UNITED STATES DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE
ECOLOGICAL SCIENCES DIVISION
WASHINGTON D.C.
and
MONTANA AGRICULTURAL EXPERIMENT STATION
BOZEMAN, MONTANA
and
WYOMING AGRICULTURAL EXPERIMENT STATION
LARAMIE, WYOMING
and
UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
WASHINGTON D.C.

NOTICE OF RELEASE OF 'RIMROCK' INDIAN RICEGRASS

The Ecological Sciences Division, Natural Resources Conservation Service, U.S. Department of Agriculture, the Agricultural Experiment Stations of Montana and Wyoming, and the USDA Agricultural Research Service announce the release of Rimrock Indian ricegrass [*Oryzopsis hymenoides* (Roem. and Schult.) Ricker ex Piper]. This grass was developed by the USDA-NRCS Plant Materials Center at Bridger, Montana.

Rimrock was collected in 1960 from a native sandy range site (elev. 1,101 meters) one kilometer north of Billings, Montana. The area receives 250-350 mm of annual precipitation. Rimrock is predominantly self-pollinated and not limited by self-incompatibility. Rimrock was tested as M-33, P-15597, T-05424, 9005424, and PI-478833, compared to 82 other accessions of Indian ricegrass, and directly increased without selection.

Rimrock is a perennial, cool-season bunchgrass found on soils that are neutral to mildly alkaline, with low water holding capacity, low clay content, high bulk density, and with few rock fragments. The distribution of this grass ranges from the Nebraska sand hills west to the eastern slopes of the Cascade and Sierra-Nevada ranges, and from Mexico to Canada at elevations up to 3,000 meters.

Rimrock is a native grass that can be used in seed mixtures for range revegetation and reclamation of disturbed sandy soils.

Rimrock produces an abundance of plump seed with protein levels of 15 to 17 percent. This seed is excellent food for upland game birds and songbirds. This grass can be planted with or adjacent to taller plants for food and cover for a wide variety of wildlife.

Rimrock was released primarily because of its ability to retain mature seed better than the cultivars 'Paloma' (origin New Mexico) or 'Nezpar' (origin Idaho). The more acute angle of the glume of Rimrock helps retain seed longer and protects from catastrophic shattering events such as high winds and heavy rain.

Breeders and Foundation seed of Rimrock is maintained by the USDA-NRCS Plant Materials Center, Bridger, Montana. Foundation, Registered, and Certified seed classes are recognized.

Release date of Rimrock Indian ricegrass is April, 1, 1996.

State Conservationist Natural Resources Conservation Service Montana	Date
State Conservationist Natural Resources Conservation Service Wyoming	Date
Director Montana Agricultural Experiment Station	Date
Director Wyoming Agricultural Experiment Station	Date
Director Biological Conservation Sciences Division U.S. Department of Agriculture Natural Resources Conservation Service	Date
Director Agricultural Research Service	Date

RECOMMENDATION FOR THE RELEASE

OF RIMROCK INDIAN RICEGRASS

Description: Indian ricegrass [*Oryzopsis hymenoides* (Roem. and Schult.) Ricker ex Piper] is a perennial, cool-season bunchgrase found on soils that are neutral to mildly alkaline, with low water holding capacity, low clay content, high bulk density, and with few rock fragments (Platou et al., 1986). The natural range of this grass extends from the Nebraska sand hills west to the eastern slopes of the Cascade and Sierra-Nevada ranges, and from Mexico to Canada at elevations up to 3,000 meters (Booth et al., 1980).

The culms are densely tufted and typically 30 to 60 cm tall. The leaf blades are slender, usually involute, with membranaceous, acute ligules (6 mm long). The diffuse panicle (7 to 15 cm long) has dichotomously branched, thin pedicels. The seed has indurate lemma and palea that are dark brown to black in color. The seed is subtended by white pilose hairs 3 mm long. The papery glumes are ovate, 3-nerved with an abrupt point (Hitchcock, 1950). Indian ricegrass has a deep, extensive, fibrous root system, capable of adjusting to shifting sands by elongating basal internodes and producing adventitious roots at these nodes (Stoddart and Wilkinson, 1938). Growth of established Indian ricegrass plants begins when soil temperatures at a 15 cm depth remain at 4° C for 3 to 4 days (Pearson, 1979).

Origin: 'Rimrock' Indian ricegrass was collected on June 29, 1960, by Leo K. Pipal from a native sandy range site (elevation 1,101 meters, 3,612 feet) one kilometer north of Billings, Montana (Yellowstone County). The collection site is located in the 250 to 350 mm (10-14 inch) precipitation zone, and was dominated by needleandthread grass *(Stipa comata).*

Indian ricegrass does not demonstrate self-incompatibility and is probably highly self-fertilized (Jones and Nielson, 1989). Under mesic conditions, anthers may be exserted, permitting cross-pollination; but under hot, stressful conditions, pollination occurs before the flower opens (ecological cleistogamy). The chromosome number for Indian ricegrass is 2n=48 (Johnson and Rogler, 1943).

Uses: Spring growth is initiated in early April and is relished by both livestock and wildlife. Sowell et al. (1985), studying the vegetation of Wyoming's Red Desert, found crude protein levels during the growing season ranging from 10.9 percent in early June to 5.0 percent by late August. An analysis of dormant winter forage found a crude protein level ranging from 6.5 percent in mid-October to a low of 3.8 percent in early December. On winter range areas, Indian ricegrass is highly palatable to all classes livestock. Indian ricegrass is very susceptible to overgrazing.

Indian ricegrass can also be used in seed mixtures for reclamation of disturbed sandy soils. To date, it has not been used extensively for this purpose because of high seed costs and seed dormancy. Huntamer (1934) found Indian ricegrass seed to exhibit both mechanical and physiological dormancy. The mechanical dormancy results from the indurate lemma and palea, which prevent the penetration of O_2 required for germination (Fendall, 1966). Although the mechanical dormancy can be reduced with mechanical or acid scarification, dormant fall seeding will provide natural stratification that will counteract both mechanical and physiological dormancies.

Indian ricegrass was commonly used as a food source by Native Americans in the Southwest and Great Basin regions. A flour made from seed of Indian ricegrass (known as Wye or Wai to the Paiute, Shoshone, and Ute tribes) was

used to make a mush with a pleasing, nutlike flavor (Reed, 1962). Stearns and Booth (1980) found the flour to be of poor baking quality when added to hard red wheat bread flour for bread making, and soft white wheat flour for cookies.

Indian ricegrass produces an abundance of plump seed with protein levels of 15 to 17 percent. This seed is excellent food for upland game birds and songbirds. Seed production fields of Indian ricegrass attract many birds, especially mourning doves *(Zenaidura* macroura). Indian ricegrass can be planted with or adjacent to taller plants for food and cover for a wide variety of wildlife.

Testing: **Rimrock** Indian ricegrass has been tested under the following acession numbers: M-33, P-15597, TO5424, 9005424, and PI-478833. This collection was first established in an Initial Evaluation Planting (IEP) at the Bridger Plant Materials Center in October 1960, comparing it to 10 other Indian ricegrass collections. In 1961, an additional 21 accessions were added. In 1963, it was established in another IEP with 41 Indian ricegrass accessions, and again in 1966 with 62 accessions. By the fall of 1964, 'M-33' was documented as one of the superior accessions, and seed 'increase was initiated at that time. To provide enough seed for a field planting program, larger fields were established on January 31, 1967 (1.0 acres, 0.4 hectares), November 10, 1969 (0.7 acres, 0.28 hectares), February 28, 1974 (2.0 acres, 0.81 hectares), and November 1, 1978 (2.0 acres, 0.81 hectares).

The Bridger PMC staff established numerous Initial Evaluation Plantings (IEP's) in single rows, and Comparative Evaluation Plantings (CEP's) in replicated plots at the Bridger PMC, off-Center field sites, and university experiment etations.

On March 1, 1974, a CEP was planted at the Bridger PMC in which eight accessions of Indian ricegrass were established in replicated 5-foot by 14-foot plots in a randomized complete block design. PI-236877 (Canadian origin) had the highest 5-year-mean forage production. Rimrock was similar to 'Nezpar' in forage production (2,107 kg/ha, Nezpar; 2,087 kg/ha, Rimrock), but significantly higher than 'Paloma' (1,740 kg/ha) (table 1).

On November 11, 1975, an IEP was established at the Bridger PMC to evaluate plants for use on strip mine reclamation. Five hundred thirty-eight accessions of 125 species were seeded, including 13 accessions of Indian ricegrass. Rimrock outperformed Paloma in all categories, including percent stand, forage production, seed production, ground cover, spring recovery, and plant height (table 2).

Large, replicated, drill-width plots (7' X 150', 2 m X 45 m) were established at the Cordero coal strip mine located 22 miles (35 km) southeast of Gillette, Wyoming, on April 11, 1978. At this site, Paloma (656 kg/ha, 4-year mean) had significantly higher forage production than did Rimrock (262 kg/ha) or Nezpar (202 kg/ha) (table 3).

In 1979, seed was made available to the Montana State University Agricultural Research Centers at Kalispell and Moccasin for field testing. At Kalispell, Rimrock and Nezpar established the best initial stands; and in 1980 the seed production of Rimrock (1,235 kg/ha) far exceeded that of Nezpar (769 kg/ha), Paloma (311 kg/ha), and PI-236877 (851 kg/ha) (table 4). At Moccasin, PI-236877 had the highest 3-year average forage production (2,630 kg/ha), followed by Rimrock (2,372 kg/ha), Nezpar (2,360 kg/ha), and Paloma (1,680 kg/ha). The first year, Rimrock had the highest crude protein (7.7%) and phosphorous (0.16%); but by the second year, Rimrock was similar to the other accessions, with crude protein of 5.1 percent and phosphorus content of 0.13

percent; and during the third year, Rimrock had the lowest crude protein (6.3%) and phosphorus (0.16%). The 3-year mean values of protein and phosphorus were similar for all four accessions. It was noted that by the fall of 1982, stands of all accessions were badly deteriorating, except for stands of Rimrock.

To test plant materials originating from areas with less than 150 mm of annual precipitation, plantings were established at the Bridger Coal Mine near Point of Rocks, 50 kilometers east of Rock Springs, Wyoming (Red Desert, elevation 2,083 m, precipitation 150-250 mm); at the Dresser Minerals Bentonite Mine, 25 km northeast of Greybull, Wyoming (Big Horn Basin, elevation 1,400 m, precipitation 120-240 mm); and at the Bridger PMC (control site, elevation 1,050 m, precipitation 250 mm). Plantings were established in the spring and fall 1980, spring and fall 1981, and fall 1984 at Rock Springs (table 5); spring and fall 1981, spring and fall 1982, and fall 1984 at Greybull (table 6); and fall 1984 at the Bridger PMC (table 7). In all of these plantings, 59 accessions of Indian ricegrass were evaluated. The top six performing accessions were Rimrock, Paloma, Nezpar, PI-236877, T16252 (Fremont County, WY), and T19167 (Sublette County, WY). At Rock Springs, Rimrock did not develop as good a stand as did Nezpar or Paloma, but it survived 8 years, while Nezpar survived 5 years, and Paloma 7 years. At Greybull, all accessions were subjected to heavy predation by rabbits, so no stands lasted longer than 3 years.

To evaluate species that could be used to reseed deteriorated rangeland in Jefferson and adjacent counties of west-central Montana, 30 accessions of 17 forage species were established in replicated plots at two sites on the Tom Carey Ranch, 25 kilometers north of Cardwell, Montana. The east site was at 1,500 meters with 300-350 mm annual precipitation. The west site was at

1,400 meters with 200-250 mm annual precipitation. At the east site, Rimrock had a 1983 through 1988 average forage production of 675 kg/ha, while Nezpar produced 576 kg/ha and Paloma 28 kg/ha (table 8). By the end of 1988 (7 years), all three accessions of Indian ricegrass had died out with only a few plants remaining. At the west site, Rimrock maintained an average production of 114 kg/ha, while Nezpar and Paloma produced 40 kg/ha and 25 kg/ha, respectively. After 7 years, Rimrock was the only Indian ricegrass remaining alive at the west site (table 9).

Collections made in the mountains and foothills of western Montana and western Wyoming were planted in an IEP in the Missoula valley on land provided by the State Forest Tree Nursery. This site is at an elevation of 975 meters and receives an average annual precipitation of 350 mm. The October 26, 1983, planting included 560 accessions of 148 species. Sixteen accessions of Indian ricegrass were included in this study. Over a 4-year period of evaluation, Rimrock, PI-236877, and Nezpar were superior to Paloma and the other 12 accessions. The categories evaluated were stand, vigor, forage production, forage uniformity, ground cover, seed production, and seed uniformity (table 10).

on October 22, 1984, replicated plots and/or rows of several forage grasses were established at the University of Wyoming, Sheridan Research and Extension Center. Four accessions of Indian ricegrass (Nezpar, Paloma, PI-236877, and Rimrock) were established in single-row plots to test their performance on heavy clay soils at the Sheridan site. The best stand, vigor, and forage production were exhibited by Rimrock and PI-236877, followed by Nezpar, and then Paloma (table 11).

The Aberdeen, Idaho PMC established replicated plots of 21 forage species in the fall of 1987 at the Trout Creek Off-Center Advanced Test Site

near Jackpot, Nevada. This site is at an elevation of 1,670 meters, and receives 250-330 mm annual precipitation. Paloma, Nezpar, and Rimrock were included in this planting. Forage production was sampled in 1992 (5th year) and 1995 (8th year). In 1992, Rimrock produced 679 kg/ha, Paloma produced 493 kg/ha, and Nezpar failed to produce measurable forage (table 12). By 1995, Rimrock was the only Indian ricegrass that was still productive, producing 560 kg/ha of air-dry forage.

At another off-Center trial site near Grantsville, Utah (established November 1994), the Idaho PMC evaluated five accessions of Indian ricegrass. This site is at an elevation of 1,325 meters and receives 250-300 mm of annual precipitation. The best performer was 9052861 (from New Mexico), followed by Rimrock (PI-478833 (table 13). Paloma failed to establish.

A summary of results from seven off-Center trial sites (Coffe Point, ID; Trout Creek, NV; Grantsville, UT; Orchard, ID; Mountain Home, ID; Winnemucca, NV; and Curlew National Grasslands, ID) indicates that Nezpar is the best overall performer, followed by 9035287 (New Mexico), Rimrock (PI-478833), and Paloma.

On April 28, 1988, 495 accessions were seeded in an IEP at the Bridger PMC including 13 accessions of Indian ricegrass. Rimrock was the top performing Indian ricegrass in all evaluation categories during the 5 years of evaluation (table 14).

Seed Production: Rimrock Indian ricegrass can be grown €or seed in areas with greater than 380 mm (15") annual precipitation or under irrigation. Row spacing should be 50 to 75 cm (20"-30") with good soil moisture conditions and 90 cm or greater under drier conditions. Rimrock has approximately 350,000 seede-per-kilogram and, when seeded at a rate of 100 seeds-per-meter of row,

will require 4 to 5 kg/ha of pure live seed. Dormant fall seeding is recommended to utilize winter for stratification of the high dormancy seed. Although little or no seed can be expected the first growing season, good production can be expected for 3 to 4 years. Seed production at the Bridger PMC has ranged from a low of 106 kg/ha (1977) to a high of 841 kg/ha (1967) with a 17-year average of 313 kg/ha (table 15).

In 1980, 2-year-old stands of Rimrock, Nezpar, and Paloma at the Kalispell Agricultural Research Center were harvested for seed. Production for Rimrock was 1,235 kg/ha, while Nezpar and Paloma produced 769 kg/ha and 311 kg/ha, respectively.

Seed shatter is a major problem in Indian ricegrass. This species has a high degree of floral indeterminacy, with seeds typically beginning to shatter while later panicles continue to bloom. Mature seeds abscise along an abscission layer between the floret and the rachilla (Whalley et al., 1990). Glumes subtending unfilled seeds open normally, but the seeds do not abscise. Whalley et al. (1990) and Jones and Nielson (1991) found that the accession PI-478833 (Rimrock) had far better seed retention than did Paloma or Nezpar. The mean glume pair angle of Paloma was 70 percent greater than that of Rimrock (48° vs. 28°). The more acute angle of the glumes of Rimrock help retain seed upon maturity. In a comparison of Rimrock and Paloma, Jones and Nielson (1991) found that after 29 days, the florets with open glumes was 98 percent for Paloma, and 61 percent for Rimrock (PI-478833). Shattering curves of the two genotypes were of similar shapes, but Paloma's rate of shatter was over twice as great as Rimrock's (figure 1). By day 29, 83 percent of the mature Paloma seed had shattered of a possible maximum of 98 percent open florets, compared to 35 of a possible 61 percent for Rimrock. Average duration of seed retention was 91 percent longer for Rimrock (6.7 days) than

Paloma (3.5 days). In contrast to Paloma, many of the Rimrock florets produced a filled seed without ever opening their glumes.

Some of the shatter was triggered by discrete shattering events. A hailstorm on day 6 caused 12 of 20 open, unshattered Paloma florets to shatter, while only 3 of 15 such florets of Rimrock shattered. A severe wind storm on day 13 caused 27 of 39 open, unehattered Paloma florets to shatter, while only 16 of 38 such florets of Rimrock did so.

Another experiment by Jones and Nielson (1991) compared forage weight, seed yield, seed retention index, seed numbers, and seed weight of Paloma, Nezpar, and Rimrock (table 16). Rimrock had the highest forage production, although it was not significantly higher than Paloma or Nezpar. Seed yields of 7.0 grams-per-plant and 1,932 seeds-per-plant for Rimrock far exceeded that of Nezpar (1.9 grams/plant, 602 seeds/plant) and Paloma (1.6 grams/plant, 331 seeds/plant). The seed retention index for Rimrock was about 2.4 and 4.1 times that of Nezpar and Paloma, respectively.

The shattering resistance, high seed yields, and relatively high floral determinacy combine to make Rimrock a good genetic source for improvement of Indian ricegrass seed production efficiency.

Seed dormancy is an important cause of poor stand establishment that has limited the use of this species. Mechanical dormancy, resulting from the exclusion of O_2 by the indurate lemma and palea (Toole, 1940), is more persistent than physiological dormancy (McDonald, 1976). Physiological dormancy has been reduced by ageing seed (Rogler, 1960), fall planting (Fendall, 1966), prechilling (Huntamer, 1934; Toole, 1940; Clark and Bass, 1970), and application of growth regulators such as kinetin and gibberellic acid (Clark and Bass, 1970; McDonald, 1976; Young et al., 1985). Mechanical dormancy has been reduced by mechanical and acid scarification, but

scarification increases germination at the expense of seed quality. Scarification with an air-gun scarifier gave better germination with less damage than a Forsberg Model **2** huller/scarifier or Quaker Oats Experimental Impact Dehuller (Griffith and Booth, **1988).** Seed damaged during acid scarification can probably be reduced by adjusting length of treatment to seed size (Stoddart and Wilkinson, **1938)** or to lemma thickness (Zemetra and Cuany, **1984).** Griffith and Booth **(1988)** suggested loss of dormancy in recently harvested seed could be accelerated by scarification before storage. Jones and Nielson **(1992)** found that scarification with an air-gun scarifier significantly increased germination of lots of Nezpar, Paloma, and Rimrock from an average of **9.5** percent to **29.7** percent, indicating that mechanical dormancy was inhibiting germination. The older seed lots **(10** to 16 years old) showed the least response to mechanical scarification. The results of a study on scarification and stratification of Indian ricegrass seed (Jones and Nielson **1992)** support the practice of scarifying new Indian ricegrass seed lots even if cool, moist field conditions following dormant fall seeding are anticipated. For new seed lots of high vigor, loss of physiological dormancy over winter in the field should generally be greater for scarified seed than unscarified seed. Percentage germination of unscarified non-prechilled (control), unscarified prechilled, scarified non-prechilled, and scarified prechilled averaged **9.3, 25.0, 29.4,** and **34.7** percent, respectively. This represents an increase in germination from control of **169, 217,** and **274** percent for prechilling alone, scarification alone, and scarification plus prechilling, respectively.

Environmental Concerns: Indian ricegrass is native to sandy/gravelly range sites throughout the western United States, however, there is significant

ecotypic variation among plants of different latitudes and elevations. Rimrock is not an aggressive competitor when seeded at southern latitudes and higher elevations. Except on very sandy sites, Indian ricegrasss is a minor component of native plant communities. On sand dunes Indian ricegrass can be one of the few species that will establish and survive. This species is quite aggressive on eandy sites because of its drought tolerance and ability to germinate and emerge from depths of up to 15 cm (6 in). The hard indurate lemma and palea on the seed of Indian ricegrass enable the seed to lay dormant in the soil for 6-10 years. Indian ricegrass is not very competatfve on heavier soils or mesic sites. This species is a bunchgrass, so does not spread vegetatively. Seed dispersal, other than seed rain in the immediate area of the plant, is by rodent and bird transportation and/or ingestion.

Indian ricegrass may hybridize with closely related species and genera. It has been theorized (Shechter and Johnson 1968) that Indian ricegrass (Oryzopsis hymenoides) has hybridized with littleeeed ricegrass (Oryzopsis micrantha) to form contracted ricegrass (Oryzopsis *contracta*). Indian ricegrass has also been crossed with green needlegrass (*Stipa* viridula) resulting in 'Mandan' ricegrass (X *Stiporyzopsis* caduca).

Literature Cited

Booth, D. T., C. G. Howard, and C. E. Mowry. 1980. 'Nezpar' Indian ricegrass: description, justification for release, and recommendations for use. Rangelands 2:53-54.

Clark, D. C., and L. N. Bass. 1970. Germination experiments with seeds of Indian ricegrass, *Oryzopsis hymenoides* (Roem. and Schult.) Ricker ex Piper. Proc. Assoc. Off. Seed Anal. 60:226-239.

Fendall, R. K. 1966. An investigation into the site and cause of seed dormancy of *Stipa comata* and *Oryzopsis hymenoides.* Ph.D. Diss. North Dakota State Univ., Fargo (Diss. Abst. 26:3569-3570).

Griffith, L. W., and D. T. Booth. 1988. Indian ricegrass seed damage and germination responses to mechanical treatments. J. Range Manage. 77:203-206.

Hitchcock, A. S. 1950. Manual of grasses of the United States. USDA Misc. Publ. 200. U.S. Gov. Print. Office, Washington, DC.

Huntamer, M. Z. 1934. Dormancy and delayed germination of *Oryzopsis hymenoides.* M.S. Thesis. State Coll. of Washington, Pullman.

Johnson, B. L., and G. A. Rogler. 1943. A cytotaxonomic study of an intergeneric hybrid between *Oryzopsis hymenoides* and *Stipa viridula*. Amer. J. Bot. 30:49-56.

Jones, T. A., and D. C. Nielson. 1989. Self-compatibility in 'Paloma' Indian ricegrass. J. Range Manage. 42:187-190.

Jones, T. A., and D. C. Nielson. 1991. High seed retention of Indian ricegrass PI-478833. J. Range Manage. 45:72-74.

Jones, T. A., and D. C. Nielson. 1992. Germination of prechilled mechanically scarified and unscarified Indian ricegrass seed. J. Range Manage. 45:175-179.

McDonald, M. B., Jr. 1976. Improving the germination of Indian ricegrass seeds. J. Seed Technol. 1:44-54.

Pearson, L. C. 1979. Effects of temperature and moisture on phenology and productivity of Indian ricegrass. J. Range Manage. 32:127-134.

Platou, A. K., P. T. Tueller, S. G. Leonard, and R. L. Miles. 1986. Soil properties associated with six common grasses of the Great Basin. J. Soil Water Conserv. 41:417-421.

Reed, F. 1962. Uses of native plants by Nevada Indians. State of Nevada. Dep. of Educ., Carson City. p.44.

Rogler, G. A. 1960. Relation of seed dormancy of Indian ricegrass *[Oryzopsis hymenoides* (Roem. & Schult.) Ricker] to age and treatment. Agron. J. 52:470-473.

Shechter, Y. and B. L. Johnson. 1968. The probable origin of *Oryzopsis contracta*. Amer. J. Bot. 55(5):611-618.

Sowell, B. F., L. J. Krysl, M. E. Hubbert, G. E. Plumb, T. K. Jewett, S. L. Applegate, M. A. Smith, and J. W. Waggoner. 1985. Cattle nutrition in Wyoming's Red Desert. Univ. Wyoming Agric. Exp. Stn. Sci. Monogr. 45.

Stoddart, L. A., and J. J. Wilkinson. 1938. Inducing germination of *Oryzopsis hymenoides* for range reseeding. J. Amer. Soc. Agron. 30:763-768.

Toole, V. K. 1940. The germination of seed of *Oryzopsis hymenoides*. J. Amer. Soc. Agron. 32:33-41.

Whalley, R. D. B., T. A. Jones, D. C. Nielson, and R. J. Mueller. 1990. Seed abscission and retention in Indian ricegrass. J. Range Manage. 43:291-294.

Young, J. Q., R. A. Evans, and D. A. Easi. 1985. Enhancing germination of Indian ricegrass seeds with sulfuric acid. J. Range Manage. 77:203-206.

Zemetra, R. S., and R. L. Cuany. 1984. Variation in lemma thickness in Indian ricegrass: implications for dormancy, scarification, and breeding. Crop Sci. 24:1082-1084.

State Conservationist
Natural Resources Conservation Service
Montana

Date

State Conservationist
Natural Resources Conservation Service
Wyoming

Date

Director
Montana Agricultural Experiment Station

Date

Director
Wyoming Agricultural Experiment Station

Date

Director
Biological Conservation Sciences Division
U.S. Department of Agriculture
Natural Resources Conservation Service

Date

Director
Agricultural Research Service

Date

Table 1. Comparative Performance Trials. Dry matter production in pounds-per-acre of eight Indian ricegrass accessions in a dryland site at the Bridger PMC. Averages of four replications, 1975-1979.

Accession	1975 *lbs/acre*	1976 *lbdacre*	1977 *lbdacre*	1978 *lbdacre*	1979 *lbdacre*	5-Year Mean *lbdacre*
PI-236877	4720''	2282 a[2/]	950 a[3/]	1643 b[4/]	1384 a[5/]	2196 a[6/]
9005432	3861	2361 a	907 ab	2183 a	1211 a	2105 ab
Nezpar	4174	1832 b	862 ab	1348 b	1183 ab	1880 bc
Rimrock	3711	1822 b	758 ab	1698 b	1319 a	1862 bcd
9007225	4213	1879 b	763 ab	1332 b	999 ab	1837 bcd
9005426	3414	1663 b	592 bc	1375 b	873 ab	1583 cde
Paloma	2738	1740 b	932 a	1311 b	1040 ab	1552 de
9007226	3216	1566 b	381 c	734 c	585 b	1296 e
Average	3756	1893	768	1453	1074	1789
C.V.	22.46%	13.70%	26.44%	22.30%	34.47%	25.74%

1/ No significant difference @ P=.05; CV=22.46%.
2/ Duncan's Multiple Range Test @P=.05; CV=13.70%.
3/ Duncan's Multiple Range Test @P=.05; CV=26.44%.
4/ Duncan's Multiple Range Test @P=.05; CV=22.30%.
5/ Duncan's Multiple Range Test @P=.05; CV=34.47%.
6/ Duncan's Multiple Range Test @P=.05; CV=25.74%.

Table 2. Performance and characteristics of Indian ricegrasses for reclamation of mined lands; planted November 1975 and May 1976 in Field 2 at the Bridger PMC; irrigated in 1976 and 1977; not irrigated in 1978 and 1979.

Accessions	Percent Stand		Vigor 1/	Foliage Production 1/				Plant Uniformity 1/			Seed Production 1/				Gound Cover 1/			Percent Winter Injury	Spring Recovery 1/		Plant Vigor 1/			Avg Plant Height	Plant Width	Head Date	Bloom Date
Years	1976	1977		1	2	3	4	2	3	4	1	2	3	4	2	3	4	4	2	3	2	3	4	cm	cm	3	4
M-889	0	0	4	-	-	9		-	-		-	-	-		-	9			-	8	4	9		15			
M-903	5	15	6	9	6	7	6	6	5	8	0	8	6	7	6	6	6	65	5	6	4	5	5	46	18	6/10	6/26
M-916	0	0																									
M-921	0	0																									
M-922	30	25	3	6	3	4	7	2	4	7	3	3	2	7	3	2	6	60	3	2	3	2	4	66	15	6/18	6/26
WY-452	0	0																									
WY-504	0	15	3	-	-	7	5	-	5	7	-	-	6	5	-	6	5	65	-	7	3	5	5	47	20	6/18	6/26
WY-510	0	0																									
WY-519	15	1	5	9	6	7	6	5	5	5	0	6	5	7	6	7	6	80	5	5	3	5	5	50	30	6/18	6/26
WY-536	25	50	3	5	2	3	2	2	2	2	4	2	1	1	2	1	2	5	3	1	2	1	1	70	25	6/18	6/26
WY-601	10	25	5	7	5	6	5	3	4	6	9	5	4	5	5	5	4	5	4	4	3	4	3	59	20	6/7	6/26
Rimrock	95	60	2	3	1	2	3	1	2	3	3	1	1	2	1	1	3	25	1	1	1	1	2	81	25	6/18	6/26
Paloma	50	30	3	3	2	5	5	2	3	6	2	2	1	5	2	3	4	65	2	3	2	3	3	57	25	6/18	6/26

1/ Rated 1-9 with 1 best.

Table 3. Cordero Mine FEP. Forage production of 16 accessions on a dryland site at the Cordero Mine, Gillette, Wyoming, 1979-1982. Averages of three reps. Planted 4/11/78.

Accession	Genus & Species	1979 Yield *lbs/acre*	1980 Yield *lbs/acre*	1981 Yield *lbs/acre*	1982 Yield *lbs/acre*	4-Year Mean Yield *lbs/acre*
PI-232127	Agropyron spicatum	450 bcd[1/]	563 a[2/]	688 a[3/]	1292 a[4/]	748 a[5/]
Whitmar	Pseudoroegneria spicata inermis	425 bcde	389 abc	477 abc	1135 ab	607 abc
Rosana	Pascopyrum smithii	630 ab	504 ab	450 bc	1076 abc	665 ab
Paloma	Oryzopsis hymenoides	297 cdefg	440 ab	590 ab	1012 abc	585 abc
9005358	Leymus cinereus	232 defg	437 ab	297 cde	1010 abc	494 bcd
PI-232128	Agropyron spicatum	484 bc	492 ab	504 abc	980 abcd	615 abc
9005356	Leymus cinereus	137 fg	368 abc	230 de	976 abcd	428 cde
Secar	Pseudoroegneria spicata spicata	202 efg	318 abcd	466 bc	893 abcd	470 bcd
9005361	Leymus cinereus	97 g	122 cd	193 e	839 abcd	313 def
Critana	Elymus lanceolatus lanceolatus	618 ab	497 ab	488 abc	829 abcd	608 abc
9005595	Nassella viridula	338 cdef	417 ab	353 cde	757 bcd	466 bcd
9016187	Leymus racemosus	507 abc	506 ab	412 bcd	736 bcd	540 abc
Nordan	Agropyron desertorum	716 a	573 a	487 abc	736 bcd	628 abc
9002949	Pseudoroegneria spicata spicata	127 fg	260 bcd	307 cde	644 cde	335 def
Rimrock	Oryzopsis hymenoides	131 fg	112 cd	173 e	519 de	234 ef
Nezpar	Oryzopsis hymenoides	242 defg	80 d	162 e	237 e	180 f

1/ Duncan's Multiple Range Test @ P=.05; CV=35.21%. Yields followed by the same letter are not significantly different.
2/ Duncan's Multiple Range Test @ P=.05; CV=39.20%. Yields followed by the same letter are not significantly different.
3/ Duncan's Multiple Range Test @ P=.05; CV=29.12%. Yields followed by the same letter are not significantly different.
4/ Duncan's Multiple Range Test @ P=.05; CV=28.15%. Yields followed by the same letter are not significantly different.
5/ Duncan's Multiple Range Test @ P=.05; CV=18.20%. Yields followed by the same letter are not significantly different.

Table 4. A comparison of three Indian ricegrass accessions at the Montana State University Agricultural Research Centers at Kalispell and Moccasin, Montana. Seeded spring 1979.

KALISPELL

	6/8/79			8/6/79			1980	
	Height	Plants/ft^2	Occupancy	Height	Maturity	Vigor	Seed Production	
	inches		%	*inches*	%	*1/*	*lbs/acre*	*lbs/acre*
Paloma	*5-6*	5.1	58	16	90	2.0	277	311
Nezpar	6	18.5	88	23	90	1.0	686	769
Rimrock	6	18.4	92	21	85	1.5	1,102	1,235

MOCCASIN

	1979			1980					1981			1982		
	Stand	Vigor	Fall Regrowth	Spring Vigor	Fall Vigor	Forage Production	Protein	Phos.	Yield	Protein	Phos.	Yield	Protein	Phos.
	%	*1/*	*1/*	*1/*	*1/*	*lbs/acre*	*%*	*%*	*lbs/acre*	*%*	*%*	*lbs/acre*	*%*	*%*
Paloma	84	8	2	3.5	1.5	2,140	6.4	.14	1,865	5.8	.14	491	7.2	.17
Nezpar	96	10	2	7.0	1.8	3,218	5.4	.11	2,377	5.8	.14	781	7.2	.19
Rimrock	95	9	2	7.8	1.0	3,617	7.7	.16	1,927	5.1	.13	804	6.3	.16

1/ Ratings: Kalispell O-5 with 0 best, Moccasin 1-10 with 10 best.

Table 5. Initial Evaluation Planting. Plant performance of Indian ricegrass accessions planted for reclamation of mined lands and range revegetation, Rock Springs, WY. Average annual precipitation is 6-10 inches.

	1980		1981		1982		1984			1985			1986		1987		1988	
Accession	Stand	Vigor	Stand	Vigor	Stand	Vigor	Stand	Vigor	Forage Prod.	Stand	Vigor	Forage Prod.	Stand	Vigor	Stand	Vigor	Stand	Vigor
	%	1/	%	1/	%	1/	%	1/	1/	%	1/	1/	%	1/	%	1/	%	1/
Seeded 4/22/80																		
Nezpar	60	2	5	6	1	3	10	3		5	6		0		0		0	
PI-236877	25	4	50	3	60	2	30	2		5	5		0		0		0	
Rimrock	15	4	20	3	15	4	10	4		5	5		5	5	5	7	1	9
Paloma	60	2	20	3	40	3	60	2		50	3		40	5	10	9	0	
Seeded 10/7/80																		
Nezpar			60	3	5	4	20		4	10	3	4	10	5	5	7	0	
PI-236877			20	3	20	3	50		4	25	4	5	25	5	10	7	1	8
Rimrock			40	3	30	3	70		2	60	3	3	60	3	50	3	5	8
Paloma			40	3	10	3	30		4	20	2	3	20	5	5	9	0	
Seeded 4/29/81																		
Nezpar			1	5	10	3	35	3	3	15	3		10	5	10	5	1	7
PI-236877			5	4	5	5	10	4	5	20	3		20	3	10	6	1	8
Rimrock			5	3	10	4	5	4	4	5	4		5	4	5	9	0	
Paloma			10	3	45	2	20	4	4	30	2		30	5	20	5	0	
Seeded 10/31/81																		
Nezpar					1	5	0						5	7	0		0	
PI-236877					1	7	5	3	5	5	4		5	5	0		1	7
Rimrock					0		5	4	5	5	5		5	7	5	9	1	7
Paloma					0		0						0		0		0	
Seeded 10/24/84																		

	Spring 1986		Fall 1987		Fall 1988	
	Stand	Vigor	Stand	Vigor	Stand	Vigor
	%	1/	%	1/	%	If
Nezpar	50	3	10	7	0	
Rimrock	70	3	20	7	0	
Paloma	55	5	10	7	1	8

1/ Rated 1-9 with 1 best.

Table 6. Initial Evaluation Planting. Plant performance of Indian ricegrass accessions planted for reclamation of mined lands and range revegetation, Greybull, WY. Average annual precipitation is 5-9 inches.

	1981		1982		1984			1985			1986		1987		1988
Accession	Stand	Vigor	Stand	Vigor	Stand	Vigor	Forage Prod.	Stand	Vigor	Forage Prod.	Stand	Prod.	Stand	Vigor	Stand
	%	1/	%	1/	%	1/	1/	%	1/	1/	%	1/	%	1/	%
Seeded 4/22/81															
Nezpar	1	5	0		0										
PI-236877	1	3	5	2	0			0			0		0		0
Rimrock	1	4	1	3	0			0			0		0		0
Paloma	1	5	5	3	0			0			0		0		0

	1982		1983		1984			1985		1986		1987		1988
	Stand	Vigor	Stand	Vigor	Stand	Vigor	Prod.	Stand	Vigor	Stand	Vigor	Stand	Vigor	Stand
Seeded 10/15/81														
Nezpar	1	3	5	4	0			0		0		0		0
PI-236877	0		5	4	5	3	5	0		0		0		0
Rimrock	10	3	10	3	5	3	5	0		0		0		0
Paloma	0		5	5	0			0		0		0		0
Seeded 4/28/82														
Nezpar	5	4	5	3	0			0		0		0		0
PI-236877	5	4	10	3	1	3		0		0		0		0
Rimrock	5	4	10	3	0			0		0		0		0
Paloma	5	4	10	3	0			0		0		0		0

	1983		1984		1985	
	Stand	Vigor	Stand	Vigor	Stand	Vigor
Seeded 10/20/82						
Nezpar	60	3	20	3	0	
PI-236877	60	2	15	3	0	
Rimrock	50	3	05	4	0	
Paloma	50	1 - 2	0	2	0	

Seeded 10/25/84

	1985 Spring		1986					1987		1988	
	Stand	Vigor	Stand	Vigor	Forage Prod	Forage Unif.	Ground Cover	Stand	Vigor	Stand	Vigor
Nezpar	90	2	40	4	5	3	8	10	5	5	4
Rimrock	75	2	10	5	6	4	8	10	4	0	
Paloma	75	3	25	3	3	3	7	15	5	0	

1/ Rated 1-9 with 1 best.

Table 7. Initial Evaluation Planting. Plant performance of Indian ricegrass accessions planted for reclamation of mined lands and range revegetation, Bridger PMC, 1988. Seeded 10/19/84. **Average** annual **precipitation is 11 inches.**

	1985				1986				1987				1988			
	Stand %	Vigor 1/	Forage Prod %	Ground Cover 1/	Stand %	Vigor 1/	Seed Prod 1/	Seed uniformity 1/	Stand %	Vigor 1/	Seed Prod 1/	Seed Uniformity 1/	Stand %	Vigor 1/	Forage Prod 1/	Ground Cover 1/
Nezpar	60	2	2	2	80	2	3	2	90	1	4	3	60	4	3	3
PI-236877	85	2	2	2	90	1	3	2	85	2	5	5	80	3	2	3
Rimrock	95	1	1	2	100	1	2	2	100	2	3	2	100	2	2	3
Paloma	95	4	5	4	100	1	1	1	100	2	1	1	100	3	3	3

1/ Rated 1-9 with 1 best.

Table 8. **Tom Carey** Field Evaluation Planting. Forage production of accessions on the east site, 1983, 1985, and 1988.

Accession	Common Name	1983 *lbdacre*	1985 *lbdacre*	1988 *lbdacre*	Average *lbs/acre*
Prairieland	Altai wildrye	2349 ab"	2925 a"	497 bc[2/]	1924 a[2/]
Oahe	intermediate wheatgrass	2648 a	1897 abcd	558 ab	1701 ab
Whitmar	beardless wheatgrass	1968 abcde	2406 ab	640 a	1671 abc
Luna	pubescent wheatgrass	2153 abc	2427 ab	429 cde	1670 abc
PI-232 127	bluebunch wheatgrass	2090 abcd	2421 ab	438 bcde	1650 abcd
PI-232128	bluebunch wheatgrass	2038 abcde	2347 ab	509 bc	1631 abcde
Magnar	basin wildrye	1911 abcde	2012 abc	458 bcd	1460 bcde
Revenue	slender wheatgrass	2056 abcde	1919 abc	229 ghi	1401 bcde
Nordan	crested wheatgrass	1848 abcdef	1818 bcde	511 bc	1392 bcde
Secar	bluebunch wheatgrass	1946 abcde	1633 bcdef	545 abc	1375 bcdef
Critana	thickspike wheatgrass	1899 abcde	1855 bcde	246 fghi	1333 bcdefg
PI-478832	mammoth wildrye	2326 ab	1387 bcdefg	126 ij	1280 cdefgh
Mandan-759	pubescent wheatgrass	1694 abcdefg	1587 bcdef	515 abc	1265 defgh
P-27	Siberian wheatgrass	1769 abcdefg	1531 bcdef	433 bcde	1241 efghi
Rosana	western wheatgrass	1592 bcdefg	1115 cdefg	249 fghi	985 fghij
sodar	streambank wheatgrass	1775 abcdefg	932 cdefg	235 cdefg	981 fghij
Swift	Russian wildrye	1771 abcdefg	808 efg	271 fgh	950 ghij
9005595	green needlegrass	1139 defgh	1239 cdefg	369 def	915 hijk
PI-47883	basin wildrye	1137 defgh	1173 cdefg	348 defg	886 hijk
Mayak	Russian wildrye	1455 bcdefg	831 defg	287 fg	858 ijk
Sawki	Russian wildrye	1082 efgh	1084 cdefg	293 fg	820 jkl
Lodorm	green needlegrass	1076 efgh	1092 cdefg	251 fghi	806 jkl
9005358	basin wildrye	1147 defgh	826 defg	326 efg	767 jkl
Vinall	Russian wildrye	1200 cdefg	683 fg	227 ghi	703 jkl
Rimrock	Indian ricegrass	1174 defgh	632 fg	2 j	602 jklm
Ladak-65	alfalfa	888 fghi	593 fg	146 hi	543 klm
Nezpar	Indian ricegrass	1175 defgh	365 g	0 j	514 klm
Rambler	alfalfa	828 ghi	453 g	9 j	430 lm
9005361	basin wildrye	226 hi	299 g	231 ghi	252 m
Paloma	Indian ricegrass	65 i	307 g	0 j	124
MEAN		1548	1353	313	1071

1/ Means followed by the same letter(s) are not significantly different at the 5% level as determined by the Duncan Multiple Range Test.
2/ Means followed by the same letter(s) are not significantly different at the 5% level as determined by LSD test.

Table 9. Tom Carey Field Evaluation Planting. Forage production of accessions on the west site, 1983, 1985, and 1988.

Accession	Common Name	1983 *Ibdacre*	1985 *Ibdacre*	1988 *Ibdacre*	Average *Ibdacre*
PI-232127	bluebunch wheatgrass	532 abcdefg"	329 b[1/]	1043 a[2/]	634 a[2/]
Critana	thickspike wheatgrass	831 a	292 bc	522 bcde	548 ab
PI-232128	bluebunch wheatgrass	561 abcdefg	308 b	746 ab	538 ab
Nordan	crested wheatgrass	531 abcdefg	320 b	695 abc	515 ab
Lodorm	green needlegrass	602 abcdef	272 bc	623 bcd	499 abc
P-27	Siberian wheatgrass	535 abcdefg	258 bc	698 abc	497 abc
Whitmar	beardless wheatgrass	421 bcdefghi	489 a	551 bcde	487 abc
Rosana	western wheatgrass	790 ab	213 bcdef	453 bcdef	486 abc
Sawki	Russian wildrye	754 abc	215 bcde	415 bcdef	461 bc
Luna	pubescent wheatgrass	452 abcdefgh	205 bcdefg	713 abc	457 bc
Oahe	intermediate wheatgrass	427 bcdefghi	237 bcd	693 ab	452 bc
Sodar	streambank wheatgrass	662 abcde	171 bcdefgh	511 bcde	448 bc
Vinall	Russian wildrye	557 abcdefg	189 bcdefgh	556 bcde	434 bcd
Mayak	Russian wildrye	721 abcd	181 bcdefgh	355 cdefg	419 bcde
Swift	Russian wildrye	769 ab	164 bcdefgh	315 defg	415 bcdef
Mandan-759	pubescent wheatgrass	374 cdefghij	206 bcdefg	624 bcd	402 bcdef
9005595	green needlegrass	338 defghij	176 bcdefgh	650 bcd	388 bcdef
Ladak-65	alfalfa	554 abcdefg	60 efgh	547 bcde	387 bcdef
Prairieland	*Altai* wildrye	223 fghij	192 bcdefgh	733 ab	383 bcdef
Rambler	alfalfa	422 bcdefghi	50 efgh	549 bcde	340 cdefg
Trailhead	basin wildrye	285 efghij	60 efgh	459 bcdef	268 defgh
Revenue	slender wheatgrass	593 abcdef	44 fgh	117 fg	252 efgh
Secar	bluebunch wheatgrass	455 abcdefgh	85 defgh	209 efg	250 fgh
9005358	basin wildrye	114 hij	59 efgh	460 bcdef	211 ghi
	basin wildrye	237 fghij	36 gh	251 efg	175 ghij
PI-478832	mammoth wildrye	201 ghij	62 efgh	213 efg	159 hij
Rimrock	Indian ricegrass	108 hij	137 cdefgh	97 fg	114 hij
9005361	basin wildrye	13 j	34 h	125 fg	57 ij
Nezpar	Indian ricegrass	89 ij	30 h	0 g	40 j
Paloma	Indian ricegrass	23 j	53 efgh	0 g	25 j
MEAN		439	171	464	358

1/ Means followed by the same letter(s) are not significantly different at the 5% level as determined by the Duncan Multiple Range Test.
2/ Means followed by the same letter(s) are not significantly different at the 5% level as determined by LSD test.

Table 10. Initial Evaluation Planting. Missoula Field Evaluation Planting. Performance of 4 of 16 accessions of Indian ricegrass at the Missoula State Forest Tree Nursery. Seeded 10/26/83.

Year	Accession	Spring		Fall		Forage	Forage	Ground	Seed	Seed
		Stand %	Vigor 1/	Stand %	Vigor 1/	Production 1/	Uniformity 1/	Cover 1/	Production 1/	Uniformity 1/
1984	Nezpar	60	2	90	1	2	3	3		-
	PI-236877	70	2	85	1	3	3	3		
	Rimrock	60	3	90	1	2	2	3	-	-
	Paloma	10	5	60	3	4	4	5		
1985	Nezpar	90	2	100	2	3	3	2	2	3
	PI-236877	95	2	100	2	2	2	2	2	2
	Rimrock	90	2	100	2	2	2	2	2	2
	Paloma	60	4	75	3	3	4	2	3	2
1986	Nezpar	90	6	90	3	3	3	2	3	5
	PI-236877	100	3	100	2	1	2	2	2	2
	Rimrock	80	4	95	2	2	3	3	3	3
	Paloma	20	6	40	4	6	5	6	6	3
1987	Nezpar	60	2	60	2	3	4	3	3	4
	PI-236877	95	1	90	2	3	2	3	2	3
	Rimrock	90	3	70	3	4	3	4	4	3
	Paloma	20	4	20	5	6	5	6	7	5
1988	Nezpar	50	4	50	3	3	5	5	3	4
	PI-236877	80	3	80	2	2	3	3	2	2
	Rimrock	60	3	50	3	3	2	3	3	2
	Paloma	20	4	20	3	4	3	4	4	3

1/ Rated 1-9 with 1 best.

Table 11. Sheridan, Wyoming Comparative Evaluation Planting. Plant performance of Indian ricegrass accessions in individual rows planted at the Shcridan, Wyoming Agricultural Research and Extension Center. Seeded 10/22/84.

Accession	Stand %	Vigor 1/	Foragc Production 1/	Foragc Uniformity 1/
Nezpar	85	2	2	4
PI-236877	90	1	2	2
Rimrock	85	1	2	2
Paloma	60	3	3	3

1/ Rated 1-9 with 1 best.

Table 12. Trout Creek, Nevada, Inter-Center Strain Trial. Forage production of Indian ricegrass accessions in display plots, 1995.

Accession	1992 Foragc Production lbs/acre	1995 Forage Production lbs/acre
Nezpar	0	-
Rimrock	606	500
Paloma	440	-

Table 13. Performance of Indian ricegrass accessions seeded at the Grantsville Inter-Center Strain Trial, Grantsville, Utah. Summary of 1995 evaluation data.

Accession	Source	PLS	Plant Height 5/17	Plant Height 9/25	Stand 1/ 5/17	Stand 1/ 9/25		Plant Density 5/17	Plant Density 9/25	Vigor 2/ 5/17	Vigor 2/ 9/25
		%	cm	cm	%	%		per ft²	per ft²		
Rimrock	Bridger	**71.4**	**1.5**	**8.5**	7.0	**5.0**	ijk	**1.0**	1.0	**7.8**	**6.8**
Nezpar	Aberdeen	**90.4**	**2.8**	**8.3**	**5.8**	**0.8**	**jk**	**0.5**	**0.0**	**8.0**	**8.0**
9035287	Los Lunas	**95.0**	**1.3**	0.0	**5.8**	**0.0**	**k**	**0.5**	**0.0**	**8.3**	**9.0**
Paloma	Los Lunas	**88.0**	0.0	0.0	**0.0**	0.0	**k**	**0.0**	**0.0**	**9.0**	**9.0**

1/ Percent stand is equal to basal cover. On 9/25/95, percent stand data was analyzed utilizing Duncan's Multiple Range Test; P=0.05, CV=46.07%; means followed by the same letter are not significantly different.

2/ Rated 1-9 with 1 best.

Table 14. Initial Evaluation Planting. Plant performance of Rimrock Indian ricegrass in comparison with Nezpar in an IEP of 495 accessions of grasses, legumes, forbs, and shrubs (13 accessions of Indian ricegrass) at the Bridger PMC. Seeded 4/28/88.

		Spring		Fall						
Year	Accession	Stand	Vigor	Stand	Vigor	Forage Production	Forage Uniformity	Ground cover	Seed Production	Seed Uniformity
		%	1/	%	1/	1/	1/	1/	1/	1/
1988	Nezpar	80	1	90	2	2	2	2		
	Rimrock	85	1	90	3	3	2	2		
1989	Nezpar	95	1	100	1	2	3	2	2	3
	Rimrock	95	1	100	1	2	2	2	2	2
1990	Nezpar	90	3	75	2	2	2	3	3	2
	Rimrock	100	1	100	2	1	2	2	1	2
1991	Nezpar	70	3	-		3	3	3	3	3
	Rimrock	100	1	-	-	1	1	2	1	1
1992	Nezpar			65	3	4	4	4	4	4
	Rimrock	-		95	2	2	2	3	2	2

1/ Rated 1-9 with 1 best.

Table 15. Seed production of Rimrock Indian ricegrass at the Bridger Plant Materials Center, 1966-1995.

Date Planted	Size hectares	Year	Production kg/ha	Harvest Date
10/26/64	.03	1966	435	7/11
		1967	841	7/24
1/31/67	.40	1968	175	7/12
		1969	395	7/11
		1970	200	7/07
11/10/69	.28	1971	265	6/29
		1972	266	7/08
		1973	128	7/03
		1974	352	7/08
2/28/74	.81	1975	173	7/11
		1976	356	7/12
		1977	106	7/12
		1978	108	8/09
11/01/78	.81	1980	401	7/10
		1981	642	7/16
		1982	161	--
AVERAGE			313	7/11

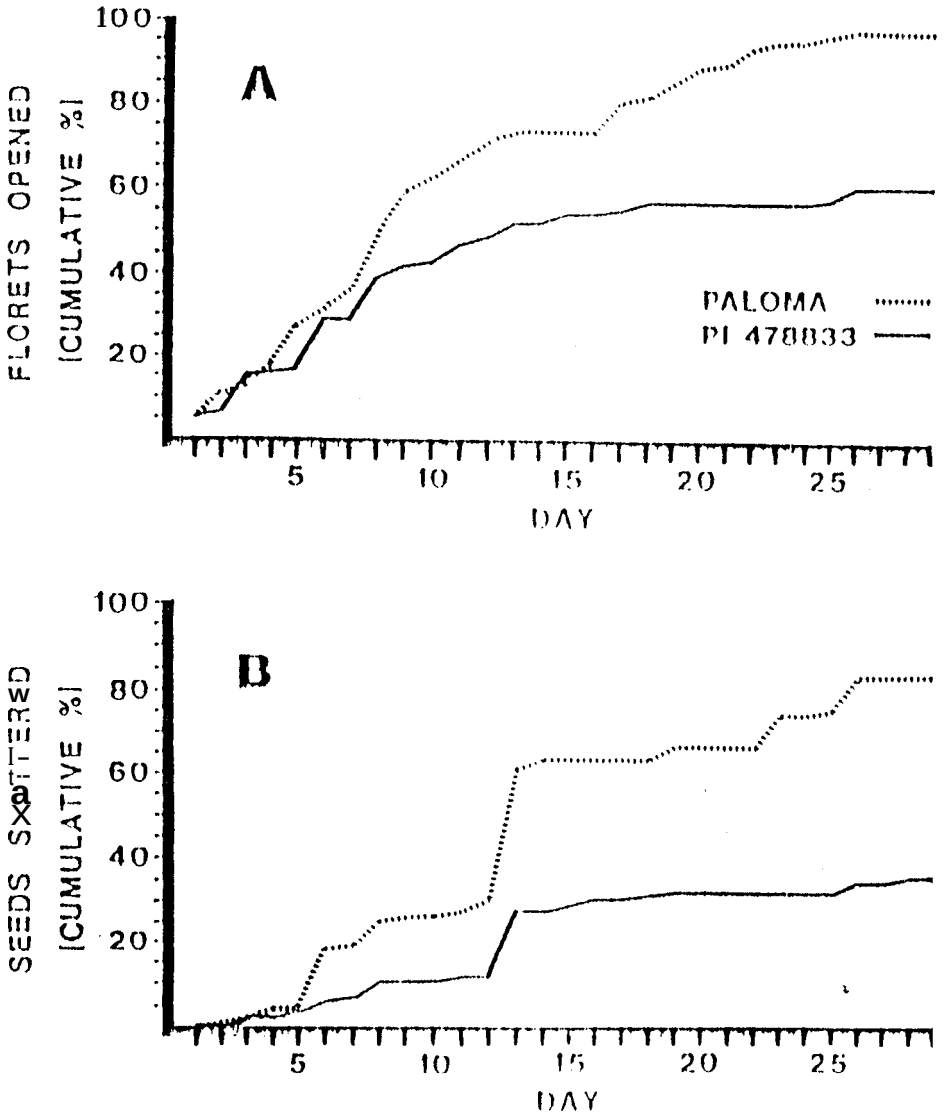

Fig. 1 . Daily cumulative percentage of a) florets opened and b) seeds shattered of Paloma and PI 478833 beginning 5 September 1989.

Table 16. Least-squares means of forage dry weight (@plant), sccd yield (g/plant), seed retention index (g seed yield/g forage dry weight), seed number, and sccd weight (mg/seed) of Rimrock, Nezpar, and Paloma at Providence, Utah, September 15, 1989.

Accession	Forage Dry Weight g/plant	Seed Yield g/plant	Seed Retention Index g SY/g FDW	Seed Number #/plant	Seed Weight mg/seed
Rimrock	**16.3** a''	**7.0** a[1/]	**0.307** a[1/]	**1932** a''	**3.64** b[1/]
Nezpar	**11.3** a	**1.9** b	**0.154** b	**602** b	**2.89** c
Paloma	**12.7** a	**1.6** b	**0.096** c	**331** b	**4.40** a
Mean	**ns**	**1.7**	**0.041**	**422**	**0.45**

1/ Means in a column followed by different letters arc significantly different by the Baycs L.S.D.(k ratio = 100).