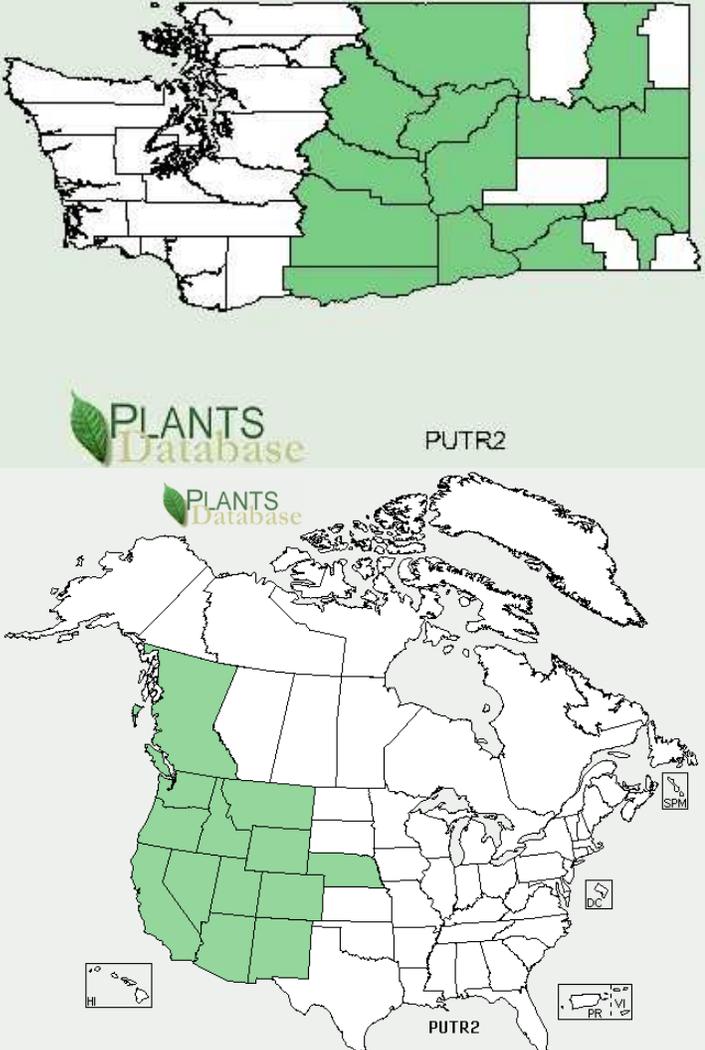


**Plant Propagation Protocol for *Purshia tridentata***  
 ESRM 412 – Native Plant Production  
 Spring 2008



<b>TAXONOMY</b>	
<b>Family Names</b>	
Family Scientific Name:	<i>Rosaceae</i>
Family Common Name:	Rose
<b>Scientific Names</b>	
Genus:	<i>Purshia</i>
Species:	<i>tridentata</i>
Species Authority:	(Pursh) DC.
Variety:	<i>tridentata</i>
Sub-species:	
Cultivar:	
Authority for Variety/Sub-species:	
Common Synonym(s):	<i>Kunzia tridentata</i> Spreng. <i>Tigarea tridentata</i> Pursh
Common Name(s):	bitterbrush, antelope bitterbrush, antelope-brush, quinine brush, black sage, deer-brush, greasewood, and buckbrush. (University of Saskatchewan).
Species Code:	PUTR2
<b>GENERAL INFORMATION</b>	

<p>Geographical range:</p>	
<p>Ecological distribution:</p>	<p>Antelope bitterbrush grows on well-drained, slightly basic to slightly acidic soils. (Shaw).</p>
<p>Climate and elevation range</p>	<p>Bitterbrush occurs on foothills, mountain slopes, mesas, and open woodlands on all aspects, from 3,100 to 10,000 feet in elevation. It sometimes has nitrogen-fixing root nodules. It has excellent drought tolerance, is moderately browse tolerant, and is intolerant of shade. It is severely damaged by fire, especially if rain is not received shortly after the burn, or if the burn occurs in the spring when soils are moist. (Utah State University).</p>
<p>Local habitat and abundance:</p>	<p>Sagebrush desert and shrub-steppe to ponderosa pine forests. (Burke Museum of Natural History and Culture). It often grows as the dominant shrub with bluebunch wheatgrass and a variety of forbs. It is also a</p>

	common associated species in many big sagebrush ( <i>Artemisia tridentata</i> L.), mountain brush, pinyon–juniper ( <i>Pinyon</i> L.- <i>Juniperus</i> L.). (Shaw).
Plant strategy type:	Early colonizer
Plant characteristics:	A many branched shrub with a rounded crown, usually growing 2 to 6 feet tall, but can grow up to 15 feet tall. It flowers April to July, fruits mature July to September. It reproduces from seeds. (Shaw).
<b>PROPAGATION DETAILS</b>	
Propagation Goal:	Plants
Propagation Method:	Seed.
Product Type:	Bareroot (field grown).
Stock Type:	1+0.
Time to Grow:	5.5 months.
Target Specifications:	Minimum height of 4 inches and caliper of 3mm. (Steinfeld).
Propagule Collection:	Most seed comes from wild collections, with the remainder coming from seed orchards managed by the Forest Service and Bureau of Land Management. All seed is kept separate by the collection area, elevation and date collected. All seed is collected or contracted for collection by the Forest Service and Bureau of Land Management or other government agencies. All seed is collected in the fall. (Steinfeld).
Propagule Processing/Propagule Characteristics:	Seed is sent to Bend Pine Extractory in the fall for cleaning. It is dried to between 5 and 8% moisture and placed in air tight plastic bags, then stored in seed freezers set at -15C (5F) at the nursery. This seed has a long storage life under these conditions. (Steinfeld).
Pre-Planting Propagule Treatments:	Seed is placed in mesh bags and soaked in cold running water for 48 hour. The seed is then laid out 3cm (1 in) thick on trays with fine screen meshed bottoms and placed in cold stratification rooms for 30 to 45 days. Rooms are equipped with foggers to keep the naked seed moist at all times (seed covered with free moisture). Temperatures are set at 1C (33F). Seed is monitored daily to detect seed mold. If mold is found, the seed is hosed down with water. (Steinfeld).
Growing Area Preparation / Annual Practices for Perennial Crops:	The nursery soils are a sandy loam (Central Point Sandy Loam Soil Series – Coarse-loamy, mixed, mesic Pachic Haploxeroll). Nine months before sowing, in late spring, 2.5cm (1in) inch of fresh sawdust is applied and disked into the surface. During the summer, the fields are irrigated to encourage weeds to sprout. The

	fields are disked at regular intervals to keep them free of weeds. Soils are formed into 1.2m (4ft) wide raised beds separated by a 0.6m (2ft) tractor path. There are six beds between irrigation pipelines. (Steinfeld).
Establishment Phase:	Seed is sown through a modified Oyjard seed drill. Seed is sown for an initial seedling density of 215 seedlings/m <sup>2</sup> (20 seedlings/ft <sup>2</sup> ). Attached to the front of the seed drill is a fertilizer bander. Depending on our soil analysis the bander places 500 kg/ha (450 lb/ac) of potassium sulfate (0-0-53) and 400 kg/ha (360 lb/ac) of ammonium phosphate (11-52-0) is placed at a depth in the soil of 10cm (4in). The seed drill has been adapted by attaching 8 steel bands to the drum. The bands are 3cm (1¼ in) wide by 1cm (3/8in) deep and 15cm (6 in) apart. As it rolls in front of the seeder, the band creates a small impression for the seed to drop into. The tubes of the seed drill have been increased in size to allow large seed to pass through and drop directly into the impressions. Behind the seed tubes are small wheels that press the seed into the surface of the soil. Within a half hour of sowing, and then covered with 1cm to 1.3cm (3/8 to ½ in) of fresh (undecomposed) sawdust. The sawdust is sprayed with Agrilock at 15% solution to hold it in place in case of high winds. Then the seedbeds are sprayed with Goal (oxyfluorfen) at 2 pints per acre as a pre-emergent control for weeds. The seedbeds are irrigated when the seed appears to be drying out. This occurs only on warm days. There is no fertilization during this period. (Steinfeld).
Length of Establishment Phase:	4 weeks (Steinfeld).
Active Growth Phase:	Irrigation: Soil tensiometers are placed at 15cm (6in) depths and monitored at least once per week. Soils are irrigate to 30cm (12in) when tensions are at -0.2 or higher. Light (5 minute) bursts of irrigation are given when surface soil temperatures (temperature probe placed under a ¼ inch of soil) are 33C (91F) in June; 35C (95F) in July; 38C (100F) in early August and 40C (104F) in mid August. Fertilizer: Fertilizer is applied in granular form over the seedlings. After application is complete, the fertilizer is washed off the foliage and into the soil with a half hour of irrigation water. Four applications are made: Approximately 6 weeks after emergence, 56 kg/ha (50 lbs/ac) of ammonium nitrate is applied when lateral roots have developed from new germinants. 8 weeks after emergence – 84 kg/ha (75 lbs/ac) of ammonium nitrate. 10 weeks after emergence

	<p>– 181 kg/ha (162 lbs/ac) ammonium sulfate, 12 weeks after emergence – 120 kg/ha (100 lbs/ac) of ammonium nitrate and 14 weeks after emergence – 120 kg/ha (100 lbs/ac) of ammonium nitrate. IPM: Handweeding of beds if necessary. If lygus insect found to damage buds, utilize mechanical insect control (Bug suck vacuum) and insecticide (Pydrin) at 10 day intervals until damage from insect no longer observed. (Steinfeld).</p>
Length of Active Growth Phase:	4 months. (Steinfeld).
Hardening Phase:	<p>By the third week in August or when the seedlings dormancy is induced. Irrigation: Only irrigate when the surface temperatures exceed 38C (100F) or pre-dawn plant moisture stress (PMS) exceeds 10 bars. In the early fall the soil profile is completely moistened and plants are kept below 5 bars pre-dawn PMS. From October through the early portion of November, the seedlings are protected from frosts through irrigation. Fertilizer: Two applications of 112 kg/ha (100 lbs/ac) applied in mid-fall after bud set 2 weeks apart. IPM: Handweed beds if needed. Prunes and wrenches: No prunes or wrenches. (Steinfeld).</p>
Length of Hardening Phase:	1 month. (Steinfeld).
Harvesting, Storage and Shipping:	<p>Usually all bitterbrush is lifted between December and early February. Seedlings are hand-lifted after the seedlings beds have been undercut using an Lundeby lifter. Lifting conditions must be in unsaturated soils, PMS below 15 bars and temperatures above –3C (27F). Seedlings are stored at 1C (33F) and 100 percent humidity for 1 to 5 days before sorting. Sorting removes seedlings that do not meet target specifications (see above). Many clients ask for seedlings to be rootpruned between 23 and 30cm (9 and 12 inch) for planting reasons. We accomplish this with paper cutters. At clients request, we will place a rubber band around a group of seedlings, usually 25. Seedlings are placed in 3 ply bags and sown shut. The bags are placed on racks and stored in coolers at 1C (33F) for storage durations less than 2 months or in freezers at –1C (29F) for greater than 2 months. (Steinfeld).</p>
Length of Storage:	Up to 5 months. (Steinfeld).
Guidelines for Outplanting:	<p>Direct seeding of antelope bitterbrush has shown mixed results. Research has shown that direct seeding is fairly successful in pinyon-juniper communities, but less so in big sagebrush and mountain brush types.</p>

	<p>Establishing antelope bitterbrush from small seedlings requires good seedbed preparation, including weed control. Seedling survival can be very low, especially when the seedlings must compete with cheatgrass (<i>Bromus tectorum</i>). Installation of larger, containerized individuals has shown more success in some studies. Shrubs should be installed 3-5 feet on center depending on the desired density and expected mortality. (Baker).</p>
<p>Other Comments (including collection restrictions or guidelines, if available):</p>	<p>Bitterbrush is important browse for cattle, sheep, and goats, especially in late fall and winter when the ground is snow-covered. It is usually not eaten by horses. It is excellent browse for many species of wildlife, and can be critical winter browse for deer. (Utah State University).</p>

### INFORMATION SOURCES

<p>References:</p>	<p>Baker, Sarah. "Plant Data Sheet: Antelope bitterbrush (<i>Purshia tridentata</i>)"  <a href="http://depts.washington.edu/propplnt/Plants/Purshiatridentata.htm">http://depts.washington.edu/propplnt/Plants/Purshiatridentata.htm</a> . 2003. Accessed 13 May 2008.</p> <p>Burke Museum of Natural History and Culture. "Purshia tridentata antelope bitterbrush, antelope-brush"  <a href="http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Purshia&amp;Species=tridentata">http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Purshia&amp;Species=tridentata</a> . 2006. Accessed 13 May 2008.</p> <p>Shaw, Nancy. "antelope bitterbrush".  <a href="http://www.fs.fed.us/global/iitf/pdf/shrubs/Purshia%20tridentata.pdf">http://www.fs.fed.us/global/iitf/pdf/shrubs/Purshia%20tridentata.pdf</a> . Accessed 13 May 2008.</p> <p>Steinfeld, David E. "Propagation protocol for production of field-grown <i>Purshia tridentata</i> plants".  <a href="http://www.nativeplantnetwork.org/network/view.asp?protocol_id=756">http://www.nativeplantnetwork.org/network/view.asp?protocol_id=756</a> . Accessed 13 May 2008.</p> <p>University of Saskatchewan. "Rangeland Ecosystems and Plants".  <a href="http://www.usask.ca/agriculture/plantsci/classes/range/purshia.html">http://www.usask.ca/agriculture/plantsci/classes/range/purshia.html</a> . 2000. Accessed 13 May 2008.</p> <p>Utah State University. "Bitterbrush".  <a href="http://extension.usu.edu/range/Woody/bitterbrush.htm">http://extension.usu.edu/range/Woody/bitterbrush.htm</a> . 2002. Accessed May 13 2008.</p>
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Other Sources Consulted:	<p>Calflora. "Purshia tridentata (Pursh) DC. var. tridentata Family: Rosaceae". <a href="http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=6953">http://www.calflora.org/cgi-bin/species_query.cgi?where-calrecnum=6953</a> . 2008. Accessed 13 May 2008.</p> <p>Schneider, Al. "Purshia stansburiana". <a href="http://www.swcoloradowildflowers.com/White%20Enlarged%20Photo%20Pages/purshia.htm">http://www.swcoloradowildflowers.com/White%20Enlarged%20Photo%20Pages/purshia.htm</a> 2008. Accessed 13 May 2008.</p> <p>Susan E. Meyer+ and Rosemary L. Pendleton. "Genetic Regulation of Seed Dormancy in Purshia tridentata(Rosaceae)". Annals of Botany Company. 2000. <a href="http://aob.oxfordjournals.org/cgi/content/abstract/85/4/521">http://aob.oxfordjournals.org/cgi/content/abstract/85/4/521</a> . Accessed 13 May 2008.</p> <p>Tuason, Thayne. "Purshia tridentata Antelope Bitterbrush". <a href="http://www.cwnp.org/photopgs/pdoc/putridentata.html">http://www.cwnp.org/photopgs/pdoc/putridentata.html</a> . Accessed 13 May 2008.</p> <p>Wikipedia. "Purshia tridentata". <a href="http://en.wikipedia.org/wiki/Purshia_tridentata">http://en.wikipedia.org/wiki/Purshia_tridentata</a> . 2008. Accessed 13 May 2008.</p>
Protocol Author:	Chris White
Date Protocol Created or Updated:	Original Protocol Created by Sarah Baker May 7 <sup>th</sup> 2003, Updated May 13 <sup>th</sup> 2008

Plant Data Sheet: Antelope bitterbrush (*Purshia tridentata*)

Range:

Bitterbrush is found from British Columbia south along the east Cascades and Columbia Gorge. It is found as far south as California and east to Wyoming, western Montana, Colorado, and New Mexico (1,2).

Climate, elevation:

Bitterbrush prefers a semi-arid, inland climate. It is found from 60-3000 meters in elevation (2).

Local occurrence:

Bitterbrush is common in the sagebrush steppe of eastern Washington and is often a dominant shrub in ponderosa pine forests.

Habitat preferences:

Bitterbrush is typically found on open, well-drained flats, slopes, and valleys with deep gravel or rocky soils (2).

Plant strategy type/successional stage:

Antelope bitterbrush is shade intolerant. It is an early colonizer on disturbed sites, perhaps due to its nitrogen-fixing ability. In areas where bitterbrush dominates and natural regeneration is not occurring, old and large individuals may be the climax community. It is likely that overgrazing has changed the natural succession and role of bitterbrush in some communities (1).

Associated species:

Bitterbrush is often found in the following communities: Antelope bitterbrush-bluebunch wheatgrass (*Pseudoroegneria spicata*), antelope bitterbrush-Idaho fescue (*Festuca idahoensis*), other steppe vegetation, and tree-dominated types such as ponderosa pine (*Pinus ponderosa*) forest and juniper (*Juniperus* spp.) woodland (1,2).

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

Bitterbrush is typically collected as seed. Propagation by stem cuttings is also possible, although specific details on the procedures are not readily available (1).

Collection restrictions or guidelines:

Bitterbrush reaches seed-bearing age in 8 to 10 years. Seeds ripen in late summer and generally turn from light in color, to dark red, and then to gray as they ripen. The seeds can be collected by shaking them from the bush onto a tarp or into a container. They should then be cleaned with a de-winger and separated from the husks with a fanning mill (2).

Seed germination:

The bitterbrush seed is a leathery, oblong achene 0.6-1.25 cm in length. To break dormancy, it should be stratified for 2-7 weeks at 2-5°C. Stratified seed must be sown while wet. A five-hour soak in a three percent hydrogen peroxide solution is an effective short-term treatment to improve germination (2).

Seed life and recommended storage conditions:

Field dried seed can be stored in bags in a cool, dry place for up to five years (2). Some studies have shown a germination rate of 74% after 25 years of storage when in proper conditions (1).

Propagation recommendations:

Seed should be sown in the spring or fall. It should not be sown more than two centimeters deep (2).

Soil or medium requirements:

The propagation medium should be well drained.

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

Direct seeding of antelope bitterbrush has shown mixed results. Research has shown that direct seeding is fairly successful in pinyon-juniper communities, but less so in big sagebrush and mountain brush types. Establishing antelope bitterbrush from small seedlings requires good seedbed preparation, including weed control. Seedling survival can be very low, especially when

the seedlings must compete with cheatgrass (*Bromus tectorum*). Installation of larger, containerized individuals has shown more success in some studies (1).

Recommended planting density:

Shrubs should be installed 3-5 feet on center depending on the desired density and expected mortality (3).

Care requirements after installed:

Information on care requirements was not available. Supplemental water would, of course, increase survival of any plant in an arid environment.

Normal rate of growth or spread; lifespan:

Adult plants reach 0.5-2 meters in height. Bitterbrush is fairly slow growing and long lived.

Sources cited:

(1) *Purshia tridentata*. Fire effects information website. U.S. Forest Service, U.S. Department of Agriculture. <http://www.fs.fed.us/database/feis/plants/shrub/purtri/all.html>. Retrieved May 5, 2003.

(2) Rose, R. et al (1998). Propagation of Pacific Northwest Native Plants. Corvallis, OR: Oregon State University Press.

(3) Sound Native Plants. <http://www.soundnativeplants.com>. Retrieved May 5, 2003.

Data compiled by (student name and date)

Sarah Baker 5/7/03

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<http://www.nativeplantnetwork.org/network/SampleBlankForm.asp>