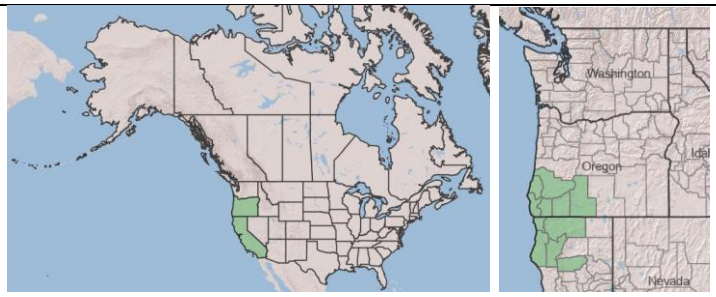
Plant Propagation Protocol for *Quercus sadleriana*

ESRM 412 – Native Plant Production

URL: https://courses.washington.edu/esrm412/protocols/*2026 /QUSA2.pdf*

Plant habit, young (left) and shoot (right). Sourced from Landscape Plants - Oregon State University.[4]

TAXONOMY	
Plant Family	
Scientific Name	Fagaceae Dumort.
Common Name	Beech family
Species Scientific Name	
Scientific Name	*Quercus sadleriana* R. Br. ter
Varieties	*No recognized varieties.*
Sub-species	*No recognized subspecies.*
Cultivar	*No common cultivars.*
Common Synonym(s)	*No common synonyms.*
Common Name(s)	Deer Oak, Sadler's Oak, Sadler Oak
Species Code (as per USDA Plants database)	QUSA2
Other Comments:	*Q. sadleriana* is likely a relict species, lacking close taxonomic relationships to other western U.S. oak species.[2,9-10] While sharing visual similarities to chestnut oaks that occur in the eastern U.S. and East Asia, *Q. sadleriana* is a genetically distinct species.[10] *Q. sadleriana* is instead classified into Section *Ponticae*, along with only one other species: *Quercus pontica*.[9] *Q. pontica* is separated from *Q. sadleriana* by 165° longitude (and exists on a range limited

	only to the Caucasus Mountains), but it still shares similar physical characteristics and environmental requirements with *Q. sadleriana.*[9]
GENERAL INFORMATION	
Geographical range	 *United States (left) and Pacific Northwest (right) distribution of* Q. sadleriana*. Entire geographic range visible in right image. from USDA PLANTS Database.*[14] *Q. sadleriana* is endemic to the Klamath-Siskiyou mountain region.[2,4]
Ecological distribution	Commonly grows on rugged, steep, and rocky slopes and ridges in full sun or part shade.[2,4,10] Tolerates a wide variety of soil types and depths, and appears to be adapted to serpentine soils.[2,10] Generally found to occur on acidic soils with low nitrate levels.[10]
Climate and elevation range	Adapted to heavy winter precipitation (both snow and rain) with little to no summer precipitation.[4,10] *Q. sadleriana* is also adapted to long winters (Sept. – June/July) and hot summers.[4,10] Elevations of 600-2200 meters.[2]
Local habitat and abundance	*Q. sadleriana* is a dominant member of the Montane Scrub community on middle to upper elevation, south- and west-facing slopes.[2,10] It is a dominant member of the shrub layer for many coniferous forest association groups within its range.[4,10] Generally occurs on forest edges and as low ground cover.[4] Associates include red fir, white fir, noble fir, Brewer's spruce, Douglas-fir, hemlock, Port Orford cedar, and tanoak.[2,10]

Plant strategy type / successional stage	Stress-tolerator species: adapted to rocky, acidic, and serpentine soils, very low nutrient levels, and a broad range of temperature and precipitation conditions.[2,10] On low-elevation sites, habitat integrity is dependent on frequent low-intensity fires.[2] In line with this, *Q. sadleriana* was found to be thriving on a previously burnt-over region by a Hoyt Arboretum seed collection group.[5]
Plant characteristics	A small thicket-forming shrub reaching 6-10' at maturity.[4] *Q. sadleriana* appears to primarily reproduce vegetatively via rhizomes and layering.[10] Twigs glabrous.[4] *Q. sadleriana* has extremely distinctive chestnut-like leaves. [2,4-5] Leaves are simple, alternate, dentate, with rounded or wedge-shaped base and acute or obtuse apex. [4] Foliage is evergreen to semi-evergreen. [4] Fruit is an ovoid acorn: 1.3-1.8 cm.[4] *Q. sadleriana* has annual fruit maturation, with high acorn production occurring in mast years.[4,7,10]
Other Comments: Species specific propagation information	Propagation information on *Q. sadleriana* is not widely available. Muth, G. J. (1979)[10] reported trying with "great difficulty" to germinate *Q. sadleriana* using acorns, and concluded that from the "scanty evidence available" that vegetative propagation, specifically layering, should be considered a major form of reproduction for the species. This suggests that vegetative methods (root cuttings) should be considered for the propagation of *Q. sadleriana*. Researchers with the Hoyt Arboretum[5] reported collecting acorns for restoration and collection work, which suggests that propagation from seed may be a viable method.
PROPAGATION DETAILS: FROM SEED [*Quercus garryana*]	
Prepared for Oregon White Oak (*Q. garryana*), with some notes on general methods for	*Q. garryana* is an imperfect congener for *Q. sadleriana* in terms of propagation. However, both species are white oaks (*Quercus* subg. *Quercus)* and thus share characteristics common to the subgenus. The species are associates on some sites and are known to hybridize.[7] The specific acorns used to develop the referenced *Q. garryana*

white oaks (*Quercus* subg. *Quercus*).	propagation protocol[12] were sourced from within *Q. sadleriana*'s range, which suggests stratification requirements may be similar. Similar practices in terms of collection, cleaning, and processing of acorns are used for species across the genus *Quercus*.[3,6,11] This suggests this information is reasonably valid for *Q. sadleriana.*
Ecotype	Rogue River-Siskiyou and Willamette National Forests, Oregon[12]
Propagation Goal	Plants[12]
Propagation Method	Seed[12]
Product Type	Container (plug)[12]
Stock Type	656 ml (40 in^3) container[12]
Time to Grow	18 months[12]
Target Specifications	Root system should form firm plug in container.[12] Oak out-planting success is highly dependent on root system quality.[6]
Propagule Collection Instructions	Acorns are ripe when natural dissemination occurs (separation from acorn cap and falling).[3] Collection can be performed prior to or immediately following natural dissemination to avoid seed losses to predators, desiccation, and early germination.[3,11-12] Earlier indications of maturity for most oak species include (1) change in pericarp color from green to yellow, brown, or black; (2) a cup scar colored pink, lemon, orange, or white; and (3) cups that slip easily from the acorns without resistance.[3] Acorns should be floated in water by the end of each collection day to check for quality via a float-test (described in Pre-Planting Propagule Treatments) and to maintain high moisture content in the period between collection and storage and/or stratification.[3]
Propagule Processing/Propagule Characteristics	For *Q. sadleriana*: acorns are ovoid and 1.3-1.8 cm.[4] *No information found on* Q. sadleriana *seed density or longevity.*
Pre-Planting Propagule Treatments	**Cleaning** The only cleaning required is removal of loose cups, twigs, and debris.[1] Quality of seed can be improved by removing acorns without healthy, intact embryos: this can be performed by hand or using a float test.[1,3,11] For a float test: sound acorns sink and other material including empty and damaged acorns float (though it is an imperfect method). [1,3,11] Floating acorns can be discarded prior to stratification.[1,3,11] Consider moisture conditions from collection site in

	implementing the float test: very arid conditions can lead to sound acorns floating initially (avoid by conducting float test overnight for these sites), wet conditions may lead to unsound acorns sinking (avoid by drying acorns for a few hours prior to testing for these sites).[3] Weevil larvae are a common problem in acorn collection. [3,11] Larvae can be killed by immersing acorns in hot water (120 °F for 40 minutes) or by fumigating them in a container with methyl bromide, carbon disulfide, or thiamine bisulfite.[3,11] Care should be exercised with hot water treatment, as a temperature of 125 °F can kill the acorns.[3,11] **Storage** As a general rule, acorns store badly. [1,3,6,11-12] As recalcitrant seeds acorns do not tolerate desiccation, so maintaining moisture levels in storage is paramount to allow for successful spring germination.[1,3,6,11-12] Additionally, white oak germination may occur during storage and survival rates can become quite low, making it very ill-advised to attempt to store seeds longer than 6 months.[3] *Q. garryana* seeds can be surface dried, placed in plastic bags, and stored at 3 °C for up to 1 month post-collection, if moisture levels are maintained between 30-50% (45-50% is a safe range).[3,11-12] Following this period, they should immediately be placed into stratification.[12] **Dormancy** With very few exceptions, white oak group acorns have little to no dormancy and germination occurs immediately after falling.[11] **Stratification Period** Place seeds into a 1% hydrogen peroxide (3:1 water/3% hydrogen peroxide) soak for 24 hours, rinse, and then place in aerated water for an additional 48 hours.[12] Then, place seeds on mesh-bottom trays, seal in plastic bags, and put in refrigeration at 1 to 3 °C for 60 days.[12] Check seeds weekly. If mold is evident, treat seeds with 1% hydrogen peroxide. [12] If an acorn radicle has started to emerge, sow the germinated seed immediately.[12]
Growing Area Preparation / Annual	Growing medium used is 40:20:20:20 peat:composted fir bark:perlite:pumice with Apex controlled release fertilizer

Practices for Perennial Crops	(16N:5P2O5:10K2O with minors; 6 to 7 month release rate at 21 °C) at the rate of 3 g Apex per 656 ml container.[12] In general, for growing oaks… the most common container medium used is a combination of pine bark, peat, and sand (3: 1: 1). [6] In addition, Osmocote (18-6-12) fertilizer is used along with weekly applications of liquid (30-10-10) fertilizers.[6]
Establishment Phase Details	After stratification, acorns are directly sown at a density of one per container.[1,12] Place acorns radicle-end downward at a 45-degree angle to allow both the radicle and cotyledon to properly grow.[1] If acorn has already germinated, gently twist radicle through the growing media in a downward motion to minimize potential damage.[1] Lightly cover with nursery grit.[12] Keep germination media moist by providing a light misting every other day.[1] Emergence occurs unevenly and may take 4-5 weeks. [12] Once the majority of germination has occurred, fertilize cells for 3 weeks with soluble 12-2-14-6Ca-3Mg at 75 to 100 ppm (frequency not specified in source protocol).[12]
Length of Establishment Phase	Seeding should be done in the fall to avoid the difficulties of storing acorns until spring (including fungi and early germination within storage).[3,11] From seeding to germination and emergence is very slow and can take up to 5 to 6 weeks.[12] Germination and visible radicle growth may already be occurring in some acorns at time of seeding, and germination also often occurs immediately after seeding.[1,11]
Active Growth Phase	During the first growing season, fertilization is dependent on weather and physiological needs.[12] Soluble 20-9-20 NPK, 20-18-18 NPK, or 17-5-24 NPK at a range of 100 to 150 ppm is applied weekly.[12] In the spring on the second growing season, seedlings are hand-fertilized with Apex controlled release fertilizer (16N:5P2O5:10K2O; 6 to 7 month release rate at 21C) at the rate of 3 gram Apex per 565 ml container.[12] Throughout the remainder of the growing season, seedlings are fertilized weekly with soluble 20-9-20 NPK or 20-18-18 NPK at a rate of 150 ppm.[12]
Length of Active Growth Phase	18 weeks[12]

Hardening Phase	No dry-down is done to induce dormancy. [12] Seedlings are moved to an outdoor growing area in mid-September of the second growing season.[12]
Length of Hardening Phase	3 to 4 weeks[12]
Harvesting, Storage and Shipping	Harvest in mid-October[12] Store in outdoor growing area.[12] Keep plants well-irrigated prior to shipping.[12]
Length of Storage	*No information found on storage length.*
Guidelines for Outplanting / Performance on Typical Sites	*No information found on outplanting guidelines.*
INFORMATION SOURCES	
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