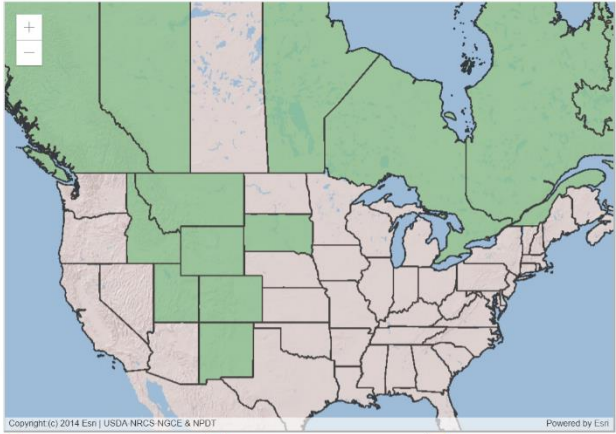
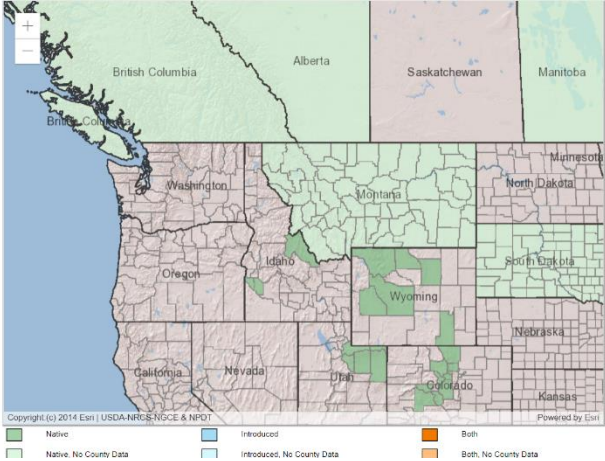
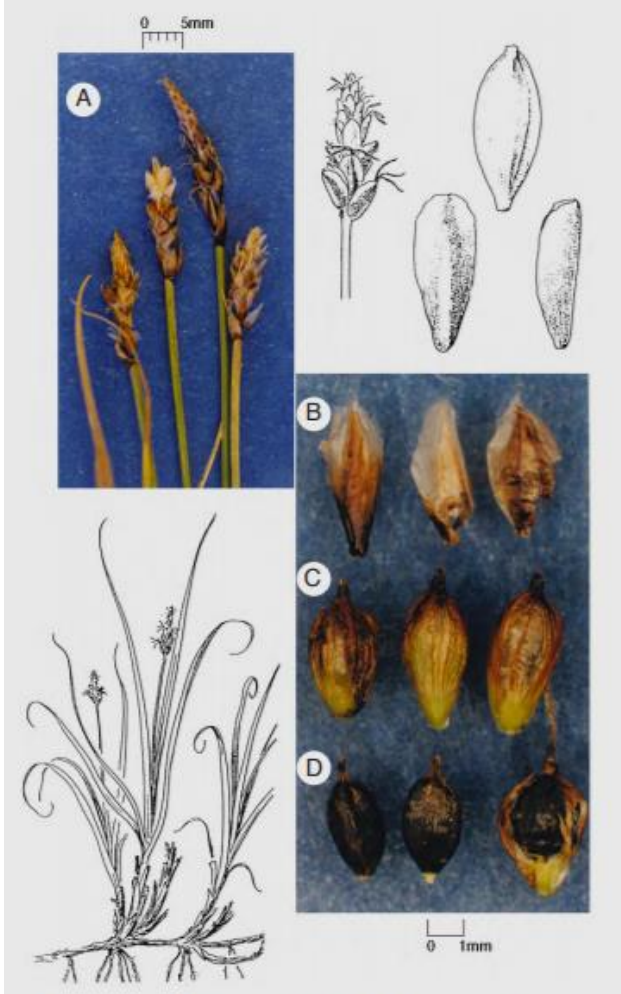


**Plant Propagation Protocol for *Carex rupestris***

ESRM 412 – Native Plant Production

URL: [https://courses.washington.edu/esrm412/protocols/\[2021\]/\[CARU3.pdf\]](https://courses.washington.edu/esrm412/protocols/[2021]/[CARU3.pdf])

<b>TAXONOMY</b>	
<b>Plant Family</b>	
Scientific Name	Cyperaceae <sup>1</sup>
Common Name	Sedge
<b>Species Scientific Name</b>	
Scientific Name	<i>Carex rupestris</i> Allioni <sup>1</sup>
Varieties <sup>1</sup>	<i>rupestris</i> <i>drummondiana</i> (Dewey) L.H. Bailey
Sub-species	none
Cultivar	none
Common Synonym(s)	<i>C. drummondiana</i> Dewey <sup>1</sup>
Common Name(s)	Curly sedge
Species Code (as per USDA Plants database)	CARU3 <sup>1</sup>
<b>GENERAL INFORMATION</b>	
<b>Geographical range</b>	<b>Images from USDA Plants database</b>
 <p>Copyright (c) 2014 Esri   USDA-NRCS-NGCE &amp; NPOT Powered by Esri</p>	 <p>Copyright (c) 2014 Esri   USDA-NRCS-NGCE &amp; NPOT Powered by Esri</p> <p> <span style="color: green;">■</span> Native      <span style="color: lightblue;">■</span> Introduced      <span style="color: orange;">■</span> Both  <span style="color: lightgreen;">■</span> Native, No County Data      <span style="color: lightblue;">■</span> Introduced, No County Data      <span style="color: lightorange;">■</span> Both, No County Data         </p>
<b>Ecological distribution</b>	Upland. Dry meadows at Subalpine to Alpine elevation. <sup>3</sup>
<b>Climate and elevation range</b>	USGS M099 Rocky Mountain-Sierran Alpine Tundra <sup>5</sup> Elevation depending on local geologic characteristics – above and below treeline. Climate is high-elevation continental temperate – short growing season, long, cold, snowy winters. Dry summers, most precipitation falls in winter as snow. <sup>5</sup>
<b>Local habitat and abundance</b>	Infrequently occurring but high local abundance <sup>3</sup> – mat-forming, produces runners. Dominant species at optimum environmental

	<p>conditions. Ecological community is small patches of <i>Antennaria</i> spp., <i>Calamagrostis breweri</i>, <i>Carex elynoides</i>, <i>Carex helleri</i>, <i>Carex filifolia</i>, <i>Carex rupestris</i>, and <i>Kobresia myosuroides</i> occurring as dominants or codominants and forbs such as <i>Geum rossii</i>, especially cushion plants <i>Trifolium dasyphyllum</i> and <i>Phlox pulvinata</i>.<sup>5</sup></p>
<p>Plant strategy type / successional stage</p>	<p>Variable structure/changing from year to year grassland community<sup>3</sup>  Germinates easily and ‘invades’ from soil seedbank or wind dispersal from nearby populations following disturbance.<sup>4</sup></p>
<p>Plant characteristics  Image: “Field Guide to Intermountain Sedges”<sup>2</sup></p>  <p><i>Carex rupestris</i>. (A) Inflorescences, (B) pistillate scales, (C) perigynia, (D) achenes (achene on right partially enveloped in the perigynium and with a twisted rachilla at its base). B and C: Left and center—dorsal views; right—ventral view. D: Left and right—dorsal views; center—ventral view.</p>	<p>Graminoid/grass-like<sup>1</sup></p> <p>Produces slender, hollow stems (culms), singly or in clusters from a slender, creeping rhizome. Culms are stout, (4-15 cm) often shorter than or equal in height to the leaves. 8-12 circinate/‘rolled up’ leaves emerge clustered around the base of the culm.<sup>2</sup></p> <p>Produces single, reddish-brown spikes (1-2 cm long, 3-4.5 mm wide) from the tips of the culms that produce both pollen and seed. Seeds mature July-August.<sup>2</sup></p>

## PROPAGATION DETAILS

Ecotype	<i>C. molesta</i> <sup>6</sup> , <i>C. brevior</i> <sup>6</sup> , <i>C. bicknellii</i> <sup>6</sup> , <i>C. frigida</i> , <i>C. ferruginea</i> related dry upland and alpine sedges.
Propagation Goal	Seed Increase
Propagation Method	Seed
Product Type	Seed
Stock Type	Plug to Field <sup>6</sup>
Time to Grow	2 years <sup>6</sup>
Target Specifications	Mature seeds <sup>6</sup>
Propagule Collection Instructions	Seeds should be collected from the wild by hand in July-August <sup>6</sup>
Propagule Processing/Propagule Characteristics	unspecified
Pre-Planting Propagule Treatments	Air-dried for two weeks, and hand screened via 2mm and 1mm screens <sup>6</sup> Cold-moist stratification for 4 weeks <sup>6</sup>
Growing Area Preparation / Annual Practices for Perennial Crops	Potting media in Ray Leach <sup>tm</sup> fir-cell conetainers <sup>6</sup>
Establishment Phase Details	Seeds sown very shallowly – 1/8” <sup>6</sup> – light improves germination <sup>7</sup> Overhead mist system used to water to avoid seed displacement. <sup>6</sup> Other alpine species release dormancy after cold stratification but re-enter dormancy with hot/summer temperatures. Moderate spring temperatures should be used for germination. <sup>7</sup>
Length of Establishment Phase	10 days to 2 weeks <sup>6</sup>
Active Growth Phase	Natural light in a greenhouse – ambient temperature 78 degrees F (25.5 C). <sup>6</sup>
Length of Active Growth Phase	Approx. two months <sup>6</sup>
Hardening Phase	Silty clay loam seed increase plots outdoors – two month old seedlings transplanted into woven poly weed barrier at 8” intervals in early April. Local conditions facilitated growth without need for supplemental watering. Cool temperatures – last frost free date approx May 15, but transplanting timed to stretch of mild nighttime temperatures. <sup>6</sup>  Regular weeding is important to avoid contamination of the seed crop with weed seeds.
Length of Hardening Phase	All plants remained vegetative in year 1, dying back in winter. All species flowered in set seed in summer of year 2. <sup>6</sup>

Harvesting, Storage and Shipping	Combine harvesting in mid-July with a small plot combine equipped with a bagger. Belt drive to air was disconnected to avoid launching seed out the back of the combine. Material should be hand-screened through ½ inch and ¼ inch hardware cloth to remove large debris. Perigynia can be removed with a Westrup huller-scarifier and achenes through air-screening. <sup>6</sup>
Length of Storage	unspecified
Guidelines for Outplanting / Performance on Typical Sites	Seed purity ranging from 87-99%, yields ranging from 20-270 lbs/acre depending on species. Good germination in appropriate temperatures following cold stratification <sup>6</sup>
Other Comments	
<b>INFORMATION SOURCES</b>	
References	<ol style="list-style-type: none"> <li>1. USDA, NRCS. 2021. The PLANTS Database (<a href="http://plants.usda.gov">http://plants.usda.gov</a>, May 25, 2021)</li> <li>2. Hurd, Shaw, et al. 2016 USDA Forest Service “Field Guide to Intermountain Sedges”</li> <li>3. Eastside Ecosystem Management Project – USDA Forest Service 1995 “Ecology of the Genus Carex</li> <li>4. C. R. Smyth (1997) 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, 184-195, DOI: 10.1080/00040851.1997.12003231</li> <li>5. USGS “M099 Rocky Mountain – Sierran Alpine Tundra Macrogroup Detail Report” (<a href="#">Macrogroup Detail Report: M099 (usgs.gov)</a> May 26, 2021)</li> <li>6. Houseal and Smith 2010 “Upland Sedge (<i>Carex</i> spp.) Propagation for Seed Increase” Landscape Ecology, Agriculture and Invasive Species</li> <li>7. Schuetz 2002 “Dormancy characteristics and Germination Timing in two Alpine <i>Carex</i> Species” Basic Appl. Ecol.</li> </ol>

Other Sources Consulted	<p>Lady Bird Johnson Wildflower Center – Plant Database – <i>Carex rupestris</i></p> <p>Wielgolaski and Johnson 1996 “Adaptation in Tundra Plants Exemplified by Transplantation Studies at two Latitudes” Proc. NIPR Symp. Polar Biol., 9, 313-324</p> <p>Benavides et al “Seed Germination of high mountain Mediterranean species; altitudinal, interpolation, and interannual variability</p> <p>Van der Valk 1999 “The Restoration of Sedge Meadows: Seed Viability, Seed Germination Requirements, and Seedling Growth of <i>Carex</i> species</p>
Protocol Author	Lorin Gardner
Date Protocol Created or Updated	05/26/21