

Ligustrum spp.

Privet
Oleaceae

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OVERVIEW

Plants in the genus *Ligustrum* (privet) are mostly native to Asian areas with a few species originating from Malaysia, Australia, Europe and North Africa. *Ligustrum* spp. have long been cultivated in many areas of the world as hedge plants and as small street trees. Many species in the genus have become weedy in places where they are cultivated. Privets produce numerous fruits that are rapidly spread through dispersal by fruit eating birds forming dense thickets capable of crowding out desirable vegetation. In Hawai'i, it is not certain how many different species are currently in cultivation. Several species are widely popular in horticulture trade throughout the world and these are most likely present in gardens of Hawai'i today. Currently, only one species is documented as naturalized in Hawai'i, *Ligustrum sinense* (Chinese privet), which was recently reported from Kaua'i and Hawai'i (Herbarium Pacificum Staff 1999, Lorence and Flynn 1999, Wagner et al. 1999). On Maui, *L. sinense* is cultivated at a residence in Kula. Other species, possibly *L. lucidum*, *L. japonicum*, and/or others are being cultivated with no sign of spread yet. However, this is based solely on preliminary surveys. Because of the weedy tendencies of many species in the genus and lack of information, more research on Maui and in the state seems warranted. Below is a brief summary of synonyms, common names, native range, and weediness elsewhere for several *Ligustrum* species commonly cultivated throughout the world and potentially present in Hawai'i.

L. indicum (Lour.) Merr., [Syn. *L. nepalense* Wall.], Nepal privet, native from the Himalayas (Neal 1948) and Indochina (Bailey and Bailey 1976), not listed as weedy.

L. japonicum Thunb., [Syn. *L. Kellermannii* Van Houtte] (Bailey and Bailey 1976), wax leaf privet, Japanese privet, native to Japan, Korea (Bailey and Bailey 1976), and Taiwan (GRIN 2002), weedy in Tennessee (TNEPPC 1999) and Georgia (GAEPPC 2001).

L. lucidum Ait., glossy privet, tree privet, native from China and Korea, weedy in parts of Florida (Dehgan 1998, FLEPPC 1999) and New Zealand (Auckland Regional Council 1997), a common street tree (Bailey and Bailey 1976).

L. ovalifolium Hassk., [*L. californicum* Hort, *L. medium* Franch & Sav.] California privet, native from Japan (Neal 1948, Bailey and Bailey 1976), not listed as weedy.

L. robustum subsp. *walkeri* (Decne.) P.S. Green, [basionym: *L. walkeri* Decne.] (IPNI 1999), Indian privet, native to Ceylon (Bailey and Bailey 1976), listed as weedy in

Reunion and Mauritius (C. Lavergne pers comm. 1997, Lorence and Sussman 1999, PIER 2002).

L. sinense Lour., Chinese privet, native from china (Neal 1948) and Korea (Dehgan 1998), weedy in Virginia, North Carolina, Georgia, Tennessee, and Kentucky (TNEPPC 1999, VANHP 2000, GAEPPC 2001), weedy in New Zealand (Auckland Regional Council 1997, Haley 1997), naturalized on Kaua'i and Hawai'i (Herbarium Pacificum Staff 1999, Lorence and Flynn 1999, Wagner et al. 1999).

L. vulgare L., European privet (Batcher 2000), common privet, native from the Mediterranean region (Neal 1948), also native to Africa (Morocco), temperate regions of Asia (Russia, Turkey), and Europe (GRIN 2002), weedy in Tennessee (TNEPPC 1999), cultivated for centuries as a hedge plant and naturalized in the eastern United States (Bailey and Bailey 1976), weedy in temperate states such as Wisconsin and north eastern states (PLANTS 2001) as well as southern parts of Canada (Batcher 2000).

TAXONOMY

Family: Oleaceae (Olive family) (Neal 1965).

Latin names: See above.

Synonyms: See above.

Common names: See above.

Taxonomic notes: *Ligustrum* is a genus of about 50 shrubs and trees from warm areas of Europe to Asia (Whistler 2000).

Nomenclature: The name, *Ligustrum*, is Latin for "privet" (Whistler 2000).

Related species in Hawai'i: See above.

DESCRIPTION

Ligustrum: "Deciduous or evergreen shrubs or rarely trees; lvs. opp., entire, often thick, mostly oblong or ovate; fls. small, white, in terminal panicles, bisexual, corolla funnelform; fr. a black, berrylike drupe, seeds 1-4." (Bailey and Bailey 1976).

L. indicum: "Semievergreen shrub or small tree; lvs. ovate-elliptic, to 3 in. long, pubescent beneath, especially along midrib; fls. in loose pyramidal panicles to 5 in. long, corolla 3/16 in. long, lobes spreading, longer than tube, stamens exerted; fr. subglobose, to 3/16 in. across." (Bailey and Bailey 1976).

L. japonicum: "Evergreen, to 10 ft. or more; lvs. to 3 or 4 in. long, short-pointed or nearly obtuse, glabrous, leathery; fls. in panicles to 6 in. long, corolla tube slightly longer than lobes" (Bailey and Bailey). "Fruit a black subglobose berry 7-10 mm long (1/4-3/8 in.)" (Whistler 2000). "Distinguishable by the shrubby habit, dark green, opposite leaves, and panicles of small white flowers with two protruding stamens." (Whistler 2000).

L. lucidum: "Evergreen, to 30 ft.; lvs. to 4 to 6 in. long, acuminate, glossy, glabrous; fls. in panicles to 10 in. long, corolla tube as long as lobes" (Bailey and Bailey 1976). "Differs in having generally larger, sharply tipped leaves." (Whistler 2000). Fruits are oblong, 1 cm long, bluish or purplish-black (Batcher 2000).

L. ovalifolium: "Semievergreen shrub, to 15 ft.; lvs. elliptic-ovate to elliptic-oblong, to 2 1/2 in. long, dark and glossy above, pale beneath; fls. nearly sessile, in panicles to 5 in. long, corolla 1.4 in. long, tube 1 1/2 times as long as spreading lobes." (Bailey and Bailey 1976). "Differs in having denser, pyramidal inflorescence and stamens not protruding." (Whistler 2000). Fruits are 5-7 mm across, black (Batcher 2000).

L. robustum subsp. *walkeri*: "Shrub or small tree, twigs conspicuously white-speckled; lvs. ovate to lanceolate, to 3 in. long, acute at apex and base, entire, glabrous; fls. in erect, terminal panicles 4-6 in. long." (Bailey and Bailey 1976).

L. sinense: "Deciduous shrub, to 12 ft.; lvs. elliptic to elliptic-oblong, to 3 in. long, pubescent on midrib beneath; fls. on slender pedicels, in open, narrow, pubescent panicles to 4 in. long, corolla 3/16 in. long, tube shorter than spreading lobes, stamens exerted." (Bailey and Bailey 1976). "Differs most obviously in having densely pubescent branchlets and narrower panicles." (Whistler 2000). Fruits are dull black (Batcher 2000).

L. vulgare: "Deciduous shrub, to 15 ft.; lvs. oblong-ovate to lanceolate, to 2 1/2 in. long; fls. pedicelled, in dense panicles to 1 1/2 in. long, corolla tube about as long as spreading lobes, stamens scarcely longer than corolla tube." (Bailey and Bailey 1976). Fruits are subglobose or ovoid, 6-8 mm long, black, and lustrous (Batcher 2000).

BIOLOGY & ECOLOGY

Cultivation: Privets have long been cultivated as hedges and specimen trees (Bailey and Bailey 1976). *L. sinense* was originally introduced to the United States as early as 1852 for use as an ornamental plant (NRCS Plant Guide 2002). Plants are generally grown in warm temperate and subtropical climates (Whistler 2000).

Invasiveness: Many *Ligustrum* species have become pests in places where they are planted, such as the United States, Hawai'i, and New Zealand (PLANTS 2001, Wagner et al. 1999, Haley 1997). *L. sinense* was reported as escaping from cultivation in Louisiana, U.S. as early as 1930 (Small 1933). By the 1950's through the 1970's, *L. sinense* was rapidly spreading (NRCS Plant Guide 2002). *Ligustrum* spp. spread quickly in shrubby thickets and are capable of out-competing and impeding regeneration of native plant species (VANHP 2000). *Ligustrum* spp. are known to spread in a variety of habitat such as along roadsides, old fields, edges of pine and hardwood forests, low woods, disturbed areas, shrublands, streams, moist areas, and coastal areas (VANHP 2000, GAEPPC 2001, Haley 1997). Seeds are born in numerous black drupes that are attractive to wildlife and commonly spread by fruit eating birds (TNEPPC 1999). Additionally, parts of *Ligustrum* spp. can be harmful to humans. Privet fruits are toxic to humans and cause symptoms such as nausea, headache, abdominal pain, vomiting, diarrhea, weakness, and low blood pressure and body temperature (NRCS Plant Guide 2002). Privet flowers also cause allergic reactions for asthmatics and hay fever sufferers (Auckland Regional Council 1997).

Pollination: Unknown. The fragrant white flowers are possibly insect pollinated.

Propagation: Privet can reproduce by sexual (seeds) and vegetative means (root suckers, cuttings) (NRCS Plant Guide 2002). Germination rates for seeds varies among reporters. Some seed viability experiments have resulted in low germination rates, while others have resulted in higher rates (Batcher 2000). Ingestion by birds may be related to higher seed viability (Langeland and Burks 2001).

Dispersal: Plants are popular ornamentals and are spread throughout the world in horticulture trade. Once established, fruit is dispersed by birds and other wildlife that are attracted to the fruit. Dispersal by birds is thought to be important in establishing new locations (Langeland and Burks 2001).

Pests and Diseases: Pests and diseases include aphids, scale insects, Japanese beetles, weevils, mites, thrips, leaf spots, blights, cankers, crown gall, and root rot (Brickell and Zuk 1997). *Ligustrum* spp. leaves are high in phenolic compounds which may help defend against insects and other herbivores (Batcher 2000). Despite this fact, *L. sinense* is reported as an important forage plant for deer in the southeastern United States (Stromayer et al. 1998). Experimental defoliation did not result in decreased flower, fruit, or seed production and viability (Obeso and Grubb 1993).

DISTRIBUTION

Native range: The native ranges for several species of *Ligustrum* are listed below.

L. indicum: native to the Himalayas (Neal 1948) and Indochina (Bailey and Bailey 1976). The Missouri Botanical Garden (2002) specimen database lists the following collection and location information: Vietnam, Lam Dong, 1,450-1,500 m (4,757-4,921 ft), 12.08N 108.39E, collection date 1997.

L. japonicum: native to Asia-Temperate: Japan (Honshu, Kyushu, Ryukyu Islands, Shikoku), Korea (South), and Taiwan (GRIN 2002).

L. lucidum: native to Asia-Temperate: China (Anhui, Fujian, Gansu, Guangdong, Guangxi, Guizhou, Henan, Hubei, Hunan, Jiangsu, Jiangxi, Shaanxi, Sichuan, Xizang, Yunnan, Zhejiang) (GRIN 2002).

L. ovalifolium: native to Japan (Brickell and Zuk 1997).

L. robustum subsp. walkeri: native to Ceylon (Bailey and Bailey 1976).

L. sinense: native to Asia-Temperate: China (Anhui, Fujian, Guangdong, Guangxi, Guizhou, Hubei, Hunan, Jiangsu, Jiangxi, Sichuan, Yunnan, Zhejiang), Hong Kong, and Taiwan. Also native to Asia-Tropical: Laos and Vietnam (GRIN 2002).

L. vulgare: native to Africa: Morocco. Also native to Asia-Temperate: Armenia, Azerbaijan, Georgia, Iran, Russian Federation, Ciscaucasia, and Turkey. Also native to

Europe: Albania, Austria, Belgium, Bulgaria, Czechoslovakia, France, Germany, Greece, Hungary, Ireland, Italy, Moldova, Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, Ukraine, United Kingdom, and Yugoslavia (GRIN 2002).

Global distribution: The global ranges for several species of *Ligustrum* are listed below. Locations are from literature searches and herbarium specimen information.

L. indicum: This species was noted in Neal (1948) as being cultivated in Hawai'i.

L. japonicum: United States: Distributed in the southeastern states from Maryland south to Florida and west to Texas, as well as Puerto Rico (PLANTS 2001). This species is considered a weed in Tennessee (TNEPPC 1999) and Georgia (GAEPPC 2001). The Pacific: Cultivated in Hawai'i (herbarium specimen in Bishop Museum). *L. japonicum rotundifolium* was included in Bishop Museum's collection as cultivated. Present on Guam (PIER 2002). The Missouri Botanical Garden (2002) specimen database lists the following collection and location information for *L. japonicum*: USA, Arkansas, collection date 1967; and Florida, Orange, 200 m (656 ft), 28.30N 81.27W, collection date 1992.

L. lucidum: United States: Distributed mainly in the southeastern states mainly from Georgia south to Florida and west to Texas, and also North Carolina and Maryland (PLANTS 2001). This species is considered a weed in Florida (FLEPPC 1999). The Pacific: Considered a weed in New Zealand, where it was first recorded in the wild in 1958 (Auckland Regional Council 1997). It is currently distributed in Northland through to the Waikato and coastal Bay of Plenty, and is also widespread throughout Auckland (Auckland Regional Council 1997). Invaded habitat includes lowland and coastal forests, shrublands, roadsides and disturbed areas (Haley 1997) Present in Australia and Norfolk Island (PIER 2002) Cultivated in Hawai'i (pers obs., PIER 2002). The Missouri Botanical Garden (2002) specimen database lists the following collection and location information for *L. lucidum*: USA, California, Alameda, 37.36.00N 121.53.00W, collection date 1999; Florida, Gadsden, 30.47N 84.50W, collection date 1976; Florida, Orange, 200 m (656 ft), 28.30N 81.27W, collection date 1992; Texas, Jefferson, 30 m (98 ft), 30.05.51N 094.07.56W, collection date 2000. Mesoamerica: Costa Rica, San Jose, 9.40N 84.00W, collection date 1965; El Salvador; Guatemala and Chimaltenango, 1,500 ft (457 m) and 7,500 ft (2,286 m), 14.40N 90.30W, collection dates 1975 and 1970; Honduras, Colon and Francisco Morazan, ranging from 900 m (2,953 ft) to 1,300 m (4,265 ft), 14.15N-15.45N and 87.10W-85.40W, collection dates from 1979-1986; and Mexico, Chiapas and Quintana Roo, 16.30N-19.40N and 88.30W-92.30W, collection dates from 1971-1982. South America: Bolivia, Cochabamba and La Paz, 3,300 m (10,827 ft) and 3,600 m (11,811 ft), 16.31S 68.05W, collection dates 1984 and 1986; and Santa Cruz ranging from 420 m (1,378 ft) to 2,040 m (6,693 ft), 18.29S 64.06W, collection dates 1989 and 1993. Africa: Madagascar and Antananarivo, 1,000 m (3,281 ft), collection date 1975; and Malawi, Southern, 800 m (2,625 ft), collection date 1986.

L. ovalifolium: United States: Distributed widely in the northern and central states including Michigan east to Massachusetts, south to North Carolina and west to Missouri, Florida, Texas, and California (PLANTS 2001). Considered common in California and parts of central and eastern United States (Batcher 2000). Also in Puerto Rico (PLANTS 2001). Pacific: This species was noted in Neal (1948) as being cultivated in Hawai'i. The Missouri Botanical Garden (2002) specimen database lists the following collection and location information for *L. ovalifolium*: USA: Florida, Dade, 10 ft (3 m), 25.37.00N 080.32.00W, collection date 1970. Mesoamerica: Costa Rica, Heredia, 10.20N 84.00W, collection date 1984; Guatemala; Honduras; and Mexico, Chiapas 16.30 N 92.30W. South America: Bolivia, La Paz, 3,300 m (10,827 ft), 16.32S 68.05W, collection date 1982.

L. robustum subsp. walkeri: Pacific: Reported as a weed in Mauritius and Reunion Islands (Lorence and Sussman 1988. PIER 2002). This species was introduced to Reunion from Mauritius in 1960 and began to colonize the understory of closed-canopy native forest described as upland wet forest 1,200–1,700 m (3,937–5,577 ft) (C. Lavergne pers comm.).

L. sinense: United States: Widely distributed throughout the eastern and central states from Massachusetts south to Florida and west to Missouri, Oklahoma and Texas (PLANTS 2001). Considered weedy in Florida (FLEPPC 1999), Georgia (GAEPPC 2001), Tennessee (SEEPPC 1996, TNEPPC 1999), and Virginia (VANHP 2000) where it invades and can dominate the shrub layer, preferring wet habitat, low woods, bottomlands, streamsides, and disturbed areas. In Florida, *L. sinense* is naturalized mostly in Panhandle and northern counties, but is also reported from some southern counties (Langeland and Burks 2001). It escapes cultivation and readily invades areas of full sun to fully shaded flood plains where it is exceptionally difficult to kill (Langeland and Burks 2001). In North Carolina, thousands of acres are infested with *L. sinense* (VANHP 2000). *L. sinense* is reported from all non-xeric habitats in Arkansas (Batcher 2000). In Alabama, *L. sinense* is reported from bogs, oak-hickory-pine forests, longleaf pine-turkey oak forest and mesic hardwood forests (Batcher 2000). In the Pacific, in New Zealand, *L. sinense* is cultivated as a farm hedge plant and now spreading in alluvial forest remnants, wastelands, shrublands, stream sides, and coastal areas (Haley 1997). *L. sinense* was first recorded in New Zealand in 1950 and now spread from the Bay of Plenty to Northland and is also present in Nelson and some other South Island areas and is widespread throughout the Auckland area (Auckland Regional Council 1997). *L. sinense* has become a serious weed in New South Wales, Australia (Lorence and Flynn 1999). In Hawai'i, *L. sinense* is noted as cultivated by Neal (1965). It is naturalized on Kaua'i and Hawai'i (Herbarium Pacificum Staff 1999, Lorence and Flynn 1999, Wagner et al. 1999), see below for detailed description. It is cultivated on Tutuila, American Samoa, and present on Fiji, Guam, Hawai'i, Lord Howe Island, and Norfolk Island (PIER 2002). It is also a weed in bush lands of Australia and in relict subtropical forests of Argentina (Langeland and Burks 2001). The Missouri Botanical Garden (2002) specimen database lists the following collection and location information for *L. sinense*: USA: California, Nevada, 240 ft (73 m), 39.21.00N 120.53.00W, collection date 1977; Georgia, Habersham, 34.40N 083.25W, collection date 1976, Newton, 33.33.00N

083.51.00W, collection date 1964; Louisiana, Lincoln and Richland, ranging from 32.25.00 N-33.33.00N and 83.51.00W-92.39.00W, collection dates from 1969-1977; Maryland, Montgomery, 39.04N 77.00W, collection date 1990; Missouri, Dunklin, 100 m (328 ft), 36.17.00N 090.02.00W, collection date 2001; North Carolina, Bladen, 34.37N 78.35W, collection date 1976, and Clay, 1,050 m (3,445 ft) 35.01.00N 079.28.09W; South Carolina, Charleston, 33.05.53N 079.28.09W, collection date 1998; Texas, Jackson and Tyler, 30 m (98 ft), 28.44-30.27.42N and 96.44-094.21.06W, collection dates 1990 and 2000. Mesoamerica: Costa Rica, various collections ranging from 1,400 m (4,593 ft) to 2,000 m (6,562 ft), 9.40N-10.30N and 84.00W-84.30W, collection dates 1935-1984; Honduras; Panama, various collections ranging from 3,000 m (9,842 ft) to 5,500 m (18,044 ft), 8.30N 82.15W, collection dates from 1968-1977. South America: Bolivia, La Paz, 3,300 m (10,827 ft) and 3,600 m (11,811 ft), 16.30S 68.07W, collection date 1986; Paraguay, Central, 25.06S 57.40W, collection date 1942. Africa: Malawi, Southern, 800 m (2,625 ft), collection date 1986. Asia: Vietnam, Ha Giang and Kon Tum, 1,100 m (3,609 ft) to 1,600 m (5,249 ft), 23.09N-28.08.11N and 104.59E-105.00.48E, collection dates 1995 and 2000.

L. vulgare: United States: *L. vulgare* has a broad distribution throughout the east coast from Maine to Georgia, inland central states from Wisconsin to Texas, and western states in Montana, Oregon, Utah and Nebraska (PLANTS 2001). It is considered, "the broadest range of the invasive *Ligustrum* species established in North America" (Batcher 2000). Widely naturalized throughout much of the United States as well as southern parts of Canada (Batcher 2000). Naturalized in eastern United States (Bailey and Bailey 1976). Considered weedy in Tennessee (SEEPPC 1996, TNEPPC 1999) and Wisconsin (Hoffman and Kearns 1997). In Tennessee, found along roadsides and other disturbed sites at elevations of less than 915 m (3,000 ft) (TNEPPC 1999). In Ohio, found in old fields, woodlands, and closed canopy forests (Batcher 2000). Documented from bottomlands and mesic and riparian forests of Arkansas (Batcher 2000). Also documented from calcareous glades and barrens and in deciduous cove forests of Tennessee (Batcher 2000). In Hamilton, Canada, this species is becoming more frequent in woodlands near Royal Botanical Gardens (Haber 1996). Pacific: Hawai'i: listed as cultivated in Hawai'i (Neal 1965). The Missouri Botanical Garden (2002) specimen database lists the following collection and location information for *L. vulgare*: North America: Canada, British Columbia, Ottawa, collection date 1973; USA, Louisiana, Clairborne, 32.48.00N 93.01.00W, collection date 1969; Massachusetts, various collections from Arlington, Belmont, and Chestnut Hill, collection dates 1898, 1909, and 1899; Missouri, Boone, 750 ft (229 m), 39.02.00N 92.20.00W, collection dates 1936 and 1957. Mesoamerica: Costa Rica, Heredia, Valle Central, 1,160 m (3,806 ft), 09.59.35N 84.05.35W, collection date 1993. South America: Ecuador, Pichincha, 2,400 m (7,874 ft) to 3000 m (9842 ft), collection dates 1983 and 1987. Europe: France, Somme, collection date 1888; Great Britain, collection date 1830. Africa: Madagascar. Asia: Republic of Georgia, 1,500 m (4,921 ft), 41.45.40N 044.30.38E, collection date 1999.

State of Hawaii distribution: The following locations were noted for *Ligustrum* spp. from literature searches and collections at the Bishop Museum (BISH) in Honolulu, HI.

L. indicum: Listed as cultivated in Hawai'i (Neal 1965).

L. japonicum: Cultivated in Hawai'i on the following islands: Kaua'i, described as a tree of 15 ft, with leaves glossy green; and O'ahu. Also cultivated on O'ahu was *L. japonicum rotundifolium*.

L. lucidum: Collections at BISH included cultivated material from O'ahu and Hawai'i.

L. ovalifolium: Listed as cultivated in Hawai'i by Neal (1965). Collections at BISH included cultivated material from O'ahu and Hawai'i.

L. robustum subsp. walkeri: Not known to be present in Hawai'i.

L. sinense: Listed as cultivated in Hawai'i by Neal (1965). Collections at BISH included cultivated material from Kaua'i, O'ahu, and Volcano and Kona, Hawai'i. Known to be naturalized on Kaua'i and Hawai'i (Herbarium Pacificum Staff 1999, Lorence and Flynn 1999, Wagner et al. 1999). According to Lorence and Flynn (1999), "This species has become naturalized profusely around the cabins at Koke'e State Park and now extends far into the forest. It likely originated at this site as yard plantings by residential cabins where shrubs reaching 4 m tall and 5 m in diameter were observed." Collections were made along Halemanu road near cabins in degraded *Acacia koa* mesic forest, and on Faya road in *Acacia/Metrosideros* forest at an elevation of 1,060 m (3,478 ft). On the island of Hawai'i, *L. sinense* was collected in Hawai'i Volcanoes National Park, near the Thurston Lava Tube, at an elevation of 3,800 ft (1,158 m), in closed *Metrosideros* forest (Herbarium Pacificum Staff 1999). On Maui, *L. sinense* was observed in a garden in Kula.

L. vulgare: Listed as cultivated in Hawai'i by Neal (1965).

Island of Maui distribution: To date, surveys of this genus by the authors, who were not very familiar with these plants, have only been preliminary. Several species seem to be cultivated occasionally as hedge plants or specimen trees, possibly *L. japonicum* and/or *L. lucidum*. None have been observed spreading from initial plantings. One planting of *L. sinense* was observed in a garden in Kula. No reproduction was observed at the time. Further research (collections and monitoring) is needed to find out which species are present and whether any spread is occurring.

CONTROL METHODS

Physical control: Mowing and cutting works well to control small populations or in areas where herbicides can not be used (Batcher 2000). Small seedlings can be hand pulled. Larger plants can be pulled up with a weed wrench. The entire root must be removed for successful control (TNEPPC 1999).

Chemical control: Chemical control methods include using herbicides such as glyphosate or triclopyr in foliar, cut stump, and basal bark applications (Batcher 2000). Various sources listed differing views on what herbicide mix and techniques worked best.

Some had better results with glyphosate, while others had better results with triclopyr. The type of method most likely depends on the specific circumstances of the invasion and testing of herbicides may be necessary to choose which will work best in any given situation. When using herbicides, be sure to follow the label.

Foliar application: Effective on large thickets where risk to non-targets is minimal (Batcher 2000). Mixes of 2% glyphosate to water with an added surfactant were suggested, as well as mixes of 2% triclopyr and water with an added surfactant.

Cut stump: Useful when treating individual shrubs or where desirable species are present (Batcher 2000). Immediately after cutting stems at or near the ground level, apply a 25% mix of glyphosate and water or triclopyr and water, covering the entire surface (TNEPPC 1999).

Basal bark: This application is effective in controlling a large number of plants using minimum disturbance. Mixes of 25% triclopyr and 75% horticultural oil are applied to the basal area of the shrub from a height of 30-38 cm (12-15 in) from the ground. Wet the area thoroughly, spray until runoff is noticeable at the ground line.

Biological control: "*Ligustrum* spp. have no known biological controls, although a few pathogens are known to attack them in North America. *Cercospora adusta*, *C. lilacis*, and *Pseudocercospora ligustri* are fungal leaf spots that affect *L. vulgare* and *L. amurense*. *Nectriella pironi* creates galls on *L. sinense*, *L. lucidum* and *L. quihoui*. *Pseudomas syringae* impacts members of the olive family including *L. amurense*. *Agrobacterium tumefaciens*, *Ganoderma lucidum* and *Glomerella cingulata* affect *L. vulgare*" (Sinclair et al. 1987).

Cultural control: Some reports of burning to control *Ligustrum* spp., if repeated, can be successful (Batcher 2000), while others say that burning only produces top kill of *Ligustrum* spp., especially in moist areas. Managers in North America suggest that control and restoration in sites invaded by *Ligustrum* spp. are most effective in areas where *Ligustrum* spp. are just beginning to invade (Batcher 2000).

Noxious weed acts: *L. lucidum* and *L. sinense* are prohibited from propagation, sale, and distribution in New Zealand (Haley 1997). Several *Ligustrum* spp. are listed in exotic pest plant council lists of invasive plant species of North America, especially east coast states.

MANAGEMENT RECOMMENDATIONS

Ligustrum spp. are notorious weeds in places where they are planted, such as the United States, New Zealand, Hawai'i, and Australia. *Ligustrum* spp. have long been cultivated in Hawai'i, yet only recently has *L. sinense* been reported as naturalized on Kaua'i and Hawai'i. Many other species are likely cultivated in Hawai'i with the potential to spread. Better information on what species are currently being cultivated and whether they show any sign of spread is needed. Potential range maps would help show what areas are vulnerable to *Ligustrum* invasion. Incipient populations near or in natural areas should be

controlled as early as possible to ensure effective control, as privet becomes harder to control with size of infestation. Lastly, plants in this genus should be monitored for signs of spread and ultimately, if deemed appropriate, plants in this genus should be prohibited.

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