

TAXONOMY	
Plant Family	
Scientific Name	ERICACEAE or PYROLACEAE (3)
Common Name	Heath Family or Shinleaf / Wintergreen Family (3)
Species Scientific Name	
Scientific Name	<i>Pyrola Picta</i> Smith
Varieties	NONE RECOGNIZED BY USDA SEE BELOW, “Sub-species”
Sub-species & Species Complex	<p>No Subspecies are universally recognized.</p> <p>It is important to note that current literature supports the concept that <i>Pyrola picta</i> is a species complex within the <i>Pyroleae</i> that is believed to be composed of 3 (and now 4) taxa within a single species. All 4 taxa were originally described by Smith in 1814, and research by Haber in 1984 has classified them as a complex within <i>Pyrola picta</i>. (8), although this is still debated. The three that are recognized repeatedly within the literature are <i>Pyrola picta</i>, <i>Pyrola aphylla</i>, and <i>Pyrola dentata</i>. These morphotypes of the <i>Pyrola picta</i> complex have been inconsistently listed within the literature as “varieties”, “forms”, “subspecies”, or distinct species (particularly in the case of <i>Pyrola dentata</i>). (2)</p> <p>The debate around differentiation of species largely is based on morphological variation in leaf form, particularly variations in size, venation, and the presence (or lack of) apparent above ground leaves. The work of Haber showed that traits previously used to distinguish the distinct species within the complex were actually present across species lines. Haber therefore concluded that <i>Pyrola picta</i> is one highly variable species.</p> <p>Proceeding literature from 2012 shows evidence of substantial genetic differentiation amongst the members of the complex, and suggests reconsideration of the current taxonomic descriptions. (2)</p> <p>Literature from 2014 suggests that a 4th species-morphotypes within the complex has been discovered, <i>Pyrola crypta</i>. (1)</p>
Cultivar	NONE RECOGNIZED
Common Synonym(s)	PYAP <i>Pyrola aphylla</i> Sm. PYAPL <i>Pyrola aphylla</i> Sm. var. <i>leptosepala</i> Nutt. PYAPP <i>Pyrola aphylla</i> Sm. var. <i>paucifolia</i> Howell PYBL <i>Pyrola blanda</i> Andres

	<p>PYCO5 <i>Pyrola conardiana</i> Andres PYDE <i>Pyrola dentata</i> Sm. PYDEA <i>Pyrola dentata</i> Sm. var. <i>apophylla</i> Copeland PYDEI <i>Pyrola dentata</i> Sm. var. <i>integra</i> A. Gray PYPA <i>Pyrola pallida</i> Greene PYPA2 <i>Pyrola paradoxa</i> Andres PYPID <i>Pyrola picta</i> Sm. ssp. <i>dentata</i> (Sm.) Piper PYPII <i>Pyrola picta</i> Sm. ssp. <i>integra</i> (A. Gray) Piper PYPIP <i>Pyrola picta</i> Sm. ssp. <i>pallida</i> (Greene) Andres PYPID2 <i>Pyrola picta</i> Sm. var. <i>dentata</i> (Sm.) Dorn PYSE4 <i>Pyrola septentrionalis</i> Andres PYSP <i>Pyrola sparsifolia</i> Suksd. (3)</p>
Common Name(s)	<p>White-Veined Wintergreen, White-Veined Pyrola, White-Veined Shinleaf (3)</p>
Species Code (as per USDA Plants database)	PYPI2
GENERAL INFORMATION	
Geographical range	<p>Western North America – Baja California to Southwestern Canada. (2)</p> <p>Includes US States: CA, OR, WA, NV, AZ, NM, UT, CO, MT, ID, SD, WY Canadian Provinces: AB, BC</p> <p>USDA Native Classification: L48 (N), CAN (N) (3)</p> <p>*See distribution maps on cover page.</p>
Ecological distribution	<p>It is primarily associated with mature coniferous forests, especially Ponderosa Pine. (4) It is also associated with Fagaceous (Beech) forests west of the Rocky Mountains. (2)</p> <p>In California, it is associated with Yellow Pine, Red Fir, Lodgepole Pine, and Redwood forest communities. (10)</p>
Climate and elevation range	<p>250 – 3000 meters in elevation, at higher elevations at the southern end of its range. (2)</p> <p>It prefers dry to moist slopes, and tolerates both the shade of closed canopies and the open sun of patchy eastside conifer forests. Does not tolerate drought.</p>

	<p><i>P. dentata</i> is known to tolerate more xeric sites, whereas the other members of the complex are more often found at lower elevations and towards the coast. (5)</p>
Local habitat and abundance	<p>Coniferous forests are the most common habitat for <i>Pyrola picta</i>.</p> <p>Commonly associated with other native <i>Pyrola</i> species, as well as the closely related <i>Chimaphila</i> and <i>Moneses</i> species. Often found in communities of <i>Vaccinium</i>, <i>Berberis</i>, and <i>Salal</i>. (Personal observations)</p> <p>It is considered common in the understory of late-successional coniferous forests, particularly below the canopy of <i>Pseudotsuga</i>, <i>Abies</i>, <i>Pinus</i>, and <i>Fagus</i> (4)(10)</p> <p>Found on dry to moist organic soils, upland sites, and tolerates both open canopies and closed canopies, with the ability to succeed with filtered or stippled light. (4)(10)</p>
Plant strategy type / successional stage	<p>Late successional species, in diverse conifer understory. Franklin and Dyrness include <i>Pyrola</i> as commonly occurring in the <i>Abies amabilis</i> zone, which is specifically a late successional community that forms after initial site invasion and establishment by either <i>Pseudotsuga menziesii</i> or <i>Abies procera</i>. (14)</p>
Plant characteristics	<p><i>Pyrola picta</i> is classified as a sub-shrub. It is a small, prostrate, slow growing perennial evergreen, growing from slender rhizomes. It grows to a height approximately 15-45cm when in flower. (9)</p> <p><i>Pyrola picta</i> is a dicot, that produces obovate or oblong to oblanceolate, basal leaves. The leaves are light-to-dark green, with some individuals exhibiting glaucous leaf surfaces. (11)</p> <p>The leaves in most individuals exhibit strong white-mottling along the primary and secondary leaf-veins, however this is a trait that is variable in intensity within the species. Individuals within the complex that do not exhibit white-mottling along the veins are often referred to as <i>P. dentata</i>. (11)</p> <p>Occasionally <i>P. picta</i> is observed with inconspicuous, incompletely formed leaves, from which flowering scapes emerge. It was previously believed that this form was leafless, leading to the belief that the <i>P. picta</i> was a saprophytic or parasitic plant. However repeated observations have shown the presence of immature leaves, less than 1 cm wide and 1.5cm long, often lacking petioles and hidden beneath leaf litter. These individuals have often been referred to as <i>P. aphylla</i>. (11) Furthermore, leaf-producing and “leafless” forms have been shown to be connected via underground stems. (12) It is believed that the leafless forms have less reliance on photosynthesis</p>

	due to fungal mycorrhizal relationships. (6) <i>Pyrola picta</i> is therefore defined as “mycoheterotrophic”. (11)
PROPAGATION DETAILS (SEED & VEGETATIVE)	
Ecotype	No information available – there is no published evidence of collections for the purpose of propagation experiments. Current research has been conducted with wild plants and wild-collected herbarium specimens. (5)(8)
Propagation Goal	<p>Propagation of <i>Pyrola picta</i> can occur by seed or vegetatively through adventitious shoots emerging from root buds. It has been hypothesized that <i>Pyrola picta</i> is better adapted for vegetative reproduction than all other <i>Pyrola</i> species, because of its ability to send out recumbent underground stems. (12)</p> <p>The goal of propagation should be the production of live plants that could be observed in the lab or transferred to the wild for restoration purposed. Production of seed could also be an important goal for seed storage.</p>
Propagation Method	<i>Pyrola</i> can be propagated by either seed or vegetative reproduction through crown division or from root-cuttings with adventitious shoots. No propagation method for this species is easy. There are few recorded observations of the germination of <i>Pyrola</i> , including no observations of its cotyledons. (12)(15)
Product Type	While no information yet exists on this topic, it could be presumed that container grown plants would be the most practical and easiest-to-produce product type. This is because the plants have strong mycorrhizal associations, therefore product options such as bareroot or plugs may not provide a sufficient volume of soil or medium to encourage growth of mycelium. The practicality of creating propagules such as seeds or cuttings is yet to be tested and proven. Initial propagation attempts should focus on the germination and growth of living individual plants. (6)
Time to Grow	The only information available on this topic suggests that a one-to-two year growth cycle may be necessary to reach sufficient maturity for outplanting. Leaves are typically produced in the first year, with flowering scapes and potentially new leaves emerging in the following year, depending on the available soil and fungal resources. (12)

Target Specifications	Full leaf development: several leaves in basal rosette at least 4cm long. (13) Seed production: Production of fruiting stalks before outplanting, presence of numerous seed capsules. (13)
Propagule Collection Instructions	Seeds may be collected from fruits in late summer, July-September. Specimens for vegetative propagation should be collected in Late Fall or Winter, when the plants are mostly dormant and energy is stored in the roots. (12)
Propagule Processing/Propagule Characteristics	No information is available on this subject.
Pre-Planting Propagule Treatments	No information is available on this subject.
Growing Area Preparation / Annual Practices for Perennial Crops	Inoculation of soil or medium with mycorrhiza would likely be beneficial. (6) Substantial horizontal growing space should be provided to accommodate the underground lateral stems. (12)
Establishment Phase Details	No information is available on this subject. There are potentially no recorded examples of witnessing germination of this species.
Length of Establishment Phase	No information is available on this subject.
Active Growth Phase	Minimum 2 years from germination to flowering. (12)
Length of Active Growth Phase	Minimum 1 year for production of leaves and development of roots and rhizome (12)
Hardening Phase	No information available on duration require for cold-hardiness or other stressors. (12)
Length of Hardening Phase	No information is available on this subject.
Harvesting, Storage and Shipping	No information is available on this subject.
Length of Storage	No information is available on this subject.
Guidelines for Outplanting / Performance on Typical Sites	Roots, rhizomes, and soil within the rhizosphere must be left relatively undisturbed. This is true both during collection and out planting. No information on performance is available.
Other Comments	Plants are easily disturbed upon collection. (7) Only collect from sites with substantial populations of fully mature individuals. Roots, rhizomes, and soil within the rhizosphere must be left relatively undisturbed. This is true both during collection and out planting. As Hitchcock and Cronquist note, “Many are interesting, but all hard to grow, and best left unmolested.” (7)

INFORMATION SOURCES

References

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Protocol Author	Scott Davis
Date Protocol Created	04/25/18 Updated 6/3/18

ADDITIONAL PHOTOS and ILLUSTRATIONS



LEFT: *Pyrola picta* in flower, **RIGHT:** *Pyrola picta* producing new leaves (photo credits: Scott Davis)
BELOW: photographs of four members of *Pyrola picta* complex, provided by Jolles & Wilson, 2014 (7)

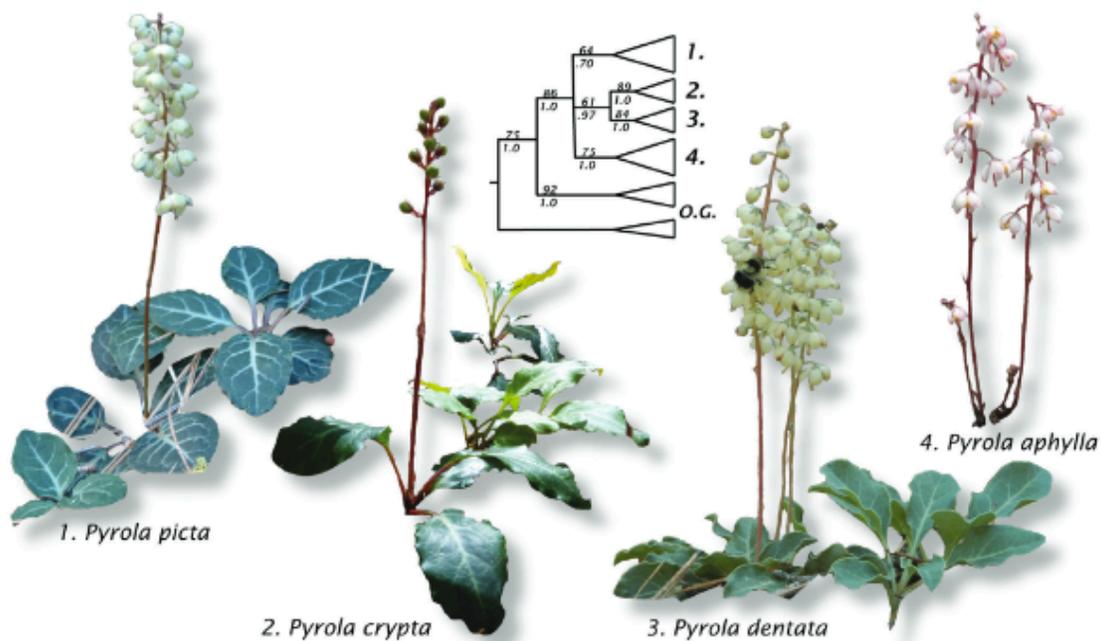


Fig. 1. *Pyrola picta* Sm., *P. crypta* (described here for former *P. picta**), *P. dentata* Sm., and *P. aphylla* Sm. are shown alongside schematic of the phylogenetic hypothesis put forward by Jolles & Wolfe (2012).