United States
Department of
Agriculture

Soil
Conservation
Service

Americus
Plant Materials
Center

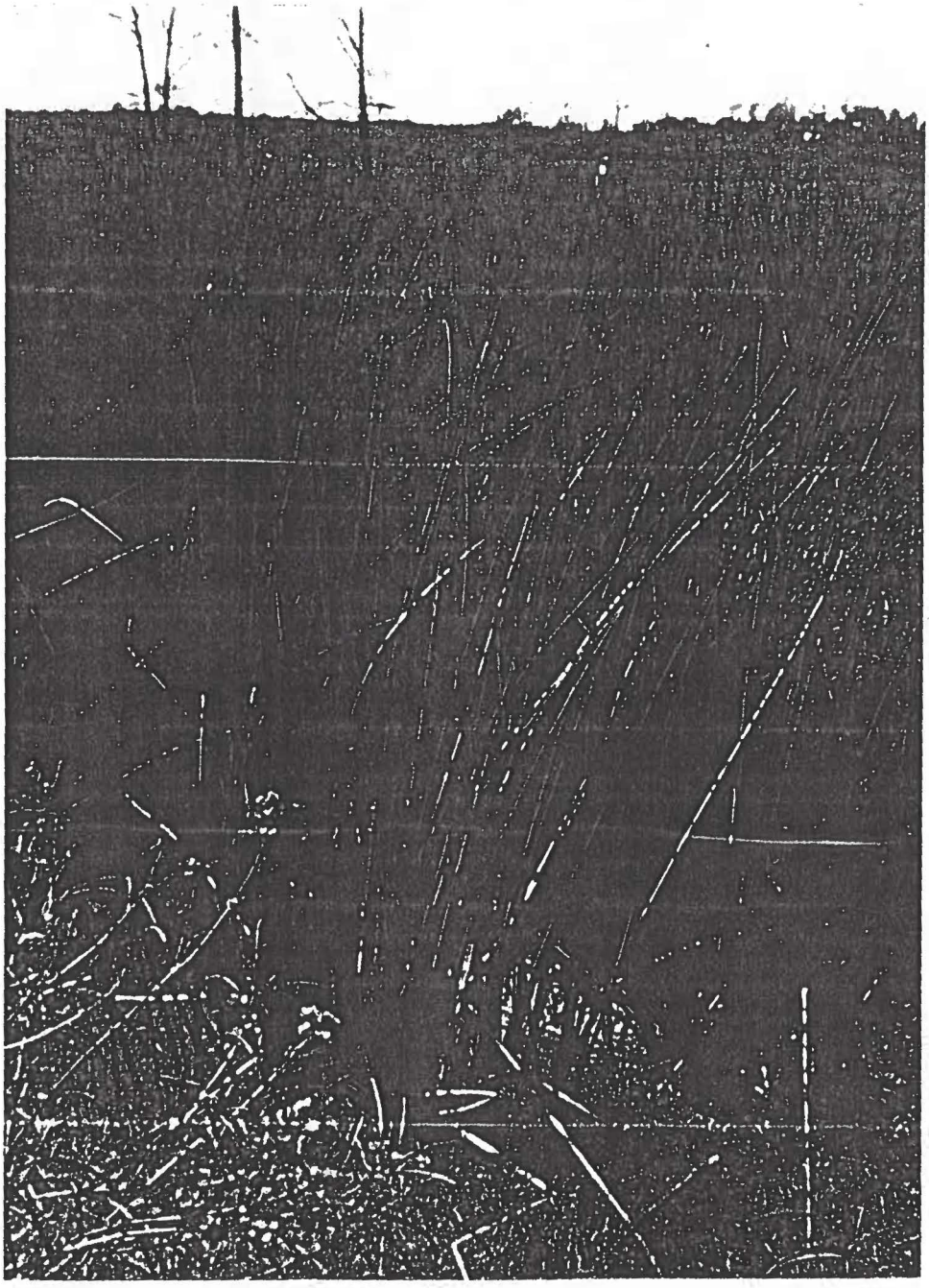
Americus, Georgia

# Release of

# 'RESTORER' Giant Bulrush

Scirpus californicus

A plant for use in constructed wetlands to treat agricultural non-point source pollution, and for the creation and restoration of wetlands.



**A release of the U.S. Department of Agriculture, Soil Conservation Service, Americus Plant Materials Center.**

**March 1993**

'RESTORER' GIANT BULRUSH

PUBLIC RELEASE DOCUMENTATION

Scirpus californicus (C. A. Meyer) Stued.

A PLANT FOR USE IN CONSTRUCTED WETLANDS TO TREAT AGRICULTURAL NON-POINT SOURCE POLLUTION, AND FOR THE CREATION AND RESTORATION OF WETLANDS

'RESTORER' GIANT BULRUSH

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

# NOTICE OF RELEASE OF 'RESTORER' GIANT BULRUSH

The United States Department of Agriculture, Soil Conservation Service, announces the release of 'RESTORER' Giant Bulrush, Scirpus californicus, (C. A. Meyer) Stued., as a selected ecotype. The other common names used for this species are California bulrush, Southern bulrush and tule. A plant for use in constructed wetlands to treat agricultural non-point source pollution, and for the creation and restoration of wetlands.

RESTORER Giant Bulrush was evaluated and selected for constructed wetlands at the Americus Plant Materials Center. It is being released by the Americus Plant Materials Center as a superior plant to be used in constructed wetlands in the southeast.

Recent evaluations reflect a growing concern over non-point source (NPS) pollution, especially agricultural wastewater, agricultural cropland runoff, and urban stormwater runoff. These principal contributors to NPS pollution problems have been difficult to remedy with conventional wastewater treatment and soil/water conservation methods.

NPS pollution from agricultural, urban areas, failed home septic tank drain fields, mining, and other land disturbing activities continue a detrimental impact 30-50% of our nations' waterways. Constructed wetlands have recently received considerable attention as low-cost, efficient means to clean up many types of

wastewater. Contaminated waters flowing through constructed wetlands are cleansed by a combination of physical, chemical, and biological activities and emerge as clean water (Hammer, 1990). The vegetative component is a major factor in the treatment processes that occur in constructed wetlands. The principal function of vegetation in constructed wetland systems is to create additional environments for microbial populations (Pullen and Hammer, 1989). The stems and leaves in the water column obstruct flow and facilitate sedimentation, and provide substantial quantities of surface area for attachment of microbes and constitute thin-film reactive surfaces. Plants increase the amount of aerobic microbial environment in the substrate. Wetland vegetation also increases the amount of aerobic environment available for microbial populations, both above and below the surface.

In recent studies of artificial wetlands, having emergent aquatic bulrushes (Scirpus spp.), cattails (Typha spp.) and reeds (Phragmites spp.), it was reported that nitrogen removal efficiency from sewage varied from 65.0 to 89.0% (Gersberg, 1984). The ammonia concentration of 24.7 mg/l in primary wastewater effluent flowing 4.7 cm/day, after being exposed to 3 aquatic plants, was reduced to 1.4, 5.3, and 17.7 mg/l for bulrush, common reed and cattails, respectively. Superior ammonia removal efficiencies of bulrushes and reeds were attributed to their better oxygen translocation ability from shoots to the roots. (Gersberg, 1986). Finlayson and Chick (1983) found N, and P removal efficiencies of Scirpus were superior to Phragmites australis and Typha spp. in artificial plastic lined wetlands receiving poultry effluent.

In 1989 the Soil Conservation Service, Americus Georgia Plant Materials Center evaluated a large assembly of aquatic plant species for potential use in constructed wetlands in Alabama and Georgia. Plants were assembled and evaluated in constructed wetland projects treating wastewater from a hog operation, dairy, catfish and a small municipality. The projects focused on obtaining more information on plants that will grow under different hydrological and substrate conditions. In addition, the projects were designed to determine which plants possess the most appropriate attributes for wastewater treatment. Also, planting methods, depth of planting,spacing by species, tolerance to ammonia, and operation and maintenance requirements of aquatic species were tested.

RESTORER can be transplanted easily with a hand tree dibble or a tractor drawn tree planter for planting larger constructed wetland sites. Bare root and container grown material can be used for transplanting. RESTORER will be commercially available in 1994.

Stem counts at two sample locations, Greensboro and Huntsville, Alabama revealed significant increases. Site 1 (Greensboro) was transplanted with three stem plants in June, 1992, and steadily increased to 20 stems in five weeks. Surface coverage at site 1 was significant all the growing season. Site 2 (Huntsville) was transplanted with three stem plants in May, 1992, and they increased to 25 in six weeks. The vigorous rhizome spread and tillering indicates that RESTORER can be planted on six feet centers and provide good surface

coverage the first growing season. Therefore, from an economic point of view, it costs the farmer, or other user about 50% less to plant RESTORER than to plant cattail which requires a spacing of three feet centers.

The U.S. Environmental Agency (EPA) conducted the analysis of water chemistry data at the Eatonton, Georgia site prior to installation of the constructed wetlands at the Key Dairy. The data revealed elevated nutrient concentrations during active lagoon discharge from this overloaded dairy lagoon. At the time total nitrogen and phosphorus concentrations exceeded 160 and 35 mg/l respectively. Since the installation of the constructed wetland, the frequency of discharge of solids and nutrients loading to the receiving streams have been reduced. In addition, comparisons of water chemistry data from the animal waste lagoon and constructed wetland indicate a greater than 90% and 80% removal of total nitrogen and phosphorus, respectively.

RESTORER survived winter temperatures of -2 F recorded at Sand Mountain Alabama Experiment Station. It maintains good vigor and green color late in the winter after most warm-season wetland plants have become dormant. Observations made in February of older stands in Eatonton, Georgia revealed only the top 25-30% of the plant stems were damaged by the winter temperatures. The bottom portions were still relatively green. New tillers were also observed in late winter below the water level.

Ager and Kerce (1970) documented the growth of giant bulrush (Scirpus californicus) in deep marsh areas and submerged vegetation zones which were only periodically exposed. This was probably due to the ability of bulrushes to

transport photosynthetic oxygen from the stems to the root system, (Langeland, 1981) and adaptation inherent in many aquatic vascular plants. Superior ammonia removal efficiencies of bulrushes were attributed to their better oxygen translocation ability from the shoots to the roots (Gershberg, 1986).

RESTORER Giant Bulrush have tall hollow stems that are about 1.5 inches in diameter in mature stands. These tall, large diameter stems could be a dominant characteristic, that provide a larger area to conduct a substantial increase in the volume of oxygen and other atmospheric gases down into the roots. Because the outer covering on the root hairs are not a perfect seal, oxygen leaks out, creating a thin film or aerobic region, (the rhizosphere) around each and every root hair. The larger region outside the rhizosphere remains anaerobic. The aerobic region surrounded by an anaerobic region is crucial to transformations of nitrogenous compounds and other substances.

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