

Plant Propagation Protocol for *Artemisia biennis*

ESRM 412 – Native Plant Production

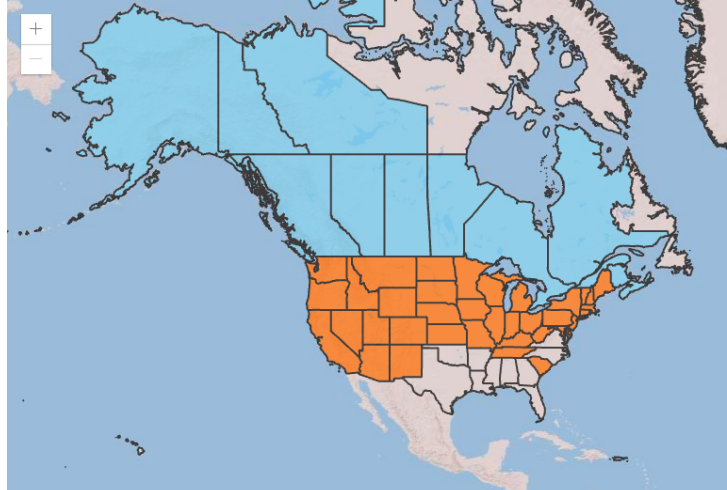
URL: <https://courses.washington.edu/esrm412/protocols/2022/ARBI2.pdf>



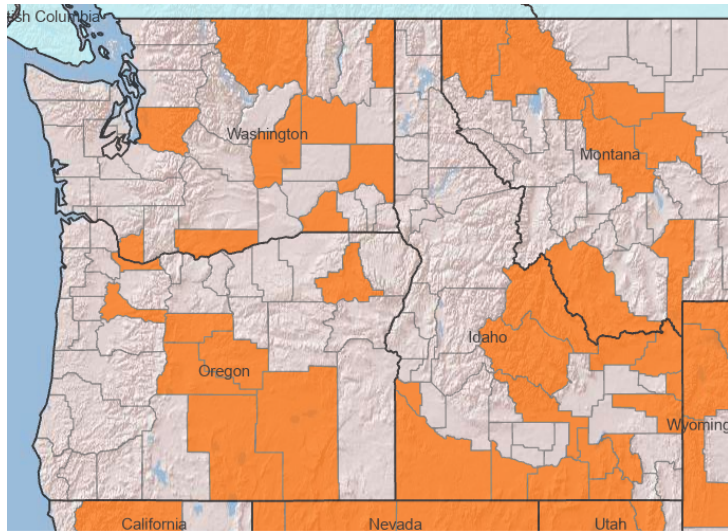
Source: Burke Herbarium Image Collection (9)

TAXONOMY	
Plant Family	
Scientific Name	Asteraceae
Common Name	Aster Family
Species Scientific Name	
Scientific Name	<i>Artemisia biennis</i> Willd.
Varieties	<i>Artemisia biennis</i> Willd. var. <i>biennis</i> <i>Artemisia biennis</i> Willd. var. <i>diffusa</i> Dorn
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	N/A
Common Name(s)	Biennial Wormwood
Species Code (as per USDA Plants database)	ARBI2
GENERAL INFORMATION	

Geographical range



North America



Pacific Northwest



Source: USDA PLANTS Database (5)

Ecological distribution

Found in grasslands, meadows, roadsides, waste places and fallow agricultural fields, as well as crop fields. (1)

Artemisia biennis was initially reported to be a weed of meadows and waste areas and thus of little consequence to production agriculture. By the mid to late 1990s population levels in agricultural fields had risen to a point warranting immediate management. (6)

Climate and elevation range	> 430 mm and < 860 annual precipitation Warm average temperature > 10 degrees Celsius Cold average temperature > 0 degrees Celsius Latitude North 60, Latitude South 33 (1)
Local habitat and abundance	<i>Artemisia biennis</i> is now widely distributed in the United States and Canada, except in the southeastern United States. It has recently become an important weed of several crops in the northern Great Plains. In surveys of soybean fields in South Dakota, Biennial wormwood was found in 92% of the field surveyed. (7) Characterization of the emergence pattern in eastern North Dakota indicates that the weed began to emerge in late June or early July in corn, dry bean, soybean, and sunflower. (8)
Plant strategy type / successional stage	Weedy/colonizer <i>Artemisia biennis</i> grows slowly after emergence, remaining as a rosette until midsummer when plants bolt and growth becomes rapid. (8)
Plant characteristics	<i>Artemisia biennis</i> plants typically grow 1 to 2 meters tall with a woody stem averaging 3 to 5 cm in diameter. The leaves are hairless, with the uppermost leaves pinnatifid. The inflorescence consists of heads in clusters that are discoid, nearly globe shaped, arranged in a spike-like form, leafy throughout, dense, and nearly sessile within terminal leaf axils. (4) Seeds can survive for two or more years in natural environments. Longevity is about two years. (3)
PROPAGATION DETAILS	
Ecotype	Kris J. Mahoney and George O. Kegode Biennial wormwood biomass allocation and seed production testing. The seeds came from Fargo, ND and Fergus Falls, MN. (2)
Propagation Goal	Plants and seeds
Propagation Method	Seed
Product Type	Container
Stock Type	Not specified

Time to Grow	2 weeks
Target Specifications	Not specified, Testing plant was chosen randomly each week
Propagule Collection Instructions	<p>Seeds used for the 1999 experiment were collected from mature plants found in a garden near Fargo, ND, in early 1999 after having overwintered in flower beds.</p> <p>Seeds used for the 2000 experiment were collected from mature plants in a soybean field located near Fergus Falls, MN in the fall of 1999.</p>
Propagule Processing/Propagule Characteristics	<p>Approximately 150 biennial wormwood seeds were spread on the damp potting soil of each peat pot. Numerous seeds were used because of the small size of the seed and the variable germinability. The peat pot is 6 cm in diameter and 7 cm deep.</p>
Pre-Planting Propagule Treatments	<p>Mature flower heads were collected and hand crushed to release the seed, and a 300 μm mesh screen. To separate seeds from large extraneous plant material.</p> <p>All <i>Artemisia biennis</i> seeds collected were stored at -15 degrees Celsius in a freezer until use.</p>
Growing Area Preparation / Annual Practices for Perennial Crops	<p>Growing Media: 1:1 mixture of sterilized greenhouse soil (sandy loam with 69% sand, 15% silt, and 16% clay) and commercial potting mix.</p> <p>Containers: Peat pots of 6 cm diameter and 7 cm deep were placed in black plastic trays, 25 cm wide by 53 cm long.</p>
Establishment Phase Details	<p>A sheet of clear plastic wrap was placed over the entire tray of peat pots to enhance germination. They were then transferred to a greenhouse which was set at a temperature of 25 plus or minus 2 degrees Celsius (This method of incubation resulted in relatively fast and uniform biennial wormwood emergence). Upon seed emergence, the plastic wrap was removed.</p>
Length of Establishment Phase	4 to 7 days

Active Growth Phase	Seedlings were thinned to three similar-sized plants per pot. Water daily and fertilize weekly with 25 ml of a solution of 3 g L ⁻¹ of 15:30:15 (N ₂ - P ₂ O ₅ - K ₂ O) fertilizer.
Length of Active Growth Phase	1 week
Hardening Phase	Seedlings are transferred to the field into 3 by 3 m plots. 25 pots containing two or three biennial wormwood seedlings each were placed into the plot in a grid pattern. They had a spacing of 0.5 m between grid locations on all sides to minimize interspecific competition.
Length of Hardening Phase	2 weeks
Harvesting, Storage and Shipping	A 1 gram sample of dry <i>Artemisia biennis</i> flowers were crushed and the seeds separated and weighed. This procedure was used because biennial wormwood produces very small seeds (1 gram equals approximately 13,000 seeds). Store the seeds at 5 degrees Celsius in dry conditions (3) Nothing explicitly mentions shipping
Length of Storage	No specific information is provided.
Guidelines for Outplanting / Performance on Typical Sites	No specific information is provided due to it becoming a serious weed for several crops.
Other Comments	A plant can produce up to 1 million seeds, which are very small with 1 gram equaling about 13,000 seeds. This comes with low viability, thus seeds will often be planted in large quantities to ensure there is enough germination. (4)
INFORMATION SOURCES	
References	See Below
Other Sources Consulted	See Below
Protocol Author	Kenzo Yoshitomi
Date Protocol Created or Updated	05/03/22

References:

- (1) Darbyshire, Stephen, and Aradath Francis. "Artemisia Biennis (Biennial Wormwood)". *Invasive Species Compendium*, 2015, <https://www.cabi.org/isc/datasheet/112441>. Accessed 29 April 2022.
- (2) Mahoney, Kris J., and George O. Kegode. "Biennial Wormwood (Artemisia Biennis) Biomass Allocation and Seed Production." *Weed Science*, vol. 52, no. 2, Cambridge University Press, 2004, pp. 246–54, <https://doi.org/10.1614/WS-03-056R>. Accessed 01 May 2022.
- (3) Kegode, George O., et al. "Germination Ecology of Biennial Wormwood (Artemisia Biennis) and Lanceleaf Sage (Salvia Reflexa) Seeds." *Weed Science*, vol. 58, no. 1, Weed Science Society of America, 2010, pp. 61–66, <https://doi.org/10.1614/WS-09-103.1>. Accessed 01 May 2022.
- (4) Kegode, George O., and Michael J. CHRISTOFFERS. "Biennial Wormwood (Artemisia Biennis Willd.)." *Weed Technology*, vol. 17, no. 3, Weed Science Society of America, 2003, pp. 646–49. Accessed 25 April 2022.
- (5) "USDA Plants Database". *Plants.Usga.Gov*, 2022, <https://plants.usda.gov/home/plantProfile?symbol=ARBI2>. Accessed 03 May 2022.
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(8) "Biology And Management Of Biennial Wormwood — Publications". *Ndsu.Edu*, 2022,
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(9) "Burke Herbarium Image Collection". *Biology.Burke.Washington.Edu*, 2022,
<https://biology.burke.washington.edu/herbarium/imagecollection/taxon.php?Taxon=Artemisia%20biennis>. Accessed 30 April 2022.

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Kegode, G. O., and S. J. Darbyshire. “The Biology of Canadian Weeds. 152. *Artemisia biennis* Willd.” *Canadian Journal of Plant Science*, vol. 93, no. 4, 2013, pp. 643–58,
<https://doi.org/10.4141/cjps2012-328>. Accessed 02 May 2022.

Mengistu, Lemma W., et al. “Genetic Diversity of Biennial Wormwood.” *Weed Science*, vol. 52, no. 1, Cambridge University Press, 2004, pp. 53–60,
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