

# PURPLE NEEDLEGRASS

*Nassella pulchra* (Hitchc.) Barkworth

Plant Symbol = NAPU4

## Alternative Names

**Common Names:** Purple stipa, purple tussockgrass

**Scientific Names:** *Stipa pulchra* Hitchc. (Columbus, 2012)

## Description

**General:** Grass Family (*Poaceae*). Purple needlegrass is a densely tufted, long-lived, upright perennial bunchgrass with conspicuously long awns (Columbus et al., 2012) (Figure 1). It has numerous basal leaves and a distinct nodding habit at anthesis. Plants are generally 2 to 3 feet tall producing an open, nodding panicle of 4 to 8 inches. The leaf blades are smooth to finely hairy. Basal blades are long, flat and 0.03 to 0.2 inches wide. The seeds (caryopsis) range from 0.3 to 0.4 inches long with a hairy lemma and a twice-bent awn reaching 1.5 to 4 inches in length (Hickman, 1993) (Figure 2). Purple needlegrass roots reach below 2 feet, with reports of roots as deep as 5-16 feet in deep soils, and are mycorrhizal (Netstate, 2009; Steinberg, 2002). Plants become dormant after seed production and begin growth again with fall rain. Plants will also regreen after summer dormancy even without the presence of precipitation, is believed to be in response to shortening day lengths (Steinberg, 2002).



Figure 1. Purple needlegrass plant with mature inflorescence. Photo CAPMC.



Figure 2. Seeds of purple needlegrass with their long, bent awns. Photo CAPMC.

Purple needlegrass is wind pollinated. Plants can regenerate either asexually by tillering and bunch fragmentation, or via seed dispersal. Seed burial is facilitated by the sharp pointed seed and long awns which twist as they dry, driving the seed into the soil. Additionally, purple needlegrass has been shown to have very high self-pollinating rates and that inbreeding and/or selection have contributed to the significant differentiation of needlegrass populations (Larsen et al., 2001).

**Distribution:** Purple needlegrass currently occurs on the west side of the Coast Range from northern Baja California north to southern Oregon, the Central Valley and foothills of the Cascade Range and Sierra Nevada as well as the Channel Islands). For current distribution consult the Plant Profile page for this species on the [PLANTS Web site](#).

## Habitat:

Purple needlegrass occurs in grasslands, oak and pine woodlands, mixed evergreen forests, chaparral, and coastal scrub (Steinburg, 2002). In natural plant communities it is frequently associated with Idaho fescue (*Festuca idahoensis*), prairie junegrass (*Koeleria macrantha*), Sandberg bluegrass (*Poa secunda*) and bottlebrush squirreltail (*Elymus elymoides*) (Heady, 1977). It can also be found with California oatgrass (*Danthonia californica*), California

fescue (*Festuca californica*), tussockgrass (*Nassella lepida*), beardless wildrye (*Leymus triticoides*), and melic grass (*Melica* spp.). In coastal areas purple needlegrass is found in association with red fescue (*Festuca rubra*) and California brome (*Bromus carinatus*).

## **Adaptation**

The distribution of purple needlegrass prior to European settlement is undetermined. It was previously widely believed that purple needlegrass was a climax species in California, occupying much of the valley and coastal grasslands. New studies suggest, however, that beardless wildrye may have been more dominant on heavier clays, while purple needlegrass was the dominant grass in more sandy areas (Holstein, 2001). Purple needlegrass grows in oak woodland, chaparral and grasslands in areas receiving between 8 and 40 inches of annual precipitation. Its elevational range extends from sea level to 4,300 feet (Columbus et al., 2012). It is well adapted to droughty soils, clays, and serpentine soils. The species grows well in full sun as well as partial shade and is tolerant of extreme summer heat and drought. Purple needlegrass does not tolerate being overshadowed by non-native annuals. Some ecotypes of the species have partial flood tolerance.

## **Uses**

*Restoration:* Purple needlegrass, the state grass of California, is appropriate for restoration and range improvement throughout much of California's Central Valley and foothills (Calscape, 2024). The species is highly valued as an erosion control grass due to its longevity, tolerance to poor soil conditions, and its ability to establish a coarse root system on disturbed sites with low soil fertility (Amme, 2003). The species is known for establishing well on disturbed soils, and roadsides. It has been successfully used in re-establishing native perennial grasses following weed control on sites previously occupied by introduced annual species (Amme, 2003; Luong & Loik, 2021).

*Wildlife/livestock:* Purple needlegrass is a valuable forage species which provides food for deer, elk, and other wildlife (Heady, 1977). It can be an important source of food for livestock, having moderate protein values and high palatability (USDA, 2009). The leaves green up early in the season and provide good quality early forage for grazing animals but the sharp-tipped seeds and awns can become injurious as they dry later in the season. However, shatter is complete within a month of maturity and difficulties can be avoided through pasture management. This species is generally not that important as a livestock forage as it fails to make up a significant portion of the forage base over most of its range and because under rangeland conditions livestock tend to avoid it later in the season. The fact that livestock do not prefer the species over others is part of reason why it persists in such abundance when compared to other natives of greater palatability for livestock (George et al., 2013; Steinberg, 2002).

*Low water use lawn and landscaping:* Purple needlegrass is an excellent native grass for use in low water landscaping. The species has also been used in native grass lawns, but its bunching habit prevents it from forming a uniform sod. Animals such as dogs have been known to get the seed lodged in their fur. The awns then break off leaving the small, sharp seed which can burrow under the skin. These problems can be avoided by mowing prior to maturity. Lawns should be mowed to no lower than 4 inches (Calscape, 2024).

## **Status**

*Threatened or Endangered:* No

Please consult the PLANTS Web site (<http://plants.usda.gov/>) and your state's Department of Natural Resources for this plant's current status (e.g., threatened or endangered species, state noxious status, and wetland indicator values).

## **Planting Guidelines**

There are typically between 115,000 and 150,000 seeds/lb in a well processed seed lot. Unprocessed seed with the awns still attached can have as few as 50,000 seeds/lb. At 115,000 seeds/lb, the pure stand recommended drill seeding rate is 9.5 pure live seed (PLS) lb per acre for approximately 25 seeds/ft<sup>2</sup>. For broadcast applications or critical area plantings, increase the drill seeding rate by 1.5 to 2. For best results, seed should be planted to a depth of ¼ to ½ inch into a firm weed-free seedbed. Seed can be planted in early spring, but late dormant fall seeding is recommended for best emergence and competition against annual weeds. For seed mixtures, using rice hulls or another dilutant is recommended to prevent the settling of smaller seed in the mixture. Like other native perennial grasses, purple needlegrass should generally not be seeded in mixes with annual grasses. Purple needlegrass does not compete well with annual grass or broadleaf weeds because of slow establishment during the first year.

## **Management**

The most important management issue for purple needlegrass seedlings is preventing overwhelming weed competition, especially from exotic grasses but also aggressive broadleaf weeds. Studies have shown the presence of annual invasive grasses can reduce the growth and seed production of purple needlegrass at all developmental stages (Hamilton et al., 1999). Young needlegrass seedlings grow at a much slower rate than most weeds. The weeds easily overshadow and outcompete new seedlings for sunlight and can dramatically impact establishment. Control weeds prior to needlegrass emergence if possible. Some options for control include mowing, herbicide applications and/or closely controlled and timed grazing.

New seedlings should not be grazed for two to three years following planting to ensure full establishment. However, under heavy competition by weeds, limited grazing can open the plant canopy and allow sunlight for new seedlings. Established purple needlegrass should not be grazed during flowering to ensure formation of the seed and to allow food storage in the crown. Purple needlegrass requires bare ground to re-seed, but volunteers readily into openings and increases once it is established. Stands are usually maintained by abundant seed production in non-grazed or properly grazed areas (Steinburg, 2002). The species can also expand vegetatively when tussocks are fragmented.

Purple needlegrass is fire tolerant and may benefit from prescribed burning. It commonly produces a more abundant seed crop the year after a fire (Steinberg, 2002). The season during which the fire occurs may determine the effects on the grass. It typically will re-sprout after spring or fall burns but does not recover as well after a summer burn due to typically higher fire temperatures at the soil surface. Larger plants often do not recover due to higher crown temperatures especially when excessive thatch has been allowed to build up, increasing fire temperatures.

### **Pests and Potential Problems**

Purple needlegrass hosts several fungal pathogens but these are not typically a problem (Farner et al., 2020). Seedlings are susceptible to damping off in cold wet weather, especially in December and January. Smut has been detected in purple needlegrass seed, and plantings and rusts can also be a problem in green house seedling transplants. Pre-treating seed with a fungicide has been used to effectively reduce fungal problems (Tilley et al, 2009; USDA, 2009).

### **Control**

Please contact your local agricultural extension specialist or county weed specialist to learn what works best in your area and how to use it safely. Always read label and safety instructions for each control method. Trade names and control measures appear in this document only to provide specific information. USDA NRCS does not guarantee or warranty the products and control methods named, and other products may be equally effective.

### **Seeds and Plant Production**

Seed production fields can be planted at a rate of 4.4 PLS lbs/ac using 20- or 30-inch row spacing (Figure 3). Purple needlegrass is also planted on 60-inchbeds with 4 rows per bed at 11 inch spacing, with a seeding rate about 10 lbs/acre (Jeff Quiter, Hedgerow Farms, personal communication). Planting at a higher seeding rate will produce more seed in year 1, but fewer years in effective seed production. Seed matures in mid- to late spring and can be collected for two to four weeks but shatters very quickly during hot, dry weather.



*Figure 3: First year purple needlegrass seed production field at the NRCS Plant Materials Center in Lockeford, CA. Photo CAPMC.*

Fields can be harvested several times using a seed stripper. Stripped seed should be dried prior to processing. During drying and curing, the awns curl up on each other and the product becomes a connected mat of seed and awns. The mat can be run through a stationary combine to separate the awns from the seed, but some seed is broken during this process. Fields with dense stands can be swathed into windrows and combined once the seed and straw have cured.

It is important to accurately determine when the field is mature enough to swath. It is also very important to form the windrows so that the seed is incorporated into or on top of the straw. Seed in the panicles hanging over the side of the windrow will shatter on to the ground during curing, but this is minimal. If windrows are rained on or are cut with high moisture levels, black mold can infect the material and the seed which can adversely affect viability.

Seed yields vary considerably, ranging between 75 to 600 pounds/acre depending on the year, wind, rains, and age of the stand. For small lots, rub floral material over large screen, then on rubber mat to separate awns from florets. Shake material on velvet cloth to separate awns and chaff from seed. A blower speed of 1.25 is recommended (Wall and Macdonald, 2009). Straw can also be baled directly after swathing for use in establishment. Bales made after combining and windrowing also contain small amounts of seed.



### Cultivars, Improved, and Selected Materials (and area of origin)

There are numerous germplasms of purple needlegrass available from the commercial seed industry. Cultivars should be selected based on the local climate, resistance to local pests, and intended use. Consult with your local land grant university, local extension, or local USDA NRCS office for recommendations on adapted cultivars for use in your area.

### Literature Cited

- Amme, D. 2003. *Nassella* Notes. Grasslands: A Publication of the California Native Grass Association 13(4):3p
- Barkworth, M.E. 2007. *Poaceae*. For: Flora of North America Editorial Committee, eds. Flora of North America North of Mexico. 12+ vols. New York and Oxford. Vol. 24.
- Calscape. 2024. [https://calscape.org/purple-needlegrass/Stipa pulchra-](https://calscape.org/purple-needlegrass/Stipa-pulchra-)(Accessed: May 22, 2024).
- Columbus, T., J.P. Smith, Jr. & D.H. Goldman. 2012. *Stipa pulchra*, in Jepson Flora Project (eds) Jepson eFlora, <https://ucjeps.berkeley.edu/eflora/eflora-display.php?tid=45644>, accessed on April 30, 2024.
- Farner, J.E., E.R. Spear, & E.A. Mordecai, 2020. Habitat type and interannual variation shape unique fungal pathogen communities on a California native bunchgrass, Fungal Ecology, 48, ISSN 1754-5048, <https://doi.org/10.1016/j.funeco.2020.100983>.
- George, M.R., S. Larson-Praplan, M. Doran, K.W. Tate, 2013. Grazing *Nassella*: Maintaining Purple Needlegrass in a Sea of Aggressive Annuals. Rangelands 35: 17-21. <https://doi.org/10.2111/RANGELANDS-D-12-00077.1..>
- Hamilton, J.G.; C. Holzapfel, & B. E. Mahall. 1999. Coexistence and interface between a native perennial grass and non-native annual grasses in California. Oecologia. 121(4): 518-526.
- Heady, H.F. 1977. Valley grassland. In: Barbour, Michael G.; Major, Jack, eds. Terrestrial vegetation of California. New York: John Wiley and Sons: 491-514.
- Hickman, J.C., ed. 1993. The Jepson manual: Higher plants of California. Berkeley, CA: University of California Press. 1400p.
- Holstein, G. 2001. Pre-agricultural grassland in central California. Madrono. 48(4): 253-264
- Larson, S. R., Cartier, E., McCracken, C. L. and D. Dyer. 2001. Mode of reproduction and amplified fragment length polymorphism variation in purple needlegrass (*Nassella pulchra*): utilization of natural germplasm sources. Molecular ecology 10(5):1165-77.
- Luong, J.C. & M.E. Loik 2021. Selecting Coastal California Prairie Species for Climate-Smart Grassland Restoration. Grasslands 43:4-9. <https://escholarship.org/uc/item/4zd2q1ns>.
- Netstate. 2009. California State grass: *Nassella pulchra*: [http://www.netstate.com/states/symb/grasses/ca\\_grass.htm](http://www.netstate.com/states/symb/grasses/ca_grass.htm). [Accessed May 22, 2024].
- Steinberg, P.D. 2002. *Nassella pulchra*. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> (Accessed May 22, 2024).
- Tilley, D., D. Dyer, & J. Anderson. 2009. Plant Guide for purple needlegrass (*Nassella pulchra*). USDA-Natural Resources Conservation Service, Plant Materials Center. Lockeford, CA 95237.
- USDA Natural Resources Conservation Service. 2009. The PLANTS database, version 3.5. <http://plants.usda.gov> (Accessed 31 Jan, 2025). Baton Rouge, LA. National Plant Data Center.
- Wall, M. & J. Macdonald. 2009. Processing Seeds of California Native Plants for Conservation, Storage, and Restoration. Rancho Santa Ana Botanic Garden Occasional Publication, Number 10, Claremont, CA. 216 pages.

### Citation

Smither-Kopperl, M. 2025. Plant Guide for purple needlegrass (*Nassella pulchra*). USDA-Natural Resources Conservation Service, Plant Materials Center. Lockeford, CA 95237.

Published: March, 2025

Edited:

For more information about this and other plants, please contact your local NRCS field office or Conservation District at <http://www.nrcs.usda.gov/> and visit the PLANTS Web site at <http://plants.usda.gov/> or the Plant Materials Program web site: <http://plant-materials.nrcs.usda.gov>.

PLANTS is not responsible for the content or availability of other Web sites.

In accordance with Federal civil rights law and U.S. Department of Agriculture (USDA) civil rights regulations and policies, the USDA, its Agencies, offices, and employees, and institutions participating in or administering USDA programs are prohibited from discriminating based on race, color, national origin, religion, sex, gender identity (including gender expression), sexual orientation, disability, age, marital status, family/parental status, income derived from a public assistance program, political beliefs, or reprisal or retaliation for prior civil rights activity, in any program or activity conducted or funded by USDA (not all bases apply to all programs). Remedies and complaint filing deadlines vary by program or incident.

Persons with disabilities who require alternative means of communication for program information (e.g., Braille, large print, audiotope, American Sign Language, etc.) should contact the responsible Agency or USDA's TARGET Center at (202) 720-2600 (voice and TTY) or contact USDA through the Federal Relay Service at (800) 877-8339. Additionally, program information may be made available in languages other than English.

To file a program discrimination complaint, complete the USDA Program Discrimination Complaint Form, AD-3027, found online at [How to File a Program Discrimination Complaint](#) and at any USDA office or write a letter addressed to USDA and provide in the letter all of the information requested in the form. To request a copy of the complaint form, call (866) 632-9992. Submit your completed form or letter to USDA by: (1) mail: U.S. Department of Agriculture, Office of the Assistant Secretary for Civil Rights, 1400 Independence Avenue, SW, Washington, D.C. 20250-9410; (2) fax: (202) 690-7442; or (3) email: [program.intake@usda.gov](mailto:program.intake@usda.gov).

USDA is an equal opportunity provider, employer, and lender.