UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
BRIDGER, MONTANA

and

MONTANA AGRICULTURAL EXPERIMENT STATIONS
MONTANA STATE UNIVERSITY
BOZEMAN, MONTANA

and

WYOMING AGRICULTURAL EXPERIMENT STATIONS
UNIVERSITY OF WYOMING
LARAMIE, WYOMING

NOTICE OF RELEASE FOR SELECTED CLASS OF GREAT NORTHERN GERMPLASM WESTERN YARROW

The U.S. Department of Agriculture Natural Resources Conservation Service-Bridger Plant Materials Center, Montana Agricultural Experiment Stations-Montana State University, and Wyoming Agricultural Experiment Stations-University of Wyoming announce the pre-varietal release for a selected class germplasm (natural track) of western yarrow (*Achillea millefolium* L. var. *occidentalis* DC.) for the intermountain west and the Northern Great Plains regions. As a selected class release this plant will be referred to as Great Northern Germplasm western yarrow.

This alternative release procedure is justified because there are no other releases of native western yarrow available to the seed industry. This native, drought-tolerant forb species has immediate utility in revegetating disturbed areas and reestablishing native plant communities in conservation enhancement and wildlife improvement programs, as well as in low-maintenance and natural landscapes.

In the spring of 2001, Great Northern Germplasm seed was included in two demonstration plots in Bluff, Utah. The yarrow performance on both sites has been remarkable in the face of a 7-year drought. Premilinary findings indicate that Great Northern Germplasm is out-performing several local, indigenous forb sources in the plantings (12).

Seed of Great Northern Germplasm was sent to Oregon State University in June 2002. Research is being conducted on the tolerance of Great Northern Germplasm to the herbicide, Plateau®. The study focuses on the seed germination and stand establishment of native species in response to chemical application (14).

Ploidy Examinations. In the spring of 2003, seed of Great Northern Germplasm was sent to the Oregon State University Seed Testing Laboratory and to the USDA-ARS Forage and Range Research Laboratory in Logan, Utah, for ploidy by cytometry testing. Seed of three introduced yarrow collections was also sent to the two labs for comparison ploidy tests. The flow cytometer in both labs detected one ploidy level in all of the samples (table 1). In August 2003, the ARS Lab subsequently conducted chromosome counts on the four samples of seed and determined the basic chromosome number, n=9, and that all the samples were tetraploid (4x=36).

Table 1. The scientific and variety name, origin, and ploidy levels of four collections of yarrow.

Scientific Name	Germplasm/Variety	Origin	Ploidy
Achillea millefolium var. *occidentalis*	Great Northern	Flathead County, MT	tetraploid
Achillea millefolium	Proa	Europe	tetraploid
Achillea millefolium	PI 439892	Russia	tetraploid
Achillea millefolium	PI 439894	Kazahkstan	tetraploid

Seed Increase. In 1998, a seed increase field was established at the Bridger PMC. Seed of western yarrow is nondormant (2) and germination is rapid and of a high percentage. Data gathered in 2002 from 5 years of seed harvest are reported in table 2.

Table 2. The 1998-2002 seeds counts, germination percentage, and seed production of Great Northern Germplasm western yarrow *Achillea millefolium* var. *occidentalis*; established in Field 2 and 3 at the Bridger PMC.

Date Planted	Field Size	Date Harvested	Seed Counts	Germination†	Seed Production	
	ac/ha		*lb*	*%*	*lb/ac*	*kg/ha*
May 2, 1996	.08/.032	August 9, 1998	4.43 mil‡	95	64	72
May 5, 1998	.12/.049	August 5, 1999	4.23 mil§	95	135	151
May 5, 1998	.12/.049	July 22, 2000	4.22 mil§	97	110	123
May 5, 1998	.12/.049	July 25, 2001	4.40 mil§	98	79	89
May 5, 1998	.12/.049	July 19, 2002	4.54 mil§	98	9	10
Average	NA	July 29	4.365 mil	97	79	89

† Tested 09/27/2002 to 10/11/2002 at Montana State Seed Testing Laboratory.
‡ Manual count conducted November 2002 at Bridger PMC.
§ Mechanical count conducted November 2002 at Mississippi PMC.

Insect or Disease Problems. Inflorescences that are harvested for seed production often contain small quantities of insect larvae and numerous live insects. There is no apparent short- or long-term effect on the seed in any way. Many beneficial and pollinating insects, such as minute pirate bug (*Orius* spp.), big-eyed bug (*Geocoris* spp.), hoverflies (Syrphidae), and several tachnid flies (*Archytas apicifer* Walker, *Gymnosoma* spp., *Tricopoda pennipes* Fabricius, *Cylindromia* spp.) are known to frequent yarrow plants (27). Pest insects include common leaf bugs (*Lygus* spp.) and flea beetles (Chrysomelidae). Root rot and mildew may occur in poorly drained soils (26).

Collection Site Information: Seed of Great Northern Germplasm was originally collected from a single population located on the cut and fill slopes of US Forest Service Road No. 5271, off Canyon Creek Road No. 316 cutoff to McGinnis Creek Road in Flathead County, Montana. The site latitude is N49°28', longitude W114°10', T32N R20W, Section 27 and 28, with a gravelly soil texture, 0-30% slope, south-to-southwest aspect, elevation 1097-1219 m (3600-4000 ft), receiving 711-762 mm (28-30 in) of annual precipitation. Collected in 1988 by Joyce Lapp, Restoration Ecologist, Glacier National Park.

Description: Great Northern Germplasm western yarrow *Achillea millefolium* L. var. *occidentalis* DC. synonyms *Achillea millefolium* L. ssp. *occidentalis* (DC.) Hyl., *Achillea millefolium* L. var. *lanulosa* (Nutt.) Piper, and *Achillea millefolium* L. ssp. *lanulosa* (Nutt.) Piper is a highly variable circumboreal species (in the Asteraceae family) that is present in all Montana and Wyoming counties and is commonly found across the entire North American continent (8). It is a self-incompatible, insect-pollinated species (4) occurring as both native and introduced forms that may differ in chromosome number (N=9); native races originating in the western U.S. (except the Pacific coast) are mostly tetraploid, and introduced races mostly hexaploid (6, 7). Botanists currently acknowledge genetic and ecological differentiation among native ecotypes at the local and regional level (10, 11). Western yarrow is a long-lived, native, herbaceous perennial forb, 30-100 cm tall, with few to many unbranched, erect, lanulose stems (5). Leaves are alternate, sessile, pinnately dissected, semi-evergreen, and aromatic with an anthemideous scent (chamomile or dog fennel-like odor). Basal foliage is up to 25 cm long, and cauline leaves typically up to 10 cm long, and 3 cm broad. Inflorescence is arranged in a compound, flat-topped corymb 6-20 cm wide, consisting of small, numerous, flower heads 4-6 mm in size. Involucre bracts are usually pubescent and greenish, with straw-colored papery margins (15). Outside ray-flower numbers are 3-12, mostly white to cream-colored, 1-2.5 mm long, and encircle the center disk-flowers. The disk-flowers number 10-75 each, and are yellow, tubular, perfect, and seed-producing. Fruit is a flattened achene and hairless, with compressed margins, and in a shape that is mostly reverse egg-shaped with no pappus.

Method of Selection: Great Northern Germplasm was selected from among 38 accessions of native and introduced yarrow collected in Montana, Wyoming, and Europe. Great Northern Germplasm was tested as accession 9057902.

Initial Evaluation Planting (IEP). Great Northern Germplasm was included in an IEP established in 1994 and evaluated through 1998 at the Bridger PMC. A total of 38 accessions were space-planted in a replicated, Randomized Complete Block Design. Individual plants were evaluated for establishment survival, vigor, and height in all years, and for seedhead production and leafiness following the establishment year (appendix a, tables 1 and 2). The western yarrow accessions from within Yellowstone and Glacier National Parks (16 each) and the introduced accessions of common yarrow (9 each) were subsequently determined to be unavailable or inappropriate for potential release and, while included in the documentation, are excluded from the performance review. The introduced accessions of common yarrow have a very atypical appearance, aggressive vigor, and extremely tall plant heights.

Great Northern Germplasm performed consistently well across all evaluation factors over the 4 years of study. Survival was excellent the first 3 years, and below average the fourth year. It rated highest in mean vigor (appendix a, table 3) and mean foliage height in 1996 (appendix a, table 4), and top-ranked in mean seedhead production (appendix a, table 5) and leafiness (appendix a, table 6) in 1996. Overall performance in the final year was above average. This accession is morphologically typical of races found in Montana and Wyoming.

See attached advanced testing documentation in appendix tables for additional information.

Off-Center Plantings. Great Northern Germplasm seed was sent to the MSU-Bozeman Western Agricultural Research Center in Corvallis, Montana, in February 2000. Researchers are comparing dry matter and oil production of Great Northern Germplasm to the commercial variety of common yarrow 'Proa' for potential specialty crop production in the medicinal and aroma-therapy industry. Great Northern Germplasm established well and was similar to Proa in lbs/acre oil and tea grade dry matter production (3).

Ecological Considerations and Evaluation: Great Northern Germplasm western yarrow is an early successional species that readily establishes on disturbed sites. It is commonly found as a minor component in many native plant communities and is considered nondominant. It is a forage source for bighorn sheep, pronghorn antelope, and deer (25). Domestic sheep and goats derive a fair amount of forage value from western yarrow, while cattle and horses mostly graze the flowerheads. The volatile oils, alkaloids, and glycosides are not considered toxic because the plant is seldom overgrazed by livestock. Sage grouse chicks rely heavily on western yarrow as a food source. Native Americans used western yarrow for many purposes, such as a tea to cure stomach ailments, a poultice treatment on infected wounds, and as a mosquito repellant (24). Studies conducted on the use of western yarrow as a sodding technique in erosion control projects produced satisfactory results (1). The Montana Department of Agriculture considers this a beneficial native species, and existing policy does not permit a species native to the state to be listed as a weed (13).

Great Northern Germplasm western yarrow meets all current Plant Materials Program criteria for noninvasiveness when used within the parameters of its anticipated area of adaptation. If used outside its known or anticipated area of adaptation, Great Northern Germplasm western yarrow should be tested under controlled conditions to ensure that it does not become weedy or has other negative effects on the environment.

In 1989, the National Park Service began utilizing seed of 9057902 (Great Northern Germplasm) in native plant mixtures for revegetation of disturbed sites within the boundaries of Glacier National Park. Ecological monitoring of the development of the native plant communities indicates that Great Northern Germplasm has not displayed aggressive or weedy behavior, and the plant community composition has not been negatively influenced by inclusion of Great Northern Germplasm seed in the mixes (appendix b).

In 2000, Montana State University began investigating the medicinal properties of Great Northern Germplasm at the Western Agricultural Research Center in Corvallis, Montana. Morphological and phenological development has been compared to the commercial variety, Proa. The native collection of Great Northern Germplasm is considerably different with a shorter stature, average vigor, very low weediness, and a much earlier flowering and seed ripening sequence than the introduced European variety (appendix c). These results are consistent with the performance of Great Northern Germplasm in more than 10 years of trials and seed production fields at the Bridger PMC (17-21).

Anticipated Conservation Use: Great Northern Germplasm was selected primarily to add species diversity in seed mixtures for rangeland, mineland, and roadside revegetation projects. Secondary use is for ornamental application in low maintenance or naturalized landscapes such as personal residences, apartment complexes, parks, and recreation areas. Furthermore, the multitude of chemical compounds contained in this species are considered an integral component of herbal, holistic, and medicinal treatment programs (28).

Anticipated Area of Adaptation: Western yarrow is one of the most widely recognized and adaptable wildflowers in North America. The range of distribution includes many habitats across large areas in Canada, all of the U.S., and south into Mexico. It prefers full sun (only tolerates partial shade) along roadsides, hills, canyons, pastures, and disturbed areas. It is scattered in sagebrush areas, open timber and subalpine zones, and occurs at elevations ranging from 732 m (Montana) to 3658 m (Colorado). It thrives in droughty conditions on gravelly loam and on thin or sandy soils (16). Western yarrow is a pioneer species and considered an increaser where the forage resource has been over utilized. It is seldom regarded as a problem weed (23) except on heavily disturbed, arable sites with favorable environmental conditions (9).

The anticipated range of adaptation for Great Northern Germplasm western yarrow is based on the range of initial collections and off-center testing was done. Great Northern Germplasm western yarrow should do well throughout its range of native sites in Montana. It should also perform well in the intermountain west and Northern Great Plains regions, though it has not been thoroughly field tested in all sites. Great

Northern Germplasm western yarrow may be adapted to a much wider range, but should be adequately tested before being extensively used outside its known area of adaptation.

Increase and Distribution: G_1 seed (equivalent to Breeders seed) will be maintained by the USDA-NRCS Bridger Plant Materials Center and G_2 seed (equivalent to Foundation seed) is available in limited quantities to interested parties for increase purposes. Commercial production is limited to two generations beyond G_2. G_2 seed is available through the Foundation Seed Program at Montana State University-Bozeman or the University of Wyoming, and the USDA-Natural Resources Conservation Service Plant Materials Center (PMC) in Bridger, Montana.

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Signatures for release of:

Great Northern Germplasm western yarrow *Achillea millefolium* var. *occidentalis*

Dave White
State Conservationist
NRCS
Bozeman, Montana

2-17-04
Date

Lincoln Burton
State Conservationist
NRCS
Casper, Wyoming

2/27/04
Date

Director
Montana Agricultural Experiment Station
Montana State University
Bozeman, Montana

2/19/04
Date

Director
Wyoming Agricultural Experiment Station
University of Wyoming
Laramie, Wyoming

3/3/04
Date

for Director
Ecological Sciences Division
NRCS
Washington, DC

5/26/04
Date

APPENDIX A.

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Appendix Table 1. Initial Evaluation Planting. The 1994 and 1995 overall mean performance of 29 accessions of western yarrow *Achillea millefolium* var. *occidentalis* and 9 accessions of common yarrow *Achillea millefolium* in Field 10 at the Bridger PMC; planted May 24 & 25, 1994.

		Survival		Vigor†		Foliage Height		Seedhead Production†
Accession	Origin	1994	1995	1994	1995	1994	1995	1995
		%	%			cm	cm	
Considered								
9054523	Flathead County, MT	100	100	6.7	4.3	18.3	29.3	2.3
9054562	Flathead County, MT	100	100	5.3	3.7	18.7	26.3	2.7
9057902	**Flathead County, MT**	**100**	**100**	**5.3**	**3.3**	**17.7**	**29.3**	**2.3**
9058057	Carbon County, MT	100	100	2.3	3.7	9	21.7	3
9058146	Carbon County, MT	100	100	3	4	10.3	24.7	2.7
9058149	Glacier County, MT	100	100	4	3.7	13.3	30	1.7
9063301	Flathead County, MT	100	100	6.3	4	16	32	2
9063359	Toole County, MT	100	100	3.7	5	12	29.7	2.6
9063360	Toole County, MT	100	100	3.3	5.3	9	23	2.3
9075993	Garfield County, MT	100	100	7.3	5	14.7	32	3.3
9075994	Flathead County, MT	100	100	6	3	10.7	28.3	2.7
9075995	Park County, MT	100	100	3.7	2.7	9.3	22.3	3
9075996	Park County, MT	100	100	3	3.5	10	25.5	3
Not considered								
9010602‡	Denmark	100	100	7.3	7	19.3	62.3	1.7
9010607‡	Hungary	100	100	7.7	7	10	67	2
9010609‡	France	100	100	7	7	17.5	57	1.5
9010610‡	France	100	100	7	6	10.7	31	2
9011404‡	Romania	100	100	4.5	5.5	12.5	42	3
9011422‡	Romania	100	100	7.3	7	21.7	73.7	1.3
9011434‡	Romania	100	100	7.3	6.3	13	60	2
9011467‡	Romania	100	100	7.7	7.3	22.7	63.3	1.7
9011646‡	Poland	83	83	8	7	17.3	68	2
9054522	Glacier National Park	100	100	6.3	6.3	26	36.7	2.7
9063167	Yellowstone National Park	100	100	4.7	3	14	26.7	1.7
9063171	Yellowstone National Park	100	83	3.3	4.7	11.7	21.7	2.7
9063180	Yellowstone National Park	100	100	4	4.3	10.7	24	3.3
9063205	Yellowstone National Park	100	83	4.3	2.7	12	23.7	2
9063221	Yellowstone National Park	100	100	4.3	1.7	14.3	26	2
9063229	Yellowstone National Park	100	100	5.3	2.3	16.3	31	2
9063327	Yellowstone National Park	100	100	4.7	3	16.7	24.7	2
9063328	Yellowstone National Park	100	100	4	2.3	16.3	26.3	1.7
9063333	Yellowstone National Park	92	92	3	5.7	11.3	23.7	3.3
9063334	Yellowstone National Park	100	100	5.3	4.7	18.3	23.3	2.3
9063400	Glacier National Park	100	100	3.7	3.3	12	25.3	3
9063402	Glacier National Park	100	100	6	4.7	18.3	36.3	2.3
9063428	Yellowstone National Park	100	100	4.7	3.6	14	33	2.7
9063644	Glacier National Park	91	91	4	4	15	29.7	3
9075940	Yellowstone National Park	100	100	3.3	5.7	14.3	20.3	3

† Rated 1-9 with 1 best.

‡ Introduced common yarrow.

Appendix Table 2. Initial Evaluation Planting. The 1996 and 1997 overall means of 29 accessions of western yarrow *Achillea millefolium* var. *occidentalis* and 9 accessions of common yarrow *Achillea millefolium* in Field 10 at the Bridger PMC; planted May 24 & 25, 1994.

Accession	Origin	Survival		Vigor†		Foliage Height		Seedhead Production†		Leafiness†	
		1996	1997	1996	1997	1996	1997	1996	1997	1996	1997
		%				cm					
Considered											
9054523	Flathead County, MT	100	91.7	2.3	5.7	12.0	14.0	2.3	3.0	3.0	5.7
9054562	Flathead County, MT	100	75.0	2.3	6.3	13.0	15.0	3.0	7.7	2.0	6.0
9057902	**Flathead County, MT**	**100**	**41.7**	**1.7**	**4.0**	**13.7**	**8.0**	**1.7**	**4.3**	**1.7**	**4.3**
9058057	Carbon County, MT	100	100	4.3	3.7	10.0	13.0	2.7	4.0	3.7	3.0
9058146	Carbon County, MT	83.3	100	4.0	3.3	8.3	16.7	2.3	3.7	4.0	3.7
9058149	Glacier County, MT	100	100	2.3	3.3	10.7	16.3	1.7	3.7	1.7	2.3
9063359	Toole County, MT	100	100	2.0	2.0	13.0	15.7	1.7	2.7	2.0	2.7
9063360	Toole County, MT	100	91.7	3.7	2.7	8.0	13.3	1.7	7.7	4.0	3.0
9063301	Flathead County, MT	91.7	91.7	6.0	5.7	9.0	11.3	3.0	7.3	5.7	5.7
9075993	Garfield County, MT	100	100	3.7	3.0	11.7	38.0	2.7	2.3	7.0	2.3
9075994	Flathead County, MT	77.7	88.9	4.3	4.7	9.7	7.3	2.3	4.7	6.0	5.3
9075995	Park County, MT	100	100	6.3	5.0	9.7	13.7	3.7	5.3	5.7	4.7
9075996	Park County, MT	66.7	66.7	4.7	4.0	3.3	8.3	4.3	3.7	8.3	4.0
Not Considered											
9010602‡	Denmark	100	100	2.3	1.3	50.0	47.7	1.0	1.3	1.0	1.3
9010607‡	Hungary	100	100	2.3	1.0	55.0	61.3	1.0	1.0	1.0	1.0
9010609‡	France	66.7	66.7	2.7	4.7	26.0	39.3	1.0	4.7	1.0	4.7
9010610‡	France	100	100	4.3	1.0	37.0	60.3	1.0	1.0	1.0	1.0
9011404‡	Romania	66.7	66.7	3.7	3.7	23.3	26.7	1.0	6.7	1.0	2.7
9011422‡	Romania	100	100	2.7	1.0	72.3	92.3	1.0	1.0	1.0	1.0
9011434‡	Romania	91.7	100	4.7	2.3	55.3	67.7	1.0	2.3	1.0	2.3
9011467‡	Romania	100	100	2.3	1.0	64.0	59.7	1.0	1.0	1.0	1.0
9011646‡	Poland	83.3	100	2.0	1.7	63.7	51.0	1.0	1.7	1.0	1.7
9054522	Glacier National Park	100	75.0	3.0	4.0	9.3	12.3	2.0	4.7	3.7	4.3
9063167	Yellowstone National Park	91.7	83.3	4.7	6.7	9.3	12.7	3.0	6.3	3.0	6.0
9063171	Yellowstone National Park	83.3	83.3	6.7	6.3	6.3	13.3	4.3	6.7	4.7	5.3
9063180	Yellowstone National Park	100	83.3	5.3	6.0	6.0	14.0	3.7	5.0	5.7	6.0
9063205	Yellowstone National Park	100	58.3	4.0	5.0	8.3	6.7	3.3	6.0	3.3	5.0
9063221	Yellowstone National Park	100	75.0	5.3	6.0	9.3	11.3	3.3	5.0	4.7	6.0
9063229	Yellowstone National Park	100	83.3	3.7	7.3	7.7	10.0	1.7	5.7	3.7	7.3
9063327	Yellowstone National Park	91.7	66.7	5.3	7.7	10.3	8.0	3.7	6.0	5.0	7.7
9063328	Yellowstone National Park	100	91.7	4.0	5.0	11.7	14.0	4.0	1.0	2.3	3.3
9063333	Yellowstone National Park	83.3	75.0	5.7	5.0	9.0	12.0	3.3	6.0	6.0	6.7
9063334	Yellowstone National Park	91.7	100	6.3	5.7	9.0	12.3	3.7	2.7	5.3	5.7
9063400	Glacier National Park	91.7	91.7	6.0	7.7	7.7	7.7	5.0	5.0	5.7	7.7
9063402	Glacier National Park	100	100	4.0	5.7	12.7	18.0	2.3	6.0	3.7	4.7
9063428	Yellowstone National Park	100	100	4.7	6.0	8.7	15.0	3.3	3.3	4.7	5.3
9063644	Glacier National Park	90.9	75.0	4.3	6.0	10.0	11.3	2.7	6.0	4.3	6.3
9075940	Yellowstone National Park	100	75.0	5.0	6.0	7.7	16.0	2.7	7.0	4.7	4.0

† Rated 1-9 with 1 best.

‡ Introduced common yarrow.

Appendix Table 3. Initial Evaluation Planting. The 1996-1997 mean vigor of 29 accessions of western yarrow *Achillea millefolium* var. *occidentalis* and 9 accessions of common yarrow *Achillea millefolium* in Field 10 at the Bridger PMC; planted May 24 & 25, 1994.

Accession	Origin	Vigor†	
		1996	1997
Considered			
9057902	**Flathead County, MT**	**1.7 a***	**4.0 bcdefgh***
9063359	Toole County, MT	2.0 ab	2.0 abc
9058149	Glacier County, MT	2.3 abc	3.3 abcdef
9054523	Flathead County, MT	2.3 abc	5.7 efgh
9054562	Flathead County, MT	2.3 abc	6.3 ghi
9063360	Toole County, MT	3.7 abcdef	2.7 abcd
9075993	Garfield County, MT	3.7 abcdef	3.0 abcde
9058146	Carbon County, MT	4.0 abcdef	3.3 abcdef
9058057	Carbon County, MT	4.3 abcdef	3.7 abcdefg
9075996	Park County, MT	4.7 abcdef	4.0 bcdefgh
9075994	Flathead County, MT	4.3 abcdef	4.7 cdefgh
9063301	Flathead County, MT	6.0 ef	5.7 efgh
9075995	Park County, MT	6.3 f	5.0 defgh
Not considered			
9054522	Glacier National Park	3.0 abcde	4.0 bcdefgh
9063400	Glacier National Park	6.0 ef	7.7 i
9063402	Glacier National Park	4.0 abcdef	5.7 efgh
9063644	Glacier National Park	4.3 abcdef	6.0 fgh
9063167	Yellowstone National Park	4.7 f	6.7 hi
9063171	Yellowstone National Park	6.7 f	6.3 ghi
9063180	Yellowstone National Park	5.3 cdef	6.0 fgh
9063205	Yellowstone National Park	4.0 abcdef	5.0 defgh
9063221	Yellowstone National Park	5.3 cdef	6.0 fgh
9063327	Yellowstone National Park	5.3 cdef	7.7 i
9063328	Yellowstone National Park	4.0 abcdef	5.0 fgh
9063229	Yellowstone National Park	3.7 abcdef	7.3 i
9063333	Yellowstone National Park	5.7 def	5.0 defgh
9063334	Yellowstone National Park	6.3 f	5.7 efgh
9063428	Yellowstone National Park	4.7 abcdef	6.0 fgh
9075940	Yellowstone National Park	5.0 bcdef	6.0 fgh
9010602‡	Denmark	2.3 abc	1.3 a
9010609‡	France	2.7 abcd	6.7 hi
9010610‡	France	4.3 abcdef	1.0 a
9010607‡	Hungary	2.3 abc	1.0 a
9011646‡	Poland	2.0 ab	1.7 ab
9011404‡	Romania	3.7 abcdef	3.7 abcdefg
9011422‡	Romania	2.7 abcd	1.0 a
9011434‡	Romania	4.7 abcdef	2.3 abc
9011467‡	Romania	2.3 abc	1.0 a

† Rated 1-9 with 1 best.

‡ Introduced common yarrow.

* Means within a column followed by the same letter/letters are not significantly different as determined by the LSD test at the 5% level.

Appendix Table 4. Initial Evaluation Planting. The 1996-1997 mean foliage height of 29 accessions of western yarrow *Achillea millefolium* var. *occidentalis* and 9 accessions of common yarrow *Achillea millefolium* in Field 10 at the Bridger PMC; planted May 24 & 25, 1994.

Accession	Origin	Foliage Height			
		1996		1997	
		cm		*cm*	
Considered					
9057902	**Flathead County, MT**	**13.7**	**ef***	**8.0**	**g***
9054562	Flathead County, MT	13.0	fg	15.0	fg
9063359	Toole County, MT	13.0	fg	15.7	fg
9054523	Flathead County, MT	12.0	fg	14.0	fg
9075993	Garfield County, MT	11.7	fg	38.0	de
9058149	Glacier County, MT	10.7	g	16.3	fg
9058057	Carbon County, MT	10.0	g	13.0	fg
9075995	Park County, MT	9.7	g	13.7	fg
9075994	Flathead County, MT	9.7	g	7.3	g
9063301	Flathead County, MT	9.0	g	11.3	fg
9058146	Carbon County, MT	8.3	g	16.7	fg
9063360	Toole County, MT	8.0	g	13.3	fg
9075996	Park County, MT	3.3	g	8.3	g
Not considered					
9054522	Glacier National Park	9.3	g	12.3	fg
9063400	Glacier National Park	7.7	g	7.7	g
9063402	Glacier National Park	12.7	fg	18.0	fg
9063644	Glacier National Park	10.0	g	11.3	fg
9063167	Yellowstone National Park	9.3	g	12.7	fg
9063171	Yellowstone National Park	6.3	g	13.3	fg
9063180	Yellowstone National Park	6.0	g	14.0	fg
9063205	Yellowstone National Park	8.3	g	6.7	g
9063221	Yellowstone National Park	9.3	g	11.3	fg
9063327	Yellowstone National Park	10.3	g	8.0	g
9063328	Yellowstone National Park	11.7	fg	14.0	fg
9063229	Yellowstone National Park	7.7	g	10.0	fg
9063333	Yellowstone National Park	9.0	g	12.0	fg
9063334	Yellowstone National Park	9.0	g	12.3	fg
9063428	Yellowstone National Park	8.7	g	15.0	fg
9075940	Yellowstone National Park	7.7	g	16.0	fg
9010602†	Denmark	50.0	c	47.7	cd
9010609†	France	26.0	de	39.3	de
9010610†	France	37.0	d	60.3	bc
9010607†	Hungary	55.0	bc	61.3	bc
9011646†	Poland	63.7	ab	51.0	bcd
9011404†	Romania	23.3	ef	26.7	ef
9011422†	Romania	72.3	a	92.3	a
9011434†	Romania	55.3	bc	67.7	b
9011467†	Romania	64.0	ab	59.7	bc

† Introduced common yarrow.

* Means within a column followed by the same letter/letters are not significantly different as determined by the LSD test at the 5% level.

Appendix Table 5. Initial Evaluation Planting. The 1996-1997 mean seedhead production of 29 accessions of western yarrow *Achillea millefolium* var. *occidentalis* and 9 accessions of common yarrow *Achillea millefolium* in Field 10 at the Bridger PMC; planted May 24 & 25, 1994.

Accession	Origin	Seedhead Production†	
		1996	1997
Considered			
9057902	**Flathead County, MT**	**1.7 a***	**4.3 cdefghij***
9063359	Toole County, MT	1.7 a	2.7 abcde
9063360	Toole County, MT	1.7 a	2.7 abcde
9058149	Glacier County, MT	1.7 a	3.7 abcdefgh
9054523	Flathead County, MT	2.3 abc	3.0 abcdef
9058146	Carbon County, MT	2.3 abc	3.7 abcdegh
9075994	Flathead County, MT	2.3 abc	4.7 defghijk
9075993	Garfield County, MT	2.7 abcd	2.3 abcd
9075994	Flathead County, MT	2.7 abcd	4.0 bcdefghi
9063301	Flathead County, MT	3.0 abcde	5.7 fghijkl
9054562	Flathead County, MT	3.0 abcde	7.7 l
9075995	Park County, MT	3.7 cdef	5.3 efghijkl
9075996	Park County, MT	4.3 ef	3.7 abcdefgh
Not considered			
9054522	Glacier National Park	2.0 ab	4.7 defghijk
9063400	Glacier National Park	5.0 f	7.7 l
9063402	Glacier National Park	2.3 abc	5.0 efghijkl
9063644	Glacier National Park	2.7 abcd	3.3 abcdefg
9063167	Yellowstone National Park	3.0 abcde	6.3 hijkl
9063171	Yellowstone National Park	4.3 ef	6.7 ijkl
9063180	Yellowstone National Park	3.7 cdef	6.7 ijkl
9063205	Yellowstone National Park	3.3 bcde	5.0 efghijkl
9063221	Yellowstone National Park	3.3 bcde	6.0 ghijkl
9063327	Yellowstone National Park	3.7 cdef	7.3 kl
9063328	Yellowstone National Park	4.0 def	6.0 ghijkl
9063229	Yellowstone National Park	1.7 a	5.0 efghijkl
9063333	Yellowstone National Park	3.3 bcde	1.0 a
9063334	Yellowstone National Park	3.7 cdef	6.0 ghijkl
9063428	Yellowstone National Park	3.3 bcde	6.0 ghijkl
9075940	Yellowstone National Park	2.7 abcd	7.0 jkl
9010602‡	Denmark	1.0 a	1.3 ab
9010609‡	France	1.0 a	6.7 ijkl
9010610‡	France	1.0 a	1.0 a
9010607‡	Hungary	1.0 a	1.0 a
9011646‡	Poland	1.0 a	1.7 abc
9011404‡	Romania	1.0 a	6.7 ijkl
9011422‡	Romania	1.0 a	1.0 a
9011434‡	Romania	1.0 a	2.3 abcd
9011467‡	Romania	1.0 a	1.0 a

† Rated 1-9 with 1 best.

‡ Introduced common yarrow.

* Means within a column followed by the same letter/letters are not significantly different as determined by the LSD test at the 5% level.

Appendix Table 6. Initial Evaluation Planting. The 1996 and 1997 mean leafiness of 29 accessions of western yarrow *Achillea millefolium* var. *occidentalis* and 9 accessions of common yarrow *Achillea millefolium* in Field 10 at the Bridger PMC; planted May 24 & 25, 1994.

Accession	Origin	Leafiness†	
		1996	1997
Considered			
9057902	**Flathead County, MT**	**1.7 a***	**4.3 bcdefghi***
9058149	Glacier County, MT	1.7 a	2.3 abcd
9054562	Flathead County, MT	2.0 ab	6.0 fghi
9063359	Toole County, MT	2.0 ab	2.7 abcde
9054523	Flathead County, MT	3.0 abcd	5.7 efghi
9058057	Carbon County, MT	3.7 abcdef	3.0 abcdef
9063360	Toole County, MT	4.0 abcdef	3.0 abcdef
9058146	Carbon County, MT	4.0 abcdef	3.7 abcdefg
9075995	Park County, MT	5.7 efg	4.7 cdefghi
9063301	Flathead County, MT	5.7 efg	5.7 efghi
9075994	Flathead County, MT	6.0 fgh	5.3 efghi
9075993	Garfield County, MT	7.0 gh	2.3 abcd
9075996	Park County, MT	8.3 hi	4.0 abcdefgh
Not considered			
9054522	Glacier National Park	3.7 abcdef	4.3 bcdefghi
9063400	Glacier National Park	5.7 efg	7.7 j
9063402	Glacier National Park	3.7 abcdef	4.7 cdefghi
9063644	Glacier National Park	4.3 bcdef	6.3 ghi
9063167	Yellowstone National Park	3.0 abcd	6.0 fghi
9063171	Yellowstone National Park	4.7 cdefg	5.3 efghi
9063180	Yellowstone National Park	5.7 efg	6.0 fghi
9063205	Yellowstone National Park	3.3 abcde	5.0 defghi
9063221	Yellowstone National Park	4.7 cdefg	6.0 fghi
9063327	Yellowstone National Park	5.0 defg	7.7 j
9063328	Yellowstone National Park	2.3 abc	3.3 abcdefg
9063229	Yellowstone National Park	3.7 abcdef	7.3 ij
9063333	Yellowstone National Park	6.0 fgh	6.7 hi
9063334	Yellowstone National Park	5.3 defg	5.7 efghi
9063428	Yellowstone National Park	4.7 cdefg	5.3 efghi
9075940	Yellowstone National Park	4.7 cdefg	4.0 abcdefgh
9010602‡	Denmark	1.0 a	1.3 ab
9010609‡	France	1.0 a	6.7 hi
9010610‡	France	1.0 a	1.0 a
9010607‡	Hungary	1.0 a	1.0 a
9011646‡	Poland	1.0 a	1.7 abc
9011404‡	Romania	1.0 a	2.7 abcde
9011422‡	Romania	1.0 a	1.0 a
9011434‡	Romania	1.0 a	2.3 abcd
9011467‡	Romania	1.0 a	1.0 a

† Rated 1-9 with 1 best.

‡ Introduced common yarrow.

*Means within a column followed by the same letter/letters are not significantly different as determined by the LSD test at the 5% level.

APPENDIX B.