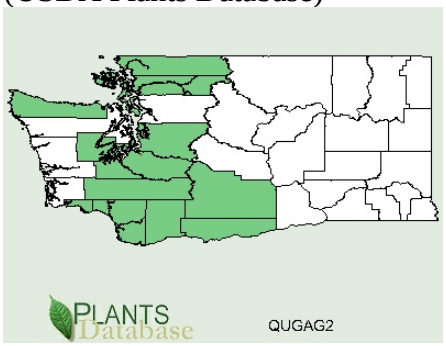
Plant Propagation Protocol for *Quercus garryana*
ESRM 412 – Native Plant Production
Spring 2008

TAXONOMY	
Family Names	
Family Scientific Name:	Fagaceae
Family Common Name:	Beech
Scientific Names	
Genus:	Quercus
Species:	Garryana
Species Authority:	Douglas ex. Hook
Variety:	garryana
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	
Common Name(s):	Garry oak, Oregon white oak
Species Code:	QUGAG2
GENERAL INFORMATION	
Geographical range	 (USDA Plants Database)  (USDA Plants Database) Range extends from British Columbia to California's Transverse ranges (Brenzel 2007).
Ecological distribution:	Garry oak occupies a diverse range of ecosystems. Because of its slow growing nature it often grows in areas too droughty

	or exposed for other tree species (Burnas and Honkala 1990). Can often be found on hills, bluffs and in valleys where well-drained rich soils occur or in dry rocky areas (Pojar and Mckinnon 1994).
Climate and elevation range	Found in zones 2a-11 and 14-23 (Brenzel 2007). Can endure temperatures from -34 degrees Celsius to 43 degrees Celsius but annual average temperatures in the Garry Oak range from 8-18 degrees Celsius. Average annual precipitation ranges from 170mm to 2630mm. Also found at low elevations up to 2290m (Burns and Honkala 1990).
Local habitat and abundance; may include commonly associated species	*Quercus garryana* is recognized as its own forest cover type and as an associated plant in eight other forest covert types. Because of this there is a very long list of associated plants with garry oak. The associated plants can be divided into the two community types that would include oak parkland and scrub-oak rock outcrop. Tow common shrub associations would be *Symphoricarpos albus,* and *Rhus diuersiloba* (Burns and Honkala 1990). Other associated species include, but are not limited to, *Pseudotsuga menziesii, Pinus ponderosa, Rubus parviflorus, Vaccinium ovatum, Mahonia aquifolium, Festuca idahoensis, Elymus glaucus, Danthonia californica* (Franklin and Dyrness 1973, Burns and Honkala 1990).
Plant strategy type / successional stage	Seral and climax species (Burns and Honkala 1990).
Plant characteristics	Deciduous, perennial trees or shrubs with entire deeply-rounded leaf lobes. Acorns ovoid to subglobose and 2-3cm in length maturing in 2 years (Hitchcock and Cronquist 1973). Has slow to moderate growth from 40-90 ft. tall and 30-60 ft. wide with rounded crown (Brenzel 2007). Bark is light gray with thick furrows and ridges (Pojar and Mckinnon 1994)
PROPAGATION DETAILS	
Ecotype	
Propagation Goal	Plants
Propagation Method	Seed
Product Type	Container
Stock Type:	
Time to Grow	There is a rapid development of the tap root initially, and shoot growth is slow but can be increased by increasing the photoperiodsm (Burns and Honkala 1990).
Target Specifications	Well established roots and some leafing
Propagule Collection	Should be collected when the acorn has turned to a brown and can be easily picked or shaken off of a tree (TWC 2007). The maturation of fruit usually occurs from late August to early November (Burns and Honkala 1990).
Propagule Processing/Propagule	No processing is necessary. Seeds are not dormant and therefore should be planted as quickly as possible. Must be

Characteristics	kept at 30% moisture content or higher in cold refrigerated conditions if stored to maintain seed viability. Acorns are usually large and heavy weighing 5grams each pound or 85grams/pound of seeds. *Q. garryana* can have high yields of fruits but can oftn be irregular in its abundance (Burns and Honkala 1990).
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	Should be planted as soon as possible to prevent loss of viability. May be soaked in hot water for 15 minutes to prevent weevil infestation (TWC 2007).
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	1-gallon containers necessary to contain the rapidly growing taproot. Well-drained potting soil should be used that I kept moist and well aerated. The seed should be planted 1-2 inches deep and the seedling should be transplanted once the first leaves open and are firm (Wilken and Burgher 2000).
Establishment Phase (from seeding to germination):	
Length of Establishment Phase:	
Active Growth Phase (from germination until plants are no longer actively growing):	
Length of Active Growth Phase:	
Hardening Phase (from end of active growth phase to end of growing season; primarily related to the development of cold-hardiness and preparation for winter):	
Length of Hardening Phase:	
Harvesting, Storage and Shipping (of seedlings):	
Length of Storage (of seedlings, between nursery and outplanting):	
Guidelines for Outplanting / Performance on Typical Sites	Planting holes should be 2X as long and deep as the original container and may need a large amount of water until established (Wilken and Burgher 2000).
Other Comments (including collection restrictions or guidelines, if available):	Seeds are the easiest method for propagation for *Q. garryana*. Fire regimes are important methods of management for once the seedlings are planted in their ecosystem. This will help to promote growth and reduce competition (Wilken and Burgher 2000).
INFORMATION SOURCES	
References (full citations):	Brenzel, Kathleen Norris. 2007. Western Garden Book. 8th

	edition. Menlo Park (CA): Sunset Publishing Corp. Burns, Russell M., and Barbara H. Honkala, tech. coords. 1990. Silvics of North America: 1. Conifers; 2. Hardwoods. Agriculture Handbook 654. U.S. Department of Agriculture, Forest Service, Washington, DC. vol.2, 877 p. Franklin, J.F. and C. T. Dyrness. 1973. Natural Vegetation of Oregon and Washington. Corvallis (OR). Oregon State University Press. Hitchcock and Cronquist. 1973. Flora of the Pacific Northwest. Seattle (WA): University of Washington Press. Pojar, Jim and Andy McKinnon. 1994. Plants of the Pacific Northwest Coast. Vancouver (BC): Lone Pine. TWC Staff. 2007. Quercus garryana Dougl. ex Hook. URL: http://www.wildflower.org/plants/result.php?id_plant=QUGA4 (accessed 4/29/2008). Lady Bird Johnson Wildflower Center, Austin (TX): University of Texas at Austin. USDA Plants Database. 2008. *Quercus garryana* Douglas ex Hook. var. *garryana* Oregon white oak. URL:http://plants.usda.gov/java/profile?symbol=QUGAG2 (accessed 4/29/2008). Natural Resource Conservation Service. Wilken Dieter and Julie Burgher. 2000. Oregon Oak. USDA, NRCS. Santa Barbara botanic Garden, Santa Barbara.
Other Sources Consulted (but that contained no pertinent information) (full citations):	
Protocol Author (First and last name):	Brandon Neuhaus
Date Protocol Created or Updated (MM/DD/YY):	Updated 04/30/2008

Plant Data Sheet

Species (common name, Latin name)
Oregon white oak or Garry oak, Quercus garryana, Dougl. ex Hook.

Range
Occurs from southwestern British Columbia, along the Pacific Coast, south to the Coast Ranges and Sierra Nevada of California. (FEIS Database; Silvics of North America)

Climate, elevation
Oregon white oak grows from sea level to 5,000 feet (1,524 m) in elevation in highly variable climatic regimes. It is found in cool, humid conditions near the coast and in hot, dry environments of inland valleys and foothill woodlands and can endure temperature extremes from -30 to 166 degrees (-34 to 47 deg C). Average annual precipitation ranges from 262 cm (103.5 inches) to 30 cm (10.6 inches). (FEIS database)

Local occurrence
Locally, Oregon white oak occurs in oak savannas or woodlands and mixed forests on dry sites such as inland valleys and foothills, south slopes, unglaciated and glaciated rocky ridges. Because it can tolerate both drought and lengthy flooding, Oregon white oak also occurs along riparian corridors in association with Fraxinus latifolia. (Silvics of North America)
Habitat preferences
Can grow in a wide variety of productive or harsh habitats, but is usually out-competed on the more productive sites. Therefore, Oregon white oak tends to dominate on either excessively dry or wet sites that limit less tolerant species within its range. (FEIS database)

Plant strategy type/successional stage
Stress tolerator. (Silvics of North America)

Associated species
Distribution on both wet and dry sites leads to a diverse list of associated species including Pseudotsuga menziesii, Pinus ponderosa, Abies amabilis, Tsuga heterophylla, Thuja plicata, Quercus spp., Arbutus menziesii, Betula occidentalis, Acer macrophyllum, Arctostaphylos spp., Ceanothus spp., Rubus parviflorus, Vaccinium ovatum, Mahonia aquifolium, Festuca idahoensis, Elymus glaucus, Danthonia californica, Phacelia linearis, and many more. (FEIS database; Franklin and Dyrness 1973)

May be collected as:
Acorns

Collection restrictions or guidelines
Acorns ripen from late August to November. This is a masting species that only produces heavy acorn crops periodically. Seeds must be kept moist between collection and sowing to ensure viability. (Silvics of North America)

Seed germination
Seeds are not dormant and will germinate as soon as they are exposed to warm, moist conditions. (Silvics of North America)

Seed life

Oak seeds generally do not store well and should be planted soon after maturity (Wilken and Burgher 2000). However, Acorns can be stored for short periods if high moisture content (30 % or more) and low temperatures are maintained in the storage facility. (Silvics of North America)

Recommended seed storage conditions
Store with high acorn moisture content (30 % or more) at cool, regulated temperatures. (Silvics of North America)

Propagation recommendations
Direct seeding at the beginning of winter or container production by seed are recommended. Container grown material can be produced by planting seeds into one-gallon containers of well-drained potting soil with a slow release fertilizer. Seeds should be planted 1-2 inches deep and the soil should be kept moist and aerated. (Wilken and Burgher 2000)

Cuttings and layering are difficult with oak species. (Silvics of North America)

Soil or medium requirements (inoculum necessary?)
See propagation section above.

Installation form (form, potential for successful outcomes, cost)
Direct seeding with protection from seed predators and herbivores for the acorns and seedlings at the beginning of winter or container grown seedlings planted in spring (after the first leaves open and become firm). (Silvics of North America; PLANTS database)

Recommended planting density
300 to 800 trees per acre. (PLANTS database)

Care requirements after installed (water weekly, water once etc.)
Watering every 2-3 weeks during the first growing season and weeding young plants until they are 6-10 inches tall are recommended (Wilken and Burgher 2000). Some form of protection from seed predators and/or herbivores is recommended (Silvics of North America).

Normal rate of growth or spread; lifespan
Initial growth is concentrated on development of a taproot. Shoot development is slow; seedlings may take 10 years or more to attain 1 m (3.3 feet) in height. Growth from root and collar sprouts of mature trees following fire is vigorous. (FEIS database)

Sources cited

FEIS database: http://www.fs.fed.us/database/feis/plants/tree/quegar/index.html
Accessed 5/2/2003

Franklin, J.F. and C. T. Dyrness. 1973. Natural Vegetation of Oregon and Washington. Oregon State University Press, Corvallis.

PLANTS database: http://plants.usda.gov/. Accessed 5/2/2003

Silvics of North America: http://www.na.fs.fed.us/spfo/pubs/silvics_manual/volume_2/quercus/garryana.htm. Accessed 5/2/2003

Wilken, D. and Burgher, J. 2000 Oregon Oak: Quercus garryana Doug. ex Hook. Accessed on 5/2/03 through PLANTS database: http://plants.usda.gov/

Data compiled by (student name and date) Anne G. Andreu, 5/2/03

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