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The Reproductive Ecology of Broadleaved Trees and Shrubs: Vine Maple

Acer circinatum Pursh

by

Edward C. Jensen, Debra J. Anderson, John C. Tappeiner II, and John C. Zasada

College of Forestry

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The Authors

Edward C. Jensen is an assistant professor and John C. Tappeiner II is a professor in the Department of Forest Resources, College of Forestry, Oregon State University, Corvallis, Oregon. Debra J. Anderson is a forester and natural resource educator for the USDA Forest Service, Umpqua National Forest, Roseburg, Oregon. John C. Zasada is a senior research forester for the USDA Forestry Sciences Laboratory, North Central Experiment Station, Rhinelander, Wisconsin.

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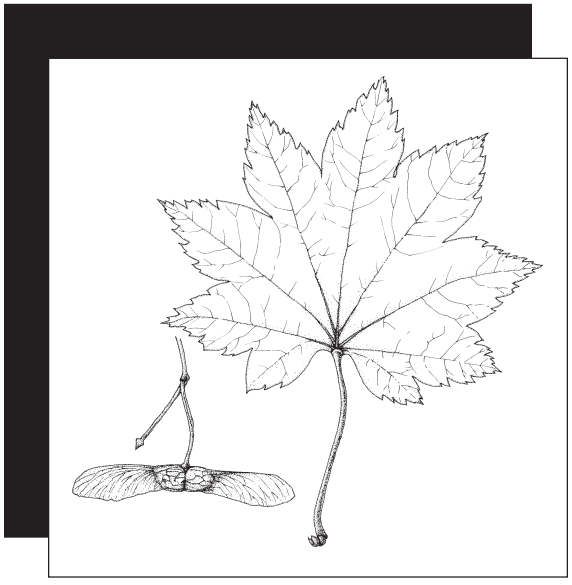
The Reproductive Ecology of Broadleaved Trees and Shrubs: Vine Maple, *Acer circinatum* Pursh

Vine maple is one of the most common broadleaved shrubs in the Pacific Northwest, especially west of the Cascade crest. It is noted for its brilliant fall color, the dramatic moss-draped arches it forms in old-growth forests, and its fierce competitiveness against young conifers on early successional sites. Although it does reproduce from seeds, it also forms large clones through layering and basal sprouting.

Physical Characteristics

Leaves and Stems



Vine maple leaves are simple, opposite, and deciduous. They average 2–4 inches in diameter, although they can be larger when grown in the shade. They typically have seven shallow, fan-like lobes (although five to nine are possible) that are serrated along the leaf margin; when the tips of the lobes are connected with a line, the outline is more or less circular. The upper surface of the leaf is green and glabrous; the underside is a paler green. Leaf petioles are 1–3 inches long and are often red.

Vine maple twigs are slender, smooth, and round. They are usually green to reddish brown but can be red if growing in the sun. Mature trunks commonly reach 6–9 inches in diameter and 15–30 feet tall, although larger specimens can occur on moist, rich sites. Bark is typically smooth, thin, and grayish brown. Vine maple buds are small, about 1/8 inch long, and pointed, with three or more imbricate scales; they are usually reddish in color. Terminal buds typically occur in pairs.

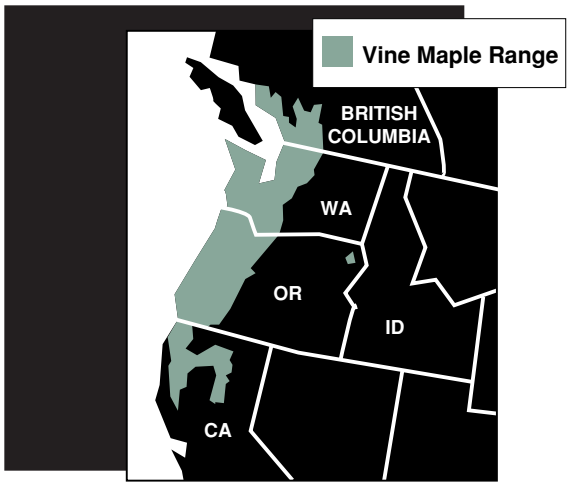
Flowers and Fruits

Vine maple flowers are small and red, and are borne in short terminal clusters. The fruit of vine maple is a propeller-like double samara with wings growing almost 180 degrees from each other. Samaras range in length from 1 to 2 inches and are red to brown when mature.

Growth Habit

Vine maple typically grows in clumps with multiple stems that are branched and crooked. The number of stems per clump varies from several to many, depending on the clump's history. When grown in the open, vine maple stems are typically stiff and erect; however, when grown in the shade, they are often spindly and form arches that may touch the ground. Stems commonly grow to be 20 feet long but sometimes reach 40 feet or more.

Habitat and Range



Vine maple is a common understory species in Pacific Northwest forests west of the Cascade crest. It prefers moist sites in the sun or shade and ranges from southwest British Columbia to northern California. It can also be found in the Wallowa Mountains of northeast Oregon and occasionally along moist slopes and streams on the east side of the Cascade Mountains. It is noted for its ability to quickly occupy burned or cutover lands.

Method of Reproduction

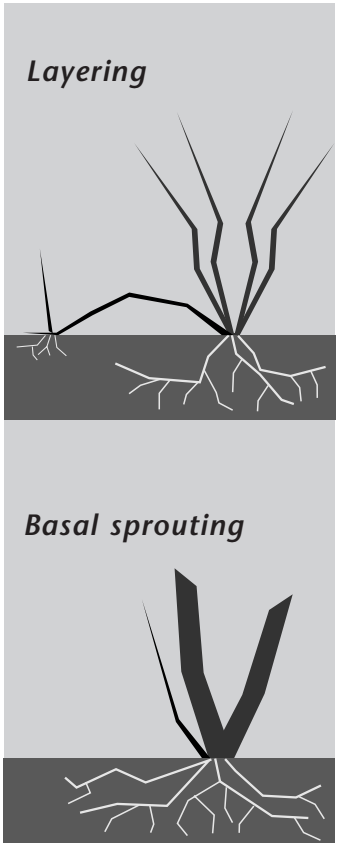
Vine maple reproduces both sexually and vegetatively via layering and basal sprouting. The success of each process is strongly influenced by stand history and human activities.

Sexual Reproduction

Vine maple flowers during spring, usually between March and June. Its fruit is a double samara that ripens between September and October and is dispersed shortly thereafter (Olson and Gabriel 1989). In nature, seeds typically germinate over a several-year period; however, managers can increase germination by mechanically rupturing the pericarp prior to a warm–cold stratification process (Olson and Gabriel 1989). Wind and animals are common seed dispersers; the importance of wind

is shown by the spinning "helicopter" flight of the samaras leaving the parent plant. Although vine maple seedlings can be found under all but the densest stand conditions, they are far more common in stands that have been thinned, or clearcut and not burned (O'Dea *et al.* 1994).

Vegetative Reproduction



Vine maple is capable of reproducing by branch layering and by basal sprouting. Layering typically occurs when upright branches are pinned to the ground by mechanical agents such as falling debris, but it also occurs when long, spindly branches bend over and touch the ground on their own. Following several months of contact with the soil, aerial stems begin to develop from dormant and adventitious buds along the above-ground side of the stem, while adventitious roots begin to develop along its underside. After as few as 7 months, a single meter of stem in contact with the soil may contain 10–30 new roots (O'Dea *et al.* 1994). Once well established, new shoots can be separated from the parent plant (either mechanically or by decay) and survive on their own. The process of layering allows a single vine maple plant to occupy and dominate a large area over time, creating a dense thicket of plants. It also facilitates re-colonization of sites following disturbance, as new sprouts rely on layered stems for water and nutrients.

Vine maple also sprouts from buds near the base of its stems. Basal sprouting is especially common following damage to above-ground stems, but it also occurs in the absence of disturbance. Regardless of the cause, the result is clumps of vine maple in which the aerial stems vary dramatically in size and age (O'Dea *et al.* 1994). The number of shoots per clump may vary from several to several dozen, depending on the vigor of the parent, the density of the surrounding stand, and the type of disturbance that occurs.

These combined processes of sexual reproduction, layering, and basal sprouting allow vine maple to aggressively colonize and occupy forest sites for long periods of time.

Role in Succession

Vine maple can be found throughout all stages of forest succession (Schoonmaker and McKee 1988). In the **stem initiation** stage of conifer stand development that follows intense disturbance (*e.g.*, cutting or fire), vine maples that survive the disturbance will sprout from their bases, taking advantage of increased light availability. If the site is not burned, vine maples that remain from the previous stand may begin layering, especially if logging slash or wind-damaged limbs fall on top of their long branches. On sites disturbed by thinning or windthrow, seedlings are often found; however, seedlings are rarely found in the understory of undisturbed stands (O'Dea *et al.* 1994). During the **stem exclusion** stage, when the crowns of overstory conifers become dense and overlapping, vine maple can be almost shaded out of the stand. In

moderately dense stands, vine maple can become nearly vine-like, supporting itself within the lower branches of the overstory (O'Dea *et al.* 1994). As the overstory opens up in the **stem re-initiation** stage, vine maple stems that are no longer supported by the canopy tend to droop. If the overstory is thinned, layering will occur if slash is dropped on vine maple clumps or if supporting trees are removed. In addition, thinning the overstory may let in enough light to stimulate vine maple to produce seeds; seedlings are often found in thinned stands. In the **old-growth** stage of forest succession, vine maple is likely to demonstrate all of the strategies described above (reproducing by seeds, layering, and sprouting). In these stands, vine maple clones often consist of several clumps of young aerial stems connected by layered, older aerial stems (O'Dea *et al.* 1994). However, if dense stands of shade-tolerant overstory trees such as western hemlock develop, vine maple can be shaded out of the stand.

Response to Changes in Environment

Human activities can greatly influence the abundance and vigor of vine maple in forest stands. For example, thinning and harvesting can have several effects: 1) large woody debris dropped onto vine maple clumps from above can pin branches to the ground, stimulating layering, 2) efforts to control vine maple by cutting can result in vigorous basal sprouting, and 3) increased light to the forest floor can enhance sprouting and growth of residual maple stems as well as encouraging seedling establishment. Fire, depending on its severity, also can have several effects: fires that damage the above-ground portion of existing maple clumps often stimulate basal sprouting, but at the same time reduce layering by destroying low-lying branches.

Fisheries and Wildlife

Vine maple leaves and seeds are of value to many species of wildlife. In fact, vine maple leaves have higher nutritional value than many associated understory plants such as salal, Pacific rhododendron, and sword fern (Russell 1974). Deer commonly browse on vine maple sprout clumps and eat the twigs in winter (Nyberg and Janz 1990). Several species of birds and mammals feed on the seeds of vine maple, including evening grosbeaks, black bears, and dusky-footed woodrats (Martin *et al.* 1961). Gomez (1992) found vine maple to be an important habitat component for many small mammals, especially in riparian zones. Many birds and small mammals also use vine maple for cover.

Cultural and Historical Values

Historically, the thin, strong branches of vine maple have found many uses—for example, Northwest Indians used them to make net bows and to construct wanigans, shelters used for sleeping and cooking (Randall *et al.* 1990). Larger stems are used locally for firewood and for smoking fish and fowl. The branches of vine maple were once used by women of the Karok tribe as a "love medicine" to enhance success in matters of the heart (Moerman 1986). In the fall, vine maple ranks among the most colorful species of the Pacific Northwest, turning brilliant colors of red and yellow.

Management Options

Vine maple might be encouraged to grow in forests to improve wildlife habitat or to enhance aesthetic qualities, especially along well traveled roads. The abundance and growth of vine maple can be encouraged in a variety of ways: 1) branches of existing plants can be pinned to the ground (with logging slash or metal pins) to stimulate layering, 2) existing stems can be damaged, either mechanically or via burning, to stimulate basal sprouting, and 3) in stands that already contain vine maple, soil can be lightly disturbed and overstories can be thinned to enhance seedling production.

In some cases, vine maple may need to be controlled to enhance the growth of other species. Control can best be accomplished with prescribed burning or herbicides. When vine maple is the principal species in the understory, slash burning after logging will often achieve the desired results. Vine maple can also be controlled with a late summer application of imazapyr (M. Newton, personal communication, 1993).

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Associated Literature

Additional papers on the ecology and management of vine maple are listed in the "Associated Literature" section that accompanies this educational package.

Additional Notes

Educational Package

This leaflet is part of a larger educational program on the reproductive ecology of Pacific Northwest broadleaved trees and shrubs. The complete program consists of two audio-visual components—a videotape on the reproductive ecology of broadleaved trees and shrubs and a series of slide-tapes on shrub identification—and four printed components: 1) an overview of plant reproduction, 2) a series of leaflets on PNW trees and shrubs, 3) a glossary of relevant terms, and 4) a list of associated literature. To obtain the complete educational package, contact: Forestry Media Center, College of Forestry, Oregon State University, Corvallis, OR 97331, (503) 737-4702. To obtain only the printed documents, contact: Forestry Publications Office, Oregon State University, Forest Research Laboratory, Corvallis, OR 97331-7401.

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Jensen, E.C., D.J. Anderson, J.C. Tappeiner II, and J.C. Zasada. 1995. THE REPRODUCTIVE ECOLOGY OF BROADLEAVED TREES AND SHRUBS: VINE MAPLE, *ACER CIRCINATUM* PURSH. Forest Research Laboratory, Oregon State University, Corvallis. Research Publication 9b. 7 p.

Vine maple is an integral part of Pacific Northwest forests. This leaflet describes principal identifying characteristics, habitat and range, methods of reproduction, role in succession and response to disturbance, value to humans and wildlife, and management options. This leaflet supports a complete educational package on the natural history and reproductive ecology of Pacific Northwest broadleaved trees and shrubs; other items in the package include a videotape, three slide-tapes, and a series of printed publications.

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