

## TUFTED HAIRGRASS

*Deschampsia caespitosa*

(L.)P.Beauv.,orth. Var

Plant Symbol = DECA18

*Contributed by: USDA NRCS Idaho, Colorado, and Oregon Plant Materials Program*



*Tufted hairgrass. Photo, courtesy of Christian Fischer.*

### Alternate Names

*Deschampsia cespitosa*, *Aira caespitosa*, salt and pepper grass, tussock grass, small-flowered tickle grass, blue-green hairgrass, fescue-leaved hairgrass, canche cespitose (PLANTS Database), (Darris and Gonzalves, 2009).

### Uses

**Grazing/haying:** In the Rocky Mountain and Intermountain regions of North America, tufted

hairgrass provides good to excellent forage for all classes of livestock and is often cut for hay from native meadows (Walsh, 1995). Hay yields can be as much as 1.5 tons per acre (Lawrence). In western Oregon and Washington, yields of 1.5 to 8.5 tons per acre have been reported (Darris and Flessner, 2001), (Gamroth, pers. com.).

Forage palatability for livestock is rated fair to good, and the nutritional energy value is fair and protein value is poor (Walsh, 1995). On rangelands in California, cattle readily consume tufted hairgrass prior to maturity. Due to its tendency to grow in cool, moist environments, it remains green and succulent throughout the growing season and is grazed readily during the summer (Sampson et al., 1951). However, it is considered a species of lower forage value in low elevation coastal environments of Oregon, Washington and California (Darris and Gonzalves, 2009). It withstands grazing and trampling very well (Lawrence).

**Restoration and reclamation:** It is used for restoration of moist to seasonally wet meadows and freshwater wetlands, and for stabilizing disturbed streambanks, canals, shorelines and upper tidal marshes. It is also used for acid and heavy metal mine spoil reclamation, alpine and boreal revegetation, grassed waterways, turf, and ornamental applications. (Darris and Gonzalves, 2009).

**Wildlife:** Utilization by deer, elk, antelope, bison, bear, horses and rabbits is variable. Cover and food values for small mammals, birds and waterfowl are rated poor to good, depending on wildlife species and location. Tufted hairgrass is a larval food plant for several butterfly species in North America and is a host for at least 40 species of Lepidopteran insects (moths and butterflies) world-wide (Darris and Gonzalves, 2009).

**Turf:** Selections of tufted hairgrass are valued as wear resistant turf, particularly on sites with water logged soils, intermediate light, low nitrogen, or high acidity (Brilman and Watkins, 2003). Turf-type cultivars have been released from European sources that tolerate repeated mowing. They are recommended for lawns, sports fields, golf course roughs and tees, and other heavy use areas, including shaded areas under trees.

## Status

This species is listed as endangered in Kentucky, Maryland and Massachusetts; rare in Indiana and of special concern in Connecticut. Consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status (e.g., threatened or endangered species, state noxious status, and wetland indicator values).

## Description

**General:** Grass Family (Poaceae). Tufted hairgrass is a native perennial cool season bunchgrass with mostly basal leaves that grows 8 to 60 inches tall. It is a highly variable species with widely varying taxonomic treatment (Barkworth et al., 2008). The species can be very long lived, with individual tussocks surviving 30 years or more (Davy, 1980). In North America, low elevation coastal types are often much larger, coarser, and more robust compared to interior and alpine or subalpine populations.

Tufted hairgrass is a strongly tufted perennial with culms reaching 20-155 cm (8-61 in) in height. The sheaths are glabrous to scabrous, and ligules are 3-7.5 mm (0.12-0.30 in) long, narrow, acuminate and membranous. Leaf blades are firm, flat or folded, 1-5 mm (0.04-0.20 in) wide and 10-50 (3.9-19.7 in) cm long; the upper surface with toothed nerves, the lower surface smooth. The panicle is 5-50 cm (2-20 in) long, loose and open, sometimes nodding, shiny, and glossy. Spikelets are 2-flowered, usually shiny, and purplish to tawny. Spikelet branches are thin but stiff and rough to the touch. Glumes are lanceolate, acute, glabrous or scaberulous. The first glume is 3-5 mm (0.12-0.20 in) long, 1-nerved and the second glume is 3-5 mm (0.12-0.20 in) long, 1- to 3-nerved. Lemmas are 2-4 mm (0.08-0.16 in) long, and often purplish at the base with callus hairs. The palea has a bifid tip, with a twisted and slightly geniculate awn that is 4-6 mm (0.16-0.24 in) long (Cronquist, et. al, 1977), (Majerus, 2009), (Perryman and Skinner, 2007), (Hitchcock et al., 1969), (Barkworth et al., 2008).

Tufted hairgrass is most likely to be confused with redtop (*Agrostis alba*) which has only one floret per spikelet. It is similar to slender hairgrass (*Deschampsia elongata*) which has a narrow panicle in comparison to tufted hairgrass (Lawrence). Chromosome number is  $2n=26$  (Peeters, 2000) and is highly cross-pollinated and self-incompatible (Walsh, 1995). Viviparous plants have also been reported.

**Distribution:** Tufted hairgrass has global distribution in moist arctic and temperate regions of the world. In North America, it occurs from Greenland to Alaska and south in the western United States into Northern Mexico. It has limited distribution in the Black Hills and northern Great Plains. It is found from Minnesota to Maine and south to Iowa, Illinois, Ohio and Georgia. Some European populations have been

introduced to North America and it is cultivated in Hawaii (Walsh, 1995). For current distribution, consult the Plant Profile page for this species on the PLANTS Web site.

## Adaptation

Tufted hairgrass occurs from sea level to 14,000 feet elevation on moderately moist to seasonally flooded, water logged sites in 20+ inch annual precipitation zones. It prefers full sun but can be found in partially shaded environments (rarely found under dense shade) with a wide variety of soil types from gravel to clay textured soils and soil pH ranging from 3.5 to 7.5. Some populations have strong tolerance to heavy metals and high soil acidity. Salinity tolerance is generally considered low, but plants occurring in upper tidal marshes may be more salt tolerant. Some populations also tolerate sites with low fertility. Associated plants commonly found growing with tufted hairgrass include sedges, rushes and bentgrass (Darris and Gonzalves, 2009), (Majerus, 2009), (Walsh, 1995), (Davy 1980). In western North America tufted hairgrass may dominate plant communities above treeline. It occurs along moisture gradients from the middle of lee slopes with early melting snowdrifts to the bottoms of lee slopes with very wet meadows (Walsh, 1995). Tufted hairgrass culms and leaves are often killed by wildfire but root crowns generally survive all but the most severe fires (Walsh, 1995).



Tufted hairgrass is a frequent component of upper tidal marshes along the Pacific Coast of North America. (Photo by Dale Darris).

## Establishment

Tufted hairgrass has approximately 1,300,000 seeds per pound (PLANTS Database). The recommended full seeding rate is 1.5 pounds pure live seed (PLS) per acre (Ogle et. al, 2010). Seed that has been delinted (hairs and awns removed from the hulls by a debearder or brush machine) flows more readily and precisely through standard drills and broadcast seeders. The species is slow to establish the first year but can dominate a site by the third year if seeding rates are heavy (2 to 3 pounds per acre). If used as a component of a seeding mix, adjust to percent of mix desired and it should be limited to no more than ¼ to

½ pound per acre if species diversity is a goal (Darris and Gonzalves, 2009). For critical area or broadcast seeding, double the seeding rate. The recommended seeding rate for turf varieties is 1 to 2 pounds per 1000 square feet. The seedbed should be firm and weed-free. Weeds should be controlled by mechanical cultivation or with herbicides prior to seeding. Most seeding in interior or alpine regions is accomplished in late fall or early winter as a dormant planting as most sites are too wet during the spring and early summer. Some populations, particularly alpine seed sources, can have dormant seed and benefit substantially from 45 to 90 days of cold moist stratification (Kaye 1997), (Bartow per. com.). In certain areas, including coastal, low elevation regions with milder winters, sowing nondormant seed is done in spring, late summer, or early fall depending on rainfall patterns and soil moisture conditions. Because of the small size of the seed and the advantage of sun light which enhances germination, shallow seeding depth (0 to ¼ inch) or only a light mulch covering is recommended. Starter fertilizers are generally not recommended for reclamation or restoration plantings where soils are well developed. However, establishment on highly eroded or depleted sites can benefit from soil amendments and fertilization based on a soil test, and high seeding rates (Walsh, 1995).

For reclamation of sites contaminated with heavy metals or acidic soils, it is recommended to use seed sources from similar sites (Darris and Gonzalves, 2009), (Walsh, 1995).

### **Management**

Tufted hairgrass is slow to establish the first year but can dominate a site by the third year if seeding rates are high and conditions allow. Once established, use a rotational, moderate use grazing system since this species often declines with continuous, season long use. Defer grazing each spring until soils are dry enough to prevent damage to the soils and plants and defer grazing at least one year after wildfire to allow recovery (Walsh, 1995), (Darris and Gonzalves, 2009). Grazing practices should allow for ample seed set at least once every 3-4 years to maintain stands (Walsh, 1995).

Species composition within tufted hairgrass meadows is very sensitive to changes in water table. Lowering of the water table by channel cutting, poor road locations and drought have changed site potential and favored the expansion of Kentucky bluegrass (*Poa pratensis*) and perennial forbs in central Oregon. Raised water tables favor increase in sedge and rush dominance (Walsh, 1995).

### **Pests and Potential Problems**

Tufted hairgrass is susceptible to diseases including ergot, several rusts, stripe smut, blind seed, several

leaf spots, rapid blight, and the turf disease, take-all patch. Insect pests include aphids, billbugs and leafhoppers (Darris and Gonzalves, 2009).

### **Environmental Concerns**

Tufted hairgrass is a bunchgrass that reproduces by seed. It generally does not move from its planting location except under ideal climatic and environmental conditions. However in some parts of Europe, it is known to spread readily into recently disturbed areas, is a weed in some forage crops, and can become a serious competitor with young trees (Davy, 1980), (Darris and Gonzalves, 2009).

### **Seed and Plant Production**

Tufted hairgrass can be grown for seed on well drained medium to fine textured soils on uplands and on poorly drained silt and clay soils in low lying areas. If planted on seasonally flooded areas, fields must be firm enough to perform weed control and dry enough to harvest as early as mid-June in western Oregon. It is slow to establish compared with many introduced grasses and does not compete well with volunteer seedlings, especially ryegrass (*Lolium* spp.). Fields should be fallowed for two years following other grasses before planting tufted hairgrass. The seedbed should be moist, fine, very firm, weed-free and mostly free of residue. Tufted hairgrass is highly cross-pollinated by wind so isolation standards similar to those set for Certified (variety and pre-variety) seed production should be used if multiple sources are grown in the same proximity (Darris, et al., 1995). For example in Oregon, minimum isolation distances for tufted hairgrass are as wide as 900 feet depending on generation and field size (Oregon Seed Certification Service, 1998).

### **Seed Production**

Spring or fall seeding is recommended in Oregon for non-dormant seed. In colder interior regions late dormant seedings are recommended. Dormant seed should be sown only in the late fall for best results. Seeding rates are 1 to 2 pounds PLS per acre with row spacing of 24 to 36 inches and planting depth of ¼ inch (Smith Jr. and Smith, 1997), (Darris, et. al, 1995). Large, robust ecotypes appear to be particularly sensitive to narrow row spacing (Darris and Stannard, 1997). Besides maximizing seed yield of some populations, widely spaced rows facilitate cultivation for weed control and the maintenance of rows by removing unwanted volunteers.





Tufted hairgrass seed. Steve Hurst @USDA-NRCS-PLANTS Database.

### Fertilization

Fertilizer recommendations vary by region. In lowland regions of western Oregon, 25 to 35 lbs of N per acre may be optionally applied at or shortly after seeding. For established stands on better drained soils, the highest seed yields are obtained by applying 100 lbs of N per acre in February or March, in a single or split application (50/50) one month apart. There is no improvement in yields with supplemental applications of 25 lbs N per acre in fall (Darris 2000). Split applications of fertilizer are recommended for uniformity, ease of management, to accommodate crop uptake and to provide flexibility in avoiding unfavorable weather conditions (Hart, et. al, 2005). Fertilizer applications should be based on soil tests. Phosphorous (P), potassium (K), and sulfur (S) may be limiting and should be applied according to recommendations for tall fescue (*Schedonorus phoenix*, synonym: *Festuca arundinacea*) seed production by Oregon State University (Hart et al., 2005). In the Intermountain, Rocky Mountain, and Great Plains regions, 45 lbs of N per acre is recommended annually (Smith Jr. and Smith, 1997).

### Weed control

Weed control is important in both new and established stands. In Oregon, annual bluegrass (*Poa annua*) and rattail fescue (*Vulpia spp.*) can be particularly competitive during the first two years of establishment. Well established stands will shade out most annual bluegrass by the third growing season. However, rattail fescue can be more persistent and is difficult to screen out of the seed during seed processing. Broadleaf weeds can be controlled with rousing, row cultivation, and herbicides in both new and established stands (Smith Jr. and Smith, 1997), (Darris, et. al, 1995). In Oregon only, grass weeds and volunteers can be controlled in established stands with one or more herbicides labeled for “grasses grown for seed”. Spot and between the row treatments of glyphosate herbicide including the use of shielded sprayers may be an option in certain

regions and states. Always read and follow herbicide label instructions.

### Irrigation

In western Oregon, irrigation is seldom required for newly fall sown or established stands due to high precipitation between fall and spring. However, spring plantings require periodic irrigation throughout the first summer of establishment. In areas with lower precipitation or droughty soils such as the intermountain west, growing season irrigation may be required every year for stand maintenance and seed production. It is recommended that stands be irrigated prior to flowering (not during pollination if sprinkler irrigated) and after seed harvest. In the fall, soil moisture levels should be brought to field capacity by early September (Smith Jr. and Smith 1997), (Darris et al., 1995).

### Harvesting

Tufted hairgrass seed shatters readily at maturity so careful timing of harvest is critical. Harvesting is done by (1) swathing (windrowing) followed by combining (threshing) the dry seed stalks a week or two later (preferably at 10% or less seed moisture content), (2) direct combining then drying the seed (below 104°F or 40°C), or (3) direct removal of seed from the panicles using a flail-vac seed stripper then drying the seed for several days (Darris et al., 1995), (Anderson per. com.), (Smith Jr. and Smith, 1997), (Krautzer et al., 2004). If windrowed, it is recommended that seed be at soft to mid dough stage (late June to mid-July in western Oregon and in August in Alaska) and allowed to cure in the field for seven to 14 days followed by combining. Direct combining is done when 5 to 10% of the seed has shattered. When using a swath/combine or direct combine method, leave a stubble height similar to the height of the tuft to reduce the amount of herbage passing through the combine (Darris et. al, 1995), (Krautzer et al., 2004). Stands should be cut once more after harvest and the crop aftermath quickly bailed and removed, or the stubble cut with a flail chopper (forage harvester) and residues piled and burned or composted. The remaining stubble should be a height of 3 to 5 inches. Overtime, basal tufts of robust ecotypes become rank and elevated and thus susceptible to damage from chopping or mowing at low heights. Open field burning may be an option for post-harvest residue management in some states or regions.

Average seed yields can vary widely from 20 to 350 pounds per acre for highly processed seed lots (Smith Jr. and Smith, 1997), (Hunt and Wright, 2007), (Darris and Flessner, 2001), (Edminster, per. com.), (Krautzer et al., 2004) depending on genetics, methods, and region. Yields as high as 1000 lbs per acre have been achieved in western Oregon for highly bred turf type varieties which have much

higher densities of fertile tillers (Edminster, per. com). In general, seed yields the first full growing season are substantially less and may be zero depending on the planting date, rate of plant development, and vernalization requirements of specific populations.

### **Seed processing and storage**

A three-step process is used to clean the seed. 1) scalp and remove fines; 2) delint with a huller/scarifier or debearder; 3) re-clean with a 1, 2 or 3 screen cleaner. A common weed seed contaminant is rattail fescue which can be removed using an indent cleaner or Carter-disk (Darris, et. al, 1995). Others suggest that scalping and debearding are not required (Smith Jr. and Smith, 1997).

Seed of tufted hairgrass stores best under conditions of low air humidity (to maintain a seed moisture content between 5 and 10%) and cool temperatures (preferably 32 to 50° F). Germination rates can decline by 25 to 50 percent in one year without climate control (Darris, et. al, 1995). However, germination rates of seed stored in controlled environmental conditions does not change appreciably. Seed of 'Peru Creek' harvested in 1997 with a germination rate of 88 percent, still had 55 percent germination when tested 10 years later.

### **Plant Propagation**

Tufted hairgrass can be established from transplants or sod. At the Aberdeen, Idaho Plant Materials Center, container (plug) plants are easily propagated in 10 cubic inch containers. Seed is pressed into the surface of a 1:1:1 mix of coconut fiber, compost and perlite and kept moist with an overhead mist irrigation schedule of 2minutes per hour during the day and day time greenhouse temperatures of 90-110° F for approximately three months before out-planting (Tilley, 2010).

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

'**Nortran**' was developed by the Agricultural and Forestry Experiment Station of the University of Alaska – Fairbanks in 1986. It was selected from collections made in Alaska and Iceland that tolerate acidic soils, low fertility and cold and wet locations. It has the ability to reseed itself on disturbed lands, is persistent under continual cutting or foraging and may be resistant to many rusts and snow molds. Breeder and Foundation seed is maintained by the Alaska Plant Materials Center (Hunt and Wright, 2007).

'**Peru Creek**' was released by the Upper Colorado Environmental Plant Center, USDA Forest Service and the Colorado Agricultural Experiment Station in 1994. The original source is from Summit County Colorado at an elevation of 11,300 feet. In

comparison trials, Peru Creek was the only accession that produced large forage yields and viable seed on mine spoils with pH 3.2-4.0. Peru Creek is recommended for revegetation of high elevation sites with low pH (acid) soils. Breeder and Foundation seed is maintained by the Upper Colorado Environmental Plant Center.

**Tillamook Selected Class Germplasm** was released by the Corvallis, Oregon Plant Materials Center and the Oregon Agricultural Experiment Station in 2002. The original source is from a coastal estuary in Tillamook Co., Oregon, at an elevation of less than 10 ft. It was selected for high plant vigor, clipping response, and foliage appearance from collections made in western Oregon and western Washington. The germplasm is intended for erosion control and revegetation along freshwater and slightly brackish waterways in coastal zones of Oregon and Washington (Darris and Flessner, 2001).

**Willamette Selected Class Germplasm** was released by the Corvallis, Oregon Plant Materials Center and the Oregon Agricultural Experiment Station in 2002. The original source is from Linn Co., Oregon, at an elevation of 225 ft. Selected from the same assembly of populations as Tillamook Germplasm, it also ranked high in plant vigor and clipping response among other factors. The intended uses include streambank and shoreline stabilization, revegetation of seasonal freshwater wetlands, and wildlife cover in the western interior valleys of Oregon and Washington below 1500 ft in elevation (Darris and Flessner, 2001).

Besides varieties and germplasm recommended for reclamation and restoration, there are least eight turf varieties of tufted hairgrass available in North America and Europe. Among them include 'Barcampsia', 'Shade Champ', 'Spike', and 'SR 6000'. The species is also widely used in ornamental and landscape plantings because of its fine wispy seed heads, selected variation in flowering color or form, and winter persistent yellow, gold, or tan stems. There are at least 20 registered and unregistered ornamental cultivars in the nursery trade.

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