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And

MONTANA AGRICULTURAL EXPERIMENT STATION
BOZEMAN, MONTANA

And

WYOMING AGRICULTURAL EXPERIMENT STATION
LARAMIE, WYOMING

And

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION
HELENA, MONTANA

NOTICE OF RELEASE OF TRAPPER GERMPLASM WESTERN SNOWBERRY SELECTED CLASS OF GERMPLASM

The Natural Resources Conservation Service (NRCS, formerly the Soil Conservation Service), U.S. Department of Agriculture, the Agricultural Experiment Stations of Montana and Wyoming, the USDA Agricultural Research Service, the U.S. Forest Service, and the Montana Department of Natural Resources and Conservation announce the naming and release of selected ecotype of western snowberry (*Symphoricarpos occidentalis* Hook.). This germplasm was evaluated and selected by the USDA/NRCS Plant Materials Center (PMC) at Bridger, Montana.

As a selected release, this plant will be referred to as Trapper Germplasm western snowberry, NRCS accession number 9081963.

Justification for this alternative release procedure is based on a critical need for broadly-adapted, hardy, fast-growing shrubs for site stabilization, land reclamation, living snowfences, and wildlife habitat applications in the northern Rocky Mountains and Great Plains. A lack of tested and adapted germplasm and the potential use of non-adapted seed sources further supports Selected class release. Additionally, this selection originates from northern Rocky Mountains and Great Plains seed sources well adapted to the conditions in the intended geographic area of use. Trapper Germplasm western snowberry was selected for superior seedling survival and plant condition-primarily for use in land reclamation, living snowfences, and wildlife plantings. This selection may not be adapted to, or perform optimally on, all sites over its recommended geographic range of use. The use of local ecotypes may be preferred for some applications on public, wildland sites.

Collection Site Information: The origin of Trapper Germplasm western snowberry pine is from 14 parent plants (Montana [8 plants], and Wyoming [6]) consisting of 5 seed sources (Montana [3 seed sources] and

Wyoming [2]). A summary of collection site information relative to each seed source appears in Appendix A. It is assumed that all parent plants were native to the geographic sites in which they were found growing (i.e., not planted seedlings from off-site seed sources).

Trapper Germplasm western snowberry is a composite of a 329-plant seed orchard located in Carbon County, Montana, approximately 3 miles south and east of the town of Bridger, at the USDA/NRCS Plant Materials Center (see Method of Selection for planting site information). A second 208-plant seed orchard is located at the Department of Natural Resources, Montana Conservation Seedling Nursery at Missoula, Montana (see Method of Selection for planting site information).

Description: Trapper Germplasm western snowberry has the same general botanical (floral, foliage, fruit, seed) and phenological attributes as the species. When descriptive information is specific to Trapper Germplasm, it is noted as such. It is assumed Trapper Germplasm traits are heritable and that the appearance and performance of the progeny from this selection will be comparable to that of the parents.

Western snowberry petals, sepals, and stamens typically number 5, although they may occasionally number 4. The corolla is relatively short and broad, short campanulate, not much, if at all, longer than wide and often bulged on one side. The petal lobes are half as long to greater than the corolla tube. The styles are elongate, about 0.16 to 0.27 inches (4 to 7 mm) in length, more or less exerted, and generally long-haired near the middle. The anthers are 0.06 to 0.08 inches (1.5 to 2 mm) and evidently less than the filaments. The corolla lobes are generally equal to or slightly greater than the tube in length. They are borne in terminal and axillary short racemes or spikes. The styles are well developed with capitate or slightly 2-lobed stigma. Flowers are white to pinkish and borne in July through August at Bridger, Montana. Leaves are without stipules, simple, with entire to occasionally coarsely lobed margins (1).

Western snowberry (*Symphoricarpos occidentalis* Hook. [Caprifoliaceae]) is a perennial, woody, deciduous shrub native to broad areas of the United States (2). It has a rhizomatous habit, forming dense colonies or thickets by adventitious shoots from widely spreading roots and rhizomes (3, 4, 5, 6, 7, 8). Western snowberry is an erect to semi-erect shrub that normally grows 2 to 4 feet (0.6 to 1.2 m) tall (2, 4, 7, 8, 9) with an average mature height of 3 feet (91 cm) (2). Trapper Germplasm western snowberry reaches 5 feet (152 cm) in height within 6 to 8 years under cultivated conditions and supplemental moisture on productive sites. Western snowberry leaves are 0.8 to 2.4 inches (2 to 6 cm) long and 0.4 to 1.4 inches (1 to 3.5 cm) wide (4, 8, 10). The fruit are greenish white to white drupes, containing two white nutlets and ripening in the fall (8, 11, 12, 13). Trapper western snowberry ripens in late October to mid-November in Bridger, Montana, with fruit collection from mid-November to early December. Approximately 150, 6-year or older Trapper western snowberry plants will yield 15 pounds (6.8 kg) of bulk seeds each year under cultivation.

The native range of western snowberry varies according to reference. It is generally considered native to broad areas of the western United States and the northern Great Plains. All references list western snowberry native to Montana, Wyoming, North Dakota, South Dakota, and Colorado. Its native range in the continental U.S. is described as extending from Washington state south into Oregon; southeast to Utah, New Mexico, and Texas; northeast to Missouri; east to Kentucky; northeast to the mid-Atlantic states and Massachusetts (27 native states) (2). A second reference omits the states of Oregon and Texas, as well as states east of Illinois and Michigan (18 native states) (14). Neither reference lists western snowberry as native to California, Nevada, or Arizona, southern states east of Texas, the southeastern U.S., or most of New England. It is considered most prevalent in the northern Great Plains (4, 8).

Method of Selection: Field collections of 19 seed sources of *Symphoricarpos* from across Montana and Wyoming were propagated as bareroot stock in 1984 through 1986 at the USDA/NRCS Plant Materials Center at Bridger, Montana. All collections were direct seeded in Field 4 and cultivated under an overhead sprinkler irrigation system.

On April 14, 1987, approximately 5 seedlings of each seed source were transplanted to the test site at the Montana Conservation Seedling Nursery (formerly the Montana State Forest Tree Nursery) at Missoula, Montana. The planting site was located in Section 30, T. 13 N., R. 19 W.; at an elevation of approximately 3,200 feet (975 meters). The site is located in a 13.9-inch (353-mm) annual precipitation zone, with approximately 7.7 inches (196 mm) falling over the course of an average growing season. The long-term, frost-free season averages between 105 and 120 days. Maximum, daytime air temperatures seldom exceed 95°F (35°C) during the growing season, with average minimum nighttime temperatures of approximately 50°F (10°C) (15). The site is located in USDA Plant Hardiness Zone 5a, with average minimum winter temperatures ranging from –15° to –20°F (-26° to –29°C) (16, 17).

The soil at the test site is Moiese Series, and is classified as a sandy-skeletal, mixed frigid Ardic Haploxeroll. It is similar to many of the loamy-skeletal, mixed, frigid, Typic Haploborolls and loamy, skeletal, mixed, frigid Udic Ustochrepts that are extensive at the lower elevations throughout much of western Montana. Typically, the surface layer of this Moiese soil is grayish-brown gravelly loam about 9 inches (23 centimeters) thick. The subsoil is brown, very gravelly sandy loam about 12 inches (30 cm) thick. The substratum to a depth of 60 inches (152 cm) or more is light brownish-gray and pale-brown, extremely gravelly loamy sand and extremely gravelly sand. Permeability is very rapid, and available water capacity is about 2.5 inches (6.3 cm). This type of soil is used primarily for urban-related development and as irrigated cropland (15, 18).

The entire woody plant test site was sprayed with Treflan® herbicide prior to planting. *Symphoricarpos* test plants were planted in rows spaced 6.6 feet (2 m) apart, and 3 feet (0.9 m) between plants within a row (15).

The western snowberry seed orchard site at Bridger is located at an elevation of 3,700 ft (1,128 m) in a 10- to 13-in (254- to 330-mm) annual precipitation zone. Bridger falls in USDA Plant Hardiness Zone 4b, with annual minimum temperatures of -20° to -25°F (-29° to -32°C). The site is located in Major Land Resource Area (MLRA) 32, Northern Intermountain Desertic Basin. This classification consists of sites in Montana and Wyoming ranging in elevation from 3,600 to 5,900 ft (1,100 to 1,800 m). The climate averages 4.9 to 8.9 in (25 to 225 mm) of annual precipitation with most precipitation in the spring and fall. Precipitation is low and erratic. The average annual temperature is approximately 45°F (7°C) with an average frost-free period of 120 to 140 days (19).

The study plan for this project specified annual data collection on percentage survival, total height, annual height growth, and vigor. This data was collected annually from 1987 through 1991. In addition, seed set and drought tolerance ratings were assigned in 1991. A field evaluation by the State Staff Forester, Plant Materials staff, and Field and Area Office personnel was conducted on June 9, 1992, that included an evaluation of each seed source for overall plant vigor, vitality, and health (plant condition).

Initial Evaluation Results

The 1987 through 1991 Initial Evaluation results appear in Appendices D through H. A summary of the final 1991 mean evaluation results by seed source appears in Table 1. The results of this evaluation, in conjunction with a field analysis in 1992, formed the basis for final selection.

Table 1. Mean evaluation results, *Symphoricarpos* IEP, Missoula, Montana, 1991.

Plot	Initial Accession Number	Species Symbol	Original Collection Location	1991 Percent. Survival	1991 Mean Height	1991 Mean Height Growth	1991 Mean Vigor Rating	1991 Mean Seed Set Rating	1991 Mean Drought Tolerance Rating
			County/State	%	cm	cm	(1-9)†	(1-9)†	(1-9)†
4 49	9026045	SYAL	Sanders, MT	80	110	36.5	3	3	3
4 50	9026012	SYAL	Goshen, WY	100	100	16.4	2	5	3
4 51	9026017	SYAL	Flathead, MT	100	90	13.2	3	5	4
4 52	9026013	SYOC‡	Sanders, MT	80	100	16.7	4	6	5
4 53	9026023	SYOC‡	Goshen, WY	100	90	14.6	4	6	5
4 54	9039285	SYOC‡	Converse, WY	100	100	18.4	6	6	5
4 55	9026060	SYOC	Fallon, MT	100	100	16.0	3	6	3
4 56	9026063	SYOC	Wibaux, MT	100	80	11.0	4	6	4
5 57	9026064	SYOC	Wibaux, MT	100	70	6.2	5	6	5
5 58	9026065	SYOC	Fallon, MT	80	80	20.0	5	7	5
5 59	9039203	SYOC	Niobrara, WY	80	90	20.0	4	6	5
5 60	9039235	SYOC‡	Hill, MT	100	90	7.8	3	2	3
5 61	9026069	SYAL	Lincoln, MT	80	100	10.2	4	3	5
5 62	9026041	SYMPH	Sanders, MT	20	100	29.0	4	5	4
5 63	9039303	SYMPH	Prairie, MT	100	80	8.0	3	2	3
5 64	9039304	SYMPH	Prairie, MT	100	70	12.8	3	3	3
6 65	9039305	SYOC‡	Prairie, MT	100	90	18.5	2	2	3
6 66	9025761	SYOC	Niobrara, WY	67	100	16.5	3	2	3
6 67	A322498	SYORU	Cheyenne ARS, WY	20	140	31.0	4	7	4
			Grand Mean:	85	94	17.0	3.6	4.6	3.9

† - (1 is best, 4 is average, 9 is worst or dead)
‡ - (Selected seed sources)

Survival

Number of seedlings surviving and percentage seedling survival by seed source by year for 1987 through 1991 appears in Appendices D and E, respectively. Most seedling mortality occurred by the end of the first growing season, with 13 seedlings from 7 seed sources perishing in 1987. Only two additional seedlings from a single seed source (6-66 Niobrara, Wyoming) died after the 1987 growing season. Mean percentage seedling survival decreased to 86.3 percent by the end of 1987, then decreased to 84.2 percent in 1989 where it remained constant until selection in 1992. By the end of the 1991 growing season, 11 of the 19 tested seed sources still maintained 100 percent seedling survival. The lowest percentage seedling survival measured 20, 20, and 67 percent for 5-62 Sanders, Montana; 6-67 Cheyenne ARS, Wyoming; and 6-66 Niobrara, Wyoming, respectively. Mean percentage seedling survival of all seed sources in 1991 was 84.2 percent. Mean percentage seedling survival of selected seed sources in 1991 averaged 96 percent, whereas non-selected seed sources averaged 80.5 percent.

Height and Height Growth

Mean height by seed source by year for 1987 through 1991 appears in Appendix F. Mean height of test seed sources in 1991 ranged from a low of 70 cm (2.3 ft) for 5-57 Wibaux, Montana, and 5-64 Prairie, Montana, to a high of 140 cm (4.6 ft) for 6-67 Cheyenne ARS, Wyoming, and 110 cm (3.6 ft) for 4-49 Sanders, Montana. The mean height of all seed sources in 1991 was 94 cm (3.1 ft).

Mean height growth by seed source by year for 1987 through 1991 appears in Appendix G. The overall mean growth rate for all seed sources was highly variable by year. It is suspected that the 1989 height growth reflects growth in 1987 and 1989, and/or that supplemental irrigation was provided 1 or both years. Mean height growth in 1991 ranged from 36.5 cm (14.4 in) for 4-49 Sanders, Montana, to 6.2 cm (2.4 in) for 5-57 Wibaux, Montana. Overall mean height growth in 1991 was 17.0 cm (6.7 in). The mean height growth of selected seed sources averaged 15.2 cm (6.0 in), whereas non-selected seed sources averaged 17.6 cm (6.9 in).

Vigor Rating

Mean vigor ratings by seed source by year for 1987 through 1991 appear in Appendix H. Vigor rating in 1991 ranged from a highest vigor value of 2 for 4-50 Goshen, Wyoming, and 6-65 Prairie, Montana, to a lowest vigor value of 6 for 4-54 Converse, Wyoming. Overall mean vigor rating for all seed sources in 1991 was 3.6. The mean vigor rating in 1991 of selected seed sources was 3.8, whereas non-selected seed sources rated 3.6.

Seed Set Rating

Mean seed set rating data was collected only in 1991 and appears by seed source in Table 1. Seed set rating ranged from a highest rating value of 2 for 5-60 Hill, Montana; 5-63 Prairie, Montana; 6-65 Prairie, Montana; and 6-66 Niobrara, Wyoming, to a rating low of 7 for 5-58 Fallon, Montana, and 6-67 Cheyenne ARS, Wyoming. The overall mean seed set rating for all seed sources in 1991 was 4.6. The mean seed rating of selected seed sources rated 4.4, whereas non-selected seed sources rated 4.7.

Drought Tolerance Rating

Mean drought tolerance rating data was collected only in 1991 and appears by seed source in Table 1. Drought tolerance rating ranged from a highest rating value of 3 for 8 seed sources to a rating low of 5 for 7 seed sources. The overall mean drought tolerance rating for all seed sources in 1991 was 3.9. The mean drought tolerance rating of selected seed sources rated 4.2, whereas non-selected seed sources rated 3.9.

Seed Source Selections

Preliminary seed source selections were made in 1992 based on the 1987 through 1991 Initial Evaluation results, as well as the appearance and performance of the plants in the field in 1992. Selection was based on seedling survival and the plant condition evaluation conducted in 1992. Four of the 19 seed sources were considered superior including 4-53 Goshen County, Wyoming; 4-54 Converse County, Wyoming; 5-60 Hill County, Montana; and 6-65 Prairie County, Montana. Based on the superior performance of a single plant from 4-52 Sanders County, Montana, in 1995, it was also selected.

In order to establish clonal orchards for seed production, dormant hardwood cuttings were taken in January 1996 from original test plants in the five selected seed sources at Missoula and transported to the Bridger PMC for adventitious rooting. All cuttings were trimmed to a uniform size, wounded, bases recut, and then treated with a rooting hormone. The cuttings were placed in a propagation bench in a perlite media under intermittent mist and 70°F bottom heat. The greenhouse was maintained at 75° to 80°F days, and 60° to 65°F nights, on 16-hour photoperiods.

A 329-plant seed orchard was established in 1998 in Carbon County, Montana, approximately 3 miles south and east of the town of Bridger, at the USDA/NRCS Plant Materials Center A second 208-plant seed orchard was established in 2000 at the Department of Natural Resources, Montana Conservation Seedling Nursery at Missoula, Montana.

Ecological Considerations and Evaluation

Trapper Germplasm western snowberry has the same reproductive and establishment characteristics as the species. It is a rhizomatous, native shrub reproducing by seeds and spreading by rhizomes or shoots under natural conditions. It forms colonies or dense thickets under certain environmental and site conditions. In the northern Great Plains, western snowberry is highly competitive and may exclude other vegetation including desirable forage species and invade pastures and grasslands (8, 20, 21, 22). It is a valuable wildlife habitat species and offers some food value for livestock.

Plant Successional Status

Western snowberry is considered a pioneer species following broadcast burning and cattle grazing (5, 7, 8, 23, 24) and is often found growing in open areas where there is evidence of past disturbance (7, 8, 24, 25, 26, 27). It also occurs on stable portions of streambanks (8, 28). It is relatively shade intolerant, and can be displaced by taller woody vegetation such as green ash (*Fraxinus pennsylvanica*) (5, 7, 8, 28).

Plant Habitat and Community Types

Western snowberry occurs in a variety of habitat types and plant communities including grasslands, mixed grass, prairie, shrubland, sagebrush, woodland, and riparian (5, 8, 29, 30, 31, 32, 33). In Montana, western snowberry occurs along the floodplain of the Yellowstone River and is associated with plains cottonwood (*Populus deltoides* var. *monilifera*), willow (*Salix* species), and Wood's rose (*Rosa woodsii*) (8, 29, 34). In Wyoming and Colorado, it is a common riverine floodplain shrub in plains cottonwood and willow communities and is associated with peachleaf willow (*Salix amygdaloides*), thinleaf alder (*Alnus incana* spp. *tenuifolia*), chokecherry (*Prunus virginiana*), and red-osier dogwood (*Cornus sericea*) (8, 35, 36, 37, 38). In eastern Montana and western North and South Dakota, western snowberry is an important component in woodland and riparian draws dominated by green ash (8, 32, 39). In western Montana, western snowberry may form dense ecotonal thickets around silver buffaloberry (*Shepherdia argentea*) stands (8, 40). A western snowberry community type has been described for Montana, North Dakota, and Alberta (5, 8, 30, 40, 41). Western snowberry often forms dense monotypic stands with little understory vegetation. It is an important species in native shortgrass and mixed grass prairies of the northern Great Plains (8, 31, 42, 43, 44). Western snowberry is found in forested habitats dominated by Douglas fir (*Pseudotsuga menziesii*) and ponderosa pine (*Pinus ponderosa*) (8, 45, 46).

The western snowberry shrubland community in Montana is found as a small- to large-patch type in mesic depressions, swales, ravines, and floodplains, typically surrounded by upland grasslands. The soils are silts, loams, and sandy loams. Some stands are occasionally flooded, others merely moist. Some examples of this community experience intermittent and brief flooding. The soils are described as fertile and well-drained to imperfectly drained silts and loams. The upper soil horizon is usually deep, although a thin sand layer may be present if the site was recently flooded (47). In other references, western snowberry is described as not tolerant of anaerobic conditions or adapted to fine-textured soils (2).

Fire Ecology

Western snowberry sprouts vigorously from root crowns and rhizomes following fire (5, 8 39, 48, 49, 50) and stands are usually denser in burned than in adjacent unburned areas (5, 8). Sprouting is promoted by both spring and fall fires, although frequent fires may reduce cover (8, 51). There is also evidence that fire reduces stem density (8, 52), stem and shoot height (8, 52, 53), percentage canopy cover and plant frequency (8, 54, 55). The immediate effect of fire on the plant is to top-kill stems, although sprouting may occur within several weeks to several months (8, 30, 56). Annual burning may restrict expansion of western snowberry colonies onto native prairie grasslands, whereas periodic burning may enhance its spread (8, 30, 49, 56, 57). Periodic burning may create healthier, even-aged stands of western snowberry with improved wildlife forage production and cover (8, 49).

Wildlife Uses

Western snowberry is valuable forage for mule deer, white-tailed deer, elk, and pronghorn (8, 10, 29, 58, 59, 60). In Montana, western snowberry may constitute up to 60 percent of the early winter diet of white-tailed deer (8, 29). In other areas of northern United States and Canada, western snowberry is an important fall and winter browse for mule deer and pronghorn. In Montana, North Dakota, and South Dakota, western snowberry fruit are eaten by sharp-tailed grouse, passerine birds, and small mammals (8, 61, 62, 63, 64). In the northern Great Plains and Wyoming, western snowberry fruits are an important fall and winter food for sharp-tailed grouse (8, 62, 65). Sizeable tracts of western snowberry favor higher densities and species richness of passerines (8, 31), and the preservation of thickets may improve wild turkey nesting habitat (8, 66).

In Montana, Wyoming, North Dakota, and Colorado, palatability of western snowberry is rated "fair" for cattle and sheep. In Montana, palatability is rated "poor" for horses, but in Wyoming, North Dakota, and Colorado it is rated "fair". Palatability in Montana is rated "good" for deer and elk (3, 8, 61). The nutritional value of western snowberry for wildlife species appears in Table 2. In Montana, Wyoming, and North Dakota, it is considered "fair" to "good" nutritional value, depending on the state, for elk, mule deer, white-tailed deer, pronghorn, upland game birds, small nongame birds, and small mammals (8, 61). Western snowberry energy rating and protein content are "fair" (3, 8, 61). In Alberta, percentage digestible protein of dry matter at leaf stage, heading stage, and seed ripe stage was 4.0, 1.8, and 1.0, respectively (8, 67). In Saskatchewan, crude protein content of western snowberry browse was 7.9 percent (February), 25.1 percent (May), 12.3 percent (June), 10.2 percent (July), and 15.2 percent (September) (8, 58).

Table 2. Nutritional value ratings for western snowberry (8, 61).

Species	Montana	Wyoming	North Dakota	Colorado
elk	fair	fair	----	poor
mule deer	good	fair	fair	poor
white-tailed deer	good	good	fair	----
pronghorn	fair	fair	fair	----
upland game birds	fair	good	fair	----
waterfowl	----	poor	poor	----
small nongame birds	fair	good	----	----
small mammals	fair	good	----	----

The cover value of western snowberry in Montana, Wyoming, North Dakota, and Colorado appears in Table 3 (3, 8, 61). Western snowberry is considered important thermal and hiding cover for wildlife (5, 7, 8, 64). In various locations of the northern Great Plains, it provides cover for wild turkeys (8, 68) and nesting cover for sharp-tailed grouse, upland waterfowl, and passerine birds (8, 69, 70, 71, 72).

Table 3. Cover value ratings for western snowberry (8, 61).

Species	Montana	Wyoming	North Dakota	Colorado
elk	poor	poor	fair	----
mule deer	fair	poor	good	----
white-tailed deer	good	fair	----	poor
pronghorn	fair	fair	good	----
upland game birds	good	good	good	----
waterfowl	good	poor	fair	----
small nongame birds	good	good	good	----
small mammals	good	good	----	----

Potential for Invasiveness

Several natural, evolutionary mechanisms may limit the rate and extent of its spread over its intended use area and native range. It is generally shade intolerant, and can be suppressed by taller woody plants such as green ash (5, 7, 8, 28). Western snowberry is described as susceptible to insect parasites and root rot fungi (8, 56). Western snowberry is also effectively controlled with multiple applications of dicamba plus 2,4-DE (8, 73) or glyphosate.

Trapper Germplasm western snowberry 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, Trapper Germplasm western snowberry should be tested under controlled conditions to ensure that it does not become weedy or has other negative effects on the environment.

Limitations to its geographic use are primarily from potentially unfavorable environmental factors such as average minimum winter temperatures below approximately -35°F (-37°C) (2); elevations in Montana above ~4,000 feet (1,219 m) (5, 8) or in Wyoming above ~9,900 feet (3,017 m) (8, 36); soil pH below 6.6 or above 8.0 (2); annual precipitation zones below ~12 inches (305 mm) or above ~45 inches (1,143 mm) (2); growing seasons less than approximately 105 to 110 days (2); flooded sites and/or heavy textured (clay) soils; salt-affected sites with electrical conductivity greater than approximately 4 dS/m (Very Slightly Saline soils); heavily shaded sites; and other factors.

Conservation Uses: Trapper Germplasm western snowberry was selected as a shrub component for erosion control, land reclamation, living snowfence, windbreak, shelterbelt, and wildlife plantings in Montana and Wyoming based on superior seedling survival and plant condition under environmental conditions at the lower limits of its drought tolerance. Its rapid establishment allows this selection to reach functional size quickly, thereby providing conservation benefits sooner. By reducing wind speed and soil erosion, soil, water, and air quality are improved. Trapper Germplasm western snowberry is useful in wildlife habitat enhancement projects providing food, shelter, nesting, and thermal cover for numerous birds and mammals as previously described in Ecological Considerations and Evaluation. Trapper Germplasm western snowberry is also useful for other conservation practices such as field borders, landscaping, carbon sequestration, logging road rehabilitation, mined land reclamation, and habitat restoration. Based on the reported performance of the species, Trapper Germplasm western snowberry should be well adapted to disturbed or degraded sites (8, 64, 74) and establish quickly on disturbances, providing good soil stabilization (3, 5, 8, 64, 74). This species is recommended for use in riparian areas (8, 74, 75) and in Colorado is considered a high priority species for oil shale restoration (7, 8). Western snowberry should lend itself well to native range restoration projects.

Anticipated Area of Adaptation: The anticipated area of adaptation of Trapper Germplasm western snowberry is based on inferences made from the original collection sites of the selected seed sources, as well as the known performance and range of the species *Symphoricarpos occidentalis* Hook. Based on the original collections sites, Trapper Germplasm western snowberry should perform well in east-central, north-central, and northwestern Montana, as well as southeastern Wyoming. Based on the performance of the species over its natural range, Trapper Germplasm should perform well in most of central and eastern Montana between elevations 1,950 to 4,000 feet (594 to 1,200 m) (5, 8) and in eastern Wyoming at elevations between 7,525 to 9,900 feet (2,280 to 3,000 m) (8, 36), although it has not been field tested in these locations. It should also perform well in western North Dakota and South Dakota at elevations between 800 to 1,800 feet (240 to 540 m) (8, 76) and in northeastern Colorado at elevations between 3,500 to 8,500 feet (1,050 to 2,550 m) (8, 61, 77), although it has not been field tested in these locations.

Trapper western snowberry grows well in USDA Plant Hardiness Zone 4a (-25° to –30°F [-32° to –34°C]) or warmer zones, and will probably grow well in Zone 3b (-30° to –35°F [-35° to –37°C]). It grows best on fertile, moist, well-drained to imperfectly drained silt loams. This selection will not perform well on excessively heavy textured or coarse, excessively drained soils. It may tolerate brief or periodic flooding, but is not considered flood tolerant. Trapper western snowberry should grow well on soils with an electrical conductivity of 4 dS/m or less, and may grow on some soils with an electrical conductivity of

6 dS/m. Anticipate decreasing growth rates and vigor with increasing salinity above 4 to 6 mmhos/cm. It should grow well in areas characterized by 12 to 45 inches (305 to 1,143 mm) of natural annual precipitation, and should grow well in drier locations if regular supplemental irrigation is provided. Trapper western snowberry should grow well in 105- to 110-day growing seasons, although seed set, maturation, and production may increase with longer growing seasons. This selection grows best in full sun locations, but may perform adequately on lightly shaded or partial-sun sites.

Although the species is not listed, Trapper western snowberry should perform well in Montana in Conservation Tree and Shrub Suitability Groups 1, 3, 4, 5, 6 (78). It is not recommended for excessively wet, poorly drained sites, heavily saline or sodic soils, or soils classified as "unsuitable" for tree and shrub planting. Trapper western snowberry is recommended for all Montana Plant Adaptation Zones (78). It is best adapted in Montana to sites in Major Land Resource Areas (MLRAs) 44 (Northern Rocky Mountain Valleys), 52 (Brown Glaciated Plain), 53A (Northern Dark Brown Glaciated Plain), 54 (Rolling Soft Shale Plain), 58A (Northern Rolling High Plains, Northern Part), and 60B (Pierre Shale Plains, Northern Part) (79).

Availability of Plant Materials: The Bridger PMC maintains G_0 seed orchards and distributes Foundation (G_1) seeds of Trapper Germplasm western snowberry for plant production purposes. Foundation seed is distributed through the Montana State University-Bozeman Seed Stocks Program. Cuttings and grafting scions are available for the establishment of G0 seed orchards. For more information, contact the Plant Materials Specialist or Bridger PMC.

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Appendix A. Original collection site information, *Symphoricarpos* IEP, Missoula, Montana.

Plot	Initial Accession Number	Original Collection Location (County/State)	Collector	Date Collected	Elevat. *M*	Annual Precip. *mm*	Range	Town.	Sec.	MLRA	USDA Winter Hard. Zone
4 49	9026045	Sanders, MT	J.T. Blaine	Aug-82	1103	483	24W	21N	31	44	5a
4 50	9026012	Goshen, WY	K.R. Culver	Oct-82	1303	381	65W	26N		67	4a-4b
4 51	9026017	Flathead, MT	V.F. Dupuis	Oct-82	903	457	21W	29N	31	44	4b-5a
4 52	9026013	Sanders, MT†	J.T. Blaine	Sep-82	1103	762	27W	25N	11	44	5a
4 53	9026023	Goshen, WY†	C.A. Krumel	Oct-82	1333	381	61W	21N	29	67	4a-4b
4 54	9039285	Converse, WY†	P.F. Scales	Aug-84	1455	279	71W	32N	5	58B	4a-4b
4 55	9026060	Fallon, MT	F.R. Toupal	Mar-82			58E	5N	14	58A	3b-4a
4 56	9026063	Wibaux, MT	F.R. Toupal	Oct-82	827	406	59E	14N	21	58A	3b-4a
5 57	9026064	Wibaux, MT	F.R. Toupal	Mar-82						58A	3b-4a
5 58	9026065	Fallon, MT	F.R. Toupal	Oct-82	839	343	58E	7N	6	58A	3b-4a
5 59	9039203	Niobrara, WY	J.W. Westerman	Sep-83		406	64W	34N	26		4a-4b
5 60	9039235	Hill, MT†	V.F. Dupuis	Oct-83	1250		15E	29N	35	52	3a-3b
5 61	9026069	Lincoln, MT	C.W. Clayton	Nov-82		432	27W	36N	23	44	4b-5a
5 62	9026041	Sanders, MT	J.T. Blaine	Aug-82	945	762	27W	23N	23	44	5a
5 63	9039303	Prairie, MT	Arnold Benson	Sep-83			49E	15N	3	58A	3a-3b
5 64	9039304	Prairie, MT	Rick Herman	Oct-83			46E	13N	12	58A	3a-3b
6 65	9039305	Prairie, MT†	Jim Smith	Sep-83			49E	16N	10	58A	3a-3b
6 66	9025761	Niobrara, WY	J.L. Schwartz	Aug-81	1363	406	64W	35N	35		4a-4b
6 67	A322498	Chey. ARS, WY	----	----	----	----	----	----	----	----	----

† - Selected seed sources.

Appendix D. Number of seedlings surviving, *Symphoricarpos* IEP, Missoula, Montana, 1987-1991.

Plot	Initial Accession Number	Species Symbol	Original Collection Location (County/State)	1987 Number Planted	1987 Number Surviving	1988 Number Surviving	1989 Number Surviving	1990 Number Surviving	1991 Number Surviving
4 49	9026045	SYAL	Sanders, MT	5	4	4	4	4	4
4 50	9026012	SYAL	Goshen, WY	5	5	5	5	5	5
4 51	9026017	SYAL	Flathead, MT	5	5	5	5	5	5
4 52	9026013	SYOC†	Sanders, MT	5	4	4	4	4	4
4 53	9026023	SYOC†	Goshen, WY	5	5	5	5	5	5
4 54	9039285	SYOC†	Converse, WY	5	5	5	5	5	5
4 55	9026060	SYOC	Fallon, MT	5	5	5	5	5	5
4 56	9026063	SYOC	Wibaux, MT	5	5	5	5	5	5
5 57	9026064	SYOC	Wibaux, MT	5	5	5	5	5	5
5 58	9026065	SYOC	Fallon, MT	5	4	4	4	4	4
5 59	9039203	SYOC	Niobrara, WY	5	4	4	4	4	4
5 60	9039235	SYOC†	Hill, MT	5	5	5	5	5	5
5 61	9026069	SYAL	Lincoln, MT	5	4	4	4	4	4
5 62	9026041	SYMPH	Sanders, MT	5	1	1	1	1	1
5 63	9039303	SYMPH	Prairie, MT	5	5	5	5	5	5
5 64	9039304	SYMPH	Prairie, MT	5	5	5	5	5	5
6 65	9039305	SYOC†	Prairie, MT	4	4	4	4	4	4
6 66	9025761	SYOC	Niobrara, WY	6	6	6	4	4	4
6 67	A322498	SYORU	Cheyenne ARS, WY	5	1	1	1	1	1
			Grand Total:	95	82	82	80	80	80

† - Selected seed sources.

Appendix E. Mean percentage seedling survival, *Symphoricarpos* IEP, Missoula, Montana, 1987-1991.

Plot	Initial Accession Number	Species Symbol	Collection Location (County/State)	1987 Number Planted	1987 %	1988 %	1989 %	1990 %	1991 %
4 49	9026045	SYAL	Sanders, MT	5	80	80	80	80	80
4 50	9026012	SYAL	Goshen, WY	5	100	100	100	100	100
4 51	9026017	SYAL	Flathead, MT	5	100	100	100	100	100
4 52	9026013	SYOC†	Sanders, MT	5	80	80	80	80	80
4 53	9026023	SYOC†	Goshen, WY	5	100	100	100	100	100
4 54	9039285	SYOC†	Converse, WY	5	100	100	100	100	100
4 55	9026060	SYOC	Fallon, MT	5	100	100	100	100	100
4 56	9026063	SYOC	Wibaux, MT	5	100	100	100	100	100
5 57	9026064	SYOC	Wibaux, MT	5	100	100	100	100	100
5 58	9026065	SYOC	Fallon, MT	5	80	80	80	80	80
5 59	9039203	SYOC	Niobrara, WY	5	80	80	80	80	80
5 60	9039235	SYOC†	Hill, MT	5	100	100	100	100	100
5 61	9026069	SYAL	Lincoln, MT	5	80	80	80	80	80
5 62	9026041	SYMPH	Sanders, MT	5	20	20	20	20	20
5 63	9039303	SYMPH	Prairie, MT	5	100	100	100	100	100
5 64	9039304	SYMPH	Prairie, MT	5	100	100	100	100	100
6 65	9039305	SYOC†	Prairie, MT	4	100	100	100	100	100
6 66	9025761	SYOC	Niobrara, WY	6	100	100	67	67	67
6 67	A322498	SYORU	Cheyenne ARS, WY	5	20	20	20	20	20
			Grand Mean:		86.3	86.3	84.6	84.6	84.6

† - Selected seed sources.

Appendix F. Mean seedling height, *Symphoricarpos* IEP, Missoula, Montana, 1987-1991.

Plot	Initial Accession Number	Species Symbol	Original Collection Location (County/State)	1987 Mean Height *cm*	1988 Mean Height *cm*	1989 Mean Height *cm*	1990 Mean Height *cm*	1991 Mean Height *cm*
4 49	9026045	SYAL	Sanders, MT	9.4	79.0	71.1	73.5	110.0
4 50	9026012	SYAL	Goshen, WY	11.9	79.8	85.4	83.6	100.0
4 51	9026017	SYAL	Flathead, MT	12.6	67.2	68.6	76.8	90.0
4 52	9026013	SYOC†	Sanders, MT	11.4	81.8	76.2	83.3	100.0
4 53	9026023	SYOC†	Goshen, WY	12.6	66.2	68.6	75.4	90.0
4 54	9039285	SYOC†	Converse, WY	15.2	75.6	71.1	81.6	100.0
4 55	9026060	SYOC	Fallon, MT	10.6	80.2	73.7	84.0	100.0
4 56	9026063	SYOC	Wibaux, MT	9.2	56.6	58.4	69.0	80.0
5 57	9026064	SYOC	Wibaux, MT	9.8	60.2	63.5	63.8	70.0
5 58	9026065	SYOC	Fallon, MT	8.4	55.3	58.4	60.0	80.0
5 59	9039203	SYOC	Niobrara, WY	6.6	68.5	68.6	70.0	90.0
5 60	9039235	SYOC†	Hill, MT	14.4	73.6	73.7	82.2	90.0
5 61	9026069	SYAL	Lincoln, MT	20.2	87.8	94.0	89.8	100.0
5 62	9026041	SYMPH	Sanders, MT	14.8	72.0	71.1	71.0	100.0
5 63	9039303	SYMPH	Prairie, MT	12.4	69.0	66.0	72.0	80.0
5 64	9039304	SYMPH	Prairie, MT	10.6	47.2	53.3	57.2	70.0
6 65	9039305	SYOC†	Prairie, MT	13.3	58.0	66.0	71.5	90.0
6 66	9025761	SYOC	Niobrara, WY	38.0	80.5	81.3	83.5	100.0
6 67	A322498	SYORU	Cheyenne ARS, WY	30.8	113.0	109.2	109.0	140.0
			Grand Mean:	14.3	72.2	72.5	76.7	93.7

† - Selected seed sources.

Appendix G. Mean height growth, *Symphoricarpos* IEP, Missoula, Montana, 1988-1991.

Plot	Initial Accession Number	Species Symbol	Original Collection Location (County/State)	1988 Mean Height Growth *cm*	1989 Mean Height Growth *cm*	1990 Mean Height Growth *cm*	1991 Mean Height Growth *cm*
4 49	9026045	SYAL	Sanders, MT	69.6	-7.9	2.4	36.5
4 50	9026012	SYAL	Goshen, WY	67.9	5.6	-1.8	16.4
4 51	9026017	SYAL	Flathead, MT	54.6	1.4	8.2	13.2
4 52	9026013	SYOC†	Sanders, MT	70.4	-5.6	7.1	16.7
4 53	9026023	SYOC†	Goshen, WY	53.6	2.4	6.8	14.6
4 54	9039285	SYOC†	Converse, WY	60.4	-4.5	10.5	18.4
4 55	9026060	SYOC	Fallon, MT	69.6	-6.5	10.3	16.0
4 56	9026063	SYOC	Wibaux, MT	47.4	1.8	10.6	11.0
5 57	9026064	SYOC	Wibaux, MT	50.4	3.3	0.3	6.2
5 58	9026065	SYOC	Fallon, MT	46.9	3.1	1.6	20.0
5 59	9039203	SYOC	Niobrara, WY	61.9	0.1	1.4	20.0
5 60	9039235	SYOC†	Hill, MT	59.2	0.1	8.5	7.8
5 61	9026069	SYAL	Lincoln, MT	67.6	6.2	-4.2	10.2
5 62	9026041	SYMPH	Sanders, MT	57.2	-0.9	-0.1	29.0
5 63	9039303	SYMPH	Prairie, MT	56.6	-3.0	6.0	8.0
5 64	9039304	SYMPH	Prairie, MT	36.6	6.1	3.9	12.8
6 65	9039305	SYOC†	Prairie, MT	44.7	8.0	5.5	18.5
6 66	9025761	SYOC	Niobrara, WY	42.5	0.8	2.2	16.5
6 67	A322498	SYORU	Cheyenne ARS, WY	82.2	-3.8	-0.2	31.0
			Grand Mean:	57.8	0.35	4.1	17.0

† - Selected seed sources.

Appendix H. Mean vigor rating, *Symphoricarpos* IEP, Missoula, Montana, 1987-1991.

Plot	Initial Accession Number	Species Symbol	Original Collection Location (County/State)	1987 Mean Vigor Rating *(1-9)*[†]	1988 Mean Vigor Rating *(1-9)*[†]	1989 Mean Vigor Rating *(1-9)*[†]	1990 Mean Vigor Rating *(1-9)*[†]	1991 Mean Vigor Rating *(1-9)*[†]
4 49	9026045	SYAL	Sanders, MT	1	3	6	4	3
4 50	9026012	SYAL	Goshen, WY	2	3	4	3	2
4 51	9026017	SYAL	Flathead, MT	1	2	3	3	3
4 52	9026013	SYOC[‡]	Sanders, MT	2	3	4	3	4
4 53	9026023	SYOC[‡]	Goshen, WY	2	3	5	3	4
4 54	9039285	SYOC[‡]	Converse, WY	1	3	3	4	6
4 55	9026060	SYOC	Fallon, MT	2	3	3	4	3
4 56	9026063	SYOC	Wibaux, MT	2	3	5	3	4
5 57	9026064	SYOC	Wibaux, MT	2	4	6	4	5
5 58	9026065	SYOC	Fallon, MT	2	3	6	4	5
5 59	9039203	SYOC	Niobrara, WY	1	2	5	3	4
5 60	9039235	SYOC[‡]	Hill, MT	1	2	3	3	3
5 61	9026069	SYAL	Lincoln, MT	2	3	3	3	4
5 62	9026041	SYMPH	Sanders, MT	2	3	5	3	4
5 63	9039303	SYMPH	Prairie, MT	2	3	3	3	3
5 64	9039304	SYMPH	Prairie, MT	2	2	3	3	3
6 65	9039305	SYOC[‡]	Prairie, MT	2	2	3	3	2
6 66	9025761	SYOC	Niobrara, WY	2	2	3	3	3
6 67	A322498	SYORU	Cheyenne ARS, WY	2	2	3	3	4
			Grand Mean:	1.7	2.7	4.0	3.3	3.6

[†] - (1 is best, 4 is average, 9 is worst or dead)
[‡] - Selected seed source

APPROVALS

2-17-04

DAVE WHITE
State Conservationist
Natural Resources Conservation Service
Montana

Date

2/27/04

LINCOLN E. BURTON
State Conservationist
Natural Resources Conservation Service
Wyoming

Date

2/19/04

JEFFEREY S. JACOBSEN
Dean and Director (interim)
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Date

3/3/04

JAMES J. JACOBS
Director
Wyoming Agricultural Experiment Station

Date

3/25/04

BUD CLINCH
Director
Montana Department of Natural Resources and Conservation

Date

5/26/04

for DIANE GELBURD
Director
Ecological Sciences Division
United States Department of Agriculture
Natural Resources Conservation Service

Date