UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PLANT SCIENCES DIVISION
WASHINGTON, D. C.

AND

MONTANA AGRICULTURAL EXPERIMENT STATION
BOZEMAN, MONTANA

AND

WYOMING AGRICULTURAL EXPERIMENT STATION
LARAMIE, WYOMING

# NOTICE OF RELEASE OF 'SHOSHONE' BEARDLESS WILDRYE

The Plant Sciences Division, Soil Conservation Service, United States Department of Agriculture, and the Agricultural Experiment Stations of Montana and Wyoming announce the release of 'Shoshone' beardless wildrye (*Elymus triticoides* Buckl.). It was developed by the Soil Conservation Service Plant Materials Center, Bridger, Montana.

Shoshone is an open-pollinated line (experimental designation P-15594, PI-434040, and WY-5) originating in 1958 as a collection from a low-lying area along the Wind River on the southern outskirts of Riverton, Wyoming. The collection site is at an elevation of 4950 feet, in a 5- to 9-inch precipitation zone in the Wind River Basin. The collection was directly increased without selection.

Shoshone is a rhizomatous grass adapted to wet or wet-saline-alkaline soils in Montana and Wyoming. Forage and seed production are equal to other beardless wildrye accessions. Recommended time of seeding is late fall.

Shoshone was tested and developed primarily for forage, stabilization, or cover on wet or wet-saline-alkaline soils. This includes pastureland; saline-affected, irrigated cropland; and dryland, saline-seep-discharge areas.

Breeder and foundation seed of Shoshone is maintained by the SCS Plant Materials Center, Bridger, Montana. Foundation, registered, and certified seed classes are recognized.

Release date of Shoshone beardless wildrye is June 30, 1980.

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6-9-80
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RECOMMENDATION FOR THE RELEASE

OF SHOSHONE BEARDLESS WILDRYE

Description:[1/] Beardless wildrye (*Elymus triticoides* Buckl.) is a native, rhizomatous, perennial grass. Culms are usually glaucous, rarely pubescent below the spike, 60 to 120 cm tall, commonly in large colonies from extensively creeping, scaley rhizomes. The ligule is a truncate rim about 1 mm long. Leaf blades are mostly 2 to 6 mm wide, flat or soon involute. The spike is erect and slender to rather dense, rarely compound. The spikelets are mostly 12 to 20 mm long with glumes very narrow to subulate, firm, nerveless or 1 to 3 nerved, awn-tipped, 5 to 15 mm long, those of the upper spikelets usually reduced or obsolete. The lemmas are 6 to 10 mm long, glabrous, firm, brownish, purplish, or tawny, and awn-tipped.

The native range of this species is on moist or alkaline soil, at low and medium elevations in Montana to Washington, south to western Texas and Baja, California. In Montana it is common in moist valleys and along streams throughout the state. In Wyoming the typical form is most successful in soils that are dry most of the year but subjected to considerable moisture in the winter. There are scattered localities in central and southern Wyoming, commonest in the Great Basin area.

Origin: 'Shoshone' beardless wildrye originated as a collection (WY-5) by Aubrey Stanton and J. L. McWilliams from a low-lying area along the

1/ Manual of the Grasses of the United States. A. S. Hitchcock. Revised Agnes Chase. Dover Publications, Inc. Yew York.

Wind River on the southern outskirts of Riverton, Wyoming. There is some question as to whether this grass was native to this site or if it was introduced to the site in the early 1940s. The collection site is at an elevation of 4950 feet in a 5- to 9-inch precipitation zone in the Wind River Basin.

Testing: The original 5-pound collection was used first to establish an Initial Evaluation Planting (IEP) comparing this accession with other ecotypes of beardless wildrye. The original IEP (seeded 10/18/60) at Bridger included only WY-5 (P-15594 or Shoshone), WY-4 (P-15593) from near Powell, Wyoming, and WY-806 from Riverton, Wyoming (received via the Bismarck PMC). P-2741 from Washington was added 2 years later (table 1). Shoshone did poorly at the Pullman PMC and only fair at the Los Lunas PMC. However, its performance has been good to excellent at both the Meeker and Bridger sites. A second, more recent IEP at Bridger on saline-alkaline soil (approximately 20 mmhos/cm conductivity) compared Shoshone with three other accessions (table 1). There is a notable similarity between Shoshone and PI-314665 (from Kazakstan, USSR) both in appearance and performance. P-2741 and C-77 are quite different (morphologically) than the other accessions, having a more elongated culm with a greater percentage of cauline leaves. Their ability to spread vegetatively is markedly greater, but they do not provide as dense ground covers as do Shoshone and PI-314665.

A replicated study was established (November 17, 1977) to compare forage and seed production, and response to nitrogen fertilization (applied 9/28/79) of five accessions of beardless wildrye: Shoshone (Riverton, WY), P-15593

(Powell, WY), P-2741 (Pullman PMC), C-77 (Los Lunas PMC), and PI-314665 (Kazakstan, USSR). A 5X5 Latin square design was used to compensate for salt concentration gradients (10 to 22 mmhos/cm) in two directions. Thus far there have been no significant differences in either forage or seed production among the five accessions (table 2). Based on general appearance, ground cover, plant vigor, and the measured parameters (forage and seed production), PI-314665 and Shoshone are the most promising accessions.

Cultural Methods Trials were established on moderately saline soils on the John Skorupa farm near Bridger to determine optimum time of seeding and the best position in the furrow in which to place the seed. Fall seeding was found to produce the best stand (table 3), but on a subsequent seeding, spring planting was just as good -- providing there was an abnormally cold, wet spring prior to germination and emergence, giving the seed the needed cold stratification. The planting of seed in the bottom of the furrow produced a significantly poorer stand than any other position. Stroh (1968) suggested that this difference was possibly caused by cooler soil temperatures in the bottom of the furrow, created by a shorter daylight period, than in the higher positions.

Seed Increase and Production: A portion of the original 5-pound collection was used to establish the first increase field (.25 acres) on 5/16/60. Seed from this planting provided for subsequent, large, seed-production fields (see table 4). Beardless wildrye is notoriously a poor seed producer, relying more heavily on its rhizomes for propagation. Seed production ranged from 50 pounds-per-acre in 1969 to 517 pounds-per-acre in 1973 with

an overall average of slightly over 200 pounds-per-acre. There are approximately 160,000 seeds-per-pound. The average harvest date is July 25. Seed shatter is very minimal, making the harvest timing less critical. Barring any severe weather conditions, a majority of the seeds will persist for 2 to 3 weeks after seed ripens. There have not been any lodging problems in seed production fields, due, in part, to the morphology of this grass, i.e., mostly basal or lower cauline leaves with the seed head suspended above the foliage on a stiff, bare culm.

Beardless wildrye has been found to be slightly susceptible to "take-all" disease, caused by the root-inhabiting fungus *Ophiobolus graminis*. Dr. Richard J. Hamilton, Associate Professor in Plant Pathology at Montana State University, stated that "This is a most difficult disease to control and the only satisfactory measure is to use crop rotations with legumes." An application of 100 pounds-per-acre of $P_2O_5$ temporarity arrested the disease, but more drastic measures had to be taken. The field was plowed to a 6-inch depth, rolled immediately, and when dried to a 2-inch depth, was harrowed three ways. The site was then irrigated with 3 inches of water. The renovation was accomplished in 10 days. The stand reestablished from rhizomes with no sign of "take-all" disease.

The only major weed problem has been annual bromes: *Bromus tectorum*, *B. japonicus*, and *B. secalinus*. The beardless wildrye does not form a tight sod, thus leaving room for invasion by annual grasses. The annual brome seed, however, can be totally removed from the beardless wildrye seed by running it through a Carter-disc separator and over a gravity table.

Seed Germination: The use of beardless wildrye as a forage grass is limited somewhat by relatively slow germination and establishment.

Wiesner and Brown (1978) found that the effects of hand scarification and hull removal showed no significant differences in germination percentage between the two treatments, but both treatments were significantly superior to the untreated control group (table 5). These data suggest that the lemma and palea and the true seed coat are restrictive to the germination process. The lemma and palea are apparently restrictive to water uptake and/or gas exchange, even when the seed coat was cut.

Acid (67 percent $H_2SO_4$ solution) and mechanical (Forsberg scarifier) both increased seed germination (table 6) but were not significantly different from one another. From safety, cleaning, and handling viewpoints, mechanical scarification would be much easier to fit into a commercial seed production and processing scheme.

To determine optimum germination conditions for this species, Wagner and Chapman (1970) used four factors and various interactions among them: (1) Temperature (15°C constant, 20°C constant, 15°C to 25°C alternating, and 15°C to 30°C alternating; (2) pretreatment (no prechill vs. prechill on moist blotters at 1.5°C for 5 days); (3) germination solution (distilled water vs. $Na_2SO_4$ solution at 7.2 atm.); and (4) ecotypes or strains (P-15593 and Shoshone).

For the last one-third of the germination period, the response to the four temperature regimes can be grouped in two classes: 15°C to 25°C alternating and 20°C constant vs. 15°C to 30°C alternating and 15°C constant; the first combination producing the best germination (figure 1). The effect

of pretreatment is significant only from days 17 to 21 (figure 2). As temperature, apparently pretreatment is relatively unimportant in early germination, but plays a significant role at the end of 21 days. Wagner and Chapman suggest this pattern may reflect an adaptive mechanism that allows some seed to germinate under a wide array of environmental conditions and other seed to germinate under more strictly defined conditions. It was also concluded that prechilling must influence both water uptake and enzymatic activity not associated with water uptake, but necessary for germination. The apparent need for prechilling treatment is supported by the fact that germination and stand establishment has been most successful with late fall plantings or spring plantings that have been subjected to cool, wet weather prior to germination (appendix A). The effect of solutions (distilled water vs. $Na_2SO_4$ solution) had no effect on germination or imbibition, and there were no significant differences among ecotypes in their response to all variables (figure 3).

Sprigging: Shoshone beardless wildrye has been the most promising species to sprig into wet, saline-alkaline soil. In moderately saline soils (10 mmhos/cm and less), Shoshone was the best overall performer:

| Species | Forage Production (kg/ha) 1978 | 1979 |
|---|---|---|
| Shoshone beardless wildrye | 3,639 | 3,085 |
| Garrison creeping foxtail | 2,615 | 1,291 |
| Rosana western wheatgrass | 2,342 | 850 |

On a more saline site (10 to 30 mmhos/cm), Shoshone dominated the site totally:

| Species | Cover Estimates (% Stand) | | Forage Production Range (kg/ha) (Soil Conductivity Range 25 to 10 mmhos/cm) | |
|---|---|---|---|---|
| | 1978 | 1979 | 1978 | 1979 |
| Shoshone beardless wildrye | 71 | 78 ) | | |
| Rosana western wheatgrass | 20 | 18 ) | 785 to 2,221 | 920 to 2,054 |
| Garrison creeping foxtail | 9 | 4 ) | | |

Stand development from sprigs is extremely slow during the first year, but once-established rhizomes spread rapidly.

Field Plantings: During a period of 20 years, Shoshone beardless wildrye has been seeded in over 100 field plantings in Montana, Wyoming, and Idaho. Adequate performance records are available on 61 plantings in Montana, 24 in Wyoming, and 2 in Idaho (see appendices A, B, and C). A majority of the plantings were on critical, saline soils -- in part -- resulting in only a 34 percent planting success rate in Montana and 42 percent in Wyoming. On the sites where Shoshone failed, the species used as a standard for comparison usually failed, also. Only in a couple of plantings, tall wheatgrass performance was considered superior to that of beardless wildrye.

Beardless wildrye is characterized by slow seedling development; competing poorly with weeds or other forage grasses during early stages of development. All too often, these field plantings are considered failures and plowed out before the planting was given every chance to develop. Because of the slow development of beardless wildrye, it is important that there is proper seedbed preparation to minimize competition from undesirable weedy species.

The successful field plantings have documented the advantages of cold stratification of the seed prior to germination; i.e., 76 percent (Montana)

and 70 percent (Wyoming) of the successful plantings were seeded during late fall or snow-free periods in the winter. Based on this information, all beardless wildrye plantings are recommended to be seeded in the fall, until proper scarification techniques can be developed to overcome the seed dormancy problem.

Once Shoshone becomes established, it is capable of sustaining a good stand for several years. Of the field plantings listed in appendices A, B, and C, ten were doing well after 7 to 13 years of evaluations. These plantings may have been in even longer or are still in, after field evaluations were discontinued.

Uses: Shoshone beardless wildrye is recommended for use on wet or wet-saline-alkaline soils for forage, stabilization, or cover. This includes pastureland; saline-affected, irrigated cropland; and dryland, saline-seep-discharge areas. This accession has been found to be adapted to most areas in Montana and Wyoming, as well as northwestern Colorado and southern Idaho.

Increase and Distribution: Breeder, foundation, registered, and certified seed classes will be recognized. Breeder seed will be maintained by the SCS Bridger Plant Materials Center. Foundation seed will be available through the SCS Bridger Plant Materials Center, the Montana Seed Growers Association, and the Wyoming Agricultural Experiment Station.

Submitted by: This recommendation for the release of Shoshone beardless wildrye was prepared by M. E. Majerus and J. G. Scheetz, Soil Conservation Service.

TABLE 1. Initial Evaluation Plantings of Shoshone beardless wildrye at various Plant Materials Centers.

| Location | Date | Accession | Stand 1/ | Seedling Vigor | Foliage Production 1/ | Spread 1/ | Seed Production 1/ |
|---|---|---|---|---|---|---|---|
| | | *Years* | *1 2 3 4* | | *1 2 3 4* | *1 2 3 4* | *1 2 3 4* |
| Bridger PMC | 10/18/60 | Shoshone | 3 1 | 5 | 3 3 | 3 1 | 7 |
| | | P-15593 | No stand | | | | |
| | | WY-806 | 1 1 | 5 | 3 3 | 3 3 | 5 |
| | | P-2741 | 1 1 | 1 | 5 | | |
| | 2/2/76 | Shoshone | 2 2 1 2 | 3 | 3 2 2 2 | 1 1 1 2 | 7 3 4 5 |
| | | C-77 | 3 3 3 1 | 1 | 1 4 4 2 | 1 2 2 1 | 7 3 5 4 |
| | | P-2741 | 5 3 3 2 | 2 | 2 2 3 2 | 2 1 1 1 | - 2 4 3 |
| | | PI-314665 | 5 2 2 2 | 3 | 3 2 2 4 | 2 1 1 3 | - 2 2 5 |
| Los Lunas PMC | 1966 | Shoshone | 4 | 4 | | | 7 |
| | | P-15593 | 4 | 4 | | | 7 |
| | | C-77 | 3 | Drowned out | | | |
| Pullman PMC | 1966 | Shoshone #1 | 7 7 7 5 | 7 | 7 | 7 | 7 |
| | | Shoshone #2 | 7 7 5 5 | 7 | 7 | 7 | 7 |
| | | P-274 | 5 3 1 1 | 5 | 5 | 3 | 5 |
| Meeker EPC | 1976 | Shoshone | 6 2 1 | 5 | 4 2 4 | | |
| | | EPC-98 | 9 9 9 | 5 | 4 2 | | |
| | | PI-210988 | - - - | - | | | |

1/ Ratings 1-9 with 1 best.

TABLE 2. Forage and seed production of five accessions of beardless wildrye on saline-alkaline soil at the Bridger PMC.

| | Forage Production (kg/ha) | | | | Seed Production (kg/ha) | |
|---|---|---|---|---|---|---|
| | 1978 | | 1979 | | 1979 | |
| Accession | Range | Average | Range | Average | Range | Average |
| P-2741 | 63-2,042 | 979 | 1,416-4,577 | 2,892 | 55-300 | 165 |
| Shoshone | 392-2,108 | 1,066 | 1,546-3,787 | 2,862 | 103-251 | 180 |
| P-15593 | 94-2,123 | 1,243 | 1,858-3,609 | 2,608 | 92-227 | 161 |
| PI-314665 | 0-2,163 | 887 | 0-3,997 | 2,406 | 0-307 | 208 |
| C-77 | 3-1,080 | 281 | 1,003-3,881 | 1,836 | 74-338 | 142 |

TABLE 3. Results of trials to determine optimum time of seeding and positioning of seed in the furrow on moderately saline soil (John Skorupa Farm, Bridger, Montana).

| Time of Seeding | Seedlings per ft | Position in Furrow | Seedlings per ft |
|---|---|---|---|
| Fall 10/26/67 | 3.01 a | West Shoulder | 4.14 a |
| Spring 5/2/68 | 2.08 b | Top | 3.11 a |
| Spring & 6 ton/acre Gypsum 5/2/68 | 1.19 c | East Shoulder | 3.00 a |
| | | Bottom | 1.81 b |

TABLE 4. Seed production yields of Shoshone beardless wildrye at the Bridger PMC.

| Year | Acreage | Fertilization | Irrigation | Harvest Date | Yield |
|---|---|---|---|---|---|
| | | *lbs/acre* | *inches* | | *lbs/acre* |
| 1962 | 0.25 | | | 7/24 | 180 |
| 1963 | 0.25 | | | 7/27 | 52 |
| 1964 | 0.25 | | | 7/22 | 228 |
| 1964 | 3.70 | | | 7/21 | 118 |
| 1965 | 0.12 | 60N-60P | | 7/27 | 150 |
| 1965 | 3.88 | 60-240 N&P | | 7/29 | 443 |
| 1966 | 0.12 | 60N-60P | 12 | 7/22 | 175 |
| 1966 | 3.88 | 58N-58P | 35 | 7/21 | 183 |
| 1967 | 3.88 | 100N-100P | 24 | 7/25 | 140 |
| 1968 | 3.88 | 100N-100P | 24 | 7/25 | 101 |
| 1969 | 1.00 | 100N-100P | 12 | 7/28 | 59 |
| 1969 | 1.34 | 100N-100P | 21 | 7/28 | 50 |
| 1970 | 2.65 | 100N-100P | 18 | 7/27 | 248 |
| 1971 | 2.65 | 60N | 15 | 7/19 | 420 |
| 1972 | 2.65 | 60N | 6 | 7/18 | 89 |
| 1972 | 2.82 | 60N | 12 | 7/24 | 152 |
| 1973 | 1.26 | 60N | 12 | 7/26 | 517 |
| 1974 | 1.26 | 60N | 9 | 7/29 | 306 |
| 1975 | - | | | | |
| 1976 | - | | | | |
| 1977 | 4.00 | 100N | 0 | 7/28 | 153 |
| 1978 | 2.77 | 100N | 3 | 7/25 | 213 |
| 1979 | 2.77 | 60N | 0 | 8/7 | 155 |

TABLE 5. Beardless Wildrye: Effects of hull removal and cutting true seed coat on germination.

| Treatment | Germination |
|---|---|
| Hull removed | 93.2 a |
| Hull removed and seed coat cut | 84.0 a |
| Untreated Control | 36.0 b |

TABLE 6. Effect of mechanical and acid scarification on the germination of beardless wildrye.

| Acid | | Mechanical | |
|---|---|---|---|
| Time | % Germ | Time | % Germ |
| Control | 67.5 b | Control | 67.5 c |
| 10 Seconds | 75.5 b | 2 Seconds | 77.0 bc |
| 30 Seconds | 73.5 b | 5 Seconds | 76.5 bc |
| 1 Minute | 79.0 ab | 8 Seconds | 89.0 ab |
| 2 Minutes | 88.5 a | 12 Seconds | 57.5 d |
| 12 Minutes | 50.0 c | | |

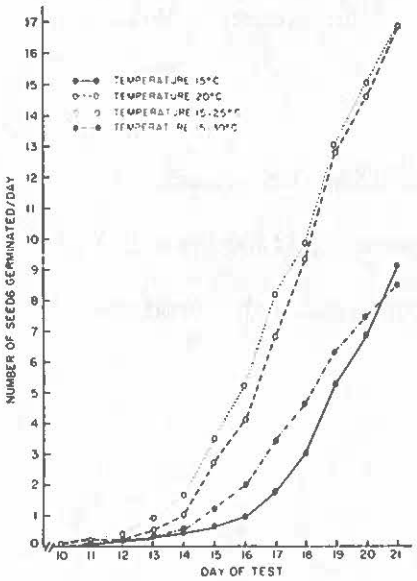


FIG. 1. Mean germination of two strains of beardless wildrye under four temperature conditions.

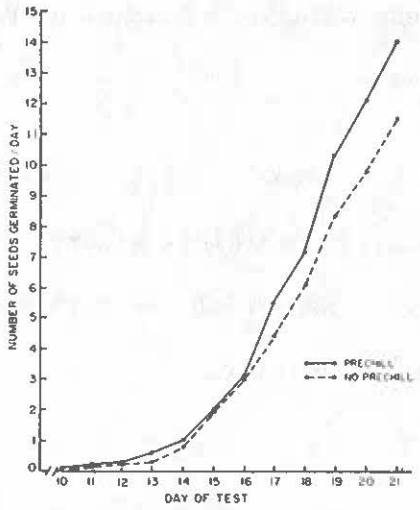


FIG. 2. Mean germination of two strains of beardless wildrye with and without prechilling.

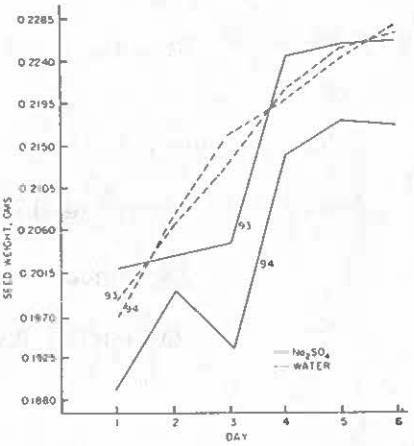


FIG. 3. Pattern of water uptake (increase in seed weight) for two strains of beardless wildrye in two germination solutions.

## LITERATURE CITED

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3. Wiesner, Loren, and Greg Brown. 1978. Scarification treatments to decrease dormancy in beardless wildrye (*Elymus triticoides* L.). *In* Annual Progress Report of the Forage Crop Research Committee. MAES-MSU, Bozeman, Montana.

APPENDIX A. Performance of Shoshone beardless wildrye Field Plantings in Montana.

| Planting Number | Field Office | Planting Date | Seeding Equipment | Seedbed Preparation | Soils & Soil Conditions | Average Rating | Longevity | Standard of Comparison | Performance |
|---|---|---|---|---|---|---|---|---|---|
| 6-64B | Joliet | 11/4/64 | Double disk, 36" | | Heldt sicl | Good | 7 1/ | None | 2/ |
| 62-64B | Choteau | 4/22/66 | | | | Failure | 1 | P-15590 ELCI2 | Failure |
| 63-64A | Choteau | 6/15/66 | Shoe drill | Fallow | Poorly drained saline, class IV | Failure | 2 | Comm. BRBI2 | Failure |
| 63-64B | Choteau | 5/10/65 | Double disk | Abandoned stubble | Class II-VII | Failure | 2 | Comm. BRBI2 | Failure |
| 65-64 | Stanford | Fall 65 | | Yes | | Poor | 3 | None | |
| 113-64 | Fort Benton | 10/19/64 | Deep furrow drill | Summer fallow | Vida 1 | Good | | Comm. AGEL3 | Good-Exc. |
| 36-65 | Malta | 10/27/65 | Double disk, 7" | Abandoned stubble | Laurel sic | Poor | 2 | Alta FEAR3 | Fair |
| 37-65A | Kalispell | 10/6/66 | Grain drill | | Heavy soil, limited drainage | Poor | 2 | Comm. AGEL3 | Failure |
| 57-65 | Lewistown | 10/15/65 | Lister drill, 14" | Firm seedbed | Saline lowland, flooded in spring | Failure | 4 | Comm. FEAR3 | Failure |
| 61-65 | Havre | 11/7/69 | | | | Poor | 3 | Comm. AGEL3 | Fair |
| 67-65 | Joliet | 10/28/65 | Double disk, 7" | Grain stubble & poor dond. sod | Saline | Failure | 1 | BROMU, FEAR3 mixed | Failure |
| 69-65 | Miles City | 5/66 | Grain drill, 7" | | Heavy clay, poorly drained | Failure | 1 | P-15593 ELTR3 | Failure |
| 27-66B | Dillon | 4/27/66 | Drill, 14" | Old hay field, no nurse crop | Avalanche 1, saline | Failure | 1 | None | |

1/ Longevity = Years of evaluation until accession proved to be adapted to the site, was recorded as a failure, or was removed by cooperator.

2/ Performance of Standard of Comparison.

APPENDIX A. Performance of Shoshone beardless wildrye Field Plantings in Montana. (Continued)

| Planting Number | Field Office | Planting Date | Seeding Equipment | Seedbed Preparation | Soils & Soil Conditions | Average Rating | Longevity | Standard of Comparison | Performance |
|---|---|---|---|---|---|---|---|---|---|
| 29-66 | Culbertson | 5/66 | Drill | | Straw l & sl saline | Good-Exc. | 9 | Comm. PSJU* | Fair |
| 65-66 | Plains | 9/20/67 | Brillion drill | Fallow | Round Butte | Failure | 1 | Comm. AGEL3 | Failure |
| 72-66 | Joliet | 11/66 | Drill, 6" | Crusted badly, fallow, plowed | Heldt cl, saline | Failure | 1 | Comm. FEAR3 | Failure |
| 73-66 | Baker | 10/67 | Disk drill | Fallow | | Good-Exc. | 9 | Comm. AGEL3 | Good-Exc. |
| 83-66 | Wh.Sulphur | 11/66 | Grain drill | Fallow | Lamoure sicl | Fair | 4 | Alta FEAR3 | Fair |
| 84-66 | Sidney | 4/15/67 | | Sprayed for weeds | Cherry sicl, saline | Fair | 4 | Comm. FEAR3 | Fair |
| 85-66 | Culbertson | 12/9/66 | Disk drill | Fallow | - sil, saline | Failure | 1 | Comm. AGEL3 | |
| 94-66 | Great Falls | 10/67 | | Double summer fallow & stubble | Vl-w2 | Failure | 1 | Garrison ALAR | Failure |
| 19-67 | Plains | 3/67 | | Good condition | Allentine-Galata alkali | Failure | 1 | Comm. AGEL3 | Failure |
| 20-67 | Plains | 5/6/67 | Grain drill | Plow & packed | Ground hardened after sprinkling | Failure | 1 | Comm. PHAR3 | Failure |
| 57-67 | Forsyth | 10/67 | Drill, 6" | Fallow | Nibbe c, very saline | Failure | 2 | Kenmont FEAR3 | Failure |
| 60-67 | Dillon | 4/20/68 | Drill | Spring plowed | Soil lacks structure, baked hard | Failure | 1 | Comm. AGEL3 | Failure |
| 61-67 | Kalispell | 11/17/67 | Grain drill | Disked & harrowed, partially frozen | Saline | Failure | 1 | Comm. AGEL3 | Failure |

* *Psathyrostachys juncea* (formerly *Elymus junceus*).

APPENDIX A. Performance of Shoshone beardless wildrye Field Plantings in Montana. (Continued)

| Planting Number | Field Office | Planting Date | Seeding Equipment | Seedbed Preparation | Soils & Soil Conditions | Average Rating | Lon-gevity | Standard of Comparison | Perform-ance |
|---|---|---|---|---|---|---|---|---|---|
| 62-67 | Broadus | 10/8/69 | Grain drill | Fallow, wet | Havre-Lohmiller | Failure | 1 | Comm. FEAR3 | Failure |
| 10-68 | Billings | 4/28/68 | Disk drill, 7" | Tilled & packed | Class III ws2 | Failure | 1 | None | |
| 32-68 | Conrad | 11/20/68 | Broadcast & harrowed | Cultivated & floated | Lambert sil | Exc. | 10+ | None | |
| 33-68 | Conrad | 5/9/68 | Double disk, 6", 5#/A | Summer fallow | Scobey sicl | Failure | 1 | None | |
| 77-68 | Havre | 11/22/69 | Drill | Summer fallow | Havre-Lohmiller, saline | Fair | 5 | Alkar AGEL3 & Rosana AGSM | Fair-Good |
| 36-69 | Wibaux | 10/69 | | Foxtail stubble | Heavy, very saline | Failure | 1 | Alkar AGEL3 & Rosana AGSM | Fair-Good Failure |
| 43-69 | Culbertson | 5/1/69 | Drill, 7" | Summer fallow | Very fine sl, saline | Failure | 1 | Alkar AGEL3 | Failure |
| 37-70 | Sheridan | 11/12/70 | Drill | Fallow | Medium texture, saline | Good | 5 | Comm. AGEL3 | Good |
| 119-70 | Jordan | 10/70 | Single disk drill | Fallow & leveled | Sicl, saline | Good-Exc. | 7 | None | |
| 120-70 | Roundup | 11/1/70 | Disk drill, 10" | Fallow | Cl | Fair-Good | 3 | None | |
| 124-70 | Conrad | 11/9/70 | Broadcast & harrowed | Cultivated & floated | Fairfield 1 | Fair-Good | 5 | None | |
| 22-71B | Bozeman | 4/11/71 | Double disk, 12" | Disk (3), roto-till (1), Harrow (4) | Alluvial bottom | Fair | 5 | Comm. FEAR3 | Failure |
| 30-71A | Fort Benton | Spring 71 | Drill, 30" | | | Good | 7 | None | |
| 112-71 | Miles City | 4/18/72 | | Fallow | | Good | 4 | Kenmont FEAR3 & Garrison ALAR | Good |

APPENDIX A. Performance of Shoshone beardless wildrye Field Plantings in Montana. (Continued)

| Planting Number | Field Office | Planting Date | Seeding Equipment | Seedbed Preparation | Soils & Soil Conditions | Average Rating | Longevity | Standard of Comparison | Performance |
|---|---|---|---|---|---|---|---|---|---|
| 120-71A | Big Sandy | 4/72 | Flat drill, 7" | Summer fallow | Dry, high alkali | Fair | 2 | Native range | |
| 136-71B | Pleatywood | 10/15/71 | Disk drill, 7" | Clean stubble | Loamy | Failure | 1 | None | |
| 32-72 | Missoula | 4/1/72 | Double disk | Tilled | Black-alkali | Failure | 1 | Comm. FEAR3 | Failure |
| 51-72 | Fort Benton | 5/23/72 | Noble drill, 9" | Fallow | Medium texture | Failure | 1 | None | |
| 130-72 | Hardin | 12/1/72 | Broadcast | Poor | Marias c, seeped | Failure | 2 | None | |
| 131-72 | Bozeman | Fall 72 | Drill, 6" | | Laurel sicl | Fair-Poor | 4 | Comm. AGEL3 Comm. OXRI* | No data |
| 3-73 | Jordan | Spring 73 | | Cocklebur stubble | Clayey range site | Failure | 2 | Rosana AGSM & Garrison ALAR | Failure |
| 13-73 | Big Timber | 5/10/73 | Drill, 12" | Intensive | Loamy surface, c subsoil, saline | Failure | 1 | None | |
| 63-13 | Wibaux | Spring 73 | Grass drill, 7" | Summer fallow & grain stubble | Farland sil | Very poor | 6 | 20 species | Failure-Good |
| 99-73 | Glendive | 10/17/74 | Drill | Fallow | | Failure | 1 | None | |
| 22-74 | Roundup | 10/74 | Drill | Good | Harlowton c | Good-Exc. | 5 | None | |
| 73-75 | Havre | 5/76 | Drill, 9" | Disk & harrow (6 times) | Heavy sicl | Poor | 3 | None | |
| 88-76 | Circle | 4/77 | Drill | Disked | Alona | Poor | 3 | P-15590 ELCI2 & Alkar AGEL3 | Poor |
| 73-78 | Wibaux | 10/25/78 | Drill | Clean saf- flower | Morton sil | Failure-Poor | 2 | Largo AGEL3, NB-328 ELGI,& M-1328 OXRI* | Failure |
| 75-78 | Havre | 11/9/78 | Drill & dragged | Paraquat, (4)disked rangeland | Sandy | Fair | 1 | Largo AGEL3, NB-328 ELGI,& M-1328 OXRI* | Fair |

* *Oxytropis riparia.*

APPENDIX A. Performance of Shoshone beardless wildrye Field Plantings in Montana. (Continued)

| Planting Number | Field Office | Planting Date | Seeding Equipment | Seedbed Preparation | Soils & Soil Conditions | Average Rating | Longevity | Standard of Comparison | Performance |
|---|---|---|---|---|---|---|---|---|---|
| 79-78 | Chinook | 11/7/78 | Broadcast & harrowed | Summer fallow | Bear Paw cl | Good | 1 | M-1328 OXRI* & NB-328 ELGI | Fair Poor |
| - | Fort Benton | 10/18/77 | PMC drill | Cultivated | Saline seep | Good | 2nd yr. | 11 species | Failure-Good |
| - | Conrad | 10/19/77 | PMC drill | Sprayed w/Roundup | Saline seep | Good | 2nd yr. | 11 species | Failure-Good |
| 91-73 | Sidney | Late summer | | Foxtail barley stubble | Extremely saline | Failure | 1 | 7 species | Failure |

* *Oxytropis riparia.*

APPENDIX B. Performance of Shoshone beardless wildrye Field Plantings in Wyoming.

| Planting Number | Field Office | Planting Date | Seeding Equipment | Seedbed Preparation | Soils & Soil Conditions | Average Rating | Longevity | Standard of Comparison | Performance |
|---|---|---|---|---|---|---|---|---|---|
| 5-57 | Torrington | 5/15/57 | Beet drill | | Very saline, Janice complex | Good | 13[1/] | Comm. AGEL3 | Good[2/] |
| 38-63 | Cody | 11/17/63 | Drill, 22" | Grain stubble | Class IIIe4 | Fair | 5 | None | |
| 43-63 | Riverton | 11/23/63 | | | | Good | 10 | None | |
| 79-64B | Kaycee | 11/3/64 | | Good, oat stubble | Saline, greasewood site | Fair | 2 | Comm. AGEL3, Comm. MESA,& Comm. MELIL | Fair |
| 82-64B | Laramie | 4/10/65 | Broadcast & raked | Newly constructed dike | Heavy soil, saline-alkaline | Poor | 2 | Comm. AGEL3 | Poor |
| 85-64 | Torrington | 4/65 | Nesbit drill | Disked corn stubble-oats cover crop | Sandy loam | Good | 3 | Comm. DAGL, Comm. BRBI2,& Comm. FEAR3 | Good |
| 7-65 | Lovell | 4/6/65 | Drilled 3/4" deep | | Heavy, wet | Failure | 1 | None | |
| 42-65A | Big Piney | 10/27/65 | Double disk, w/grass box | Disk & plow oat cover crop | Saline, uplands | Failure | 1 | None | |
| 65-65 | Worland | Late June 67 | | | Heavy, wet, saline | Failure | 1 | None | |
| 5-66B | Newcastle | Spring 66 | | Fallow | Class IVe2 | Failure | 1 | Comm. AGEL3 | Failure |
| 62-66 | Farson | 5/5/67 | Drill w/packer wheels | Plowed, leveled | Subirrigated | Failure | 1 | Comm. BRBI2 & Comm. FEAR3 | Fair |
| 63-66 | Kaycee | 2/12/68 | Grass drill | Plowed, disked, leveled | Havre sil, mod. wet saline | Good | 5 | None | |
| 66-66 | Sheridan | 5/1/67 | Drill | Plow, disked, harrow, floated | Class IVs12, saline | Failure | 3 | Comm. FEAR3 | Failure |

1/ Longevity = Years of evaluation until accession proved to be adapted to the site, was recorded as a failure, or was removed by cooperator.

2/ Performance of Standard of Comparison.

APPENDIX B. Performance of Shoshone beardless wildrye Field Plantings in Wyoming. (Continued)

| Planting Number | Field Office | Planting Date | Seeding Equipment | Seedbed Preparation | Soils & Soil Conditions | Average Rating | Lon-gevity | Standard of Comparison | Perform-ance |
|---|---|---|---|---|---|---|---|---|---|
| 67-66 | Buffalo | 10/66 | Drill | Disk, harrow, pack | Overflow, saline | Good | 10+ | Comm. AGEL3 | Fair |
| 75-66A | Saratoga | 10/66 | Drill | Poor (seeded into sod) | Wet bottom, saline | Failure | 1 | P-15601 PHAR3 | Failure |
| 74-66B | Saratoga | 10/5/66 | J.D. drill | Disked lightly | Seedbed too loose, high saline | Failure | 2 | Comm. AGEL3 | Failure |
| 11-67 | Lovell | 3/67 | | Plow, fallow | Cl, mod.-strong alkali | Failure | 2 | Comm. FEAR3 | Failure |
| 64-67 | Big Piney | 10/15/67 | Grain drill | Plowed & leveled | Muddy series | Good | 5 | Comm. FEAR3 | No record |
| 65-67 | Lander | 10/24/67 | | Disked grain stubble | | Fair | 5 | Comm. AGEL3 | Fair |
| 85-69 | Laramie | 5/13/70 | Drill | Summer fallow | Marias c | Good | 7 | Comm. AGEL3 | Good |
| 86-69 | Lovell | 10/69 | Broadcast w/drill | Double disk & harrowed | Stutzman | Fair-Good | 5 | None | |
| 90-69 | Powell | 12/2/69 | Drill, 7" | Packed & corrugated | Woodrow-Billings-Lost Wells, saline | Failure | 2 | Kenmont FEAR3, Alkar AGEL3 | Failure |
| 67-78 | Newcastle | 10/28/78 | Drill | Bladed off sagebrush & cactus, disked (2) | | Failure | 1 | P-15590 ELCI2, NB-328 ELGI | Failure |
| 66-77 | Kaycee | 10/15/78 | Drill | Plow, disked, floated | | Poor | 1 | Comm. AGEL3 | Good-Exc. |

APPENDIX C. Performance of Shoshone beardless wildrye Field Plantings in Idaho.

| Planting Number | Field Office | Planting Date | Seeding Equipment | Seedbed Preparation | Soils & Soil Consitions | Average Rating | Longevity | Standard of Comparison | Performance |
|---|---|---|---|---|---|---|---|---|---|
| ID-75-6 | Burley | 5/1/75 | | | | Fair | 4 1/ | | 2/ |
| ID-75-21 | Rexburg | 6/3/76 | | | | Fair-Good | 2 | | |

1/ Longevity = Years of evaluation until accession proved to be adapted to the site, was recorded as a failure, or was removed by cooperator.
2/ Performance of Standard of Comparison.