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THE  
UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
WASHINGTON, D.C.

and

MONTANA AGRICULTURAL EXPERIMENT STATIONS  
MONTANA STATE UNIVERSITY  
BOZEMAN, MONTANA

and

WYOMING AGRICULTURAL EXPERIMENT STATIONS  
UNIVERSITY OF WYOMING  
LARAMIE, WYOMING

in cooperation with the

DEER LODGE VALLEY CONSERVATION DISTRICT  
DEER LODGE, MONTANA

## NOTICE OF RELEASE OF <NAME> GERMPLASM SILVER BUFFALOBERRY SELECTED CLASS OF NATURAL GERMPLASM

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 in cooperation with the Deer Lodge Valley Conservation District, announce the Selected Class pre-varietal release of <NAME> Germplasm silver buffaloberry *Shepherdia argentea* (Pursh) Nutt. for use in the intermountain foothills and mountains of Montana and Wyoming, with particular emphasis on areas characterized by soils with low pH and contamination by heavy metals. This release was evaluated and jointly selected by staff from the Deer Lodge Valley Conservation District and USDA/NRCS Plant Materials Center, Bridger, Montana.

As a pre-varietal release, this selection will be referred to as <NAME> Germplasm silver buffaloberry, NRCS accession number 9081334.

Justification for alternative release is based on a critical need for well-adapted plant materials for non-amended, as well as lime-amended acidic and heavy-metal contaminated sites in low- to mid-mountain elevations in the foothills of central Montana and Wyoming. A lack of tested and adapted germplasm and the potential use of non-adapted seed sources further support Selected Class release. Additionally, this selection originates from a northern Rocky Mountain seed source that should prove well adapted to the conditions in the intended geographic area of use. <NAME> Germplasm silver buffaloberry was selected for superior seedling survival, vigor rating, and mean plant growth relative to other *Shepherdia argentea* accessions tested. <NAME> Germplasm silver buffaloberry can also be used in other conservation applications such as saline reclamation, riparian and woody draw restoration, wildlife habitat enhancement, and mined land reclamation.

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**Collection Site Information:** The original <NAME> Germplasm silver buffaloberry (accession number 9081334) seed collection was made in September 1995 by Matthew Marsh, then DATC Project Leader, on the east side of "B" Hill near Radio Hill Road, south of Anaconda, Montana. The area was contaminated with mine waste and smelter fallout and was severely impacted by surface wind and water erosion. Seed was collected from between 2 and 6 individual plants. The surface pH of the soil in this area ranges from 4.0 to 5.0, as determined by field measurements throughout Anaconda and nearby locations.

**Description:** Silver buffaloberry, Elaeagnaceae (Oleaster) Family is a deciduous thorny, thicket-forming long-lived woody perennial. Silver buffaloberry is a native shrub to small tree that is drought and winter hardy, with a mature height ranging from 91 to 610 meters (3 to 20 feet). The branches of silver buffaloberry often terminate in thorns, with silvery gray leaves both top and bottom, 2 to 5 centimeters (1 to 2 inches) in length. Fruits are reddish, globe-shaped (drupes) 1/8 to 1/4 inch across. *Shepherdia argentea* is dioecious, that is, male and female flowers are found on separate plants. The seed is a small, very-hard shiny-brown achene. This accession is a red-fruited variety, although *Shepherdia argentea* can produce orange berries. It is assumed <NAME> Germplasm traits are heritable and the progeny from the selection will appear and perform in a similar manner as the species. <NAME> Germplasm silver buffaloberry reached a mean plant height of 85 centimeters (33.5 inches) on a tilled and fertilized test site in a 355-millimeter (14-inch) annual precipitation zone eight years after planting without supplemental irrigation. Plant height in the Bridger Plant Materials Center orchard averaged 200 to 300 centimeters (6.6 to 10 feet) in the fall of 2009. It appears this selection of silver buffaloberry has the same general botanical attributes as 'Sakakawea', a Bismarck Plant Materials Center release of silver buffaloberry.

**Method of Selection:** <NAME> Germplasm silver buffaloberry is being released as a 'Natural-Track' germplasm, i.e., it has been selected and increased without purposeful manipulation. This selection was compared to two non-local sources of *Shepherdia argentea* in a Woody Comparative Evaluation Planting (CEP) installed near Anaconda, Montana, in the fall of 2000. The two non-local seed sources consisted of one Utah and one Sweetwater County, Wyoming source. Both seed sources were reportedly from lands non-impacted by mining activities. The goal of the Woody Comparative Evaluation Planting was to compare the performance of local, indigenous seed sources of woody plants to non-local sources of the same species. Species selection was based on earlier research that identified species-specific tolerances of low soil pH and elevated heavy metals levels in woody plants found growing in the Anaconda Smelter Superfund Site area. This study was part of a more comprehensive effort, the Development of Acid/Heavy Metal Tolerant Cultivars (DATC) project, a collaborative effort between Deer Lodge Valley Conservation District and the Bridger Plant Materials Center in Bridger, Montana initiated in 1995 and supported over various grant cycles by the Environmental Protection Agency, and Montana Natural Resource Damage Program.

All three collections were field planted in 2000 at the Mill Creek site near Anaconda, Montana, tested and evaluated annually for eight years from 2002 and 2009. <NAME> Germplasm silver buffaloberry exhibited superior seedling survival, vigor rating, and mean plant height on a tilled but otherwise un-amended acid/heavy-metal impacted site under the ambient climatic conditions of the Upper Clark Fork Watershed (Deer Lodge County, Montana). In addition, over 350 <NAME> Germplasm silver buffaloberry seedlings were transplanted to Field 30 at the Plant Materials Center, Bridger, Montana, in order to create a Foundation seed orchard. <NAME> Germplasm silver buffaloberry has also performed well on soils classified as "Very Slightly Saline" and "Slightly Saline" by the USDA..

**Testing:** The 0.16-hectare (0.4-acre) Woody Comparative Evaluation Planting site, located approximately 6.4 kilometers (4 miles) southeast of Anaconda, Montana, has been impacted by emission fallout from the Upper and Lower Works, as well as the Washoe smelter. The Upper and Lower Works smelters were in operation from 1884 to 1902 when the Washoe smelter

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assumed smelting operations until 1980. The study site lies approximately 183 meters (200 yards) east of Mill Creek at an elevation of 1,567 meters (5,140 ft) in USDA Winter Hardiness Zone 4a. Soils at the site are in the Haploboroll's Family and consist of deep, well-drained soils formed in mixed alluvium composed of granitic, meta-sedimentary, and volcanic rocks. The alluvium is derived from the Mill Creek drainage. Cobbles and stones commonly occur on the soil surface. In 1999, the site was plowed to a depth of 15.25 centimeters (6 inches), rototilled, and packed. Laboratory analysis of four 0- to 15.25-centimeter (0- to 6-inch) composite soil samples taken after tilling to 15.25 centimeters (6 inches) indicated an average pH of 4.53. Average arsenic, cadmium, copper, lead, and zinc concentrations in the four soil samples were 423 milligrams per kilogram (parts per million), 6 milligrams per kilogram, 510 milligrams per kilogram, 233 milligrams per kilogram, and 308 milligrams per kilogram, respectively (table 1).

Table 1. Acid extractable heavy-metal levels (EPA method 3050) and pH of 0- to 6-inch composite soil samples.

Sample No.	pH	As	Cd	Cu	Pb	Zn
	<i>s.u.</i>	<i>mg/kg</i>	<i>mg/kg</i>	<i>mg/kg</i>	<i>mg/kg</i>	<i>mg/kg</i>
A.T. 0-6" NE	4.0	610	7	620	320	370
A.T. 0-6" NW	4.9	360	5	340	120	222
A.T. 0-6" SE	4.6	530	5	340	150	200
A.T. 0-6" SW	4.6	190	7	740	340	440
☒	4.53	422.5	6	510	232.5	308
Phytotoxic Criteria <sup>†</sup>	< 5.0	136-315	5.1-20	236-750	94-250	196-240

† EPA phytotoxicity standards (CDM Federal 1997).

The <NAME> Germplasm silver buffaloberry orchard at the Bridger Plant Materials Center receives approximately 254 to 305 millimeters (10 to 12 inches) of average annual precipitation plus limited and infrequent supplemental irrigation during droughty periods on the growing season. The Plant Materials Center is located in south-central Montana at an elevation of 1,128 meters (3,700 feet) with soils classified as Heldt silty clay loam. The Heldt soil series is classified as a fine, montmorillonitic, mesic, Ustetric, Camborthid, on 4 to 8 percent slopes. The upper 46 centimeters (18 inches) of the profile are characterized as mildly alkaline, whereas the lower 46 to 152 centimeters (18 to 60 inches) are strongly alkaline. These soils are formed in deep alluvium and have moderate shrink-swell potential, but high frost-action potential. Although permeability is slow, these soils are well-drained and runoff is considered medium with only a slight risk of erosion. The mean annual soil temperature is 8.9 to 10.6°C (48 to 51°F) and the frost-free period ranges from 120 to 130 days. This soil falls in the Windbreak Suitability Group 1, and is characterized by deep, friable, nearly level to steep, well-drained soils on stream terraces and fans. Soils in this group are reported well suited for silver buffaloberry.

**Methods and Materials:** The study tested 19 accessions consisting of two or three accessions of each of the seven shrub/tree species (table 2). The 1-0 and 2-0 seedlings were transplanted in a Randomized Complete Block Design replicated 20 times on October 18, 2000. An individual plant of each accession is represented in each replication. The seedlings were spaced 1.4 meters (4.5 feet) apart within rows and 2.75 meters (9 feet) apart between rows. The plot receives no supplemental irrigation. Vispore™ (0.9-meter x 0.9-meter; 3-feet x 3-feet) tree mats were installed the spring following planting on all entries to suppress weeds and retard soil moisture evaporation.

Table 2. Seed origin and elevation of entries in the Woody Comparative Evaluation Planting.

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Family/Species	Seed Origin county/state	Elevation feet
<b>Caprifoliaceae:</b>		
<i>Symphoricarpos albus</i> (L.) Blake	Deer Lodge Co., MT	6000
<i>S. albus</i> (L.) Blake	Ravalli Co., MT	3500
<i>S. occidentalis</i> Hook.	Deer Lodge Co., MT	5559
<i>S. occidentalis</i> Hook	CO Seed Source	unknown
<i>S. occidentalis</i> Hook	Weston Co., WY	5000
<b>Elaeagnaceae:</b>		
<i>Shepherdia argentea</i> (Pursh) Nutt. <NAME>	Deer Lodge Co., MT	6000
<i>S. argentea</i> (Pursh) Nutt.	UT Seed Source	unknown
<i>S. argentea</i> (Pursh) Nutt.	Sweetwater Co., WY	6000
<b>Grossulariaceae:</b>		
<i>Ribes cereum</i> Dougl.	Deer Lodge Co., MT	5700
<i>R. cereum</i> Dougl.	Chaffee Co., CO	8000
<b>Pinaceae:</b>		
<i>Pinus contorta</i> Dougl. ex Loud.	Deer Lodge Co., MT	6400
<i>P. contorta</i> Dougl. ex Loud.	Albany Co., WY	9500
<i>P. contorta</i> Dougl. ex Loud.	Custer Co., ID	6300
<i>Pinus ponderosa</i> P. & C. Lawson	Deer Lodge Co., MT	5850
<i>P. ponderosa</i> P. & C. Lawson	Lawrence Co., SD	5500
<i>P. ponderosa</i> P. & C. Lawson	San Juan Co., CO	8000
<b>Rosaceae:</b>		
<i>Rosa woodsii</i>	Deer Lodge Co., MT	5168
<i>R. woodsii</i>	Ravalli Co., MT	3400
<i>R. woodsii</i>	Pueblo Co., CO	6000

Plant survival, height, and vigor were assessed in 2001 (May 21 and August 14), 2002 (May 20 and August 20), 2003 (May 28 and August 26), 2004 (June 30), 2005 (August 29), 2006 (August 28), 2007 (August 21), 2008 (August 24) and 2009 (September 7). Plant height was recorded in centimeters and measured from the ground to the uppermost live foliage. Vigor rating was measured on a scale of 1 to 9, with 1 representing excellent vigor and 9 representing plant mortality.

## Results and Discussion:

### Survival

The mean percentage survival of the <NAME> Germplasm silver buffaloberry after 8 years of evaluation at the Woody Comparative Evaluation Planting was 55 percent, versus 10 percent for each of the other two silver buffaloberry accessions tested. Table 3 presents percentage survival data for each year between 2002 and 2009. In cases of increasing percentage survival over time, seedlings appearing dead one year were determined to be alive the following year, usually the result of sprouting suckers or latent buds.

Table 3. Mean percentage survival, Woody Comparative Evaluation Planting, 2002 through

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2009, Anaconda, Montana

Species & Seed Source	2002	2003	2004	2005	2006	2007	2008	2009
	%	%	%	%	%	%	%	%
<b>PICO 9078320</b>	<b>85</b>	<b>40</b>	<b>25</b>	<b>25</b>	<b>25</b>	<b>20</b>	<b>10</b>	<b>15</b>
PICO m039ID0002	30	15	10	10	10	0	0	0
PICO m038WY0002	20	15	5	10	10	10	10	10
<b>PIPO 9081318</b>	<b>100</b>	<b>100</b>	<b>95</b>	<b>95</b>	<b>95</b>	<b>80</b>	<b>80</b>	<b>75</b>
PIPO m04CO0002	85	85	85	75	50	30	25	20
PIPO m020SD9903	100	100	95	95	95	90	75	70
<b>RICE 9081329</b>	<b>75</b>	<b>65</b>	<b>70</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>60</b>	<b>65</b>
RICE m024CO0003	65	50	50	40	40	45	40	40
<b>ROWO 9081638</b>	<b>75</b>	<b>65</b>	<b>65</b>	<b>55</b>	<b>50</b>	<b>50</b>	<b>50</b>	<b>50</b>
ROWO m076CO0003	15	5	5	0	0	0	0	0
ROWO m07MT0003	20	10	15	10	10	10	10	10
<b>SHAR 9081334 &lt;NAME&gt;</b>	<b>80</b>	<b>80</b>	<b>80</b>	<b>75</b>	<b>75</b>	<b>70</b>	<b>65</b>	<b>55</b>
SHAR m022WY0005	60	35	30	35	20	15	15	10
SHAR m015UT9901	25	20	10	10	10	10	10	10
<b>SYAL 9078388</b>	<b>90</b>	<b>85</b>	<b>95</b>	<b>90</b>	<b>85</b>	<b>90</b>	<b>90</b>	<b>75</b>
SYAL m045MT003	30	30	30	30	30	25	25	25
<b>SYOC 9081639</b>	<b>85</b>	<b>80</b>	<b>65</b>	<b>30</b>	<b>20</b>	<b>20</b>	<b>20</b>	<b>25</b>
SYOC m021WY0004	90	75	70	65	55	50	55	50
SYOC m018CO9904	90	85	75	70	65	65	55	50

at evaluation time produced a sucker or latent bud the following year. Environmental stresses from edaphic and climatic conditions resulted in decreasing survival for all species and seed sources tested over the course of the study. It should be noted the test site was exceptionally dry the year of establishment (9.57 inches), but the years following were near or above the long-term average (13.93 inches) (table 4). Fluctuating annual precipitation did not appear to be a major factor in seedling survival.

Table 4. Annual precipitation and mean percentage survival, Woody Comparative Evaluation Planting, 2000 through 2009, Anaconda, Montana.

Year	Annual Precipitation <i>inches</i>	SHAR	SHAR	SHAR	All Sources	All Sources
		<NAME> Germplasm %	Wyoming %	Utah %	Local %	Non-Local
2000	9.57					
2001	13.99					
2002	16.23	80 (-20) <sup>a</sup>	60 (-40)	25 (-75)	84.3 (-15.7)	52.5 (-47.5)
2003	15.42	80 (0)	35 (-25)	20 (-5)	73.6 (-10.7)	43.8 (-8.7)
2004	13.37	80 (0)	(35) (0)	10 (-10)	70.7 (-2.9)	40.0 (-3.8)
2005	15.75	75 (-5)	35 (0)	10 (0)	61.4 (-9.3)	37.5 (-2.5)
2006	19.03	75 (0)	20 (-15)	10 (0)	58.6 (-2.8)	32.9 (-4.6)
2007	16.47	70 (-5)	15 (-5)	10 (0)	55.7 (-2.9)	29.2 (-3.7)
2008	16.89	65 (-5)	15 (0)	10 (0)	53.6 (-2.1)	26.7 (-2.5)
2009	18.79	55 (-10)	10 (-5)	10 (0)	51.4 (-2.2)	24.6 (-2.1)

<sup>a</sup> – Numbers in parentheses represent the change in mean percentage survival from the previous year to the current year.

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## Plant Height and Growth

The mean height over time of surviving plants of silver buffaloberry appears in Table 5. <NAME> Germplasm had the greatest mean height of the three seed sources tested each year for the eight-year evaluation period. By 2009, <NAME> Germplasm silver buffaloberry had reached a mean height of 85.36 cm, a decrease from 2008 caused by deer browsing and breakage. Height

Table 5. Mean plant height, Woody Comparative Evaluation Planting, 2002 through 2009, Anaconda, Montana.

	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>
<b>Seed Source</b>	<b>Height</b>	<b>Height</b>	<b>Height</b>	<b>Height</b>	<b>Height</b>	<b>Height</b>	<b>Height</b>	<b>Height</b>
	<i>cm</i>	<i>cm</i>	<i>cm</i>	<i>cm</i>	<i>cm</i>	<i>cm</i>	<i>cm</i>	<i>cm</i>
<b>SHAR &lt;NAME&gt;</b>	<b>29.88</b>	<b>37.94</b>	<b>41.69</b>	<b>73.93</b>	<b>79.93</b>	<b>84.18</b>	<b>98.31</b>	<b>85.36</b>
SHAR m022WY0005	5.58	7.79	12.67	20.14	33.25	44.00	46.00	40.00
SHAR m015UT9901	9.20	13.25	15.00	31.50	24.00	38.10	57.50	67.00

growth of <NAME> Germplasm silver buffaloberry was the greatest of the three seed sources tested from 2003 to 2005, but growth among the test accessions varied later in the study, presumably the result of various factors including adaptation, animal predation, and surviving plant number (table 6).

Table 6. Mean height growth, Woody Comparative Evaluation Planting, 2002 through 2009, Anaconda, Montana.

	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>	<b>2006</b>	<b>2007</b>	<b>2008</b>	<b>2009</b>
	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>	<b>Mean</b>
<b>Seed Source</b>	<b>Growth</b>	<b>Growth</b>	<b>Growth</b>	<b>Growth</b>	<b>Growth</b>	<b>Growth</b>	<b>Growth</b>	<b>Growth</b>
	<i>cm</i>	<i>cm</i>	<i>cm</i>	<i>cm</i>	<i>cm</i>	<i>cm</i>	<i>cm</i>	<i>cm</i>
<b>SHAR &lt;NAME&gt;</b>	<b>NA</b>	<b>8.06</b>	<b>3.75</b>	<b>32.24</b>	<b>6.00</b>	<b>4.25</b>	<b>14.13</b>	<b>-12.95</b>
SHAR m022WY0005	NA	2.21	4.88	7.47	13.11	10.75	2.00	-6.00
SHAR m015UT9901	NA	4.05	1.75	16.5	-7.5	14.1	19.4	9.5

## Vigor Rating

The mean vigor rating of surviving plants was rated on a scale from 1 to 9 (1=highest vigor) based on a visual assessment of their vigor or robustness. Dead plants were entered as missing values. As seen in Table 7. <NAME> Germplasm silver buffaloberry exhibited significantly better vigor than the other two silver buffaloberry accessions for years 2002 through 2007. In 2008 and 2009, the vigor of the two surviving Utah plants was relatively high (4.0), whereas the vigor of the two surviving Wyoming plants remained substantially lower (6.5). <Name> Germplasm silver buffaloberry retained a relatively high vigor rating (4.91) in 2008 and 2009 when compared to all other species and accessions tested.

Table 7. Mean plant vigor rating, Woody Comparative Evaluation Planting. 2002 through 2009,

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Anaconda, Montana,

Species & Seed Source	2002	2003	2004	2005	2006	2007	2008	2009
	Vigor	Vigor	Vigor	Vigor	Vigor	Vigor	Vigor	Vigor
	Rating	Rating	Rating	Rating	Rating	Rating	Rating	Rating
	(1-9)	(1-9)	(1-9)	(1-9)	(1-9)	(1-9)	(1-9)	(1-9)
<b>PICO 9078320</b>	<b>5.80</b>	<b>5.10</b>	<b>6.50</b>	<b>7.60</b>	<b>7.40</b>	<b>7.25</b>	<b>5.5</b>	<b>5.67</b>
PICO m039ID0002	5.00	5.00	7.00	8.00	8.00	0.00	0.00	0.00
PICO m038WY0002	4.00	4.50	5.50	6.00	6.50	7.50	7.00	7.00
<b>PIPO 9081318</b>	<b>2.10</b>	<b>3.40</b>	<b>5.63</b>	<b>5.74</b>	<b>5.84</b>	<b>5.94</b>	<b>5.63</b>	<b>5.47</b>
PIPO m04CO0002	4.20	4.80	7.29	8.00	7.90	8.67	7.40	7.00
PIPO m020SD9903	3.20	2.70	4.84	5.26	5.37	4.67	4.53	4.14
<b>RICE 9081329</b>	<b>4.80</b>	<b>2.80</b>	<b>3.86</b>	<b>3.25</b>	<b>3.42</b>	<b>3.58</b>	<b>3.25</b>	<b>4.08</b>
RICE m024CO0003	5.40	5.10	5.90	5.38	5.13	5.78	4.50	5.00
<b>ROWO 9081638</b>	<b>4.20</b>	<b>4.50</b>	<b>4.54</b>	<b>4.36</b>	<b>5.00</b>	<b>5.00</b>	<b>5.10</b>	<b>5.00</b>
ROWO m076CO0003	7.00	7.00	8.00	0.00	0.00	0.00	0.00	0.00
ROWO m07MT0003	5.00	4.00	6.00	4.00	7.00	7.00	5.50	6.50
<b>SHAR &lt;NAME&gt;</b>	<b>2.50</b>	<b>2.50</b>	<b>3.94</b>	<b>4.00</b>	<b>3.67</b>	<b>3.57</b>	<b>4.39</b>	<b>4.91</b>
SHAR m022WY0005	6.60	5.20	6.67	7.29	6.25	6.33	5.33	6.50
SHAR m015UT9901	5.80	5.00	5.50	6.00	5.50	5.00	4.50	4.00
<b>SYAL 9078388</b>	<b>3.60</b>	<b>4.00</b>	<b>4.53</b>	<b>5.67</b>	<b>6.24</b>	<b>6.28</b>	<b>6.33</b>	<b>7.13</b>
SYAL m045MT003	3.60	3.00	4.17	4.83	4.83	3.60	3.80	4.80
<b>SYOC 9081639</b>	<b>4.60</b>	<b>5.20</b>	<b>6.85</b>	<b>6.50</b>	<b>6.00</b>	<b>4.75</b>	<b>5.00</b>	<b>6.20</b>
SYOC m021WY0004	3.80	2.80	4.57	4.39	4.09	4.00	4.18	3.90
SYOC m018CO9904	4.00	4.50	4.80	5.36	5.39	4.85	5.36	5.60

**Ecological Considerations and Evaluation:** <NAME> Germplasm silver buffaloberry is a native, drought- and winter-hardy shrub that grows well on most well-drained soils. It is tolerant of “Non-Saline” to “Slightly Saline” soils, and can be found in varied habitat, including streamsides, coulees and on exposed moist hillsides. It suckers and forms thickets, but is not considered invasive. There is currently a strong preference and resultant demand in the restoration and reclamation communities for using local ecotypes. <NAME> Germplasm silver buffaloberry passes the NRCS Plant Materials Program, Environmental Evaluation of Plant Materials Releases (attached) for potential invasiveness.

**Anticipated Conservation Use:** <NAME> Germplasm silver buffaloberry has exhibited superior survival, height, and vigor rating on severely impacted mine land sites with acidic and heavy-metal containing soils. The selection has also performed well at the Bridger Plant Materials Center. The species is common in native landscapes across the northern Great Plains: Montana, North Dakota, South Dakota, Wyoming, Nebraska, and Minnesota. It is assumed that <NAME> Germplasm silver buffaloberry exhibits the same level of soil salinity tolerance as the species and selections from the species. In unpublished tests at the Bridger Plant Materials Center, Bridger, Montana, silver buffaloberry exhibited relatively good seedling survival, rates of height growth, and vigor rating when grown on soils classified as “Very Slightly Saline” (electrical conductivity values ranging from 2 to <4 dS/m) and some tolerance to soils classified as “Slightly Saline” (4 to <8 dS/m).

Although silver buffaloberry is not considered a favored browse of livestock or wildlife, it can be heavily browsed when seedlings are young, and is frequently damaged by antler rubbing from deer.

<NAME> Germplasm silver buffaloberry, like the species, can be used in a variety of conservation applications in addition to mine land reclamation including windbreaks, shelterbelts,

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riparian restoration projects, living snowfences, low maintenance landscapes, and wildlife enhancement plantings. Silver buffaloberry provides ideal cover and nesting sites for a variety of birds, and is a favored food for sharp-tailed grouse and songbirds. It provides browsing and shelter for large and small wildlife and is considered important browse for big game animals. With its low, dense stature, silver buffaloberry is well suited for outer rows of windbreaks and shelterbelts. This species is reportedly capable of fixing nitrogen in root nodules containing bacteria, and therefore may be an important nitrogen source for other species in adjacent plantings or islands. Silver buffaloberry provides excellent bank stabilization once established and, although it grows well on well-drained sites, can tolerate some period of saturated soil conditions. This species prefers full sun. Common diseases include stem decay and branch canker.

**Anticipated Area of Adaptation:** <NAME> Germplasm silver buffaloberry originated as a wildland collection made in the upper Clark Fork River basin of western Montana where a native population was found growing on soil impacted by acid/heavy-metal contamination, and where effects of wind and surface water erosion were widespread. The testing of this selection has been limited to the immediate area of its origin and the Bridger Plant Materials Center in south-central Montana where it has performed well. <NAME> Germplasm silver buffaloberry appears best adapted to low- to mid-elevations ranging from 915 to 2,300 meters (3,000 to 7,500 feet). This selection should prove well adapted for use on many drastically disturbed acidic and heavy-metal impacted areas of low- to mid-mountain elevations in the northern Rocky Mountain region, given other favorable environmental conditions. As a seed source found growing naturally in the northern Rocky Mountains, it is assumed this selection will perform well in other mountainous regions of the Intermountain West with similar environments and climates.

**Seed Increase:** A seed orchard of <NAME> Germplasm silver buffaloberry was established at the Plant Materials Center, Bridger, Montana in 2000. Wildland seeds were container grown and transplanted as 1-0 and 2-0 stock to create a seed production orchard. Mechanical and chemical cultivation is used to manage weeds and other competing vegetation in the orchard. Fruit production of <NAME> Germplasm silver buffaloberry in Bridger, Montana, began in 2007, however, seed fill that year was negligible. Viable seed was harvested in 2008 and 2009, with production increasing significantly in 2009. Although ease of harvest and seed ripeness improve with time, the risk to losses from birds and deer also increases. <NAME> Germplasm silver buffaloberry averages between approximately 83,700 and 92,511 seeds per kilogram (38,000 and 42,000 seeds per pound). The Montana Conservation Seedling Nursery reports the average germination of silver buffaloberry as approximately 50 percent. Average date of harvest of <NAME> Germplasm silver buffaloberry at the Plant Materials Center, in Bridger, Montana, ranges from late August through October each year. Ripe berries remain on the shrubs, and if not consumed by wildlife, may persist until spring (Bismarck Plant Guide, revised 2006). Hand picking of fruit is difficult due to the presence of thorns. An alternative and preferred collection method is to shake the limbs to cause the fruit to drop onto tarps. Harvested fruit is kept cool and moist until processing. The fruit is macerated in order to remove the seeds from the pulp.

**Increase and Distribution:** Generation G<sub>1</sub> (equivalent to Foundation) seed of <NAME> Germplasm silver buffaloberry is available from the USDA-Natural Resources Conservation Service (NRCS), Plant Materials Center in Bridger, Montana, through the Foundation Seed Stocks Program at Montana State University-Bozeman or the University of Wyoming. Limited G<sub>1</sub> seed stock will be available in the spring of 2011. Commercial production of two generations (G<sub>2</sub> and G<sub>3</sub>) beyond G<sub>1</sub> is allowed.

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