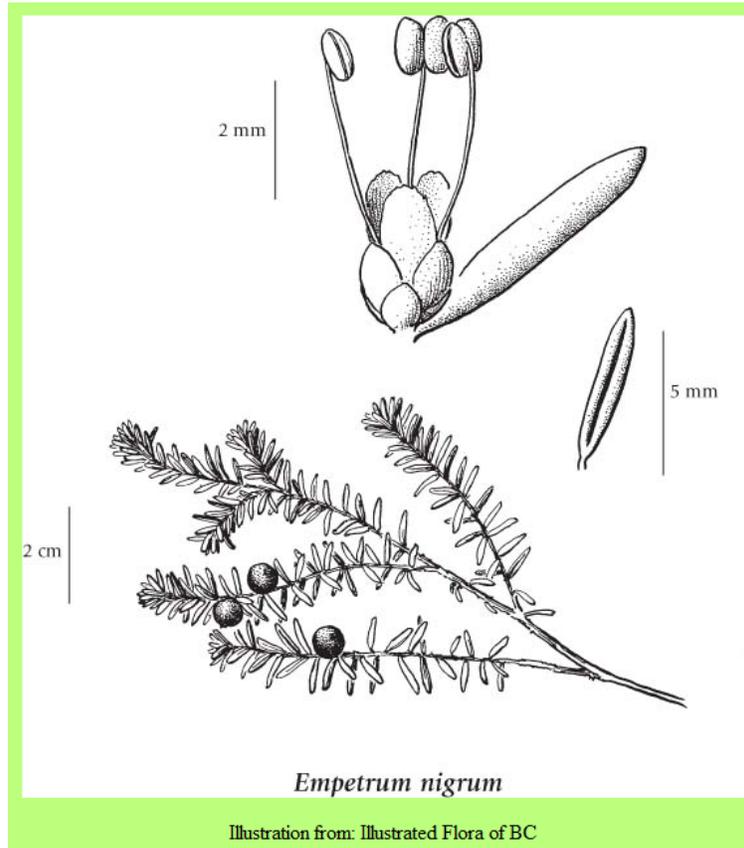


# Plant Propagation Protocol for *Empetrum nigrum*

ESRM 412 – Native Plant Production



<b>TAXONOMY</b>	
Family Names	
Family Scientific Name:	<i>Empetraceae</i>
Family Common Name:	Crowberry family
Scientific Names	
Genus:	<i>Empetrum</i>
Species:	<i>Nigrum</i>
Species Authority:	Carl Linnaeus, May 1 <sup>st</sup> 1753 <sup>3</sup>
Varieties:	<i>Empetrum nigrum</i> var. <i>asiaticum</i> <i>Empetrum nigrum</i> var. <i>japonicum</i> <sup>10</sup>
Sub-species:	<i>Empetrum nigrum</i> L. ssp. <i>hermaphroditum</i> (Lange ex Hagerup) Böcher <i>Empetrum nigrum</i> L. ssp. <i>nigrum</i> <sup>4</sup>

Common Synonyms:	<i>Empetrum eamesii</i> Fern. & Weig. <i>E. atropurpurem</i> (Lange) Hagerup; <i>E. hermaphroditicum</i> (Lange) Hagerup. <sup>11</sup>
Common Name(s):	Black Crowberry, Crowberry, Curlewberry, Crakeberry, Mossberry
Species Code:	EMNI <sup>4</sup>

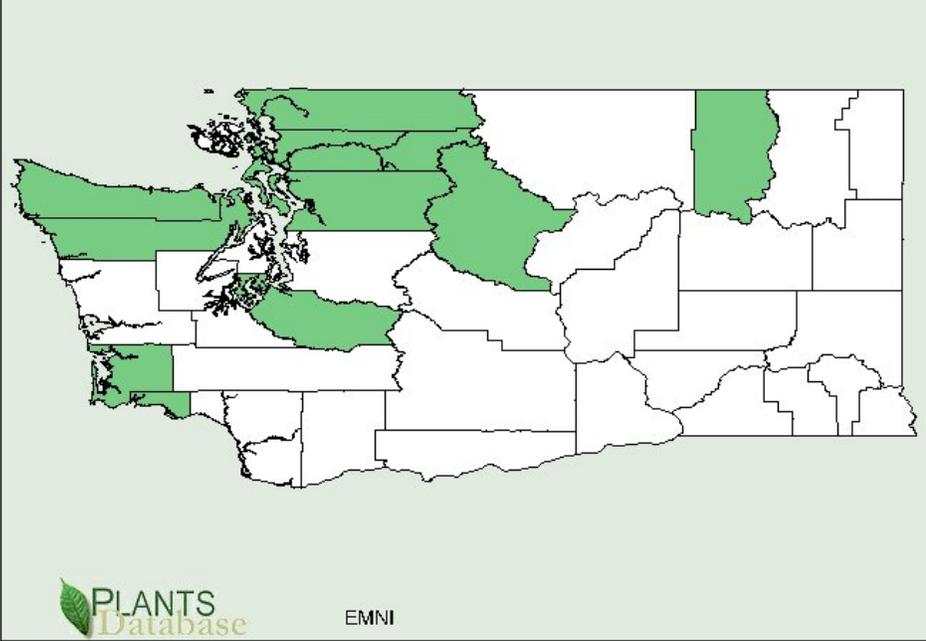
**GENERAL INFORMATION**

Geographical range:  
(Maps<sup>4</sup>)

**Native Status:**  
*Empetrum nigrum* L.

View Distribution Native Introduced

See U.S. county distributions (when available) by clicking on the map or the linked states below:  
**USA** (AK, CA, MI, MN, NY, OR, VT, WA), **CAN** (AB, BC, LB, MB, NB, NF, NS, NT, NU, ON, PE, QC, SK, YT), **DEN** (GL), **FRA** (SPM)

	<p><i>Empetrum nigrum</i> L. - black crowberry EMNI in the state of Washington</p>  <p><i>E. nigrum</i> is distributed circumpolarly. With populations throughout Alaska, across the Yukon Territory and Canada to Labrador, Newfoundland, and Greenland. It occurs south through New England and the Great Lakes states, as well as along the Pacific Coast to northern California. <i>E. nigrum</i> also has a wide distribution throughout Europe<sup>6</sup> and in the subantarctic Falkland Islands.<sup>10</sup></p>
<p>Ecological distribution:</p>	<p><i>E. nigrum</i> is found from sea level to alpine zones. It occurs in a wide variety of habitats including sphagnum bogs or muskegs, open tundra, rockfields, conifer forests, coastal bluffs, alpine meadows, maritime grasslands, maritime heathlands and exposed sea cliffs.<sup>6,9</sup></p>
<p>Climate and elevation range:</p>	<p><i>E. nigrum</i> is tolerant of a wide range of soil moisture conditions, but is intolerant of prolonged water logging, and on wet sites it is found in better drained areas. <i>E. nigrum</i> is adapted to harsh climates and it often inhabits sites exposed to wind, fog, and salt aerosols. <i>E. nigrum</i> is found in sandy to rocky soils, glacial till, and alluvial deposits. Soil pH ranges from 2.5 to 7.7. <i>E. nigrum</i> establishes itself on mineral soils and stagnant surfaces that are nutrient enriched but it is also classified as an indicator of nitrogen-poor soils.<sup>6</sup> Average elevation of <i>E. nigrum</i> growth is 1175 meters, with the maximum being 2525 meters.<sup>5</sup></p>
<p>Local habitat and abundance; may include commonly associated species</p>	<p><i>E. nigrum</i> is a dominant or codominant in a variety of different habitats. It may occur as an understory dominant in open conifer woodlands with black spruce (<i>Picea mariana</i>), white spruce (<i>P. glauca</i>), or shore pine (<i>Pinus contorta</i> var. <i>contorta</i>). <i>E. nigrum</i> can dominate shrub-types with</p>

	<p>dwarf birch (<i>Betula nana</i>), willow (<i>Salix</i> spp.), and ericaceous shrubs in bogs or muskegs and on open, moist tundra.<sup>6</sup></p> <p>Other associated species<sup>6,8</sup> include:</p> <p>Arctic Bentgrass (<i>Agrostis mertensii</i>)  Bog Birch (<i>Betula glandulosa</i>)  Paper Birch (<i>Betula papyrifera</i>)  Bigelow Sedge (<i>Carex bigelowii</i>)  Northern Singlespike Sedge (<i>Carex scirpoidea ssp. scirpoidea</i>)  Alaska Cedar (<i>Chamaecyparis nootkatensis</i>)  Lichens (<i>Cladonia</i> spp. and <i>Cladina</i> spp.)  Purple Crowberry (<i>Empetrum eamesii ssp. atropurpureum</i>)  False Toadflax (<i>Geocaulon lividum</i>)  Appalachian Fir-clubmoss (<i>Huperzia appressa</i>)  Feathermosses (<i>Hylocomium</i> spp. and <i>Pleurozium</i> spp.)  Mountain Sandwort (<i>Minuartia groenlandica</i>)  Quaking Aspen (<i>Populus tremuloides</i>),  Boott's Rattlesnake-root (<i>Prenanthes boottii</i>)  Dwarf Rattlesnakeroot (<i>Prenanthes nana</i>)  Bog Labrador Tea (<i>Rhododendron groenlandicum</i>)  Lapland Rosebay (<i>Rhododendron lapponicum</i> var. <i>lapponicum</i>)  Bearberry Willow (<i>Salix uva-ursi</i>)  Three-toothed Cinquefoil (<i>Sibbaldiopsis tridentata</i>)  Alpine Goldenrod (<i>Solidago leiocarpa</i>)  Sphagnum Mosses (<i>Sphagnum</i>)  Northern Blueberry (<i>Vaccinium boreale</i>)  Bog Blueberry (<i>Vaccinium uliginosum</i>)</p>
<p>Plant strategy type / successional stage (stress-tolerator, competitor, weedy/colonizer, seral, late successional)</p>	<p><i>E. nigrum</i> is a pioneer on sandy blowouts, dry, lichen-covered depressions on eskers, and in avalanche areas. However, it is more often associated with late seral or climax communities, particularly white or black spruce types. <i>E. nigrum</i> can be common and abundant in these types of old forests that have had no recent fires.<sup>6</sup> Numerous studies indicate that <i>E. nigrum</i> has allelopathic properties against seed germination of associated species. Its phenolic compounds are released through rain, dew, and snowmelt to the soil. Phenolic effects are strongly apparent in the humus under dense clones of <i>E. nigrum</i>. For example, the fungal component of the Scot's Pine (<i>Pinus sylvestris</i>) mycorrhizal symbiosis is strongly impaired by <i>E. nigrum</i> extracts, and this reduces nitrogen acquisition by pine seedlings.<sup>11</sup></p>
<p>Plant characteristics (life form (shrub, grass, forb), longevity, key</p>	<p>The plant forms large clumps, up to 10 inches (25 cm) tall and spreads by above ground, creeping stems. The branching stems spread along the ground and send out roots forming large, shallowly rooted mats. Wild populations of <i>E. nigrum</i> are a mixture of plants originating from seed</p>

<p>characteristics, etc)</p>	<p>and from creeping stems that root along the ground (natural layering).<sup>7</sup> The leaves are linear to elliptic, and the lower surface is grooved to reduce evapotranspiration in harsh climates.<sup>6</sup></p> <p><i>Empetrum nigrum</i> is a diploid with unisexual flowers and dioecious plants; and <i>E. nigrum</i> spp. <i>Hermaphroditum</i> is a tetraploid with either perfect or sometimes partly unisexual flowers.<sup>4, 11</sup></p> <p>The small and inconspicuous flowers occur in the axils of the leaves. The fruits are about .25 to .35 inches in diameter, black, and sometimes have a thin white waxy coating.<sup>8</sup> Flowering occurs in spring in areas of early snowmelt and continues through July. Fruits mature from August to late fall and persist through the winter under snow cover. The dark-blue to black fruit is a drupe containing six to nine nutlets. Seeds are dispersed by birds and animals. Some seeds may become established under the parent, but seedling mortality is generally high. <i>E. nigrum</i> seeds have been found buried beneath the soil, although only a small percent of the seeds are actually viable.<sup>6</sup></p> <p>Young <i>E. nigrum</i> plants have a strong primary root, but as the plants age, a shallow root system with many lateral roots develops. Sprouting from underground or basal portions is the main form of reproduction of <i>E. nigrum</i>. In addition, adventitious roots form where procumbent branches come in contact with the ground.<sup>6</sup></p> <p>Site characteristics influence <i>E. nigrum</i> morphology: on sites with high wind exposure, <i>E. nigrum</i> is branched and prostrate; on wet sites it is sparsely branched and has long annual growth increments; on dry sites it has branching shoots and is bushy.<sup>6</sup></p>
<b>PROPAGATION DETAILS</b>	
<p>Propagation Goal:</p>	<p>Plants</p>
<p>Propagation Methods:</p>	<p>Vegetative or Seed</p>
<p>Product Type:</p>	<p>Container with vegetative cutting or plug with seeding.</p>
<p>Time to Grow:</p>	<p><b>Vegetative</b> At least 3 weeks<sup>9</sup></p> <p><b>Seed</b> Seeds can be very slow to germinate so it varies depending on seed stock and conditions.</p>
<p>Target Specifications:</p>	<p>Root system established from cutting or seedling.</p>
<p>Propagule Collection (how,</p>	<p>Cuttings of half-ripe wood, at least 3 cm with a heel can be taken in mid to late summer. Cuttings of mature wood with the current year's growth</p>

when, etc):	can be taken in the fall. <sup>9</sup> Seeds can be collected from fruits when they ripen in the fall or in the spring once snow melts.
Propagule Characteristics:	<b>Vegetative</b> Leafy stem cuttings taken in mid-summer root easily in peat. Plant growth following rooting is rapid. Plants do not regenerate from root cuttings or prostrate leafless stems. <sup>7,9</sup>  <b>Seed</b> Seeds exhibit physiological dormancy. <sup>1</sup>
Pre-Planting Propagule Treatments:	Stored seed requires 5 months warm then 3 months cold stratification at 5°C. <sup>9</sup> Seeds are placed in cold moist stratification for 60 days. <sup>1</sup>
Growing Area Preparation:	The plant prefers light (sandy), medium (loamy) and heavy (clay) soils and requires moist, well-drained soil. The plant prefers acid and neutral soils. and can grow in very acid soils. It can grow in semi-shade (light woodland) or no shade. <sup>9</sup>
Establishment Phase:	Germination occurs at 20D/15N C alternating temperature cycle. <sup>1</sup>
Length of Establishment Phase:	The seed can be very slow to germinate. <sup>9</sup>
Active Growth Phase (from germination until plants are no longer actively growing):	When they are large enough to handle, prick the seedlings out into individual pots and grow them on in the greenhouse for at least their first winter. <sup>9</sup>
Guidelines for Outplanting / Performance on Typical Sites:	Plant them out into their permanent positions in late spring or early summer, after the last expected frosts <sup>9</sup>  <b>Growth Requirements</b> <sup>4</sup> Adapted to Coarse Textured Soils: No Adapted to Fine Textured Soils: Yes Adapted to Medium Textured Soils: Yes Anaerobic Tolerance: Low CaCO <sub>3</sub> Tolerance: Medium Cold Stratification Required: Yes Drought Tolerance: Medium Fertility Requirement: Medium Frost Free Days, Minimum 90 Hedge pH: Minimum 4.3 pH, Maximum 7.8 Planting Density per Acre: 700-1700 plants/acre

	Precipitation: 16 – 55 in. Root Depth, Minimum 16 in. Salinity Tolerance: None Temperature: Minimum (°F) -43
<b>INFORMATION SOURCES</b>	
References:	<ol style="list-style-type: none"> <li data-bbox="532 415 1443 632">1. Baskin, Carol C.; Baskin, Jerry M. 2002. Propagation protocol for production of container <i>Empetrum nigrum</i> L. plants; University of Kentucky, Lexington, Kentucky. In: Native Plant Network. URL:<a href="http://www.nativeplantnetwork.org">http://www.nativeplantnetwork.org</a> (accessed 17 April 2012). Moscow (ID): University of Idaho, College of Natural Resources, Forest Research Nursery.</li> <li data-bbox="532 674 1443 848">2. Douglas, G.W., D.V. Meidinger, and J. Pojar (editors). 1999. <i>Illustrated Flora of British Columbia. Volume 3: Dicotyledons (Diapensiaceae Through Onagraceae)</i>. B.C. Ministry of Environment, Lands &amp; Parks and B.C. Ministry of Forests. Victoria.</li> <li data-bbox="532 890 1443 961">3. The International Plant Names Index (2012). Published on the Internet <a href="http://www.ipni.org">http://www.ipni.org</a> [accessed 18 April 2012].</li> <li data-bbox="532 1003 1443 1178">4. John T. Kartesz, Biota of North America Program. <i>Empetrum nigrum</i> L. black crowberry. PLANTS Profile. USDA, Natural Resources Conservation Service. <a href="http://plants.usda.gov/java/profile?symbol=EMNI">http://plants.usda.gov/java/profile?symbol=EMNI</a>. [Accessed 4/18/2012]</li> <li data-bbox="532 1220 1443 1360">5. Klinkenberg, Brian. (Editor) 2012. <i>E-Flora BC: Electronic Atlas of the Plants of British Columbia</i> [eflora.bc.ca]. Lab for Advanced Spatial Analysis, Department of Geography, University of British Columbia, Vancouver. [Accessed: 2012, April 17]</li> <li data-bbox="532 1402 1443 1619">6. Matthews, Robin F. 1992. <i>Empetrum nigrum</i>. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available:<a href="http://www.fs.fed.us/database/feis/">http://www.fs.fed.us/database/feis/</a> [Accessed: 2012, April 17].</li> <li data-bbox="532 1661 1443 1835">7. Natural Resources Conservation Service. Managing Wild Bog Blueberry, Lingonberry, Cloudberry, and Crowberry Stands in Alaska. University of Alaska, Fairbanks. August 2006. <a href="ftp://ftp-fc.sc.egov.usda.gov/AK/Publications/Berrymanagement.pdf">ftp://ftp-fc.sc.egov.usda.gov/AK/Publications/Berrymanagement.pdf</a>. [Accessed: 2012, April 17]</li> </ol>

	<p>8. New York Natural Heritage Program. Black Crowberry (<i>Empetrum nigrum</i> ssp. <i>hermaphroditum</i>). NYNHP Conservation Guide. 2011. [Accessed 2012, April 18]</p> <p>9. Plants For A Future. <i>Empetrum nigrum</i> – L. England and Wales. <a href="http://www.pfaf.org">http://www.pfaf.org</a>. [Accessed 2012, April 18]</p> <p>10. USDA, ARS, National Genetic Resources Program. <i>Germplasm Resources Information Network - (GRIN)</i> [Online Database]. National Germplasm Resources Laboratory, Beltsville, Maryland. URL: <a href="http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?15127">http://www.ars-grin.gov/cgi-bin/npgs/html/taxon.pl?15127</a> (18 April 2012).</p> <p>11. USDA Forest Service, Eastern Region. Conservation Assessment for Black crowberry (<i>Empetrum nigrum</i>) L. Hiawatha National Forest. March 2002.</p>
Other Sources:	<p>Bokhorst S, Bjerke JW, Davey MP, Taulavuori K, Taulavuori E, Laine K, Callaghan TV, Phoenix GK. 2010. Impacts of extreme winter warming events on plant physiology in a sub-Arctic heath community. <i>Physiologia Plantarum</i>. 140(2): 128-140.</p> <p>Hagen, Dagmar. Propagation of native Arctic and alpine species with a restoration potential. Dept. of Botany, Norwegian University of Science and Technology. 2002.</p> <p>J. N. B. Bell and J. H. Tallis, <i>Journal of Ecology</i> Vol. 61, No. 1 (Mar., 1973), pp. 289-305</p> <p>M.R. Penskar and S.R. Crispin. 2009. Special Plant Abstract for <i>Empetrum nigrum</i> (black crowberry). Michigan Natural Features Inventory. Lansing, MI. 3 pp.</p> <p>S.G. Aiken, M.J. Dallwitz, L.L. Consaul, C.L. McJannet, L.J. Gillespie, R.L. Boles, G.W. Argus, J.M. Gillett, P.J. Scott, R. Elven, M.C. LeBlanc, A.K. Brysting and H. Solstad. 1999 onwards. Flora of the Canadian Arctic Archipelago: Descriptions, Illustrations, Identification, and Information Retrieval. Version: 29th April 2003. <a href="http://www.mun.ca/biology/delta/arcticf/">http://www.mun.ca/biology/delta/arcticf/</a>.</p>
Protocol Author (First and last name):	Robyn Turner
Date Protocol Created or Updated	04/18/2012

(MM/DD/YY):	
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