Annual Update
2011-2012
Jacksonville Manatee Protection Plan
Population Inventory and Analysis

Prepared by
Jacksonville University
for the
Waterways Commission
of the
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EXECUTIVE SUMMARY

This document is the 2011-**12** annual update to the Duval County Manatee Protection Plan. It represents additional population inventory and analysis of data gathered between October 1, 2011 and August 31st, **2012** by Jacksonville University. In 2004, the recommendation was made that the 1999 Edition of the Duval County MPP be updated into a new edition. Data, figures, tables and agency names were outdated or no longer appropriate. The latter, was considered to be an administrative update and did not affect the inner workings of the Duval MPP itself. The new updated document was approved by the FWC in November 2006. Among the plan's changes are clarifications of the applicability of the MPP to multi-family boat facilities and revisions to the "Unacceptable" category. In 2009 ATM Inc., conducted a boating study of Duval County for the City of Jacksonville, the results of which are to be incorporated into the **latest Manatee Protection Plan rewrite and update in 2012-13.**

Aerial Sightings: The Single Highest Day Count (SHDC) of manatees represents the highest number of animals counted on a single survey day throughout the year. For the Lower St. Johns River (LSJR), **the SHDC was 177 animals per survey (May 2012) was the highest to date**, 121 animals per survey (May 2011), 116 animals per survey (June 2010) which was higher than 55 animals per survey (June 2009-the lowest on record). In 2008, it was 140 animals per survey which was lower than in previous years, but still greater than the general mean of **124** manatees per survey (1994-2012**).** In April of 2007, there were 151 manatees per survey. This represented the highest number of animals sighted so early in the season, most likely due to an unusually mild winter. In September of 2006, the count was 153 manatees per survey. A peak of 170 manatees per survey was seen in June 2005. Prior to this, it was 160 (May 2004); 150 (June 2003); 106 (May 2002). Dry weather (1999–2001) caused higher salinity in the LSJR that lead to poor or no regeneration of tape grass beds *(Vallisneria americana)* that manatees primarily rely on for food. As a result, overall per survey counts were generally lower than expected. Apart from the year 2000/2001 data, it appears that SHDC increased until 2005 and then begun to decline to normal levels seen in the late 1990's (range 124-136 manatees per survey). Increased counts were probably also influenced by better knowledge of the survey area and where manatees are likely to occur.

In the Intracoastal Waterway (ICW) **the SHDC was 17 manatees per survey (April 2012)**, similar to 20 manatees per survey (May 2011) and lower than 32 manatees per survey in May 2010. In June 2009, it was 18 manatees per survey. In May of 2008, it was 30 manatees per survey. It was 21 and 19 manatees per survey (April 2007, and April 2006, respectively); 29 manatees per survey (July 2005); 23 manatees per survey (2003 and 2004); 28 manatees per survey (April 2002) was the highest since 1994. In 2001, SHDC was 23 manatees that were higher than the 13 reported in 2000. Counts between 2001 and 2005 appear to be more consistent with counts prior to the period of drought for years 1994-1998.

In LSJR, the mean number of manatees per survey by year increase from 16-51 manatee/survey (2000-2006, respectively). In 2007, numbers decreased to 34 manatees/survey, probably due to the return of drought conditions that negatively impacted the manatee grass bed habitat. In 2008, there was a period of recovery (41 manatees/survey) and then a decline to 15 manatees/survey in 2009, **followed by increases from 2010 to 2012 of 37- 60 manatees per survey, respectively. General means in the ICW have been consistent for the last seven years 2000-2012 (5 manatees/survey/yr. range 3-10).**

The proportion that calves represented of the total number of manatees sighted ranged from 3.40 % to 11.53 % with a mean of **7.76 %** (LSJR); and 0.91 % to 12.05 % with a mean

of **6.89 %** (ICW) over the duration of the study. Percentages for the 2002 season were lower in the ICW (0.91 %) but not significantly different for the same months in 2003 (1.20 %), possibly attributed to unusual weather conditions. In 2004, percent calves was higher than the general mean in both the LSJR (9.52 %) and ICW (10.68 %) but in 2005 the percentages are similar to the general mean in LSJR and below the general mean in the ICW.

Cumulative counts of manatees at various locations in the ICW and LSJR are included to show density abundance and location of manatees in the County. The latter does not appear to have changed in spite of the lower numbers of manatee observed during the 2001/2002 season. The 2002-2006 numbers indicate a rebound similar to the pre-drought years.

Highest concentrations of manatees occurred south of Fuller Warren Bridge (east and west banks) and Doctor's Lake in summer where substantial submerged aquatic vegetation exists. Spatial distribution of manatees (2002-2007) was well spread throughout the county similar to the drought years 2000/2001. Since the latter half of 2006 and into 2007, average salinity levels have remained relatively high resulting in reduced availability of tape grass in the county. Higher salinity was caused by drought conditions (lack of precipitation). As a result, animals were traveling more in search of food further south of the study area which resulted in a lower summer count. During 2008-2009, the amount of rainfall increased significantly throughout the summer resulting in lower salinities which favored grass bed and algae growth. However, a corresponding increase in manatee numbers as a result of this was not realized, and the reason for this is not yet clear. **In 2010, there appeared to be the beginnings of a rebound in the manatee numbers observed in the Jacksonville area and this continued into 2012.**

Manatee Mortality: **As of September 2012, there were a total of 9 reported deaths in Duval County, of which 3 were watercraft related, 1 Perinatal, 2 cold stress and 3 undetermined (FWRI 2012).** In 2011, there were a total of 15 reported deaths in Duval County, of which 5 were watercraft related, 4 Perinatal, 3 cold stress and 2 undetermined. In 2010, there were 2 watercraft mortalities, and from 2008 to 2009, there were at total of 19 watercraft mortalities in the county. This represented the sixth time the county surpassed the "unacceptable" level of watercraft related mortality as stipulated in the MPP (1st in 2002, 2nd in 2004, 3rd in 2006, 4th 2008, 5th 2009, and 6th 2011). This unacceptable level is triggered when there have been five or more watercraft related mortalities in all county waters within the last 12 months. **The agencies did not met officially regarding the 2011 threshold being surpassed. However, FWC, USFWS, and COJ are currently in the process of rewriting the MPP.**

A number of large vessel mortalities appear to have occurred in the past few years. Although no large vessel deaths were reported in 2010, a tug operator did report hitting a manatee near Broward River mouth on June 16th 2011. **Preliminary data suggests a large vessel may have killed a manatee recovered from near Reddie Point in 2012.** Numbers of large vessel caused mortalities in the past include 7 (2002), 3 (2006), 2 (2007), 5 (2008), and 3 (2009).

Since 2009, there seems to be a shift in the pattern of watercraft deaths towards the mouth of the river, rather than a more county wide spread in prior years. Manatee deaths seem to have occurred in an area extending from Downtown to the mouth of the St. Johns River.

In 2012, there were a total of 8 reported deaths in Duval County, of which 3 were watercraft related, 1 Perinatal, 2 cold stress and 2 undetermined. In 2011, there were a total of 15 reported deaths in Duval County, of which 6 were watercraft related, 4 Perinatal, 3 cold stress and 2 undetermined. In 2010, there were a total of 9 reported deaths in Duval County, of which 2 were watercraft related, 2 other human, 1 Perinatal, 1 cold stress and 3 undetermined. In 2009, there were a total of 14 deaths, of which 8 were watercraft-related, 3 perinatal, 1 cold stress and 2 undetermined. In 2008, there were a total of 14 reported deaths, of which 11 were watercraft related, 2 cold stress and 1 undetermined (FWRI 2012). County, State and Federal agencies met October 30th, 2009 to discuss the 19 watercraft deaths that occurred from May 5th 2008 to September 11th 2009. Issues of inadequate signage and enforcement were discussed. The same agencies met September 18th, 2008 to discuss 8 watercraft deaths in Duval County during that year, and how Duval County should respond to those incidents. It was suggested that there was an identifiable pattern of activity associated with large vessels that caused three of the mortalities recovered near Lions Club. In order to address the increasing trend in large vessel caused mortalities, City of Jacksonville (COJ), Jacksonville Marine Transportation Exchange (JMTX), and the Port of Jacksonville developed a manatee awareness placard similar to the Right Whale placard for commercial vessel operators.

Habitat: **Line transect data from 2004-2011, indicated that there was a significant decline in the length of grass beds, SAV length, total cover percentage, and the proportion of tape grass at sites sampled in Duval County by the SJRWMD (Figures 3a-b). Aerial observations indicated visible declines in grass beds since 2005. From January to May 2012, salinity in the river was elevated above the norm due to a lack of precipitation. From June to September the average salinity dropped below the norm following significant rainfall (Figure 4b). No significant algae blooms were observed in 2012.** Longer term salinity changes in the St. Johns River are addressed in the following section *Symposium on freshwater withdrawals from the St. Johns River.* In 2011, salinity remained above the norm all year, especially from May to September. This represents an extended period of elevated salinity conditions which began July 2010. No extensive toxic algae blooms were observed in 2011. Toxic algae blooms developed early in 2010 near Welaka and moved north to Jacksonville around mid-summer. Fish kills were reported and an increase in dolphin deaths occurred. The dolphin deaths were declared an Unusual Marine Mammal Mortality Event by NOAA. Manatee seemed to be unaffected by these events. In 2009 the salinity was higher initially, lower over the summer, and then elevated after October. In 2009, salinity was generally lower compared to 2008 because of more rainfall. The fresher conditions, high water temperature, and nutrient input caused by run-off from precipitation, lead to the emergence of toxic algae blooms in the St. Johns River. As in the past, the algae blooms did not seem to adversely impact manatees. Increased run-off from rain, most likely elevated the amount of color in the water reducing light availability to the grasses. In addition, extensive algae blooms probably also caused shading and reduced light availability for optimum grass growth. Salinity recorded at the Jacksonville University dock remained elevated during the first half of 2008 (January to August) then decreased with the onset of tropical storm activity. Data from SJRWMD indicated a further decline in grass bed indices for 2007. The grass beds remain stressed due to periodic drought conditions. Grass beds north of the Buckman Bridge regenerated significantly since late 2002 to 2006 and then declined again in 2007. In 2007, drought

conditions returned and numbers of manatees sighted declined in the summer due to a die back of submerged aquatic vegetation. The lack of precipitation led to elevated salinity levels in the river that forced animals to move further south within the St. Johns in search of food. Indices for percent feeding indicated more animals feeding each year subsequent to 2002. Numbers feeding remain similar to 2004 levels. This may be because the food supply leveled off in 2004/2005/2006 and there were more total numbers of manatees. However, food supply still remains below 1998 levels in terms of the grass bed length, percent cover, diversity index and proportion of tape grass. All these indices show a fall as a result of the drought (2001/2002) and then recovery with the return to more normal conditions.

Symposium on freshwater withdrawals from the St. Johns River: the 2nd meeting of the University of Florida Water Institute Symposium meeting is scheduled for February 24-26th 2010 in Gainesville, Florida. The 1st meeting occurred September 16-18th 2008 and indicated that, from salinity modeling conducted by SJRWMD, harbor deepening activities have a significant potential to alter salinity profiles and cause harm to biological systems.

Select Water Supply Impact Study Findings by the **National Research Council 2009**:

1. "During Phase I, the District predicted that projected future water withdrawals could have dramatic consequences on SAV in some areas, especially where *V. americana* populations now fluctuate in the lower St. Johns River."
2. "Although *V. americana* presumably could migrate further upstream, there is less shallow water area there, so a net loss of habitat is still expected."
3. "..more spatially explicit predictions of the salinity increases in the littoral zone" were recommended and, "To enhance their monitoring program, the District should consider adding at least one continuous salinity monitoring station in the littoral zone during Phase II to detect short-term salinity excursions where *V. americana* is at risk."
4. "The workgroup should also undertake more study of salinity tolerance of local populations from the St. Johns River, perhaps via mesocosm studies, in order to validate the values derived from the literature."
5. "Finally, the workgroup might assess whether any other existing SAV species, for example *Ruppia maritima*, might be able to take the place of *V. americana* as a dominant macrophyte in the littoral zone."

Warm Water Attractants: Manatees have been observed assembled in groups at warm water out falls since March, 1994. *Jacksonville Electric Authority's Southside (JEASS)* and *Kennedy Generating Stations (JEAKS)* and *Jefferson Smurfit's* paper mill were all located within a 7 mile radius of Downtown. It has been several years since these facilities dismantled, removed, or stopped discharge warm water into the St. Johns River. As a result, ever decreasing numbers of animals have been observed at these locations. During the winters between 2002/03 to 2005/06 JEA undertook monitoring for manatees. In spite of the Southside plant being shut down in October 2002, manatees continued to be congregated at the site but did not remain for very long before departing. JEA also installed a retaining gate to prevent manatees moving up and into the old discharge pipes where they could potentially become trapped and die. No animals were seen at Southside Generating Station after December 3rd 2002. In 2003, no manatees were reported by JEASS until 4 adults were seen

on 05/05/2003 and 2 adults and 2 calves were seen 04/15/2003. During the winters of 2004 and 2005 no manatees were observed at this site. Aerial observation since then indicates that manatees have stopped using this site to congregate.

Ortega River: During the winters of 2004/05 to 2010/11, no manatees were observed at the warm water source identified in Ortega River. In January 2010, a cold stressed manatee was rescued from the Ortega River by FWC. **During the winter of 2011/12 4-5 animals sometimes consisting of mother and calf pairs were observed in the area for a short time before departing. Also, it was not uncommon to see animals in the area during the rest of the year.**

JEA District # 2 Outfall and North Side Generating Station: **Manatees continue to be seen at the JEA District # 2 waste water treatment outfall near north Bartram Island throughout the year. Aerial observations by Jacksonville University, reported 1-4 animal sightings from 1/16/2012 to 2/14/2012, and 1-2 animals sighted from 3/6/2012 to 9/5/2012. There were** 8 sightings of 1-2 animals from 11/8/2010 to 12/7/2010, 12 sightings of 1-6 animals from 3/7/2011 to 5/23/2011, and 5 sightings of 1-2 animals from 8/8/2011 to 9/23/2011. **In addition, "Sea to Shore" was contracted by JEA to do a study of the outfall that concluded in 2011. Moreover, it was determined that a number of animals were congregating in San Carlos Creek adjacent to JEA's North Side Generating Station because of a broken pipe. As a result, 6 animals were rescued or assisted and released from the area between 1/25/12 to 3/15/12.** FWC reported 40 sightings ranging from 1-5 animals between 11/6/2008 to 3/30/2009; JEA reported 16 sightings ranging from 1-2 animals from 10/07/2009 to 3/29/2010. Aerial observations by JU, reported 17 sightings of 1-4 animals from 5/6/2009 to 11/17/2009, and 8 sightings of 1-4 animals from 3/31/2010 to 6/16/2010.

Rescue attempts were made and one animal was relocated by Sea World of Florida and FWC on Dec 19th 2006. On August 15th 2007 an entrapped manatee was rescued from the JEA North Side Generating Station. In addition, on January 18th 2008, two manatees were rescued from the JEA District # 2 outfall north of Bartram Island by Sea World of Florida and FWC. The discharge from the site is fresher than the surrounding ambient waters. As a result, it is likely to serve as an attractant for manatees throughout the entire year, and not just during colder weather. Manatees are attracted to the site in winter, when the discharge is also warmer than the surrounding ambient waters. The close proximity of this site to the location of shipping lanes in St. Johns River means that there possibly exists a higher potential for vessel/manatee interactions. Recently, some manatees that appear to have been killed by large vessels have been recovered close to this location.

Additional information:

NAS Mayport: **In 2012, 16 sightings of manatee occurred within the Mayport basin (average 1 animal/sighting). In addition, on 1/24/2012 a Right whale was observed heading east at buoys 3 & 4, and a pod of whales (species unspecified) was observed 7 miles north of the jetties.** In the spring of 2011, Mayport NAS initiated a manatee awareness and reporting program in addition to its existing marine mammal reporting program. Manatee signs were posted at intervals along Mayport basin, and a data log kept of sightings and actions taken.

Duval Manatee Rescues: **In 2012, four manatees were rescued from San Carlos Creek near JEA's North Side Generating Station and one from Goodby's Creek. In addition, two animals were assisted and released in San Carlos Creek and one more from the JEA#2 (warm/fresh) water outfall near Bartram Island.** On September 19th 2011, four adult manatees became tidally stranded at a residence north of Blue Cyprus Park. The animals were assisted and released back into the St. Johns River successfully. The incident generated some TV media interest that aided in education and outreach efforts. There have been five other rescues in the past: Ortega River (1/4/2010), Mill Cove (3/14/2010), two manatees from SJR near the BP Refinery (2/6/2009), and Trout River (7/25/2009).

THIS REPORT CONTAINS THE FOLLOWING UPDATED SECTIONS TO THE 2010 EDITION OF THE DUVAL COUNTY MANATEE PROTECTION PLAN:

EXECUTIVE SUMMARY

1. INTRODUCTION, INVENTORY ANALYSIS SECTION (Pages 9-19). Information sources (Page 20).

2. TABLES SECTION (Pages 21-42).

3. FIGURES SECTION (Pages 43-56).

4. SERIES A – AERIAL SIGHTINGS (Pages 57-62).

5. SERIES B – MANATEE MORTALITY 2008/2009 (Pages 63-67).

Introduction

The Duval County Manatee Protection Plan (MPP) was developed by the Jacksonville Waterways Commission for the Jacksonville City Council. Jacksonville University conducted the research on which the plan is based. Extensive studies were conducted beginning in 1994 and have continued to present. In 1999, the State of Florida approved the Duval County Manatee Protection Plan. The Plan had initially been approved by the Florida Department of Environmental Protection. In April 2000, the state rule implementing the boat speed zones were adopted by the Florida Fish and Wildlife Conservation Commission. New federal manatee protection slow speed zones by the U.S. Fish and Wildlife Service were effective September 5th 2003 for Duval, Clay and St. Johns Counties. The biggest change is the area located downstream of the Hart Bridge which requires watercraft to travel under 25 miles per hour (mph). The manatee protection is also expanded approximately one mile further downstream (Federal Register. August 6th 2003. 68(151): 46869-46917) in order to complement existing state and local governmental manatee protection measures. A signage plan was implemented in May 2005 and completed September 2007. In 2009, a boating study was undertaken by ATM Inc., the results of which are to be incorporated into the latest plan rewrite and update (2011-12).

The MPP contains a provision that the plan be reviewed and updated annually. This report contains additional data concerning the manatee population in Duval County and is the 2012 annual update. **Updated information is shown in bold.**

Inventory and Analysis

Manatees

Distribution and Abundance: Aerial surveys by Jacksonville University (March, 1994 – **September**, 2012) conform to current FDEP Manatee Aerial Survey Protocol. Intensive bimonthly surveys were conducted in areas manatees frequent: (1) the St. Johns River, its tributaries and (2) the Atlantic Intracoastal Waterway (Nassau Sound to Palm Valley). **These two flight paths do not overlap.** During winter months, industrial warm water sources in Northeast Florida were also monitored. **During 713 bimonthly surveys (374 SJR; 339 ICW), a total 16,280 manatee sightings were recorded (14,549 SJR; 1,731 ICW), 7 % calves (Table 1).** When water temperatures decrease (December through March), the majority of manatees in Duval County waters migrate south to Blue Springs and/or other warmer South Florida waters.

Historical manatee survey data from Jacksonville University indicate that manatees were observed feeding, resting and mating in greater numbers south of the Fuller Warren Bridge relative to other waters in Duval County. Sightings in remaining waters consisted mostly of manatees traveling or resting. The data suggested that manatees use the Intracoastal Waterway as a travel corridor during their seasonal (north/south) migrations along the east coast and that they stay close to the shore, utilizing small tributaries for feeding when in these waters.

Aerial survey counts of manatees are indices of abundance at the time of each survey. As a result, counts must be viewed as relative only to trends in general abundance, distribution

countywide, and habitat use patterns (Irvine 1980). *Map Series A, Manatee Aerial Sightings*, provides graphical distribution information about manatees. **Differences in seasonal distribution patterns for manatees in 2011–2012 were not found to be significantly different from past years, except that manatee arrived in the study area earlier. In 2010, manatees arrived later because of an extended winter season.** ***Map Series A,*** **shows manatee distribution from Summer 2011 through Summer 2012.** Seasons were classified as winter (December-February), spring (March-May), summer (June-August), and fall (September-November). **The proportion that calves represented of the total number of manatees sighted ranged from 3.40 % to 11.53 % with a mean of 7.76 % (LSJR); and 0.91 % to 12.05 % with a mean of 6.89 % (ICW) over the duration of the study.** These proportions were similar to those reported by Campbell and Irvine (1978) of 9.6 %, Valade (1991) 5 % and Kinnaird (1983a) of 7 %, for the LSJR in Duval County.

The Single Highest Day Count (SHDC) for LSJR was 177 animals per survey (May 2012), and was the highest since 1994. In May 2011 it was 121 animals per survey. This was similar to last year 116 animals per survey (June 2010). In June 2009, it was 55 manatees per survey, the lowest on record. In June 2008, the SHDC for LSJR was 140 animals per survey, lower than the previous five years, but greater than the general mean of 121 manatees per survey (1994-2010). The SHDC of manatees represents the highest number of animals counted on a single survey day throughout the year. In April of 2007, it was 151 manatees per survey. This represented the highest number of animals sighted so early in the season, due to an unusually mild winter. In September of 2006, it was 153 manatees per survey, but reached a peak of 170 manatees per survey (June 2005). Prior to this, it was 160 (May 2004); 150 (June 2003); 106 (May 2002). Dry weather (1999–2001) caused higher salinity in the LSJR that lead to poor or no regeneration of tape grass beds *(Vallisneria americana)* that manatees primarily rely on for food. As a result, overall per survey counts were generally lower than expected. Apart from the year 2000/2001 data, it appears that SHDC increased until 2005 and then begun to decline to normal levels seen in the late 1990's (range 124-136 manatees per survey). Increased counts were probably also influenced by better knowledge of the survey area and where manatees are likely to occur. The SHDC has alternated between the months of May and June each year since 2000. Prior to 2000 the SHDC occurred in July, August and September. In 2006/2007, due to a mild winter the season expanded from April to September (Table 1).

In LSJR, the mean number of manatees per survey by year increase from 16-51 manatees/survey (2000-2006, respectively). **The general mean for the period 1994-2011 was 44 manatees per survey.** Then in 2007, numbers decreased to 34 manatees/survey, probably due to the return of drought conditions that negatively impacted the manatee grass bed habitat. These numbers do not necessarily mean an increase in real population numbers for the Florida manatee, since many anthropogenic threats to manatees and habitat still exist. It was likely that more individuals were migrating into the northeast Florida region. In 2008, mean number of manatees/survey increased slightly to 41, but decreased sharply in 2009 (15 manatees/survey). This was unexpected because 741 more animals were observed on the east coast during the State Synoptic Aerial Survey earlier in the year than the previous 2007 survey. The increased sightings did not translate into more animals visiting Northeast Florida that year. Moreover, the literature indicates that some growth has indeed occurred in the Atlantic sub population. For the years 1986-2000, the Atlantic population had a growth rate of 3.7 % (95 %CI: 1.1 to 6 %)

(Runge *et al.* 2007a). Craig and Renolds (2004) used a Bayesian method and predicted that from 1982-1989, the growth rate was 5-7 % per year, 0-4 % (1990-1993), and then increased 4-6 % per year (1994-2001). The Atlantic sub population represents about 47% of the Florida synoptic count, the Northwest (11 %), the Southwest (37 %), and the Upper St. Johns or Blue Springs (5 %) (U.S. Fish and Wildlife Service. 2001. State Manatee Management Plan, September 2007). **In 2011, the mean number of manatees in Duval County was higher than the general mean, and increased from 37-44 manatees per survey from the previous year. Although numbers appear to be higher in 2012 (60 manatee per survey) note that the number of aerial surveys has decreased significantly (Table 1).**

In the Intracoastal Waterway (ICW) the SHDC was 17 manatees per survey (April 2012); 20 manatees per survey (May 2011). This was lower than 32 manatees per survey in May 2010. In June 2009 the SHDC was 18 manatees per survey, and in May 2008 it was 30 manatees per survey. SHDC was 21 and 19 manatees per survey (April 2007, April 2006, respectively); 29 manatees per survey (July 2005); 23 manatees per survey (2003 and 2004); 28 manatees per survey (April 2002) was the highest since 1994. In 2001, SHDC was 23 manatees that was higher than the 13 reported in 2000. Counts between 2001 and 2005 appear to be more consistent with counts prior to the period of drought for years 1994-1998 (range 19-23 manatees). **The general mean of 5 manatees per survey per year (range 0-32 animals) has not changed since 2000 to 2012 (Table 1).**

Cumulative counts of manatees at various locations in the ICW (Table 2) and LSJR (Table 3) are included to show density abundance and location of manatees in the County. The latter does not appear to have changed in spite of the lower numbers of manatee observed in 2009, or during 2001/2002. The 2002-2005 numbers indicate a significant rebound similar to pre-drought years and the 2006-2008 numbers indicate slight decrease and stabilization. Numbers in 2007 are lower because of a drought which caused animals to move further south out of the study area, so they were not counted. The 2009 data is somewhat anomalous because the low numbers of manatees normally associated with droughts were observed during a period of more than adequate rainfall. **In 2012, the manatee population continued to increase from the previous year indicate a sustained rebound in the local population following a series of droughts in the recent past. Also, note that the data for 2012 does not represent a full year. In addition, the JEA No. 2 waste water treatment outfall was included because manatees have been consistently attracted to this site (2004-2012). Also, a category for manatees in the LSJR south of Doctors Lake has been included (Table 3).**

Increased spring and summer sightings are attributed to an influx of animals from outside the study area **(Figure 1a, b-2a, b). Manatee abundance is correlated with both temperature and photoperiod. LSJR totals exhibit an increasing trend from 2000 to 2005 and a decreasing trend from 2005 to 2009. The trend seems to be increasing again from a low in 2009 to high in 2012. In the ICW totals remain relatively stable over the past several years.**

Some of these animals could come from Blue Spring (170 Km further south within the St. Johns River system) and the rest are made up of south Florida east coast animals (Kinnaird 1983a). Kinnaird (1983a) mentioned the then current population of Blue Springs animals

numbering some 35 in 1982/83. Ackerman (1995) mentions 88 individually identified manatees at Blue Springs in the winter of 1993-94. Between 1990-1999 this population had an annual growth rate of 6.2 % (95 %CI: 3.7-8.1 %) (Runge et al. 2004). This represents the fastest growing sub population unit accounting for about 5 % of the total Florida count (State Manatee Management Plan, September 2007). **More recent raw data indicate that the Blue Springs management group has continued to grow at a slightly faster rate during 2000-2012 (Table 4).** Satellite telemetry data support that most animals come into the LSJR as a result of south Florida east coast animals migrating north/south each year (Deutsch et al. 2000). Sightings by Jacksonville University seem to indicate that the majority of animals moving into the County come from further south within the LSJR system (Map Series A). However, scar pattern identification suggested that significant numbers of manatees are part of the Atlantic sub-population and, that in the last decade only one manatee carcass recovered in Duval County has been identified as coming from the Blue Spring population (Cathy A. Beck, Wildlife Biologist, Sirenia Project, U.S.G.S. personal communication).

Manatees were distributed throughout LSJR and ICW waters in spring (*Map Series A*). Highest concentrations of manatees occurred south of Fuller Warren Bridge (east and west banks) and Doctor's Lake in summer where substantial submerged aquatic vegetation exists. In 2001/2002 manatees seemed to be more spread out throughout the county than in 2000 and this may be due to the fact than manatee were forced to spend more time traveling in search of sparse food resources. In late summer and fall manatees tended to occur in the main stem of LSJR. In winter, most animals moved south out of Duval County. During spring and summer, manatees with new calves were consistently seen in the upstream areas of tributaries because these areas are more sheltered. Wills Branch Creek continues to be one such birthing area in Cedar River. In 2003-2005, manatees were observed throughout the County similar to 2001-2003. Also, more manatees were seen on the east bank of St. Johns River and west bank south of NAS JAX than in 2000/2001. Greater numbers in these areas can be attributed to regeneration of *Vallisneria americana* tape grass beds. **During spring of 2012, 426 manatees were observed throughout the whole study area (LSJR/ICW), more than spring of 2011 (259 manatees). This represents a continued increase since the previous springs of 162 manatees (2010), and 147 manatees (2009). High spring counts in the recent past included 395 manatees in 2008, 369 (2007), and 218 (2006). During the summer of 2012, 248 manatees were observed, compared to summer of 2011 (261 manatees). This was lower than the previous summer of 363 manatees, but more than 174 manatees in summer of 2009. Note than there were diminishing numbers of aerial surveys in recent years with 11 aerial surveys conducted in 2012, 15 (2011), 18 (2010, 15 (2009) and 20 (2008).** For comparison in 2008 there were 560 manatees, 247 (2007), and 441 animals (2006). The higher numbers of animals seen earlier in the season (spring 2007) may be attributed to a relatively mild winter that caused waters to warm sooner. The dip in numbers in summer 2007 may be attributed to drought conditions that affected the grass beds. At this time there is no apparent explanation for the significant dip in numbers in the study area during 2009.

LSJR: Prior to 2000, manatees were observed to spend most of the time resting, followed by traveling and feeding and less time was spent cavorting (**Table 5a-d**). In winter it was difficult to find manatees feeding because manatee abundance was low anyway. Also, no

manatees were observed cavorting in winter. In winter 2004 one manatee was seen resting near the Buckman Bridge (east bank of the river). No manatees were seen at power plants. **During fall 2011, a total of 122 animals were seen, less than in 2010 (239 manatees) and significantly more than 21-31 in 2008/09, respectively. More animals were observed resting and feeding in 2011 than 2010. Fewer traveling and cavorting animals occurred in 2011 compared to 2010. A large number 89 (37%) were engaged in mating behavior in 2010 compared to previous years. Manatees seemed to stay in the area longer because they arrive later, following a severe winter. A relatively large number of manatees was seen in the winter of 2012 (10 animals) compared to previous years. No manatees were seen in winter 2011.** In spring 2011, there were 211 manatees, almost double than seen the previous year (107). In 2011, traveling and feeding percentages decreased, while percent resting remained similar. Mating percent increased 41% in 2011 (87 animals) compared to 2009/10 (0-2 animals).
The same number of animals was observed during the past two summers (325 animals). During the summers of 2010/11 there was no difference in the percentages of animals traveling (30%) and cavorting (22%), however, resting animals increased to 43% (30% in 2010) and feeding animals decreased to 5% (14% in 2010). During the falls of 2007/08/09 not more than 45 manatees were observed. During 2008/09 there was a significant reduction in the number feeding (6%) compared to prior years. Also, no manatees were seen cavorting in the last two years 2007/08 compared to prior years. Spring and summer of 2001/2002 data appear to be similar in that the percent of manatees observed traveling was higher in the past two years than before (1998/1999) and percent resting was lower in 2002 than 2001. The apparent change in behavior may be attributed to dry weather conditions, higher than normal salinity and the resulting low food availability that may have caused the manatees to travel more in search of food than previous years. In 2003, percentages for traveling and resting manatees are similar again to the pre-drought years. That is, manatees spent most of the time resting, followed by traveling and feeding and the least time cavorting. Indices for percent feeding indicated more animals feeding each year subsequent to 2002. This may be because the food supply continued to increase in 2003/2004 and there were more total numbers of manatees. By 2005/2006 these numbers began to stabilize. Feeding animals were for the most part located south of Buckman Bridge. Grass beds north of Buckman Bridge regenerated significantly since late 2002-2006 and then declined again in 2007. This fluctuation in food supply probably caused the increase in percentage of animals cavorting (2006) followed by a subsequent decreased in 2007. In 2007 we saw a return to drought conditions and numbers of manatees sighted in the study area declined in the summer due to a die back of submerged aquatic vegetation. Lack of precipitation led to elevated salinity levels in the river that forced animals to move further south within the St. Johns in search of food. This was reflected in the lower percentage of resting and feeding animals and the increased percentage in the number of traveling animals compared to before the drought. It appears that the same phenomenon occurred post 2000/2001 during a similar period of drought.

ICW: Traveling and resting behavior in the ICW remained predominantly unchanged from 1994-**2012**; the ICW continues to be a travel corridor for migration (Tables 6a-d). **No manatees were observed feeding in 2012. In spring 2012, 71 manatees were observed, higher than previous years.** In spring 2011, 48 manatees were observed, similar to 2010, 55 manatees, compared to 32 (2009), 78 (2008), 55 (2007), 42 (2006), 46 (2005), and 70 (2004).

Most animals were observed traveling (70%; 27% in 2012) and fewer resting (0%; 3% in 2012). No animals were observed feeding, with only 2 cavorting (Table 6c). During summer 2012, 2 traveling animals were observed, a markedly lower number than in previous years. In summer 2011, 36 animals were observed, similar to 2010, 38 animals, compared to 44 (2009), 83 (2008), 24 (2007), 32 (2006), 63 (2005), and 25 (2004). **The early summer was dry and we suspect that the majority of animals had moved further south out of the study area to fresher reaches of the river. No animals were observed resting, feeding or cavorting.** No animals were observed feeding from 2003 to 2008. During summers, more animals were seen cavorting from 2005-2010 (14-32%) in contrast to 1994-2004 (1%) **and no animals in 2012** (Tables 6d).

Grass Beds: **Line transect data from 2004-2011, indicated that there was a significant decline in the grass bed length, SAV length, total cover percentage, and the proportion of tape grass at sites sampled in Duval County (SJRWMD 2012; Figure 3a, b). Aerial observation indicated that there has been a visible decline in the grass beds since 2005. In 2011, there was some increase in grass bed length and total cover percentage; however, *Vallisneria americana* has declined to zero in 2009 north of Buckman, and zero in 2010 south of Buckman. The latter has been replaced by other more salt tolerant species like *Ruppia maritima*. Ruppia (Widgeon grass) does not tend to form extensive beds like *Vallisneria* and only exists in narrow bands near the shallow section of SAV beds.** In 2010, toxic algae blooms were seen in the river beginning around April near Welaka, and moving north to Jacksonville around July/August. Around the same time, a number of significant fish kills were reported to include large red fish. In addition, during this timeframe twelve dolphin deaths occurred in the river from Crescent Lake to the Blount Island. The dolphin deaths have since been declared an "Unusual Marine Mammal Mortality Event" by the NOAA. Moreover, significant amounts of foam like substance have occurred along the river following these events. Manatees do not seem to have been adversely affected by this phenomenon. In 2009, prominent algae blooms were observed throughout the LSJR beginning in Lake George around the March/April time frame. The algae blooms did not seem to be as large as those seen in 2005. Never the less, toxic algae blooms were observed earlier than usual than in previous years. Data for 2007 showed continued decline in grass bed condition due to stress from periodic drought conditions. Following is information supplied by SJRWMD regarding state of the grass beds in Duval County 2007 **(Figure 3a, b)**. The number of transects was highest in 1998 (26) and lowest in 2000 (6) however, **returned to around 19 for 2001 -2010, numbers of individual sites and transects have been reduced recently due to budget constraints, the extent of which is not yet fully known.** As indicated earlier there was a drought experienced between 2000/2001. **An earlier analysis for Duval County indicated that there** has been a decrease in the mean grass bed length over the past 8 years from 77 m (1998) to 64 m (2006). **Since 2006 it has further decreased from 54 m on average to near zero in 2011.** Total cover percentage (this is the reciprocal of what was considered percentage bare) decreased from 62% (1998) to about 20% (2000-2002) then rebounded after the drought up to 67% (2004) and then began declining again to 37% (2006). The decline in 2005/2006 may have occurred because of deteriorating water quality conditions which was demonstrated by the appearance of toxic blue green algae blooms in the river firstly in August of 2005. Algae blooms were again observed in 2007 and 2008 to a lesser extent. Excessive algae and turbidity from sedimentation caused by rainfall and upstream construction activities also contributes to

shading/smothering which can kill submerged aquatic vegetation. **Total cover percentage has remained near 0% from 2009 to 2011.** The proportional percentage of tape grass (*Vallisneria*) cover versus other species (calculated as the summed patch lengths of *Vallisneria* divided by the total patch lengths of all species present) shows some improvement since the drought from 42% (2002) to about 60% (2003) then averaged about 55% (2004-2006) but is still below the 1998 level of 69%. **Percent *Vallisneria* has decreased to near zero from 2009 to 2011.** The Shannon-Weiner index of diversity has shown a fall in diversity from 92% (1998) to 39% (2002), then a rebound after the drought to 84% (2004) followed by a slight decline to 69% (2006). The diversity index and total cover percent seem to mirror each other. Grass bed condition has not returned to pre drought levels.

Salinity: Tape grass grows well from 0-12 ppt and can tolerate waters with salinities up to 15-20 ppt for short periods of time. Growth becomes limited above about 10-12 ppt based on analyses of high-estuarine distribution (Twilly and Barko 1990[1]). The availability of tape grass decreased significantly in the County from 2004 to 2007, because low precipitation in 2005/2006 caused higher than usual salinity values-compare 1999, with 2000/2002. In 2003, environmental conditions returned to a more normal precipitation pattern. As a result, we recorded lower salinity values that favored tape grass growth. In 2004, salinities were initially higher than in 2003 but decreased significantly after August with the arrival of heavy rainfall associated with hurricanes that skirted Northeast Florida (Charley, Francis, Ivan and Jeanne) **(Figure 4a)**. In 2005 salinities remained low throughout the year favoring continued grass bed growth and regeneration. However, in August the development of toxic blue green algae blooms may have hampered growth of submerged vegetation. During the latter part of 2006 and into 2007 salinity levels have been relatively high leading to a decrease in the availability of tape grass in the county. In 2008 the salinity was relatively high from March to July and then decreased in August with the arrival of Tropical Storm Fay. In 2009, salinity was elevated, and fluctuated above the norm at the beginning of the year for limited periods of time before falling below the norm from June to September, because of above normal rainfall. In 2010, salinity was relatively low at the beginning of the year, and then after July remained significantly elevated above the norm. **The salinity remained above the norm from May 2011 to May 2012, after which, much rainfall caused a significant lowering of salinity levels in the river (Figures 4b).**

The pattern of variability surrounding the mean numbers of manatees observed seasonally **(not location)** in the LSJR and the ICW seem to be consistent with those observed in previous years. **Figures 5 and 6 show the data pooled over the duration of the study period 1994-2012.**

Mortality Information: **The total of State-wide deaths documented as of September 2012 was 274, of which 68 were watercraft-related. Other causes included Flood gate (2), other human (2), perinatal (62), cold stress (109), other natural (9), undetermined (109) and unrecovered (11). In 2012, watercraft deaths for the key counties totaled 46. Other causes of death for the key counties included Flood gate (2), other human (4), perinatal (39), cold stress (13), other natural (26), undetermined (70) and unrecovered (1) (Table 7). Watercraft caused mortality of manatees in Florida, by month compared for the years 1994–July 2012 is shown in Figure 7. Cold stress, undetermined, perinatal, and watercraft causes of death were the most significant for 2012 (FWRI 2011).**

Total mortality rates for manatees in Duval County decreased from 19 deaths/Yr. (1991) to 5 (1993). Then increased to 13 (1998); decreased to 6 (2001). Then increased to 19 (2003), decreased to 8 (2007), increased 14 (2008, 2009), decreased to 9 (2010), **increased to 15 (2011) and since September 2012 have decreased to 8 (Table 8, and Figure 8). The five-year running average from watercraft mortality was 3.98 (range 2-7) deaths since 1980 and 4.95 (range 2-7) deaths since 2000 (Figure 8). The trend in Duval county deaths continues to edged upwards since 2000, and the recent state wide mortalities trend has been relatively flat since 2002 (Figure 9).**

As of September 2012, there were a total of 8 reported deaths in Duval County, of which 3 were watercraft related, 1 Perinatal, 2 cold stress and 2 undetermined (FWRI 2012). In 2011 there were 6 watercraft mortalities, and from 2008 to 2009, there were at total of 19 watercraft mortalities in the county. This represented the sixth time the county surpassed the "unacceptable" level of watercraft related mortality as stipulated in the MPP (1st in 2002, 2nd in 2004, 3rd in 2006, 4th 2008, 5th 2009, and 6th 2011). This unacceptable level is triggered when there have been five or more watercraft related mortalities in all county waters within the last 12 months.

In recent years there seems to have been a shift in the pattern of watercraft deaths towards the mouth of the river, rather than a more county wide spread as in past years. Note that no carcasses attributed to watercraft caused deaths were recovered south of Downtown since 2009 (Duval County). At this time, the agencies have not yet met officially regarding the 2011 threshold being surpassed. However, it is important to note that the FWC, USFWS and COJ are currently in the process of rewriting the MPP. In addition, a number of large vessel mortalities appear to have occurred in the past few years. The data indicated that there were no large vessel deaths in 2010. On June 16th 2011, a tug operator did report hitting a manatee near Broward River mouth. **Since 2009, all the watercraft caused manatee deaths seem to have occurred in an area of the St. Johns extending from Arlington River to the mouth of St. John River (Figure 10 and map Series B).**

Historical Information regarding meeting of the agencies

County, State and Federal agencies met October 30th, 2009 to discuss 19 watercraft deaths that occurred in Duval County from May 5th 2008 to September 11th 2009. Issues of inadequate signage and enforcement were discussed. Three of the 8 watercraft related deaths were caused by large vessels. The carcasses were recovered in the area from Talleyrand docks to Drummond Point, and included Trout River. Since May 5th 2008, almost half the deaths (8 or possible 9) of 19 total deaths were caused by large vessels. Also, the carcasses were recovered in an area from Lions Club to the mouth of the river. The rest of the watercraft related carcasses recoveries were made from the mouth of Arlington River to the St. Johns River mouth.

County, State and Federal agencies met September 18th, 2008 to discuss 8 watercraft deaths in Duval County during 2008. It was suggested that there was an identifiable pattern of activity associated with large vessels that caused three of the mortalities recovered near Lions Club. Since September, this trend was strengthened by the fact that there were three more deaths caused by large vessels near the mouth of the river during October, bringing the total watercraft related deaths to 11 for 2008. In summary, about half of the deaths in 2008

(5 or possibly 6) were caused by large vessels, and the associated carcasses were recovered from Lions Club to the mouth of the St. Johns River. The rest of the carcasses were recovered from Julington Creek (2), Ortega River (1), Downtown (1), and ICW near the St. Johns County line (1).

In 2007, there were a total of 8 reported deaths, of which 2 was watercraft related, 3 cold stress and 3 undetermined (FWRI 2008). The 2 watercraft related deaths were attributed to large vessels, and the carcasses were recovered at Talleyrand docks and near Mayport.

In 2006, there was a total of 13 reported deaths, of which 8 were watercraft related, 1 perinatal, 1 cold stress, 1 natural, and 2 undetermined (FWRI 2008). Three of 8 watercraft deaths were attributed to large vessels, with carcasses recovered at Blount Island, Talleyrand docks, and White Shell Bay. County, State and Federal agencies met January 31st, 2007 to discuss the 8 watercraft deaths in Duval County during 2006 and how Duval County should respond to those incidents. It was agreed that there was no identifiable pattern of activity that caused the mortalities in 2006 (see September 2006-2007 update for details regarding actions taken by waterways to address the issue).

In 2005, there were a total of 14 reported deaths of that 4 were watercraft, 2 perinatal, 2 cold stress and 6 undetermined (FWRI 2008).

In 2004, there were 15 reported deaths total of which 5 were watercraft, 4 perinatal, 1 cold stress and 5 undetermined. County, State and Federal agencies met November 9th to discuss the five watercraft deaths in Duval County during 2004 and how Duval County should respond to these incidents (see September 2004 update for details regarding actions taken by waterways to address the issue).

In 2003, there were 19 deaths of which 4 were watercraft, 4 perinatal, 3 cold stress, 2 other natural and 6 undetermined.

In 2002, there were a total of 14 reported deaths of which 10 were watercraft, 2 undetermined, 1 unrecovered and 1 perinatal. As a result, this triggered a mortality threshold standard in the MPP that led to a moratorium on permits issued by the state for marine construction (see September 2002 update for details regarding actions taken by waterways to address the issue).

Mortality due to watercraft impacts in 2012 (Table 9) was highest in, Lee County (11), Brevard (6), and Volusia (5). Intermediate numbers of watercraft-caused deaths were documented in Broward (3), Duval (3), Indian River (3), and Martin (3); and lower numbers of deaths were documented in Citrus (2), Collier (2), Dade (1), Palm Beach (1), Sarasota (0), and St. Lucie (2). Table 9 shows manatee mortality caused by watercraft-related impacts and serves as a comparison of Duval County to other "key" counties in Florida from 1992 through September 2012. Table 10 shows total manatee mortality/yr. and cause in Duval County from 1976 to September 2012 (FWRI 2012).

Map Series B, Duval County Manatee Mortality 2011/2012 **shows locations of carcass recoveries.**

Warm-Water Attractants: **In January 2012, 4-5 manatees were observed at the warm water source in the Ortega River basin (aerial and ground surveys). The animals were monitored by FWC, JU and home owners without incident.** Since 2006, no manatees have been observed at the warm water source in Ortega River during cold weather. A few animals were seen at the JEA District # 2 waste water treatment outfall near north Bartram

Island (Table 11). **Aerial observations by JU, reported 10 sightings of 1-4 animals from 1/16/2012 to 3/6/2012, in most cases this consisted of a mother and calf pair. An addition, 6 more sightings occurred during the warmer months of 1-2 animals from 4/3/2012 to 9/5/2012.** JU also reported 8 sightings of 1-2 animals from 11/8/2010 to 12/7/2010, 12 sightings of 1-6 animals from 3/7/2011 to 5/23/2011, and 5 sightings of 1-2 animals from 8/8/2011 to 9/23/2011. **In addition, "Sea to Shore" was contracted by JEA to do a study of the outfall that concluded early 2012. The final report was not yet available for this update. Moreover, it was determined that a number of animals were congregating in San Carlos Creek adjacent to JEA's North Side Generating Station because of a broken pipe. As a result, 6 animals were rescued or assisted and released from the area between 1/25/12 to 3/15/12 (see Table 13).**

Historical information

FWC reported 40 sightings ranging from 1-5 animals between 11/6/2008 to 3/30/2009; JEA reported 16 sightings ranging from 1-2 animals from 10/07/2009 to 3/29/2010. Aerial observations by JU, reported 17 sightings of 1-4 animals from 5/6/2009 to 11/17/2009, and 8 sightings of 1-4 animals from 3/31/2010 to 6/16/2010. Rescue attempts were made and one animal was relocated by Sea World of Florida and FWC on Dec 19th 2006. On August 15th 2007 an entrapped manatee was rescued from the JEA North Side Generating Station. In addition, on January 18th 2008, two manatees were rescued from the JEA District # 2 outfall north of Bartram Island by Sea World of Florida and FWC. The discharge from the site is fresher than the surrounding ambient waters. As a result, it is likely to serve as an attractant for manatees throughout the entire year, and not just during colder weather. Manatees are attracted to the site in winter, when the discharge is also warmer than the surrounding ambient waters. The close proximity of this site to the location of shipping lanes in St. Johns River means that there possibly exists a higher potential for vessel/manatee interactions. Recently, some manatees killed by large vessels have been recovered close to this location. On January 6th 2009, a female manatee (Bella) and her calf were rescued from the JEA District # 2 outfall. These animals were rehabilitated at Sea World and reintroduced into Julington Creek on May 28th 2009. On July 15th the calf's carcass was recovered transected, and on July 25th the mother suffered acute impact and was rescued to Sea World, but had to be euthanized. For a summary of recent rescues see Table 12.

No significant warm water discharges exist in Duval County. Historically, warm water discharges consisted of three power generating stations and two paper mills. Area power plants include: St. Johns River Power Park and Southside and J.D. Kennedy Generating Stations. Seminole Kraft and Jefferson Smurfit Containerboard Corporation are the two paper mills in Duval County. Each of these areas provided warm-water refuges for manatees in the winter months and during periods of cold weather. The last of which - Southside Generating Station - was closed on October 31st 2001.

During the winters (2002-2007), it was not possible to gain access to the monitoring sites at Southside Generating Station because construction activities associated with dismantling of the power station caused Jacksonville Electric Authority (JEA) to have concerns about health safety, insurance and liability issues. As a result, JEA undertook monitoring for manatees themselves using their own personnel. In 2002, total daily count varied from 0-14 adults between 11/3/02 to 12/12/02. From 1-3 adults were observed around 11/9/02 with 1 calf.

Then, from 2-14 adults were observed around 11/19/02 with 2-4 calves - representing the largest peak. From 2-4 adults were observed around 11/26/02, and then 1-2 adults around 12/3/02. JEA then installed a large mesh metal gate at the end of the effluent canal to prevent manatees from moving up into the effluent discharge pipes. Once this was installed no more manatees were reported (Lindsay Schoppe, Environmental Division, Jacksonville Electric Authority, personal communication). In 2003, no manatees were reported by JEA until 4 adults were seen on 05/05/2003 and 2 adults and 2 calves were seen 04/15/2003. In 2004/2005/2006/2007/2008, no manatees were reported at the site. **Aerial surveys indicated no manatee at this site during 2009/2010/2011/2012.**

JEASS officially closed on Oct 31st 2001. Total daily count at JEASS varied from 0-5 between 11/15/01 to about 2/18/02. Five manatees were observed in mid-November. No manatees were seen between mid-November to January. Then from 0-2 manatees were seen in the first week of February during the colder weather. On 01/5/02 FWC/Sea World and JU attempted to rescue a manatee but were unsuccessful. JEAK was again not producing warm water effluent and was monitored with less frequency. No animals were observed at JEAK between 11/29/01 to 2/18/02.

NAS Mayport

In the spring of 2011, Mayport NAS initiated manatee awareness and reporting program. Signs were posted at intervals along Mayport basin, and a data log kept of sightings and actions (Table 12). **In 2012, 16 sightings of manatee occurred (average 1 animal/sighting) within the basin. In addition, on 1/24/2012 a Right whale was observed heading east at buoys 3 & 4, and a pod of whales (species unspecified) was observed 7 miles north of the jetties.**

Duval Rescues

In 2012, four manatees were rescued from San Carlos Creek near JEA's North Side Generating Station and one from Goodby's Creek. In addition, two animals were assisted and released in San Carlos Creek and one more from the JEA#2 outfall near Bartram Island (Table 13). On September 19th 2011, four adult manatees became tidally stranded at a residence north of Blue Cyprus Park. The animals were assisted and released back into the St. Johns River successfully. **The incident generated some TV media interest that aided in education and outreach efforts.** There have been five other rescues in the past: Ortega River (1/4/2010), Mill Cove (3/14/2010), two manatees from SJR near the BP Refinery (2/6/2009), and Trout River (7/25/2009) see Table 13.

Information sources

Manatee Protection Plan 2006 and Annual Updates 2007, 2008, 2009, 2010, 2011.

The updated document was approved by the FWC in November 2006. Among the plan's changes are clarifications of the applicability of the MPP to multi-family boat facilities and revisions to the "Unacceptable" category.
http://www.coj.net/City-Council/Jacksonville-Waterways-Commission/JWC-MPP.aspx

Manatee Protection Plan 1999 and Annual Updates 2000-2005.

In 1999, the State of Florida approved the Duval County Manatee Protection Plan. The Plan had initially been approved by the Florida Department of Environmental Protection. In April 2000, the state rule implementing the boat speed zones were adopted by the Florida Fish and Wildlife Conservation Commission.
http://www.coj.net/Departments/Recreation-and-Community-Services/Waterfront-Management-and-Programming/Waterways-and-Boating/Manatee-Protection-Plan.aspx

Duval Manatee Protection Outreach

The Manatee Research Center Online (MARCO) web site at Jacksonville University and the Jacksonville Marine Transportation Exchange web site have been updated to show the latest manatee sightings aerial survey maps so that recreational and commercial vessel operators (including personal watercraft) can see where manatees are in the county. These maps have also been shown on a regular basis on the local news weather updates on TV (First Coast News) and the "Outdoors" Section of the newspaper (Florida Times Union). **In addition, maps are forwarded to key personnel with JSO Marine Unit, FWC, USFWS and JMTX.**
http://www.ju.edu/marco/Pages/default.aspx
http://jmtxweb.org/environmental.htm

Duval County Manatee Protection Rule (68C-22.027, FAC):

Amendments to the speed zones rule were adopted on January 10, 2007.
https://www.flrules.org/gateway/ruleno.asp?id=68C-22.027

Federal Protection Areas Map:
http://www.fws.gov/northflorida/Manatee/federal-manatee-protection-areas.htm

TABLE 1a. Summary of the total number of aerial surveys, adults and calves observed, and Single Highest Day Counts (SHDC) by year (1994-September 2012).

Year		No. of surveys	Adults	Calves	Total	% Calves	SHDC Count	SHDC Date	Mean No./survey
LSJR	1994 [1]	19	783	67	850	7.89	113	9/6/94	45
	1995	22	583	36	619	5.82	76	7/20/95	28
	1996	21	706	92	798	11.53	124	7/15/96	38
	1997	23	1,113	89	1,202	7.4	136	8/18\97	52
	1998	26	775	82	857	9.57	125	9/11/98	33
	1999	20	804	87	891	9.76	127	9/28/99	45
	2000	20	294	28	322	8.7	67	5/3/00	16
	2001	18	454	17	471	3.61	85	6/4/01	26
	2002	23	796	28	824	3.40	106	5/14/02	36
	2003	23	1,018	68	1,086	6.26	150	6/25/03	47
	2004	18	836	88	924	9.52	160	5/20/04	51
	2005	21	848	76	924	8.23	170	6/22/05	44
	2006	22	996	115	1,111	10.35	153	9/27/06	51
	2007	19	584	58	642	9.03	151	4/23/07	34
	2008	20	759	58	817	7.10	140	6/4/08	41
	2009	15	200	23	223	10.31	55	6/3/09	15
	2010	18	631	40	671	5.96	116	6/16/10	37
	2011	15	624	34	658	5.17	121	5/23/11	44
	2012*	11	607	52	659	7.89	177	5/12/12	60
Total		374	13,411	1,138	14,549	7.76 [2]	124 [3]		39 [4]

SHDC=Single Highest Day Count

[1] March to the end of December

[2] Mean % Calves

[3] Mean highest day count

[4] General Mean of total/survey counts

* Sept.

TABLE 1b. Summary of the total number of aerial surveys, adults and calves observed, and Single Highest Day Counts (SHDC) by year (1994-September 2012).

Year		No. of surveys	Adults	Calves	Total	% Calves	SHDC Count	SHDC Date	Mean No./survey
ICW	1994 [1]	12	74	7	81	8.64	21	5/12/94	7
	1995	23	79	6	85	7.06	21	5/30/95	4
	1996	23	84	11	95	11.58	16	5/16/96	4
	1997	24	73	10	83	12.05	20	4/21/97	3
	1998	18	46	3	49	6.12	19	6/12/98	3
	1999	14	32	4	36	11.11	12	6/21/99	3
	2000	21	54	3	57	5.26	13	5/3/00	3
	2001	17	77	2	79	2.53	23	4/27/01	5
	2002	22	109	1	110	0.91	28	4/30/02	5
	2003	18	82	1	83	1.20	23	5/14/03	5
	2004	18	92	11	103	10.68	23	5/20/04	6
	2005	20	111	6	117	5.13	29	7/6/05	6
	2006	19	77	3	80	3.75	19	4/21/06	4
	2007	16	101	8	109	7.34	21	4/23/07	7
	2008	19	184	11	195	5.64	30	5/5/08	10
	2009	14	77	7	84	8.33	18	6/15/09	6
	2010	16	97	11	108	10.19	32	5/19/10	7
	2011	14	84	2	86	2.33	20	5/23/11	6
	2012*	11	81	10	91	10.99	17	4/3/12	8
Total		339	1,614	117	1,731	6.89 [2]	21 [3]		5 [4]

SHDC=Single Highest Day Count

[1] March to the end of December

[2] Mean % Calves

[3] Mean highest day count

[4] General Mean of total/survey counts

* Sept.

TABLE 2. Total aerial sightings of manatees in the Intercoastal Waterway, Duval Co., FL. (March 1994-September 2012).

LOCATION	ADULTS*	CALVES*	TOTAL*
Nassau Sound	32	0	32
Sawpit Creek	55	0	55
ICW North of Fort George River	95	1	96
Sisters Creek	45	3	48
Fort George Inlet	16	0	16
Mayport	17	0	17
St. Johns Bluff	56	1	57
Blount Island	183	16	199
Mill Cove	135	7	142
Atlantic Blvd. Bridge to SJR confluence	80	2	82
Beach Blvd. Bridge to Atlantic Blvd.	141	8	149
JTB Bridge to Beach Blvd. Bridge	183	11	194
Palm Valley Bridge to JTB Bridge	317	24	341
Container Corporation, Fernandina	67	9	76

*These numbers indicate total per survey counts of manatees. Individual manatees may migrate to other areas between flights.
Source Jacksonville University 2012.

Note:No manatees were seen at Container Corp. of America in 1998-2002 since the introduction of a diffuser array on the effluent warm water discharge.

TABLE 3. Total aerial sightings of manatees in Lower St. Johns River, Duval Co., FL. (March 1994-September 2012).

LOCATION	ADULTS*	CALVES*	TOTAL*
Quarantine Island	123	5	128
Dames Point	34	1	35
Trout River	353	29	382
JEA#2 (2004-12)	83	22	105
Arlington River	57	3	60
Pottsburg Creek	63	4	67
Miller Creek	32	2	34
Downtown	153	9	162
San Marco	156	3	159
Ortega River	225	23	248
Sadler Point	158	13	171
Pirates Cove	57	4	61
NAS/JAX	266	14	280
Mulberry Cove	152	12	164
Rudder Club	706	69	775
Club Continental	1275	117	1392
Doctors Lake	2039	81	2120
SJR south of Dr.Lake	1833	165	1998
SJR south of Julington	1144	114	1258
Julington Creek	279	29	308
Durbin Creek	17	1	18
Mandarin Point	1661	131	1792
Plummers Point	366	32	398
Beauclerc Bluff	334	21	355
Goodbys Creek	180	13	193
Christopher Point	890	81	971
Point La Vista	199	5	204
Lions Club Boat Ramp	30	0	30
JEA - Southside	85	8	93
Jefferson Smurfit	14	2	16

* These numbers indicate total per survey counts of manatees.
Individual manatees may migrate to other areas between flights.
Source Jacksonville University 2012.

TABLE 4. Manatee yearly attendance at Blue Springs State Park.

Season	Total Seen	Stayed Here	Max. Single Count
1970-71	11	11	11
1971-72	18	16	
1972-73	missing data		
1973-74	missing data		
1974-75	24	14	16
1975-76	23	20	
1976-77	20	16	16
1977-78	21	20	20
1978-79	23	22	23
1979-80	26	23	23
1980-81	35	29	35
1981-82	36	27	27
1982-83	42	33	33
1983-84	43	29	30
1984-85	37	32	31
1985-86	57	44	50
1986-87	50	47	38
1987-88	54	50	47
1988-89	57	45	52
1989-90	63	59	57
1990-91	63	59	54
1991-92	75	67	67
1992-93	73	70	67
1993-94	88	77	81
1994-95	89	71	74
1995-96	94	75	74
1996-97	94	77	72
1997-98	106	92	87
1998-99	114	99	86
1999-00	132	115	112
2000-01	153	120	96
2001-02	141	118	97
2002-03	162	139	123
2003-04	142	142	128
2004-05	200	145	129
2005-06	261	195	182
2006-07	265	188	193
2007-08	279	192	202
2008-09	301	195	231
2009-10	329	297	317
2010-11	344	252	309
2011-12	400	266	293

Source: Wayne Hartley, SMC 2012.

TABLE 5a. Number of manatees engaged in various activities between spring 1994-summer 2012 (LSJR).

Year/Season	Total	Number			
	No.	T	R	F	C
Fall '94	310	30	270	10	0
Fall '95	113	33	58	14	8
Fall '96	170	34	38	82	16
Fall '97	290	37	238	12	3
Fall '98	298	40	118	120	20
Fall '99	284	75	80	58	71
Fall '00	35	10	22	3	0
Fall '01	43	13	13	12	5
Fall '02	168	40	48	19	61
Fall '03	196	31	101	51	13
Fall '04	31	5	17	6	3
Fall '05	110	33	43	29	5
Fall '06	309	107	76	99	27
Fall '07	45	16	14	15	0
Fall '08	31	15	14	2	0
Fall '09	21	10	5	0	6
Fall '10	239	73	28	49	89
Fall '11	122	27	53	35	7
Falls Mean	156	35	69	34	19
SD	110	26	75	36	27
CI	51	12	35	16	12

T = Traveling; R = Resting; F = Feeding and C = Cavorting
SD = Standard deviation
CI = 95% Confidence interval for the mean
Source Jacksonville University 2012.

TABLE 5b. Number of manatees engaged in various activities between spring 1994-summer 2012 (LSJR).

Year/Season	Total	Number			
	No.	T	R	F	C
Winter '94-95	16	4	12	0	0
Winter '95-96	2	0	2	0	0
Winter '96-97	0	0	0	0	0
Winter '97-98	1	1	0	0	0
Winter '98-99	2	1	0	1	0
Winter '99-00	0	0	0	0	0
Winter '00-01	0	0	0	0	0
Winter '01-02	1	0	1	0	0
Winter '02-03	0	0	0	0	0
Winter '03-04	4	2	2	0	0
Winter '04-05	6	2	4	0	0
Winter '05-06	1	1	0	0	0
Winter '06-07	1	1	0	0	0
Winter '07-08	1	0	1	1	0
Winter '08-09	1	0	1	0	0
Winter '09-10	0	0	0	0	0
Winter '10-11	0	0	0	0	0
Winter '11-12	10	1	9	0	0
Winters Mean	3	1	2	0	0
SD	4	1	3	0	0
CI	2	0	2	0	0

T = Traveling; R = Resting; F = Feeding and C = Cavorting
SD = Standard deviation
CI = 95% Confidence interval for the mean
Source Jacksonville University 2012.

TABLE 5c. Number of manatees engaged in various activities between spring 1994-summer 2012 (LSJR).

Year/Season	Total	Number			
	No.	T	R	F	C
Spring '94	226	51	85	75	15
Spring '95	189	26	131	2	30
Spring '96	96	48	30	1	17
Spring '97	350	80	33	178	59
Spring '98	113	27	46	25	15
Spring '99	290	74	139	34	43
Spring '00	186	50	81	23	32
Spring '01	140	47	49	19	25
Spring '02	330	111	51	130	38
Spring '03	161	49	72	30	10
Spring '04	374	125	89	109	51
Spring '05	187	39	76	61	11
Spring '06	186	86	35	15	50
Spring '07	354	144	149	38	23
Spring '08	308	87	113	70	38
Spring '09	71	23	21	25	2
Spring '10	107	34	32	41	0
Spring '11	211	40	58	26	87
Spring '12	355	94	77	125	59
Springs Mean	223	65	72	54	32
SD	99	35	39	49	23
CI	45	16	17	22	10

T = Traveling; R = Resting; F = Feeding and C = Cavorting
SD = Standard deviation
CI = 95% Confidence interval for the mean
Source Jacksonville University 2012.

TABLE 5d. Number of manatees engaged in various activities between spring 1994-summer 2012 (LSJR).

Year/Season	Total	Number			
	No.	T	R	F	C
Summer '94	311	26	245	6	34
Summer '95	313	73	179	48	13
Summer '96	532	62	241	210	19
Summer '97	561	108	284	125	44
Summer '98	446	77	237	54	78
Summer '99	389	60	187	51	91
Summer '00	102	37	36	16	13
Summer '01	288	75	105	24	84
Summer '02	326	141	77	71	37
Summer '03	725	186	166	225	148
Summer '04	504	107	93	260	44
Summer '05	626	111	195	259	61
Summer '06	616	163	262	96	95
Summer '07	235	96	73	44	22
Summer '08	477	115	204	111	47
Summer '09	130	45	41	34	10
Summer '10	325	112	97	46	70
Summer '11	325	98	141	16	70
Summer '12	294	51	75	146	22
Summers Mean	396	92	155	97	53
SD	168	42	79	84	36
CI	76	19	36	38	16

T = Traveling; R = Resting; F = Feeding and C = Cavorting
SD = Standard deviation
CI = 95% Confidence interval for the mean
Source Jacksonville University 2012.

TABLE 6a. Number of manatees engaged in various activities between spring 1994-summer 2012 (ICW).

Year/Season	Total	Number			
	No.	T	R	F	C
Fall '94	5	2	3	0	0
Fall '95	2	0	2	0	0
Fall '96	4	4	0	0	0
Fall '97	5	1	4	0	0
Fall '98	4	3	1	0	0
Fall '99	5	4	1	0	0
Fall'00	5	3	2	0	0
Fall '01	0	0	0	0	0
Fall '02	12	9	2	1	0
Fall '03	2	2	0	0	0
Fall '04	7	2	4	1	0
Fall '05	7	6	1	0	0
Fall '06	5	4	1	0	0
Fall '07	22	10	10	0	2
Fall '08	10	0	10	0	0
Fall '09	8	5	3	0	0
Fall '10	10	6	4	0	0
Fall '11	16	10	6	0	0
Falls Mean	7	4	3	0	0
SD	5	3	3	0	0
CI	2	1	1	0	0

T = Traveling; R = Resting; F = Feeding and C = Cavorting
SD = Standard deviation
CI = 95% Confidence interval for the mean
Source: Jacksonville University 2012.

TABLE 6b. Number of manatees engaged in various activities between spring 1994-summer 2012 (ICW).

Year/Season	Total	Number			
	No.	T	R	F	C
Winter '94-95	47	0	47	0	0
Winter '95-96	20	2	17	1	0
Winter '96-97	38	0	38	0	0
Winter '97-98	0	0	0	0	0
Winter '98-99	2	2	0	0	0
Winter '99-00	0	0	0	0	0
Winter '00-01	1	1	0	0	0
Winter '01-02	3	3	0	0	0
Winter '02-03	0	0	0	0	0
Winter '03-04	0	0	0	0	0
Winter '04-05	2	1	1	0	0
Winter '05-06	0	0	0	0	0
Winter '06-07	0	0	0	0	0
Winter '07-08	20	8	9	0	3
Winter '08-09	1	0	1	0	0
Winter '09-10	2	2	0	0	0
Winter '10-11	3	0	3	0	0
Winter' 11-12	5	2	3	0	0
Winters Mean	8	1	7	0	0
SD	14	2	14	0	1
CI	6	1	6	0	0

T = Traveling; R = Resting; F = Feeding and C = Cavorting
SD = Standard deviation
CI = 95% Confidence interval for the mean
Source: Jacksonville University 2012.

TABLE 6c. Number of manatees engaged in various activities between spring 1994-summer 2012 (ICW).

Year/Season	Total	Number			
	No.	T	R	F	C
Spring '94	42	24	5	11	2
Spring '95	60	25	25	1	9
Spring '96	32	17	4	9	2
Spring '97	45	28	15	2	0
Spring '98	10	3	5	2	0
Spring '99	16	10	0	0	6
Spring '00	36	14	13	2	7
Spring '01	50	30	13	7	0
Spring '02	62	26	33	3	0
Spring '03	48	40	3	5	0
Spring '04	70	35	13	14	8
Spring '05	46	27	17	0	2
Spring '06	42	15	17	0	10
Spring '07	55	20	35	0	0
Spring '08	87	48	27	0	12
Spring '09	32	9	16	0	7
Spring '10	55	43	12	0	0
Spring '11	48	30	18	0	0
Spring'12	71	50	19	0	2
Springs Mean	48	26	15	3	4
SD	19	13	10	4	4
CI	8	6	4	2	2

T = Traveling; R = Resting; F = Feeding and C = Cavorting
SD = Standard deviation
CI = 95% Confidence interval for the mean
Source: Jacksonville University 2012.

TABLE 6d. Number of manatees engaged in various activities between spring 1994-summer 2011 (ICW).

Year/Season	Total	Number			
	No.	T	R	F	C
Summer '94	4	4	0	0	0
Summer '95	9	7	2	0	0
Summer '96	21	15	2	4	0
Summer '97	13	5	8	0	0
Summer '98	35	12	18	0	5
Summer '99	15	13	2	0	0
Summer '00	16	10	6	0	0
Summer '01	26	18	8	0	0
Summer '02	35	21	11	3	0
Summer '03	33	23	10	0	0
Summer '04	25	24	1	0	0
Summer '05	63	28	26	0	9
Summer '06	32	22	4	0	6
Summer '07	35	17	10	0	8
Summer '08	83	50	28	0	5
Summer '09	44	16	21	4	3
Summer '10	38	24	2	0	12
Summer '11	36	25	11	0	0
Summer '12	2	2	0	0	0
Summers Mean	30	18	9	1	3
SD	20	11	9	1	4
CI	9	5	4	1	2

T = Traveling; R = Resting; F = Feeding and C = Cavorting
SD = Standard deviation
CI = 95% Confidence interval for the mean
Source: Jacksonville University 2012.

TABLE 7. Causes of manatee mortality for Florida's Key Counties, September 2012.

County	Watercraft	Flood Gate	Human	Perinatal	Cold Stress	Natural	Undetermined	Unrecovered	Total
Brevard	6	0	1	16	4	3	25	1	56
Broward	3	1	0	1	1	1	4	0	11
Citrus	2	0	1	4	0	5	4	0	16
Collier	2	0	0	0	0	2	2	0	6
Dade-Miami	1	0	1	0	0	0	0	0	2
Duval	3	0	0	1	2	0	2	0	8
Indian River	3	0	0	0	0	0	2	0	5
Lee	15	0	0	8	3	12	16	0	54
Martin	3	1	0	0	0	0	2	0	6
Palm Beach	1	0	0	0	1	0	4	0	6
Sarasota	0	0	0	1	1	0	2	0	4
St.Lucie	2	0	1	2	0	1	2	0	8
Volusia	5	0	0	6	1	2	4	0	18
Total	46	2	4	39	13	26	70	1	201

Source: FWCC/FWRI 2012

TABLE 8. Florida manatee mortality, 1992- September 2012.

County	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012*	# Total	% of Total
Brevard	31	30	42	40	57	62	47	46	49	52	50	42	65	57	87	57	72	107	184	99	56	1,332	26.14
Broward	9	4	4	5	6	3	7	15	4	9	10	8	6	9	15	4	10	15	27	12	11	193	3.79
Citrus	9	8	5	6	6	5	4	8	6	10	9	10	7	18	10	12	22	6	14	14	16	205	4.07
Collier	19	18	13	10	70	21	14	19	35	31	13	37	23	34	14	16	17	27	39	28	6	504	9.89
Dade	10	5	11	14	7	14	9	12	8	11	9	9	7	5	7	13	9	9	22	15	1	207	4.06
Duval	8	5	6	7	10	10	13	9	11	6	14	19	15	14	13	8	14	14	9	15	8	228	4.47
Indian R.	1	-	2	5	10	7	5	6	10	5	7	6	6	16	6	7	12	18	55	27	5	216	4.24
Lee	19	17	33	31	145	43	31	33	44	51	58	81	51	75	82	91	45	60	78	70	54	1,192	23.39
Martin	8	3	7	6	6	6	8	9	6	7	9	6	5	9	17	7	4	15	17	11	6	172	3.38
Palm Bch.	3	5	3	6	7	6	5	7	9	8	14	12	9	8	7	3	8	16	18	11	6	171	3.36
Sarasota	1	5	6	12	8	3	4	13	11	5	16	22	7	20	20	5	8	17	14	6	4	207	4.06
St. Lucie	4	4	2	2	4	2	1	2	2	4	4	0	1	8	5	2	6	9	26	15	8	111	2.18
Volusia	5	5	6	10	9	9	15	12	13	27	13	14	13	22	22	26	26	31	27	34	18	357	7.01
Total	127	109	140	154	345	191	163	191	208	226	226	266	215	295	305	251	253	344	530	357	199	5,095	100.00

* = September

Source: FWCC/FWRI 2012.

TABLE 9. Watercraft caused mortality in Florida's Key Counties, 1992- September 2012.

County	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	# Total	% of Total
Brevard	7	9	9	6	13	12	9	12	13	7	17	8	11	6	22	10	10	7	13	7	6	214	19.31
Broward	2	2	3	0	1	0	2	5	2	4	3	5	1	2	6	1	3	3	4	2	3	54	4.87
Citrus	3	1	2	0	2	1	2	4	1	1	3	3	1	6	2	5	8	2	2	5	2	56	5.05
Collier	4	5	4	4	5	4	7	10	5	8	6	7	5	4	1	6	6	5	7	5	2	110	9.9
Miami-Dade	4	0	1	2	0	5	2	1	2	5	1	2	2	1	1	4	2	2	3	2	1	43	3.88
Duval	2	2	2	3	3	2	3	2	4	1	10	4	5	4	8	2	11	8	2	6	3	87	7.85
Indian R.	0		0	1	4	1	3	1	4	1	2	1	1	5	2	0	2	2	4	2	3	39	3.52
Lee	2	5	10	8	14	9	9	10	13	23	13	9	13	12	21	14	14	19	12	13	15	258	23.29
Martin	1	0	1	1	2	3	1	2	1	1	2	1	1	0	5	2	1	6	3	2	3	39	3.52
Palm Bch.	0	3	2	2	3	1	2	2	3	3	6	5	3	6	0	0	6	4	2	3	1	57	5.14
Sarasota	0	2	2	0	1	2	0	4	5	2	4	1	2	3	6	0	2	4	4	1	0	45	4.06
St. Lucie	1	1	0	0	1	0	0	0	1	1	1	0	0	1	0	1	2	0	2	3	2	17	1.53
Volusia	1	0	1	1	2	1	8	5	4	11	3	2	3	8	3	8	7	4	6	6	5	89	8.03
Total	27	30	37	28	51	41	48	58	58	68	71	48	48	58	77	53	74	66	64	57	46	1,108	100.00

* = September

Source: FWCC/FWRI 2012.

TABLE 10. Causes of manatee mortality in Duval County, Florida. 1976 - September 2012.

Year	Watercraft	Human	Perinatal	Cold Stress	Other Natural	Undetermined	Unrecovered	Total/Year
1976	2	0	0	0	0	4	0	6
1977	1	0	1	0	0	9	0	11
1978	5	0	0	0	0	5	1	11
1979	6	1	1	0	0	1	2	11
1980	0	0	1	0	0	1	1	3
1981	1	0	0	0	1	5	0	7
1982	1	0	1	0	0	1	0	3
1983	2	0	0	0	0	5	1	8
1984	7	0	0	0	6	3	0	16
1985	4	0	0	0	2	3	0	9
1986	2	0	0	2	0	8	1	13
1987	5	0	2	3	1	1	0	12
1988	4	0	0	2	2	1	0	9
1989	6	1	3	4	2	4	0	20
1990	3	3	0	4	0	3	0	13
1991	9	2	4	0	1	3	0	19
1992	2	0	1	0	3	2	0	8
1993	2	0	2	0	0	1	0	5
1994	2	1	1	1	1	0	0	6
1995	3	0	0	0	1	3	0	7
1996	3	0	0	1	2	4	0	10
1997	2	0	3	1	0	4	0	10
1998	3	0	3	2	0	5	0	13
1999	2	0	1	1	1	4	0	9
2000	4	0	2	2	0	2	1	11
2001	1	0	1	2	0	2	0	6
2002	10	0	1	0	0	2	1	14
2003	4	0	4	3	2	5	1	19
2004	5	0	4	1	0	5	0	15
2005	4	0	2	2	0	6	0	14
2006	8	0	1	1	1	1	1	13
2007	2	0	0	3	0	3	0	8
2008	11	0	0	2	0	1	0	14
2009	8	0	3	1	0	2	0	14
2010	2	2	1	1	0	3	0	9
2011	6	0	4	3	0	2	0	15
2012*	3	0	1	2	0	2	0	8
Total	145	10	48	44	26	117	10	399

* = September 2012.

Source: FWCC/FWRI 2012.

TABLE 11. Aerial manatee observations at the JEA # 2 Waste Water Treatment Outfall: March 2010-September 2012.

Date	Observer	Tide	Manatees				Time	Weather	Air
			Adults	Calves	Total	Activity			Temp (°C)
3/31/2010	GFP	L	1	0	1	R	14:00	CLR >5K	23
6/16/2010	GFP	L	2	1	3	C	9:50	>5K CLR SUN	29
6/16/2010	GFP	L	4	0	4	T	9:51	>5K CLR SUN	29
11/8/2010	GFP	L	1	1	2	R	10:10	CLR SUN	10
11/8/2010	GFP	L	0	1	1	R	14:30	CLR SUN	19
11/8/2010	GFP	L	1	0	1	T	14:32	CLR SUN	19
11/29/2010	GFP	L	0	1	1	R	10:10	CLD BKN >5K	23
12/7/2010	GFP	L	0	1	1	R	10:30	CLR SUN WINDY	3
12/7/2010	GFP	L	1	1	2	R	14:35	CLR SUN WINDY	7
Total 2010			10	6	16	Ave=1.8			
3/7/2011	GFP	L	1	0	1	R	15:15	OVER CAST HI CLD	13
3/21/2011	GFP	H	1	1	2	R	10:15	>5K SUN HZY	17
5/9/2011	GFP	L	1	0	1	R	10:45	SUN SMOKE	26
5/9/2011	GFP	L	5	1	6	R	10:45	SUN SMOKE	26
5/23/2011	GFP	L	1	1	2	R	10:25	SUN HZY	26
8/8/2011	GFP	H	2	0	2	R	10:05	CLD	29
8/8/2011	GFP	L	1	0	1	T	14:04	FEW CLDS	35
8/8/2011	GFP	L	1	0	1	T	14:21	FEW CLDS	35
11/22/2011	GFP	H	1	0	1	R	11:00	HI CLD SUN	25
Total 2011			14	3	17	Ave=1.9			
1/16/2012	GFP	L	1	0	1	R	09:50	CLR 4.4K BKN	10
1/17/2012	GFP	L	1	0	1	R	09:47	CLR	13
2/13/2012	GFP	L	2	2	4	R	09:55	CLR SUN	4
2/14/2012	GFP	L	1	1	2	R	10:10	HI CLD WINDY SUN	14
3/6/2012	GFP	H	1	1	2	R	10:19	CLR SUN	19
4/3/2012	GFP	L	2	0	2	R	13:49	CLR SUN CLD	31
5/1/2012	GFP	L	0	1	1	R	09:58	CLR SUN FEW	25
7/10/2012	AQW	H	1	1	2	R		CLR	35
9/5/2012	GFP	L	1	0	1	R	09:45	CLR SUN	27
Total 2012			10	6	16	Ave=1.8			

Source: Jacksonville University 2012.

Note: Tide = Low (L), Medium (M), and High (H); Activities = Traveling (T), Resting (R), Feeding (F), and Cavorting/mating (C).

TABLE 12. Manatee sightings reported at Mayport NAS 2007-2012.

DATE	TIME	LOCATION	NO. SIGHTED	REPORTED BY	NOTES/Indicate if Juvenile or adult
5/18/2007	1600	PIER F-1	2	Phil. Sea	One has damaged tail fluke
6/16/2010	1300	E-2	1	Sub	
8/27/2010	1555	E-2	1		
9/3/2010	1530	B-3	2	Farragut	2 manatees seen between USS Farragut and USS Roosevelt
9/20/2010	0925	Tug Basin	3	Harbor Ops	3 manatees hanging out for approx 1 hr inside boat slips. Pictures taken. See Folder with Photos. (Pics 564&565 same manatee, 572 other 2)
6/22/2011	1500	D-1	2	USS Underwood	2 Manatees seen along D-1. Pictures taken by Sailor.
6/23/2011	0938	C-2	1		
6/24/2011	0800	Southwall	1		
6/26/2011	0900	D-1-1	1		
6/29/2011	1445	Tug Basin (Slots)	1		
7/5/2011	0900	Tug Basin	1		
8/4/2011	1500	E-1 portside	1	USS Klakring	Observed during RHIB ops; had just pulled the RHIB up; instructed them to contact HOPS and delay any more RHIB ops until manatees moved away from the area.
8/15/2011	0900	C-2-1	1		
8/16/2011	1157	Tug Basin (Slots)	1		
8/18/2011	1025	Tug Basin (Slots)	1		
8/23/2011	1020	Tug Basin (Slots)	1		
8/30/2011	1100	F-1	1	IAP-Hill	also reported to HOPS Dockmaster.
9/6/2011	0813	Tug Basin (Slots)	1		
9/7/2011	1124	Basin	1		
9/15/2011	1014	Tug Basin (Slots)	1		
10/16/2011	0553	Tug Basin (Slots)	2		
11/5/2011	1053	C-Pier	1		
11/7/2011	0827	E-2-2	2		Adult and baby
11/7/2011	1400	A/B pier	2	Seaward Marine	Adult and baby
11/14/2011	0745	Middle basin 450 yards from gate	1		
12/12/2011	0945	D-4-1	2		
12/14/2011	1425	B-3-1	1		
1/6/2012	0815	D-4	1		
1/17/2012	0809	D-2-1	1		
1/24/2012	0725	Buoy 3 & 4	1 Right Whale	C tractor 12	Right Whale heading East
1/30/2012	1225	Tug Basin (Slots)	1		
1/31/2012	1237	7 miles N of jetties	Pod of whales		

Source: Mayport NAS 2012. Reviewed log book at 1100 on 24 Aug 2012.

TABLE 12 continued. Manatee sightings reported at Mayport NAS 2007-2012.

DATE	TIME	LOCATION	NO. SIGHTED	REPORTED BY	NOTES/Indicate if Juvenile or adult
2/12/2012	1104	C-1-1W	1		
5/8/2012	1100	Tug Basin	1		
5/8/2012	1255	E-3	1		
5/14/2012	1420	D-3-1	1		
5/18/2012	1230	Tug Basin	1	P. Loop Environmental	Pictures
5/21/2012	2003	E-2	Not specified		
6/8/2012	0024	E-3-1	1		
6/24/2012	0805	E-3	1		
6/25/2012	1455	D-1	1	USS Gettysburg	
7/26/2012	1045	E-1-1	1		
7/31/2012	1327	Tug Basin (Slots)	1		
8/18/2012	1845	Tug Basin (Slots)	3		

Source: Mayport NAS 2012. Reviewed log book at 1100 on 24 Aug 2012.

TABLE 13. Manatee Rescues in the Duval County area 2000-2012.

Date	Field Number & Aliases	Size (cm)	Sex	Location	Circumstance
3/15/2012	RNE1208	270	M	Goodbys Creek	Rescue
2/17/2012	RNE1207	233	F	San Carlos Creek	Rescue
2/13/2012	RNE1206	151	M	San Carlos Creek	Rescue
2/13/2012	RNE1205	258	F	San Carlos Creek	Rescue
1/31/2012	RNE1204	288	F	San Carlos Creek	Rescue
1/25/2012	RNE1203	263	M	San Carlos Creek	Assist & Release
1/25/2012	RNE1202	270	M	San Carlos Creek	Assist & Release
1/17/2012	SWFTM1202B	294	F	SJR, JEA Dist. #2	Assist & Release
9/13/2011	RNE1103	290	M	N of Blue Cyprus Pk	Tidal Strand: Assist/Released
9/13/2011	RNE1104	280	F	4940 Toproyal	Tidal Strand: Assist/Released
9/13/2011	RNE1105	312	M	N of Blue Cyprus Pk	Tidal Strand: Assist/Released
9/13/2011	RNE1106	300	M	4940 Toproyal	Tidal Strand: Assist/Released
6/16/2011	RNE1102_Assitsed & released	290	F	Dunns Creek	Tidally stranded
1/4/2010	RNE1001	312	F	Ortrga River	Natural: Cold Stress
3/14/2010	RNE1002	332	F	Mill Cove	Natural: Cold Stress
2/6/2009	RNE0901_Bella	336	F	SJR,nr. BP Refinery Sta.	Natural: Cold Stress
2/6/2009	RNE0902_Bella's calf	180	F	SJR,nr. BP Refinery Sta.	Natural: Cold Stress
7/25/2009	SWFTM0916B(RNE0908/RNE0901)	336	F	Trout River	Watercraft: Propeller
1/3/2008	SWFTM0801B (RNE0801)_Ana Lucia	230	F	Ortega River	Natural: Cold Stress
1/7/2008	SWFTM0802B (RNE0802)	213	M	Sherman Creek, Mayport	Natural: Cold Stress
1/18/2008	SWFTM0803B (RNE0803)_Libby	204	F	SJR, JEA Dist. #2	Natural: Cold Stress
1/18/2008	SWFTM0804B (RNE0804)_Sawyer	197	M	SJR, JEA Dist. #2	Calf by itself:Cold Stress
6/26/2008	RNE0810	~215	U	Ortega River	Entanglement; crab trap
1/2/2007	RNE0701	204	M	Goodbys Creek	Natural: Cold Stress
8/16/2007	RNE0705_dependant calf	118	F	San Carlos Creek	Entrapment; JEA Northside
4/25/2006	RNE0601_died during transport	355	M	SJR nr. Prudential Drive	Watercraft: Propeller
10/18/2006	RNE0602_died following day	265	M	Cedar River	Watercraft: Propeller
12/19/2006	RNE0603/RNE0311_moved & released	258	F	Drummond Pt./Creek	Natural
1/13/2005	RNE0501	216	M	ICW: south of Beach Blvd	Natural: Cold Stress
10/30/2005	RNE0508	264	F	Mill Cove	Watercraft
7/30/2004	RNE0402_tide rose, swam away	360	F	Hugenot Park	Natural: Stranded/mud flat

Source: FWC, FWRI, Marine Mammal Pathobiology Laboratory, Manatee Rescue Database, unpublished data, 2012.

TABLE 12. Manatee Rescues in the Duval County area 2000-2012.

Date	Field Number & Aliases	Size (cm)	Sex	Location	Circumstance
5/11/2003	RNE0302	305	U	Doctors Lake (Clay Co.)	Entanglement; crab trap
11/11/2003	RNE0307_mother	298	F	Doctors Lake (Clay Co.)	Entanglement; crab trap
11/11/2003	RNE0308_dependant calf	169	M	Doctors Lake (Clay Co.)	Calf of rescued mother
12/5/2003	RNE0310/REC0002_moved & released	248	M	Ortega River_basin	Natural: Cold Stress
12/5/2003	RNE0309_moved & released	252	M	Ortega River_basin	Natural: Cold Stress
12/7/2003	RNE0311_calf by itself	153	F	Ortega River_basin	Natural: Cold Stress
12/18/2003	RNE0313	222	M	Ortega River_basin	Natural: Cold Stress
12/18/2003	RNE0312_calf by itself	194	F	Ortega River_basin	Natural: Cold Stress
12/18/2003	RNE0314	208	F	Ortega River_basin	Natural: Cold Stress
1/11/2002	RNE0201	232	F	Ortega River_basin	Natural: Cold Stress
1/11/2002	RNE0202	228	F	Ortega River_basin	Natural: Cold Stress
1/3/2001	RNE0101	277	F	JEA Southside	Natural: Cold Stress
1/3/2001	RNE0102	208	M	JEA Southside	Natural: Cold Stress
1/4/2001	RNE0103	233	M	JEA Southside	Natural: Cold Stress
1/24/2001	SWFTM0107B (Dynamo)	227	M	JEA Southside	Natural: Cold Stress
7/1/2001	RNE0105_calf by itself	125	M	Little Jetties Park	Stranded on shore
4/20/2000	RNE0001_died during transport	299	M	JU dock 1 mile west	Watercraft collusion
6/5/2000	RNE0002_captured/moved & released	250	M	SJR 4524 River Trail Rd.	Entrapment: culvert

Source: FWC, FWRI, Marine Mammal Pathobiology Laboratory, Manatee Rescue Database, unpublished data, 2012.

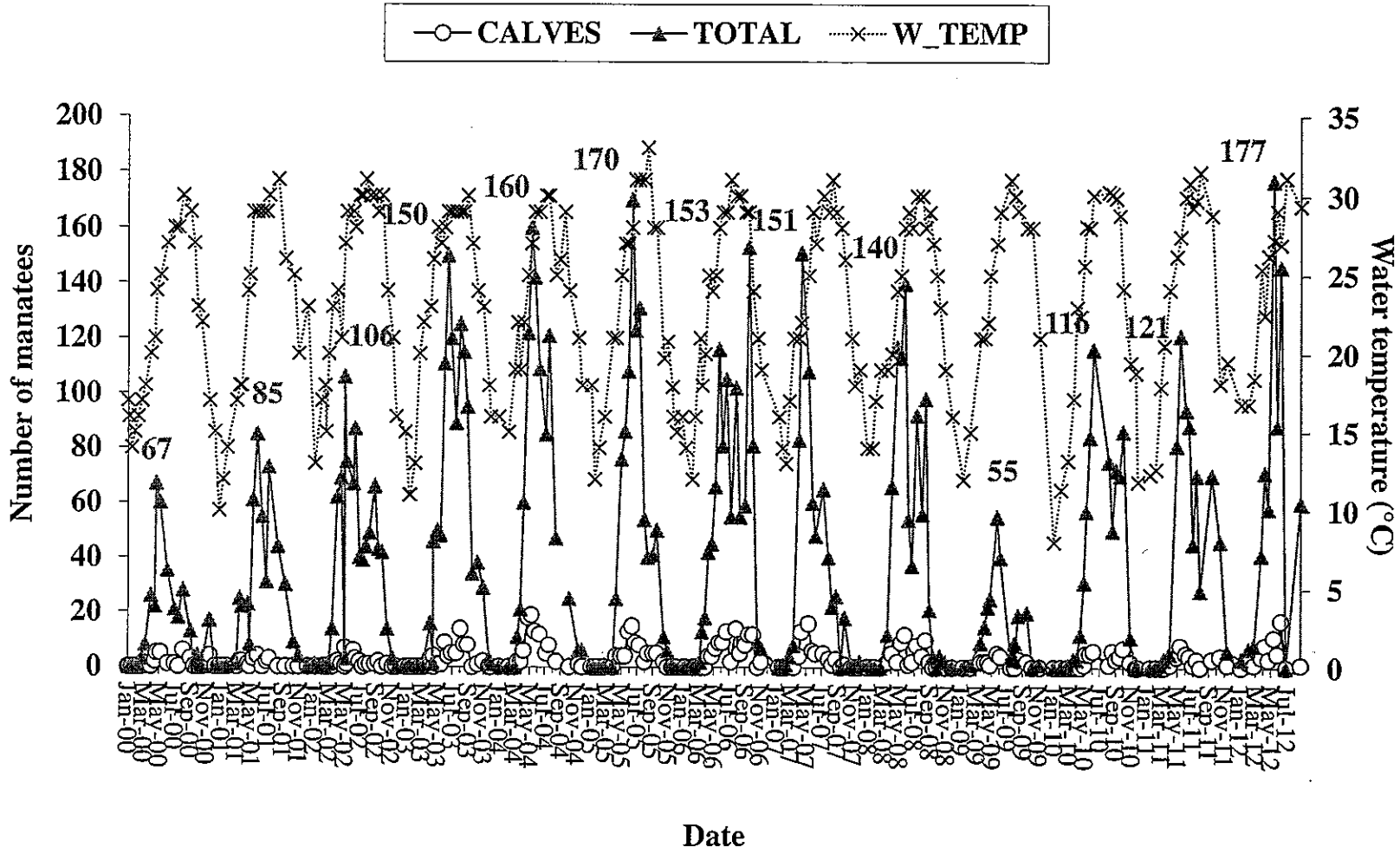


FIGURE 1a. Aerial sightings of manatees and water temperature in the St. Johns River 2000–September 2012.

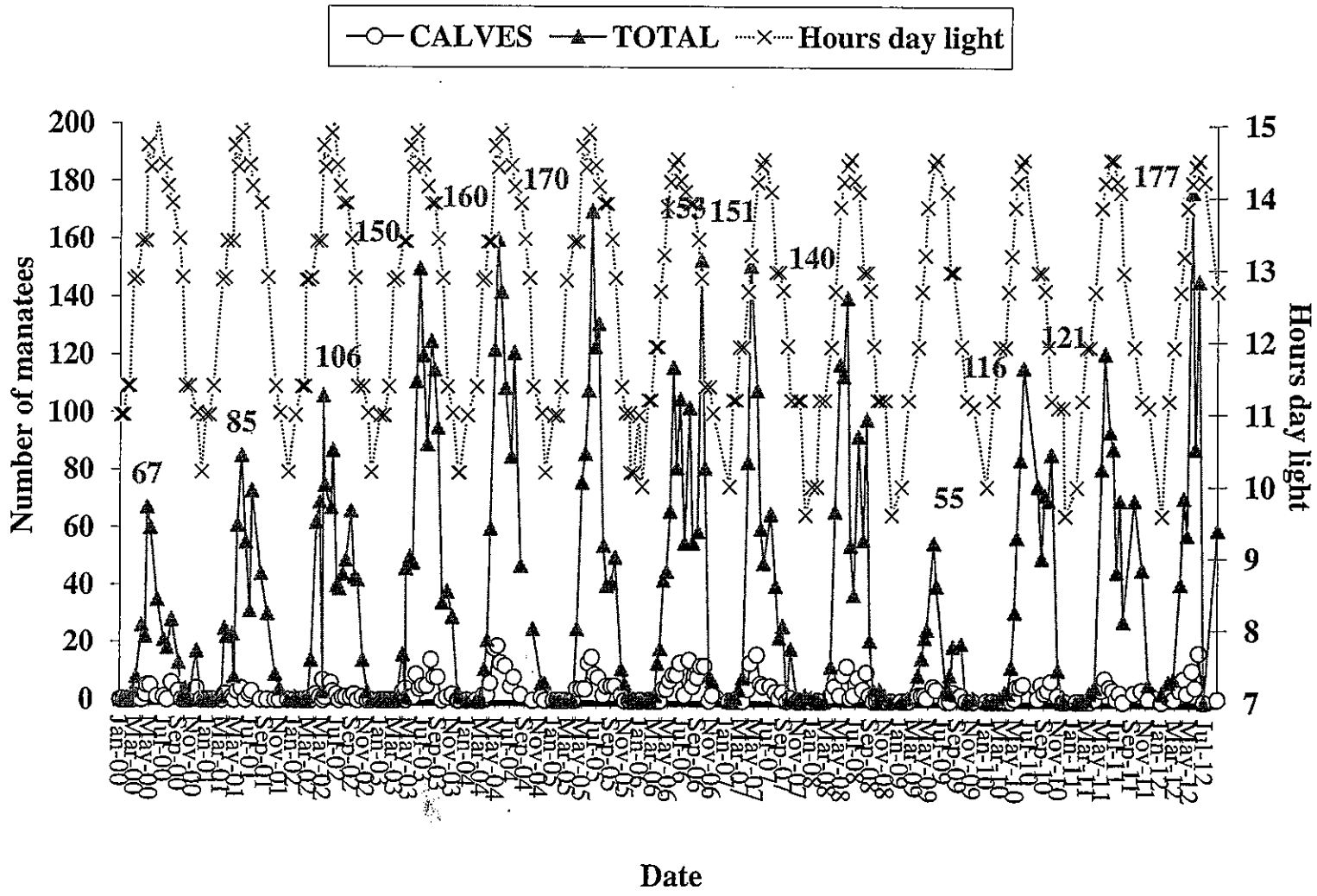


FIGURE 1b. Aerial sightings of manatees and hours daylight in St. Johns River 2000–September 2012.

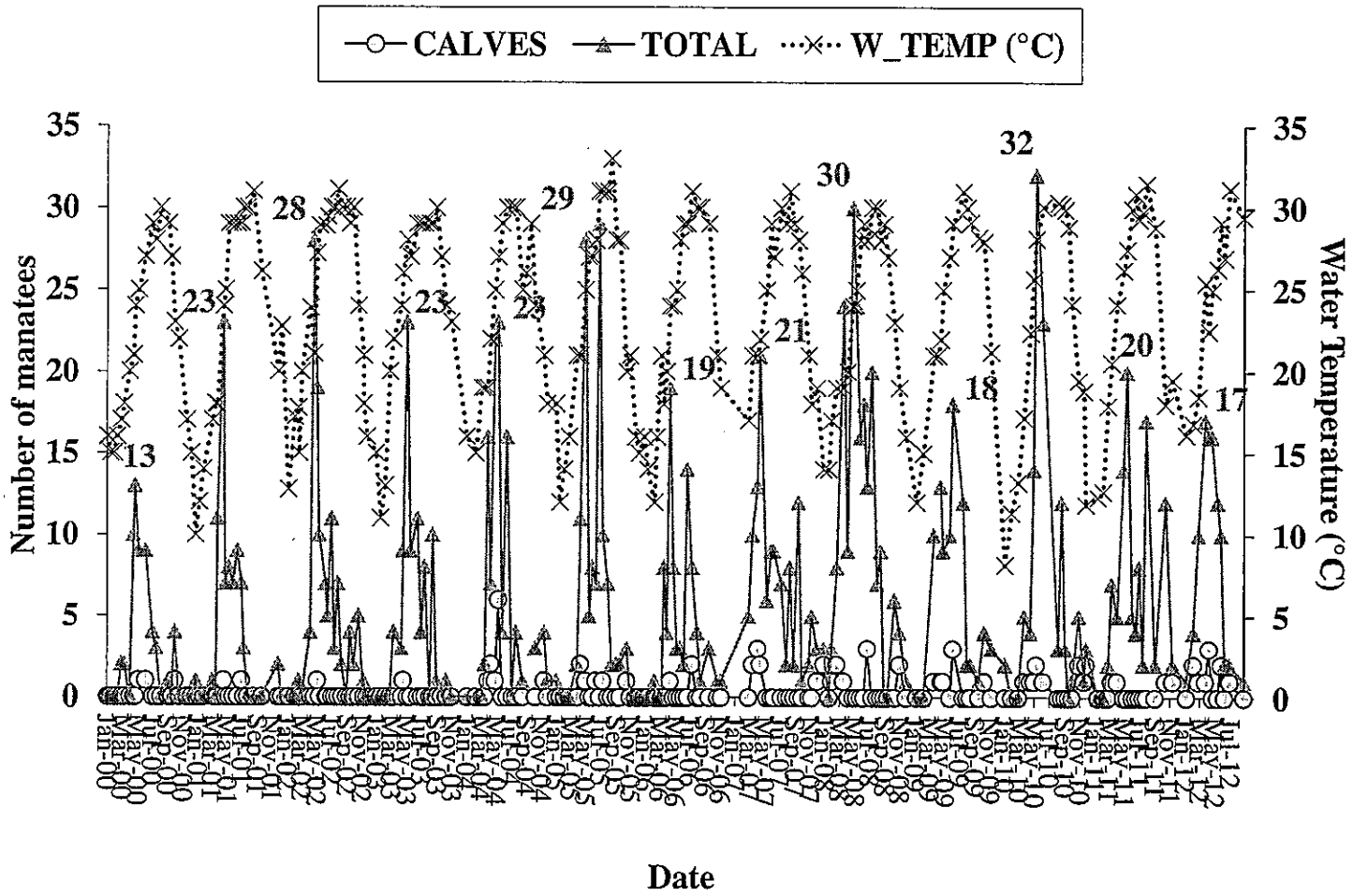


FIGURE 2a. Aerial sightings of manatees and water temperature in the Intracoastal Waterway 2000–September 2012.

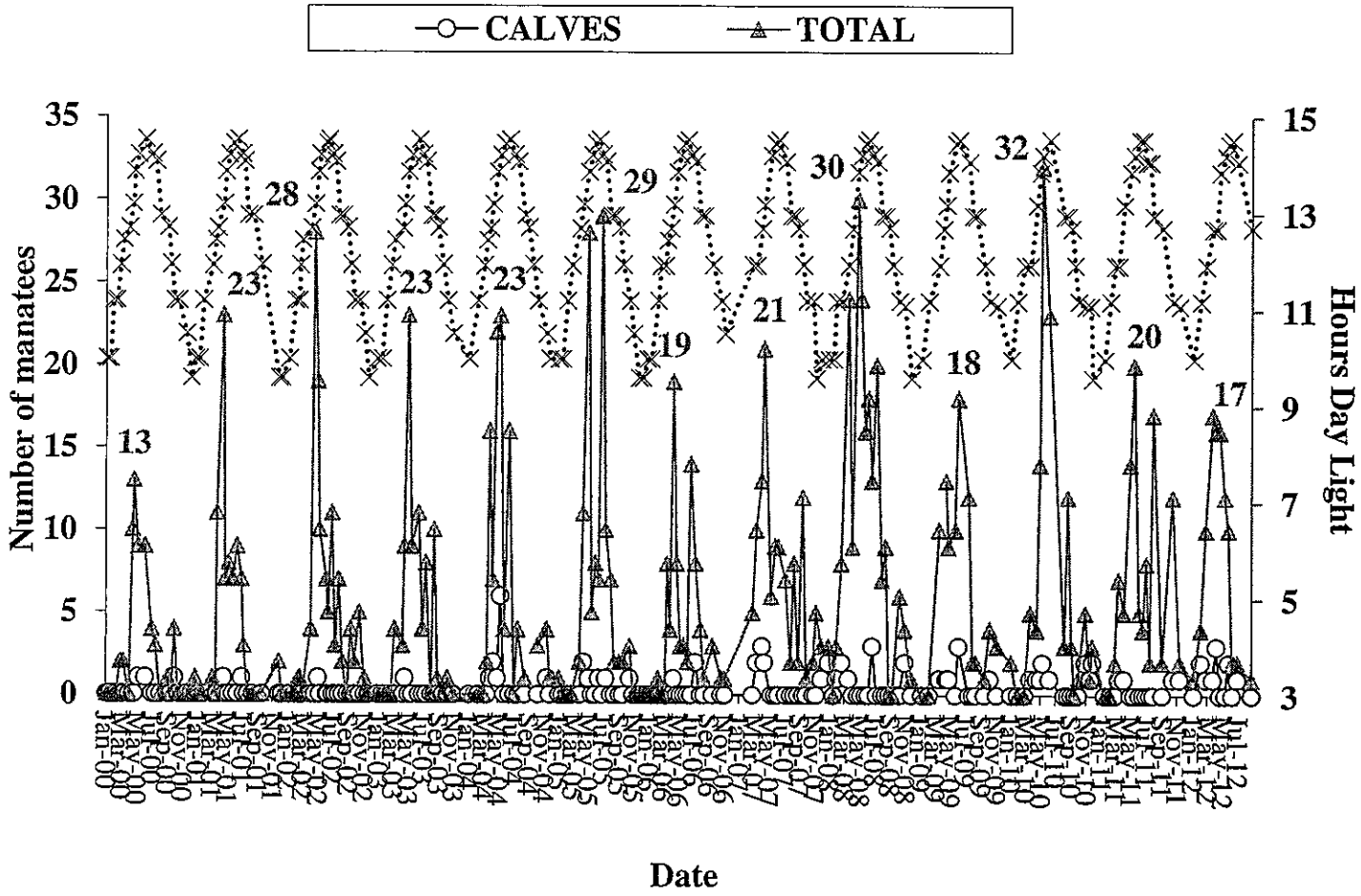
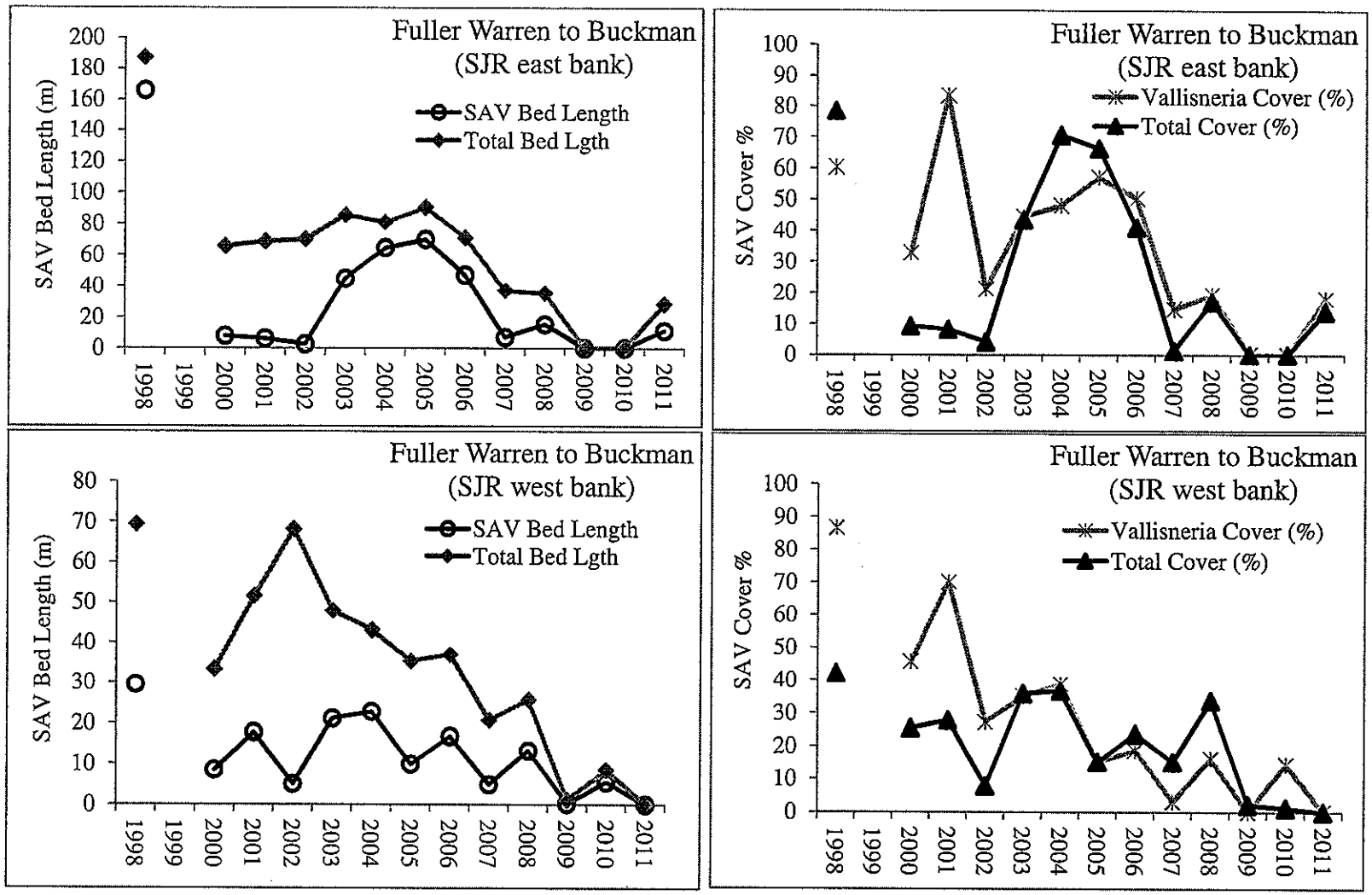
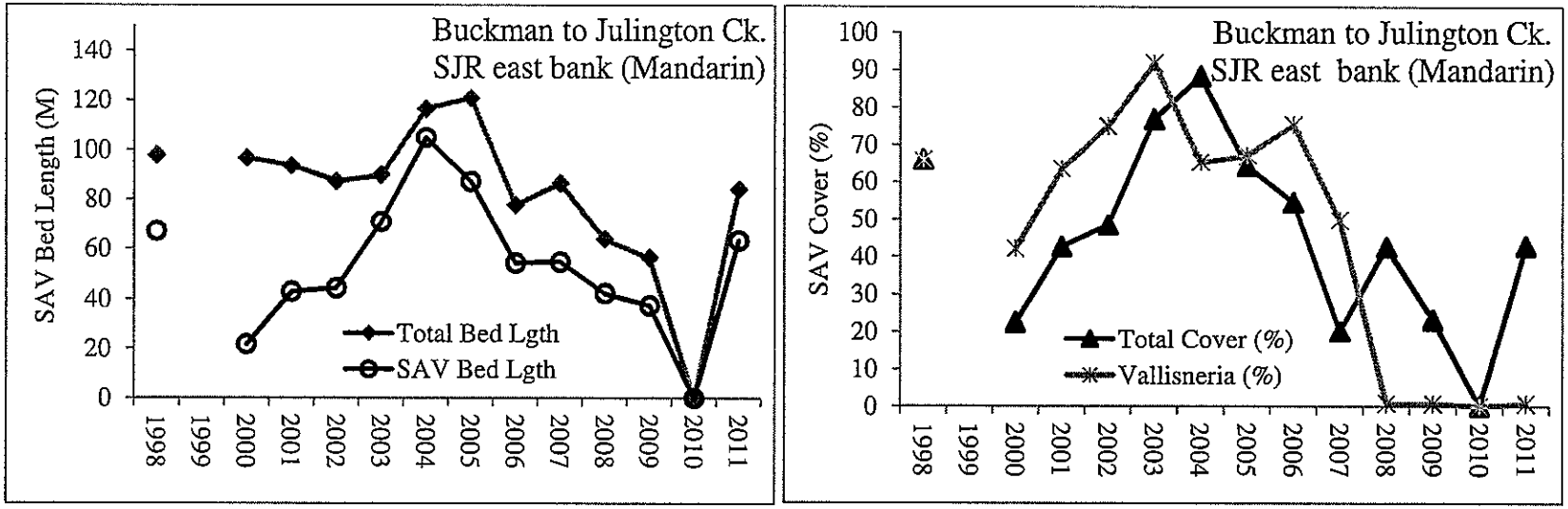


FIGURE 2b. Aerial sightings of manatees and hours daylight in The Intracoastal Waterway 2000-September 2012.



Source data: SJRWMD 2011. Lower St. Johns River Basin Submerged Aquatic Vegetation Monitoring Program.

FIGURE 3a. Submerged Aquatic Vegetation data for Duval County. East and west banks of SJR from the Fuller Warren Bridge to the Buckman Bridge).



Source data: SJRWMD 2010. Lower St. Johns River Basin Submerged Aquatic Vegetation Monitoring Program.

FIGURE 3b. Submerged Aquatic Vegetation data for Duval County. East bank of SJR from the Buckman Bridge to Julington Creek).

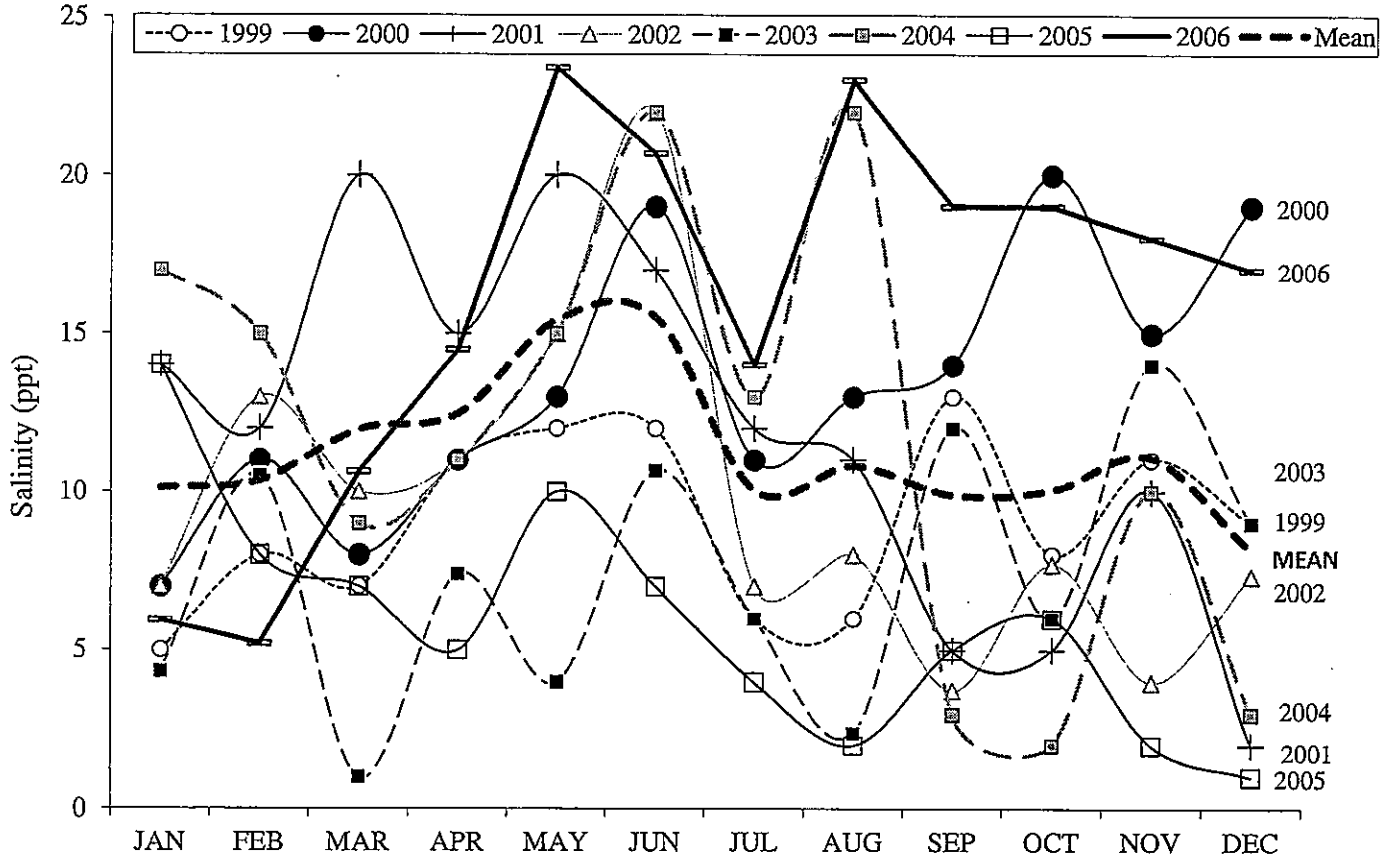


FIGURE 4a. Mean monthly salinity recorded at Jacksonville University dock for each month by year (1999-2006). The thick red dotted line indicates the general mean for each month over all years (See Figure 4b. for 2005-2012).

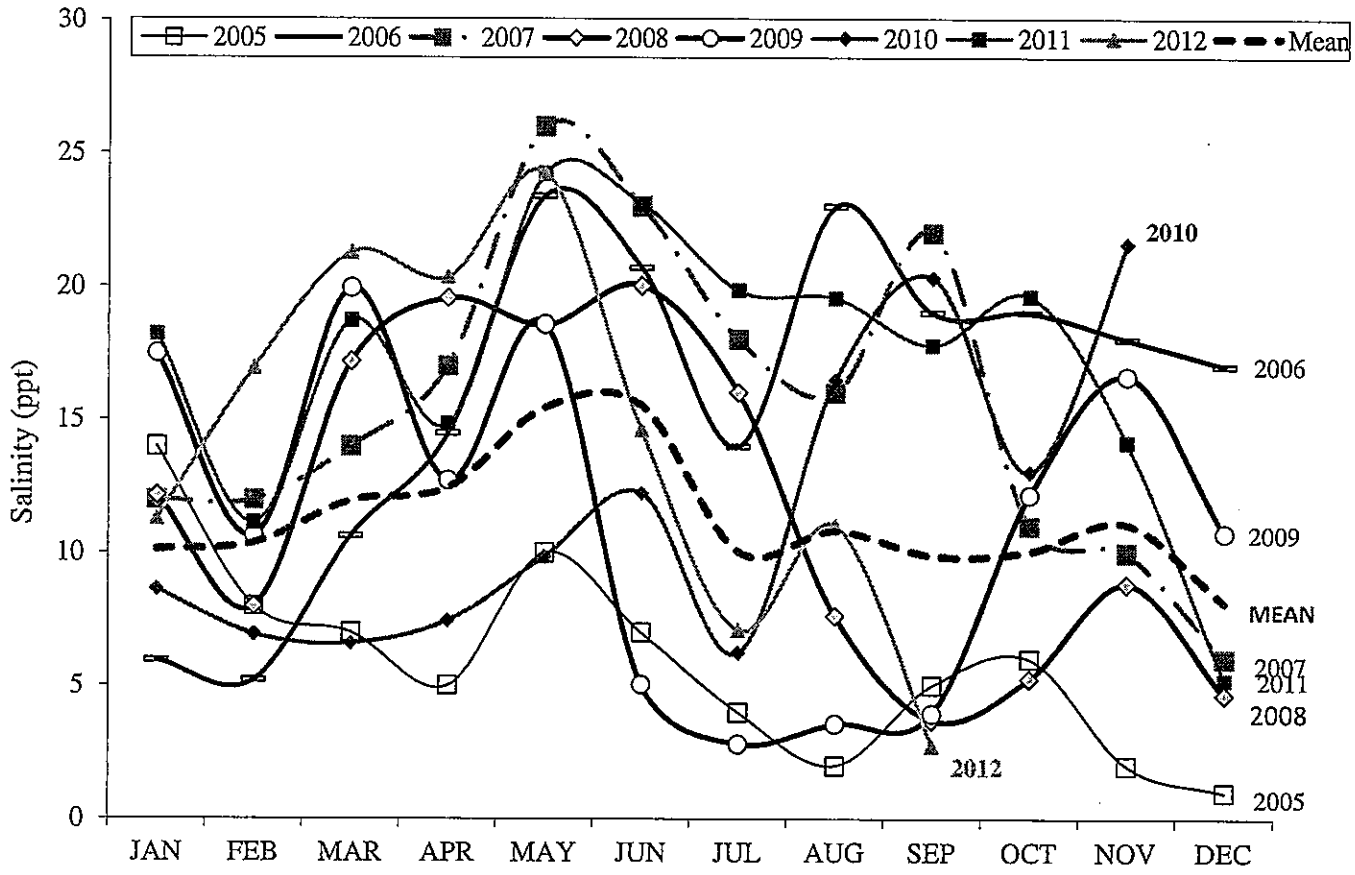


FIGURE 4b. Mean monthly salinity recorded at Jacksonville University dock for each month by year (2005-2012). The thick red dotted line indicates the general mean for each month over all years (Figure 4a. for 1999-2006).

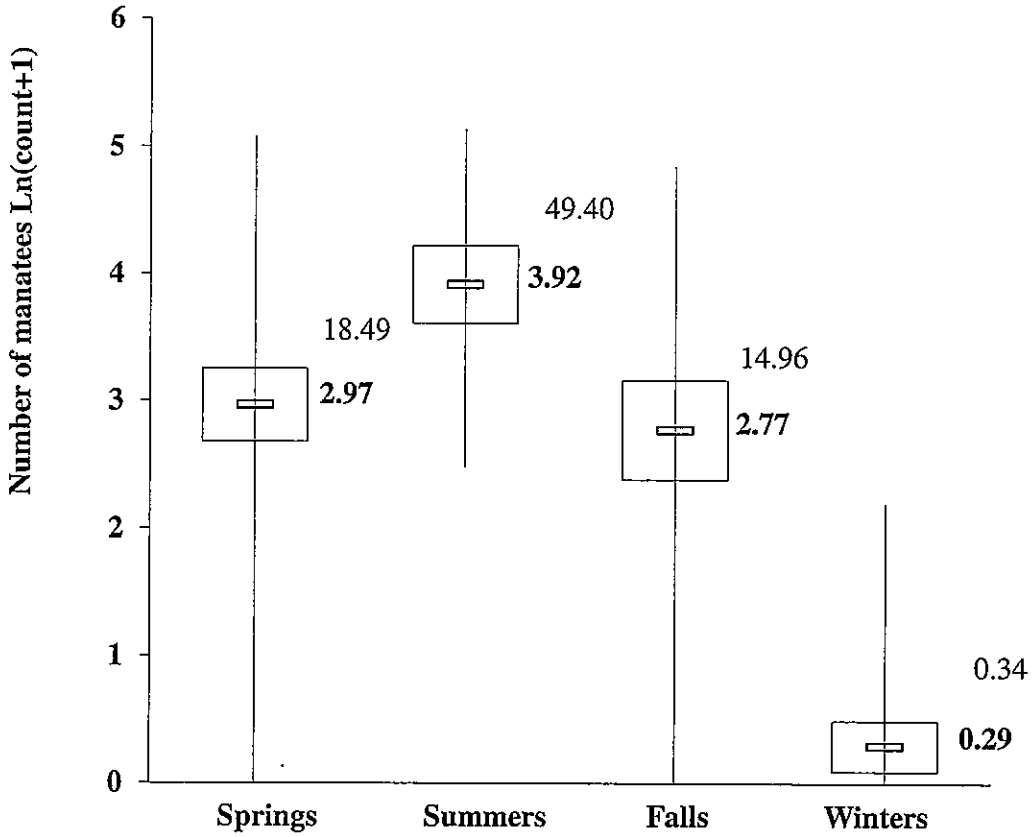


FIGURE 5. Mean counts of manatees in the LSJR by season (horizontal lines) 1994-2012. Vertical lines show maximum and minimum counts. Boxes show 95% confidence intervals of the mean. Y-axis indicates the natural log of the number of manatees counted + 1 (Unbolded numbers are converted to actual numbers).

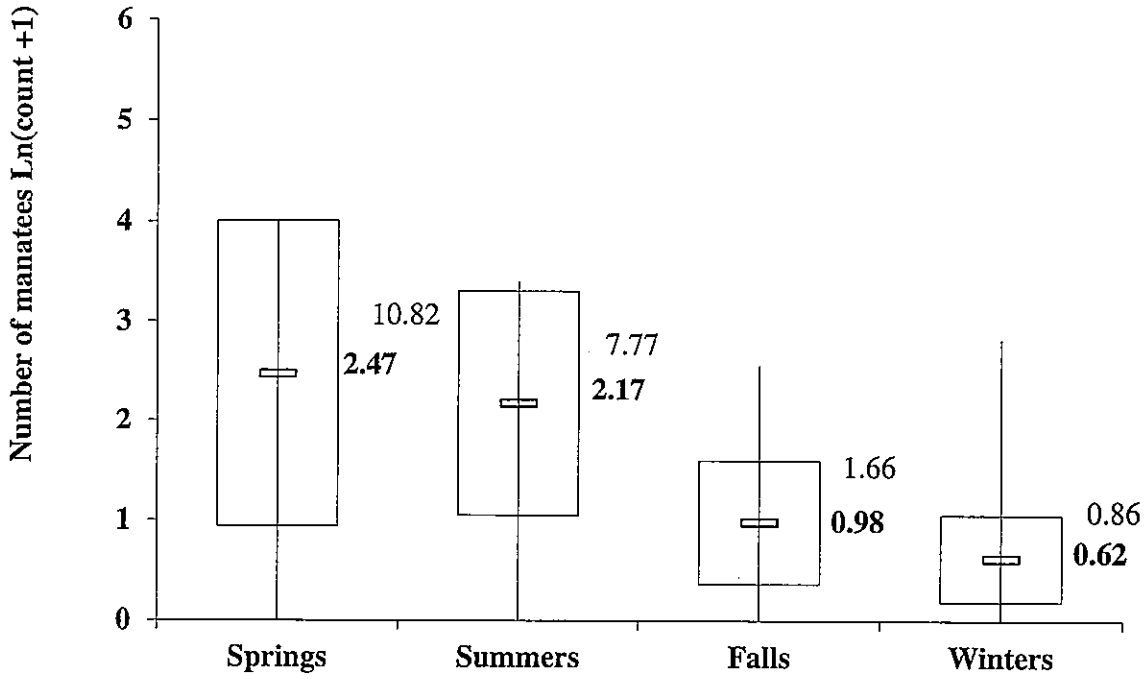
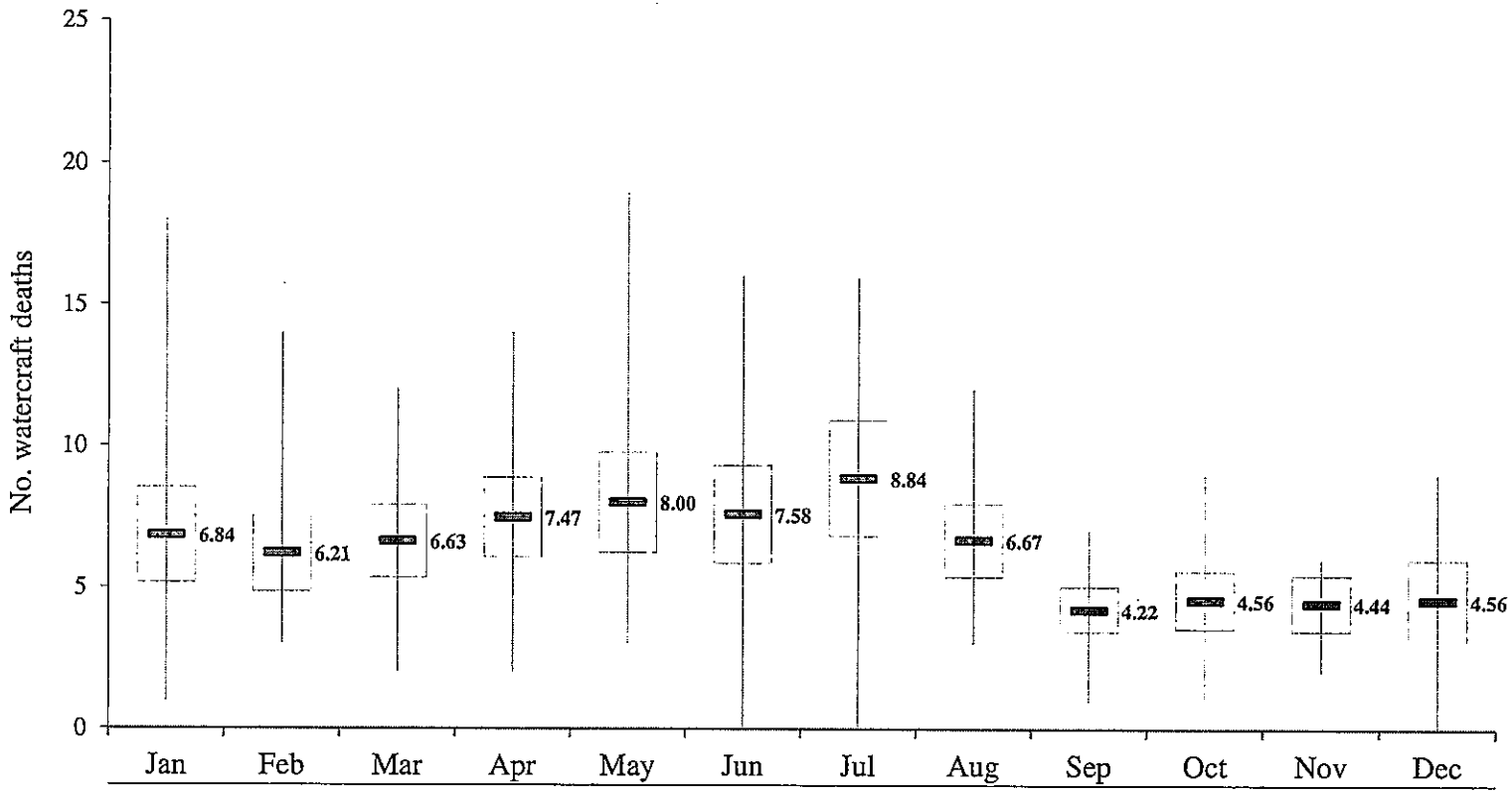
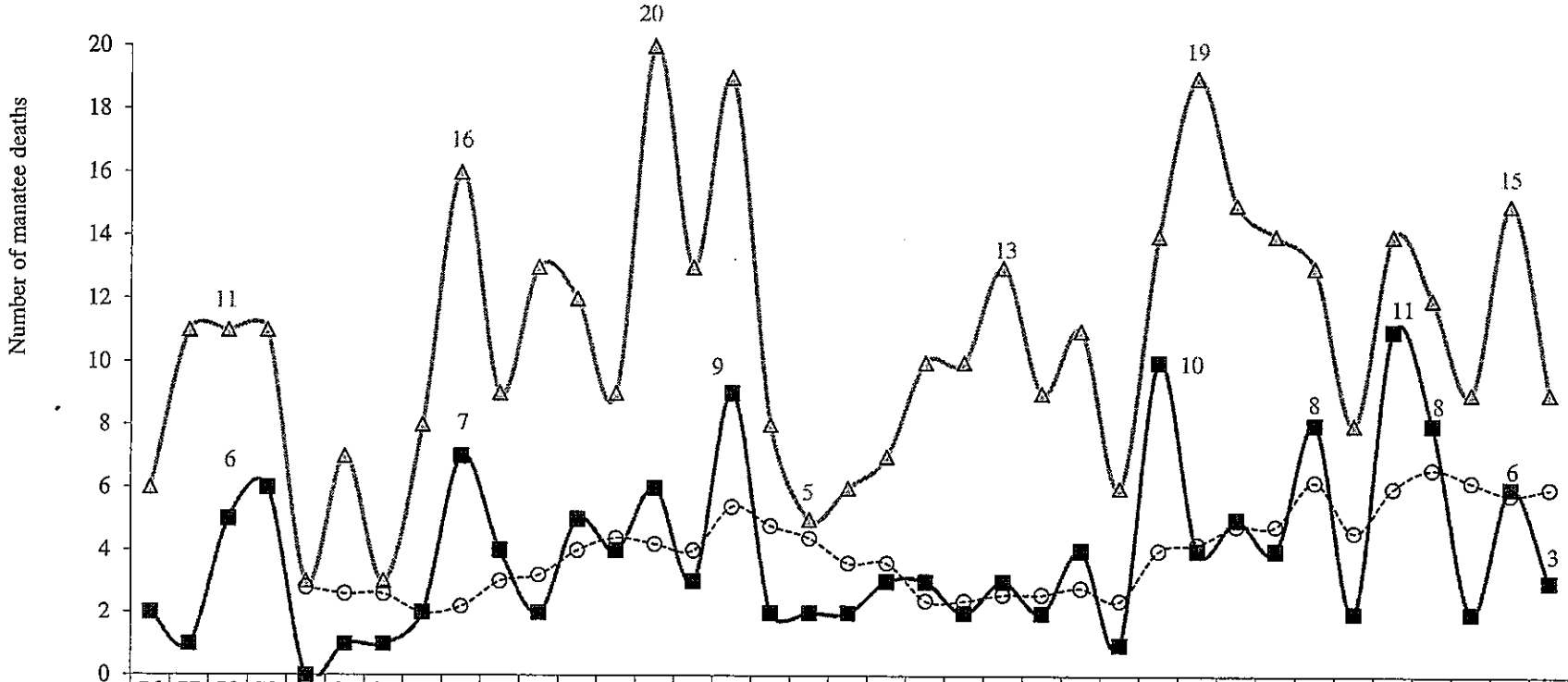


FIGURE 6. Mean counts of manatees by season in the ICW 1994 – 2012 (horizontal lines). Vertical lines show maximum and minimum counts. Boxes show 95% confidence intervals of the mean. Y-axis indicates the natural log of the number of manatees counted + 1 (Unbolded numbers are converted to actual numbers).



Source data: FWRI 2012.

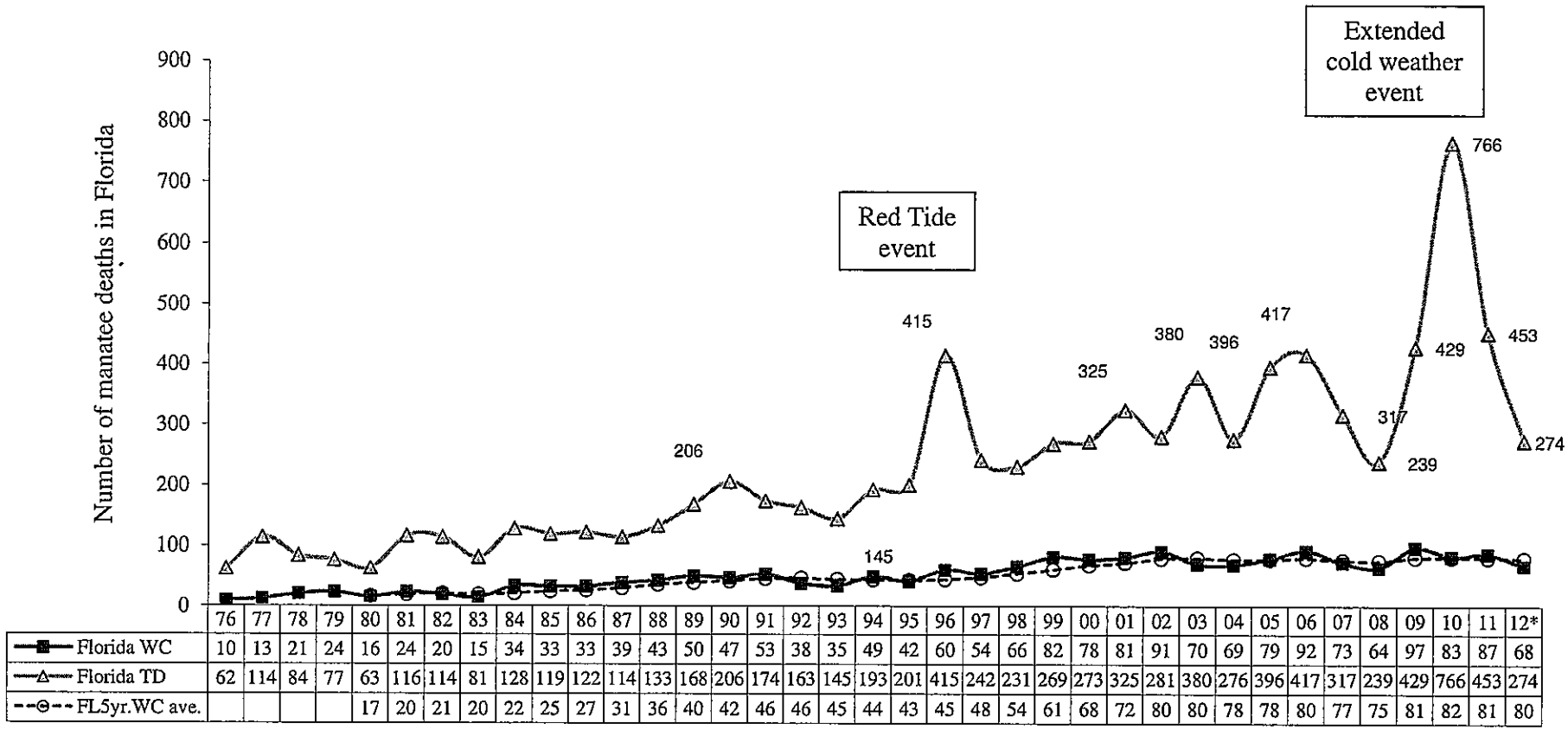
FIGURE 7. Watercraft caused mortality of manatees in Florida compared for the years 1994 – July 2012. Mean monthly counts of manatees (horizontal lines). Vertical lines show maximum and minimum counts. Boxes show 95% confidence intervals for the mean.



	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12*
Duval WC	2	1	5	6	0	1	1	2	7	4	2	5	4	6	3	9	2	2	2	3	3	2	3	2	4	1	10	4	5	4	8	2	11	8	2	6	3
Duval TD	6	11	11	11	3	7	3	8	16	9	13	12	9	20	13	19	8	5	6	7	10	10	13	9	11	6	14	19	15	14	13	8	14	12	9	15	9
D5yr.WC ave.					3	3	3	2	2	3	3	4	4	4	4	5	5	4	4	4	2	2	3	3	3	2	4	4	5	5	6	5	6	7	6	6	6

12* = July 2012
Duval WC = Watercraft deaths of manatees.
Duval TD = Total deaths of manatees (all causes).
D5Yr.WC ave. = Five year running average of watercraft deaths of manatees.
(Source: FWRI 2012).

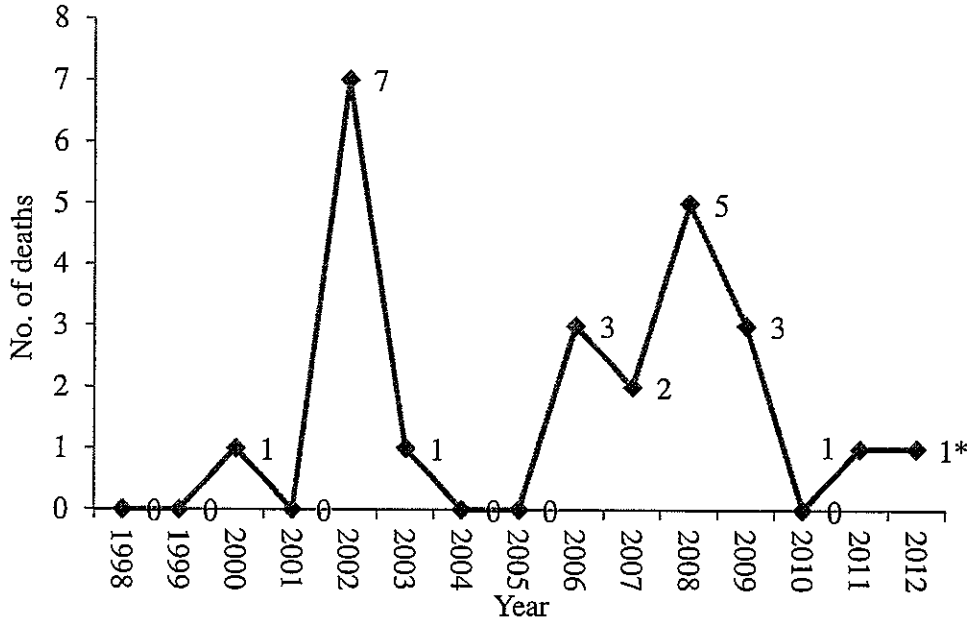
FIGURE 8. Watercraft and total manatee mortality in Duval County, Florida (1976–July 2012).



	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12*
Florida WC	10	13	21	24	16	24	20	15	34	33	33	39	43	50	47	53	38	35	49	42	60	54	66	82	78	81	91	70	69	79	92	73	64	97	83	87	68
Florida TD	62	114	84	77	63	116	114	81	128	119	122	114	133	168	206	174	163	145	193	201	415	242	231	269	273	325	281	380	276	396	417	317	239	429	766	453	274
FL5yr.WC ave.					17	20	21	20	22	25	27	31	36	40	42	46	46	45	44	43	45	48	54	61	68	72	80	80	78	78	80	77	75	81	82	81	80

12* = July 2012.
Florida WC = Florida watercraft mortality.
Florida TD = Florida total mortality (all causes).
FL5yr.WC ave. = Florida five year running average of watercraft deaths of manatees.
Source: FWRI 2012.

FIGURE 9. Watercraft and total manatee mortality in Florida (1976–July 2012).



Source data: FWRI 2012

FIGURE 10. Manatee mortalities with cause attributed to large vessels.
In 2008, there was one death attributed to a mid-size vessel (MMPL Category II or higher) not included in the above count.
* = preliminary data for 2012.

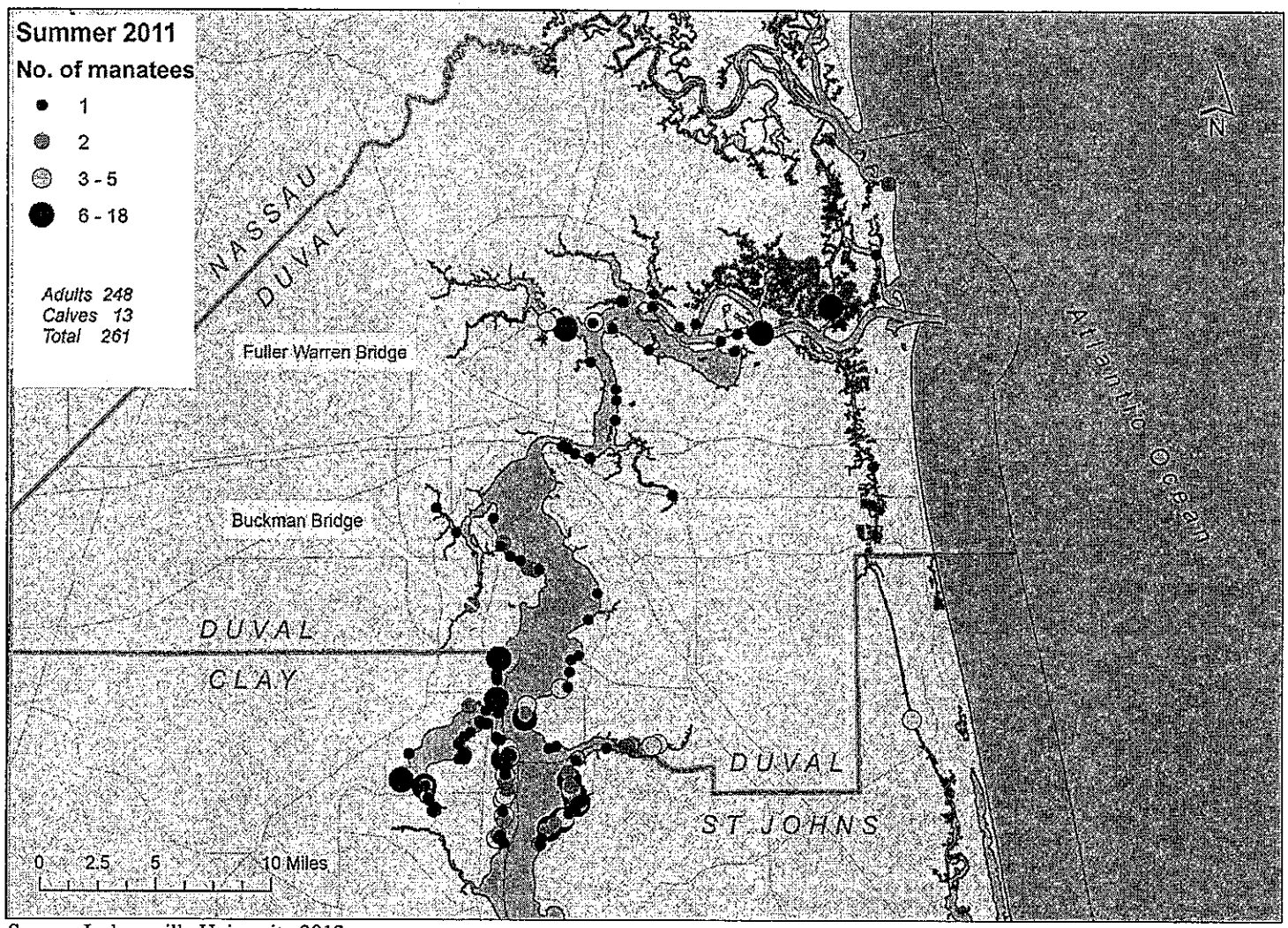
Aerial sightings of manatees

1. The following maps show manatee distribution from **Summer 2011–Summer 2012.**

2. Seasons were classified as follows:
   Winter - December - February
   Spring - March - May
   Summer - June - August
   Fall - September - November

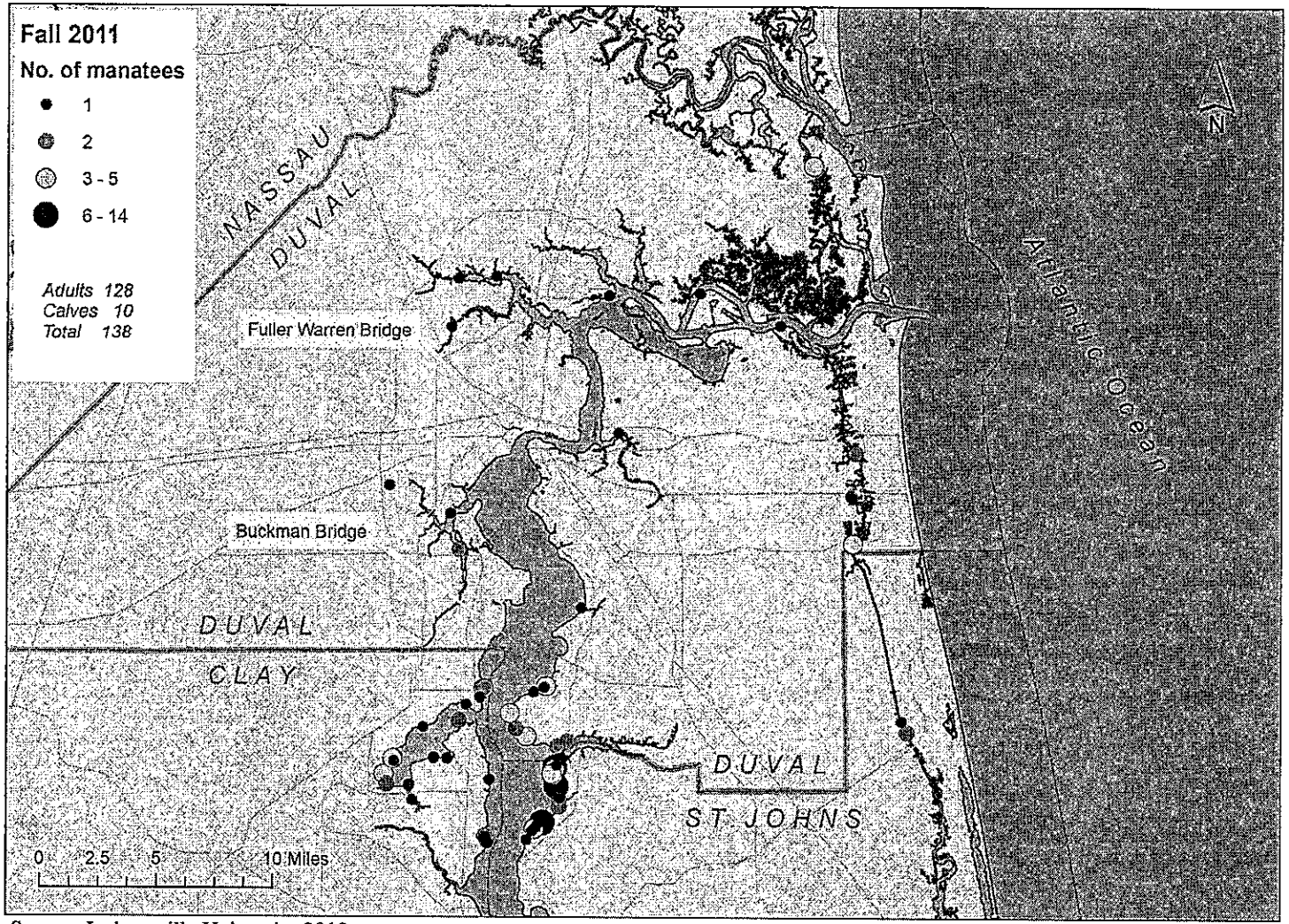
SERIES A - MANATEE AERIAL SIGHTINGS

SERIES A – Manatee aerial sightings, Duval Co., FL. (Summer, 2011).



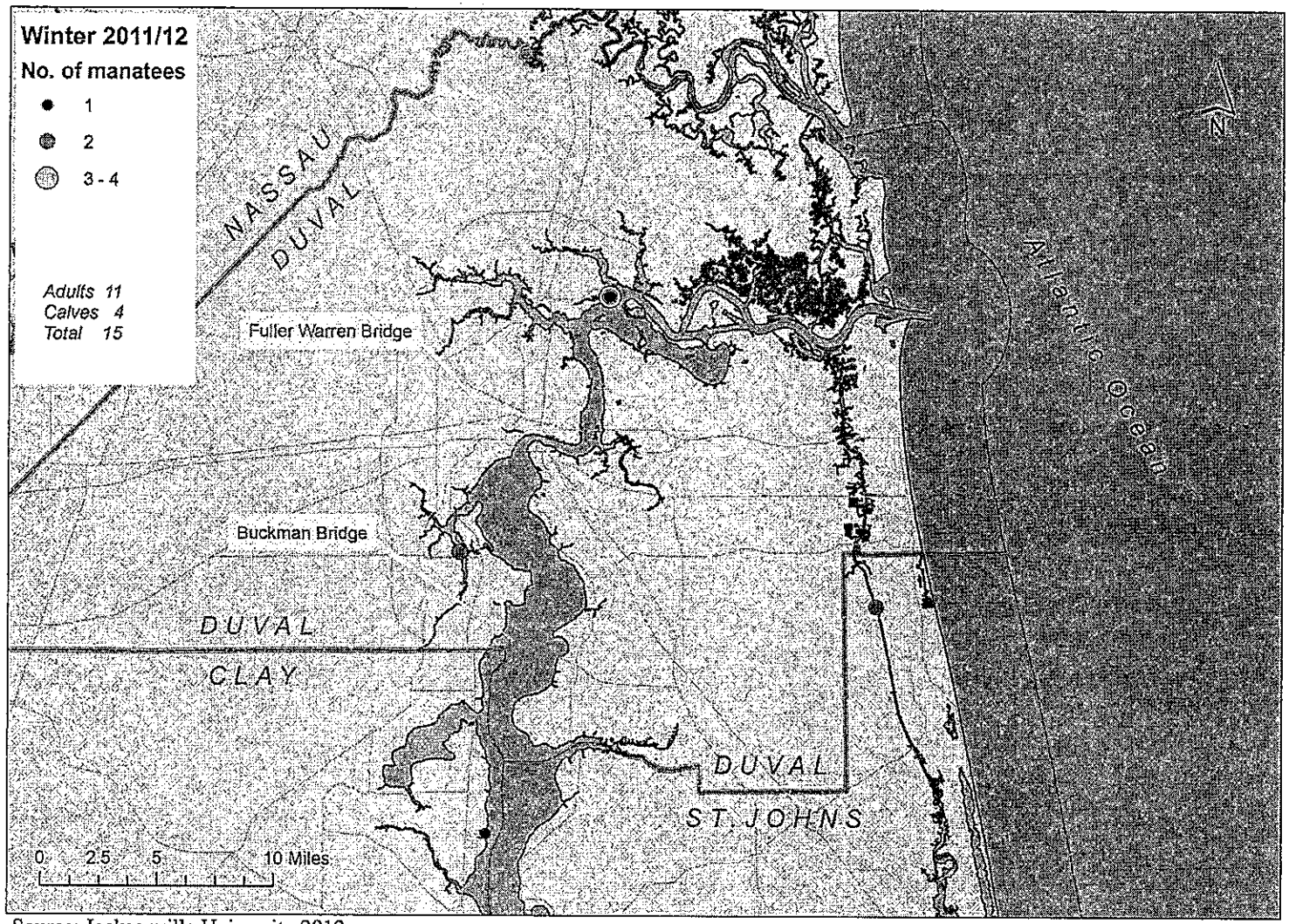
Source: Jacksonville University 2012.

SERIES A – Manatee aerial sightings, Duval Co., FL. (Fall, 2011).



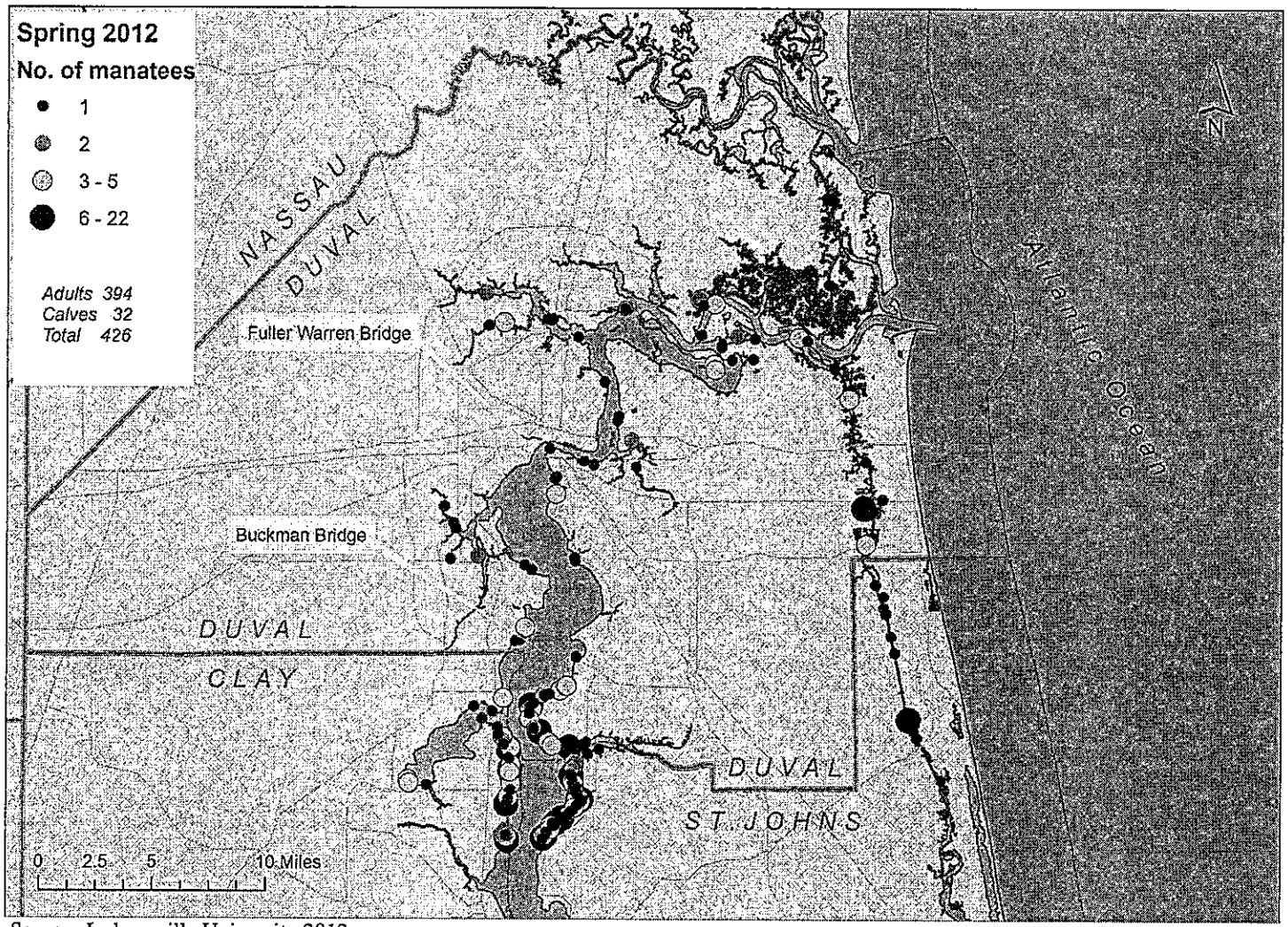
Source: Jacksonville University 2012.

SERIES A – Manatee aerial sightings, Duval Co., FL. (Winter, 2011-2012).



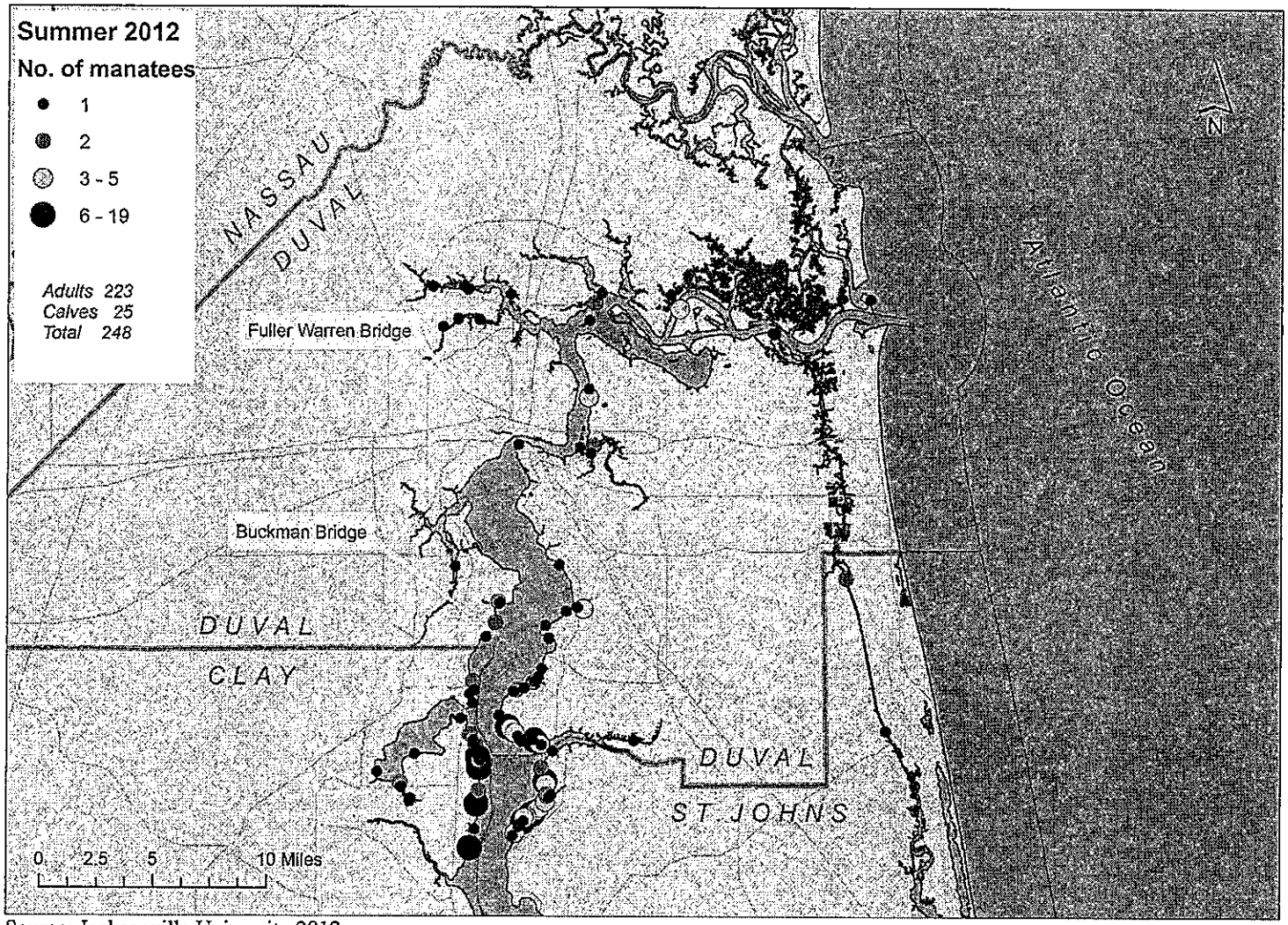
Source: Jacksonville University 2012.

SERIES A – Manatee aerial sightings, Duval Co., FL. (Spring, 2012).



Source: Jacksonville University 2012.

SERIES A – Manatee aerial sightings, Duval Co., FL. (Summer, 2012).



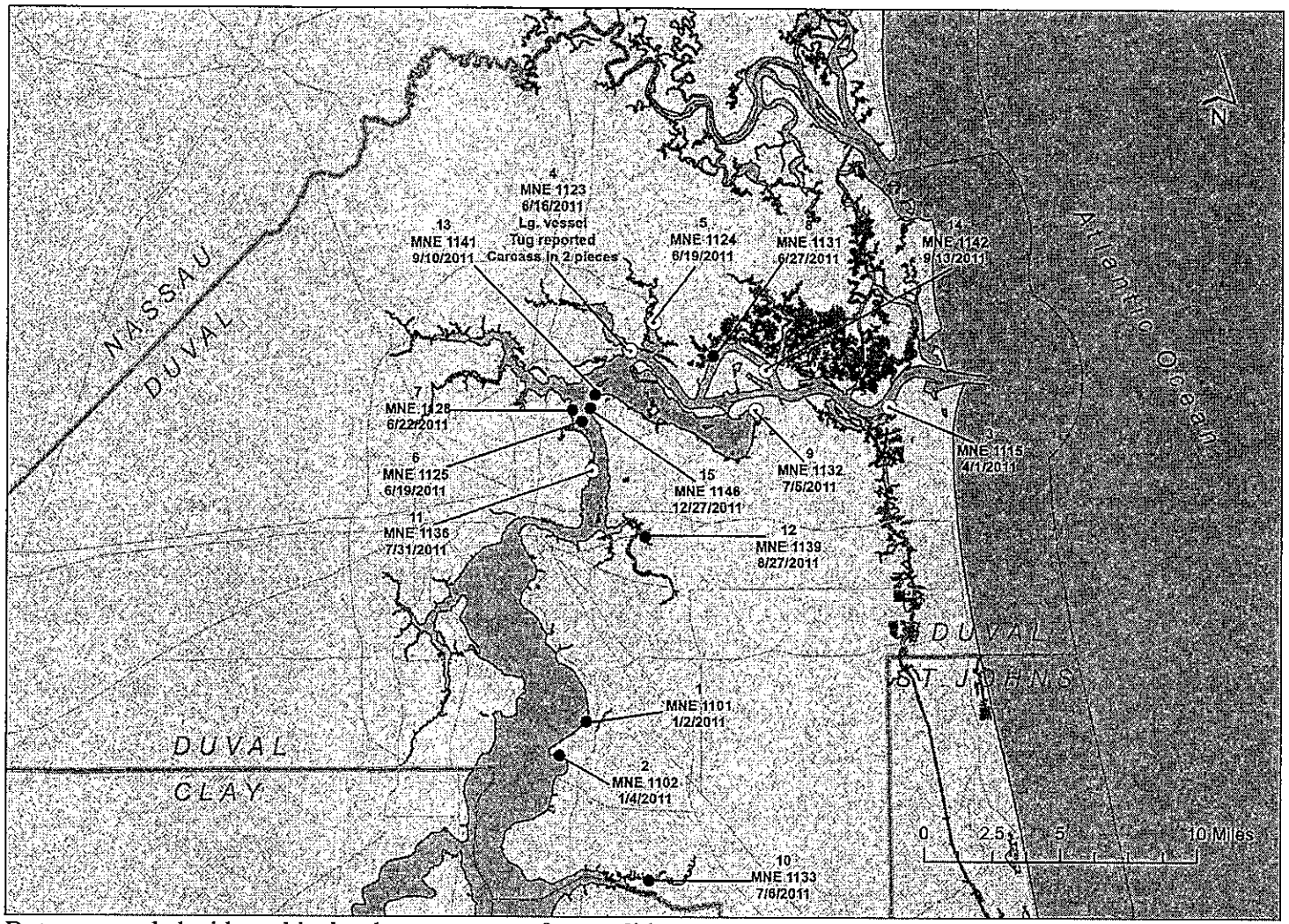
Source: Jacksonville University 2012.

Manatee mortality

1. Map of manatee mortality 2011, Duval Co., FL.
2. Table of manatee deaths from all causes (2011) Duval Co., FL.
3. Map of manatee mortality, September 2012, Duval Co., FL.
4. Table of manatee deaths from all causes (September 2012) Duval Co., FL.

SERIES B – MANATEE MORTALITY

SERIES B – Manatee mortality, Duval Co., FL. 2011.



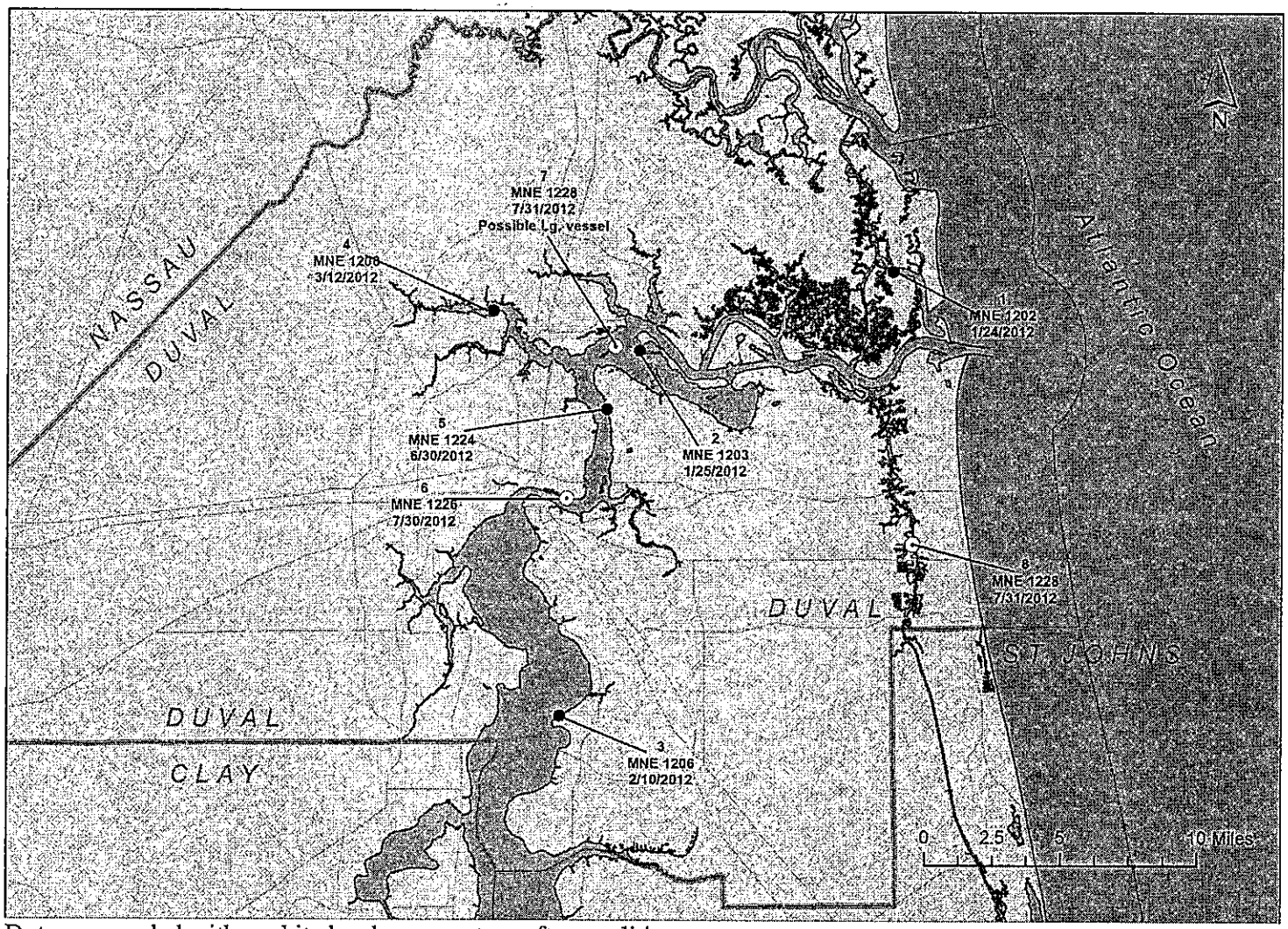
Dots surrounded with a white border are watercraft mortalities.
Source: FWRI 2012

Table 12. Manatee deaths from all causes until September 2011, Duval Co., FL.

Count	Date	Manatee field ID	Sex	Total Length	Mortality category
1	1/2/2011	MNE1101	M	245	5-Natural-Cold Stress
2	1/4/2011	MNE1102	F	219	5-Natural-Cold Stress
3	4/1/2011	MNE1115	M	340	1-Watercraft
4	6/16/2011	MNE1123	M	330	1-Watercraft_Tug/Reported
5	6/19/2011	MNE1124	F	350	1-Watercraft
6	6/19/2011	MNE1125	M	137	Perinatal (=< 150)
7	6/22/2011	MNE1128	F	326	8-Undetermined
8	6/27/2011	MNE1131	F	138	Perinatal (=< 150)
9	7/5/2011	MNE1132	M	272	1-Watercraft
10	7/6/2011	MNE1133	M	147	Perinatal (=< 150)
11	7/31/2011	MNE1136	M	311	1-Watercraft
12	8/27/2011	MNE1139	U	130	Perinatal (=< 150)
13	9/10/2011	MNE1141	F	380	8-Undetermined
14	9/13/2011	MNE1142	M	327	1-Watercraft
15	12/27/2011	MNE1146	M	307	5-Natural-Cold Stress

Source: FWC, FWRI 2012.

SERIES B – Manatee mortality, Duval Co., FL. September 2012.



Dots surrounded with a white border are watercraft mortalities.
Source: FWRI 2012. Preliminary Data.

Table 12. Manatee deaths from all causes until September 2012, Duval Co., FL.

Count	Date	Manatee field ID	Sex	Total Length	Mortality category
1	1/24/2012	MNE1202	M	229	8-Undetermined
2	1/25/2012	MNE1203	M	215	5-Natural-Cold Stress
3	2/10/2012	MNE1206	F	225	8-Undetermined
4	3/12/2012	MNE1208	M	279	5-Natural-Cold Stress
5	6/30/2012	MNE1224	F	145	Perinatal (=< 150)
6	7/30/2012	MNE1226	M	346	1-Watercraft
7	7/30/2012	MNE1227	F	279	1-Watercraft_Lg vessel possibly
8	7/31/2012	MNE1228	F	299	1-Watercraft

Source: FWC, FWRI 2012.