

**Family:** *Sapindaceae*

**Taxon:** *Aesculus californica*

**Synonym:** *Calothyrsus californica* Spach (basionym) **Common Name:** California buckeye

<b>Questionnaire :</b>	current 20090513	<b>Assessor:</b>	Chuck Chimera	<b>Designation:</b> L
<b>Status:</b>	Assessor Approved	<b>Data Entry Person:</b>	Chuck Chimera	<b>WRA Score</b> 0
101	Is the species highly domesticated?		y=-3, n=0	n
102	Has the species become naturalized where grown?		y=1, n=-1	
103	Does the species have weedy races?		y=1, n=-1	
201	Species suited to tropical or subtropical climate(s) - If island is primarily wet habitat, then substitute "wet tropical" for "tropical or subtropical"		(0-low; 1-intermediate; 2-high) (See Appendix 2)	Intermediate
202	Quality of climate match data		(0-low; 1-intermediate; 2-high) (See Appendix 2)	High
203	Broad climate suitability (environmental versatility)		y=1, n=0	n
204	Native or naturalized in regions with tropical or subtropical climates		y=1, n=0	n
205	Does the species have a history of repeated introductions outside its natural range?		y=-2, ?=-1, n=0	y
301	Naturalized beyond native range		y = 1*multiplier (see Appendix 2), n= question 205	n
302	Garden/amenity/disturbance weed		n=0, y = 1*multiplier (see Appendix 2)	n
303	Agricultural/forestry/horticultural weed		n=0, y = 2*multiplier (see Appendix 2)	n
304	Environmental weed		n=0, y = 2*multiplier (see Appendix 2)	n
305	Congeneric weed		n=0, y = 1*multiplier (see Appendix 2)	y
401	Produces spines, thorns or burrs		y=1, n=0	n
402	Allelopathic		y=1, n=0	y
403	Parasitic		y=1, n=0	n
404	Unpalatable to grazing animals		y=1, n=-1	n
405	Toxic to animals		y=1, n=0	y
406	Host for recognized pests and pathogens		y=1, n=0	y
407	Causes allergies or is otherwise toxic to humans		y=1, n=0	y
408	Creates a fire hazard in natural ecosystems		y=1, n=0	y
409	Is a shade tolerant plant at some stage of its life cycle		y=1, n=0	n
410	Tolerates a wide range of soil conditions (or limestone conditions if not a volcanic island)		y=1, n=0	y
411	Climbing or smothering growth habit		y=1, n=0	n

412	Forms dense thickets	y=1, n=0	n
501	Aquatic	y=5, n=0	n
502	Grass	y=1, n=0	n
503	Nitrogen fixing woody plant	y=1, n=0	n
504	Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)	y=1, n=0	n
601	Evidence of substantial reproductive failure in native habitat	y=1, n=0	n
602	Produces viable seed	y=1, n=-1	y
603	Hybridizes naturally	y=1, n=-1	
604	Self-compatible or apomictic	y=1, n=-1	
605	Requires specialist pollinators	y=-1, n=0	n
606	Reproduction by vegetative fragmentation	y=1, n=-1	n
607	Minimum generative time (years)	1 year = 1, 2 or 3 years = 0, 4+ years = -1	3
701	Propagules likely to be dispersed unintentionally (plants growing in heavily trafficked areas)	y=1, n=-1	n
702	Propagules dispersed intentionally by people	y=1, n=-1	y
703	Propagules likely to disperse as a produce contaminant	y=1, n=-1	n
704	Propagules adapted to wind dispersal	y=1, n=-1	n
705	Propagules water dispersed	y=1, n=-1	y
706	Propagules bird dispersed	y=1, n=-1	n
707	Propagules dispersed by other animals (externally)	y=1, n=-1	y
708	Propagules survive passage through the gut	y=1, n=-1	n
801	Prolific seed production (>1000/m2)	y=1, n=-1	n
802	Evidence that a persistent propagule bank is formed (>1 yr)	y=1, n=-1	n
803	Well controlled by herbicides	y=-1, n=1	y
804	Tolerates, or benefits from, mutilation, cultivation, or fire	y=1, n=-1	y
805	Effective natural enemies present locally (e.g. introduced biocontrol agents)	y=-1, n=1	

Designation: L

WRA Score 0

## Supporting Data:

101	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Is the species highly domesticated? No] No evidence
102	2011. WRA Specialist. Personal Communication.	NA
103	2011. WRA Specialist. Personal Communication.	NA
201	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Species suited to tropical or subtropical climate(s) 1-intermediate] "Climate: California buckeye occurs in a Mediterranean climate with cool moist winters and hot dry summers [5,15,18]. The mean annual rainfall is less than 14 inches, and temperatures are in excess of 100 degrees Fahrenheit (38 degrees C) for several successive days every summer."
202	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Quality of climate match data? 2-high] "Climate: California buckeye occurs in a Mediterranean climate with cool moist winters and hot dry summers [5,15,18]. The mean annual rainfall is less than 14 inches, and temperatures are in excess of 100 degrees Fahrenheit (38 degrees C) for several successive days every summer."
203	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Broad climate suitability (environmental versatility)? No] "Climate: California buckeye occurs in a Mediterranean climate with cool moist winters and hot dry summers [5,15,18]. The mean annual rainfall is less than 14 inches, and temperatures are in excess of 100 degrees Fahrenheit (38 degrees C) for several successive days every summer."
203	2011. Dave's Gardern. PlantFiles: California Buckeye - <i>Aesculus californica</i> . <a href="http://davesgarden.com/guides/pf/go/53823/">http://davesgarden.com/guides/pf/go/53823/</a>	[Broad climate suitability (environmental versatility)? No] "Hardiness: USDA Zone 7a: to -17.7 °C (0 °F) USDA Zone 7b: to -14.9 °C (5 °F) USDA Zone 8a: to -12.2 °C (10 °F) USDA Zone 8b: to -9.4 °C (15 °F)"
204	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Native or naturalized in regions with tropical or subtropical climates? No] "Climate: California buckeye occurs in a Mediterranean climate with cool moist winters and hot dry summers [5,15,18]. The mean annual rainfall is less than 14 inches, and temperatures are in excess of 100 degrees Fahrenheit (38 degrees C) for several successive days every summer." [No evidence]
204	2007. Randall, R.P.. Global Compendium of Weeds - <i>Aesculus californica</i> [Online Database]. <a href="http://www.hear.org/gcw/species/aesculus_californica/">http://www.hear.org/gcw/species/aesculus_californica/</a>	[Native or naturalized in regions with tropical or subtropical climates? No]
205	2002. Dirr, M.. Dirr's trees and shrubs for warm climates: an illustrated encyclopedia. Timber Press, Portland, OR	[Does the species have a history of repeated introductions outside its natural range? Yes] "In Europe, leaves persist into the fall."
205	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Does the species have a history of repeated introductions outside its natural range? Not in Forestry Compendium] "List of countries North America [USA] California natural" [no evidence of widespread planting outside of native range]
205	2011. Backyard Gardener. <i>Aesculus californica</i> . <a href="http://www.backyardgardener.com/plantname/pda_3712.html">http://www.backyardgardener.com/plantname/pda_3712.html</a>	Does the species have a history of repeated introductions outside its natural range? Yes] " <i>Aesculus californica</i> is a 15 to 20 foot tall deciduous tree or shrub, grown in California and Europe. It is rounded with a symmetrical branching pattern. Foliage is striking, dark green, glossy compound palmate leaves. Naturally occurs in dry canyons and gullies of California, but seems to prosper in the moist climate of England. Flowers are white to pink, fragrant, occurring on 4- to 8-inch long, 3-inch wide showy panicles.
205	2011. Dave's Gardern. PlantFiles: California Buckeye - <i>Aesculus californica</i> . <a href="http://davesgarden.com/guides/pf/go/53823/">http://davesgarden.com/guides/pf/go/53823/</a>	[Does the species have a history of repeated introductions outside its natural range? Yes] "Huntington, Arkansas...Plants I grew from seed gathered in American River canyon, CA growing well and dropping leaves in July, just like in natural CA habitat only mine are growing in Arkansas' humidity and summer rain. Have not had problems with summer water as long as drainage is good. In nature these trees usually grow on canyon slopes or just above flood level of streams." [Arkansas ... outside native range]
205	2011. Plants For A Future Database. <i>Aesculus californica</i> . <a href="http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica">http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica</a>	[Does the species have a history of repeated introductions outside its natural range? Yes] "Although fairly hardy throughout Britain, it grows best in areas where winter temperatures do not fall below -10°C ... A moderately fast-growing and long-lived tree in the wild[229], in Britain it grows best in eastern and south-eastern England. Plants thrives at Kew" [England]

301	2005. Wagner, W.L./Herbst, D.R./Lorence, D.H.. Flora of the Hawaiian Islands website. Smithsonian Institution, Washington, D.C. <a href="http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/index.htm">http://botany.si.edu/pacificislandbiodiversity/hawaiianflora/index.htm</a>	[Naturalized beyond native range? No] No evidence
301	2007. Randall, R.P.. Global Compendium of Weeds - <i>Aesculus californica</i> [Online Database]. <a href="http://www.hear.org/gcw/species/aesculus_californica/">http://www.hear.org/gcw/species/aesculus_californica/</a>	[Naturalized beyond native range? No] No evidence
302	2007. Randall, R.P.. Global Compendium of Weeds - <i>Aesculus californica</i> [Online Database]. <a href="http://www.hear.org/gcw/species/aesculus_californica/">http://www.hear.org/gcw/species/aesculus_californica/</a>	[Garden/amenity/disturbance weed? No] [Listed as a weed but with no evidence of impacts] Darrow, R.A. Erickson, L.C. Holstrum, J.T.Jnr., Miller, J.F., Scudder, W.F. and Williams, J.L. Jnr. (1966) Report of the Terminology Committee, Standardized Names of Weeds. WSSA (14), 346-386. Weed Science Society of America. (weed)
303	2007. Randall, R.P.. Global Compendium of Weeds - <i>Aesculus californica</i> [Online Database]. <a href="http://www.hear.org/gcw/species/aesculus_californica/">http://www.hear.org/gcw/species/aesculus_californica/</a>	[Agricultural/forestry/horticultural weed? No] No evidence
304	2007. Randall, R.P.. Global Compendium of Weeds - <i>Aesculus californica</i> [Online Database]. <a href="http://www.hear.org/gcw/species/aesculus_californica/">http://www.hear.org/gcw/species/aesculus_californica/</a>	[Environmental weed? No] No evidence
305	2009. Red Planet Inc.. Tree Encyclopedia - Horse Chestnut - <i>Aesculus hippocastanum</i> . <a href="http://www.cirrusimage.com/tree_horse_chestnut.htm">http://www.cirrusimage.com/tree_horse_chestnut.htm</a>	[Congeneric weed? Yes] "Horse Chestnut - <i>Aesculus hippocastanum</i> L...Ecological Impacts: This species is on the Mid Atlantic Exotic Pest Plant Council list. It has been planted as an ornamental for the attractive large white flowers and has escaped intended plantings. The weak-wooded branches break easily. The large leaves, nuts and dropping twigs create litter. Once established, this species competes with native species for sunlight, moisture and nutrients...Control and Management: • Manual- Girdle remove bark and phloem layer from 10 cm band around trunk; Note: damaging the xylem layer could encourage suckering • Chemical- Cut stems then apply herbicide; retreat suckers. Contact your state extension service. Follow label instructions and wear appropriate personal protective equipment."
401	2002. Fralish, J.S./Franklin, S.B.. Taxonomy and ecology of woody plants in North American forests (excluding Mexico and subtropical Florida). John Wiley and Sons, New York	[Produces spines, thorns or burrs? No] No evidence
401	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Produces spines, thorns or burrs? No] "General: Buckeye Family (Hippocastanaceae). This native, deciduous shrub or tree reaches 12 m in height with a broad, rounded crown. The palmately compound leaves occur in leaflets of 5 to 7 and each leaflet is oblong lanceolate and finely serrate. The inflorescence has many showy flowers in a panicle-like arrangement and it is erect, 1-2 dm. in length. Each individual flower has 4-5 petals and these are white to pale rose with 5-7 exerted stamens. The fruit is pear-shaped and smooth. The large, shiny light-brown seeds are 2-5 cm."
402	1983. Heisey, R.M./Delwiche, C.C.. A Survey of California Plants for Water-Extractable and Volatile Inhibitors. Botanical Gazette. 144(3): 382-390.	[Allelopathic? Yes] "We tested 55 plant species in northern California for water extractable and volatile inhibitors of plant growth with seed bioassays: 69% significantly inhibited, and none significantly stimulated, radicle growth of <i>Hordeum vulgare</i> when tested as 1:25 or 1:50 (g tissue:ml water) extracts, whereas 38% inhibited and 15% stimulated <i>Bromus mollis</i> . Extracts of species in the Compositae and Labiatae, as well as <i>Aesculus californica</i> , <i>Ailanthus altissima</i> , <i>Brassica nigra</i> , <i>Ceanothus integerrimus</i> , <i>Lupinus arboreus</i> , <i>Nicotiana glauca</i> , <i>Ribes cereum</i> , and <i>Scrophularia californica</i> , were the most inhibitory. Only <i>Artemisia tridentata</i> , <i>Heteromeles arbutifolia</i> , <i>Salvia sonomensis</i> , and <i>Trichostema lanceolatum</i> released strongly inhibitory volatiles; <i>T. lanceolatum</i> was clearly the most toxic species tested, its extracts and volatiles greatly suppressing growth of the indicators. Five of the species most inhibitory in the initial screening were selected for further investigation Their extracts reduced germination and growth of a number of northern California plants, but when the extracts were inoculated with 0.5 g soil and incubated several months at room temperature, most gradually diminished in toxicity"

402	2004. Jimenez, I./Woods, J.. The Alleopathic Effects of Extracts from <i>Umbellularia californica</i> and <i>Aesculus californica</i> on the Grass <i>Lolium perenne</i> . California State Science Fair Project Summary. <a href="http://www.usc.edu/CSSF/History/2004/Projects/J1412.pdf">http://www.usc.edu/CSSF/History/2004/Projects/J1412.pdf</a>	[Allelopathic? Yes] "California bay and California buckeye are species that have known allelopathic effects on other organisms. Plant growth is sparse under bay trees and buckeye seeds have been known to stupefy fish and retard the growth of competing plants. These two plants were chosen to make the herbicides in an attempt to formulate an organic herbicide to replace Roundup that is being sprayed at our school. The data on the leaf spray treatments showed the established plants changing in color from a healthy green to a definitive dead (crispy) brown one week after treatment with the 100% buckeye extract and the same results with the 100% bay extract 9 days after the initial treatment. The 50% extracts had similar effects on the established grass but with an increased time span to kill the grass. The soil treatments, had some effect in the four trials in that it took one day longer for the seeds to germinate in the treated soil and the grass at about a 20% slower growth rate. We want to continue to work with these extracts in a more uncontrolled environment in the coming year."
403	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Parasitic? No] "This native, deciduous shrub or tree reaches 12 m in height with a broad, rounded crown" [no evidence].
404	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Unpalatable to grazing animals? No] "Despite its toxicity, California buckeye flowers, leaves, and shoots are palatable to livestock and wildlife. Hedrick [14] has listed it among the 20 chaparral browse plants most preferred by cattle and black-tailed deer."
405	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Toxic to animals? Yes] "California buckeye is toxic to all classes of livestock and wildlife. The bark, leaves, stems, fruits, and seeds all contain glycosidal compounds which cause haemolytic action on red blood cells and depress the central nervous system when ingested. This species has been implicated in inducing abortion in cattle [5,18]."
406	2005. CAB International. Forestry Compendium. CAB International, Wallingford, UK	[Host for recognized pests and pathogens? Yes] "Pests recorded Fungus diseases: <i>Phytophthora ramorum</i> (sudden oak death syndrome (SODS)) Pests recorded at the generic level ( <i>Aesculus</i> ): Insects: <i>Chaetocnema confinis</i> (flea beetle) <i>Cossus cossus</i> (carpenter moth) <i>Diaspidiotus ostreaeformis</i> (pear oyster scale) <i>Diaspidiotus perniciosus</i> (San José scale) <i>Popillia japonica</i> (Japanese beetle) <i>Pseudaulacaspis pentagona</i> (mulberry scale) <i>Rosellinia necatrix</i> (dematophora root rot) <i>Scolytus intricatus</i> (European oak bark beetle) <i>Zeuzera pyrina</i> (moth, wood leopard) Fungus diseases: <i>Apiognomonium errabunda</i> (anthracnose) <i>Nectria galligena</i> ( <i>Nectria</i> canker (apple, pear)) Bacterial diseases: <i>Rhizobium radiobacter</i> (crown gall) <i>Rhizobium rhizogenes</i> (gall)"
407	2006. Quinn, R.D./Keeley, S.C./Wallace, M.D.. Introduction to California chaparral. University of California Press, Berkeley and Los Angeles, CA	[Causes allergies or is otherwise toxic to humans? Yes] "All parts of the plant are poisonous to people. The seeds were ground up and used by Native Americans to stun fish. The flowers have also been reported to be poisonous to bees."
408	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Creates a fire hazard in natural ecosystems? Yes] "Fire ecology: Early leaf fall results in accumulation of dry litter around the plant early in the fire season...Seeds would probably not survive fire because they are highly susceptible to desiccation by heat...Information regarding California buckeye's response to fire is limited. Sampson [25] has said that sprouting chaparral brush species, including California buckeye, recover rapidly following a fire, sending out new shoots during the first growing season. Growth in subsequent seasons is also rapid, with the plant sometimes exceeding its prefire mass within a few years. Sprouting can occur within a few weeks following fire, even in the summer months. Growth is supported by drawing on food and water reserves in the fully developed root system."
409	2009. Lady Bird Johnson Wildflower Center. Native Plant Database - <i>Aesculus californica</i> . <a href="http://www.wildflower.org/plants/result.php?id_plant=AECA">http://www.wildflower.org/plants/result.php?id_plant=AECA</a>	[Is a shade tolerant plant at some stage of its life cycle? Possibly No] "Light Requirement: Sun , Part Shade"
409	2009. Las Pilitas Nursery Logo. <i>Aesculus californica</i> . <a href="http://www.laspilitas.com/nature-of-california/plants/aesculus-californica">http://www.laspilitas.com/nature-of-california/plants/aesculus-californica</a>	[Is a shade tolerant plant at some stage of its life cycle? Possibly No] "Native to the central coast ranges and Sierra Nevada mountains in partial shade to full sun"
409	2011. Dave's Gardern. PlantFiles: California Buckeye - <i>Aesculus californica</i> . <a href="http://davesgarden.com/guides/pf/go/53823/">http://davesgarden.com/guides/pf/go/53823/</a>	[Is a shade tolerant plant at some stage of its life cycle? Possibly No] "Sun Exposure: Sun to Partial Shade"
409	2011. Plants For A Future Database. <i>Aesculus californica</i> . <a href="http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica">http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica</a>	[Is a shade tolerant plant at some stage of its life cycle? No] "It cannot grow in the shade... Requires a position in full sun[200]. Prefers dry sunny locations"

410	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Tolerates a wide range of soil conditions? Yes] "Soil: California buckeye grows in sandy, sandy-loam, or gravelly-loam soils"
410	2009. Lady Bird Johnson Wildflower Center. Native Plant Database - <i>Aesculus californica</i> . <a href="http://www.wildflower.org/plants/result.php?id_plant=AECA">http://www.wildflower.org/plants/result.php?id_plant=AECA</a>	[Tolerates a wide range of soil conditions? Yes] "Soil Description: Poor, dry soils."
410	2011. Dave's Gardern. PlantFiles: California Buckeye - <i>Aesculus californica</i> . <a href="http://davesgarden.com/guides/pf/go/53823/">http://davesgarden.com/guides/pf/go/53823/</a>	[Tolerates a wide range of soil conditions? Yes] "Soil pH requirements: 6.6 to 7.5 (neutral) 7.6 to 7.8 (mildly alkaline) 7.9 to 8.5 (alkaline)"
410	2011. Plants For A Future Database. <i>Aesculus californica</i> . <a href="http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica">http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica</a>	[Tolerates a wide range of soil conditions? Yes] "Prefers a deep loamy well-drained soil but is not too fussy"
411	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Climbing or smothering growth habit? No] "This native, deciduous shrub or tree reaches 12 m in height with a broad, rounded crown."
412	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Forms dense thickets? No] "California buckeye exhibits both tolerant and intolerant characteristics. It occurs as a widely scattered individuals in open grasslands. It also occurs as an understory shrub in mixed evergreen forest [3]. It is a climax indicator in chaparral and mixed oak communities [1] and in California buckeye woodlands [8]."
412	2000. Barbour, M.G./Billings, W.D.. North American terrestrial vegetation. Cambridge University Press, Cambridge, UK	[Forms dense thickets? No] "A somewhat shorter, more spreading deciduous tree, <i>Aesculus californica</i> , occurs as scattered individuals or in small clumps" [no evidence that this plant excludes other vegetation]
501	2000. Barbour, M.G./Billings, W.D.. North American terrestrial vegetation. Cambridge University Press, Cambridge, UK	[Aquatic? No] "Terrestrial"
502	2000. Barbour, M.G./Billings, W.D.. North American terrestrial vegetation. Cambridge University Press, Cambridge, UK	[Grass? No] "Hippocastanaceae"
502	2011. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN) [Online Database Index]. National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl">http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl</a>	[Grass? No] "Sapindaceae subfamily: Hippocastanoideae. Also placed in: Hippocastanaceae"
503	2000. Barbour, M.G./Billings, W.D.. North American terrestrial vegetation. Cambridge University Press, Cambridge, UK	[Nitrogen fixing woody plant? No] "Hippocastanaceae"
503	2011. USDA, ARS, National Genetic Resources Program. Germplasm Resources Information Network (GRIN) [Online Database Index]. National Germplasm Resources Laboratory, Beltsville, Maryland. <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl">http://www.ars-grin.gov/cgi-bin/npgs/html/index.pl</a>	[Nitrogen fixing woody plant? No] "Family: Sapindaceae subfamily: Hippocastanoideae. Also placed in: Hippocastanaceae"
504	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Geophyte (herbaceous with underground storage organs -- bulbs, corms, or tubers)? No] "This native, deciduous shrub or tree reaches 12 m in height with a broad, rounded crown."
601	2000. Barbour, M.G./Billings, W.D.. North American terrestrial vegetation. Cambridge University Press, Cambridge, UK	[Evidence of substantial reproductive failure in native habitat? No] No evidence
602	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Produces viable seed? Yes] "The fruit is pear shaped and smooth. The large, shiny light brown seeds are 2-5 cm...Harvest the large seeds from the tree or shrub about November. Plant them in the ground immediately--half buried in an area of full sun or light shade."



603	1989. dePamphilis, C.W./Wyatt, R.. Hybridization and Introgression in Buckeyes ( <i>Aesculus hippocastanaceae</i> ): A Review of the Evidence and a Hypothesis to Explain Long-Distance Gene Flow. <i>Systematic Botany</i> . 14(4): 593-611.	[Hybridizes naturally? Unknown] "Abstract: Evidence from morphology, distribution patterns, allozyme variation, and meiotic irregularities associated with decreased pollen germinability confirms the existence of a broad hybrid zone involving three parapatric species of <i>Aesculus</i> in the southeastern United States. The overall hybrid zone involving the three species is at least 200 km in width and probably represents the overlap of two hybrid zones: one between <i>A. pavia</i> and <i>A. sylvatica</i> and the other between <i>A. flava</i> and <i>A. sylvatica</i> . Both zones are highly asymmetrical, with hybrid populations occurring primarily in the Piedmont, where <i>A. sylvatica</i> is native. Detailed analyses of the hybrid zone involving <i>A. pavia</i> and <i>A. sylvatica</i> showed that hybrid populations consistently lack one or both of the putative parental species. Morphology and allozyme variation provide similar estimates of the position of the hybrid zone, but allozymes allow the detection of a larger zone than apparent on the basis of morphology. All available evidence is consistent with the hypothesis that extensive introgression has occurred among these species. Nevertheless, allozymic differentiation between these species is insufficient to reject hypotheses other than introgression that could generate the genetic structure observed in hybrid populations. Observations of pollinator activity in populations of <i>A. pavia</i> , <i>A. sylvatica</i> , <i>A. flava</i> , and their hybrids showed that these species share a number of important pollinators, including several species of bumblebees ( <i>Bombus</i> ) and the ruby-throated hummingbird ( <i>Archilochus colubris</i> ). Spring migration patterns of the ruby-throated hummingbird coincide closely with the flowering phenology of each of the <i>Aesculus</i> species, suggesting that hummingbirds could be vectors of long distance pollen dispersal. The lifespan of pollen under field conditions is sufficient to permit transport of pollen in this fashion over distances of tens or hundreds of kilometers. Directional migration and arrival of hummingbirds after peak flowering would enforce a directional pattern of gene flow and could generate an asymmetrical hybrid zone of unusually great width." [hybridization occurs within genus, but unknown if <i>A. californica</i> forms natural hybrids with other species]
604	2011. Plants For A Future Database. <i>Aesculus californica</i> . <a href="http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica">http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica</a>	[Self-compatible or apomictic? Unknown] "The scented flowers are hermaphrodite (have both male and female organs) and are pollinated by Bees." [unknown if able to self compatible]
605	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Requires specialist pollinators? No] "Apian considerations: Honeybees are the chief pollinators of California buckeye, but the pollen and nectar are toxic to them."
605	2005. Callahan, F.. Plant of the Year California Buckeye ( <i>Aesculus californica</i> (Spach) Nutt.). <i>Kalmiopsis</i> . 12: 9-15.	[Requires specialist pollinators? No] "The flowers are toxic to European honeybees ( <i>Apis mellifera</i> ); however, native pollinators relish the collection of nectar without side effects. The adult pale swallowtail butterfly ( <i>Papilio eurymedon</i> ) appears particularly fond of this plant."
606	2011. Dave's Gardern. PlantFiles: California Buckeye - <i>Aesculus californica</i> . <a href="http://davesgarden.com/guides/pf/go/53823/">http://davesgarden.com/guides/pf/go/53823/</a>	[Reproduction by vegetative fragmentation? No] "Propagation Methods: From seed; direct sow outdoors in fall From seed; stratify if sowing indoors From seed; direct sow after last frost" [no evidence]
607	2009. Sagebud. California Buckeye ( <i>Aesculus californica</i> ). <a href="http://plants.sagebud.com/california-buckeye-aesculus-californica/">http://plants.sagebud.com/california-buckeye-aesculus-californica/</a>	[Minimum generative time (years)? Probably 3+] "It has a moderate growth rate and a height of 40 feet at maturity." [probably flowers in >3-4 years]
607	2011. Dave's Gardern. PlantFiles: California Buckeye - <i>Aesculus californica</i> . <a href="http://davesgarden.com/guides/pf/go/53823/">http://davesgarden.com/guides/pf/go/53823/</a>	[Minimum generative time (years)? Probably 3+] "This is only for young people to plant. It grows extremely slow."
607	2011. Plants For A Future Database. <i>Aesculus californica</i> . <a href="http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica">http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica</a>	[Minimum generative time (years)? Probably 3+] "A moderately fast-growing and long-lived tree in the wild "
701	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Propagules likely to be dispersed unintentionally? No] "The fruit is pear-shaped and smooth. The large, shiny light-brown seeds are 2-5 cm." [no means of external attachment]
702	2002. Dirr, M.. <i>Dirr's trees and shrubs for warm climates: an illustrated encyclopedia</i> . Timber Press, Portland, OR	[Propagules dispersed intentionally by people? Yes] Ornamental
703	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Propagules likely to disperse as a produce contaminant? No] "The fruit is pear-shaped and smooth. The large, shiny light-brown seeds are 2-5 cm." [no evidence, and unlikely with such large seeds]

704	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Propagules adapted to wind dispersal? No] "The fruit is pear-shaped and smooth. The large, shiny light-brown seeds are 2-5 cm."
705	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescall.html">http://www.fs.fed.us/database/feis/plants/tree/aescall.html</a>	[Propagules water dispersed? Yes] "Seed dispersal is poor and is accomplished mainly by gravity or water; dispersal by animals is rare."
706	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescall.html">http://www.fs.fed.us/database/feis/plants/tree/aescall.html</a>	[Propagules bird dispersed? No] "The palatability of the seeds for black-tailed deer, rodents, and Stellar's jay is fair to poor" [birds and other animals are seed predators]
706	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Propagules bird dispersed? No] "Wildlife: Do not plant buckeyes near apiaries as the flowers are poisonous to honey bees. No wildlife eat buckeye seeds except squirrels, such as the California ground squirrel ( <i>Citellus beecheyi</i> )." [not fleshy fruited]
707	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Propagules dispersed by other animals (externally)? Yes] "Wildlife: Do not plant buckeyes near apiaries as the flowers are poisonous to honey bees. No wildlife eat buckeye seeds except squirrels, such as the California ground squirrel ( <i>Citellus beecheyi</i> )." [seed predators, but squirrels and rodents may disperse seeds by storing them for later consumption]
707	2011. Dave's Gardern. PlantFiles: California Buckeye - <i>Aesculus californica</i> . <a href="http://davesgarden.com/guides/pf/go/53823/">http://davesgarden.com/guides/pf/go/53823/</a>	[Propagules dispersed by other animals (externally)? Yes] "Squirrels will selectively eat parts of the seeds. They bury others which can sprout like acorns."
708	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescall.html">http://www.fs.fed.us/database/feis/plants/tree/aescall.html</a>	[Propagules survive passage through the gut? No] "Seed dispersal is poor and is accomplished mainly by gravity or water; dispersal by animals is rare."
708	2006. USDA NRCS. Plant Guide - California Buckeye - <i>Aesculus californica</i> . USDA NRCS National Plant Data Center, <a href="http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf">http://plants.usda.gov/plantguide/pdf/cs_aeca.pdf</a>	[Propagules survive passage through the gut? No] "Wildlife: Do not plant buckeyes near apiaries as the flowers are poisonous to honey bees. No wildlife eat buckeye seeds except squirrels, such as the California ground squirrel ( <i>Citellus beecheyi</i> )." [animal consumption of seeds likely results in predation, and not internal dispersal]
801	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescall.html">http://www.fs.fed.us/database/feis/plants/tree/aescall.html</a>	[Prolific seed production (>1000/m <sup>2</sup> )? No] "California buckeye reproduces by seed [5]. The average tree produces approximately 100 seeds per year."
802	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescall.html">http://www.fs.fed.us/database/feis/plants/tree/aescall.html</a>	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "Seeds are viable for only 1 year and are shed from November to mid February"
802	2009. Lady Bird Johnson Wildflower Center. Native Plant Database - <i>Aesculus californica</i> . <a href="http://www.wildflower.org/plants/result.php?id_plant=AECA">http://www.wildflower.org/plants/result.php?id_plant=AECA</a>	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "Description: Fall-sown seeds germinate easily without pretreatment. Seed Collection: Seeds dry and shrivel quickly."
802	2011. Plants For A Future Database. <i>Aesculus californica</i> . <a href="http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica">http://www.pfaf.org/user/Plant.aspx?LatinName=Aesculus+californica</a>	[Evidence that a persistent propagule bank is formed (>1 yr)? No] "The seed has a very limited viability and must not be allowed to dry out. Stored seed should be soaked for 24 hours prior to sowing and even after this may still not be viable"
803	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescall.html">http://www.fs.fed.us/database/feis/plants/tree/aescall.html</a>	[Well controlled by herbicides? Yes] "Control treatments: California buckeye is susceptible to spray or injection/cut surface treatments of phenoxy herbicides and picloram [7,14,27]. Hand or mechanical brush control is ineffective unless the root crown is removed [25,28]."



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804	1992. Howard, J.L.. <i>Aesculus californica</i> . In: Fire Effects Information System, [Online]. USDA Forest Service, <a href="http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html">http://www.fs.fed.us/database/feis/plants/tree/aescal/all.html</a>	[Tolerates, or benefits from, mutilation, cultivation, or fire? Yes] "sexual: California buckeye can sprout from the stump or root crown...Plant adaptations: California buckeye sprouts from the root crown after aboveground portions of the plant have been damaged [5,28]. Seeds would probably not survive fire because they are highly susceptible to desiccation by heat...Information regarding California buckeye's response to fire is limited. Sampson [25] has said that sprouting chaparral brush species, including California buckeye, recover rapidly following a fire, sending out new shoots during the first growing season. Growth in subsequent seasons is also rapid, with the plant sometimes exceeding its prefire mass within a few years. Sprouting can occur within a few weeks following fire, even in the summer months. Growth is supported by drawing on food and water reserves in the fully developed root system [20]."
805	2011. WRA Specialist. Personal Communication.	[Effective natural enemies present locally (e.g. introduced biocontrol agents)? Unknown]

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