Jessica Taylor
ESRM 412 – Native Plant Production
Protocol for *Wyethia amplexicaulis,* Mule's Ears
April 11, 2007

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Steve Hurst. Provided by ARS Systematic Botany and Mycology Laboratory. USA, NV. Usage Guidelines. (From the USDA website, accessed 4/11/07, altered from original)

Family Names	
Family Scientific Name:	Asteraceae
Family Common Name:	Sunflower
Scientific Names	
Genus:	*Wyethia*
Species:	*amplexicaulis Nutt.*
Species Authority:	Nathaniel Wyeth, who first collected it. Thomas Nuttall.

Variety:	N/A
Sub-species:	N/A
Cultivar:	N/A
Authority for Variety/Sub-species:	N/A
Common Synonym	
Genus:	**Espeletia*
Species:	**amplexicaulis* Nutt. (USDA, Knoke)
Species Authority:	N/A
Variety:	N/A
Sub-species:	N/A
Cultivar:	N/A
Authority for Variety/Sub-species:	Nathaniel Wyeth
General Information	
Common Name:	Mule's ears *northern mule-ears, smooth dwarf sunflower (Knoke)
Species Code (as per USDA Plants database):	WYAM
Ecotype:	Paradise Creek drainage near Pullman, Wa *Habitat : Slightly moist spots in the shrub-steppe, to open areas at mid-elevation. (Knoke)
Date Entered or Updated (MM/DD/YY):	2/24/2005
General Distribution (elevation range, ecosystems, etc):	Western US east to Montana and south to Colorado and Nevada where mean annual precipitation ranges from 12-20 inches (USDA, 2004). In eastern Washington it occurs in dry to mesic open slopes and meadows from sagebrush to open Ponderosa pine forest. In the northwestern US its wetland status is classified as FAC- (US Fish and Wildlife Service, 1988). *East of the Cascades from British Columbia to Oregon (Knoke)
Propagation Details	
Propagation Goal:	Plants
Propagation Method	Seed
Product Type:	Container (plug)
Stock Type:	N/A

Time to Grow:	10 Months
Target Specifications:	Tight root plug in container.
Propagule Collection:	Fruit is an achene. Seed is collected in late July or early August when the inflorescence is dry and the seeds are dark brown in color. Seedheads are clipped from the plants and stored in paper bags at room temperature until cleaned.
Propagule Processing/Propagule Characteristics (including seed density (# per pound), seed longevity, etc):	Small amounts are crushed by hand to free the seed, then cleaned with an air column separator. Larger amounts are threshed with a hammermill, then cleaned with air screen equipment. Clean seed is stored in controlled conditions at 40 degrees Fahrenheit and 40% relative humidity. We determined 28,200 seeds/lb for this ecotype.
Pre-Planting Propagule Treatments (cleaning, dormancy treatments, etc):	Seed from northern Nevada and California requires 4 weeks of cool, moist stratification (Young and Evans, 1979). Mirov also reported that California seeds needed prechilling before germination (Mirov, 1936). Baskin and Baskin report that seeds possess physiological dormancy that is broken by cold stratification (Baskin and Baskin, 2002). Unpublished data from trials conducted at the Pullman Plant Materials Center revealed that low rates of germination occurred without stratification and with 45 days of cold, moist stratification. 90 or more days of cold, moist stratification resulted in 79% germination.
Growing Area Preparation / Annual Practices for Perennial Crops:	In November seed is sown in 10 cu. in. Ray Leach Super cell conetainers filled with Sunshine #4 and covered lightly. A thin layer of pea gravel is applied to prevent seeds from floating. Conetainers are watered deeply and placed outside. Alternately, seed can be moist stratified in a refrigerator for 90 days before sowing in the greenhouse.

Establishment Phase:	Containers are moved to the greenhouse in mid-February or early March. Germination usually begins in 7-10 days and is complete in 30 days.
Length of Establishment Phase:	2 weeks
Active Growth Phase:	Plants are watered deeply every other day and fertilized once per week with a complete, water soluble fertilizer containing micro-nutrients. Plants are moved to the lath house in June. They are watered every other day if the weather is cool, and every day during hot, dry spells. They are fertilized once per week with a water soluble complete fertilizer containing micro-nutrients. Fertilizer and water are reduced as fall approaches. Plants may only develop 2-3 true leaves during this period and may become dormant during the late summer.
Length of Active Growth Phase:	6-7 months
Hardening Phase:	Since the plants are grown outside, additional hardening is not needed.
Length of Hardening Phase:	N/A
Harvesting, Storage and Shipping:	If sufficient root growth has occurred, plants may be transplanted to the field in late fall. If the plants have not yet developed a tight root plug, they should be held over winter. Rapid root growth will occur with the arrival of early spring temperatures and the plants will be ready for out planting in early May. Those held over winter are left in the lath house with no protection except snow cover, but plants exposed to extreme low temperatures should be afforded some insulation. It may be possible to grow plants more quickly by using refrigerator stratified seed sown directly in the greenhouse at an earlier date, but we have not tried this approach.
Length of Storage:	N/A
Guidelines for Outplanting / Performance on Typical Sites:	Transplanting is done in the late fall or in early May by using an electric drill and portable generator to drill 1.5 inch diameter holes at the planting site. Survival in seed increase plantings without competing vegetation

	averages 75%. Transplanting into sites with existing vegetation reduces survival and vigor depending on weather conditions following planting. Flowering and seed production occurs 4-5 years after transplanting
Other Comments:	Some insect seed predation has been noted. A planting made in 1998 yielded its first good crop of seed in 2004.
Propagator (Author) That Developed This Protocol	
First Name:	Dave
Last Name:	Skinner

References: (from original protocol)

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Additional References:

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