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**B**entgrasses have been utilized in American turf since the late Nineteenth Century. Native to Eurasia, the bentgrasses were widely distributed by European colonists and first commercialized by English seed companies. Early use was for "wetlands" pastures, followed by golf courses and lawns.

The genus *Agrostis*, according to Hitchcock's Manual of Grasses, consists of approximately 200 species plus many subspecies.

Although each is quite heterogeneous (mixed morphological types from seed propagation) there are four commonly accepted as turfgrass types:

- 1 *Agrostis Palustris* — creeping bent grass
- 2 *A. canina* — velvet bent
- 3 *A. tenuis* — colonial bent
- 4 *A. alba* — Redtop bent.

## Origin and types

**Creeping Bent:** A mixed species type known as South German Bent was first available for sowing of putting greens in the late 1800's. It was harvested from moist soil pastures in present day Austria and Hungary, and later from other areas of Europe.

South German consisted of varying proportions of the four above mentioned species and probably their natural hybrids. Resulting greens turf quickly segregated into predominating patches of individual creeping bents and velvet bent to a lesser extent in more favorable temperate climates.

In the absence of pesticides and turfgrass technology, or until the 1930's, much attention was devoted to the more vigorous and better appearing patches. Vegetative selection and propagation began in the 1920's with the initiation of the USGA Green Section

research program at the Arlington Turf Gardens. Similar efforts were practiced by early greenkeepers in their then-secretive methods to practice their trade by themselves.

**The C Series**—Although many hundreds of segregates were selected and propagated for turf, including over 200 in the "C" series of the USGA, only a handful managed to pass the ravages of nature and man. Among the best were Toronto (C-15) which proved best adapted in the midwest, Cohansey (C-7) with better heat tolerance, Washington (C-50) east of the Great Lakes, Arlington (C-1) and Congressional (C-19) in the mid-Atlantic region, and Old Orchard (C-52) for the upper Midwest. Many others were propagated and used to a lesser extent.

The evolution and use of vegetative bents as single genetic types has  
*continued on page 76*

# The Bent Grasses

by J.M. Duich, Ph.D., Pennsylvania State University, State College, PA



Segregation into patches happens quickly with South German Bent.

August blotches on *Poa annua*/bentgrass fairway under level management.

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**From the turf care group at Union Carbide**

## BENT GRASS from page 72

proven such narrow genotypes cannot long survive in pure form as most recently evidenced by the devastating "bacterial decline" of Toronto bent. Apomictic bluegrasses (genetically uniform) since the advent of Merion bluegrass in 1950 show a similar relapse over time and area to those who monitor the turf scene.

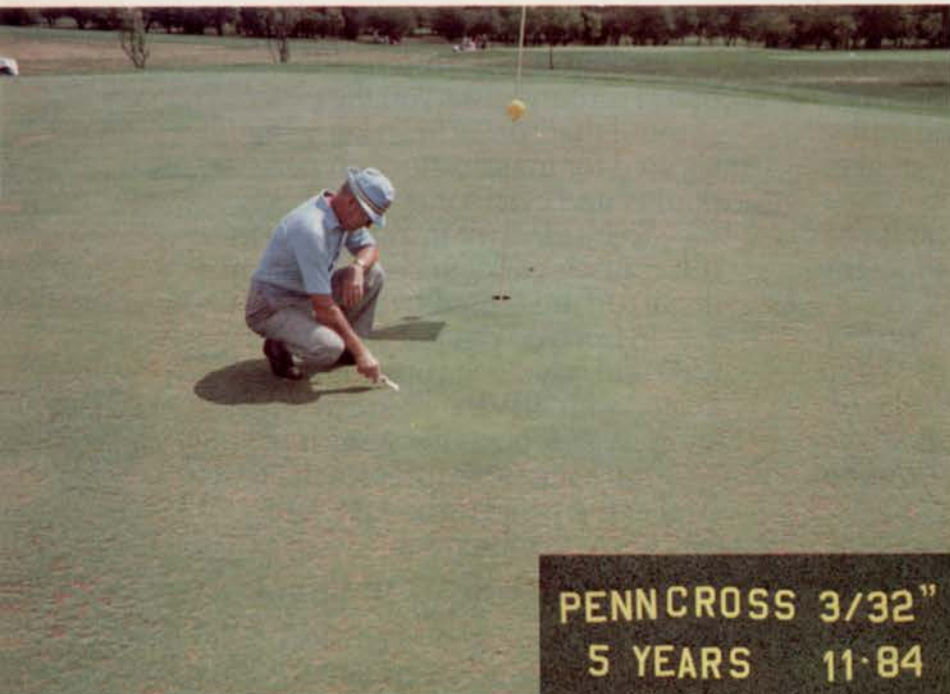
with *Poa annua*. Secondly, expanded use demonstrated its adaptation to be the widest of any cool-season grass variety. Finally, in conjunction with improved soil modification techniques, the development of fungicides for *Pythium*, and overall improved management technology, Penncross use extended further and further into the South.

Southern use increased due to a

each, from Washington and Seaside bents. Penneagle was bred for putting-green-quality upright growth, and vigor to compete with *Poa annua*, although curtailed compared to Penncross. Its use is increasing, particularly in northern areas for fairways.

**Emerald and Prominent**—Emerald (Smaragd) from Sweden and Prominent from Holland have been commercially available in limited quantities in recent years. Their performance at today's close heights of cut (approximately 1/8-inch) have yet to be proven. Ten year tests at Penn State show both to segregate and unable to compete with *Poa annua*.

Compared to other species, experimental work with creeping bentgrasses is quite limited. Bent improvement for fairways is underway at Rutgers, as well as improved winter-hardy types in Canada. At Penn State, PSU-126 has been distributed to over 100 golf courses in 30



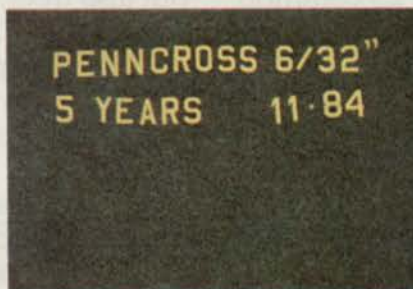
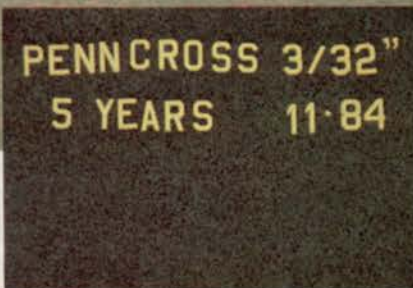
**Bacterial decline** of Toronto bent (C-15) except for patch of Cohansey at base of pin.

**Seaside**—The discovery and seed harvest of creeping bent growing in tidal flatlands pastures near Coos Bay, Oregon, in the late 1920's resulted in the first domestic source of creeping bent. Known originally as Coos or Cooos bent, Seaside has since been commercially available, but many locations and generations removed from the original.

Seaside use increased with the need for a seeded type to repair deteriorated or damaged vegetative greens. Except for a "synthetic" S. German composed of mixing domestic species of bent, Seaside was the only seeded creeping bent available for over three decades.

**Penncross**—The first seeded creeping bent bred specifically for turf, Penncross, became commercially available in 1956. Its availability coincided with the major northern golf course construction boom which lasted until the early 1970's. During this period, Penncross was used on over 90% of newly constructed courses.

Penncross use increased due to its ability to compete most favorably



**Algae infestation** on Penncross cut at 3/32-inch is not found on same grass cut at 6/32-inch.

cycle of winterkill of hybrid bermudass and a desire to eliminate the need for winter overseeding. Recent Penncross greens established in the deep south, especially Florida, shall warrant close attention relating to species adaptation and turf management skills.

**Penneagle**—Penneagle creeping bent (1978) was developed from four advanced generation selections, two

---

**The greatest single threat facing putting green bent is the season-long practice of excessive close mowing to maintain fast putting speeds.**

---

states, Canada and S. Africa. Pending continuing favorable performance, this upright growing creeping bent may become commercially available in 1986.

**Velvet Bent:** Since its introduction as a component of South German bent, velvet bent attracted attention due to its very dense and fine-textured foliage. Adaptation has been found as best suited to maritime climates, such as upper New England.

Velvet bents are tolerant of acid soils and shade. Upon establishment they must be sparsely fertilized with nitrogen to avoid thatching and sponginess. Former types such as Piper, Raritan Kernwood and various local types are no longer commercially available. Limited seed quantities of Kingstown, a University of Rhode Island release, are being produced.

**Colonial Bent:** Allegedly bunch types, colonial bents are tolerant of mowing under one-inch. Diverse growth habit types include those with short stolons and/or rhizomes. Upon



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being introduced from Europe, the colonial bents have always been identified as ecotypes based on their areas of initial naturalization.

New Zealand Browntop, Prince Edward Island and Rhode Island Colonial were among the earliest "varieties" commercialized. Since the mid-1930's, the Oregon production of Highland and Astoria bents has prevailed. Highland production exceeds all other bentgrasses tenfold!

Colonial bents were a common mixture component with Kentucky bluegrass and fine leaved fescues for many years prior to the advent of improved varieties. Their general use for this purpose rapidly declined as turf use expanded and the colonials dominated turf stands.

Musser and Duich evaluated the growth habit of 54 colonial bents in 1954. We found 44 of 45 domestic seed lots to contain from 3 to 51 percent stoloniferous types. One domestic and nine New Zealand types contained no stolons.

The main turf use of colonial bents in the U.S. has been for golf fairways beginning with the introduction of irrigation in the 1930's. Use increased in the late 40's as shorter heights of cut

plus irrigation eliminated bluegrasses and fescues.

During this period, colonial bents were found to be susceptible to many diseases, i.e. brownpatch, pythium, snowmolds, dollarspot, leafspots and others. Disease problems led to initial fungicide spraying of fairways in the early 1950's. By necessity, fungicide applications became a near weekly

### Triplex mowing, especially with clipping removal, is becoming the most innovative management approach in years.

practice for some. However, foremost among problems with the culture of colonial bents has been the dominance of invading *Poa annua*.

Varietal improvement has been limited to the non-creeping Exeter, Holflor, and Bardot cultivars. The dominance of lower cost Highland has

curtailed consumer interest in these varieties. An extensive program to develop rhizomatous colonial bents is under way at Penn State.

**Redtop Bent:** Quick germination and seedling growth were virtues for early use of Redtop in turf seed mixtures. However, the overuse of this small seeded grass led to its dominance of new turf stands. As a short-lived perennial, stands quickly deteriorated except for longer lasting rhizome types which are considered weeds. The introduction of turf-type perennial ryegrasses has practically eliminated Redtop as a turfgrass.

### Management trends

A major fallacy concerning bentgrasses, particularly the creeping, is that they require high levels of nitrogen, in particular, and water.

For years, texts, articles, and advertisements have stated bent greens need 1 to 1½ pounds N per month of growing season, tees higher yet, and fairways of approximately half these rates. Those utilizing such programs have had to cope with nothing but excesses: mowing, clipping, thatch, puffiness, scalping, grain, aeration, verticutting, spraying, *continued on page 104*



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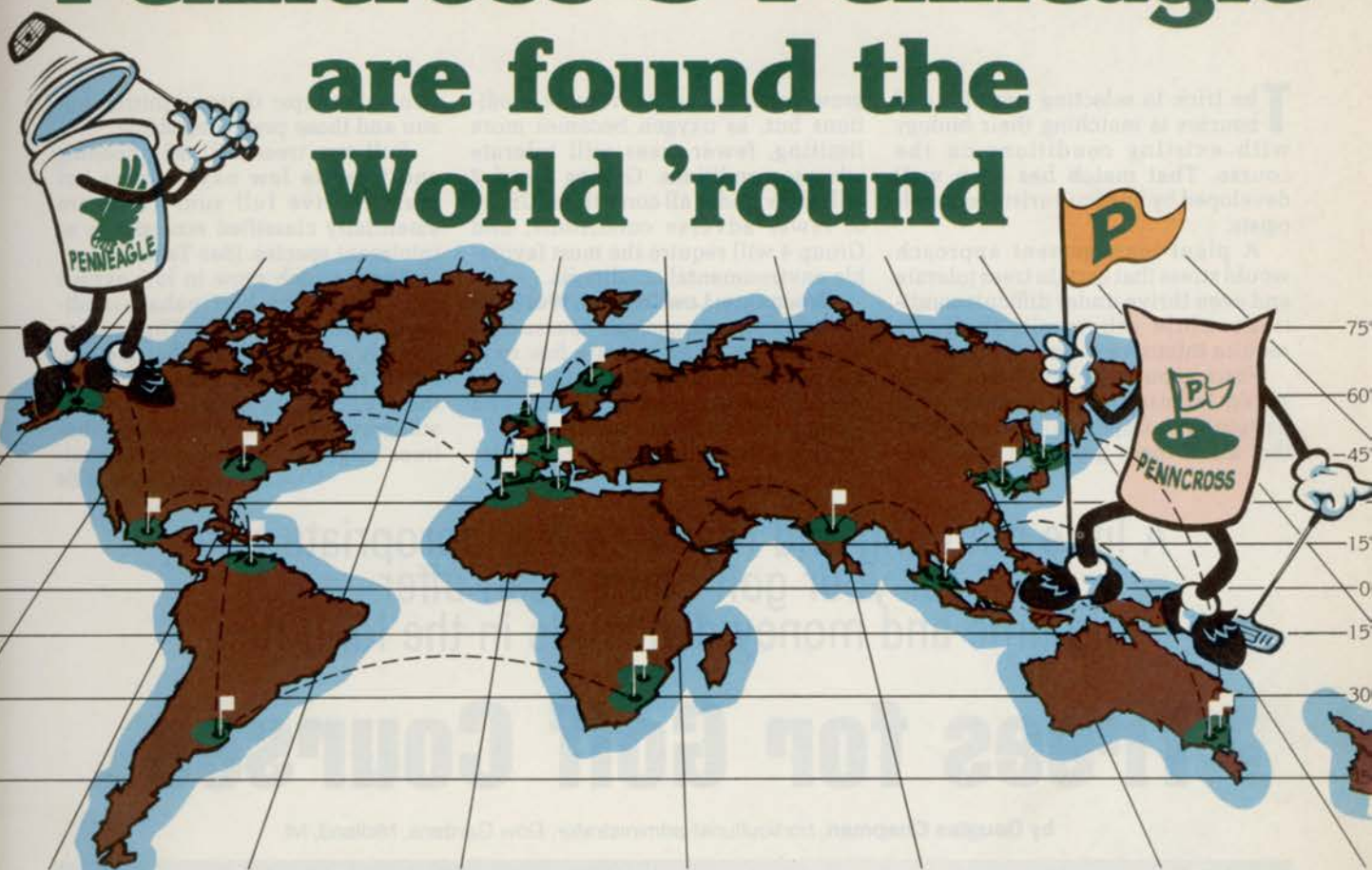
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The trick to selecting trees for golf courses is matching their biology with existing conditions on the course. That match has been well developed by horticulturists and ecologists.

A plant management approach would stress that certain trees tolerate and even thrive under difficult conditions while others either die or require intensive maintenance.

Four groups of trees are well-suited for use on golf courses. It is particularly important to recognize that all of these groups of trees will

grow under the most favorable conditions but, as oxygen becomes more limiting, fewer trees will tolerate adverse conditions. Groups 1 and 2 will grow under all conditions; Group 3, fewer adverse conditions; and Group 4 will require the most favorable environmental conditions.

**Group One: Low Oxygen, Wet Soils**

Trees under average golf course conditions must often tolerate low oxygen soils and some flooding. In nature, they frequently grow in swamps and along lake shores or streams.

These trees are best separated into

two subgroups; those requiring full sun and those preferring shade.

Full sun trees will take flooding and tolerate low oxygen soils but must receive full sun. These are essentially classified ecologically as intolerant species. (See Tables)

Trees which grow in low oxygen soils, yet perform best in shady conditions, are less numerous. They are frequently swamp plants that grow in either shade or full sun. The key is these understory or specimen plants will grow in heavier soils where other trees' might require extensive drain-

*continued on page 84*

A little planning and research on appropriate trees for your golf course can offer big time and money dividends in the long run.

# Trees for Golf Courses

by Douglas Chapman, horticulturist-administrator, Dow Gardens, Midland, MI



*Celtis occidentalis*, common hackberry, is a tree that requires well drained, fertile soil and is good for intensely maintained areas.