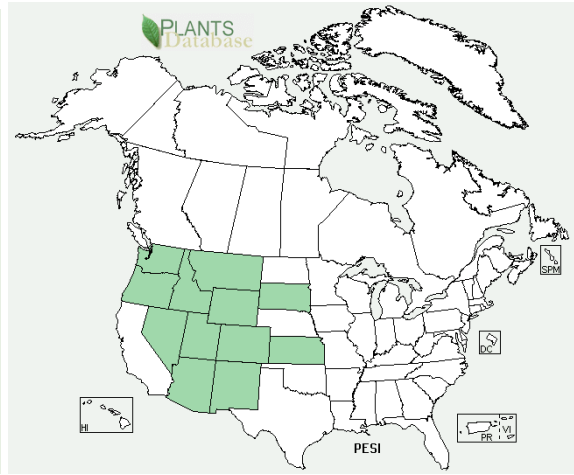
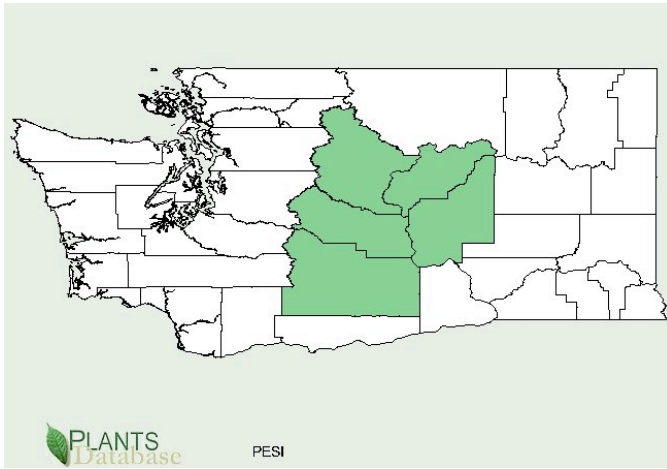


**Plant Propagation Protocol for [Insert Species]**  
**ESRM 412 – Native Plant Production**



(Unknown 5 was source for both of these pictures)

<b>TAXONOMY</b>	
<b>Family Names</b>	
Family Scientific Name:	Cactaceae
Family Common Name:	Cactus Family
<b>Scientific Names</b>	
Genus:	<i>Pediocactus</i>
Species:	<i>simpsonii</i>
Species Authority:	Englemann
Variety:	N/A
Sub-species:	N/A
Cultivar:	N/A
Authority for Variety/Sub-species:	N/A
Common Synonym(s) (include full scientific names (e.g., <i>Elymus glaucus</i> Buckley), including variety or subspecies information)	<i>Pediocactus nigrispinus</i> , <i>Pediocactus simpsonii</i> (Engelm.) Britton & Rose var. <i>robustior</i> (J.M. Coult.) L.D. Benson, <i>P. simpsonii</i> var. <i>nigrispinus</i> . There is debate over whether or not this last variety is in fact a variety of <i>P. simpsonii</i> or its own species <i>P. nigrispinus</i> . Latest decision was it is still a variety (Giblin).
Common Name(s):	Mountain Cactus, Snowball Cactus, Mountain Ball Cactus, Hedgehog cactus, Simpson's hedgehog cactus
Species Code (as per USDA Plants database):	PESI (Unknown 5)

<b>GENERAL INFORMATION</b>	
Geographical range (distribution maps for North America and Washington state)	Arizona, Colorado, Idaho, Kansas, Montana, New Mexico, Nevada, Oregon, South Dakota, Utah, Washington and Wyoming (Unknown 5)
Ecological distribution (ecosystems it occurs in, etc):	Coniferous forests, Mountain Ranges, Prairie Grasslands, Desert Valleys, Pinyon-Juniper Woodlands (Unknown 3)(Unknown 4)
Climate and elevation range	400-2000 m in PNW (Unknown 4); 1400-3500 m (Unknown 3) for most <i>P. simpsonii</i>
Local habitat and abundance; may include commonly associated species	Often found near sagebrush (Knoke), or in coniferous forests (Unknown 4).
Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)	Drought resistant, cold resistant up to -20 degrees Fahrenheit, flattens in winter (Faucon) or sometimes retreats below surface during dormancy, at higher elevations it tends to grow on exposed areas to maximize sunlight, primarily only needs water regularly at beginning of growing season, fire resistant (Dringman). Shallow root system prefers basalts and other rocky soils (Dringman).
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc)	<p><i>P. simpsonii</i> is a perennial shrub. Usually a solitary plant but it can grow in clusters, flowers in late spring to early summer (May-July), flowers tend to be pink or yellow, bell-shaped and .5-1 inch long. Plant is usually ~6in in diameter and can be up to 8in tall with a light green stem. Tubercles are arranged, and usually 0.25 to 0.6 inches long. Spines arc out in a flat manor that can almost cover the surface of the plant (Unknown 2). Young areoles are usually woolly, mature plants have 5 to 11 pale yellow central spines that 0.4 to 0.8 inch long, and 15 to 35 whitish 0.25 to 0.5 inch long radials (Faucon). Produces sub-globous green fruit (Knoke) that splits open when fully ripened.</p> <p>Doesn't do well with humidity. (Faucon)</p> <p>LOTS OF VARIABILITY, widest distribution of <i>Pediocactus</i> family</p>
<b>PROPAGATION DETAILS</b>	
Ecotype (this is meant primarily for experimentally derived protocols, and is a description of where the seed that was tested came from):	Information not found.

Propagation Goal (Options: Plants, Cuttings, Seeds, Bulbs, Somatic Embryos, and/or Other Propagules):	Plants
Propagation Method (Options: Seed or Vegetative):	Seeds; <i>P. simpsonii</i> will not grow from cuttings (Barclay). Germination can be a slow (sometimes taking a year or longer) and difficult process with this species, and the use of scarification and stratification are very helpful (Unknown). Do not keep seeds wet with stratification, but alternate wet and dry with changes in temperature (Unknown 2).
Product Type (options: Container (plug), Bareroot (field grown), Plug + (container-field grown hybrids, and/or Propagules (seeds, cuttings, poles, etc.))	Well suited for container growth indoors in shallow (Unknown 6), well-drained and porous soil, or raised outdoor containers such as window-planters, somewhat prone to rot if over-watered. (Unknown 2)
Stock Type:	Information not found.
Time to Grow (from seeding until plants are ready to be outplanted):	Sow seeds indoors before last frost, at some point in winter (Unknown 6). Should be ready for outplanting by spring, may not bloom the first year. Grows at roughly 0.5 in/year (Dringman).
Target Specifications (size or characteristics of target plants to be produced):	0.5-1 inch
Propagule Collection (how, when, etc):	Remove seedpods from the cactus, split open and be sure to clean any debris or fleshy matter from seed before planting. (Unknown 6)
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	Information not found.
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	Remove ALL fleshy matter from seed (Unknown 6)
Growing Area	Make sure not to overwater, especially in winter. Can lead to rot, and/or kill

Preparation / Annual Practices for Perennial Crops (growing media, type and size of containers, etc):	plant (Unknown 2). Be sure soil has plenty of ventilation (Faucon).
Establishment Phase (from seeding to germination):	Information not found.
Length of Establishment Phase:	Information not found.
Active Growth Phase (from germination until plants are no longer actively growing):	Information not found.
Length of Active Growth Phase:	Information not found.
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):	Winter preparation: Depends on first frost and snowfall of the year. In cold/snowy enough conditions <i>P. simpsonii</i> may retreat very close to or underneath the surface of the ground to retain warmth. (Shaw) (Unknown 2)
Length of Hardening Phase:	Information not found.
Harvesting, Storage and Shipping (of seedlings):	Information not found.
Length of Storage (of seedlings, between nursery and outplanting):	Information not found.
Guidelines for Outplanting / Performance on Typical Sites (eg, percent survival, height or diameter growth, elapsed time before	Move to elevated spot that receives a good amount of sunlight with some shade. (Unknown 1)  Does best in high areas with well-ventilated soil containing little organic matter (Faucon).

flowering):	
Other Comments (including collection restrictions or guidelines, if available):	This species has lost a significant amount of its natural population due to people removing these cacti from nature, be careful when collecting not to remove all the cacti (Barclay).
<b>INFORMATION SOURCES</b>	
References (full citations):	<p>Barclay, Ian. "Ian." <i>The Desert Northwest</i>. N.p., 2005. Web. 16 Apr 2012. &lt;<a href="http://www.desertnorthwest.com/gallery/travel_0507_ewa/">http://www.desertnorthwest.com/gallery/travel_0507_ewa/</a>&gt;.</p> <p>Dringman, Dixie A.. "Washington State Cactus and their History." . N.p., 04 10 2000. Web. 17 Apr 2012. &lt;<a href="http://home.eunet.no/~tgimre/MyCacti/_html/wsc.html">http://home.eunet.no/~tgimre/MyCacti/_html/wsc.html</a>&gt;.</p> <p>Faucon, Philippe. "Mountain Cactus." <i>Desert Tropicals</i>. N.p., 2005. Web. 16 Apr 2012. &lt;<a href="http://www.desert-tropicals.com/Plants/Cactaceae/Pediocactus_simpsonii.html">http://www.desert-tropicals.com/Plants/Cactaceae/Pediocactus_simpsonii.html</a>&gt;.</p> <p>Giblin, David. "Washington Flora Checklist." . University of Washington Herbarium, 8 12 2008. Web. 16 Apr 2012. &lt;<a href="http://biology.burke.washington.edu/herbarium/waflora/checklist.php?Taxon=Pediocactus_nigrispinus&amp;ID=9684">http://biology.burke.washington.edu/herbarium/waflora/checklist.php?Taxon=Pediocactus_nigrispinus&amp;ID=9684</a>&gt;.</p> <p>Knoke, Don. "WTU Herbarium Image Collection." <i>Burke Museum of Natural History &amp; Culture</i>. University of Washington Herbarium, 2012. Web. 16 Apr 2012. &lt;<a href="http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Pediocactus&amp;Species=nigrispinus">http://biology.burke.washington.edu/herbarium/imagecollection.php?Genus=Pediocactus&amp;Species=nigrispinus</a>&gt;.</p> <p>Shaw, Joe. "Cold Hardy Plants: <i>Pediocactus simpsonii</i>." <i>Oblog</i>. N.p., 24 feb 2010. Web. 18 Apr 2012. &lt;<a href="http://opuntiads.com/oblog/2010/cold-hardy-plants-pediocactus-simpsonii">http://opuntiads.com/oblog/2010/cold-hardy-plants-pediocactus-simpsonii</a>&gt;.</p> <p>Unknown, 1. "Propagating Mountain Ball Cactus." . N.p., 2008. Web. 16 Apr 2012. &lt;<a href="http://gardening.coloradohighaltitude.com/PropagatingNativePlants/Cactus/ball.php">http://gardening.coloradohighaltitude.com/PropagatingNativePlants/Cactus/ball.php</a>&gt;.</p> <p>Unknown, 2. "<i>Pediocactus simpsonii</i>." . N.p., n.d. Web. 18 Apr 2012. &lt;<a href="http://cactus-art.biz/schede/PEDIOCACTUS/Pediocactus_simpsonii/Pediocactus_simpsonii">http://cactus-art.biz/schede/PEDIOCACTUS/Pediocactus_simpsonii/Pediocactus_simpsonii</a>&gt;.</p> <p>Unknown, 3. "<i>Pediocactus simpsonii</i> in Flora of North America at eFloras.org." <i>Flora of North America</i>. N.p., n.d. Web. 16 Apr 2012. &lt;<a href="http://www.efloras.org/florataxon.aspx?flora_id=1&amp;taxon_id=242415309">http://www.efloras.org/florataxon.aspx?flora_id=1&amp;taxon_id=242415309</a>&gt;.</p> <p>Unknown, 4. "<i>Pediocactus nigrispinus</i> in Flora of North America at eFloras.org." <i>Flora of North America</i>. N.p., n.d. Web. 16 Apr 2012. &lt;<a href="http://www.efloras.org/florataxon.aspx?flora_id=1&amp;taxon_id=2424">http://www.efloras.org/florataxon.aspx?flora_id=1&amp;taxon_id=2424</a>&gt;.</p>

	<p>15308&gt;.</p> <p>Unknown, 5. "Plants Profile for <i>Pediocactus simpsonii</i>." <i>USDA.gov</i>. USDA, 2012. Web. 15 Apr 2012.  <a href="http://plants.usda.gov/java/profile?symbol=PESI">http://plants.usda.gov/java/profile?symbol=PESI</a>&gt;.</p> <p>Unknown, 6. "Dave's Garden." <i>PlantFiles: Mountain Cactus, Snowball Cactus <i>Pediocactus simpsonii</i> var. <i>nigrispinus</i></i>. Internet Brands, 2012. Web. 18 Apr 2012.  <a href="http://davesgarden.com/guides/pf/go/129021/">http://davesgarden.com/guides/pf/go/129021/</a>&gt;.</p>
Other Sources Consulted (but that contained no pertinent information) (full citations):	<p>Beaston, Bill. "<i>Pediocactus nigrispinus</i>." . N.p., n.d. Web. 18 Apr 2012.  <a href="http://www.labs.agilent.com/botany/cacti_etc/images/cacti/Pediocactus/nigrispinus.html">http://www.labs.agilent.com/botany/cacti_etc/images/cacti/Pediocactus/nigrispinus.html</a>&gt;.</p>
Protocol Author (First and last name):	Zak Hale
Date Protocol Created or Updated (MM/DD/YY):	04-18-12

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