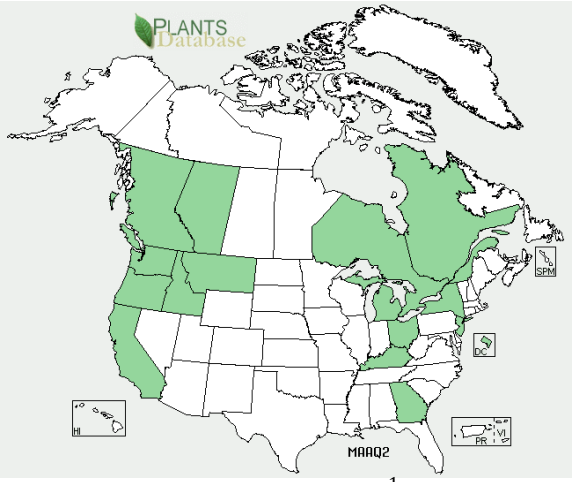
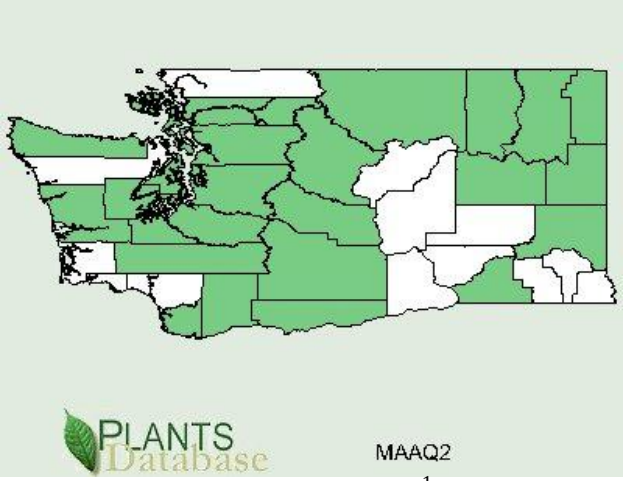
Plant Propagation Protocol for *Mahonia aquifolium*
ESRM 412 – Native Plant Production



Distribution in North America[1]



Distribution in Washington state[1]

TAXONOMY	
Family Names	
Family Scientific Name:	*Berberidaceae*
Family Common Name:	Barberry
Scientific Names	
Genus:	*Mahonia**
Species:	*aquifolium*
Species Authority:	Pursh
Variety:	
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	
Common Synonym(s) (include full scientific names (e.g., *Elymus glaucus* Buckley), including variety or subspecies information)	BEAQ *Berberis aquifolium* (Pursh) BEAQA *Berberis aquifolium* Pursh var. aquifolium BEPI2 *Berberis piperiana* (Abrams) McMinn MAPI3 *Mahonia piperiana* Abrams ODAQ *Odostemon aquifolium* (Pursh) Rydb.
Common Name(s):	Oregon grape, barberry[1] tall mahonia, hollyleaved barberry, mountain grape, Oregon grape-holly, and Oregon hollygrape[2] shining Oregon grape[3]
Species Code (as per USDA Plants database):	MAAQ2
GENERAL INFORMATION	

*Though *Mahonia* is still the commonly accepted name, this plant has been placed in the *Berberis* genus[5]

Geographical range (distribution maps for North America and Washington state)	See above maps British Columbia to Northern California[7]
Ecological distribution (ecosystems it occurs in, etc):	Habitat preference: open woods, clearings[7] Mesic to dry open or closed forests in the lowland steep and montane zones, open sites and woods and thickets.[3] Common on disturbed sites and under open-canopy Douglas-fir forests in the coast and interior.[7]
Climate and elevation range	Cool, moderate shade, no severe winter wind. [7] Low elevations[9] Found from sea level to 1800 m in B.C.[3]
Local habitat and abundance; may include commonly associated species	Location: Understory of Arbutus menziesii/ Psuedotsuga menziesii dominated forest of Puget trough. Abundance: Represents 4% or less of the understory in this forest.[8]
Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	Adapted to coarse and medium textured soils, but not fine textured soils.[1] Low $CaCO_3$ tolerance [1] High drought tolerance[1] Can handle soil with a pH between 5 and 8.[1,7] Shade tolerant[1,7] No salinity tolerance[1] Natural stands contain scattered individual plants arising from seeds and clumps of the species arising both from seed and suckers.[2]
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc)	Shrub, subshrub[1] Moderate growth rate according to the USDA[1] Maximum height of 8 feet[1]

	Berberis aquifolium is an upright evergreen shrub from 0.6 to 3 m in height. The stems are slender, stiff, usually upright, and usually without branches. The wood is whitish and brittle. The root systems produce horizontal rhizomes up to 1.8 m long from which suckers arise. It has alternate, stiff and leathery, pinnately compound leaves, which have five to 13 leaflets with a form like holly (coarse dentate with prickles). Leaves are dark green above, except in winter, when exposed leaves take on a purplish color. They have bright-yellow flowers in terminal (sometimes lateral) racemes. The flowers have a honey-like fragrance. The fruits (berries) are 6 to 10 mm long and ripen from green to blue or blue-black in late summer.[2]
PROPAGATION DETAILS	
Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from):	N/A
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Plants
Propagation Method (Options: Seed or Vegetative):	Seeds
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Bareroot
Stock Type:	N/A
Time to Grow (from seeding until plants are ready to be outplanted):	N/A
Target Specifications (size or characteristics of target plants to be produced):	N/A
Propagule Collection (how, when, etc):	Hand picking or flail onto cloths. Check fruits frequently prior to collection to determine collection timing and to avoid losses to birds and mammals. Mature seeds are a dark burgundy in color and 3-5 mm in length.[3]
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	33,000 seeds per pound of fruit[1] Could not find any record of longevity

Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	According to John Francis of the Forest Service, the fruits can be cleaned by gentile maceration, wet sieving, and screening. Seeds should not be allowed to dry out completely and should be stratified at 5 °C before sowing.[2] In a trial by Jim Barner of the Forest Service, the seeds were cleaned by maceration. The pulp and debris were floated off; seeds are dried on mesh trays. The lot was then air-screened using an office Clipper, with a top screen: 9 round and a bottom screen: 1/23 round, medium speed, high air.[5] Seeds can be stored at 33-38 degrees F.[5,10] Stored seeds should be cold stratified for 90 days before planting in the spring.[3]
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	In place of cold stratification, seeds can be sown in fall and covered with 0.3-1.3 cm of soil plus 0.5 cm of sand and then another layer of mulch until germination begins.[3] Planting Density per Acre, Minimum: 1700[1] Planting Density per Acre, Maximum: 4800[1]
Establishment Phase (from seeding to germination):	No Information
Length of Establishment Phase:	No Information
Active Growth Phase (from germination until plants are no longer actively growing):	Prick out the seedlings when they are large enough to handle and grow them on in a cold frame for at least their first winter.[6]
Length of Active Growth Phase:	No Information
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):	No Information
Length of Hardening Phase:	No Information
Harvesting, Storage and Shipping (of seedlings):	No Information
Length of Storage (of seedlings, between nursery and outplanting):	No Information
Guidelines for Outplanting / Performance on Typical Sites (eg,	Plant them out in late spring or early summer.[6]

percent survival, height or diameter growth, elapsed time before flowering):	
Other Comments (including collection restrictions or guidelines, if available):	No Information

PROPAGATION DETAILS

Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from):	N/A
Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Plants
Propagation Method (Options: Seed or Vegetative):	Vegetative
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Bareroot
Stock Type:	N/A
Time to Grow (from seeding until plants are ready to be outplanted):	N/A
Target Specifications (size or characteristics of target plants to be produced):	N/A
Propagule Collection (how, when, etc):	N/A
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	No Information
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	

Method	Success Rate	Collection Time
Softwood	Good	Late spring to early summer
Semi-Hardwood Cuttings	Moderate to Good	Late summer to early fall from shoots of current year's growth
Hardwood Cuttings	Moderate to Good	Late fall through early winter from current years wood that is dormant, leafless and buds not yet swollen

	<table><tr><td>Root Cuttings</td><td>High</td><td>Spring</td></tr><tr><td>Suckers</td><td>Good</td><td>Spring</td></tr></table> From source 3. Treat cuttings with rooting hormone and use 2:1 vermiculite:sand medium in a cold frame.[3] According to John Francis of the Forest Service, cuttings root well when taken in November and treated with 0.8 to 1.0 percent of IBA (Indolbuteric acid).[2] Division of established plants is an alternate method of vegetative propagation.[2]
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	No Information
Establishment Phase (from seeding to germination):	No Information
Length of Establishment Phase:	No Information
Active Growth Phase (from germination until plants are no longer actively growing):	No Information
Length of Active Growth Phase:	No Information
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):	No Information
Length of Hardening Phase:	No Information
Harvesting, Storage and Shipping (of seedlings):	No Information
Length of Storage (of seedlings, between nursery and outplanting):	No Information
Guidelines for Outplanting / Performance on Typical Sites (eg, percent survival, height or diameter growth, elapsed time before flowering):	No Information
Other Comments (including collection restrictions or guidelines, if available):	No Information

INFORMATION SOURCES

References (full citations):	[1]"*Mahonia aquifolium* (Pursh) Nutt." The PLANTS database. USDA, NRCS. 12 May 2010. <http://plants.usda.gov/java/profile?symbol=MAAQ2 >. [2] Francis, John K. USDA Forest Service and International Institute of Tropical Forestry. *"Mahonia aquifolium* (Pursh) Nutt." San Juan, PR. [3] Garry Oak Ecosystems Recovery Team. 2008. "Mahonia aquifolium (Tall Oregon Grape)." *Native Plant Propagation Guidelines: shrubs.* <http://www.goert.ca/propagation_ guidelines/shrubs/mahonia_aquifolium>. [4] Lady Bird Johnson Wildflower Center. 2010."Mahonia aquifolium." *Native Plant Database*. University of Texas at Austin. <http://www.wildflower.org/plants/result.php?id_ plant=MAAQ2 >. [5]Barner, Jim 2009. "Propagation protocol for production of *Berberis aquifolium* Pursh seeds." *Native Plant Network* USDA FS - R6 Bend Seed Extractory, Bend, Oregon. 18 May 2010. <http://www.nativeplantnetwork.org> Moscow, ID: University of Idaho, College of Natural Resources, Forest Research Nursery. [6]Plants For a Future. 2003. Plants for a future: database search results: *Mahonia aquifolium*. <http://www.ibiblio.org /pfaf/cgi-bin/arr_html?Mahonia+aquifolium>. [7]NORTHWESTERN NATIVE PLANTS FOR URBAN LANDSCAPES: ORNAMENT AND RESTORATION IN THE NATIVE IDIOM. Center for Urban Horticulture, May 1994 [8] <http://soilslab.cfr.washington.edu/madrone/ch01_ch.pdf> [9]<http://www.nps.gov/noca/rescat/rescat9g.htm> [10]<http://wpsm.net/Berberis.pdf>.
Other Sources Consulted (but that contained no pertinent information) (full citations):	"tall Oregon grape." Native Plant Guide. King County. 2008. 18 June 2010. <http://green.kingcounty.gov/Go Native/Plant.aspx?Act=view&PlantID=25>.

	Brenzel, Kathleen Norris. *Sunset Western Garden Book*. Menlo Park, CA: Sunset Pub., 2007. Print.
Protocol Author (First and last name):	Hannah Harper
Date Protocol Created or Updated (MM/DD/YY):	18 May 2010

Note: This template was modified by J.D. Bakker from that available at:
http://www.nativeplantnetwork.org/network/SampleBlankForm.asp

Species (common name, Latin name)

'Tall Oregon Grape' BERBERIDACEAE Berberis aquifolium

Range

1. British Columbia to Northern California

Climate, elevation

1. Cool, moderate shade, no severe winter wind.

3. Low elevations

Local occurrence (where, how common)

2. Understory of Arbutus menziesii/ Psuedotsuga menziesii dominated forest of Puget trough, 4% or less.

Habitat preferences

1. Open woods, clearings.

Plant strategy type/successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)

Associated species

2. Arbutus menziesii, Psuedotsuga menziesii, Salix scouleriana, Tsuga heterophylla, Abies grandis, Thuja plicata, Pinus contorta. Symphoricarpos albus, Vaccinium ovatum, Lonicera hispidula, Holodiscus discolor. Festuca occidentalis

May be collected as: (seed, layered, divisions, etc.)

1. Best collected by cuttings or division

Collection restrictions or guidelines

1. Take cuttings in November

Seed germination (needs dormancy breaking?)

1. Seeds require 90 days at 41 degrees F, not dried after collection

Seed life (can be stored, short shelf-life, long shelf-life)

4. 3-4 years at just above 0 C.

Recommended seed storage conditions

4. Seperate seeds from berries, dry superficially, seal in jar and store at temperature just above 0 C.

Propagation recommendations (plant seeds, vegetative parts, cuttings, etc.)

1. Best to propagate by cutting or division to get a desirable form and consistencey if to by used in a hedge or background setting.

Soil or medium requirements (inoculum necessary?)

1. Well drained acidic soil

Installation form (form, potential for successful outcomes, cost)

1. Good for a hedge or border, background or ground cover. Plant grow to 2m, can reach 3m; approximately 1-2m spread.

Care requirements after installed (water weekly, water once etc.)

Drought tolerator, Pruning required to maintain good appearance.

Normal rate of growth or spread; lifespan

1. Grows 1m every 3-4 years.

Sources cited

1. WOODY NORTHWESTERN NATIVE PLANTS FOR URBAN LANDSCAPES: ORNAMENT AND RESTORATION IN THE NATIVE IDIOM. Center for Urban Horticulture, May 1994
2. <http://soilslab.cfr.washington.edu/madrone/ch01_ch.pdf>

3. <http://www.nps.gov/noca/rescat/rescat9g.htm>
4. <http://wpsm.net/Berberis.pdf>.

Data compiled by (student name and date)

Rob Wines, June 11 2003