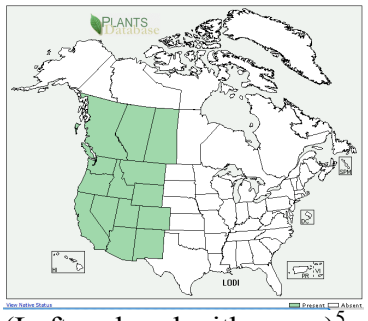
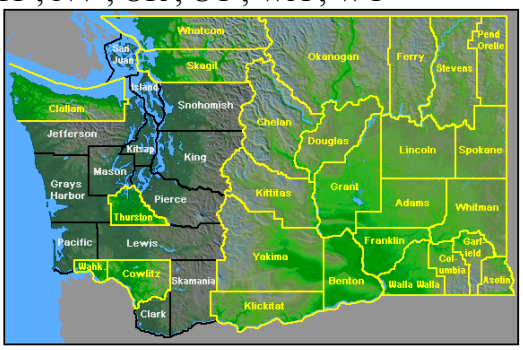
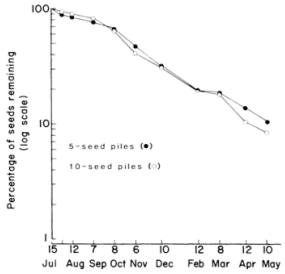
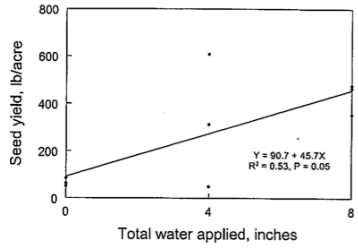
Plant Propagation Protocol for *Lomatium dissectum*
ESRM 412 – Native Plant Production

TAXONOMY	
Family Names	
Family Scientific Name:	Apiaceae
Family Common Name:	Carrot Family
Scientific Names	
Genus:	*Lomatium*
Species:	*dissectum*
Species Authority:	Mathias & Constance
Variety:	*Lomatium dissectum var. dissectum* *Lomatium dissectum var. multifidum*
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)	*Ferula multifida* (Nutt.) A. Gray *Leptotaenia dissectum* Nutt. *Leptotaenia multifida* Nutt.
Common Name(s):	Giant Biscuitroot, Fernleaf Biscuitroot, Giant Lomatium, Giant Desertparsley, Chocolate-tips, Cough Root
Species Code (as per USDA Plants database):	LODI
GENERAL INFORMATION	
Geographical range (distribution maps for North America and Washington state)	USA: AZ , CA , CO , ID , MT , NV , OR , UT , WA , WY   (Left: colored with green)[5] (Right: highlighted on this map with a yellow border)[4] Canada: AB , SK
Ecological distribution :	Grows on open, dry, rocky slopes[6]

Climate and elevation range:	Rocky slopes from low to mid elevations (800-2200m).[8]
Local habitat and abundance; may include commonly associated species:	Commonly associated species are: Aspen, poison hemlock, cow parsnip, pinyon pine, snowberry, big sagebrush. Frequent in east of the Cascade Mountains in semiarid habitats and grow interspersed among the grass tussocks in meadow steppe in the Intermountain West of North America.[8]
Plant strategy type / successional stage:	Can grow on a wide variety of soil types, but does require a well-drained soil. It prefers acid, neutral, and alkaline soils.[8] Drought tolerant[6]
Plant characteristics:	Perennial, blooms early summer, fruits spring-fall, rapid growth period spring-summer. Short life span. Slow vegetative spread. Traditional uses: Medicine, also comprises a major portion of the root vegetables used by the interior plateau peoples of British Columbia, Washington Idaho and Montana.[6] Roots were gathered in the fall. Blackfoot Indians used to make a hot drink that was taken as a tonic by sick people.[2] Flowers in early spring and produces fruits (schizocarps) that ripen in early summer[1] At the time of dispersal, seeds are dormant and have under-developed, linear embryos.[8]
PROPAGATION DETAILS	
Propagation Goal:	Plants
Propagation Method:	Seed
Product Type:	Container (plug)
Stock Type:	
Time to Grow	About 4 years
Target Specifications:	Plants grow each year from a large taproot, producing up to 10 highly dissected leaves often >40 cm in length.[11]
Propagule Collection (how, when, etc):	Irrigation experiment: collected near Harper, OR, USA (43 8330N, 1178470W) during June 2005 and 2007. The seeds were collected at the point of natural dispersal, when they were dry on the plants. [8] Early Succession Patterns experiment: Seeds of all native species were hand-stripped from sub-alpine populations located on mountains within the Front Range of the Canadian Rockies in south-eastern British Columbia.[10]
Propagule Processing/Propagule Characteristics	Seeds from moist habitats have longer stratification period than those from semiarid habitat.[8] There are approximately 99,000 seeds per kg (45,000 seeds per

(including seed density (# per pound), seed longevity, etc):	lb).[14] Seeds planted in soil is viable less than one year if they have not germinated.[12]
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	Seeds exhibit morpho-physiological dormancy.[6] Thus, cold stratification at 5-8C for 14 weeks has a significant effect on embryo length.[8]
Growing Area Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	Seeds are adapted to coarse- to fine- textured soils with pH of 6.5 to 7.5.[14] Post dispersal seed predation experiment: 22 seedlings were planted in a 50:50 mixture of peat and sand in 7.5-cm peat pots and grown in a greenhouse. After one month each of the 22 plants was transferred to an 18-cm polyvinyl chloride pot filled with the same soil mixture. Plants were fertilized once. 21 plants survived for the next 2 yr. [13]
Establishment Phase (from seeding to germination):	Post dispersal seed predators remove about 98.5 % of seeds that do not germinate within one year.  (Graph above) Five seeds per pile and ten seeds per pile were placed every 2 m along three 60-m transects and removal rates of seeds from beetles did not differ between pile sizes.[12] Under natural conditions, these seeds are exposed to dry and warm environments during the summer, mild temperatures and moist conditions during the autumn and chilling temperatures during the winter. Seeds then germinate during the late winter or early spring.[8]
Length of Establishment Phase:	Post dispersal seed predation experiment: After 43 week (10 May 1982), 60 seeds (9.1%) remained and by this date all germination had ended for the year. (Germination is usually restricted to late February through March at the study site, but a cool, wet spring permitted germination into April.)[12]
Active Growth Phase (from germination until plants are no longer actively growing):	Containerized plants should be left outside for an additional winter before transplanting the following spring.[14] Although flowers are self-fertile, they still require visitation by pollinators for fertilization to occur.[14]
Length of Active Growth Phase:	Germination begins in March and growth continues for 3 to 4 months until the plants go dormant in late July or August.[14]
Hardening Phase (from end of active growth	Post dispersal seed predation experiment: By July most of the plants were mostly dormant. The plants were moved from the greenhouse

phase to end of growing season; primarily related to the development of cold-hardiness and preparation for winter):	to a growth chamber set at 5°C on 13 October to give them a cold treatment. About 3 months later, they were returned to the greenhouse on 7 January 1980, where they were kept throughout their second growing season and monitored weekly for flowering. This was to maximize growth so they could reach a size sufficient to produce seeds by their 3rd year. The plants were moved on 2 October 1980 to the Observatory Garden on campus, where they remained outside through the remainder of the experiment. This allowed plants to produce seeds under natural pollination and spring conditions. Topsoil from the garden was added up to the rim of each pot and the pots were sunk partly in the ground.[13]
Length of Hardening Phase:	Hardening phase is not necessary for they go dormant in August.[14]
Harvesting, Storage and Shipping:	The seeds of each umbel are collected when fully mature and ready to be dispersed.[13] Next, seeds are stored in paper bags in a cold room at 8 to 10C until processing. Once processed, the seeds are stored in a refrigerator at 2 to 50 C.[10] Dormancy Loss experiment: Seeds are first rinsed with running water and their surface are sterilized by soaking them in 70 % ethanol for 1 min and 0.5 % sodium hypochlorite for 30 min. Then, the seeds were rinsed with deionized water and then dried to a water content of about 8 %. Dry seeds were stored in dark bottles at room temperature until used. The experiments were conducted with seeds that were in storage from 2 weeks to 4.5 months.[8]
Length of Storage :	More than 18 months if properly cleaned and stored.
Guidelines for Outplanting / Performance on Typical Sites (eg, percent survival, height or diameter growth, elapsed time before flowering):	 Above is a trend for increasing seed yield with increasing irrigation.[9] Flowers are grouped into compound umbels composed of a combination of 50-200 male and hermaphroditic flowers. Flowering and seed production typically begins 3 years after transplanting. [14]
Other Comments (including collection restrictions or guidelines, if available):	They are not endangered species but, in some regions, are threatened by overexploitation for medicinal use.
INFORMATION SOURCES	
References (full citations):	See below

Other Sources Consulted (but that contained no pertinent information) (full citations):	
Protocol Author (First and last name):	Sarah Choe
Date Protocol Created or Updated (MM/DD/YY):	04/18/12

Reference:

[1]Hitchcock, C. Leo., and Arthur Cronquist. *Flora of the Pacific Northwest: An Illustrated Manual*. Seattle, WA: University of Washington, 1978. Print.

[2]Johnston, Alex. "Blackfoot Indian Utilization of the Flora of the Northwestern Great Plains." *Economic Botany* 24.3 (1970): 301-24. *Springer Link*. Web. 10 Apr. 2012. <http://dx.doi.org/10.1007/BF02860666>.

[3]Kaye, Thomas N., Kathy L. Pendergrass, Karen Finley, and J. Boone Kauffman. "The Effect of Fire on the Population Viability of an Endangered Prairie Plant." *Ecological Applications* 11.5 (2001): 1366. *JSTOR*. Web. 14 Apr. 2012. <http://www.jstor.org/stable/3060926>.

[4]Knoke, Don, and David Giblin. "Lomatium dissectum." *Burke Museum of Natural History and Culture*. ©2012 Burke Museum of Natural History and Culture., n.d. Web. 12 Apr 2012.

[5]"NATIVE PLANT DATABASE." *Lady Bird Johnson Wildflower Center*. © 2012 Lady Bird Johnson Wildflower Center, n.d. Web. 12 Apr 2012. <http://www.wildflower.org/plants/result.php?id_plant=LODI>.

[6]"Plant Data Sheet." . University of Washington, 2004. Web. 7 Apr 2012. <http://depts.washington.edu/propplnt/Plants/lomatium dissectum.htm>.

[7]Pratt, Mindy, Roger Banner, James Bowns, and Allen Rasmussen. "Giant Biscuitroot." *Utah State University Cooperative Extension*. Utah State University, 2012. Web. 12 Apr 2012. <http://extension.usu.edu/rangeplants/htm/giant-biscuitroot>.

[8]Scholten, M., J. Donahue, N. L. Shaw, and M. D. Serpe. "Environmental Regulation of Dormancy Loss in Seeds of Lomatium Dissectum (Apiaceae)." *Annals of Botany* 103.7 (2009): 1091-101. Print.

[9]Shock, C.C., Feibert, E., Saunders, L., and N. Shaw. 2010. "Native wildflower seed production with limited subsurface drip irrigation." Oregon State University Agricultural Experiment Station, 2009 Annual Report: 193-209.

[10]Smyth, C R. "Early Succession Patterns with a Native Species Seed Mix on Amended and Unamended Coal Mine Spoil in the Rocky Mountains of Southeastern British Columbia, Canada." Arctic and Alpine research 29.2 (1997) : 184-195.

[11]Thompson, John N. "Coping with Multiple Enemies: 10 Years of Attack on Lomatium Dissectum Plants." *Ecology* 79.7 (1998): 2550. *JSTOR*. Web. 15 Apr. 2012. <http://www.jstor.org/stable/176843>.

[12]Thompson, J.N. (1985). "Postdispersal seed predation in Lomatium spp. (Umbelliferae): Variation among individuals and species." Ecology 66: 1608-1616. *JSTOR.* Web. 15 Apr. 2012. <http://www.jstor.org/stable/1938023>.

[13]Thompson, J N. "Variation among individual seed masses in Lomatium grayi (Umbelliferae) under controlled conditions: magnitude and partitioning of the variance." Ecology 65.2 (1984) : 626-631. *JSTOR.* Web. 15 Apr. 2012. <http://www.jstor.org/stable/1941425>.

[14]Tilley, D., St. John, L. Ogle, D., Shaw, N., and J. Cane. 2010. Plant guide for fernleaf biscuitroot (*Lomatium dissectum*). USDA-Natural Resources Conservation Service, Idaho Plant Materials Center. Aberdeen, ID.

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

Original Protocol Attached:

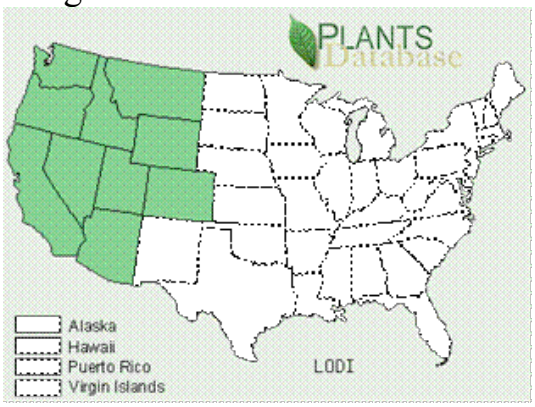
Plant Data Sheet

Species: Lomatium dissectum v. dissectum. Fern-leaved desert parsley.

Native Name: chalůksh

Traditional uses: Medicine, also comprises a major portion of the root vegetables used by the interior plateau peoples of British
Columbia, Washington Idaho andMontana.

Range:



Elevation: From low to mid elevations.

Local occurrence: L. dissectum is found from British Columbia and Alberta south to California, Colorado and Arizona. Low to mid elevations.

Habitat preferences: Grows on open, dry, rocky slopes. Drought tolerant. Intermediate Shade Tolerance

May be collected as: seed, tubers

Seed germination: Seeds exhibit morpho-physiological dormancy, cold stratification

Propagation recommendations: Seeds are placed in cold moist stratification for 330 days. Germination occurs at 18 C

Soil or medium requirements: Fine, medium, coarse soils. ph minimum 6.5 ph maximum 7.5. Root depth 12 inches

Installation form: Container (plug), Bare root

Recommended planting density: Minimum-maximum.

Normal rate of growth or spread lifespan: Perennial, blooms early summer, fruits spring-fall, rapid growth period spring-summer. Short life span. Slow vegetative spread.

Sources:

Hunn, Eugene. Ethnobiology class notes.

Natural Resources Conservation Service
http://plants.usda.gov/cgi_bin/topics.cgi?earl=plant_profile.cgi&symbol=LODI
Data compiled by: Karen Suyama June 2005

Pojar J., McKinnon A.,1994 *Plants of the Pacific Northwest,* B.C. Ministry of Forests and Lone Publishing, Canada