Damn the **Torpedograss!**

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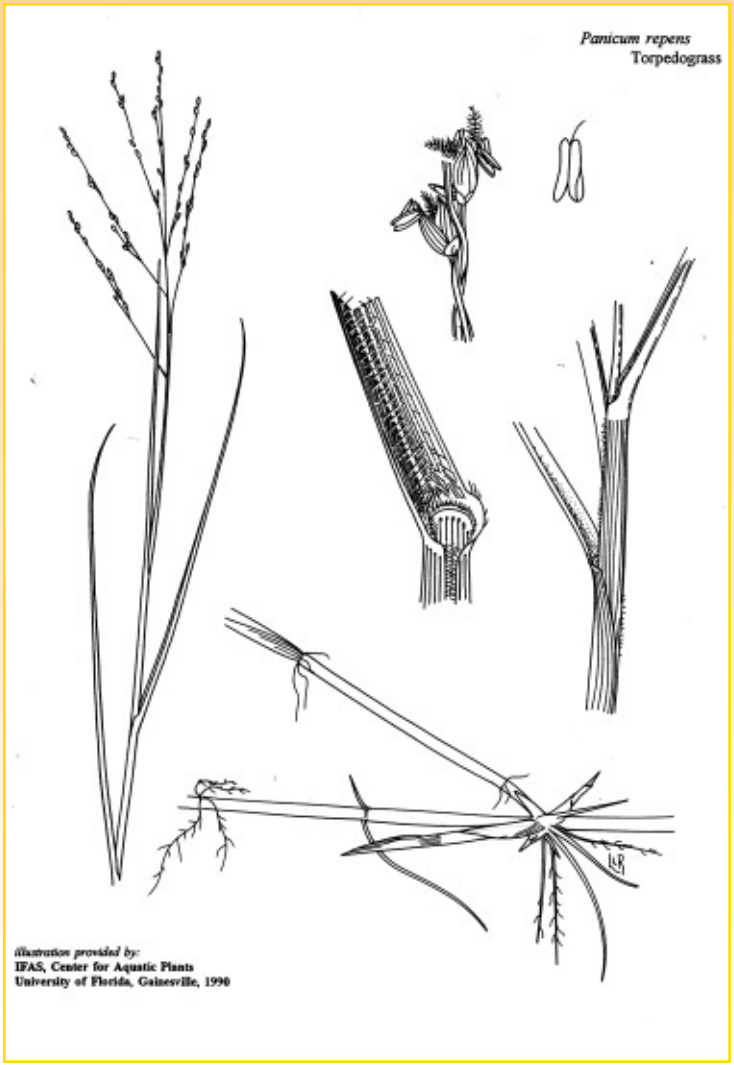
Introduction

Torpedograss, native to Old World Eurasia, is well established as one of the world's worst weeds (Holm et al., 1977, Panchal, 1981, Chandrasena and Dhammika, 1988). It was introduced to the U.S. in the early 20th century either as an accidental ballast pollutant or as a potential forage grass for the southeastern states (Tabor, 1952). Although cattle will use it as forage, it is now considered invasive in Florida. In 1950, the University of Florida warned, "Torpedograss is a serious weed when established in farm and grove land and indiscriminate planting without regard to future crops or adjoining land is dangerous" (Hodges and Jones, 1950).

Botanical description

Torpedograss [Panicum repens (L.) Beauv.] is in the Poaceae family. Culms are rigid, 40-100 cm high, erect and/or decumbent. Culms originate from sturdy, robust rhizomes which have many nodes. Bladeless overlapping sheaths may wrap the culm base. Upper leaves are numerous with loosely overlapping sheaths. Sheaths, as a rule, are pilose along the margin, but may be glabrous. The ciliate truncated membranous ligule is approximately 1 mm long. Blades are linear, 4-15 cm long and 2-5 mm wide coming to a point. The leaf is stiff and rigid, flat or somewhat involute and spreading. The upper surface is usually scantily pilose but may be glabrous. The panicle is open, approximately 12 cm long and can be terminal or axillary. Spikelets are ovate, glabrous and 2-5 mm long (Hitch cock and Chase, 1910). Seed production and viability is variable (Whyte et al., 1968; Peng and Two, 1984; Wilcut et al. 1988a).



The rhizome system is extensive. Rhizomes are 3-5 mm in diameter and 7 m or more in length, ending in a sharp, "torpedo-like" apex which can easily penetrate soil. Rhizomes can grow to a depth of 7 m, however most of the rhizomes are located in the top 60 cm of soil (Bor, 1960; Manipura and Somaratne, 1974). Active and dormant axillary buds occur along the entire length of the rhizome (Chandrasena and Dhammika, 1988). Rhizomes are noted for bulbil-like thickenings, which contain abundant carbohydrate reserves (Somaratne, 1952; Manipura and Somaratne, 1974). Substantial carbohydrate reserves yield the capacity for rapid regeneration from axillary buds when rhizomes are fragmented or cut. (Chandrasena and Peiris, 1989). Rhizomes are the principal means of dissemination, method of persistence, and cause of difficulty for control (Wilcut et al., 1988b).

Distribution and Habitat

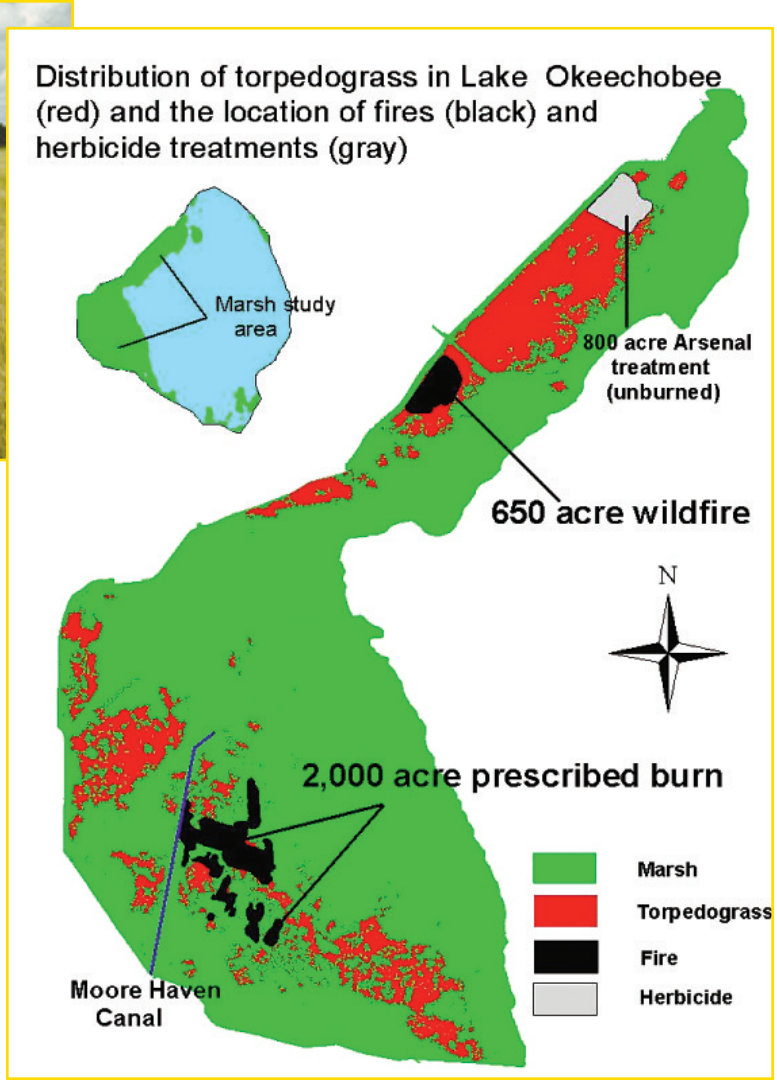
Torpedograss occurs in 70% of Florida's public waters (Schardt, 1994) and

Kissimmee chain of lakes

Torpedograss is a serious problem in East Lake Tohopekaliga shorelines, in the areas where cattle do not forage. In other areas, management by cattle is a tremendous boon in Kissimmee chain of lakes. They feed on torpedograss during winter low pool, when Bahia grass is senescent. Cattle have effectively managed torpedograss in many areas of the Kissimmee chain.

Torpedograss is a recurrent problem during FWC lake restorations involving extreme drawdowns and muck removal, as it is often among the first pioneers to emerge when restoration work is done. During the 2000 drawdown and restoration project of Lake Alligator, 80 acres of torpedograss required treatment. FWC staff expects serious problems during 2002 drawdown/restoration of Lake Tohopekaliga.

Dense torpedograss has overtaken many shallow areas of Lake Okeechobee's western marsh where fragrant water lily formerly bloomed. Here the torpedograss nearly dwarfs SFWMD researchers.



is naturalized in 57% of Florida's 67 counties (Wunderlin, 2000).

The preferred habitat for torpedograss is a warm to hot climate with sandy soils, plentiful moisture, and full sun (Holm et al., 1977). Sensitivity to prolonged cold temperature limits the spread of torpedograss in upper latitudes or altitudes. In the tropics, torpedograss is more commonly found in low coastal areas. Wilcut et al., (1988b) reported that exposing torpedograss rhizomes for 24 hours to 4.5 C was lethal and concluded that, due to lack of cold hardiness, torpedograss is restricted to regions with mild winters. In cool climates, torpedograss is less aggressive and is easily displaced by temperate species.

Torpedograss grows in many soil types from sandy, well-drained soils to heavy waterlogged soils. It grows best in soils that are poorly drained and have some degree of waterlogging (Holm, et al., 1977; Changrasena and Dhammika, 1989a). Torpedograss is drought-resistant, and the rhizomes can survive prolonged periods of water stress (Lubke et al., 1981). Interestingly, Wilcut et al. (a988b) reported that air-drying torpedograss rhizomes to 35-60% of the original weight had no significant effect on the regenerative capacity. This indicates that although torpedograss grows best in a moist environment, it can persist without water, adding further to its "weedy" characteristics. It thrives well in full sunlight, but can grow in partial shade (Holm et al., 1977).

Economic uses

Torpedograss serves as a soil stabilizer along ditchbanks, canals ,and rice paddies during periods of high water or heavy runoff (Tarver, 1979; Panchal 1981). It has also been used as a forage (Tarbor, 1952; Manipura and Somartne, 1974; Siregar and Soemarwoto, 1976). Tarver (1979) reported plantings of torpedograss throughout southern Florida and in many counties in North Florida . However, it was later found that torpedograss did not have the nutritive qualities of other forage grasses (Whyte. et al. 1959).

Control Methods

Several herbicides, both alone and together with physical treatments including burning and disking (Smith, 1993), have been investigated. Also, attempts have been made to control the plant with fungal innoculants (Thayer, 1990). SFWMD research has shown that the best current control technology should combine fire with herbicide treatments. This combination yields the best and most-reproducible results. Fire reduces plant biomass and stimulates new plant growth, which is often more susceptible to herbicide than unburned plants. Increased susceptibility may result from both better herbicide contact, as new torpedograss growth is more exposed after burning has consumed previous mature torpedograss thatch, and herbicide effectiveness increases as more herbicide penetrates through the immature cuticle of young shoots.

Current coverage in Lake Okeechobee

Torpedograss has displaced more than 16,000 acres of the 100,000 acres of native plant habitat in Lake Okeechobee's marsh. Torpedograss has demonstrated a wide range of tolerance to moisture. It is capable of withstanding, and even growing, under flooded conditions in the lake's marsh. As a consequence, torpedograss persists at virtually all stages in the lake.

Prescribed burning consumes thick torpedograss mats and stimulates new growth. The new growth is more susceptible to herbicide treatments.

Resource Management Goal and Objectives for Lake Okeechobee

The Goal of the torpedograss management program is to protect the health and diversity of Lake Okeechobee's natural plant and animal communities from the ecological degradation caused by torpedograss.

Objectives

- Achieve an overall reduction of torpedograss so that Lake Okeechobee's native communities are no longer dominated by torpedograss and annual maintenance costs are minimized.
- Implement an effective public information awareness program that will encourage support for torpedograss management.

Lake Okeechobee Torpedograss Management Efforts

Fire

In the lake, prescribed fire is the most appropriate available physical

Management recommendations for Lake Okeechobee

- Encourage continued funding for the continued treatment of dense and outlier populations of torpedograss in Lake Okeechobee
- Encourage torpedograss control programs for other publicly-owned natural areas in Florida.
- Continue funding of research program in the Lake to identify and optimize the most effect methods to control torpedograss.
- Transfer the results from continued torpedograss control research to other natural areas in Florida.
- Seek partnerships with concerned citizen groups to support torpedograss management programs.
- Continue investigations into sound management options.
- Use the support and resources of organizations such as the Florida Exotic Pest Plant Council to organize a network of professionals to lobby the State Legislature and U.S. Congress to support and enact laws encouraging the management of torpedograss and other exotic pest plants
- Cooperate with agencies and organizations such as Florida's water management districts, the Florida Department of Environmental Protection, the IFAS cooperative extension service, and the Florida Native Plant Society in the production and dissemination of information intended to educate the public about the problems associated with nuisance exotic plants such as torpedograss.

Above: Torpedograss covered this area of Lake Okeechobee's northwest marsh. After the entire area burned in early 2001, torpedograss has not yet regrown where herbicides were applied after the fire (blackened area).

Below: Five-acre torpedograss blocks were treated twice in four years. Several native plant species are colonizing these blocks.

method. Burning removes old torpedograss thatch and stimulates new growth which is more susceptible to subsequent herbicide treatment.

SFWMD costs for prescribed burning have included staff time, helicopter time and other equipment and materials. Staff support for fire management has also come from other Regional Fire Council member agencies.

When fires occur in the areas currently infested by torpedograss in Lake Okeechobee, water levels usually remain no more than two or three inches below ground level. During such water regimes, fire stimulates torpedograss growth. It recovers very rapidly and vigorously and new growth sprouts from previously dormant nodes. The use of prescribed fire as a precursor to herbicide treatment, is effective in breaking apical dominance and increasing herbicide efficacy.

Torpedograss grows in wet to moist areas where its rhizomes are generally protected from damage by fire when aerial portions burn. During extreme drought periods, water levels may recede two to three feet below the surface of the ground. Fire then destroys not only the aerial vegetation but also the upper, dry, compacted peat layers to a depth of three or four inches. Torpedograss is generally killed when its rhizomes are burned, which is determined by depth of rhizomes and depth of burning. In 1990, during a prescribed fire and in a 1997 wildfire, water levels had receded below the surface of the ground, with resultant torpedograss mortality.

Herbicides

Herbicide treatments with ARSENAL® herbicide have been adopted as the most effective available treatment. Such treatments cost approximately $170 per acre, with 90% control lasting, in some cases, up to one year. Therefore, about $2.72 million would be needed to treat 16,000 acres.

Biological control

Attempts to limit growth of torpedograss in Florida by inoculation of native fungi has shown little promise except for populations growing under conditions of stress (Thayer, 1990).

To date, the United States Department of Agriculture (USDA) has not conducted any torpedograss biocontrol investigations. Grasses have traditionally been considered "off limits" as biocontrol research targets, however, more recent work has found potential for selective biocontrol in the grass family. Great care must be exercised, but grasses that occupy a unique habitat, like lake margins, are more likely than wider-ranging upland species to have specific feeders. No funds are currently available for such research (Ted Center, personal comm).

Funding

The DEP Bureau of Invasive Plant Management granted $309,000 to SFWMD for torpedograss management in the lake (FY 2000). Both agencies aim to continue torpedograss management with DEP grants likely to continue as a funding source.

Other potential sources

Preliminary discussions with staff from the US Army Corps of Engineers Aquatic Plant Control Operations Support Center do not hold promise for financial support. Their primary program mandate is to maintain navigation and torpedograss infestations do not typically threaten navigation.

Funds may become available from Lake Okeechobee Protection Act and the Water Supply Contingency Plan programs.

Research needs

Seasonality of treatments

Questions remain regarding whether better control can be achieved in particular season or time of the year. To date, effectiveness of treatments has not shown a clear relationship with time of treatment during the year.

Flooding responses

Research contracted by SFWMD with the US Army Corps of Engineers is ongoing to evaluate response of torpedograss to different water levels. Initial findings include the potential for torpedograss expansion during periods of low water levels.

DuPuis Preserve

Dupuis provides an excellent opportunity to conduct torpedograss studies on a smaller scale and in an area that is readily accessible. Several large isolated wetlands are nearly 100% torpedograss. Qualitative observations at DuPuis Preserve have seemed to show competition between maidencane (*Panicum hemitomon*) and torpedograss. Maidencane seems to act as a barrier to the spread of torpedograss. It is unknown whether this barrier effect is reproducible, and if it is a result of physical, chemical or other function. However, it deserves further investigation. Studies could include seeding or planting maidencane in conjunction with herbicide, fire or other management techniques. It is unlikely to be practical to attempt this on a large scale such as throughout the Lake Okeechobee littoral zone.

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Kissimmee River system

Torpedograss has not been a problem species on the Kissimmee River. Before re-flooding along outer elevations of Rattlesnake Hammock in Pool A, torpedograss was initially dominant. It has subsequently remained only as a component of the wet prairie community. It has recently expanded in some newly reflooded portions of the Pool C floodplain. District researchers are not convinced it will become a nuisance requiring management. Further, it may not necessarily exert negative impacts even if dominant along the peripheral wet prairie. Ongoing monitoring will reflect its coverage over time and some associated functional values including fish and wildlife habitat.