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An Endangered Species Act Issue for Southeastern Florida: Johnson's Seagrass

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Summary

Johnson's seagrass, a small marine plant growing in shallow estuaries and coastal lagoons only along the southeastern Florida coast, has been listed by the National Marine Fisheries Service (NMFS) as a threatened species under the Endangered Species Act (ESA), the first marine plant so listed. The continued existence of this species appears to be most affected by water clarity and sediment disturbance (*e.g.*, stormwater runoff, boating and personal watercraft activities, and siltation) as well as by hurricanes and storm surges. In addition, limited seed production by this species makes its recovery uncertain. State and local government officials, marine industries, and the U.S. Army Corps of Engineers as well as private citizens are concerned that protection under the ESA could preclude, or increase expenses for, routine dredging projects and the expansion of three Florida ports. NMFS will seek to protect this species through ESA measures and address local concerns that species protection may interfere with maintenance dredging projects. This report will be updated as this issue evolves.

Background

Johnson's seagrass, *Halophila johnsonii*, is a very small (two-inch high) flowering marine plant with the most limited geographic distribution of about 60 species of seagrasses worldwide. It grows on a variety of sediment types ranging from mud to coarse sand discontinuously and patchily¹ in estuaries and coastal lagoons along about 150 miles of the southeastern Florida coast from Sebastian Inlet to Virginia Key in north Biscayne Bay. Although it most frequently grows from the intertidal zone to about six feet below mean tidal height, Johnson's seagrass has been reported growing at depths greater than other seagrass species at 12 feet or deeper in very clear water on tidal deltas adjacent to inlets and in Hobe Sound. As an opportunistic species, Johnson's seagrass expands the total area covered by seagrasses through its ability to survive in environments where other

¹Most patches are less than one square meter in size.

seagrass species cannot — both in the intertidal area above and the subtidal area below other seagrass species. Large patches of this species are reported to occur inside Lake Worth Lagoon, south of West Palm Beach; in Indian River Lagoon, the largest patches are usually on tidal deltas adjacent to inlets.

Johnson's seagrass appears to have a relatively high tolerance for low light levels and fluctuating salinity and temperature — features that may allow this species to colonize environments where other species of seagrass cannot survive. However, severe storms can damage seagrasses through erosion and siltation. During hurricanes, sediments moved by storm surges and other turbulent flow (*e.g.*, waves and currents) can easily dislodge, erode, or bury existing seagrass communities, particularly shallow-rooted species such as Johnson's seagrass. Milder storms can resuspend sediments and limit light penetration.

In general, seagrasses stabilize sediments as well as provide shelter (habitat) and dissolved oxygen for many marine animals. Seagrasses provide micro-habitats for small marine animals and are a source of easily decomposed and digested organic matter (food) for various invertebrates, fish, and larger animals, including endangered West Indian manatees and threatened green sea turtles. Various species of commercially and recreationally valuable fish and shellfish live within seagrass beds. Juvenile fish of various commercially and recreationally important species hide in seagrass beds to escape predators. It is reasonable to infer that a similar ecological role can be attributed to Johnson's seagrass, although study of this species has been limited. In addition, marine biodiversity is greater where Johnson's seagrass occurs.

Only female flowers have been observed for Johnson's seagrass, and this species' mechanisms of seed dispersal and establishment of new beds have not been studied. Although some suggest that Johnson's seagrass only reproduces asexually, fruit has been described by several investigators.² In addition, this species has a small, shallow rhizome (*i.e.*, root) structure relative to total plant biomass, a high biomass turnover rate, and a rapid lateral spreading rate of as much as 1.25 centimeters per day. The small rhizome structure suggests that Johnson's seagrass is unable to store large energy reserves. While some suggest that these two characteristics — uncertain reproductive capacity and small energy reserves — make Johnson's seagrass vulnerable to stress/disturbance and less likely to repopulate any area from which it disappears, others assert that species with higher biomass turnover and lateral spreading rates are, in general, better at colonizing available habitat. Johnson's seagrass has been reported in some human-influenced areas of the Intracoastal Waterway, suggesting that this species' ability to repopulate is significant. However, regrowth and reestablishment of surviving populations of Johnson's seagrass could be more difficult than for species with a life history that features a wide dispersal of seeds. The ecology of Johnson's seagrass has not been extensively studied, making generalizations from other species difficult and suspect.

²N.J. Eiseman and C. McMillan. "A New Species of Seagrass, *Halophila johnsonii*, from the Atlantic Coast of Florida." *Aquatic Botany*, v. 9 (1980): 15-19; C.J. Dawes, *et al.* "A Comparison of the Physiological Ecology of the Seagrasses *Halophila decipiens* Ostenfeld and *H. johnsonii* Eiseman from Florida." *Aquatic Botany*, v. 33 (1989):149-154.

The National Marine Fisheries Service (NMFS) proposed to list Johnson's seagrass as a threatened species on September 15, 1993,³ and a definition of the critical habitat for this species was proposed on August 4, 1994.⁴ On April 20, 1998, NMFS reopened the proposed listing of Johnson's seagrass as a threatened species for additional public comment.⁵ On September 14, 1998, NMFS published the final rule listing Johnson's seagrass as a threatened species, effective October 14, 1998.⁶ This is the first marine plant listed under the Endangered Species Act (ESA) as a threatened or endangered species. Under the ESA, NMFS is required to consider additional protective regulations for this species.

Human Activities Stressing This Species

Many possible risks for this species are inferred from environmental risks to other species of seagrass. Based on data from other seagrass species and from observations of Johnson's seagrass,⁷ continued existence of this species appear to be most affected by reduction of water clarity (*e.g.*, water quality and sediment disturbance, especially from poor stormwater control practices), with additional concerns for boating and personal watercraft activities (propeller scars, anchor mooring, and out-current jet blowouts),⁸ dredging of navigation channels, and shading from over-water construction (*e.g.*, docks). The time required for recovery of damaged seagrass ecosystems is affected by a variety of factors, such as the cause and extent of damage, the seagrass species affected, and physical characteristics of the damage site.

Reduction of water clarity caused by human activity and increased coastal land use can threaten seagrass by reducing photosynthesis. Erosion caused by boat wakes may also increase turbidity and siltation. Siltation not only reduces incident light, but can also create anoxic conditions in the sediment by limiting oxygen diffusion. Such anoxic conditions are problematic to seagrasses as they may cause problems with root metabolism or result in the production of compounds, such as sulfides, that can be toxic to the seagrass. With as much as 70% of runoff pollution contributed by non-point sources, water quality problems, especially poor stormwater control practices, can increase water turbidity as well as nutrient loading. Being a deeper water species, Johnson's seagrass is more susceptible to subtle changes in water quality. Excessive nutrients (*e.g.*, nitrogen and phosphorus) from urban and agricultural land runoff can stimulate increased algal growth

³58 *Federal Register* 48326.

⁴59 *Federal Register* 39716.

⁵63 *Federal Register* 19468.

⁶63 *Federal Register* 49035.

⁷W.J. Kenworthy. *The Distribution, Abundance, and Ecology of Halophila johnsonii Eiseman in the Lower Indian River, Florida*. Final Report to the Office of Protected Resources, NMFS. Silver Spring, MD, 1993.

⁸Propeller scars are damage caused to vegetation and bottom habitat by propellers on boat motors operated in shallow water. Anchor mooring refers to damage caused by anchors from boats which can disturb and damage vegetation and bottom habitat, especially if these anchors are dragged along the bottom as boats are pulled by currents. Out-current jets on personal watercraft direct water straight down instead of outward, increasing the potential for sediment "blow-outs."

that severely reduces water clarity and increases epiphyte loading, shading seagrasses. In addition, seagrass habitat may be affected by the timing and duration of stormwater runoff. Although Johnson's seagrass is reported to tolerate a wide range of salinities, additional research is required to better understand this species' ecological response to freshwater inflows.

Propeller scars and anchor mooring can break and excavate seagrass root systems, severing rhizomes, completely removing them from the sediment, and reducing the physical stability of the community. Severing seagrass rhizomes removes what little stored materials and energy these plants accumulate, making them highly susceptible to any stress, *e.g.*, light limitation due to turbidity. In addition, propellers and anchors often alter bottom topography (*e.g.*, propellers make trenches in the sediment), which influences seagrass recovery time. For example, boats are reported to have damaged or destroyed about 18,000 acres (20%) of the seagrass beds in Biscayne National Park.⁹ Personal watercraft (*e.g.*, jet skis) are also recognized as a potential hazard to seagrass beds in very shallow water. Some seagrass beds can require as long as 5 years to recover from minor damage and a decade or more to recover where the wash from a boat motor or personal watercraft operated in shallow water digs a crater in a seagrass bed. However, since seagrass species vary in their ability to recover from scarring, one must be cautious in inferring that such characteristics are also relevant to Johnson's seagrass, which is capable of spreading quickly.¹⁰

Dredging of navigation channels can resuspend and redistribute sediments, severely decreasing available light, burying plants, and altering bottom topography. However, dredging in Florida is highly regulated to prevent such damage, and Johnson's seagrass continues to occur on tidal deltas adjacent to several inlets that have been regularly dredged for many decades. Major ports, harbors, and navigation channels are maintained at depths greater than 6 feet and Johnson's seagrass has not been reported within such dredged basins or navigation channels — only in adjacent shallow areas. Thus, it would be new dredging in shallow areas, rather than maintenance dredging of previously dredged basins and navigation channels, that would be more likely to affect Johnson's seagrass habitat. Although some have suggested that dredging may have enhanced this species, scientific evidence does not support this argument.

Protection Efforts

The state of Florida has taken steps to protect seagrass habitat. New and redeveloped sources of stormwater discharge are required to meet state water management district regulations. Several counties are reportedly installing point-source stormwater management systems that may improve water quality from point sources. In addition, improvements in wastewater treatment within the past two decades are reported to have increased water clarity in Lake Worth and other lagoons, allowing seagrass cover to expand. Although limited by federal navigation rules promulgated by the U.S. Coast Guard, state of Florida efforts to mark navigation channels and establish speed zones to protect seagrasses that are adjacent to Florida state parks and are important manatee

⁹Associated Press. "Biscayne National Park Scarred by Boat Groundings." August 10, 1998.

¹⁰If Johnson's seagrass is a weedy species, it might recover more rapidly compared to turtle grass, which has been the subject of most studies on the effects of propeller scarring.

habitat may promote multiple public benefits.¹¹ Non-motor and controlled access areas have resulted in improved seagrass habitat.

Since Johnson's seagrass grows on its submerged lands, the state of Florida holds that NMFS measures to protect this species must be consistent with state of Florida policies and involve Florida as a necessary partner. NMFS has an active seagrass program¹² and anticipates proposing separate regulations outlining specific protective measures for this seagrass. Federal activities that may affect Johnson's seagrass and require ESA §7 consultation are identified by NMFS as including Corps of Engineers project authorizations, Environmental Protection Agency discharge permits, Coast Guard vessel traffic regulation, management of refuges and species by the Fish and Wildlife Service, authorization of state coastal zone management plans by the National Ocean Service, and commercial fishery management by NMFS. NMFS anticipates reopening the public comment period on the proposed designation of critical habitat before making a final decision on whether and, if so, where to designate such critical habitat. The state of Florida questions whether the best available scientific data as well as socio-economic evaluations support the proposed critical habitat.¹³ Protecting Johnson's seagrass habitat would also afford additional protection for the six other seagrass species found in Florida waters as well as to the animal communities that depend on these plants.

Controversy

Some characterize the concern over Johnson's seagrass as being a traditional conflict between environmental preservation and economic development. Although NMFS anticipates maintenance dredging can be authorized through ESA §7 consultations for areas where Johnson's seagrass occurs, some individuals are concerned that protection under the ESA could preclude, or increase the expenses for, routine dredging projects and the expansion of three southeast Florida ports. More specifically, Martin County public services executives are concerned that listing of Johnson's seagrass could jeopardize future plans to reconfigure St. Lucie Inlet to retard beach erosion.¹⁴ Additional measures required to protect Johnson's seagrass at dredging projects may include more detailed site surveys and reduced mixing zones for dredge-generated turbidity — measures unlikely to significantly increase overall project costs.¹⁵ In addition, NMFS may issue an ESA permit for "taking" or displacing one or several Johnson's seagrass populations in St. Lucie Inlet

¹¹Frank J. Sargent, *et al.* *Scarring of Florida's Seagrasses: Assessment and Management Options*. FMRI Technical Report TR-1. St. Petersburg, FL: Florida Department of Environmental Protection, Florida Marine Research Institute, 1995. 43 p.

¹²Mark S. Fonseca, *et al.* *Guidelines for the Conservation and Restoration of Seagrasses in the United States and Adjacent Waters*. NOAA Coastal Ocean Program Decision Analysis Series No. 12. Silver Spring, MD: NOAA Coastal Ocean Office, November 1998. 222 p.

¹³For example, the state claims that most Johnson's seagrass meadows have been found within Lake Worth Lagoon, rather than within the inlet areas previously proposed for designation.

¹⁴Edward Filo. "Protected Sea Grass Threatens Inlet Plans." *Vero Beach Press-Journal*, October 6, 1998.

¹⁵Personal communication with Keith Mille, Environmental Specialist, Florida Department of Environmental Protection, Tallahassee, on October 30, 1998.

if this limited dredging project is determined unlikely to jeopardize the continued existence of the species.

Although Johnson's seagrass is uncommon in the Intracoastal Waterway, some are concerned that its presence could impede routine maintenance dredging in the limited segments of this transportation corridor where it does occur. However, NMFS has concluded an ESA §7 consultation with the Corps of Engineers on maintenance dredging of existing, authorized federal navigation projects in this area, and determined that maintenance dredging of those channels constructed within the last 10 years is unlikely to jeopardize the continued existence of Johnson's seagrass.

The Florida Department of Environmental Protection has expressed concern to NMFS that information on this species is inadequate for deciding on appropriate protection and recovery efforts, and has suggested that NMFS consider a focused, protection-oriented research effort on Johnson's seagrass to assure that the most appropriate management strategies for the species can be developed to reconcile development with species protection. Until Johnson's seagrass and its ecology are better understood, scientists suggest protecting this species by taking a cautious and conservative approach to dealing with problems affecting it and its habitat.¹⁶

¹⁶Personal communication with Dr. Richard L. Turner, Associate Professor, Florida Institute of Technology, Melbourne, on October 23, 1998.