

Recreational Boating Impacts at Timucuan Preserve

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Executive Summary

A one year study of boating traffic, conflicts and impacts was performed at Timucuan Preserve, focusing on the Fort George River and smaller creeks around the Kingsley Plantation. Observations were concentrated on the summer months and also around holiday weekends, as these were believed to have the greatest traffic and potential impacts. Study methodology used both land-based observers with radar guns as well as observations over a larger area from a moving boat.

Total traffic numbers for the seven month boating period of April-October were estimated to be:

Fort George River near Kingsley Plantation:	15,000-21,000	unique boating visits
Simpson Creek/Myrtle Creek System:	4000-6000	visits
Smaller Creeks (Garden Creek):	1000	visits.

Erosional effects from boat wakes on sandy shorelines were judged to be negligible. Localized boat-wake induced erosion on muddy banks could not be ruled out, but no conclusive evidence was observed. In contrast, natural processes reworking muddy tidal channels are active and obvious.

Observed conflicts between boaters and wildlife appeared to be mainly based on volume and are likely unavoidable. Observed conflicts between boaters on the Fort George River near Kingsley on crowded weekends were mainly a function of large numbers in a small area. No significant conflicts were observed on the Intracoastal Waterway. Observed conflicts on Simpson Creek arose from the difference in speed between fast moving personal watercraft (PWC) and slow or stationary fishermen or kayakers. Two areas here may prove suitable for speed controls: near the Long Island Outfitters' dock, and at the Simpson Creek/Myrtle Creek/Nassau Sound confluence.

Introduction

Timucuan Ecological and Historic Preserve is a 46,000 acre park managed by the National Parks Service (NPS). It is located just northeast of Jacksonville, FL, and loosely ranges from the St John's River in the South to the Nassau River in the North, and straddles the Intracoastal Waterway. Figure 1 shows the general park location as given by the NPS.



Figure 1. Location of Timucuan Preserve.

The present study covers a much smaller section of the park, concentrating on the rivers and creeks around the Kingsley Plantation, which is a popular historical and educational attraction. Figure 2 shows the smaller study area with regions of interest marked. This area is a significant recreational area for both boaters and non-boaters. Typical users include:

- (1) Fishermen/women from boats, shore, and bridges,
- (2) Families and friends on boating excursions,
- (3) Personal Watercraft (PWC) enthusiasts,
- (4) Kayakers,
- (5) Boaters traveling the Intracoastal Waterway,
- (6) Visitors to Kingsley Plantation.

Timucuan is also a significant haven for wildlife close to a major metropolitan area. Egrets, herons, and migratory birds are found in large numbers (see Figure 3). Recreational fish such as sheephead and seatrout are found in large numbers and attract many fishermen and women.

The large numbers of boaters present on weekends and holidays offers the potential for conflicts with each other and with wildlife. This report details a yearlong study of the boating impacts in this area: numbers, types, activities and potential conflicts with other users and with wildlife. The study concentrated on times when traffic was likely to be high, which meant that observations were taken from spring through fall and/or on holidays.



Figure 2. Referenced Areas: (1) Kingsley Plantation; (2) Simpson Creek; (3) Myrtle Creek; (4) Intracoastal Waterway; (5) Garden Creek; (6) Low Tide Sandbanks; (7) Half Moon Bluff; (8) Long Island Outfitters; (9) Nassau Sound; (10) US A1A; (11) Sisters Creek and Joe Carlucci boat ramps (off map); (12) Point Isabel.

This study had three main goals:

- (1) To quantify the numbers, types, and speeds of boats at selected areas of the park,

- (2) To observe and identify potential conflicts between various users,
- (3) To evaluate boating impacts on the natural environment.

This goal was accomplished through 21 man-days of observation at various points throughout the park, together with a review of the relevant literature.



Figure 3. Wildlife is plentiful in Timucuan.

Study Methodology

Two main types of measurements were made:

- (1) Land-based observations with a radar gun,
- (2) Boat-based observations traveling through the study area.

Land-based observations were made from four locations (see Figure 2):

- (1) Kingsley Plantation on the Fort George River,
- (2) Simpson Creek at the A1A bridge,
- (3) Myrtle Creek at the A1A bridge,
- (4) The intersection of the Ft. George River and the Intracoastal Waterway.

Of these, the largest number of observations were made at the Kingsley Plantation to obtain comparative records over a longer time period. Records taken always included: boat type, length, and speed. On some occasions, additional information such as boat direction and activity was also recorded.

Boat speeds were measured with a Sports Pro K band radar gun from Astro Products, which is essentially a relabeled traffic radar. Figure 4 shows the system being used near the Kingsley Dock. This was found to give good performance for a shore-based observer with good sight lines at boat speeds of greater than 5 mph. Boat speeds slower than this were estimated by eye. Accuracy is believed to be within 10%, with the greatest errors occurring when boats traveled at a significant angle to the observer. Boat lengths were estimated by eye, and are believed to be accurate to within 2 feet for all except the largest boats (over 30 feet).



Figure 4. Use of the radar gun from Kingsley Plantation.

Kingsley Plantation/Fort George River

The Fort George River at the Kingsley Plantation (see Figure 2) has many different uses: It is a recognized overnight anchoring location for boats traversing the Intracoastal Waterway; it and the surrounding creeks are popular fishing locations. Kayakers regularly paddle between the Kingsley Plantation and Long Island Outfitters via Simpson Creek. Figure 5 shows the Kingsley Plantation as seen from the Fort George River.



Figure 5. Kingsley Plantation

However, the greatest use of the Fort George River by the Kingsley Plantation is as a purely recreational boating area. On pleasant days, and in particular on weekends and holidays, hundreds of families and friends travel just east of Kingsley to the clean sandbanks near the south end of Simpson Creek (see Figure 2 for location). At low tide, these become extensive and great flotillas anchor or pull up on the sandbanks. The overall feel is of a giant backyard swimming pool, with barbecues and children playing in the water. Figure 6 shows boat traffic near the sandbanks both on a low traffic weekday, and on a typical non-holiday weekend. This area is a significant playground for personal watercraft, which often perform full speed runs back and forth in front of the plantation - the maximum PWC speed observed here was 56mph. At high tide, the Fort George River is several hundred feet wide at this location, and conflicts with other users are relatively small. At low tide, the navigable area shrinks considerably as the sandbanks expand, with under 100 feet of channel width at the narrowest location. At all tide levels, weekend traffic is often too high for tubers and waterskiers to operate comfortably as they require

considerably open space for safe operation. On weekdays, however, there is considerably more room, particularly at high tide.



Figure 6. Recreational boat traffic near the low tide sandbanks on the Fort George River near Kingsley. (Top) Kingsley Plantation dock looking west over low tide sandbanks on a low traffic weekday; (Bottom) Low tide sandbank on a typical non-holiday weekend, looking towards northeast from east of Kingsley at Point Isabel (see Figure 2). At least 18 boats are visible in this small area. The Simpson Creek entrance is near the left of the picture.

For the large number of boats on the Fort George River near Kingsley, there appear to be relatively few overt conflicts. We have observed numerous examples of both motorboats and PWCs disturbing people fishing in the area around Kingsley. However, the large majority of craft slow down considerably when passing people fishing, and fishermen tend to stay away from the most crowded areas, presumably because the boats scare fish. Wildlife also avoid the most crowded areas, but many egrets in slightly less crowded areas ignore the boats passing by while they hunt at the edges of the salt marsh. In general, the observed conflicts appeared due to heavy traffic and would be difficult to reduce. Speed limits in this area do not seem necessary at this time.

Boat-Induced Erosion

Observations were made of the shoreline for evidence of erosion induced by boat wakes. Overall, little evidence was found. Staked shorelines were used at several locations to estimate erosion but stakes above the high water line showed insignificant bank evolution, and stakes below high water were quickly washed away. Visual observations occasionally showed highly localized increases in turbidity caused by boat wakes breaking near the shoreline, but this appeared negligible compared to the overall volumes of sediment in the river. In wider sections of the river, wind-generated waves also appeared to have significant power: for example, a relatively strong 35mph wind

blowing along a 500 yard stretch of the Fort George river will generate waves with six inch height (see Kamphuis, 2000). This is comparable to boat wake heights but, unlike boat wakes, would occur continuously. Smaller winds, and winds acting in more confined portions of the river and creek system would of course produce smaller waves.

Reviews of other studies of boat-induced erosion gave somewhat contradictory and inconclusive results. On sandy coasts, both Kirkegaard et al. (1998) and Osborne and Boak (1999) found that vessel-generated wave groups caused a net *onshore* sand migration and profile steepening: i.e. the wave groups are accretionary, not erosive. For muddy coasts, the scientific literature is clear that both boat wakes in shallow water of less than about 7 ft depth, and boat wakes breaking at the shoreline can cause sediment suspension, which is transported elsewhere by both steady and fluctuating currents (e.g. Parchure et al., 1999; Bauer et al., 2002). However, the net effect of this suspension is unclear; whether sediment is simply redeposited elsewhere or whether there is a net erosive effect. Some studies (Johnson, 1994; Bauer et al., 2002) have determined a net erosive effect, while others (Osborne and Boak, 1999) have found this to be negligible in comparison to other processes.

In the present case, other processes may be more important than any boat-induced erosion for sandy shorelines. On the Fort George River, these are obviously very active and sediment transport by strong tidal currents could be felt while wading in some areas. Growth of sand spits over several years has been noted to us by park personnel and is almost certainly due to non-boating mechanisms.

Muddy shorelines are also active but are somewhat more difficult to evaluate. We have looked for evidence of boat-induced erosion but again were unable to find conclusive proof either way. General shoreline shapes and appearance are consistent with being formed by natural processes. Visual inspection of shorelines showed many vertical mud banks, but no wake-induced undercuts. However, because of the large tidal range, it would be difficult for undercuts to form in any case. Overall, because of the large traffic numbers, our general judgement is that muddy shorelines are probably affected somewhat by the considerable boat traffic, but there is no clear evidence of widespread erosion.

Boat Counts near Kingsley Plantation.

In all, 21 observer days were spent near Kingsley, where an observer day is defined as a four hour continuous stretch of boat counts. These included observations on all of the major summer holiday weekends (Memorial Day, July Fourth, and Labor Day), observations on non-holiday weekends, and weekday observations. All observations were made in spring-fall: boat traffic in winter is likely to be significantly less. Table 1 summarizes the major findings.

Table 1. Aggregate boat traffic statistics on Fort George River near Kingsley Plantation

Observation Period	Average Traffic/hour	Average Speed (mph)	Average Length (ft), Motorboats only (no PWC or kayak)	Boat Type (%) PWC/Kayak/Motorboat
Holiday Weekends	56	17	21	24 / 4 / 72
Non-Holiday Weekends	30	23	19	13 / 7 / 80
Weekdays	8	21	22	11 / 6 / 83

This shows a large increase in traffic on holiday weekends but a decrease in speed, presumably because of congestion. These are clearly the most crowded weekends, but with only 9 days on major holiday weekends, and approximately 55 non-holiday weekend days during the peak April-October months, non-holiday weekends still produce the largest total traffic numbers. Average boat lengths vary only slightly during different periods. Motorboats (a category which also includes sailboats under power due to the extremely small numbers) make up most of the traffic on all days with personal watercraft (PWCs) far behind, and kayaks a small but still significant fraction. The number of PWCs on holiday weekends increases very strongly. Part of this increase may be because of the tendency of motor boats towing PWCs to anchor at the sandbanks near Kingsley and then cruise around in the PWCs, which may lead to them being counted more than once.

These numbers may be used to give a very rough estimate of total traffic during the peak April-October season. With approximately 150 weekdays, 55 non-holiday weekend days and 9 major holiday weekend days, and assuming peak traffic is over an 8 hour period each day yields a total traffic past the Kingsley dock of around 27,000 boats for the seven month boating season of April-October.

This is not the number of unique visits: it proved impossible to keep track of boats and PWCs traveling past the plantation and returning several hours later, so these were double counted. (When a vessel traveled back and forth in a short time of under 10 minutes, these were single counted). Because of this, and using judgment based on many days of observations, we reduce 27,000 by a factor of 1.3 to 1.8, **which gives a range of 15,000-21,000 unique boat visits near Kingsley during the peak boating months of April-October.**

Figures 7-9 give a more detailed breakdown of boat traffic statistics. *Boat length statistics here and in all following figures account only for motorboats and not PWCs or kayaks. This is because PWCs and kayaks have relatively small size variations when compared to the wide range of sizes observed for motor boats.*

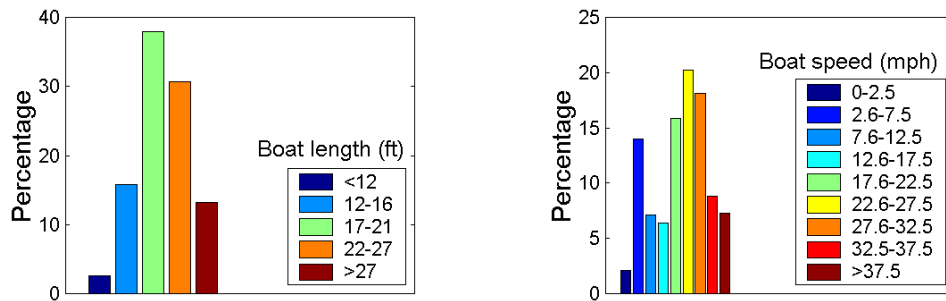


Figure 7: Detailed breakdown of boat traffic types on holiday weekends

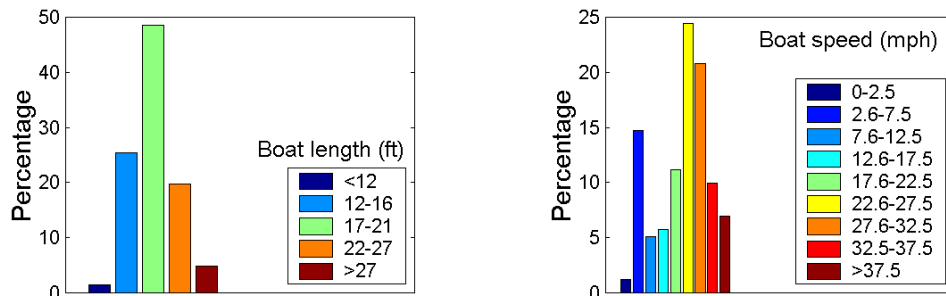


Figure 8. Detailed breakdown of boat traffic on non-holiday weekends.

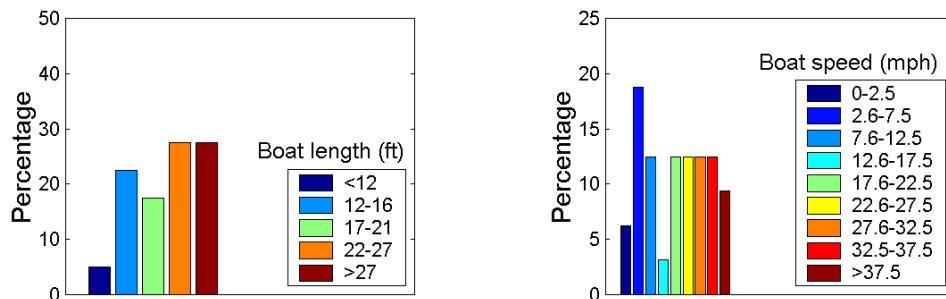


Figure 9. Detailed breakdown of boat traffic on weekdays.

Simpson Creek/Myrtle Creek

Simpson Creek extends from the Fort George River in the south to Nassau Sound in the North (see Figure 2). It is quite narrow - around 40 feet wide at its narrowest point just south of the Highway A1A bridge. Myrtle Creek branches off Simpson Creek near its south end to travel east of Long Island and joins back to Simpson Creek near Nassau Sound. Simpson Creek is navigable to small and medium sized pleasure craft at mid and

high tide, while Myrtle Creek at high tide is mainly used by personal watercraft and kayakers. Neither creek is entirely navigable at low tide: Simpson Creek is marginal starting around a mile south of Nassau Sound while Myrtle Creek becomes completely dry. In contrast, kayakers can navigate Simpson Creek during a wider portion of the tidal cycle. A small boat ramp where US A1A crosses Simpson Creek is mainly used by people fishing in the Creek and in Nassau Sound. Long Island between Simpson and Myrtle Creeks is the home to Long Island Outfitters and Kayak Amelia, which runs kayak trips and rentals throughout the park.

Three main sets of users are found on the Simpson Creek/Myrtle Creek system:

- (1) Boat fishing above mid tide on all of Simpson Creek, boat fishing at all times near both entrances and significant shore fishing near the US A1A bridge,
- (2) Kayakers found over most of the tidal cycle,
- (3) Personal Watercraft enthusiasts found near high tide.

The twisting channels of both Simpson and Myrtle Creek make a challenging race course that is the main reason for the presence of PWCs. However, these are quite episodic - they are only found on days when high tide is not too early or too late in the day, and usually on weekends and holidays. PWCs here tend to travel in groups and at high speed for such a small system. These give rise to potential safety concerns, particularly in the narrower stretches of the system.



Figure 10. Motor boat and kayak fishing near the north end of Simpson Creek.

Because Simpson Creek and Myrtle Creek are relatively narrow, it is very easy to startle wildlife like wading birds for all boat types, but fast boats were observed to startle more birds than slow boats. This appears to be the main wildlife impact and is difficult to avoid. The narrow width also creates conflict between users. We have observed PWC flotillas traveling at high rates of speed past angry fishermen near the north end of the Simpson Creek/Myrtle Creek/Nassau Sound junction (but did not get speeds) and have anecdotes from regular users of similar interactions with kayakers. According to Kayak Amelia personnel, these inconsiderate users are in the minority, but may be giving the majority a bad name. The possibility of establishing two speed-controlled zones should be investigated: (1) near the Long Island Outfitters' dock, where many kayaks launch and which is the scene of initial instruction for beginning kayakers; and (2) near the Simpson Creek/Myrtle Creek/Nassau Sound junction, which is a popular fishing spot. These are

relatively short stretches of water, and speed controlled zones could reduce conflicts and increase safety.

We have also looked for evidence of boat wake-induced erosion on Simpson Creek. Again, this region has quite active sedimentary processes as evidenced by numerous oxbows. An obvious region of erosion is at Half Moon Bluff near Nassau Sound (see Figure 2 for location). Figure 11 shows typical detail at low tide, with fallen trees and mud blocks. This has clearly been ongoing for many years and appears controlled by tidal currents. However, in the narrow portions of Simpson Creek, boat wakes can only be dissipated by the muddy banks. This is certain to cause some erosive pressure, but evidence of significant erosion such as slumps or undercuts was not readily visible (except at Half Moon Bluff).



Figure 11 Half Moon Bluff on Simpson Creek showing tidal current-induced erosion.

Table 2 and figure 12 show overall statistics for traffic on Simpson Creek and Myrtle Creek combining numbers from holiday and non-holiday weekends. Observations were made from the A1A bridges on Simpson and Myrtle Creek. Because not as many observation days (three) were used, combined statistics are presented only. All aspects of aggregate statistics are different from traffic on the Fort George near Kingsley. Traffic counts are much lower, as is the average speed and length, and kayakers in particular are much more common. Boat lengths are likely low because of the inexperience of an observer on one holiday weekend, but are probably within one or two feet and clearly, boats here are considerably smaller than on larger water bodies such as the Fort George River. Average speeds are also very low but this is somewhat deceiving. Figure 12 shows that the speed distribution is somewhat bimodal, with many kayakers and fishermen traveling slowly, but a significant number of faster-moving craft, many of which are PWCs.

Table 2. Aggregate traffic statistics for Simpson Creek/Myrtle Creek near A1A bridges.

Observation Period	Average Traffic/hour	Average Speed (mph)	Average Length (ft), Motorboats only	Boat Type (%) PWC/Kayak/Motorboat
All weekends	8	9	12	21 / 51 / 28

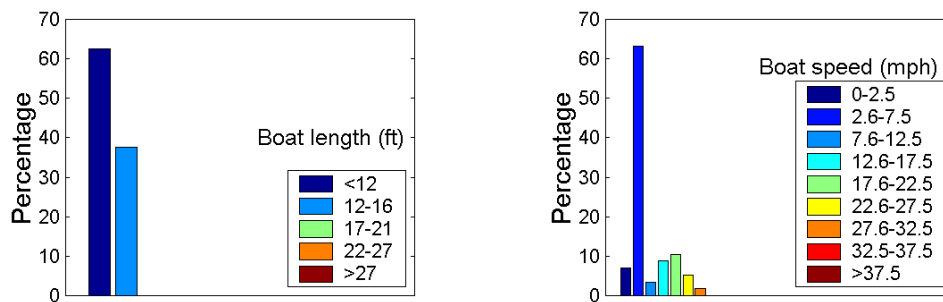


Figure 12. Detailed weekend breakdown of boat traffic on Simpson Creek/Myrtle Creek near A1A.

For weekday traffic on Simpson Creek, we have three overall counts from a boat traversing the system. Because of the small numbers of boats present, it is difficult to provide accurate statistics, but a total traffic count of around 2-4/hour seems reasonable. The continual presence of fishermen and kayakers ensures that numbers do not drop off as much as on the Fort George River, which is more of a weekend recreational area. No PWCs were observed on any of the weekday traverses, but because of the small number of observations, this is not conclusive.

From this, a total traffic can be estimated for the summer months of April-October. Again using 150 weekdays and 64 weekend days, we arrive at a total of 8000 boats counted. Dividing again by the repetitive counting factor of 1.3-1.8, we arrive at **around 4000-6000 boats during the peak boating season of April-October**. Because fewer boats appeared to be double counted here, true visits are probably near the higher end of this estimate. These numbers agree well with records of the total number of kayaks per year from Kayak Amelia at Long Island Outfitters, which estimates around 2500 kayak visits per year.

Fort George/Intracoastal Waterway

Most boats on the Fort George/Simpson/Myrtle Creek system come from the Intracoastal Waterway, which has several boat ramps within a short distance. Figure 13 shows two of these which are widely used along Heckscher Drive (A1A) (see Figure 2 for location).



Figure 13. Joe Carlucci (left) and Sisters Creek (right) boat ramps on the Intracoastal Waterway on a low traffic weekday.

Observations at the intersection of the Fort George River and the Intracoastal Waterway showed numbers and types of boats on consecutive days on both a weekend and weekday. No holiday weekend observation days were included. Total traffic numbers seem low when compared to the Fort George River near Kingsley. This may be because of poor weather on the two observation days - since almost all traffic on the Ft. George River comes from the Intracoastal Waterway, total numbers should be comparable. Additionally, since the Intracoastal Waterway is more of a highway than a playground, we expect fewer repetitive counts from boats traveling back and forth in a short time. The most notable observation from the data is that there are essentially no kayaks on the Intracoastal Waterway. Because kayaks have a relatively small range, they tend to stay near launch points. Thus they travel near Kingsley and on Simpson Creek, and not on the Intracoastal Waterway.

Table 3. Aggregate traffic statistics for Intracoastal Waterway near the Fort George River

Observation Period	Average Traffic/hour	Average Speed (mph)	Average Length (ft), Motorboats only	Boat Type (%) PWC/Kayak/Motorboat
Total non-holiday	13	20	20	9 / 0 / 91

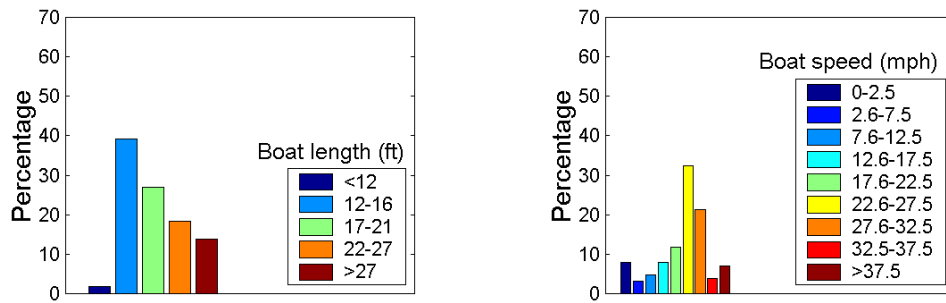


Figure 14. Detailed breakdown of observed boat traffic on Intracoastal Waterway.

Total annual traffic here is taken to be the similar to traffic at Kingsley; around 15,000-21,000/year. The decrease in kayaks and PWCs is likely made up by additional N-S Intracoastal traffic traveling longer distances. *However, it should be stressed that because fewer observations (two) were made here, these numbers have much greater uncertainty.*

Smaller Creeks

There are many smaller dead end creeks around this area that branch off from the main waterways. These were observed to have very low traffic - so low that, after short observations, the time that would have been spent performing extended boat counts here was judged to be better spent elsewhere. Garden Creek is an example of this type - it is a small creek just west of Kingsley Plantation on the Intracoastal Waterway (see Figure 2). The only people observed in this creek were fishing and, once, a boat may have mistaken the mouth of Garden Creek for the Fort George River but quickly turned around once it realized its mistake. An average boat traffic of 5 vessels/day may be a good estimate for these types of creeks. **This gives an overall traffic count of 1000 visits in the April-September months.** Impacts and conflicts appear to be negligible, as does boat-induced erosion.



Figure 15. The mouth of Garden Creek near low tide looking east, with the Kingsley dock visible in the background.

Summary and Conclusions

The larger area around Kingsley Plantation, encompassing the Fort George River, Simpson, Myrtle, and smaller Creeks, and the Intracoastal Waterway, is a major recreational resource for the people of northeastern Florida. Fishing, kayaking, use of personal watercraft (PWCs), and general recreating are all popular. The area is particularly popular on holiday weekends, but has significant traffic even on weekdays. Total traffic during the April-October months was estimated to be 15,000-21,000 unique visits around the Kingsley Plantation with smaller numbers in other areas.

Erosive pressures from boat wakes on sandy shorelines were judged to be negligible. Erosion on muddy shorelines was more difficult to evaluate: natural processes are actively rearranging the shorelines, but wake-induced erosion could not be ruled out. Boat-induced sediment resuspension leading to increased turbidity was observed locally, but overall impacts are again uncertain.

No speed controlled areas are recommended in the Fort George River or the Intracoastal Waterway, as these areas appear to be doing relatively well without regulation. The possibility of establishing speed zones in Simpson Creek near Long Island Outfitters and near the Simpson Creek/Myrtle Creek/Nassau Sound confluence should be investigated further, as user conflicts were noted in these locations.

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