EFFECTS OF PERSONAL WATERCRAFT OPERATION ON SHALLOW-WATER SEAGRASS COMMUNITIES IN THE FLORIDA KEYS

Executive Summary

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Prepared for:

Personal Watercraft Industry Association
1819 L Street NW
Suite 700
Washington, DC 20036

Prepared by:

Continental Shelf Associates, Inc.
759 Parkway Street
Jupiter, Florida 33477
Telephone: (561) 746-7946

EXECUTIVE SUMMARY

Seagrass beds, which can cover hundreds of acres of contiguous seafloor in south Florida, are the base of a complex shallow water marine community including algae, invertebrates, and fishes that utilize the grasses for shelter and as a food source. Seagrass beds in south Florida have been subjected to disturbance and scarring for decades, with most of the shallow seagrass beds in Florida showing some level of scarring. This study was sponsored by the Personal Watercraft Industry Association to assess whether personal watercraft, when used in water depths of 2 ft or more as recommended by the manufacturer, harm seagrass beds or other shallow water species associated with the seagrass community. One of the primary recommendations by the manufacturers is for the watercraft to be operated in a water depth of at least 2 ft.

A location in the immediate vicinity of Duck Key, which is situated to the northeast of Marathon in the Florida Keys, was selected as the field test site (**Figure 1**). Abundant or common species within the seagrass beds included the seagrass species *Halodule wrightii*, *Syringodium filiforme*, and *Thalassia testudinum*, the green algae *Penicillus capitatus* and *Halimeda incrassata*, the hard corals *Cladocora arbuscula*, *Manicina areolata*, *Porites furcata*, and *Siderastrea radians*, and various small sponges.

Data collected during this study indicated the following:

- No suspension of bottom sediments or turbidity was caused by 50 repetitive personal watercraft test runs along a 60-m long transect at speeds of 20 to 30 mph in water depths ranging from 19 to 36 in. (**Figure 2**);
- Water turbulence from the personal watercraft jet drive did not extend down to the level of the seagrass blades when watercraft were operated on a plane in a water depth of approximately 20 in. (**Figure 3**);
- No statistically significant differences in abundances of seagrasses or other benthic biota were found in randomly placed quadrats along the 60-m long transect following the personal watercraft test runs;
- A suspension of fine sediments and some exposure of seagrass rhizomes were noted in the shallowest areas (water depths of 21 to 28 in.) of two 10-m diameter circular test sites following up to 6 min of intensive starting, stopping, and turning maneuvers with personal watercraft (**Figure 4**); and
- No statistically significant differences in abundances of seagrasses or other benthic biota were found in quadrats randomly deployed within the 10-m diameter circular test areas following the intensive personal watercraft operations (**Figure 5**).

METHODS

Personal watercraft typical of the sizes and power commonly used in the Florida Keys were supplied by the personal watercraft industry for use in the study. The personal watercraft carried either one or two persons during the testing to more realistically duplicate actual riding conditions. The watercraft were operated along a straight 60-m transect and within two 10-m diameter circular sites established in selected seagrass areas in water depths ranging from 19 to 36 in. Video records were made before, during, and after tests runs along the 60-m transect and within the circular test areas using a topside video camera shooting from an elevated position and an underwater video camera. Marine biologists also placed 20 cm by 20 cm fixed quadrats at randomly selected locations within the test areas and counted seagrass shoots and other conspicuous biota within the quadrats before, during, and after personal watercraft test runs.

60 METER TRANSECT

Personal watercraft test runs along the 60-m transect were made in both directions using various watercraft carrying either one or two persons. An initial six runs along the transect were made, then a set of intermediate quadrat counts and video data were collected along the transect. An additional 44 runs along the transect were made using three different personal watercraft, followed by post-run quadrat counts and video data collection.

Topside video data collected during personal watercraft test runs along the 60-m long transect showed no visible turbidity associated with any of the test runs. Water depths at 10-m intervals along the transect during the runs ranged from 19 to 36 in. A video camera in an underwater housing and attached to brackets alongside the 60-m transect recorded video footage of the turbulence, including that from the jet drive, created as the personal watercraft passed the camera while running along the transect. Personal watercraft were moving at speeds of between 20 and 30 mph when passing the video camera field-of-view. The turbulence, which was caused primarily by the jet drive, was recorded on videotape and did not reach down to the level of the seagrass blades when the watercraft passed by the video camera on a plane at a location where the water depth was approximately 20 in.

The personal watercraft did not suspend bottom sediments along the 60-m transect when operated on a plane. No detectable changes were identified in abundances of seagrasses or other benthic fauna in the randomly deployed sampling quadrats following 50 test runs along the transect. Additionally, underwater video data collected along the 60-m transect showed no discernible differences before and after the test runs.

10 METER DIAMETER CIRCLES

The effects of starting, stopping, turning, and maneuvering in a confined area were measured within the two 10-m diameter circular test areas after personal watercraft were operated for timed intervals of 5 min 40 sec in Circle #1 and 6 min in Circle #2. Surface video taken during test runs in the circular areas showed fine sediments suspended by the personal watercraft in both test circles. Comparisons of pre-run and post-run video footage along perpendicular lines within the circular test areas indicated surficial sediments had been suspended and removed from some locations. Seagrass rhizomes were slightly exposed in a few quadrats and along the perpendicular lines within the shallowest segments of the test areas, although the seagrasses were still in place. Many small hard coral colonies from the species *Cladocora arbuscula*, *Manicina areolata*, and *Porites furcata*, most of which were less than 2 cm in diameter and which had not been visible and were presumably hidden or buried under a thin sediment layer during the pre-run counts within quadrats, were exposed or uncovered following the test runs.

The tests, which included the repetitive starting of the personal watercraft from a dead stop and sharp turning in either direction while accelerating for a prolonged interval in a confined area at water depths of less than 2 ft, were observed to cause some suspension of fine surficial sediments. This occurred in the shallowest sections of the circular test areas, at depths of 21 to 23 in. within Circle #1 and 28 in. within Circle #2. Seagrasses falling within randomly deployed quadrats in the two circular test areas did not show a significant change in abundance following the completion of test runs. The abundances of four hard coral species and two green algae species observed within the quadrats also did not exhibit a statistically significant change following test runs.

RESULTS

A statistical analysis of the diver-collected seagrass shoot counts and abundance data for other biota from the randomly placed quadrats along the 60-m transect and within the 10-m diameter circles was made following the study. In all three of the test areas there was no quantitative evidence of the personal watercraft test runs affecting the three seagrass species or *Penicillus* alga abundance. There was also no quantitative evidence of the personal watercraft testing affecting the abundances of the observed hard coral and other alga species in each of the three test areas.

The results of the tests conducted in this study indicate the operation of personal watercraft in water depths of 2 ft or more, as recommended by the manufacturers, does not detrimentally affect seagrass beds by causing a detectable change in the abundances of seagrasses or other common benthic biota within grassbeds. Personal watercraft used under the recommended guidelines during testing did not cause scarring of the grassbeds.

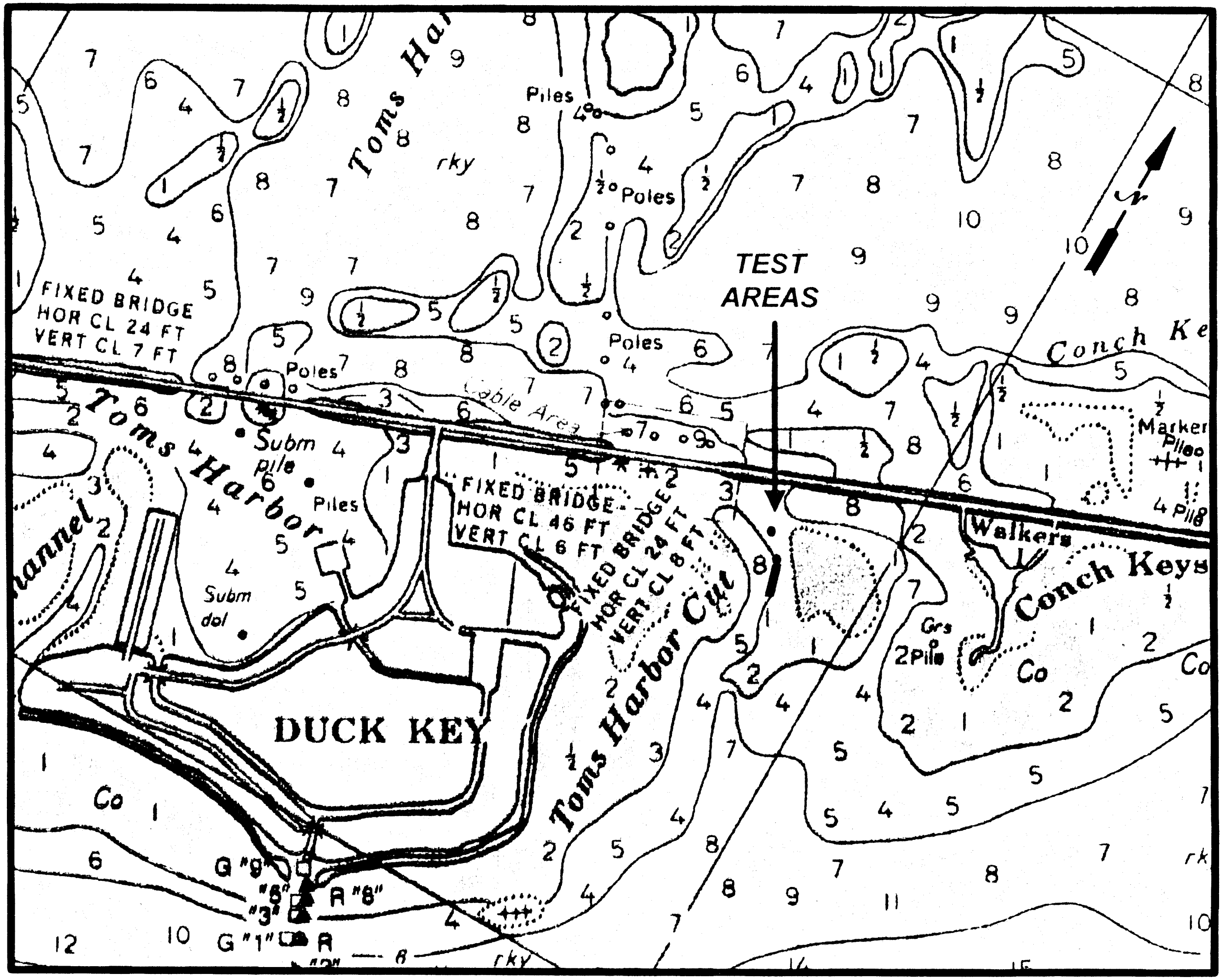

Figure 1. Study site location east of Duck Key.

Figure 2. Video frames of personal watercraft test runs along 60-m transect with one rider (top) and two riders (bottom).

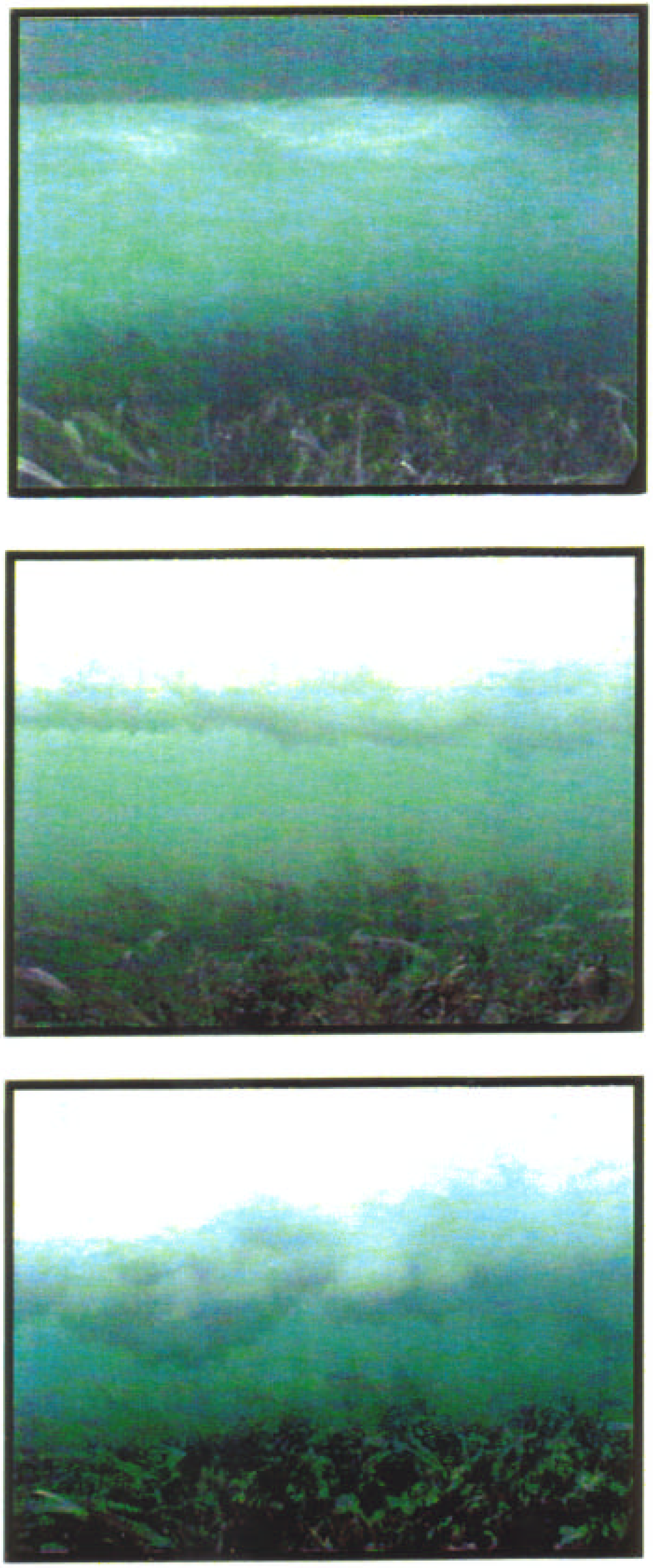

Figure 3. Three video-frame sequence of turbulence created by personal watercraft on a plane in 20-in. water depth.

Figure 4. Photographs of Circle #1 test area during (top) and immediately following (bottom) personal watercraft test rides.

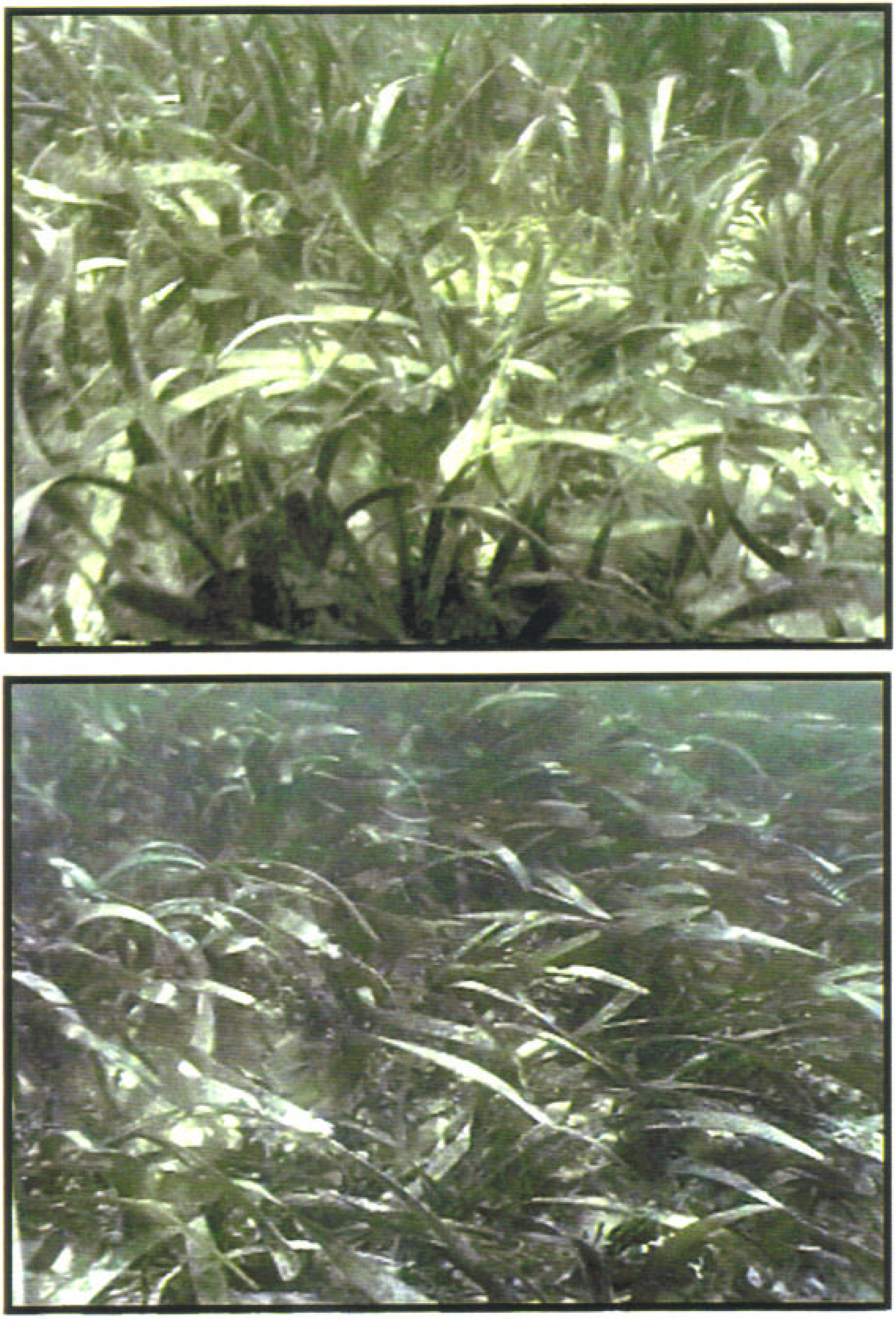

Figure 5. Video frames of seagrass at the intersection of the 10-m transects within Circle #2 before (top) and after (bottom) 6 min of test runs.