

Philadelphus L.

mock orange

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Growth habit, occurrence, and use. The mock oranges—*Philadelphus* spp.—have been placed in several families: Saxifragaceae (Harrington 1954), Hydrangeaceae (Hitchcock and others 1961), and more recently, the Philadelphaceae (Hickman 1993). Hydrangeaceae, however, is the most widely accepted placement (Cronquist and others 1997; USDA NRCS 2001). There are about 50 to 65 species of mock orange, occurring primarily in temperate and subtropical areas of the Northern Hemisphere. Four or five species are native to the United States. Two of these—Lewis mock orange (*Philadelphus lewisii* Pursh) and littleleaf mock orange (*P. microphyllus* Gray)—occur in the western United States and are used in wildland as well as in ornamental plantings (table I). Both western species are erect to rounded, multi-stemmed, deciduous shrubs with opposite, entire or nearly entire leaves and fragrant white flowers (Hickman 1993; Munz and Keck 1973; Welsh and others 1987).

Lewis mock orange, the state flower of Idaho, was named for Captain Meriwether Lewis, who collected the plant 1806. It is an extremely variable plant, growing from 1.5 to 3 m tall and producing leaf blades that are 25 to 75 mm long. The species is distributed from British Columbia to California and eastward into Montana (table I). It exhibits wide ecological amplitude, growing in riparian areas and on cliffs, talus slopes, and rocky hillsides from the big sagebrush (*Artemisia tridentata* Nutt.) zone to ponderosa pine (*Pinus ponderosa* Dougl.) and lodgepole pine (*Pinus contorta* Dougl.) forests at elevations from sea level to 2,440 m (Hitchcock and others 1961; Hopkins and Kovalchik 1983).

Littleleaf mock orange is a smaller plant, ranging from 0.9 to 2 m in height and producing leaf blades 8 to 25 mm long. It is distributed from Utah to central Mexico (table I) and grows in pinyon–juniper, mountain brush, aspen (*Populus tremuloides* Michx.), lodgepole pine, Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco), and white fir (*Abies concolor* Lindl.) communities (Hitchcock 1943; Welsh and others 1987).

Both species furnish excellent cover and habitat for wildlife. Lewis mock orange provides good browse for deer (*Odocoileus* spp.) and elk (*Cervus elaphus*), especially on some winter ranges (Kufeld 1973; Leege 1968; Marchant and Sherlock 1984; USDA Forest Service 1937). It is usually not grazed heavily by livestock, but in some areas it does receive fair amounts of use (Leege 1968; USDA Forest Service 1937). Plants resprout and are often more palatable following fire (Leege and Hickey 1971; USDA Forest Service 1937). Quail (*Callipepla* spp.) and squirrels consume Lewis mock orange seeds (Van Dersal 1938). Mule deer (*O. hemionus*) browse littleleaf mock orange (Patton and Ertl 1982).

Mock oranges are valuable plants for revegetating disturbances on steep, rocky, unstable slopes within their native ranges (Stevens and others in press). Seedlings or larger stock are recommended for

planting such sites. Mock oranges are also useful for planting in drier areas of degraded riparian zones.

Mock orange species and their cultivars are used as ornamentals. Lewis mock orange was first cultivated in 1823 or 1884, and littleleaf mock orange in 1883 (Rehder 1940). Both are used as borders, screens, and hedges or as isolated specimens in sunny areas. They can also be used for low-maintenance landscaping and in recreational area plantings (Kruckeberg 1982, Sutton and Johnson 1974, Wright 1980). They do well on a wide variety of soils and require little maintenance. Plants grow vigorously, flower reliably, and are generally free of insect and disease problems.

Native Americans used stems of Lewis mock orange for making arrows (USDA FS 1937). Flowers are used in preparing perfumes and teas (Taylor 1972).

Genetic variation and hybridization. Natural variability in mock orange floral and vegetative characteristics is extensive and has contributed to development of the complex synonymy for each species (Cronquist and others 1997; Hickman 1993; Hitchcock and others 1961; Holmgren and Reveal 1966; Hu 1955; Rydberg 1905). This variability has been exploited to develop numerous hybrids (Rehder 1940; Rydberg 1905) and several ornamental cultivars (Wright 1980). 'Waterton' Lewis mock orange, selected from the Waterton Lakes area of Alberta, is a hardy, bushy shrub with flowers scattered over the crown of the plant (Taylor 1972). The *P. lemoinei* (*P. coronarius* H *P. microphyllus*) group of hybrids exhibit the pineapple scent and beauty of their littleleaf mock orange parent (Sutton and Johnson 1974; Wright 1980).

Flowering and fruiting. Mock orange flowers are white, fragrant, and showy, with 4 (5) petals and numerous stamens. They are produced in few-flowered cymes at the ends of shoots formed the previous year. Western species flower from May to July (Hitchcock and others 1961; Munz and Keck 1973; Orme and Leege 1980). Fruits are woody, turbinate, loculicidal capsules that mature in late summer (figure 1); those of Lewis mock orange dehisce in September or October (Marchant and Sherlock 1984; Orme and Leege 1980). The seeds are dispersed by wind and gravity.

Seeds of both species are slender, 3 mm long, pale brown, and caruncular with a thick, brown seedcoat (Hurd 1995; Taylor 1972) (figures 1 and 2). The embryo is cylindrical and well developed (figure 2). A thin layer of endosperm adheres to the seedcoat. Lewis mock orange plants grown from seed may begin flowering in the second or third year (Everett 1957).

Collection, cleaning, and storage of seeds. Mock orange seeds are collected in late summer by hand-stripping the capsules after they have turned dark brown and the valves have just begun to open (Stevens and others in press). After drying, seeds are extracted by crushing the capsules with a barley de-bearder, or if most capsules have opened, seeds are separated from coarse debris using an aspirator or air-screen machine (Glazebrook 1941). Shaking or crushing the dried capsules and screen to remove debris cleans small lots. The number of cleaned seeds of Lewis mock orange was estimated at 11,600,000/kg (5,300,000/lb), with a range of 7,700,000 to 18,000,000 (3.5 to 8 million/lb) (Glazebrook 1941; Hurd 1995; Mirov and Kraebel 1939; Swingle 1939). Fill of cleaned seedlots varies with rigor of cleaning. Acceptable purity for commercial seed purchases is 95% and acceptable germination is 65% (Jorgensen in press).

Seeds of Lewis mock orange can be sown as soon as they are ripe or placed in storage for later planting. Reports of longevity vary, but the seeds appear to be orthodox in storage behavior. Refrigerated storage has been recommended (Marchant and Sherlock 1984). Taylor (1972) reported that dry seeds could be stored in airtight containers in a cool place for 1 year.

Germination. Seeds of Lewis mock orange reportedly require light for germination (Dirr and Heuser 1987), but exposure to continuous light or darkness may be inhibitory (Glazebrook 1941). Germination is enhanced by 20 to 75 days of wet prechilling at 0 to 5 EC (Dirr and Heuser 1987;

Marchant and Sherlock 1984; Stickney 1974). Germination seeds from 2 sources that were chilled for 8 weeks at 5 EC and incubated at 22 to 26 EC was 64% (Glazebrook 1941) and 52% (Mirov and Kraebel 1939). Without prechilling, germination of seeds from 4 Idaho and Oregon collections incubated at 15 or 20/10 EC (8/16 hours) for 28 days was 12% or less (Shaw 1995) (table 2). A 28-day prechill at 3 to 5 EC improved germination with the increase greater when seeds were incubated at 15 EC compared to 20/10 EC (table 2).

Littleleaf mock orange is readily propagated from seeds (Sutton and Johnson 1974; Swingle 1939). Germination of untreated seeds collected in New Mexico was 12 times greater when they were incubated at 15 compared to 20/10 EC (8/16 hours) for 28 days (Shaw 1995) (table 2). Prechilling for 28 days at 3 to 5 EC improved germination if seeds were subsequently incubated at 20/10 EC, but decreased germination if they were incubated at 15 EC (table 2). Germination of both species is epigeal (figure 3).

Nursery practice. Bareroot stock of Lewis mock orange may be produced by fall-seeding untreated seeds or by spring-seeding prechilled seeds (Stevens and others in press). Uniformity of seed spacing may be improved by diluting the small seeds with rice hulls. Seeds should be covered very lightly. Seedlings develop rapidly and can be transplanted as 1-year-old stock.

Container stock may be grown from seeds (Atthowe 1993). Seedlings should be provided with shade for the first month and not watered excessively, as they are fragile and susceptible to damping-off (Taylor 1972). The 3-leaf stage should be attained before seedlings are transferred to larger containers.

Mock orange is easily propagated from softwood or hardwood cuttings, rooted suckers, divisions, or layers (Hartmann and others 1990; Macdonald 1986; Sutton and Johnson 1974). Softwood cuttings harvested in midsummer root readily under a mist system. Root production is enhanced by treatment with 1,000 ppm indole butyric acid (IBA) (Dirr and Heuser 1987; Marchant and Sherlock 1984). Hardwood cuttings may be harvested and planted in fall or early spring (Hartmann and others 1990; Macdonald 1986). These should be treated with 2,500 to 8,000 ppm IBA. Both types of cuttings can also be rooted in a cold frame (Macdonald 1986; Marchant and Sherlock 1984).

Field practice. Mock orange seeds may be broadcast seeded on a rough seedbed and covered lightly or spot-seeded on prepared seedbeds (Stevens and others in press). Seeds may also be surface-planted using a seeder that presses the seeds into the soil surface. Best results are obtained if seeds are planted in well-drained sites free of herbaceous competition. Seeds may be mixed with other shrub seeds that require surface or shallow planting.

Mock orange seedlings quickly develop a fibrous root system and transplant easily as bareroot or container stock (Everett 1957; Sutton and Johnson 1974). Youtie (1991, 1992) obtained good survival of Lewis mock orange planting stock grown from cuttings and planted on a disturbed site in the Columbia River Gorge. Plant growth is reportedly slow for Lewis mock orange (Taylor 1972) and moderate to rapid for littleleaf mock orange (Sutton and Johnson 1974).

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Figure 1—*Philadelphus*, mock orange: capsules and cleaned seeds.

Figure 2—*Philadelphus lewisii*, Lewis mock orange: seed (**left**) and longitudinal section of a seed (**right**).

Figure 3—*Philadelphus lewisii*, Lewis mock orange: germinant (**left**) and emerging seedling (**right**).

Table 1—*Philadelphus*, mockorange: nomenclature and occurrence

Scientific name & synonym(s)	Common name	Occurrence
<i>P. lewisii</i> Pursh <i>P. californicus</i> Benth. <i>P. gordonianus</i> Lindl. <i>P. columbianus</i> Koehne <i>P. gordonianus</i> var. <i>columbianus</i> Rehd.	Lewis mock orange, Indian arrowwood, syringa*, wild mock orange	British Columbia, SW Alberta, Washington, Oregon, Idaho N of the Snake River, Montana E of the Continental Divide, & N California
<i>P. microphyllus</i> Gray <i>P. nitidus</i> A. Nels. <i>P. stramineus</i> Rydb.	littleleaf mock orange, little-leaf mock orange, desert mockorange	Idaho, Nevada, Utah, SE Wyoming, W Colorado, SE California, Arizona, New Mexico, W Texas, N Mexico

Sources: Conquist and others (1997), Davis (1952), Hickman (1974), USDA ARS (2002), Welsh and others (1987). * This common name, although widely used, creates some confusion, as it also the generic name of the lilacs, which the mock oranges bear some resemblance.

Table 2—*Philadelphus*, mock orange: germination test conditions and results

Species, seed source, & elevation	Seed fill (%)	Viability (%)	Wet prechill (days)	Percentage germination	
				15 EC	20/10 EC
<i>P. lewisii</i>					
Banks, ID (830 m)	98	96	0	1	1
	98	96	28	57	16
Craters of the Moon National Monument, ID (1,680 m)	100	92	0	12	6
	100	92	28	41	23
Grant Co., OR (1,020 m)	100	90	0	8	5
	100	90	47	33	
Idaho City, ID (1,650 m)	99	96	0	2	2
	99	96	28	34	33
<i>P. microphyllus</i>					
Sandoval Co., NM (2,380 m)	98	63	60	5	
	98	63	28	44	20

Sources: Shaw (1995).

Note: Seeds were prechilled at 3 to 5 EC and then incubated at 15 or 20/10 EC (8/16 hours) for 0 or 28 days. The percentage germination was then determined. For 28 days of incubation, seeds were exposed to 8 hours of light (PAR=350 $\mu\text{Mol}/\text{m}^2/\text{sec}$) each day. Exposure corresponded to the high temperature period of the alternating temperature regime. Viability is based on the percentage of viable seeds to germinate normally.