

CRESTED WHEATGRASS

Agropyron cristatum (L.)
Gaertn.
Plant Symbol = AGCR

Contributed By: USDA, NRCS, Idaho State Office



Jeanne M. Janish
 Cronquist et al. (1977)
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Alternate Names

fairway wheatgrass, fairway crested wheatgrass

Uses

Grazing/rangeland/hayland: Crested wheatgrass is a perennial, introduced grass commonly seeded in the arid sections of the western United States. Crested wheatgrass is commonly recommended for forage production. It is palatable to all classes of livestock and wildlife. It is a preferred feed for cattle, sheep, horses, and elk in spring and also in the fall, if additional growth occurs. It is considered a desirable feed for deer and antelope in spring and fall, if additional growth occurs. It is not considered a desirable feed for cattle, sheep, horses, deer,

antelope, and elk in the summer. In spring, the protein levels can be as high as 18 percent and decrease to about 4 percent as it matures. Digestible carbohydrates remain high throughout the active growth period. It is commonly utilized for winter forage by cattle and horses, but protein supplements are required to ensure good animal health. It is noted for its ability to withstand very heavy grazing pressure (65-70 percent utilization), once stands are established. Crested wheatgrass is a good forage producer in the areas where best adapted. Crested wheatgrass is generally not recommended above 12-14 inches of precipitation, because better, alternative forage species are available. Crested wheatgrass stands generally produce from 1.5 to 2 times more than native grass stands, generally in the bluebunch wheatgrass (*Pseudoroegneria spicata*) ecosystems. The best forage types, in order, are Siberian, desert, and Fairway.

Erosion control/reclamation: Crested wheatgrass is well adapted to stabilization of disturbed soils. It competes well with other aggressive introduced plants during the establishment period. Crested wheatgrass is not compatible in mixes with native species, because it is very competitive and will out-compete slower developing native species. Their drought tolerance, fibrous root systems, and good seedling vigor make these species ideal for reclamation in areas receiving 8 to 16 inches annual precipitation. In areas above 14 inches annual precipitation, 'Roadcrest' and 'Ephraim' may exhibit their rhizomatous traits and make excellent low maintenance lawns when broadcast seeded to establish thick lawns. These grasses can be used in urban areas where irrigation water is limited to provide ground cover, weed control and to stabilize ditch banks, dikes, pipelines, power lines, and roadsides.

Wildlife: Birds and small rodents eat crested wheatgrass seeds. Deer, antelope, and elk graze it, especially in spring and fall. Upland and songbirds utilize stands for nesting. Where it is planted as a monoculture, the resulting biodiversity is lower than that found in a diverse plant community.

Status

This is a species introduced from Asia. Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's

current status, such as, state noxious status and wetland indicator values.

Description

General: Grass Family (Poaceae). It is a long-lived, cool season, drought tolerant, introduced, and winter hardy grass with an extensive root system. Related species include the following: Desert wheatgrass (*Agropyron desertorum*) and Siberian wheatgrass (*Agropyron fragile*).

Spike 2 to 7 cm long. The spikelets more widely spreading with the glumes somewhat contoured, gradually tapering into awns 2 to 5 mm long. Fairway or crested wheatgrass has short-broad spikes that taper at the top, smaller seeds, grows shorter, and has finer leaves and stems than desert wheatgrass. Desert wheatgrass has longer spikes than fairway, but vary in spike shape from comb-like to oblong. Fairway and desert grow from 1 to 3 feet tall with seed spikes 1.5 to 3 inches long. Spikelets are flattened, closely overlapping, oriented at a slight angle on the rachis. The lemmas are linear-lanceolate narrowing to a short awn. Glumes are awl shaped and firm, and keeled. Culms are erect. Leaves are flat, smooth below, slightly scabrous (coarse) above and vary in width from 2 to 6 mm. Siberian is very similar to fairway and desert, but has finer leaves and stems, narrower and awnless glumes and lemmas, and the spikelets are more ascending, which gives the spike a narrow, oblong, sub-cylindrical shape. Siberian is more droughts tolerant and retains its greenness and palatability later into the summer than either desert or fairway.

Distribution

This species was introduced from Asia and is naturalized from the Pacific coast to New York. For current distribution, please consult the Plant Profile page for this species on the PLANTS Web site.

Establishment

Crested wheatgrass should be seeded with a drill at a depth of 1/2 inch or less on medium to fine textured soils and 1 inch or less on coarse textured soils. Single species seeding rates recommended for crested wheatgrass and its close relatives are 5-7 pounds Pure Live Seed (PLS) per acre or 20 to 30 PLS per square foot. Single species seeding rates recommended for Siberian wheatgrass is 6-8 pounds PLS per acre or 24-30 PLS per square foot. If used as a component of a mix, with alfalfa (*Medicago* spp.), sainfoin (*Onobrychis viciifolia*), yellow sweetclover (*Melilotus officinalis*), cicer milkvetch (*Astragalus cicer*), or others adjust to percent of mix desired. For mined lands and other harsh critical areas, the

seeding rate should be increased to 10-12 pounds PLS per acre or 40 to 50 PLS per square foot. Mulching and light irrigation on highly disturbed, droughty areas are beneficial for stand establishment.

The best seeding results are obtained from seeding in very early spring on heavy to medium textured soils and as dormant seeding in late fall on medium to light textured soils. Late summer (August - mid September) seedings are not recommended unless irrigation is available.

Crested and Siberian wheatgrasses establish quickly, with 'Hycrest' and 'Vavilov' noted for their seedling vigor. They should not be seeded with native species, unless seeding rates are very low (< 2 pounds per acre). They may compliment native stands that are already partially established. Under favorable conditions they are good weed barriers.

Stands may require weed control measures during establishment, but application of 2,4-D should not be made until plants have reached the four to six leaf stages. Mow when weeds are beginning to bloom to reduce weed seed development. Grasshoppers and other insects may also damage new stands and use of pesticides may be required.

Adaptation: Crested wheatgrass is adapted for non-irrigated seedings, where annual precipitation averages 8-16 inches or more (fairway should average 10 inches or more), and where the frost-free period is generally less than 140 days. Desert and hybrid cross are superior above 8 inches annual precipitation in spring recovery and grazing readiness. On droughty sites with 7-10 inches annual precipitation, Siberian wheatgrass may be the best choice. It is known to surpass desert and hybrid cross in rate of establishment, stand persistence, and total forage yield on the more arid sites. Siberian has been seeded in areas with as little as 5 inches of precipitation with some success.

Crested wheatgrass should generally be seeded below 7,000 feet elevation. Fairway does well up to 9,000 feet elevation. Crested wheatgrass does well on shallow to deep, moderately coarse to fine textured, moderately well to well drained soils. Under saline conditions, vigor and production are reduced. Fairway is not well adapted to silty soils. Siberian types are well adapted to light-sandy, droughty soils. All crested wheatgrasses are cold tolerant and can withstand moderate periodic flooding, not exceeding 7-10 days in the spring. They are very tolerant of fire. They will not tolerate long periods of

inundation-standing water, poorly drained soils, or excessive irrigation.

Management

Crested wheatgrass produces leaves in the spring about 10 days after bluegrass species and about two weeks earlier than native wheatgrasses. They make good spring growth, little summer growth and good fall growth if moisture is available.

Crested wheatgrass has good palatability for livestock and some wildlife. Livestock and wildlife will graze crested wheatgrass throughout the spring growing season until it becomes too coarse, and again in fall if re-growth occurs. Established stands can withstand very heavy grazing.

New stands of crested wheatgrass should not be grazed until they are firmly established and have started to produce seed heads. Six inches of new growth should be attained in spring before grazing is allowed in established stands. Three inches of stubble should remain at the end of the grazing season to maintain the long-term health of the plant. In addition, leaving three inches or more stubble will result in a 10 - 14 day earlier growth period or "green-up" in spring.

Crested wheatgrass is a low maintenance plant requiring little additional treatment or care. However, spring/fall deferment or grazing rotations are recommended to maintain plant health and to maximize forage production potential.

Crested wheatgrass is competitive with weedy species, but can be crowded out by some aggressive introduced weedy species and native woody species.

Crested wheatgrass can be used for hay production and will make nutritious feed, but is more suited to pasture use. Light infrequent applications of nitrogen (25 pounds/acre) and light irrigation will increase total biomass production and lengthen the growing period. Re-growth of crested wheatgrass is slow.

Environmental Concerns: Crested wheatgrass is long-lived and spreads primarily via seed. Spread of rhizomatous varieties is very slow in the case of the 'Roadcrest' and 'Ephraim'. They are not considered "weedy" or invasive species. Most seedings do not spread beyond original plantings. They will cross with each other, but do not cross with native species.

Crested wheatgrass resists cheatgrass competition better than most native species, because it germinates earlier and grows more rapidly at colder

temperatures. This has an important competitive advantage, when dealing with winter annual species, such as cheatgrass.

Full, properly managed stands of crested wheatgrass generally exclude native grasses and forbs. When inter-seeded into native stands, crested wheatgrass commonly co-exists with native grasses, forbs and shrubs. Some native shrubs, such as big sagebrush and rabbitbrush, often invade crested wheatgrass stands, especially if native seed sources are nearby.

Due to commonly being planted in monocultures (single species) stands in the past, some feel crested wheatgrass is not ecologically appropriate. It is important to consider the paragraph above and to plant multiple species mixes to avoid this perception.

Seed Production

Seed production of crested wheatgrasses has been very successful under cultivated conditions. Row spacing of 24 to 30 inches when irrigated and 36 inches or greater under dryland conditions are recommended. Early spring or late fall seedings are recommended under dryland conditions. Early spring seedings are recommended under irrigated conditions. When irrigated, spring seedings consistently yield more seed during the first year of seed production. To obtain maximum seed production, fall plantings are not recommended.

Control weeds during stand establishment and long term management of stand by clipping, hand rouging or light rates of herbicide (2,4-D or Bromoxynil according to label) after the five-leaf stage. Fertilizer is generally not recommended during establishment. If soil nitrogen and phosphorus are low, an application of 10-15 pounds per acre nitrogen and 20-30 pounds per acre phosphorus may be applied prior to planting. Fertilize for full seed production following the establishment year in early fall or use a split application in early fall and again in early spring. Very early spring application of nitrogen may be beneficial on sandy soils to promote vegetative growth. When irrigated, apply adequate moisture for germination, establishment, and to bring soils to field capacity. Following stand establishment, fertilize and irrigate soon after seed harvest in fall to stimulate seed head primordia development. Do not stress plants during re-growth and tillering in the fall, late boot stage, and during pollination. Avoid irrigating during flowering.

Seed fields are productive for four to five years. Average production of 200 to 300 pounds per acre can be expected under dryland conditions in 14 inch

plus rainfall areas. Average production of 500 to 600 pounds per acre can be expected under irrigated conditions. The seed heads do not readily shatter, but some shatter can be expected. Harvesting is best completed by direct combining when the top of the seed head begins to shatter or wind-rowing at hard dough stage and combining with pickup attachment in about 5 to 7 days. Seed is generally harvested in mid July to mid August.

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

Foundation and registered seed is available through the appropriate state Crop Improvement Association or commercial sources to grow certified seed.

Agropyron cristatum is not as drought tolerant as desert or Siberian wheatgrasses. They are adapted to the northwest, intermountain, and Great Plains regions with at least 10 inches of annual precipitation. They do well on shallow to deep, moderately coarse to fine textured, moderately well to well drained and weakly acidic to moderately alkaline (saline and sodic) soils. Under alkaline conditions, vigor and production are reduced. The Fairway type was first recognized in 1950 as being different than other crested types. Fairway is shorter, denser, finer stemmed, and less productive than desert wheatgrass at lower elevations and may exceed desert wheatgrass production at higher elevations. Cultivars include the following: 'Douglas', 'Ephraim', 'Parkway', 'Roadcrest', and 'Ruff'.

'Douglas' was developed by ARS in Logan, Utah and released in 1994 in cooperation with the Utah Agricultural Experiment Station and NRCS. The breeding populations were derived from accessions originating in the former USSR, Iran, and Turkey. One accession was characterized with very broad leaves and was used as the female parent in all crosses. Douglas has larger seed than other crested wheatgrasses and has excellent seedling vigor. It produces less forage than other cultivars, but is leafier and remains green longer into the growing season suggesting improved forage preference and improved fire resistance. Douglas requires 13-14 inches or more annual precipitation. It is not recommended for turf applications, but may work very well in roadside applications. Certified seed is available. ARS in Logan, Utah maintains breeder and foundation seed.

The Forest Service Shrub Laboratory in Provo, Utah and Utah Division of Wildlife Resources developed 'Ephraim' from an accession originating in Turkey. It was released in 1983 by the developing agencies in

cooperation with NRCS and Agricultural Experiment Stations in Arizona, Idaho, and Utah. It is weakly rhizomatous, with rhizomes being expressed at higher precipitation zones above 14 inches. It is well adapted to disturbed areas, roadsides, and mine spoils. It has been used successfully as a low maintenance turf. It is not well adapted to silty soils. It is a good seed producer. Certified seed is available. Aberdeen PMC maintains breeder and foundation seed.

'Parkway' was developed by the Canada Department of Agriculture, Research Station, and Saskatoon, Saskatchewan and released in 1969. It is recommended for hay and pasture. It is a good seed producer and has good lodging resistance. It is not recommended for turf applications. Certified seed is available. Agriculture and Agri-Food Canada, Research Station, Swift Current, Saskatoon, Saskatchewan, maintains breeder and foundation seed.

'Roadcrest' was developed by ARS in Logan, Utah and released in 1998. It is a long-lived perennial, and is significantly more rhizomatous than Ephraim, the only other somewhat rhizomatous crested wheatgrass cultivar. Roadcrest is recommended for use along roadsides or similar low-maintenance turf application areas in 10 inch and higher rainfall areas. Certified seed is available. ARS in Logan, Utah maintains breeder and foundation seed.

'Ruff' was developed by ARS, Lincoln, Nebraska and released in 1974 by ARS and the Nebraska Agricultural Extension Service. It is recommended for a short season, spring forage crop. It can be used as a low maintenance turf on roadsides, parks, and playgrounds in low rainfall areas of the central Great Plains. Common seed is available, but certified seed is not available.

Agropyron desertorum is more drought tolerant than crested or fairway wheatgrass. It is not as drought tolerant as the Siberian type. Desert wheatgrass is adapted to the Northwest, Intermountain and Great Plains regions with at least 8 inches ('Douglas' requires 13-14 inches) of annual precipitation below 6500 feet elevation. It does well on shallow to deep, moderately coarse to fine textured, moderately well to well drained and weakly acidic to moderately alkaline soils. Under saline conditions, vigor and production are reduced. It is considered slightly more saline tolerant and more productive than fairway wheatgrass.

The following cultivars are desert wheatgrasses: 'Nordan' and 'Summit'.

ARS at the Northern Great Plains Research Laboratory, Mandan, North Dakota, developed 'Nordan'. ARS and ND Agricultural Experiment Station released Nordan in 1953. It is uniform, erect, with heavy seeds that are awnless. The seed heads are dense and compressed. It has good seedling vigor and seed quality and long-term forage yields are equal to the newer varieties. It is very palatable in spring and fall, but less so in summer. Certified seed is available. ARS at the Great Plains Research Laboratory maintains breeder and foundation seed.

'Summit' was introduced from Western Siberian Experiment Station, Omsk, and former USSR. Canada Department of Agriculture released it in 1953. It is considered very similar to 'Nordan'. Certified seed is available. The Canada Department of Agriculture, Saskatoon, Saskatchewan, maintains breeder and foundation seed.

Agropyron cristatum × *Agropyron desertorum* is a hybrid cross, which results in a plant with excellent seedling vigor. The following cultivars are hybrid crosses and considered similar to desert wheatgrass: 'Hycrest' and 'CD-II'.

ARS in Logan, Utah released 'CD-II' in 1996. CD-II is a selection of 'Hycrest' and was released to ensure the genetic purity of the cross. It has increased growth characteristics under cold temperatures. Characteristics and performance are the same as Hycrest. Certified seed is available. ARS Logan, Utah maintains breeder and foundation seed.

ARS in Logan, Utah developed 'Hycrest' by crossing Fairway and desert wheatgrasses. ARS, NRCS, and Utah Agricultural Experiment Station released it in 1984. It is easier to establish than either of its parents and is more productive during the establishment period than either parent. Long-term productivity exceeds Fairway and it is equal to the desert wheatgrass. The leaves and stems are coarser and it has more stems than Fairway. Good stands have been established in the 8 inch or greater precipitation zones. It is best adapted to 5,000 to 9,000 feet elevation zones, but good stands are common to 2,500 feet. It does well on shallow to deep, coarse to fine textured, moderately well to well drained soils. Under slightly saline conditions, vigor and production are reduced. It is not adapted to excessively saline areas. Certified seed is available.

ARS, Logan, Utah, maintains breeder and foundation seed.

Agropyron fragile is similar to desert wheatgrass, but is considered more drought tolerant than fairway, desert, and hybrid cross types. 'P27' and 'Vavilov' are Siberian wheatgrass.

'P27' was developed by the Aberdeen and Pullman Plant Materials Centers from collections originating from Kazakhstan and was released in 1953 by NRCS, Aberdeen and Pullman PMCs, and Idaho Agricultural Experiment Station. Its seeds are awnless, have finer leaves, retain greenness, and retain palatability later into the summer than other crested or desert wheatgrass. It yields less and has poorer seedling vigor than these two related wheatgrasses. It is best adapted to 8 inches and above annual precipitation and is noted for tolerating longer drought periods once established better than other wheatgrasses. It is well adapted to light-sandy, droughty soils. Certified seed is available. Aberdeen PMC maintains breeder and foundation seed.

ARS in Logan, Utah developed 'Vavilov' from collections originating from the former USSR, Turkey, and P-27. ARS and the Utah Agricultural Experiment Station released it in 1994. Seedling vigor is similar to Hycrest and is consistently better than P-27. It is more droughts tolerant and better adapted to sandy soils than other crested wheatgrasses. It is best adapted to 8 inches and above annual precipitation up to 7,000 feet elevation and is noted for tolerating longer drought periods once established than other crested wheatgrasses. It is expected that Vavilov will eventually replace P-27 on the commercial seed market. Certified seed is available. ARS Logan, Utah maintains breeder and foundation seed.

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Edited: 17jan01jsp; 07feb03ahv; 24may06jsp

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CRESTED WHEATGRASS *Agropyron cristatum* (L.) Gaertn. Plant Symbol = AGCR

Contributed by: USDA NRCS Idaho State Office



Loren St. John
USDA NRCS Idaho PMC

Uses

Grazing/rangeland/hayland: Crested wheatgrass is commonly recommended for forage production. It is palatable to all classes of livestock and wildlife and is a desirable feed in spring and also in the fall if it regrows enough. It is commonly utilized for winter forage by cattle and horses, but protein supplements are required to ensure good animal health. It can withstand very heavy grazing pressure (65% use and greater) once stands are established. The best forage types in order are Siberian, desertorum, and Hycrest. The cristatum type is not considered a productive forage type.

Erosion control/reclamation: Crested wheatgrasses are useful for soil stabilization. They compete well with other aggressive introduced grasses, but because of this trait, they are not compatible in mixes with native species. Their drought tolerance, fibrous root

systems, and good seedling vigor make these species ideal for reclamation in areas with 8 to 20 inches annual precipitation. In areas above 14 inches of precipitation, the cristatum types may exhibit their rhizomatous traits and make excellent low maintenance lawns. These grasses can be used in urban areas where irrigation water is limited to provide ground cover and to stabilize ditchbanks, dikes, pipelines, powerlines and roadsides.

Wildlife: Birds and small rodents eat crested wheatgrass seeds; deer, antelope and elk graze it, especially in spring and fall. Upland and song birds utilize stands for nesting.

Status

Please 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

Crested wheatgrasses *Agropyron cristatum*, *Agropyron desertorum*, and Siberian wheatgrass *Agropyron fragile* are perennial grasses commonly seeded in the western United States. They are long-lived, cool season, drought tolerant, introduced grasses with extensive root systems. Cristatum type crested wheatgrass grows from 1 to 3 feet tall and seed spikes may be 1.5 to 3 inches long with a short-broad shape that tapers at the tip. Flower clusters within the spike are flattened and closely overlapping. Each seed has a short awn. Stems are leafy and erect, forming a dense tuft. Leaves are flat, smooth below, slightly coarse above, and vary in width from 1/16 to 1/4 inch.

Adaptation and Distribution

Cristatum type crested wheatgrass is adapted to areas where annual precipitation averages 10 and where the frost free period is generally less than 140 days; it does well up to 9,000 feet elevation. Crested wheatgrass grows on shallow to deep, moderately coarse to fine textured, moderately well to well drained and weakly acidic to moderately alkaline soils. Under saline conditions, vigor and production are reduced. The cristatum type is not well adapted to silty soils. All crested wheatgrasses are cold tolerant, can withstand moderate periodic flooding in the spring, and are very tolerant of fire. They will not

tolerate long periods of inundation, poorly drained soils or excessive irrigation.

Crested wheatgrass is distributed throughout the western United States. For a current distribution map, please consult the Plant Profile page for this species on the PLANTS Website.

Establishment

Crested wheatgrass should be seeded with a drill at a depth of 1/2 inch or less on medium to fine textured soils and 1 inch or less on coarse textured soils. Single species seeding rates recommended for all crested wheatgrasses are 5 to 7 pounds Pure Live Seed (PLS) or 20 to 30 PLS per square foot. If used as a component of a mix, adjust to percent of mix desired. For critical areas, increase the seeding rate to 40 to 50 PLS per square foot. Mulching and light irrigations on highly disturbed areas are beneficial for stand establishment.

The best seeding results are obtained from seeding in very early spring on heavy to medium textured soils and in late fall on medium to light textured soils. Late summer (August to mid September) seedings are not recommended unless irrigation is available.

If weed control is needed, application of 2,4-D should not be made until plants have reached the four to six leaf stage. Mow weeds that are beginning to bloom to reduce weed seed development. New stands may also be damaged by grasshoppers and other insects and use of pesticides may be required.

Management

Crested wheatgrasses produce leaves in the spring about 10 days after bluegrass species and about 2 to 3 weeks earlier than native wheatgrasses.

New stands of crested wheatgrass should not be grazed until they are firmly established and have started to produce seed heads. Six inches of new growth should be attained in spring before grazing is allowed in established stands. Three inches of stubble should remain at the end of the grazing season to maintain the long term health of the plant.

Crested wheatgrasses are low maintenance plants requiring little additional treatment or care. However, spring/fall deferment or grazing rotations are recommended to maintain plant health and to maximize forage production potential.

Crested wheatgrass can be used for hay production and will make nutritious feed, but is more suited to

pasture use. Light, infrequent applications of nitrogen (25 pounds/acre) and irrigation will increase total biomass production and lengthen the green period.

Environmental Concerns

Crested wheatgrasses are long-lived, spread primarily via seed, but may also spread via rhizomes in the case of the cristatum types. They are not considered "weedy" or invasive species. Most seedings do not spread beyond original plantings, or if they do spread, the rate of spread is not alarming. They will cross with each other (exception Siberian types do not cross with other types), but do not cross with native species.

Crested wheatgrasses resist cheatgrass competition better than native species because it germinates earlier and grows more rapidly at colder temperatures. This is an important competitive advantage when dealing with winter annual species such as cheatgrass.

Due to commonly being planted in monocultures (single species) stands in the past, some feel crested wheatgrasses are not ecologically appropriate. It is important to consider multiple species mixes to avoid this conception.

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

'Douglas' (former USSR, Iran and Turkey) may be used on roadsides; 'Ephraim' (Turkey) is rhizomatous when planted in higher precipitation zones above 14 inches, and is useful for disturbed areas, mine spoils, roadsides and turf applications; 'Parkway' is recommended for hay and pasture; and 'Ruff' is recommended for a short season spring forage crop, roadsides, parks, and playgrounds in low rainfall areas of the central Great Plains.

Crested wheatgrasses *Agropyron cristatum* (L.) Gaertn. X *Agropyron desertorum* (Fisch. ex Link) J.A. Schultes (Hycrest type) is a hybrid between the cristatum and desertorum types which results in a plant with excellent seedling vigor. 'Hycrest' (central Asia/former USSR) is easier to establish than either of its parents and is more productive during the establishment period than either parent. Long term productivity exceeds the cristatum type and is equal to the desertorum type.

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Edited: 31Jan2002 JLK; 24may06jsp

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