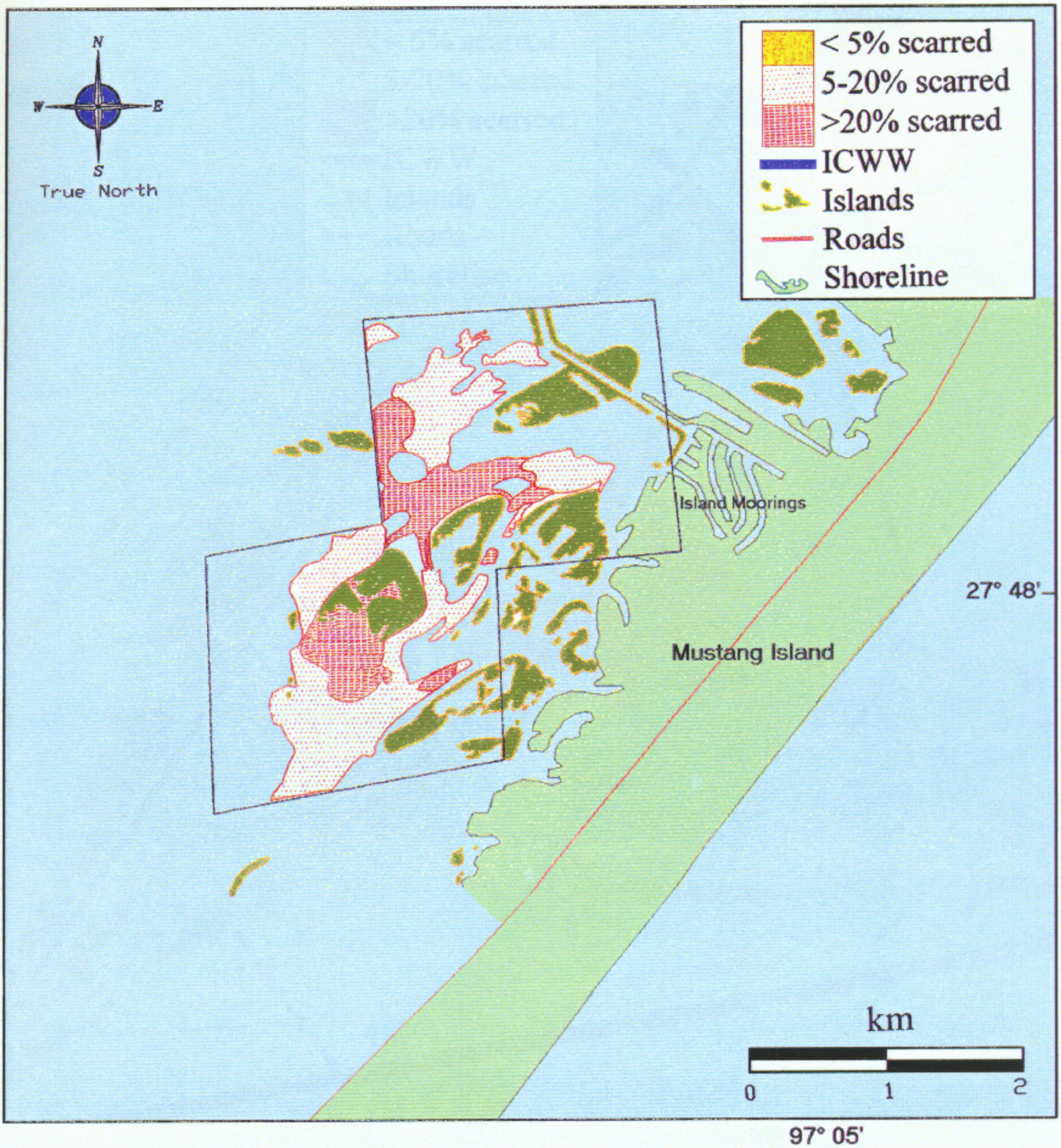

Figure III.4. East Flats. Distribution and intensity of seagrass scars.

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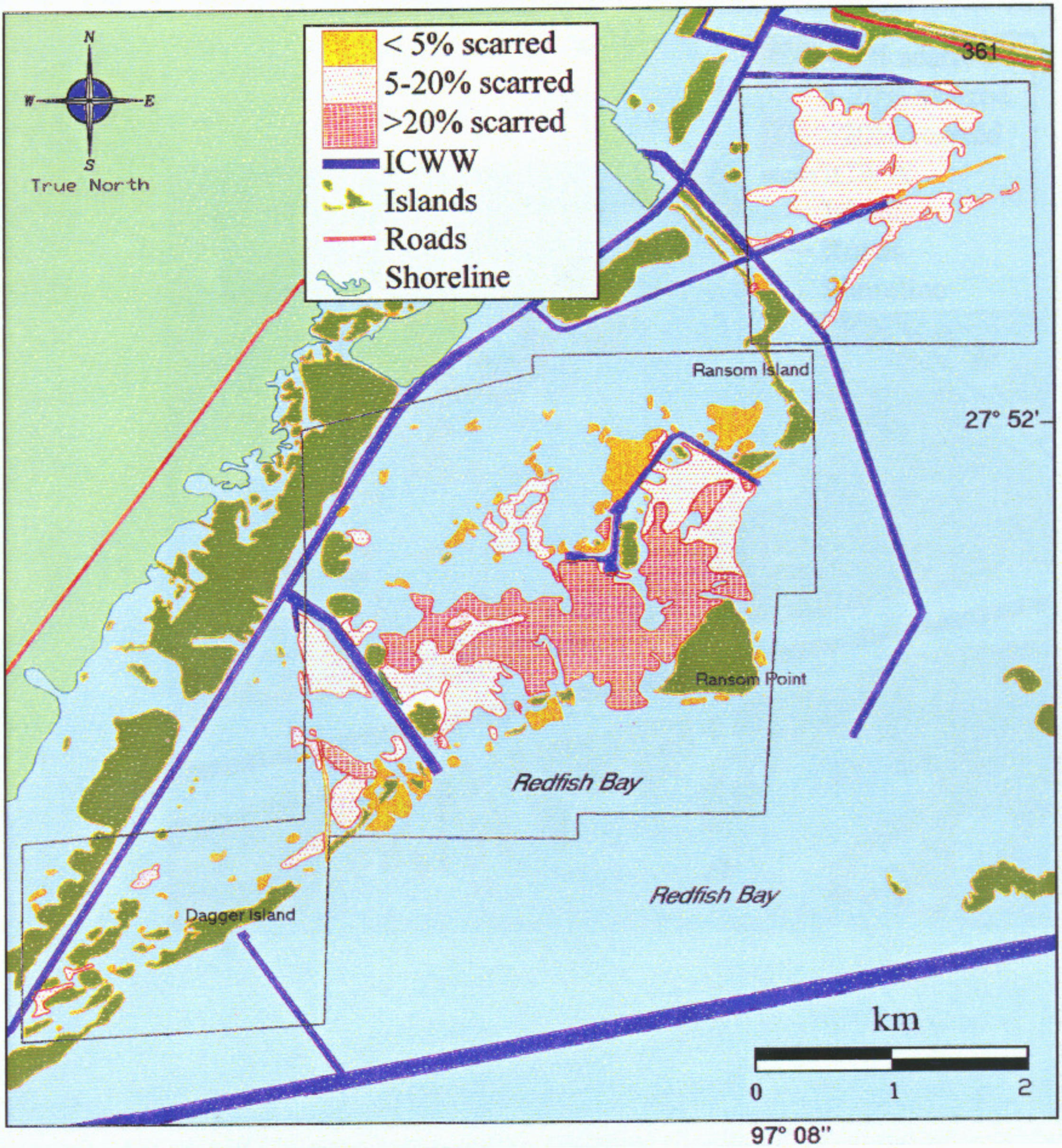

Figure III.5. Redfish Bay. Distribution and intensity of seagrass scars.

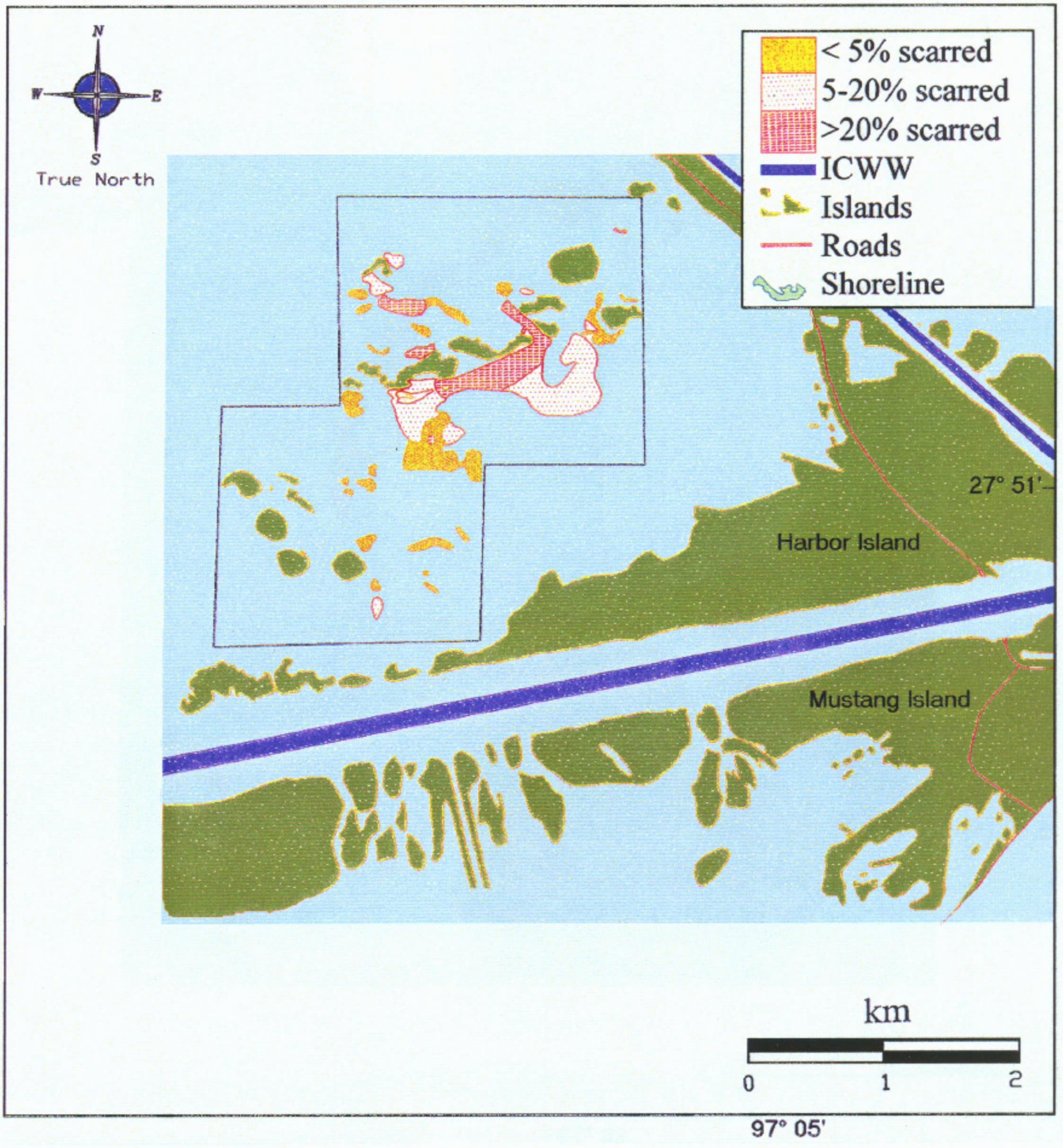

Figure III.6. Harbor Island. Distribution and intensity of seagrass scars.

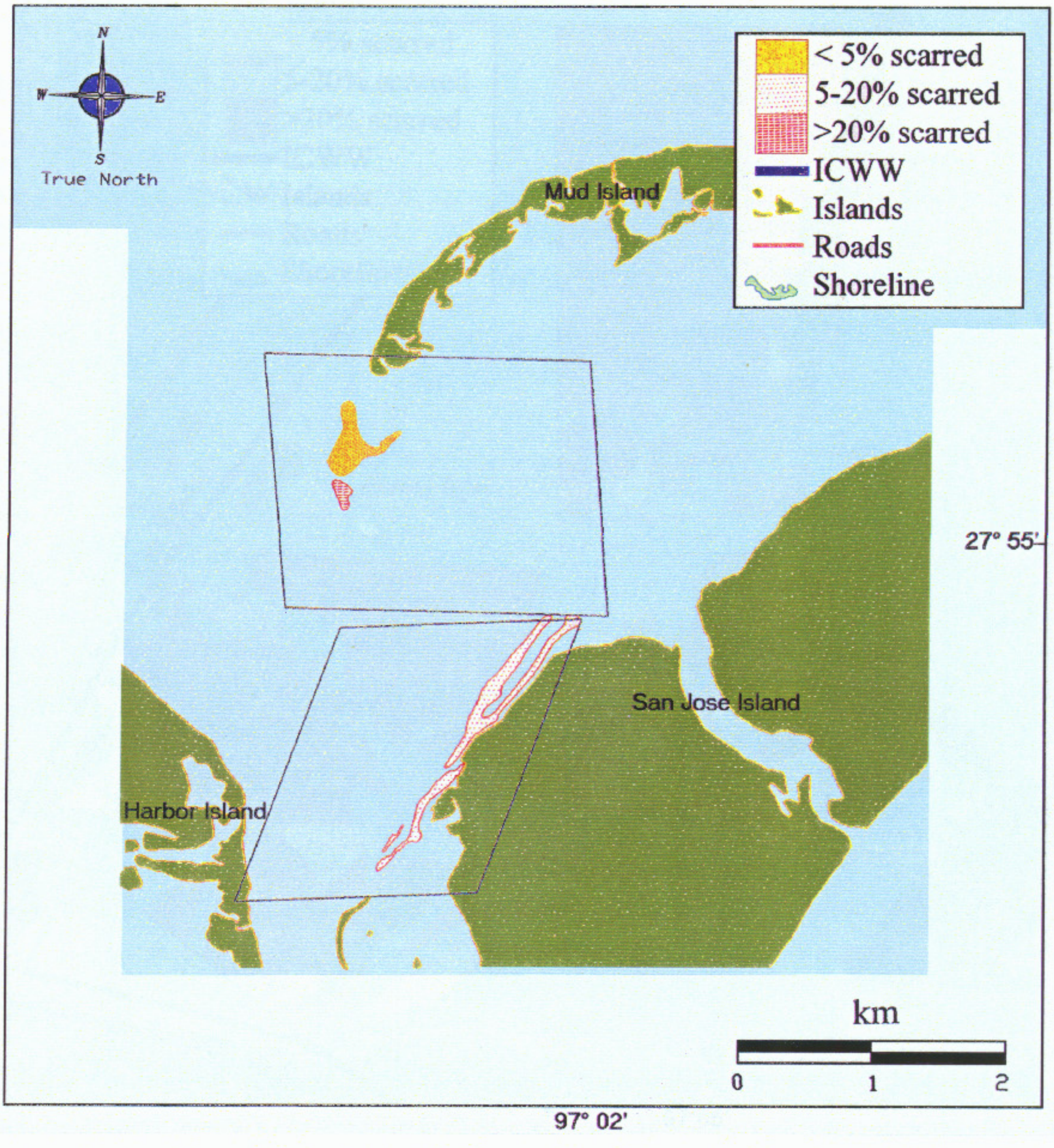

Figure III.7. Lydia Ann / Mud Island. Distribution and intensity of seagrass scars.

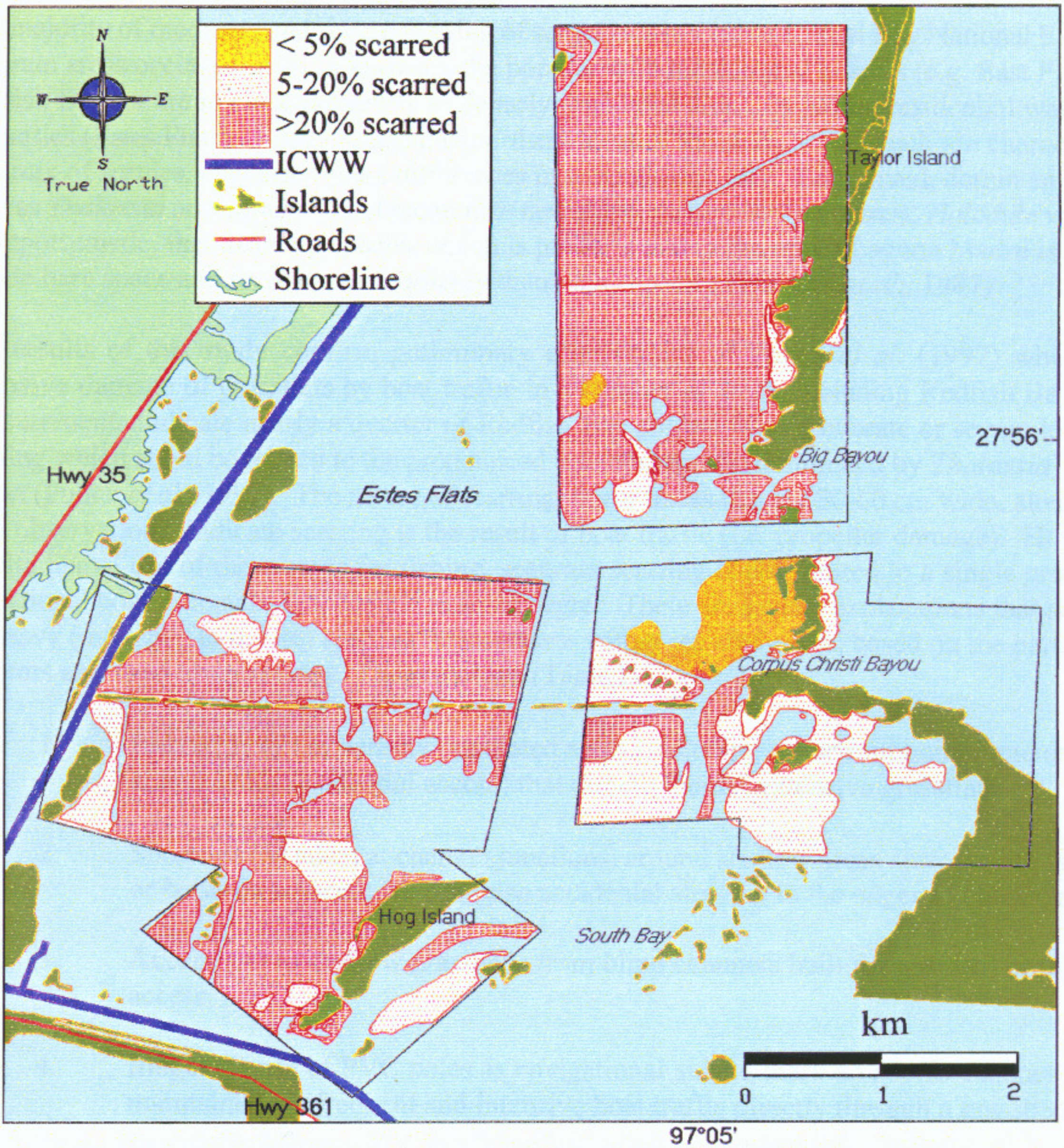

Figure III.8. Estes Flats. Distribution and intensity of seagrass scars.

IV. DISCUSSION

The majority of moderate and severe scarring of seagrasses in Corpus Christi Bay National Estuarine program areas occurred in areas known to be popular with recreational boaters (e.g. East Flats and Redfish Bay) or are in close proximity to densely populated areas, including residential waterfront properties (Estes Flats). Heavy scarring in northern areas of the study area, which are characterized by a mix of species, may also reflect differences in seagrass recovery. Long-lived, dominant species such as *Thalassia testudinum* do not recolonize new substrate rapidly; in contrast, *Halodule wrightii*, an opportunistic, fast-growing species which is predominant in the upper Laguna Madre is able to invade bare space and recover more quickly than many species (Fonseca *et al.*, 1987).

The results of this study confirm preliminary observations of Pulich *et al.* (1997) who noted extensive damage of grassflats by boat traffic in a number of areas, including Redfish Bay. Our measurements indicate nearly a quarter of Redfish Bay suffers from moderate or severe levels of scarring which could be related to the pronounced loss of seagrass (dominated by *Thalassia*) in this region (Pulich *et al.*, 1997). The nature of scarring, linear traces that are 30-60 cm wide, along with field observations, indicate scarring is the result of boat traffic (i.e. propeller damage). However, despite heavy use of these areas for fishing, seagrass scarring is not limited to a single group; all recreational boaters may be responsible to some degree. There are several explanations that account for heavy (moderate to severe) scarring in seagrasses within our study area, based on the patterns of the scars and field observations. These include (Table IV.1).

1. Proximity (P) to densely populated areas (including waterfront homes and dredged channels for residential access) that directly border extensive grassflats.

2. Shortcuts (S) taken at channel junctions, around shallow areas surrounding islands, or between adjacent islands (also accidental straying to the edges of channels).

3. Access (A) to shallow grassbeds from blind channels built for gas well or pipeline access.

4. Illegal (I) use of PVC poles as navigational aids to mark an access channel that is maintained via frequent and intensive boat traffic directly through a grassbed.

Our observations agree with conclusions reached by Sargent *et al.* (1995) who suggested that scarring of seagrasses in Florida was related to accidental events (misjudgement of water depth, or channel location), shortcuts to access an area or maintain a channel through a grassbed, or ignorance with respect to damage caused by propellers and importance of seagrass habitats. Consequently, management priorities should focus on education, but should also include efforts by state resource managers to improve marking of secondary channels to minimize damage to adjacent grassbeds. In heavily populated regions, it may be appropriate to construct channels to minimize random and destructive boating through grassbeds, thereby concentrating boat traffic in designated channels. This would also discourage construction of illegal channels through grassbeds. In addition, areas

Table IV.1. Most probable explanations for scarring observed within the various regions surveyed in this study (regions are listed in order of decreasing scarring severity). See text for full explanation of abbreviations.

Region	Probable Cause[1]	Comments
Estes Flats	S,P,I	Adjacent to waterfront homes, high population density, channels not well marked, heavy use area
East Flats	S	Popular hunting and fishing area, near waterfront homes and canals
Shamrock Island	A,S	Channels not marked
Redfish Bay	A,S	Channels surround large, shallow grassbed
JFK Causeway	A,S,P,I	Many gas well channels, PVC poles mark channel through grassbed
Lydia Ann/Mud Island	S	South tip of Mud Island is very shallow compared to surrounding areas
Upper Laguna Madre	A,S,I	Adjacent to waterfront homes and canals, high population density, poles mark channels through grassbeds
Harbor Island	A,S	Gas well channels provide access to grassbeds

[1] Probable Cause: P=proximity, S=shortcut, A=access point, I=illegal use of navigational aids

showing seagrass decline that are heavily impacted by scarring from boat traffic may need to be given additional protection through a combination of efforts, including signage to educate the public and increased enforcement.

In addition to providing the first quantitative data on scarring of seagrasses on the south Texas coast, this study provides valuable baseline information for assessment of recovery. Although no work has been conducted in Texas on seagrass recovery from scarring, studies from Florida indicate the process is slow and may take up to 10 years, depending on species and location (reviewed by Sargent *et al.*, 1995). Also, recent work on water flow during tidal exchanges in submerged aquatic plant communities indicates channelization within vegetative stands has distinct effects on water flow and exchange (Rybicki *et al.*, 1997); if true for seagrasses, then scarring of grassbeds could lead to long-term changes in community structure. Consequently, future research efforts should be directed toward understanding of the long-term effects of seagrass scarring, especially to justify the variety of management options that are available to state resource agencies.

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