RECOMMENDATION FOR THE RELEASE OF GREAT NORTHERN COMMON YARROW SELECTED CLASS OF NATURAL GERMPLASM

Introduction

Scientific Name: *Achillea millefolium* L.

Common Name: common yarrow, western yarrow, wooly yarrow, milfoil, wild-tansy

Germplasm Name: Great Northern

Other Identification Used: 9057902

Origin: The 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: Common yarrow *Achillea millefolium* L. synonyms *Achillea lanulosa* Nutt. J., *Achillea millefolium* var. *lanulosa* (Nutt.), and *Achillea millefolium* var. *occidentalis* DC. (Asteraceae family) is a highly variable circumboreal species 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 hybridize and differ primarily in chromosome number (N=9); native races are mostly tetraploid and introduced races hexaploid (6, 7). Botanists currently support taxonomic classification under one species name, while acknowledging genetic and ecological differentiation at the local and regional level (10, 11). Common 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 to 25 cm long and cauline leaves typically up to 10 cm long, 3 cm broad. Inflorescence arranged in a compound, flat-topped corymb 6-20 cm wide, consisting of small, numerous, flower heads 4-6 mm in size. Involucre bracts pubescent, greenish, with straw-colored papery margins (14). Outside ray-flowers 3-12, mostly white to cream-colored, 1-2.5 mm long, encircling the center disk-flowers 10-75 each, 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 Development: Great Northern Germplasm was selected from among 38 accessions of common yarrow collected in Montana, Wyoming, and Europe. Direct increase of G_2 seed constitutes the germplasm.

Uses: 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 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 (18, 22).

Area of Adaptation: Common 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 (Montana) to 3658 m (Colorado). It thrives in droughty conditions on gravelly loam and on thin or sandy soils (15). Common 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 (17) except on heavily disturbed, arable sites with favorable environmental conditions (9).

Insect or Disease Problems: Inflorescences that are harvested for seed production often contain small quantities of insect larvae and numerous live insects. These do not seem to have a 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 (21). Pest insects include common leaf bugs (*Lygus* spp.) and flea beetles (Chrysomelidae). Root rot and mildew may occur in poorly drained soils (20).

Increase and Distribution: Foundation (G_2) and certified seed classes are recognized. Commercial production is limited to one generation beyond G_2. Foundation 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 (NRCS) Plant Materials Center (PMC) in Bridger, Montana. Foundation seed will be available in 2003.

Performance of Great Northern Germplasm Common Yarrow

Testing: Great Northern Germplasm was tested as 9057902.

Initial Evaluation Planting (IEP). Great Northern Germplasm was included in an IEP established in 1994 at the Bridger PMC. A total of 38 accessions were spaced-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 (tables 1 and 2). The introduced accessions (9 each) and accessions from within Yellowstone and Glacier National Parks (16 each) were subsequently determined to be inappropriate or unavailable for potential release and, while included in the documentation, are excluded from the performance review.

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 (table 3) and mean foliage height in 1996 (table 4), and top-ranked in mean seedhead production (table 5) and leafiness (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. The introduced accessions, while performing well, have a very a-typical appearance, aggressive vigor, and extremely tall plant heights.

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 '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/ac oil and tea grade dry matter production (3).

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. Great Northern Germplasm seems to be 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 (13).

Table 1. Initial Evaluation Planting. The 1994 and 1995 overall mean performance of 38 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.

Table 2. Initial Evaluation Planting. The 1996 and 1997 overall means of 38 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.

Table 3. Initial Evaluation Planting. The 1996-1997 mean vigor of 38 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.

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

Table 4. Initial Evaluation Planting. The 1996-1997 mean foliage height of 38 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

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

Table 5. Initial Evaluation Planting. The 1996-1997 mean seedhead production of 38 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.

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

Table 6. Initial Evaluation Planting. The 1996 and 1997 mean leafiness of 38 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.

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

Seed Increase. In 1998, a seed increase field was established at the Bridger PMC. Seed of common 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 7.

Table 7. The 1998-2002 seeds counts, germination percentage, and seed production of Great Northern Germplasm common yarrow *Achillea millefolium*; 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.

Environmental Considerations: Common yarrow *Achillea millefolium* 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 (19). Domestic sheep and goats derive a fair amount of forage from common yarrow. Cattle and horses generally consume up to 20% as summer use. The volatile oils, alkaloids, and glycosides are not considered toxic because the plant is seldom overgrazed by livestock. Sage grouse chicks rely heavily on common yarrow as a food source. Native Americans used common yarrow for many purposes, such as a tea to cure stomach ailments, a poultice treatment on infected wounds, and as a mosquito repellant (16). Studies conducted on the use of common yarrow as a sodding technique in erosion control projects produced satisfactory results (1).

No other release of common yarrow is available to the seed industry. There is a commercial shortage of native forb seed for use in restoring disturbed areas and re-establishing native plant communities in conservation enhancement and wildlife improvement programs. The majority of available seed of this species comes only from harvest of native sources.

Submitted by: This recommendation for the release of Great Northern Germplasm common yarrow was prepared and submitted by Susan R. Winslow and Mark E. Majerus, USDA-NRCS for joint release by the USDA-NRCS and the Montana and Wyoming Agricultural Experiment Stations, January 2003.

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