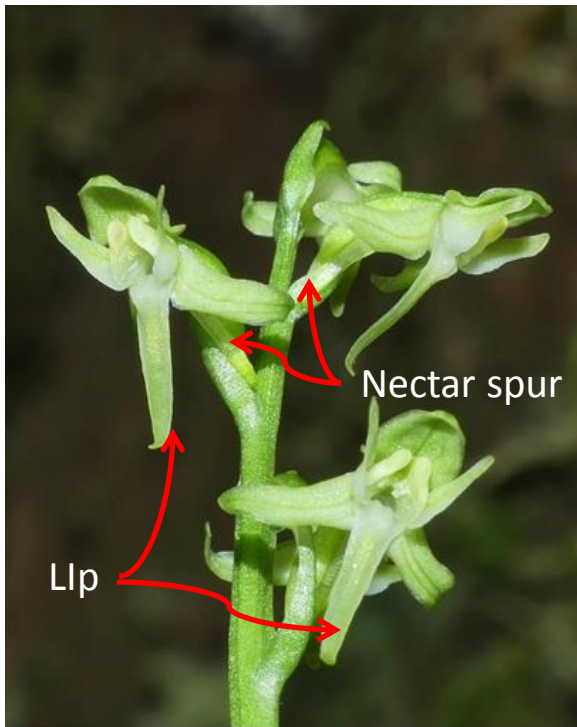


Blunt-leafed Rein Orchis (*Platanthera obtusata*)

The blunt-leaved orchid occurs across northern North America and Asia, and south in mountain regions of North America. It is represented by subspecies *obtusata* in North America. The Asian subspecies *oligantha* may occur in the Aleutian Islands. It is found throughout most of Alaska, including north of the Arctic Circle. In southeast Alaska it occurs near the shore in coastal forests and also near the Mendenhall Glacier. It has a single blunt leaf and a stalk up to 35 cm high with up to 15 small light green flowers.

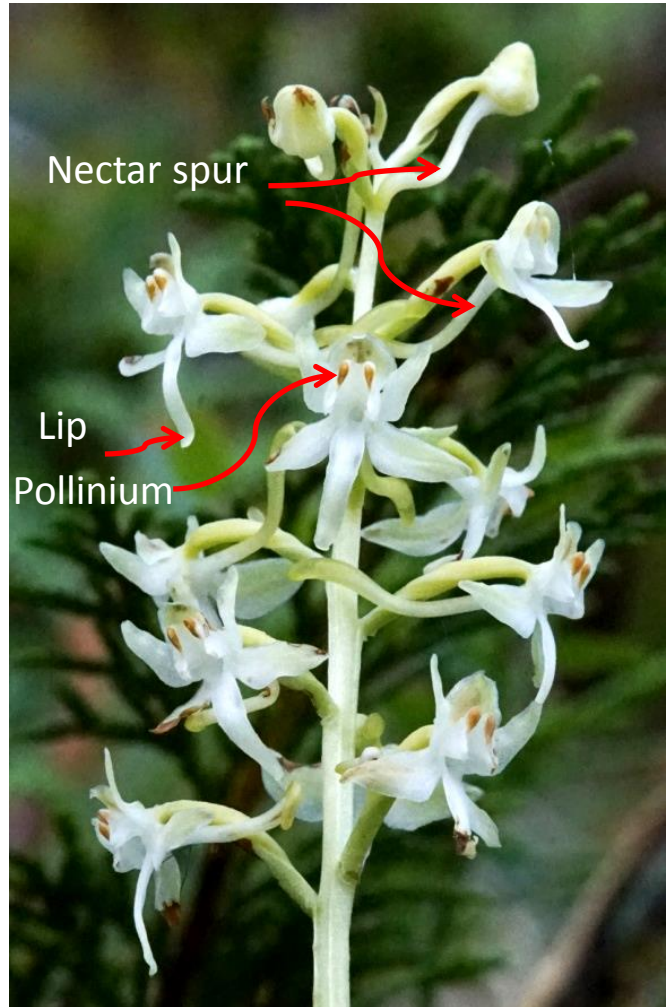


Blunt-leaved Rein Orchis



Mosquitoes are the primary pollinators of the blunt leaved orchid. It releases an odor similar to that of the human body (and presumably other mammals?) that attracts mosquitoes. The entrance to the nectar spur is uniquely adapted through dual openings adjacent to each pollinium, forcing the insect to contact either viscidium as it feeds. The nectar spur may be up to 8 mm long, which could exclude smaller mosquitoes. We have seen dance flies visiting these flowers, and geometrid moths have been reported bearing pollinia.

Pad-leaved Rein Orchis (*Platanthera orbiculata*)



This orchid occurs from southeast Alaska east across North America, with close relatives in Japan. In southeast Alaska, it is associated with western red cedar forests on Prince of Wales Island and southward.

In North America, this species is segregated into two varieties that differ in nectar spur length. The short-spurred variety (var. *orbiculata*) occurs in Alaska, and has the largest flowers of our native rein orchids. The inflorescence may reach 60 cm, with 8-14 long-lasting pale green to white flowers that are apparently pollinated by large moths. The nectar spur is about 2 cm long, and the widely spaced pollina appear to be deposited on eyes of pollinators.

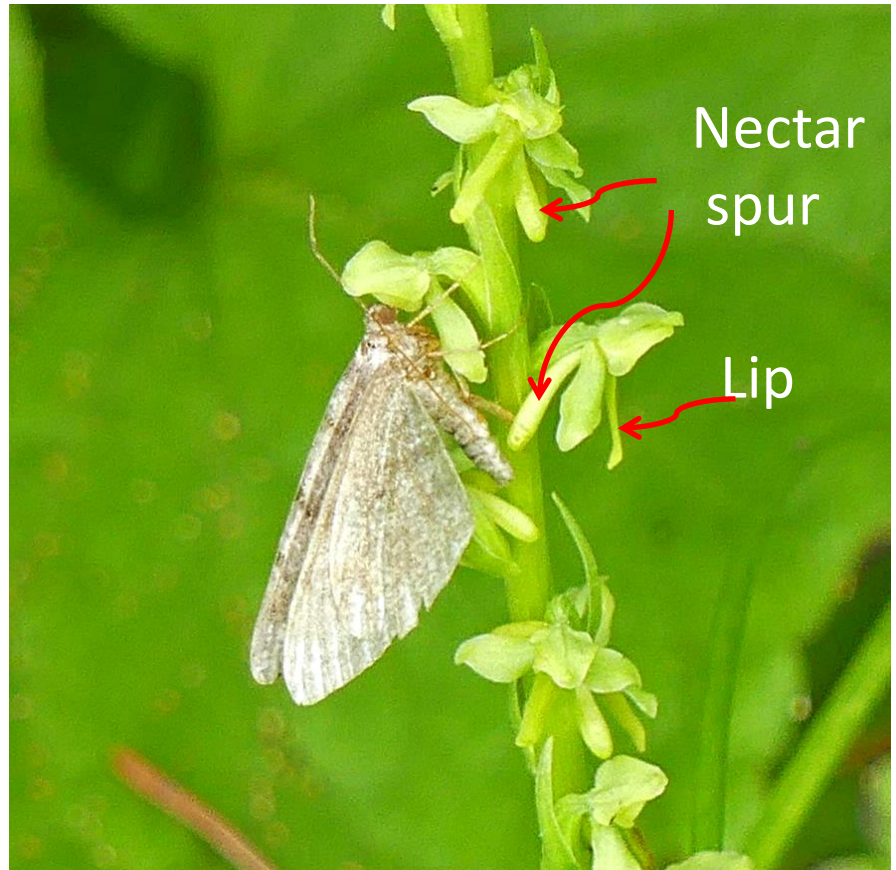
Slender Bog Orchis (*Platanthera stricta*)

This is a widespread and common rein orchid in wetlands of northwestern North America. It is quite frequent in open and partially shaded edges of muskeg in southeast Alaska, and often occurs with skunk cabbage.

Flowering begins in late spring, with the dark to pale green flowers persisting into summer. Inflorescences may reach up to 1 m high with 10-50 flowers. Larger plants may be so robust as to appear to be different species from smaller plants.



Slender Bog Orchis



Flowers have with 4 mm long lips and a thick nectar spur of the same length. They are pollinated primarily by geometrid moths and bees with tongues long enough to reach nectar. Occasional pollinators with shorter tongues include dance flies and other smaller moths.

White Piperia
(*Piperia candida*)



Alaska Piperia
(*Piperia unalascensis*)



Photo source: <http://nativeorchidsofthepacificnorthwest.blogspot.com/>

These species occur throughout the Pacific Northwest, but tend to be uncommon. The white piperia is known from Prince of Wales Island, while the Alaska piperia has been found in Glacier Bay, the Chilkat Vally, and on Baranof Island. Neither have been found in the immediate Juneau area. The plants may reach 70 cm high with 20-80 small flowers (2.5-3.5 mm lips and nectar spurs). Little information is available on their pollination.

Giant Rattlesnake Orchid (*Goodyera oblongifolia*)

This widespread species occurs eastward from Alaska across Canada and south in mountains to Mexico. It prefers near coastal forests in the Juneau area where it roots in partially decomposed spruce and hemlock needles.

The evergreen leaves are dark green with distinctive white venation, and form clones of rosettes connected by rhizomes.

This is one of two late blooming orchids, flowering in late summer at the same time as the closely related hooded ladies tresses. It produces a one-sided inflorescence spike up to 45 cm high with 5-70 small white flowers. Lips are less than 4 mm long.



Spreading clone of plants connected by rhizomes.



Giant Rattlesnake Orchid

This orchid is reported to be pollinated by late-emerging male bees, and to have low rates of pollination. We have not observed pollinators but found only 35% of flowers formed seed pods in one study area. This may represent low rates of bee visitation in shaded forest habitat.

Vegetative spread may be an alternative to low seed set, and could contribute to large clones of plants. This process also may replace rosettes that reportedly die after flowering.

A second flowering of shorter inflorescences extends into early fall. No pollinators nor seed pods were observed on these plants, and it is unknown if their rosettes die. However, numerous plume moths visited and removed nectar from these plants. Plume moths over-winter as adults and may depend upon such nectar resources.



Hooded Ladies' Tresses (*Spiranthes romanzoffiana*)

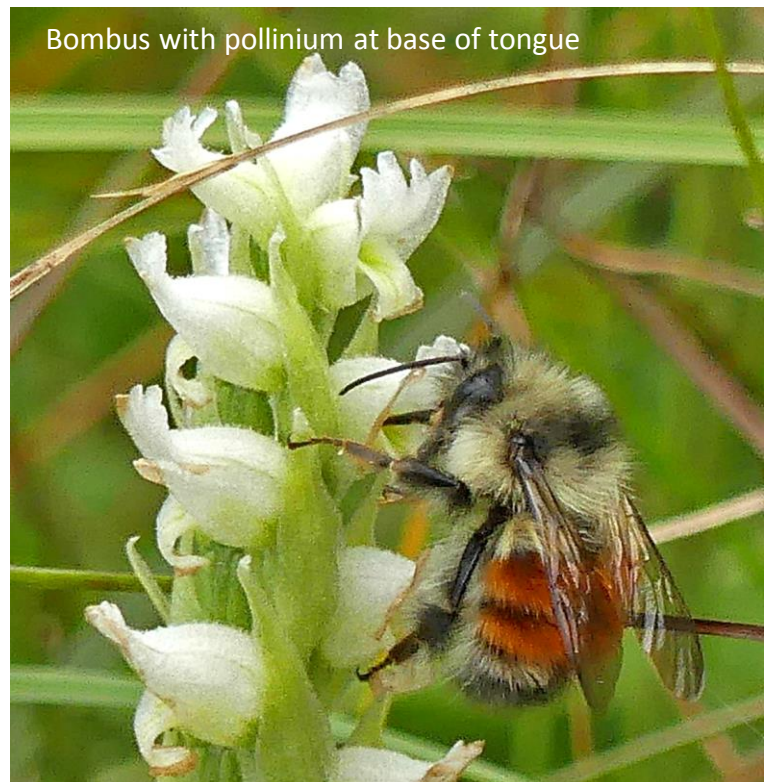
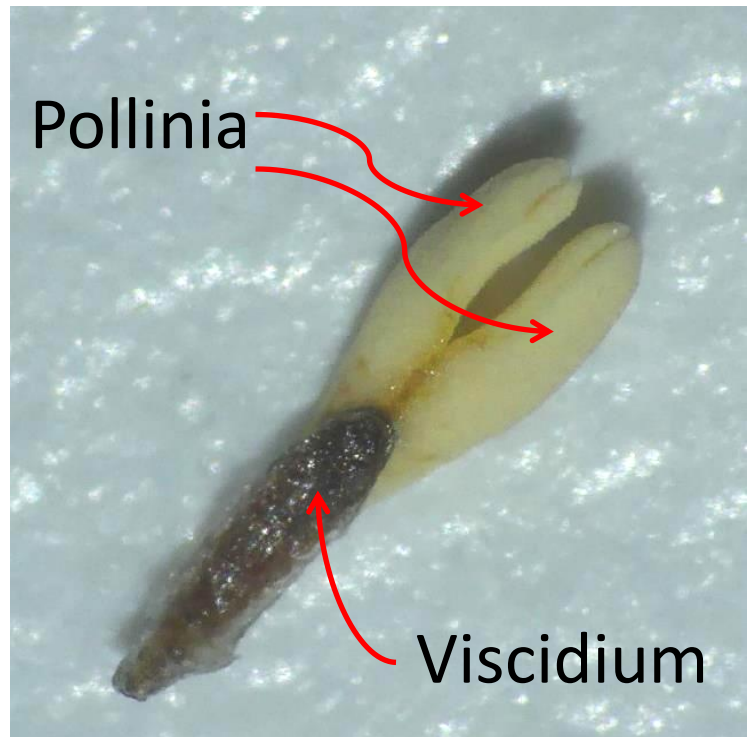
This ladies tresses is widespread in wetlands and grasslands across northern North America as well as northern in Europe. In southeast Alaska it is infrequent in muskeg and in meadows along lakeshores, rivers and beaches; also open woodlands and thickets. It has a variable flowering time, from early to late summer, and can be one of the last orchids to flower. It produces a spike of 10-60 white flowers reaching 55 mm high.

The name "ladies' tresses" refers to the spiral arrangement of flowers. "Hooded" refers to the closure of the top of the flower by the lateral petals and sepals.



Hooded Ladies'-tresses

Flowers of ladies tresses have 7.5 mm-long lips. The flowers are almond-scented and produce nectar. Late flowering plants are pollinated by male bees that usually emerge in August. The pollinium contains two pollen masses, and is attached to the base of the bee's tongue by an elongated viscidium. Pollination success in muskeg averaged about 80 % of flowers forming seed pods.



Two-leaved (Aleutian) Adder's mouth (*Malaxis diphyllus*)

The two-leaved adder's moth is apparently one of the rarest North American orchids, and originally thought to be restricted to the Aleutian Island. It is now known to occur in southeast Alaska, where it grows in unshaded shallow soil pockets on sea cliffs and rocks near saltwater, as well as beach meadows, muskeg, and sub-alpine slopes.

It usually has two basal leaves, and may be confused with the one-leaved or white adder's mouth. Flowering occurs in late spring, producing 30-100 yellow-green flowers in a tight raceme that may reach 30 cm inches high.



Two-leaved Adder's Moth

Flowers are quite small; the lip is about 2 mm long. Flowers are also non-resupinate due to a full 360 degree twist. Insect pollination is required for seed pod production. Closely related species have a fungus-like smell and are apparently pollinated by fungus gnats. Pollinia are attached to insects by a glue droplet to which pollinia are first attached.



Bog Adder's Mouth (*Malaxis paludosa*)

This adder's mouth is one of the rarest native orchids. It is usually found in sphagnum bogs across North America as well as northern Europe and Asia.

It is apparently restricted to muskeg in SE Alaska, where its small size may prevent discovery. Two localities are known for this orchid in the Juneau area. One is historical, and only a single plant has been found recently at a second site. Although it is reported to root in mosses above the soil layer the plant we observed was rooted in peat soil.

This is the smallest native orchid. It reaches up to 20 cm high, but may be much shorter. Flowering begins in early summer.



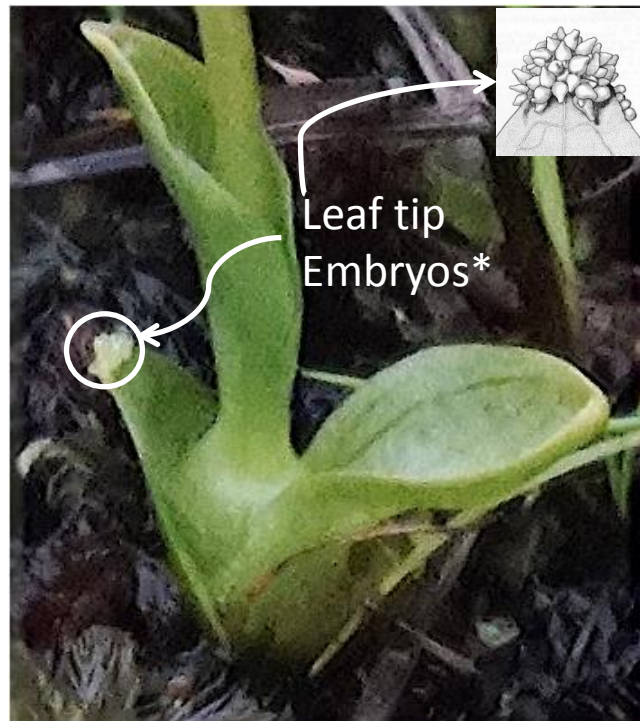
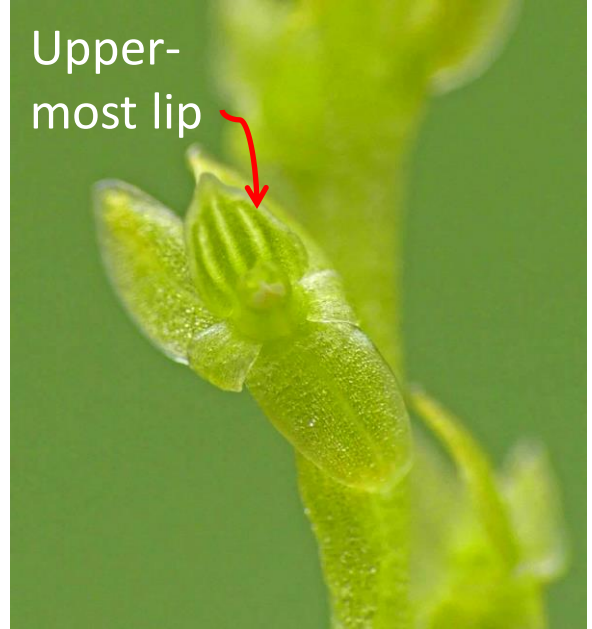
Bog Adder's Mouth

Flowers of the bog adder's mouth are the smallest of all of our native orchids. The lip is about 1.5 mm long, with dark and light green stripes. The lip is uppermost (non-resupinate) due to a 360 degree twist. Darwin observed that once the seed pod is matured it is rotated back to the original position.

Insect pollination is required for production of seed pods. In one study, flowers were found to have a sweet odor, but were pollinated by fungus gnats. Pollinia are attached to insects by a glue droplet to which pollinia are first attached.

This is the only native orchid that produces leaf-tip embryos, or bulbets, which disperse and generate new plants. After dispersal, the embryos must establish a fungal mycorrhizae for further development.

**Drawing from Figure 1.2 in: Taylor, R.L. 1967. Canadian Journal of Botany 45:1553-1556.*



Northwestern Twayblade (*Listera banksiana*)

As its name indicates, the northwest twayblade is restricted in distribution to the Pacific Northwest. The western fairy slipper and western coralroot have similar distributions, and may occur together. In the Juneau area, this orchid usually occurs in heavy forest shade of coastal areas or inland along rivers. It is usually uncommon, occurring as an isolated plant or in small groups. It often occurs with the heart-leaved twayblade, and occasionally with the western fairy slipper, giant rattlesnake orchid and pad-leaved orchid.

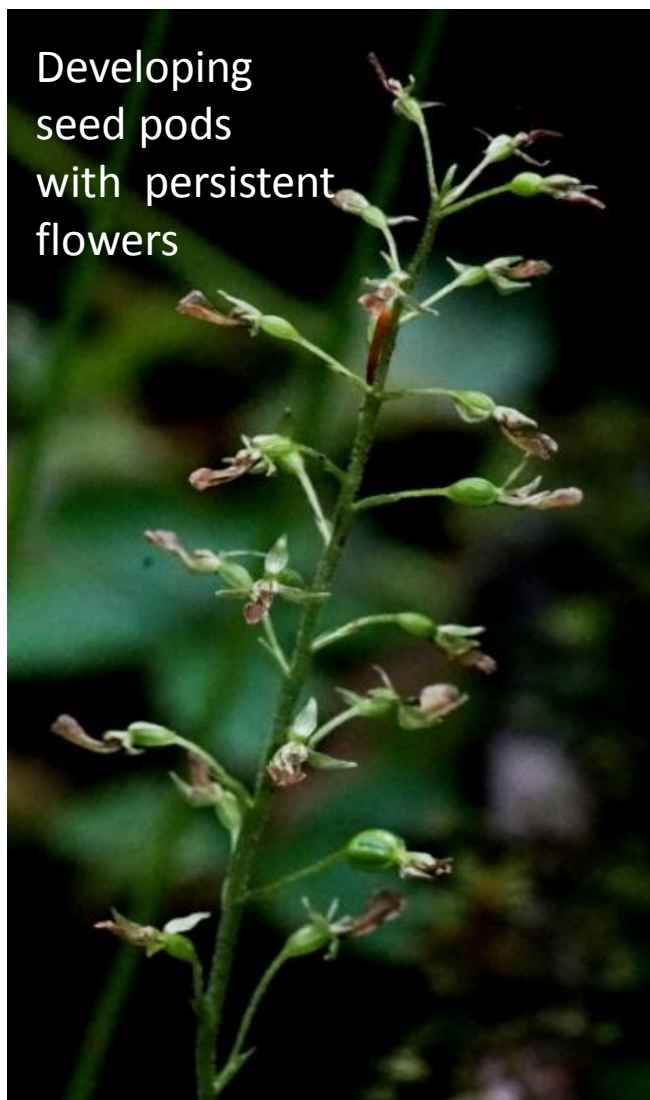
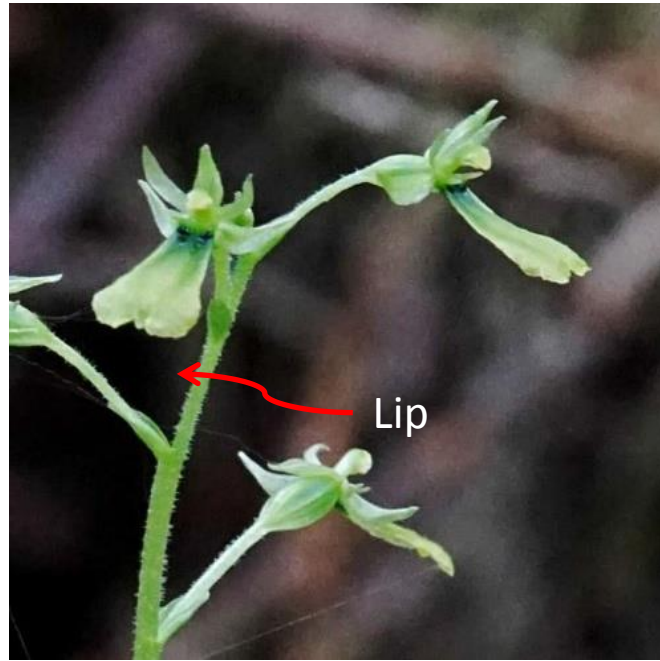
Flowering occurs in spring. Inflorescences can reach up to 30 cm high, with up to 20 small green flowers. Only two leaves are present, and are paired on the stem above the base of the plant.



Northwestern Twayblade

Little information is available on pollination of this species. The broader lip (about 5.5 mm long) suggests attraction of larger pollinators than the gnats and small flies that pollinate the smaller heart-leaved twayblade. In most twayblades, a touch-sensitive trigger hair releases a quick-drying glue onto visiting insects. This is immediately followed by release of the pollinia, which are glued to the insect.

Production of seed pods appears to be frequent in this species, as in the heart-leaved twayblade. Flowers persist through the summer on developing seed pods.



Northern Twayblade
Listera borealis



Broad-lipped Twayblade
Listera convallariodes



Photo source: <http://nativeorchidsofthepacificnorthwest.blogspot.com/>

The northern twayblade occurs across Canada and central Alaska, In southeast Alaska, it is known only from near the Yukon border. The broad-lipped twayblade occurs in the southern Pacific Northwest, western mountains, and the eastern Great Lakes and Canada. It is absent from the northern half of southeast Alaska, but occurs southward in spruce and cottonwood forest, meadows and beach fringe habitats. Both species may reach 20-30 cm high with up to 20 flowers and lips about 10mm long. No information is available on pollination of either species.

Western Heart-leaved Twayblade (*Listera cordata* var. *nephrophylla*)



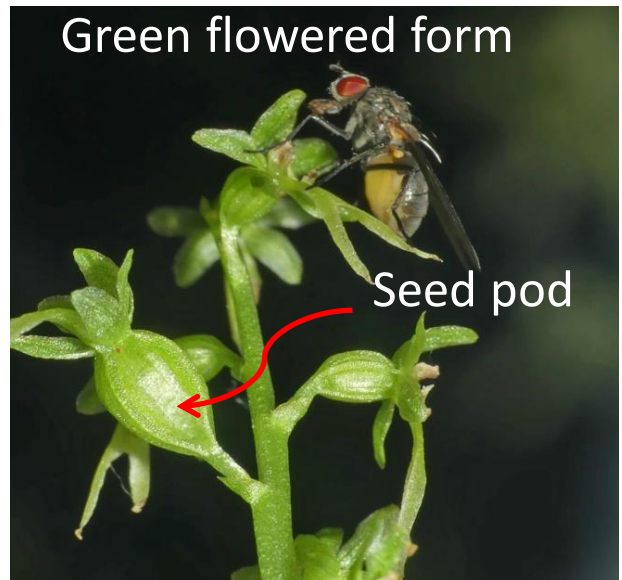
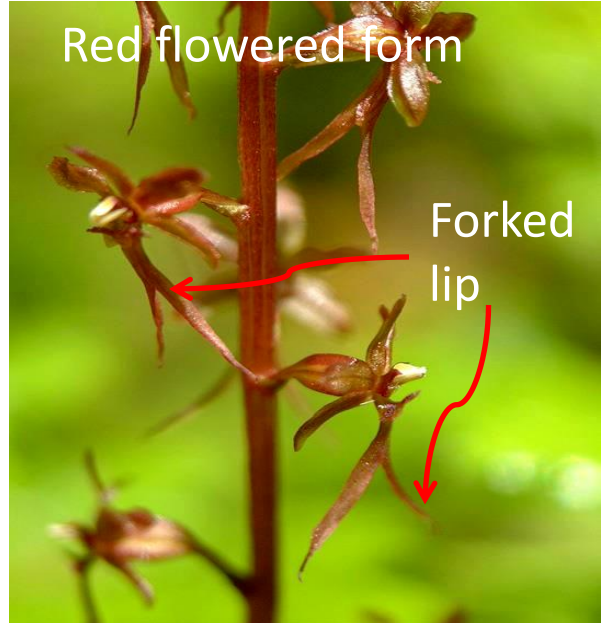
The heart-leaved twayblade occurs from Alaska east across Canada and the northern U.S., and in mountains and coastal forests of the Pacific Northwest. A red-flowered form (*rubescens*) often co-occurs with green-flowered plants. Variety *cordata*, which is slightly smaller, may occur in our area.

This species occurs in small to large colonies, often in thick moss, in heavily shaded coastal and riparian forests. Leaves of non-flowering plants are often present among flowering plants. This is our smallest forest orchid; the inflorescence reaches up to 30 cm high and has 5-25 green or red flowers. It often occurs with the giant rattlesnake orchid, and may occur with the northwest twayblade, though it is less common.

Western Heart-leaved Twayblade

This orchid emerges in spring and begins flowering almost immediately. Flowers are quite small; the forked lip is about 5 mm long. Insect pollination is required to produce seed. The primary pollinators are reported to be fungus gnats, which are attracted by a fetid odor. However, a small amount of nectar is also produced and may attract pollinators. We have not observed pollinators.

As in other twayblades, a touch-sensitive trigger hair releases a quick drying glue onto the visiting insect. This is immediately followed by attachment of pollinia to the insect via the glue. Flowers are retained on developing seed pods through the summer.



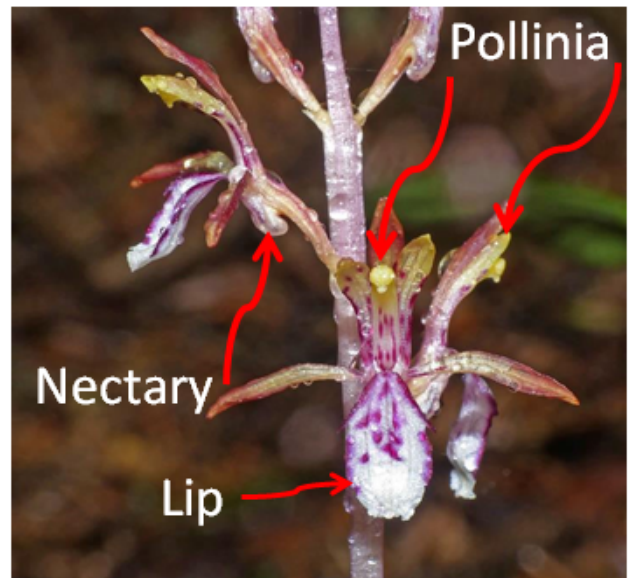
Western Coralroot (*Corallorhiza mertensiana*)

This species is restricted to coastal forests of the Pacific Northwest. It roots in partially decomposed spruce and hemlock needles. It is dependent upon mycorrhizae for nutrients and thought to specialize on *Russula* mushrooms. This species and the giant rattlesnake orchid are frequent associates and appear to prefer to grow within about 100 meters of the shore line.

The western coralroot flowers in early summer, with stalks up to 60 cm high. Both darker purple and pigment-free pale color forms are often present. Lips are often described as solid colored, though those in the Juneau area are purple spotted.



Western Coralroot



The relatively showy open flowers have a prominent lip about 7 mm long, and an apparent nectary (mentum), which suggests that the western coral root would be insects pollinated. However no information is available on pollination, and we have observed no insect visitation. In a northern California study, the closely related spotted coralroot (*C. maculata*) had over 50% self pollination, and was also pollinated by dance flies.

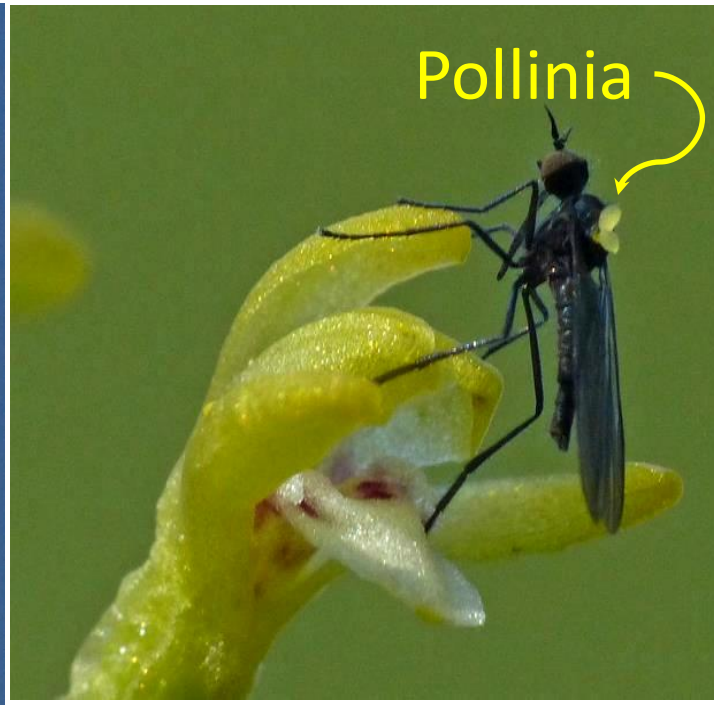
Early Coralroot (*Corallorhiza trifida*)



The early coralroot occurs from Alaska east across North America, as well as in northern Europe. In southeastern Alaska, it occupies coastal forests, and also occurs near glaciers. It is the only coralroot capable of photosynthesis through its leafless stem, through which it supplements fungal resources. However, only flowering stems are produced. Mycorrhizal fungi have been found connecting this orchid with living trees. It flowers in early summer, reaching up to 35 cm high with up to 20 flowers. Plants and flowers are green to yellow green. The lip is white with red spots and about 3.25 mm long.

Early Coralroot

Most coralroot orchids self-pollinate, but also may be cross-pollinated by insects. The red spots on the lip of the early coralroot may serve to attract pollinators. The sequence below shows a dance fly entering an early coralroot flower, and after having exited the flower with orchid pollinia attached to its back. By visiting another plant, the dance fly could provide cross-pollination.



Useful references.

Brown, P.M., and S.F. Folsom. 2006. Wild Orchids of the Pacific Northwest and Canadian Rockies. The University Press of Florida. Gainesville, Florida.

Brown, P.M., and S.F. Folsom. 2003. Wild Orchids of North America, North of Mexico. The University Press of Florida. Gainesville Florida.

Coleman. R.A. 1995. The Wild Orchids of California. Cornell University Press. Ithaca, New York. (*Quite useful information from a nearby area*).

Dressler, R.L. 1981. The Orchids, Natural History and Classification. Harvard University Press. Cambridge, Mass. (*Academic, but useful information on orchid natural history*).

Darwin, C. 1822. The fertilization of Orchids by Insects. 1st edition. London. (*Revised in 1877; both versions have been reprinted. Good insight into Darwin's reasoning power*).

Luer, C.A. 1975. The Native Orchids of the United States and Canada Excluding Florida. New York Botanical Garden. Bronx, New York. (*A valuable extensively detailed and illustrated catalogue of native orchids; range maps for all species*).

van der Pijl, L. and C.H. Dodson. 1966. Orchid Flowers: Their Pollination and Evolution. University of Miami Press, Coral Gables Florida. (*Academic, but a quite useful well-illustrated reference for understanding orchid pollination*).

Swedell, W.P. 1999. Uncovering the Juneau Botanical Club's herbarium. Alaska State Museum Concepts, Technical Paper No.1. (History of the Juneau Botanical Club plant studies).

Szczawinski, A.F. 1959, The Orchids of British Columbia. British Columbia Provincial Museum Handbook No. 16. (*Small pamphlet, but useful information on distribution in an adjacent area*).

Internet resources

Orchid taxonomic treatment in Flora North America

http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=10638

North American orchid conservation center

<https://serc.si.edu/research/projects/north-american-orchid-conservation-center>

Native orchid conference & journal

<http://www.nativeorchidconference.info/journal.html>

Photographs and discussion of pacific northwest orchids

<http://nativeorchidsofthepacificnorthwest.blogspot.com/>

Orchid recovery

<https://www.ic.edu/biology/orchidrecovery>

University of Alaska Fairbanks Herbarium and data base. Collection records for southeast Alaska.

<https://www.uaf.edu/museum/collections/herb/>

Searchable through ARCTOS

(<http://arctos.database.museum/SpecimenSearch.cfm>)

Electronic atlas of the flora of British Columbia. Excellent photos and interactive distribution maps showing collection records; covers southeast Alaska.

<http://ibis.geog.ubc.ca/biodiversity/eflora/>

Glossary (plural endings are in parentheses)

anther - part of the stamen producing pollen

anther cap – caplike structure over pollinia

anther sac – saclike enclosure over pollina

arboreal – living on trees

autogamy – self-pollination

basal leaf – leaf appearing at the base of the plant stalk

bract – leaf-like structure below a flower

bulbet - a small bulb that is dispersed from a plant

capsule – the mature ovary containing seeds

caudicle – extension of the pollinium that adheres to a pollinator

chlorophyll – green pigment essential for photosynthesis

column – structure combining pistil and stamens

cross-pollination – transfer of pollen between plants

dorsal – upper side

germination – initiation of growth in seeds or pollen

fen – floating peatland with water flowing at the surface

humus – decomposed organic material

inflorescence – cluster of flowers

labellum – orchid lip

lip – modified orchid petal

mentum – spur-like projection from the base of lateral sepals

monocot – group of plants bearing a single embryonic leaf at germination

morphology – form and structure

muskeg – firm (non-floating) peatland

mycorrhiza(zae) – root connection between orchid and fungus by which nutrients are exchanged

mycotropic – obtaining food from a mycorrhizal relationship

Nomenclature – technical names assigned to plant species

nonresupinate – orchid flower with the petal at the top side

ovary – the part of the pistil containing ovules

pedicel – flower stalk above a bract

perennial – plant living multiple years

petal – one of three parts forming the inner whorl of an orchid flower

phenology – study of flowering time

photosynthesis – production of carbohydrates by plants using light energy, carbon dioxide and water

pistil – seed producing organ, part of the orchid column

protandrous – maturing of the anther before the stigma, prevents self-pollination

pollen – **anther**- borne grains that contain male gametes, which germinate on the flower stigma

pollinarium(ia) – pollinium and associated structures usually transported by insects

pollinium(ia) – mass of pollen grains

resupinate – 180 degree twist in the ovary that positions the lip at the lower side of the flower

rhizome – a horizontal usually underground stem, may generate a new plant

riparian – along rivers, riverine

rostellum – an extension of the stigma

saccate – shaped like a pouch

saprophyte – a plant that does not manufacture food

Self-pollination – pollination of a plant by its own pollen grains, opposite of outcrossing

sepal – one of the outer whorl of three flower parts that cover the petals in buds

sessile – unbranched, lacking a stalk

spike - an inflorescence containing sessile flowers

stamen – male pollen producing part of a flower

staminode – a sterile stamen, in *Cypripedium* flowers.

stigma(ata) – the part of the pistil that receives pollen and provides a site for pollen germination

stipe – similar to a caudicle, bears viscidia

symbiosis – cooperatively living between organisms

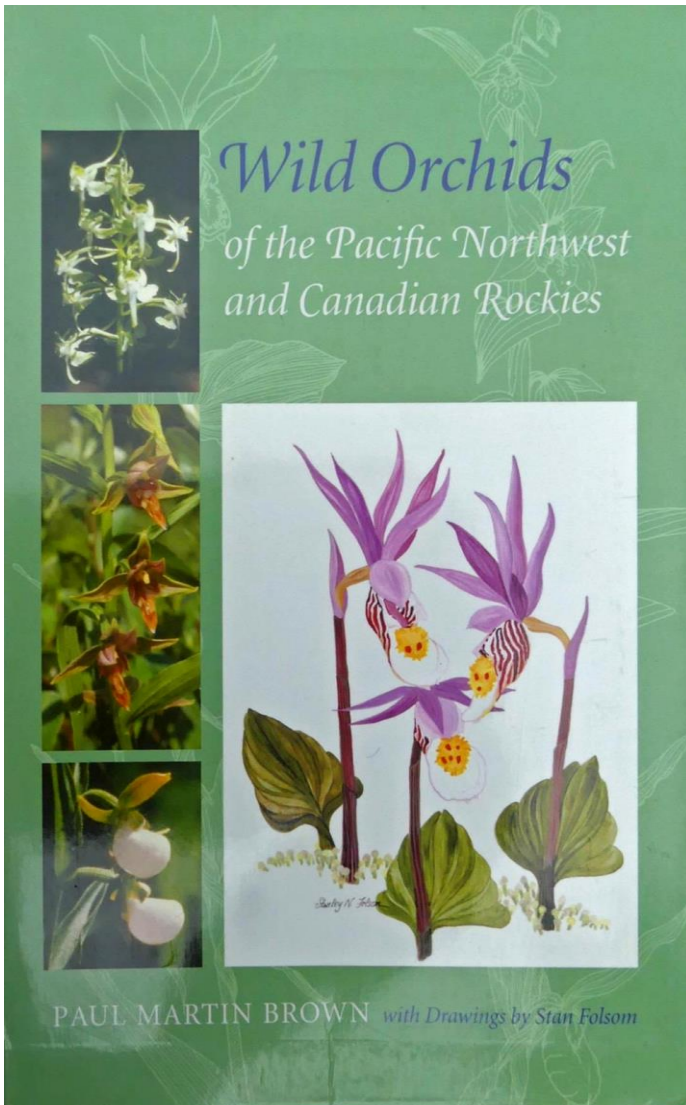
taxon – a classification unit, such as a plant species

terrestrial – living in soil or on the ground

tuber – thickened underground stem capable of generating new vegetative growth

viscidium(ia) – sticky surface of the caudicle or stipe that adheres to an insect pollinator

vegetation – the collective plant species growing in a given area.



We recommend this book as a field guide and more detailed information source on the orchids in Alaska.

Brown, Paul Martin 2006 *Wild Orchids of the Pacific Northwest and Canadian Rockies* University Press of Florida

The keys in this field guide are developed to allow identification without the need for collecting the plant.

The guide indicates that orchids should never be collected from their native habitats. All orchids grow in association with specific fungi and these fungi are rarely present out of the orchids' original homes.

