

FagaceaeC Beech family

Chrysolepis Hjelmqvist

chinquapin

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Synonyms. The 2 species of *Chrysolepis* found in the United States are distinct from their Asian relatives in the genus *Castanopsis* and were placed by Hjelmqvist (1948) in their current genus. This genus was accepted in Hickman's extensive and long-researched flora of California (1993). These American species, which have a floral morphology that is intermediate between *Castanopsis* and *Lithocarpus*, represent the ancient condition of the family Fagaceae (McKee 1990). The common name also has changed throughout the years. Early workers called the species Achinquapin. Later, it became Achinkapin but more recently it was changed back to Achinquapin (Hickman 1993; Keeler-Wolf 1988).

Occurrence and growth habit. In North America, the genus *Chrysolepis* consists of 2 species and 1 variety (Hickman 1993), all located in the Pacific Coast region. Giant chinquapin *Chrysolepis chrysophylla* var. *chrysophylla* (Dougl. ex. Hook) Hjelmqvist is a tree that ranges from southwestern Washington southward to San Luis Obispo County in the Cascade, Klamath, and Coast Mountains of California. A remnant stand also exists in El Dorado County in the north central Sierra Nevada. This species achieves its best form from Marin County, California, northward (Griffin and Critchfield 1972) to Lane County, Oregon. Giant chinquapin also has a shrub form *C. chrysophylla* var. *minor* (Benth.) Munz, often called Golden chinquapin that is found throughout the range of its taller brethren.

The second species *C. sempervirens* (Kellogg) Hjelmqvist which is always a shrub, has the common name "bush chinquapin." This species is found from the Cascade Mountains of southern Oregon westward in the Siskiyou Mountains of northern California, and southward along the east-facing slopes of the north Coast Range and the west-facing slopes of the Sierra Nevada, San Jacinto, and San Bernardino Mountains (McMinn 1939). Throughout, its habitat is characterized as being of low quality with shallow, rocky, and often droughty soils. In western Siskiyou County, California, and in other places where the ranges of the 2 shrub forms overlap, hybridization probably occurs (Griffin and Critchfield 1972).

Giant chinquapin is often found as a single tree or in groves; it rarely occupies extensive areas. This shade-tolerant tree is rarely found in a dominant position; it is more often found in intermediate and codominant crown positions. Pure stands are uncommon and rarely exceed 10 ha (McKee 1990). In the Klamath Mountains of northern California, giant chinquapin shows a distinct preference for mesic conditions, with highest basal areas occurring on north-facing slopes or in mesic canyon bottoms (Keeler-Wolf 1988). In general, best growth is achieved in moist environments with deep and infertile soils (Zobel and others 1976). The shrub forms occupy a plethora of

topographic/edaphic sites over an elevational range that varies from 300 to 3,000 m. The shrub forms can be quite extensive and achieve greatest coverage in the extreme environments of xeric sites at higher elevations. Here they dominate, with their area corresponding to the extent of past disturbance. The amount of time that they dominate also can be lengthy, given a lack of seed source for inherently taller competitors. Over a long time span, however, disturbance is necessary for the continued presence of chinquapin. Because of its wide ecological amplitude, chinquapin is part of many associations that include most of the forest-zone conifers and hardwoods on the Pacific Coast. A general pattern for all the species and varieties is that they are at their competitive best on infertile soils (McKee 1990).

Chinquapins are vigorous sprouters and most trees originate as root crown sprouts. The sprouts grow rapidly and outstrip natural conifer seedlings for several years. Mature trees tend to have straight boles and narrow crowns. The largest trees may reach over 33 m in height and 1 to 1.2 m in girth (Sudworth 1908). For shrubs, variety *minor* tends to be stiff and upright in exposed areas and semiprostrate in shaded environments. Bush chinquapin is stiff and upright in all environments.

Use. The light, fairly hard, and strong wood of chinquapin has been used for veneer, paneling, cabinets, furniture, turned products, pallets, and fuel (EDA 1968).

Flowering and fruiting. The flowers of giant chinquapin, which bloom from June through midwinter, and the flowers of the shrubs, which bloom throughout the summer, are unisexual, with staminate and pistillate flowers being borne on the same plant. The staminate flowers are borne in groups of 3 in the axils of bracts, forming densely flowered, erect cylindrical catkins 2.5 to 7.6 cm long; 1 to 3 pistillate flowers are borne in an involucre, usually at the base of the staminate catkins or borne in short separate catkins. At the time of peak blooming in June, each tree is covered with erect creamy white blossoms, which provide a pleasing contrast to the more somber foliage, (Peattie 1953).

The fruit consists of 1 to 3 nuts (figures 1 and 2) enclosed in a spiny golden brown bur. The nuts mature in fall of the second year (Hickman 1993). The minimum seed-bearing age (from root crown sprouts) is 6 years (McKee 1990). Giant chinquapin trees have been reported as producing seeds at 40 to 50 years of age but probably do so before this age (McKee 1990). Controversy exists over seed productivity. Sudworth (1908) reported that the tree form is an abundant seeder, but Peattie (1953) noted that although flowering is abundant, fruiting is "strangely shy." Insects, squirrels, and birds often consume most of a given crop. Indeed, Powell (1994) observed tree squirrels (*Sciurus* spp.) cutting burs of large chinquapins during a bumper seed year. By late fall, the ground beneath the trees was covered with burs.

Collection, extraction, and storage. Because of heavy predation by many animals, collectors should hand-pick the burs in late summer or early fall, after they ripen but before they open (Hubbard 1974). The collected burs should be spread out to dry in the sun or in a warm room. After drying, the nuts can be separated from the burs mechanically. The following number of nuts per weight have been recorded (Hubbard 1974; McMinn 1939):

		No./kg	No./lb
giant chinquapin	<i>C. chrysophylla</i> var. <i>chrysophylla</i>	1,826B2,420	830B1,100
golden chinquapin	<i>C. chrysophylla</i> var. <i>minor</i>	1,540	700
bush chinquapin	<i>C. sempervirens</i>	2,640	1,200

When stored in sealed containers at 6 °C, chinquapin seeds retain their viability well for at least 2 years, and probably longer. Viability of 1 sample of giant chinquapin seeds stored in this manner dropped only from 50 to 44% in 5 years (Hubbard 1974).

Pregermination treatments. Mirov and Kraebel (1937) found that no stratification was needed.

Germination. Germination of untreated seeds of giant chinquapin in 3 tests ranged from 14 to 53% (Hubbard 1974) the poorest of all hardwoods in the Klamath Mountains Province of southwestern Oregon and northern California (McDonald and others 1983). Mirov and Kraebel (1937) found highest germination values for giant chinquapin to be 50% in 24 days and for bush chinquapin was 30% in 16 days. Germination is hypogeal (figure 3) and best in peat.

Nursery practice. Little is known about raising chinquapins in nurseries. In a study at the Rancho Santa Ana Botanic Gardens in California, the 3 native species were raised in pots. Some survived through 1 or more potting stages, but none survived after outplantings (Hubbard 1974). Propagation by layering, grafting, or budding is feasible (Hubbard 1974).

Seedling care. Natural regeneration of giant chinquapin usually is sparse or totally lacking. Powell (1994) noted that not a single seedling was present on ground covered with burs beneath large seed trees. McKee (1990) also inferred that regeneration was lacking in environments of deep litter and dense understory vegetation. Sudworth (1908) noted that regeneration was best if seeds were covered, apparently by eroded soil. Keeler-Wolf (1988) found sexually reproduced seedlings and saplings to average about 19/ha (7/ac) in the Klamath Mountains but only in shaded mesic environments. In the Oregon Cascades, McKee (1990) noted that chinquapin reproduction occurred in light leaf mulch in partial shade, with plantlets that were 15 to 45 cm tall at ages 4 to 12. For bush chinquapin in the northern Sierra Nevada on 10 study areas over a 10-year period, not 1 seedling was found. Although tiny plants looked like seedlings, a gentle tug showed that they were connected to parent-plant root systems. The number of new sprouts averaged over 39,000/ha (16,000/ac) 6 years after site preparation by bulldozer bared the ground (McDonald and others 1994).

Altogether, this evidence suggests that for both natural and artificial regeneration, best seedling care will be achieved with covered seed in partially shaded, moist conditions. Seedling growth in this environment, however, is unknown.

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