

UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICE  
PLANT MATERIALS CENTER  
CORVALLIS, OREGON

and

INSTITUTE FOR APPLIED ECOLOGY  
CORVALLIS, OREGON

NOTICE OF RELEASE OF SAN JUAN GERMPLASM ROEMER'S FESCUE  
SELECTED CLASS OF MANIPULATED TRACK GERMPLASM

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) and the Institute for Applied Ecology announce the release of a selected class pre-variety of Roemer's fescue (*Festuca roemeri* var. *roemeri* [Pavlick] E.B. Alexeev. synonym: *Festuca idahoensis* Elmer ssp. *roemeri* [Pavlick] S. Aiken).

This population will be referred to as San Juan Germplasm Roemer's fescue. It has been assigned USDA NRCS accession number 9079513 and PI 665694. The Oregon Seed Certification Service designated it as PVGOR105. San Juan Germplasm is released as a selected class of certified seed and plants, manipulated track. There is a conservation need for this material at this level of development and additional selection is not warranted.

**Origin:** Parental G0 seed of San Juan Germplasm was collected from three naturally occurring stands (populations) of Roemer's fescue growing on islands within the San Juan Islands and Olympic Rainshadow Level IV ecoregions that are part of the Puget Lowland Level III ecoregion (U.S. Environmental Protection Agency 2011). At least eight plants were sampled at each location. The collections were first made in 2001–2002 under the coordination of the Institute for Applied Ecology. The three collection sites range in elevation from 12 to 91 m (40–300 ft) above sea level in an area where the average annual precipitation is between 64 cm and 102 cm (25–40 in).

Table 1. Origin of three parent populations comprising San Juan Germplasm

Fidalgo Island	Skagit Co., WA	Elevation 300 ft	Lat. 48.4101°N	Long. -122.6444°W
Smith Prairie	Island Co., WA	Elevation 100 ft	Lat. 48.2050°N	Long. -122.6180°W
Yellow Island	San Juan Co., WA	Elevation 40 ft	Lat. 48.5861°N	Long. -123.0306°W

**Method of selection:** From 2003 to 2006 a common garden study of Roemer's fescue was conducted at the USDA NRCS, Corvallis Plant Materials Center (Benton County, Oregon; elevation 69 m [225 ft]; moderately well-drained Woodburn silt loam; mean annual precipitation 107 cm [42 in]). The study was a cooperative effort among the Institute for Applied Ecology, USDA NRCS, USDI Bureau of Land Management, and USDA Forest Service. Results documented substantial genetic variation within and among 47 populations from throughout the range of the species in the Pacific Northwest, USA, for growth, fitness, phenological, and morphological traits (Tables 2 and 3). Using climatic and physiographic variables, genetic patterns over the landscape were examined through principal component and regression analysis. Elevation and latitude of the seed source, and to a lesser extent temperature and precipitation, explained a significant

proportion of the genetic variation, suggesting that observed variation was associated with adaptation to local environments. Roemer's fescue variation clustered into seed transfer zones corresponding to EPA Level III ecoregions. However, the Puget Lowlands ecoregion was further subdivided with the San Juan Islands/Olympic Rainshadow (Level IV ecoregions) separated from the rest of the area (Wilson et al., 2008).

In order to enhance genetic diversity, all three populations collected on islands within the San Juan Islands/Olympic Rainshadow ecoregions were selected to represent the San Juan Germplasm (Table 1). While some patterns of variation among these populations overlapped with mainland populations from further south in the Puget Lowland ecoregion, they were kept separate. The decision was based on minor genetic differences, the natural geographic isolation between these two groups, and other concerns (Wilson et al., 2008). Mean flowering date for all three island populations is similar, maximizing the potential opportunity for cross pollination (Table 2). Random mating among the populations was promoted by using a Latin Square G1 crossing block in order to form a polycross (Darris et al., 2008). Seed production, testing, and conservation use involves G2 seed and later generations.

**Description:** San Juan Germplasm Roemer's fescue is a native cool season, perennial bunchgrass with mostly basal foliage. The foliage is fine textured and densely tufted (cespitose). Morphological diversity among the three parent populations appears moderate. Leaves are sometimes glaucous (covered with a whitish waxy coating) and their color varies throughout a wide spectrum of green and pale blue colors for this germplasm. Plants rarely flower until the second full growing season. Stem color ranges from green to purple or red, turning mostly straw colored at seed maturity. Mean culm (plant) heights varied from 86 to 88 cm (34–35 in) and mean basal width ranged from 12 to 14 cm (4.7–5.5 in) (Table 2).

The botanical traits for the three populations that form San Juan Germplasm Roemer's fescue fall within the taxonomic limits of *Festuca roemeri* var. *roemeri* (Wilson, 2007). The panicle (seed head or inflorescence) is loosely open to moderately contracted and 5–20 cm (2–8 in) long; branches are erect to slightly spreading. The spikelets are 9–13.5 mm (0.35–0.53 in) long with 4–6 florets. Glumes are exceeded by the upper florets. Lemma awns are 2–5 mm (0.08–0.20 in) long. Leaf sheaths are closed for less than half their length and collars are glabrous; ligules are 0.1–0.5 mm (0.004–0.02 in) long; blades are 0.5–1.2 mm (0.02–0.05 in) in diameter (Darbyshire and Pavlick, 2007). Roemer's fescue is an allotetraploid ( $2n=28$ ) and is highly cross-pollinated by wind.

Among the three parent populations representing San Juan Germplasm, mean flowering date (Julian date 136; May 16) and seed maturity dates (Julian dates 170–172; June 19–June 21) were similar. Julian date is the number of days counted from January 1<sup>st</sup> as day 1. Incidence of rust disease was low (0–4%) (Table 2).

**Suggested area of use:** Based on results of the common garden study, the origin of parent populations and what is known about the species, San Juan Germplasm Roemer's fescue is primarily recommended for use within the San Juan Islands/Olympic Rainshadow ecoregions in northwest Washington below 305 m (1000 ft) in elevation. Movement of the germplasm within this provisional seed transfer zone should pose minimal risk of maladaptation. This zone lies within USDA Plant Hardiness Zone 8b

(U.S. National Arboretum, 2012). Pending further investigations on adaptation, area of use may extend to the remainder of the Puget Lowland Level III ecoregion and parts of adjacent ecoregions for select purposes outside of restoration. Use should not extend beyond the species natural range.

As with the species in general, San Juan Germplasm is likely to grow best in full sun and part shade near trees on moderately well to well-drained, medium to fine-textured soils that are moderately acidic to slightly basic. Although Roemer's fescue is considered drought tolerant and has extensive roots, it favors more mesic rather than xeric habitats within a site. While the species is known for tolerance to serpentine soils, moderate to low fertility conditions and fire, the specific adaptation of San Juan Germplasm to such extremes remains to be tested.

**Anticipated use:** Recommended uses for San Juan Germplasm include restoration of upland prairies, oak savanna, grassy balds, and similar native plant communities, as well as wildlife habitat improvement. This includes food or cover for various song and game birds, small mammals, and beneficial insects. Roemer's fescue can be sown alone or in a mixture with forbs or other grasses. After further evaluation, other uses may include general revegetation and erosion control of disturbed sites and roadsides where a fine textured perennial grass is desired, low input turf, and cover crop for vineyards or young orchards. Roemer's fescue is a potential native alternative to introduced sheep, hard, and chewings red fescues in several applications. Potential as a forage grass may be similar to Idaho fescue but remains to be tested.

**Ecological considerations and evaluation:** San Juan Germplasm is the result of simple geographic selection and open crossing of three populations for one generation for the limited purpose of enhancing genetic diversity over single wild populations. This germplasm is not anticipated to have substantial genetic improvement or hybrid vigor in terms of ease of establishment, reproductive capability, and plant growth over other naturally occurring, fit populations of Roemer's fescue found within the same ecoregion.

San Juan Germplasm is recommended for use primarily within the ecoregion (San Juan Islands/Olympic Rainshadow) and elevation range from which the three parent populations originated. Within this area and adjacent seed transfer zones, the species is not considered weedy and is widely accepted as beneficial rather than detrimental to natural plant communities. According to the NRCS "Worksheet for Environmental Evaluation of Plant Releases" as applied to the intended area and type of use, this germplasm was deemed to have a low chance of adversely affecting the environment, be easy to control, have a moderate level of importance for conservation use, and a moderate chance to propagate and maintain itself under natural conditions. San Juan Germplasm is not necessarily intended to replace on-site sources of Roemer's fescue for ecological restoration plantings. Individuals with such concerns for a particular environment or ecosystem should make their decisions on a case by case basis. Uses beyond habitat restoration should be tested using standard precautions.

San Juan Germplasm Roemer's fescue is a known host of stem rust disease of grasses (*Puccinea graminis*). It may also be host to other rusts (*Puccinea* spp.) and trace amounts of ergot (*Claviceps purpurea*) have been observed in plants of this germplasm. The rust and ergot potentially carried by this species occur commonly on other introduced and

endemic grasses in the suggested area of use. Therefore, their occurrence on San Juan Germplasm, if detected, is not considered to pose a unique problem or special risk to other new or already susceptible species. In the unlikely event of ergot becoming abundant, special precautions should be considered to avoid toxicity to grazing animals (such as mowing or temporary livestock exclusion).

**Release production:** Seed of San Juan Germplasm Roemer's fescue is readily produced using cultural practices similar to those for other fine fescues in the Pacific Northwest, USA. Post-harvest residue (straw, older foliage) should be removed and remaining stubble should be 4–7 cm (1.6–2.8 in) tall. From 2010 to 2012, seed yields ranged from 48 to 219 kg per ha (42–192 lb per acre). Yields were low due in part to atypical wide spacing among plants within and between rows.

In Oregon, seed certification requires a minimum isolation distance of 274 m (900 ft) between fields of different Roemer's fescue populations, regardless of pre-variety class or generation. In addition, Roemer's fescue can hybridize with fescues in the sheep fescue complex (sheep, hard, and Idaho fescues), so similar isolation distances from these species may be applicable. Roemer's fescue does not cross with species in the red fescue complex.

Red fescue often contaminates Roemer's fescue seed fields and can be difficult to distinguish for removal using anatomical differences alone. An ammonia fluorescence test conducted by a seed lab in conjunction with a seed lot germination test will detect red fescue contamination in a field. The roots of red fescue (and species in the red fescue complex) fluoresce yellow while the roots of Roemer's fescue (and species in the sheep fescue complex) fluoresce green when sprayed with a 0.5% solution of ammonium hydroxide. For seed certification of pre-variety Roemer's fescue germplasm in Oregon, the maximum allowable red fescue seed content determined by this test is 1 percent for all classes and generations.

**Availability of plant materials:** The USDA NRCS Plant Materials Center, Corvallis, Oregon, will maintain G2 and G3 generation seed. Beginning in 2012, a limited quantity of selected class certified (green tag) seed will be available to qualified commercial growers upon request. G2, G3, and G4 seed are recommended for certification. There is no limitation on the number of years a field can be in production. Seed is expected to be commercially available by late 2013 or 2014.

#### **References:**

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**Prepared by:** Dale Darris and Annie Young-Mathews, USDA NRCS Plant Materials Center, Corvallis, Oregon. (July, 2012).

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Table 2. Morphology, phenology, and disease occurrence of Roemer's fescue. Selected populations for each germplasm (seed zone) are highlighted.																
Seed Zone or Group	Population	rust03	col03	ht04	wid04	til04	fol04	phen	anth	an-e	an-l	mat	surv05	fol05	ferl05	surv06
Coastal (Oregon)	Cummins Creek Trail	3%	1.0	110	17	6.1	4.7	2.4	130	127	135	170	98%	5.4	3.5	13%
Coastal (Oregon)	Cape Perpetua	2%	2.1	87	16	5.8	5.5	1.9	136	131	139	175	97%	6.1	4.0	28%
Coastal (California)	Mt. Tamalpais	5%	1.9	82	16	6.6	5.1	2.4	130	124	136	172	81%	5.3	3.2	8%
Coastal (California)	San Bruno Mt.	2%	2.1	68	13	5.2	4.8	1.8	133	130	137	179	84%	5.0	3.1	10%
Columbia Gorge	Memaloose Park	0%	1.3	65	15	5.8	3.4	2.9	136	126	145	172	67%	3.2	4.0	0%
Columbia Gorge	Drano Lake	19%	1.1	97	14	4.1	3.7	2.2	141	127	148	180	75%	3.3	0.6	6%
High elevation	Fairview Peak	31%	1.2	90	17	5.4	5.2	2.0	132	127	138	169	88%	4.4	3.2	8%
High elevation	Blue Mt. near Deer Park	6%	1.1	74	14	3.2	4.3	2.4	121	114	131	161	83%	3.8	0.3	13%
High elevation	Mary's Peak	11%	1.0	76	16	1.8	5.7	1.4	144	136	155	176	77%	5.0	0.6	13%
High elevation	Hurricane Ridge	5%	1.9	66	9	2.2	2.3	1.8	125	121	132	163	29%	2.0	0.5	2%
High elevation	Silver Fork Elliot Cr.	13%	1.0	81	14	5.1	4.5	3.2	125	122	131	160	81%	3.6	3.7	5%
High elevation	Horse Rock Ridge	20%	1.0	89	18	5.3	4.7	2.2	136	127	140	172	83%	4.3	1.1	0%
High elevation	Table Rock Wilderness	5%	1.1	81	15	3.1	4.4	1.8	134	130	142	169	75%	3.4	0.6	2%
Puget Lowland	Glacial Heritage Preserve	11%	1.1	103	15	3.6	5.0	2.1	134	128	138	167	95%	5.2	2.1	13%
Puget Lowland	Mortar Pt. 3	13%	1.1	106	14	4.0	4.5	2.2	135	133	140	167	89%	5.1	2.6	14%
Puget Lowland	Thirteenth Division Prairie	13%	1.0	102	14	3.6	4.5	2.1	134	131	142	168	92%	4.8	2.0	13%
Puget Lowland	Scatter Creek	9%	1.1	102	13	3.7	4.5	1.9	134	129	138	167	89%	4.8	2.3	17%
Puget Lowland	Mima Mounds	8%	1.0	101	11	3.2	3.6	1.9	134	131	142	167	80%	5.1	1.8	5%
Puget Lowland	Johnson Prairie	16%	1.0	99	13	3.5	4.1	2.0	136	129	144	167	86%	4.2	1.8	9%
Puget Lowland	Yelm	10%	1.0	94	11	3.4	4.0	2.0	136	133	141	169	59%	4.2	2.2	5%
Puget Lowland	Upper Weir Prairie	11%	1.0	102	11	3.2	3.5	2.1	135	129	141	168	89%	3.0	1.3	13%
Puget Lowland	Rocky Prairie N.A.P.	5%	1.0	103	11	3.0	3.9	1.8	141	134	145	169	81%	3.9	1.3	11%
San Juan/Olympic	Fidalgo Island; Ravine Trail	2%	2.6	88	14	4.3	3.9	2.0	136	131	141	172	66%	3.9	1.3	6%
San Juan/Olympic	Yellow Island	4%	1.4	88	14	4.1	6.0	2.0	136	130	143	172	96%	6.2	1.2	24%
San Juan/Olympic	Smith Prairie, Whidbey Is.	0%	2.7	86	12	3.0	4.9	1.6	136	130	145	170	77%	5.2	1.3	6%
Klamath Mountains	Pyramid Rock	11%	1.5	73	14	4.4	3.9	2.0	139	129	148	177	79%	4.0	2.9	2%
Klamath Mountains	Lodgepole Meadow	8%	2.8	79	12	4.0	3.3	1.6	142	127	149	182	81%	3.4	0.9	5%
Klamath Mountains	Hukill Hollow	2%	2.2	78	10	4.1	2.9	2.8	136	126	142	166	56%	2.4	1.8	3%
Klamath Mountains	Edgewood-Weed Road	13%	1.0	82	12	2.7	4.7	2.0	136	130	140	169	69%	3.9	2.3	0%
Klamath Mountains	Cobleigh Road	21%	1.1	74	10	2.7	2.9	1.7	144	137	152	178	34%	2.9	1.8	5%
Klamath Mountains	Ace Williams Mt.	19%	1.2	79	10	2.8	2.8	1.6	140	136	147	178	52%	2.5	0.4	2%
Klamath Co.	Duncan Springs	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

Table 2 continued on next page.

Table 2. (cont.) Morphology, phenology, and disease occurrence of Roemer's fescue. Selected populations for each germplasm (zone) are highlighted.

Seed Zone or Group	Population	rust03	col03	ht04	wid04	til04	fol04	phen	anth	an-e	an-l	mat	surv05	fol05	fer05	surv06
Willamette Valley	Kloster Mountain	36%	1.0	105	17	5.3	4.6	2.0	139	136	143	177	83%	4.5	2.7	5%
Willamette Valley	Rock Hill	19%	1.0	94	17	4.4	5.5	2.1	134	130	138	169	83%	5.3	2.3	11%
Willamette Valley	Weiss Road ridgeline	51%	2.8	91	14	4.3	4.3	1.8	144	134	153	175	63%	4.0	1.2	0%
Willamette Valley	Morton Farm	42%	1.3	82	13	4.6	4.5	2.1	139	134	142	172	85%	4.8	1.3	0%
Willamette Valley	Bald Hill west <sup>1</sup>	36%	2.5	81	13	4.1	4.6	1.6	146	139	159	176	70%	5.2	1.4	7%
Willamette Valley	Kingston Prairie	13%	2.2	93	14	3.6	4.9	1.9	142	131	162	171	75%	5.6	1.2	2%
Willamette Valley	Spencer's Butte	30%	2.3	89	16	4.5	4.8	2.0	138	134	143	172	80%	5.0	1.9	2%
Willamette Valley	Row Point, Dorena Reservoir	17%	1.9	90	12	4.1	3.7	2.1	140	135	148	172	52%	2.8	0.4	0%
Willamette Valley	Bald Hill southeast <sup>1</sup>	38%	2.8	80	12	4.0	4.1	1.8	143	138	150	177	67%	4.6	1.4	3%
Willamette Valley	Novick Property	39%	2.5	83	13	3.4	3.9	1.5	142	134	152	175	56%	3.7	0.6	2%
Willamette Valley	Baskett Butte	23%	2.8	84	14	4.0	5.4	1.8	141	134	150	173	73%	5.7	1.2	2%
Willamette Valley	Abiqua Road	14%	1.1	108	14	3.2	3.6	1.8	144	134	157	175	65%	3.4	0.1	2%
Willamette Valley	Fire Knob	17%	1.5	84	13	2.7	4.3	1.5	141	138	145	169	64%	3.8	0.5	0%
Willamette Valley	Open Spaces Park	51%	2.2	69	10	2.6	3.2	1.4	145	133	153	178	58%	3.8	1.5	0%
Willamette Valley	Beazell	31%	1.4	77	10	2.5	3.6	1.4	148	136	155	178	45%	4.4	0.7	0%

<sup>1</sup>Bald Hill west and Bald Hill southeast were treated as one population for the Willamette Valley germplasm

rust03 = % of leaf rust (*Puccinia* spp.) infection on plants, 2003  
col03 = color of foliage score from 1=blue to 3=green, 2003  
ht04 = culm height cm, 2004  
wid04 = basal width cm, 2004  
til04 = fertile tiller score, 1=fewest, 10=most, 2004  
fol04 = foliage abundance score, 1=lowest, 10=highest, 2004  
phen = phenology score on March 23, 2004 (1=vegetative, 2=boot, 3=jointing, etc.)  
anth = Mean Julian date of anthesis for entire population  
an-e = earliest Julian date of anthesis for any family in a population  
an-l = latest Julian date of anthesis for any family in a population  
mat = Mean Julian date of seed maturity  
surv05 = % survival of plants in a population, 2005  
fol05 = foliage abundance score, 1=lowest, 10=highest, 2005  
fert05 = fertile tiller score, 1=fewest, 10=most, 2005  
surv06 = % survival of plants in a population, 2006

Table 3. Seed Yield of Roemer's fescue. Selected populations for each germplasm (zone) are highlighted.

Seed Zone or Group	population	yield/plant (g)	Std.Dev.	Minimum	Maximum	Variance
Coastal (Oregon)	Cummins Creek Trail	34.69	5.55	26.38	43.50	30.76
Coastal (Oregon)	Cape Perpetua	34.25	10.24	21.13	51.14	104.87
Coastal (California)	Mt. Tamalpais	33.16	12.85	19.50	53.50	165.03
Coastal (California)	San Bruno Mt.	26.22	8.16	14.88	41.57	66.56
Columbia Gorge	Memaloose Park	19.56	15.90	2.00	33.00	252.93
Columbia Gorge	Drano Lake	17.86	7.44	4.67	31.25	55.40
High elevation	Fairview Peak	27.74	14.88	10.25	48.88	221.40
High elevation	Blue Mt. near Deer Park	9.69	4.77	4.38	19.57	22.73
High elevation	Mary's Peak	5.17	5.36	0.50	14.80	28.69
High elevation	Hurricane Ridge	4.02	1.88	1.40	6.40	3.54
High elevation	Silver Fork Elliot Cr.	24.81	11.28	12.67	43.43	127.31
High elevation	Horse Rock Ridge	24.26	9.64	13.00	41.71	92.91
High elevation	Table Rock Wilderness	10.65	8.12	1.25	26.67	65.91
Puget Lowland	Glacial Heritage Preserve	14.67	5.91	3.17	21.75	34.89
Puget Lowland	Mortar Pt. 3	12.29	4.14	6.50	17.50	17.14
Puget Lowland	Thirteenth Division Prairie	12.05	4.21	7.25	19.29	17.71
Puget Lowland	Scatter Creek	11.11	4.11	4.57	17.14	16.87
Puget Lowland	Mima Mounds	10.93	5.84	2.29	19.17	34.13
Puget Lowland	Johnson Prairie	10.73	4.61	4.80	16.50	21.27
Puget Lowland	Yelm	9.94	5.25	2.33	19.29	27.60
Puget Lowland	Upper Weir Prairie	9.14	4.42	2.20	15.67	19.52
Puget Lowland	Rocky Prairie N.A.P.	7.82	3.85	1.00	13.25	14.85
San Juan/Olympic	Fidalgo Island; Ravine Trail	14.09	4.02	7.00	19.13	16.19
San Juan/Olympic	Yellow Island	10.29	4.25	3.63	15.50	18.07
San Juan/Olympic	Smith Prairie, Whidbey Is.	8.64	2.69	4.60	12.00	7.23
Klamath Mountains	Pyramid Rock	15.80	8.74	1.25	25.50	76.31
Klamath Mountains	Lodgepole Meadow	12.30	4.75	4.50	20.60	22.54
Klamath Mountains	Hukill Hollow	10.51	5.61	4.00	19.88	31.47
Klamath Mountains	Edgewood-Weed Road	7.65	4.17	3.40	14.13	17.43
Klamath Mountains	Cobleigh Road	5.74	3.50	1.40	10.60	12.24
Klamath Mountains	Ace Williams Mt.	5.42	2.39	2.29	10.43	5.73
Klamath Co.	Duncan Spring	4.27	5.32	0.67	16.00	28.33
Willamette Valley	Kloster Mountain	24.24	9.50	11.43	42.00	90.26
Willamette Valley	Rock Hill	15.56	6.32	7.00	22.60	39.99
Willamette Valley	Weiss Road ridgeline	13.70	7.52	0.33	24.40	56.59
Willamette Valley	Morton Farm	13.05	10.65	4.67	28.50	113.47
Willamette Valley	Bald Hill west	12.53	5.32	4.00	20.38	28.33
Willamette Valley	Kingston Prairie	11.45	5.13	4.25	20.00	26.35
Willamette Valley	Spencer's Butte	10.86	6.86	2.86	21.38	47.05
Willamette Valley	Row Point, Dorena Reservoir	9.19	4.43	5.17	19.00	19.59
Willamette Valley	Bald Hill southeast	7.58	1.41	4.86	9.50	2.00
Willamette Valley	Novick Property	7.49	5.82	1.33	17.29	33.87
Willamette Valley	Baskett Butte	6.97	3.58	3.00	12.83	12.85
Willamette Valley	Abiqua Road	6.77	4.46	1.00	12.71	19.90
Willamette Valley	Fire Knob	6.15	6.21	1.20	16.17	38.51
Willamette Valley	Open Spaces Park	5.59	3.86	0.67	9.67	14.92
Willamette Valley	Beazell	5.07	4.60	0.50	14.50	21.16

**SIGNATURES for RELEASE of SAN JUAN GERMPLASM ROEMER'S FESCUE**  
*(Festuca roemerii)*

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Ron Alvarado  
State Conservationist, Oregon  
Natural Resources Conservation Service

Date: \_\_\_\_\_

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Roylene Rides at the Door  
State Conservationist, Washington  
Natural Resources Conservation Service

Date: \_\_\_\_\_

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Tom N. Kaye  
Executive Director  
Institute for Applied Ecology

Date: \_\_\_\_\_

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Terrell Erickson  
Director, Ecological Sciences Division  
Natural Resources Conservation Service

Date: \_\_\_\_\_