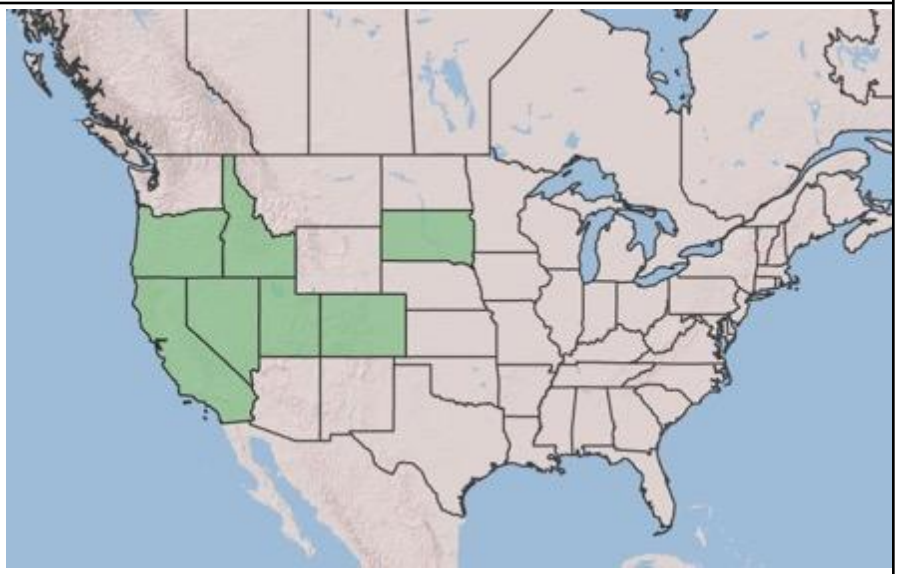
Plant Propagation Protocol for *[Insert Species]*
ESRM 412 – Native Plant Production

TAXONOMY	
Plant Family	Poaceae [1]
Scientific Name	*Achnatherum webberi*
Common Name	Webber needlegrass
Species Scientific Name	
Scientific Name	*Achnatherum webberi* (Thurb.) Barkworth [1]
Varieties	None according to USDA Plants database [1]
Sub-species	None [1]
Cultivar	None known
Common Synonym(s)	*Stipa webberi* (Thurb.) B.L. Johnson *Oryzopsis webberi* (Thurb.) Benth. ex Vasey *Eriocoma webberi* Thurb.
Common Name(s)	Webber needlegrass or Webber's needlegrass [2]
Species Code (as per USDA Plants database)	ACWE3 [1]
GENERAL INFORMATION	
Geographical range	 Oregon, Idaho, California, Nevada, Utah, Colorado, South Dakota [1]

Ecological distribution	Found in low elevation, Sagebrush Steepe environments. They prefer well drained, rocky or gravely soils. [5]
Climate and elevation range	Vaires, but often found at 4,500 to 5,500 feet in elevation [5]. Annual precipitation in these environments is around 8-10 inches, they are adapted to withstand cold winters and warm summers [5].
Local habitat and abundance	Often found alongside Wyoming big sagebrush (*Artemisia tridentata* subsp. *wyomingensis*) on slopes and summits [5]. Also found with *A. thurberianum* and *A. hymenoides* [5].
Plant strategy type / successional stage	Perennial, stress tolerant component of the reference, climax plant community in Great Basin sagebrush steppe ecological sites [5].
Plant characteristics	Perennial, densely packed bunchgrass that is not rhizomatous. Culms are 12–35 cm tall. Leaf blades are 0.5-1.5 mm broad, rigid. Lemmas are pilose. Awns are 4-11 mm long and deciduous, which is a crucial distinguishing feature from A. pinetorum [4, 7].
PROPAGATION DETAILS: FROM SEED	
Ecotype	No experimental data available. Information on propagation is based on the similar *A. thurberianum* [8]. Collect seed within the same climate zone as the restoration site [8, 9].
Propagation Goal	Plants, Seeds
Propagation Method	Seed
Product Type	Container, Propagules (seeds for direct seeding)
Stock Type	No data available for *A. webberi*. Congener *A. thurberianum* is produced as a bulk seed lot at USDA Bend Seed Extractory [10].
Time to Grow	No data available.
Target Specifications	No data available.
Propagule Collection Instructions	Awns are deciduous at maturity [4, 7]. Collect before shattering begins. Hand strip the panicles into bags during the hard-dough stage. Applying firm thumbnail pressure should slightly dent the caryopsis [11]. Congener *A. thurberianum* ripens late July, following flowering in May and June [6]. Move collection into leaf bags used by USDA Bend Seed Extractory for *A. thurberianum* [10].

Propagule Processing/Propagule Characteristics	No data for *A. webberi*. Congener: *A. thurberianum*: 7.23% moisture after cleaning [10]. Cleaned using Westrup LA-H brush machine (#40 mantle, medium speed) followed by air screening [10]. Viability assessed via tetrazolium test, viable embryos stain red [11].
Pre-Planting Propagule Treatments	Seed dormancy is a known challenge across *Achnatherum* [12]. Congener: *A. robustum* germination exceeded 75% across a wide temperature range (0–40°C) without major dormancy barriers [12]. Congener: *A. inebrians* use mechanical scarification and warm water soaking to break dormancy [13].
Growing Area Preparation / Annual Practices for Perennial Crops	No data for *A. webberi*. Congener: A. speciosum, use well-drained, low-nutrient, rocky soils. For direct seeding, controlling competing exotic annual grasses, cheatgrass excludes needlegrass seedlings through competition for soil moisture [14].
Establishment Phase Details	Natural germination is expected in early spring when the soils warm. Cool-season *Stipa*-tribe grasses germinate across a range of temperatures, alternating temperatures are generally more effective than ones that remain constant [12, 15].
Length of Establishment Phase	No data available. Germination in related cool-season bunchgrasses occurs within 2 to 4 weeks with good moisture levels.
Active Growth Phase	Congener: *A. thurberianum* begins growth early spring, then fruits May to June before going summer-dormant, may green up in fall with adequate moisture [6].
Length of Active Growth Phase	March to July, possibly later [6].
Hardening Phase	No data
Length of Hardening Phase	No data
Harvesting, Storage and Shipping	Store seed at 33 - 38°F in a sealed container with low moisture content [10].
Length of Storage	No data
Guidelines for Outplanting / Performance on Typical Sites	No direct performance data specific to *A. webberi* available. Plant into dry, rocky or loamy soils in sagebrush steppe environments, which range from south-central Oregon and northern Nevada [1, 5]. Fall or early spring seeding is recommended. Reduce cheatgrass competition before seeding [14].
INFORMATION SOURCES	

References	[1] USDA, NRCS. *Achnatherum webberi* (Thurb.) Barkworth. USDA PLANTS Database. https://plants.usda.gov/core/profile?symbol=ACWE3. [2] ITIS. *Achnatherum webberi*, TSN 507962. https://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=507962. [3] Romaschenko, K. et al. 2019. A key to the North American genera of Stipeae (Poaceae, Pooideae). *PhytoKeys* 126: 1–74. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6650443/ [4] Barkworth, M.E. 2003. *Achnatherum webberi*. In: Flora of North America, Vol. 24. Oxford University Press. Available via SEINet: http://swbiodiversity.org/seinet/taxa/index.php?taxon=70832. [5] USDA NRCS. Ecological Site Description R023XY006NV. Jornada EDIT. https://edit.jornada.nmsu.edu/catalogs/esd/023X/R023XY006NV. [6] Utah State University Extension. Thurber's Needlegrass. https://extension.usu.edu/rangeplants/grasses-and-grasslikes/thurbers-needlegrass. [Congener A. thurberianum] [7] SEINet Portal Network. *Achnatherum webberi*. http://swbiodiversity.org/seinet/taxa/index.php?taxon=70832. [8] Johnson, R.C., E.A. Leger, and K. Vance-Borland. 2017. Genecology of Thurber's Needlegrass in the Western United States. *Rangeland Ecology and Management* 70(2): 210–218. *[Congener A. thurberianum]* [9] Kulpa, S.M. et al. 2023. Fine-scale spatial genetic structure in *Achnatherum thurberianum*. *Evolutionary Applications* 16(4): 842–861. *[Congener A. thurberianum]* [10] Barner, J. 2007. Propagation protocol: *Achnatherum thurberianum* seeds. USDA FS–R6 Bend Seed Extractory. Native Plant Network. https://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=poaceae-achnatherum-3371. [Congener A. thurberianum] [11] USDA NRCS. 2004. Seed Moisture as an Indication of Harvest Readiness. Plant Materials Technical Note. https://www.nrcs.usda.gov/plantmaterials/mtpmcsr13733.pdf.

	[12] Young, J.A. and R.A. Evans. 2003. Germination of seeds of robust needlegrass. *Journal of Range Management* 56(3): 281–285. *[Congener A. robustum]* *[13] Wang, J. et al. 2021. Interactive effects of Epichloë endophyte, dormancy-breaking treatments, and geographic origin on seed germination of Achnatherum inebrians. Microorganisms 9(11): 2183. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8625081/ [Congener A. inebrians]* *[14] Young, J.A. and R.A. Evans. 2000. Cheatgrass competition and establishment of desert needlegrass seedlings. Journal of Range Management 53(5): 487–491. [Congener A. speciosum]* *[15] Feng, G. et al. 2020. Thermal and hydrotime requirements for seed germination of seven Stipa species. Frontiers in Plant Science 11: 562349. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7554346/ [Congener genus]*
Other Sources Consulted	Native Plant Network Protocol Database https://npn.rngr.net/propagation/protocols.
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