2007 National Life Jacket Wear Rate Observation Study Final Report

Featuring a Decade of Data

Comparison data from 1998 to 2006

Thomas W. Mangione
Mihaly Imre
Heather E. Parsons
Brian Antonio

JSI Research & Training Institute, Inc.
Boston, Massachusetts

March 31, 2008

Table of Contents

I. Introduction

This report provides data and analysis on the 2007 National Life Jacket Wear Rate Observation Study with comparison information from the 1998 through 2007 studies. Tracking changes in life jacket wear rates over time provides important statistics for those individuals and groups responsible for educating the public about boating safety, improving boating safety programs, and for legislative efforts targeting safety improvements for recreational boating. The Boating Statistics 2006 report, published by the Department of Homeland Security United States Coast Guard (USCG), shows that among the 474 drowning deaths in 2006, approximately 90% (423) of the individuals were not wearing a life jacket. These statistics make it essential to not only track the national life jacket wear rate among recreational boaters, but also to understand the circumstances and patterns in which life jackets are worn.

Calendar year 2007 marked the tenth year of life jacket wear rate data collection efforts conducted by JSI. The ten years of data allow for a higher level of analysis (i.e., controlling for the impact of influencing factors like age, weather, and boat type) in order to unmask potential trends and indicators of increased or decreased life jacket wear among different groups of recreational boaters (e.g., adult boaters or male boaters). Overall, examining all groups of recreational boaters together, the average life jacket wear rate for 2007 was 21.4%, essentially the same as previous years, where the lowest rate was 21.3% (1999) and the highest was 23.9% (1998). However, this overall mean life jacket wear rate obscures the influence of age and boat type on life jacket wear. Section IV (p 20) of the report will go into further detail about the influence of these factors on life jacket wear rates. Similar to the previous nine years of observation, 2007 presented no dramatic or significant changes in the life jacket wear rates compared to previous years of observation. The following is a detailing of methods for data collection and data analysis efforts, and conclusions to be drawn based on ten years of life jacket wear rate data.

II. Methods

To provide reliable and valid indicators of changes in life jacket wear rates, it was essential for observation procedures to remain as close as possible to those used in previous years. The same states have been observed for each of the ten years of data collection efforts, over the same period of time. The vast majority of the sites in each of 30 states observed have remained the same for all ten years. The following is a detailing of the methods used in all ten years of data collection efforts.

Time period - Observations were conducted during the summer months of each year, beginning the weekend of July 4th and ending on Labor Day weekend.

Site selection - A total of 30 states were chosen in which to conduct observations. The states were originally selected by a stratified random sampling procedure. Approximately three-fourths of the coastal states (19 out of 26 states) were chosen, and approximately one-half of the inland states (11 out of 24) were selected. Four sites from each state were visited, except in California, where eight sites were observed due to the size of the state. The 124 sites represented a wide range of water venues including lakes, rivers, harbors and bays, and intracoastal waterways. The sites were selected based on consultations with local offices of the USCG, members of the local Coast Guard Auxiliary or Power Squadron, and state boating or fishing law

enforcement agencies. Sites were selected to roughly represent a variety of available boating venues in the state, as well as their proximity to one another to allow for relatively short travel time between sites. In addition, sites needed to have suitable shore-based viewing locations from which observations of life jacket wear could be made using high-powered binoculars.

Observational procedures - Observations were conducted for four-hour periods either in the morning or the afternoon of a Saturday or Sunday. The goal was to observe as many boats as possible during a four-hour time frame. Viewing locations were on shore at a narrowing, bridge, or near a marina to facilitate observations. Two-person teams observed boating activity. One team member made the observations using high-powered binoculars and called out the information, which was then recorded on observation forms by the second team member. Team members alternated responsibilities frequently to ward off fatigue. In addition to recording information on boating activity and life jacket wear, observers recorded data about the site. This included information on weather and water conditions. JSI project staff trained the observers during two half-day sessions. The first half-day training consisted of reviewing the observation manual, observation forms, and required equipment. The observation manual contained procedures, definitions, and pictures of various types of boats to facilitate consistent classification by the observers. The second half-day of training allowed observation team members an opportunity to practice using the required equipment and observation forms with the assistance and guidance of a JSI project staff member.

Observation Forms - There were two observation forms designed. The first was the boat observation form, which was intended to record information about the boat and people on the boat. The second form was the site form, which was designed to record information about the site, weather and water conditions. The forms have remained the same from year to year, with the exception of two changes made in 1999 and one change made in 2004. These changes are discussed in detail below.

A) Boat Forms - Observers recorded the observation time period in two hour blocks of time (8am - 10am, 10am -12pm, 12pm - 2pm, 2pm - 4pm, 4pm - 6pm); the type of boat observed (skiff, speedboat, cabin cruiser, personal watercraft (PWC), pontoon boat, houseboat, sailboard, day sailor, cabin sailboat, rowboat, inflatable, canoe, kayak, and other); the type of propulsion (outboard engine/motor, inboard engine, sail only, sail and auxiliary engine/motor, paddles/oars, air fan, and other); length of boat (under 16 feet, 16-20 feet, 21-25 feet, and over 25 feet); type of operation (motoring, sailing, paddling, drifting, or at anchor); and activity engaged in (fishing, fishing tournament, water-skiing, white-water, high speed racing, swimming, pleasure boating, and other). Observers also recorded operator/passenger status; gender (male, female, or unknown); age (under six, 6 - 12, 13 - 17, 18 - 64, 65 or older); life jacket wear (wearing or not wearing); life jacket type (old or new). In addition, if the boat was involved in water-skiing, observers indicated which boaters were skiing at the time.

B) Site Form - At each site, the observers recorded the beginning time and ending time of the observation period, water type (lake, river, harbor/bay, Great Lake, intracoastal waterway) and water temperature. The following environmental factors were measured by observers at each two hour time block during the observation period: air temperature; wind speed; wave height (less than six inches, six inches up to two feet, or over two feet); weather (sunny, partly cloudy, cloudy, raining, or stormy); and visibility (good, fair, or poor).

Over the past ten years of observations only three categories of information have been changed. In 1999, the original 6 to 17 year old age category was divided into a 6 to 12 year old group and a 13 to 17 year old group. Also in 1999, the boat category of canoes/kayaks was separated to record canoes and kayaks individually. In this report, life jacket wear rates are reported for both the combined and separated categories of age and canoes and kayaks to allow for nine years of previous data to be included in the analysis. Finally, in 2004 the USCG requested that JSI breakout the boat size categories from three (under 16 feet, 16-25 feet and over 25 feet) to four categories (under 16 feet, 16-20 feet, 21-25 feet and over 25 feet). Observations made in 2004 - 2007 are the only years to record observations using the expanded boat size categories. The old classification size variable will be used to measure trends since 1998.

Information on Boats and People Observed

To date, 142,165 boats and 392,027 boaters have been observed (Figure 1). For this year, 2007, 14,567 boats carrying 41,978 boaters were observed. Across the ten years, the number of boats, and the number of boaters observed have increased. However, the proportions of the different types of boats, length of boats, operation and activity of boats, as well as the age and gender of the boaters observed has remained fairly consistent (see Figures 1 through 7). This indicates that the sites chosen have yielded diversity in the boats and boaters observed each year, but also a diversity that has remained consistent across the years. These figures demonstrate that the degree of representativeness of the sample of recreational boaters and their boating habits has remained constant across the ten years.

Figures 8 through 14 illustrate the weather and water conditions across the sites from year to year. Like the boat and boater data, across all of the sites the mixture of the weather and water conditions has remained fairly constant over the years. Therefore, any changes reported in life jacket wear rates were not due to changes in types of boats or boaters observed from year to year, and most likely not due to fluctuations in weather or water changes across the sites.

Figure 1 – Number of Boats and People

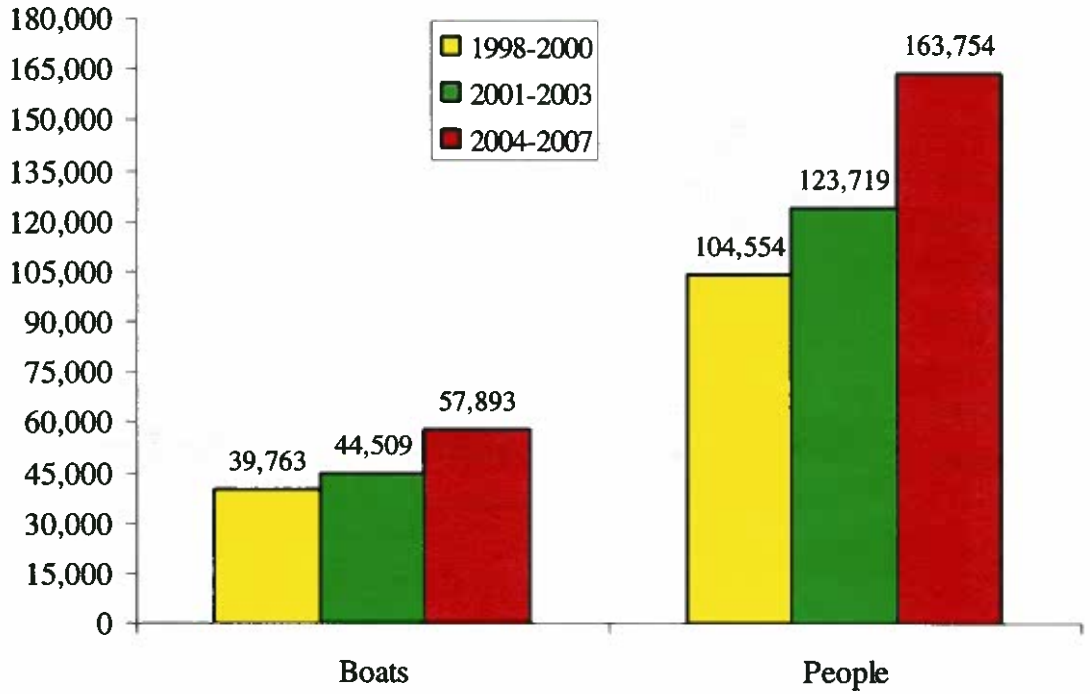


Figure 2 – Types of Boats

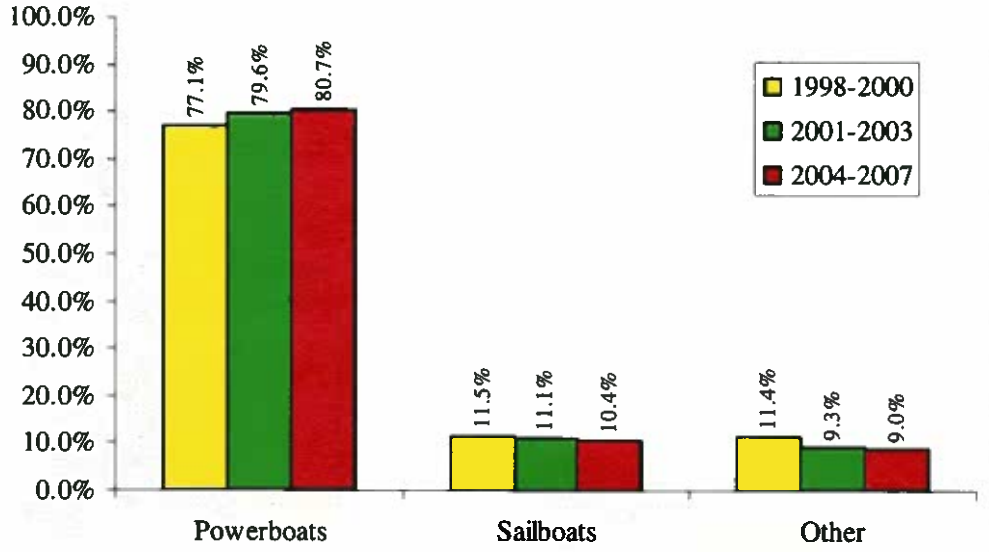


Figure 3a – Length of Boats

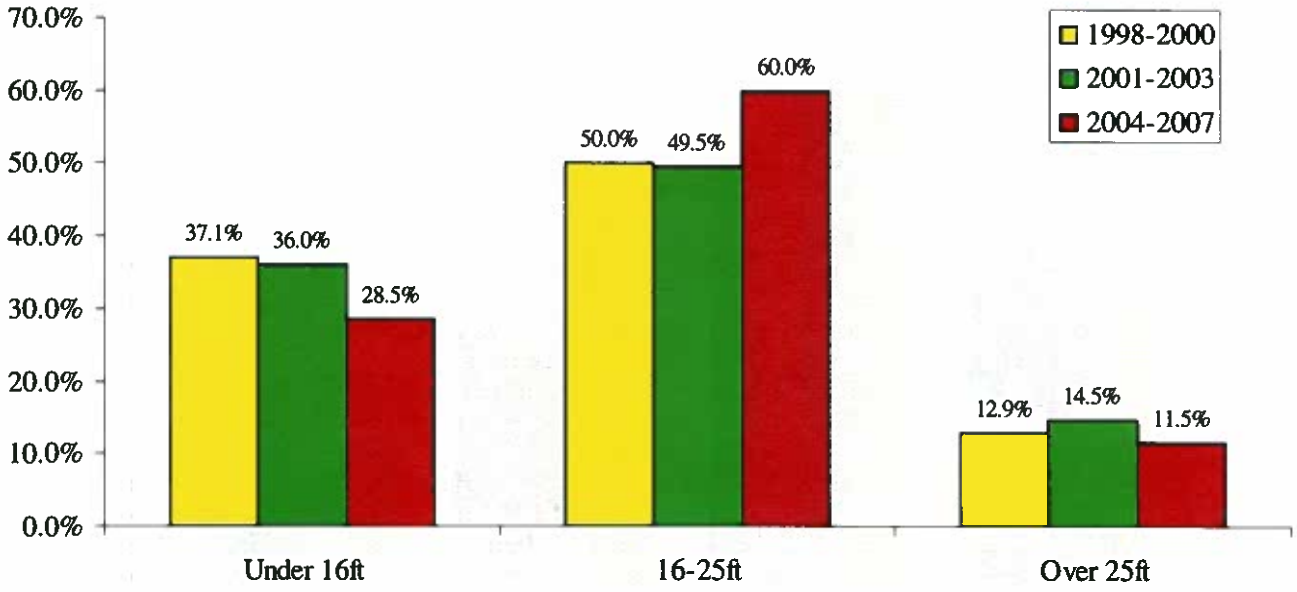


Figure 3b – Length of Boats 2004-2007 Data Only

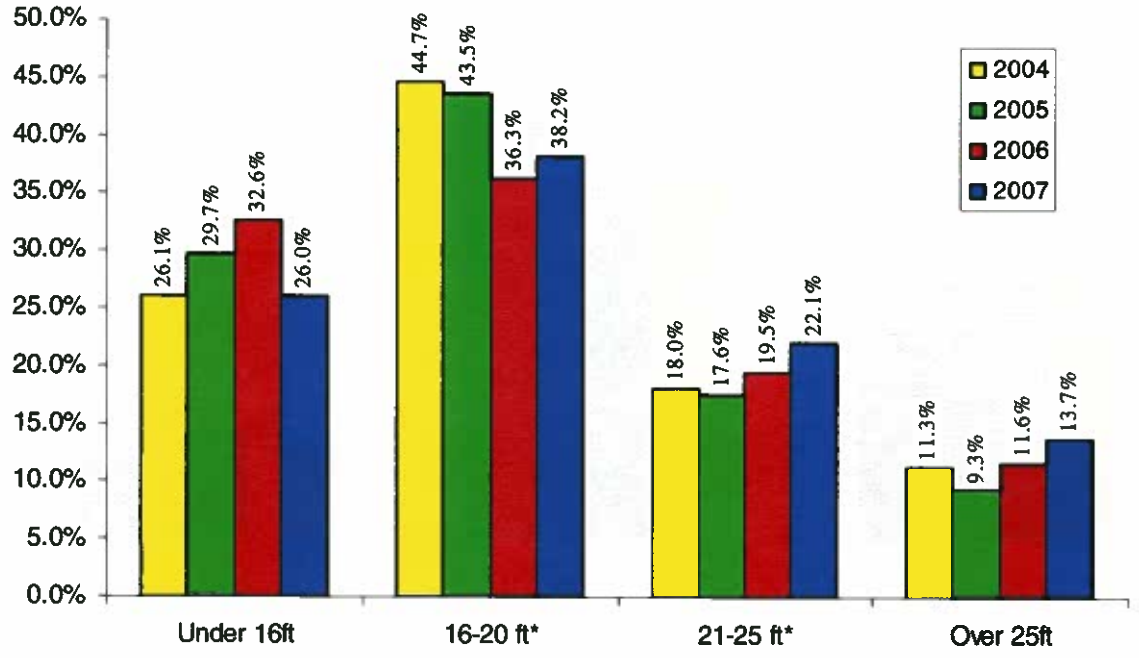


Figure 4 – Operation of Boats

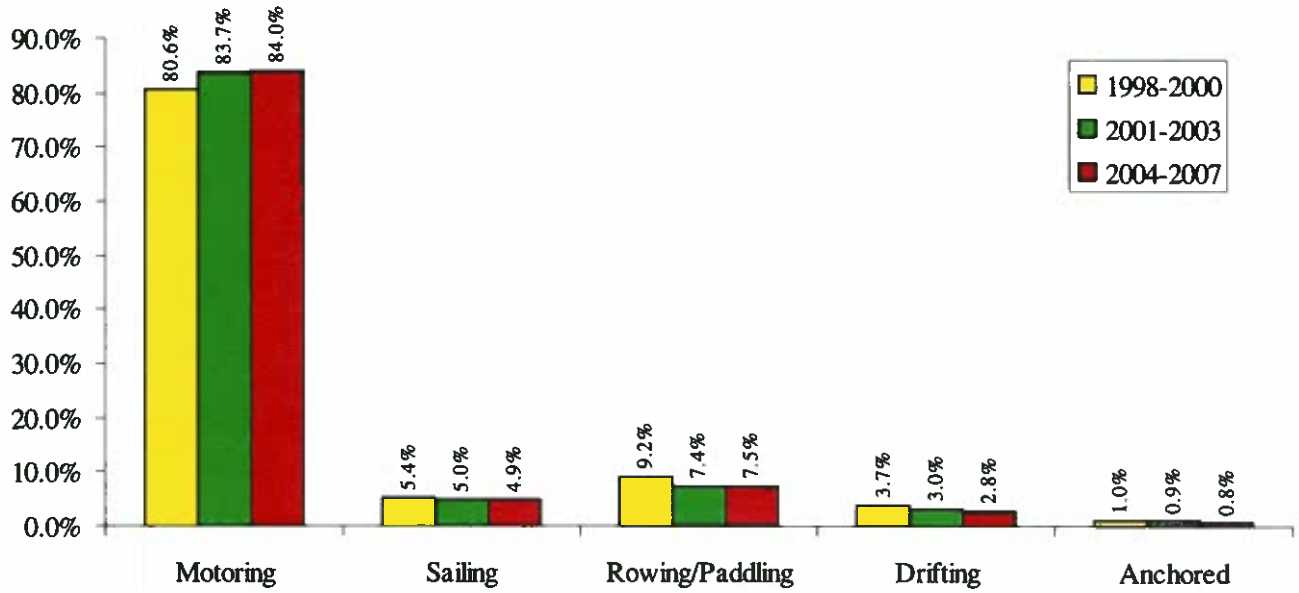


Figure 5 – Activity of Boaters

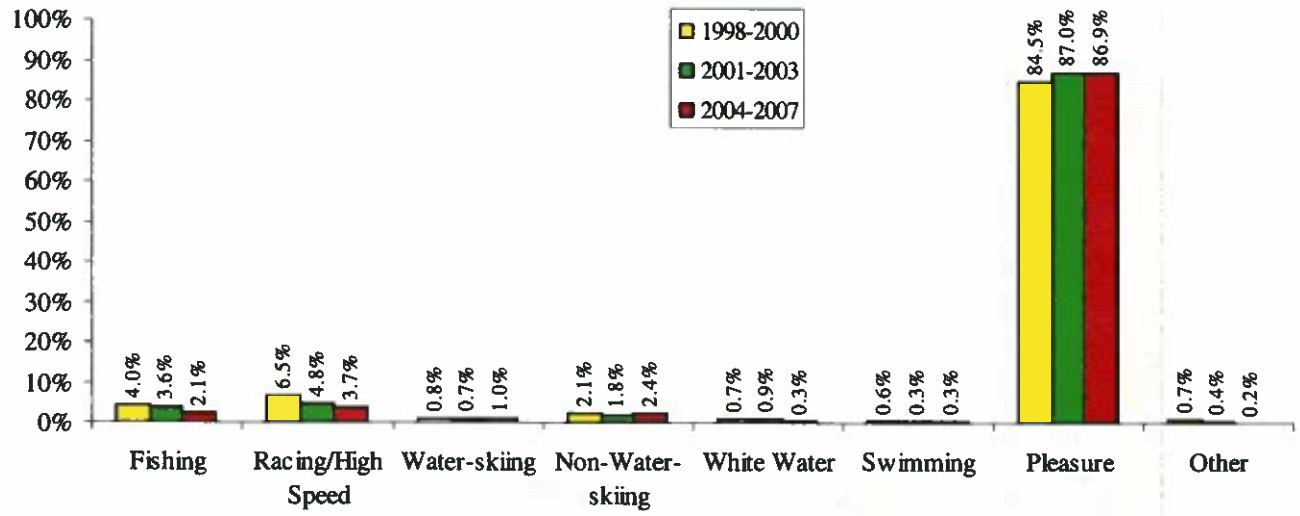


Figure 6 – Gender of Boaters

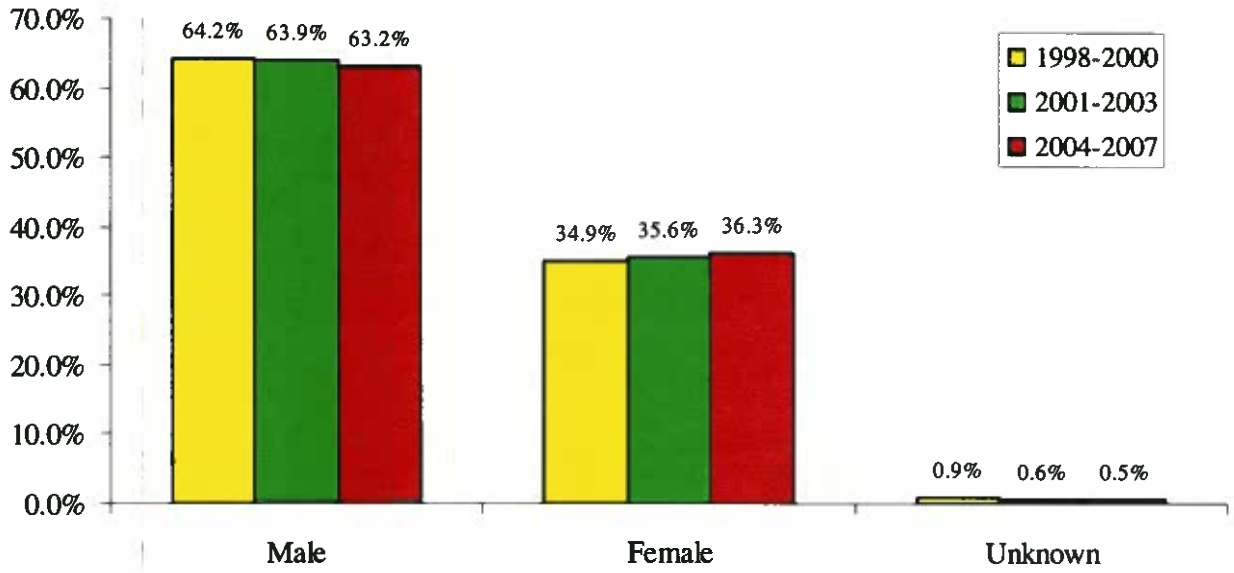


Figure 7 – Age of Boaters

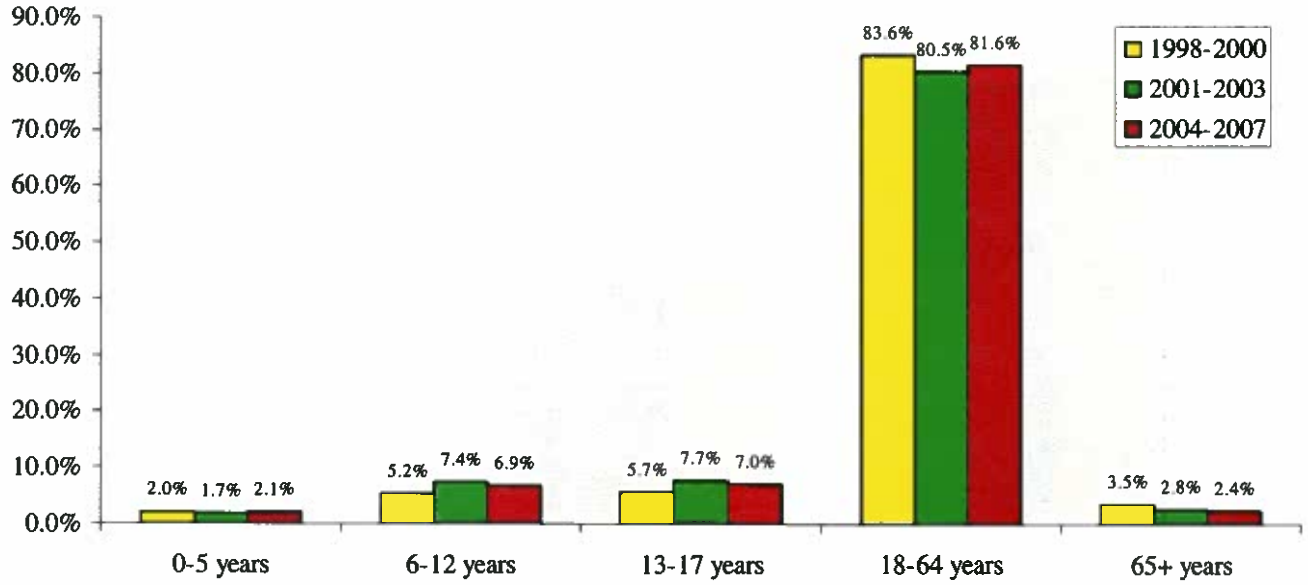


Figure 8 – Water Temperature in which all Boats Operated

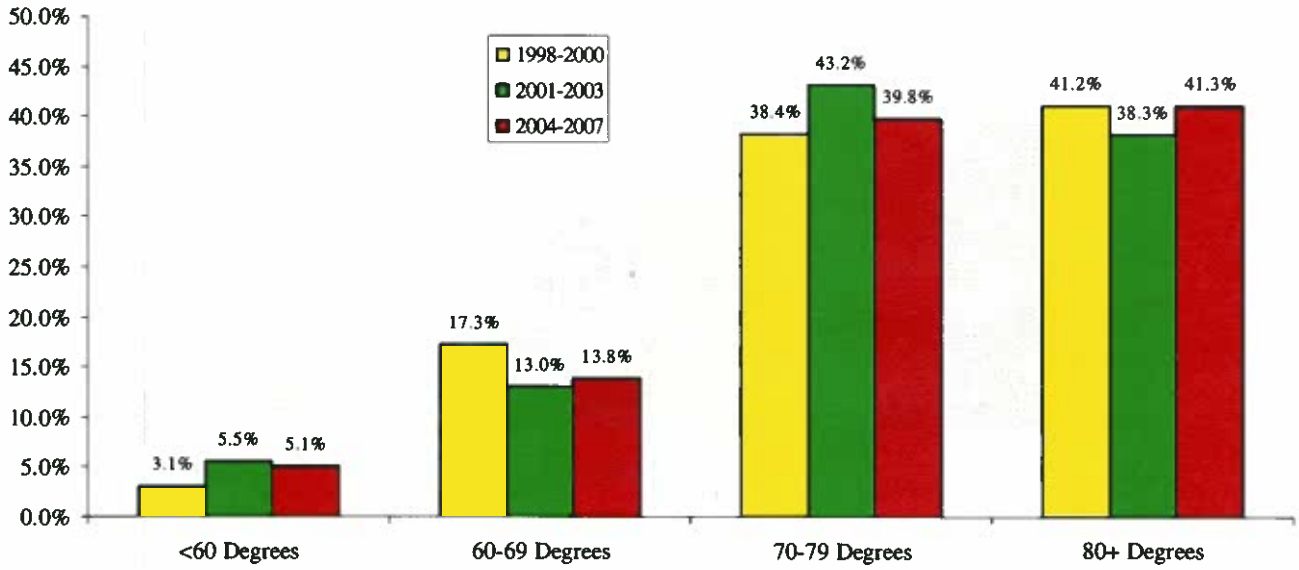


Figure 9 – Water Current in which all Boats Operated

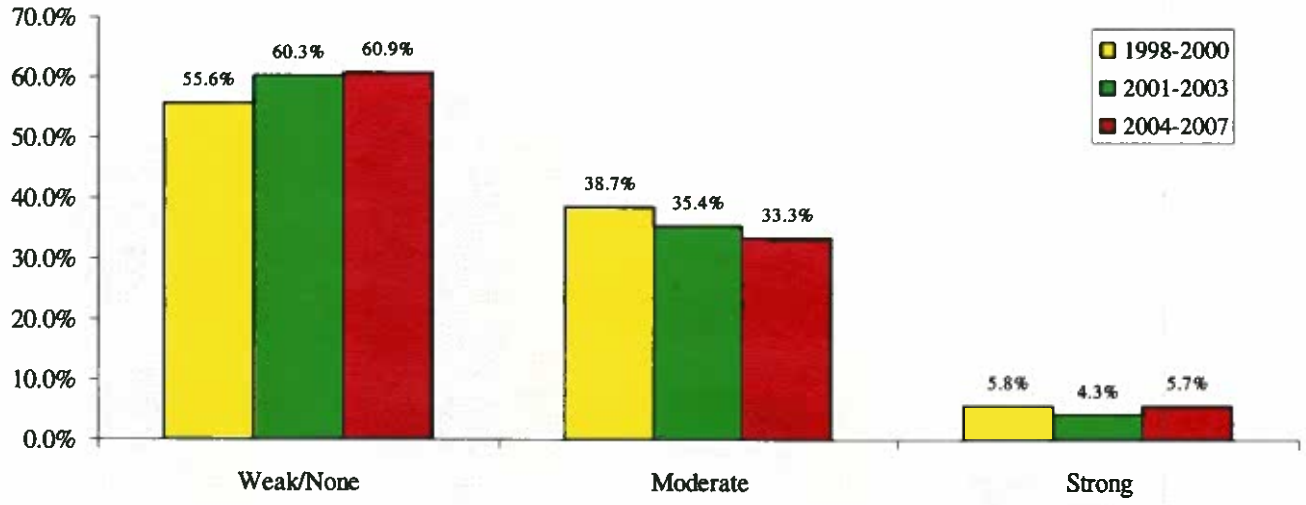


Figure 10 – Wave Height in which all Boats Operated

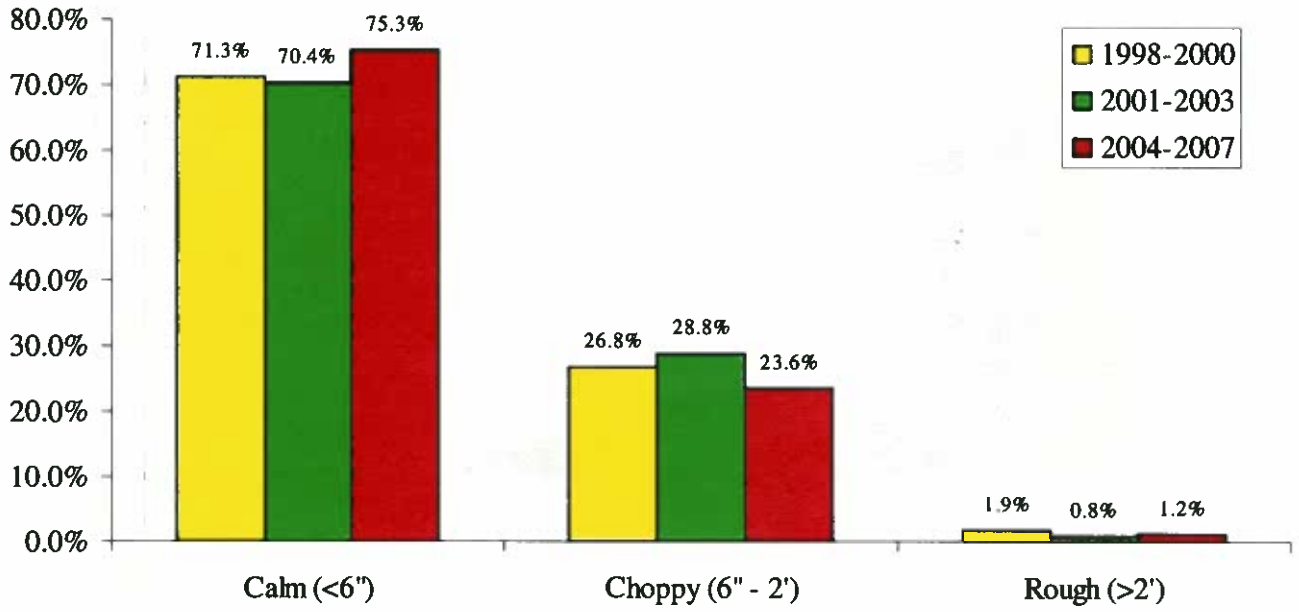


Figure 11 – Visibility in which all Boats Operated

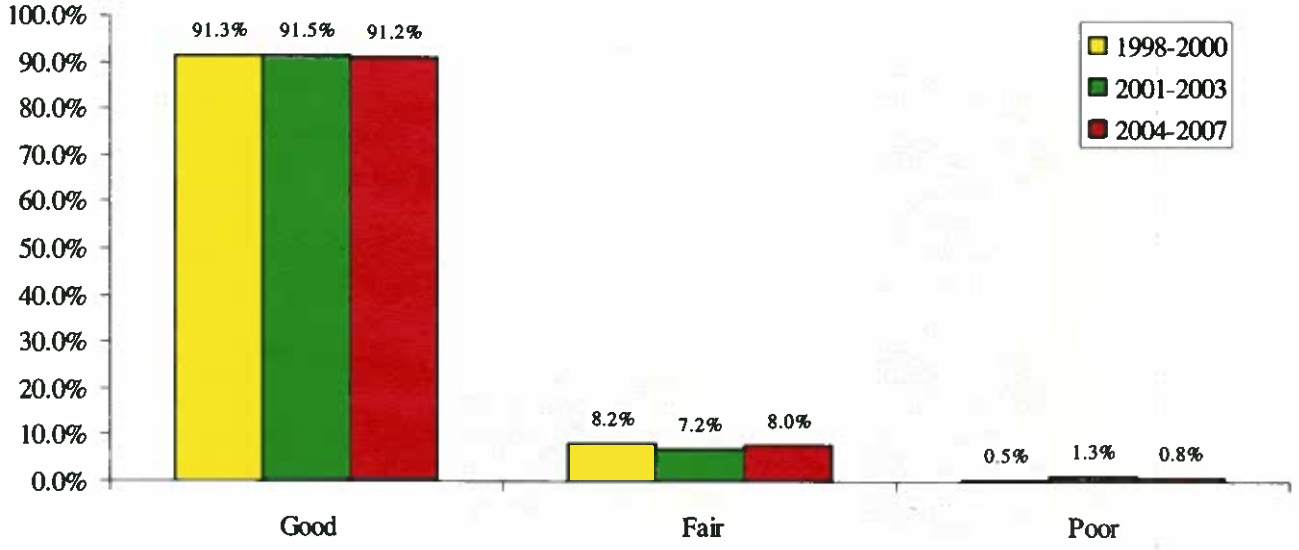


Figure 12 – Weather in which all Boats Operated

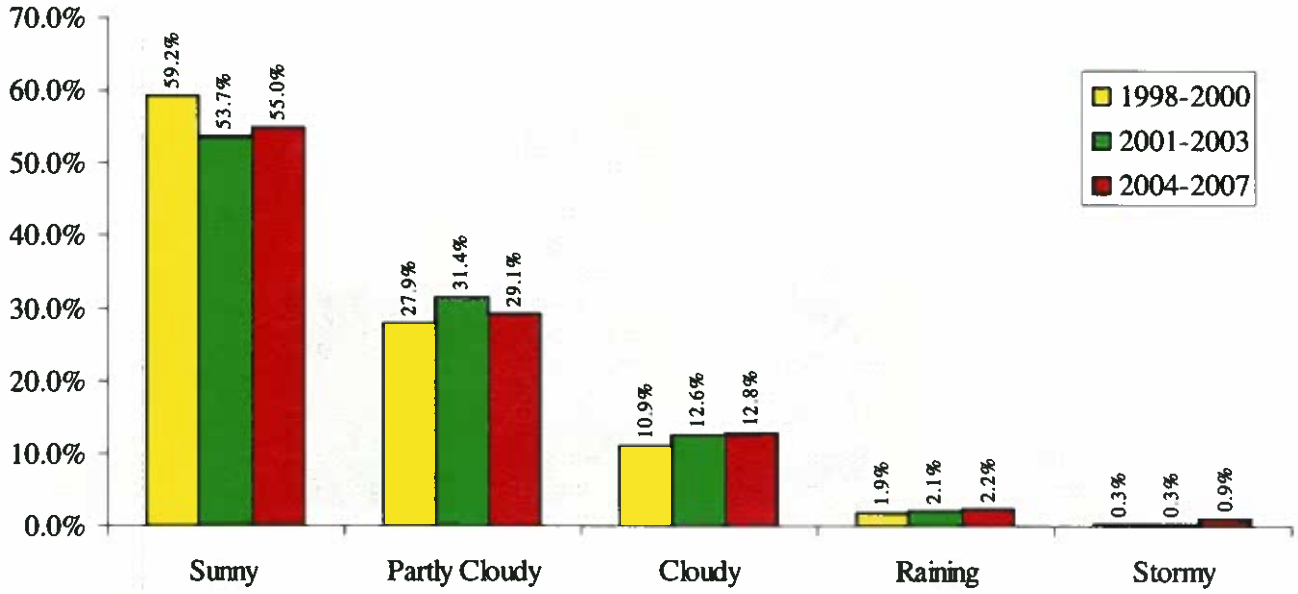


Figure 13 – Air Temperature in which all Boats Operated

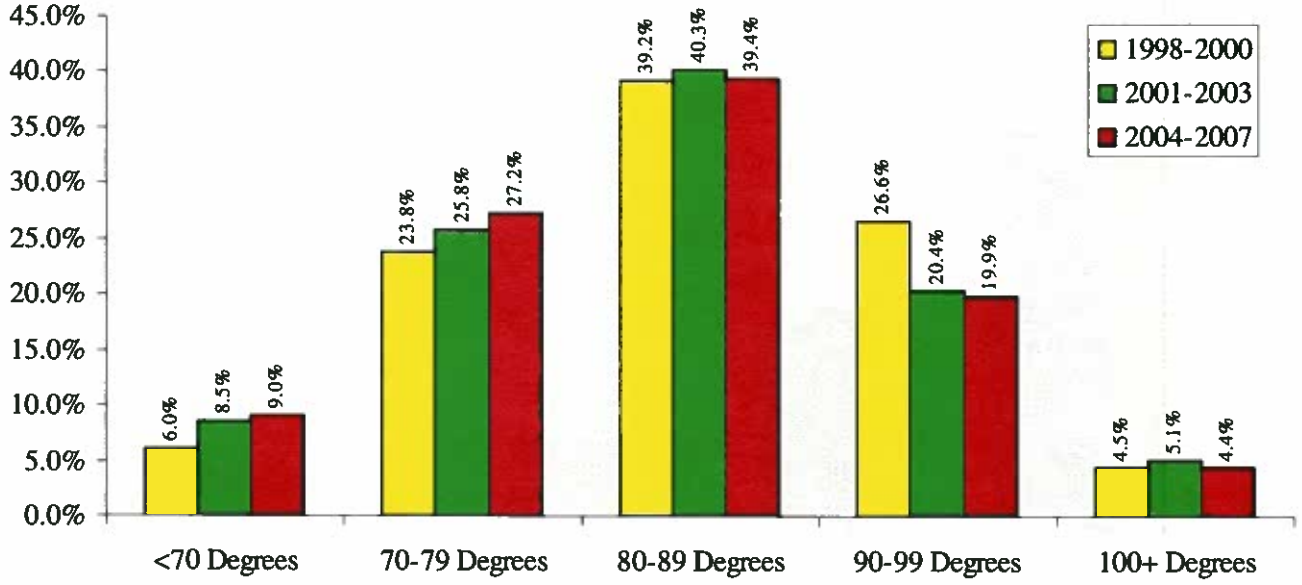
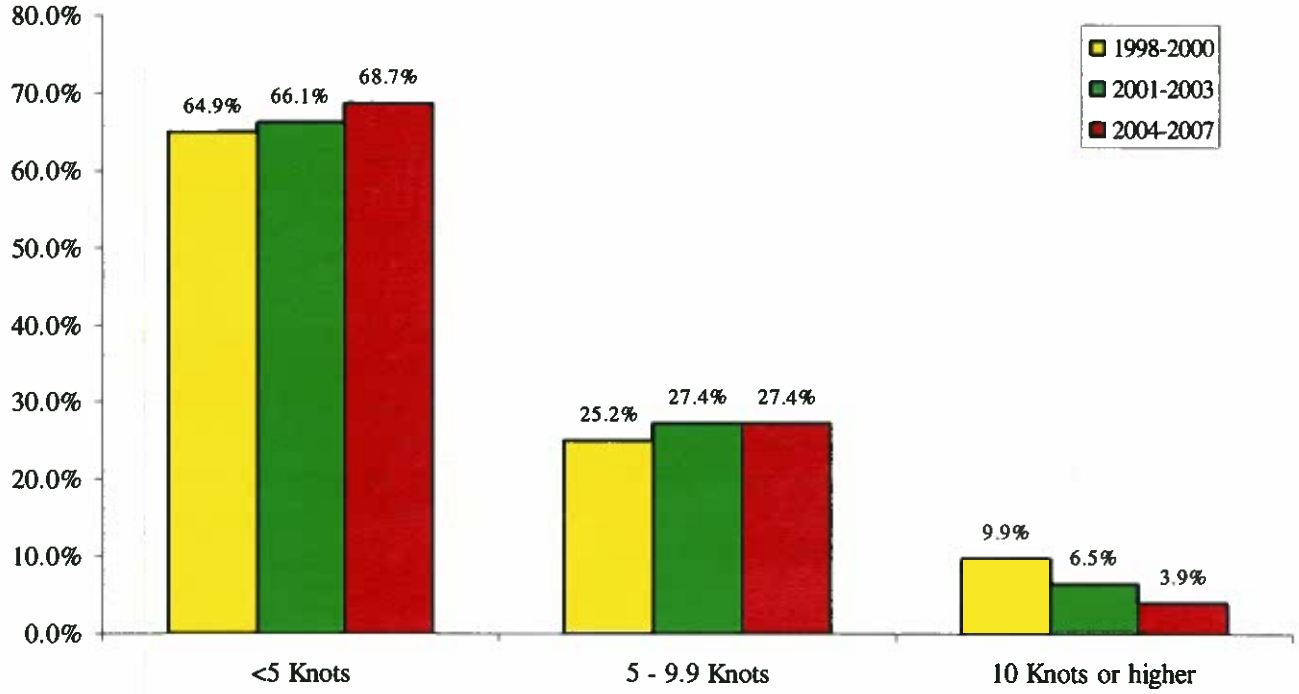


Figure 14 – Wind Speed in which all Boats Operated



III. RESULTS

1. OVERALL LIFE JACKET WEAR: 1998 to 2007

1.1 Overall Trends: 1998 to 2007

Figure 1.1 shows the impact of Personal Water Craft wear rates (PWC) for each year's overall average wear rate by both including and excluding PWC's from the analysis. With PWC's in the analysis, the overall wear rate for 2007 was 21.4%; with them out of the calculation, the 2007 rate drops to 16.9%. There has been little variation in these rates across the ten years, with the highest rate with PWC recorded in 1998 at 23.9% and the lowest in 1999 at 21.3%. For rates without PWC's, the highest rate of 18.1% was recorded in three different years: 1998, 2003 and 2005; the lowest rate of 15.4% was recorded in 1999.

In 2007 the overall wear rate for all people and all boats did not show an increase (21.4%). After removing PWC's from the statistics, the overall wear rate is 16.9%. Calculating estimates for youth and adults separately without PWC's, the overall rate for youth in 2007 (62.2%) is consistent with rates for the last two years, which, on average, are higher than all previous time periods. The overall wear rate for ALL adults in 2007 is 8.5% (see Figure 1.2), which is not an increase in wear rates.

Figure 1.1 – Overall Mean Life Jacket Wear Rates

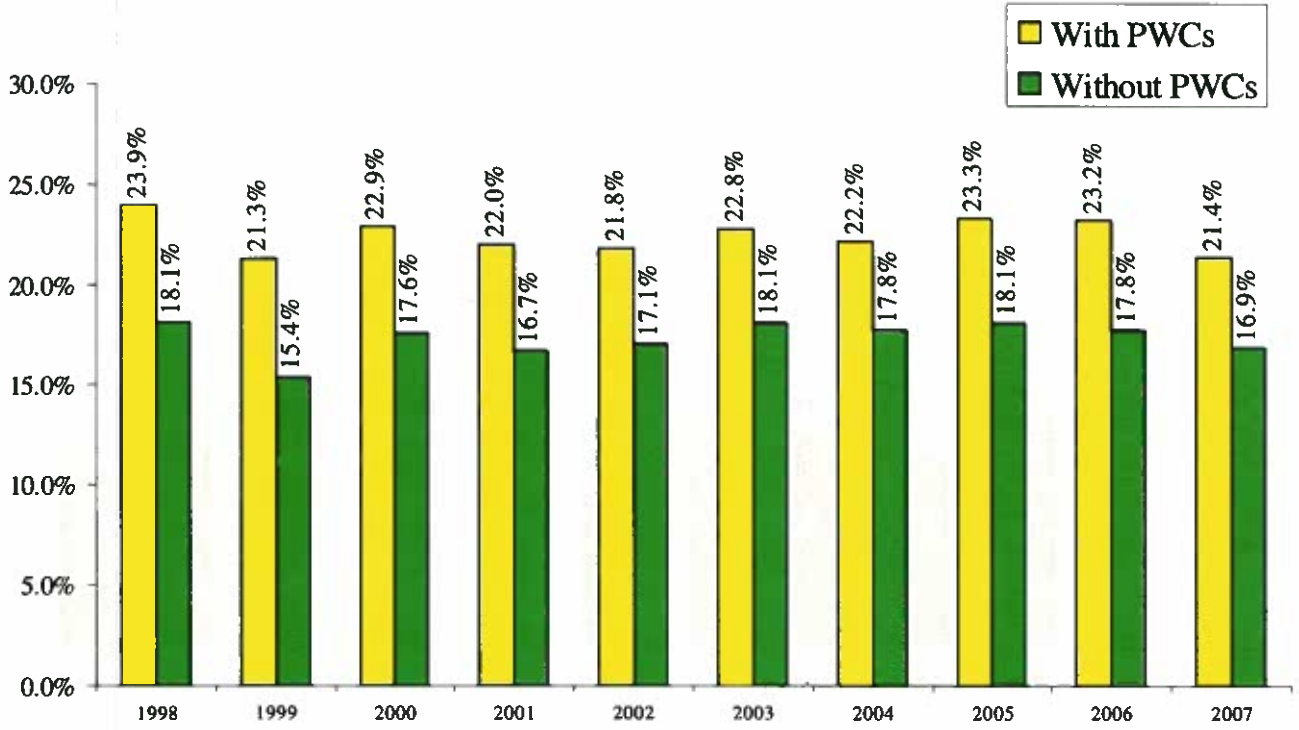
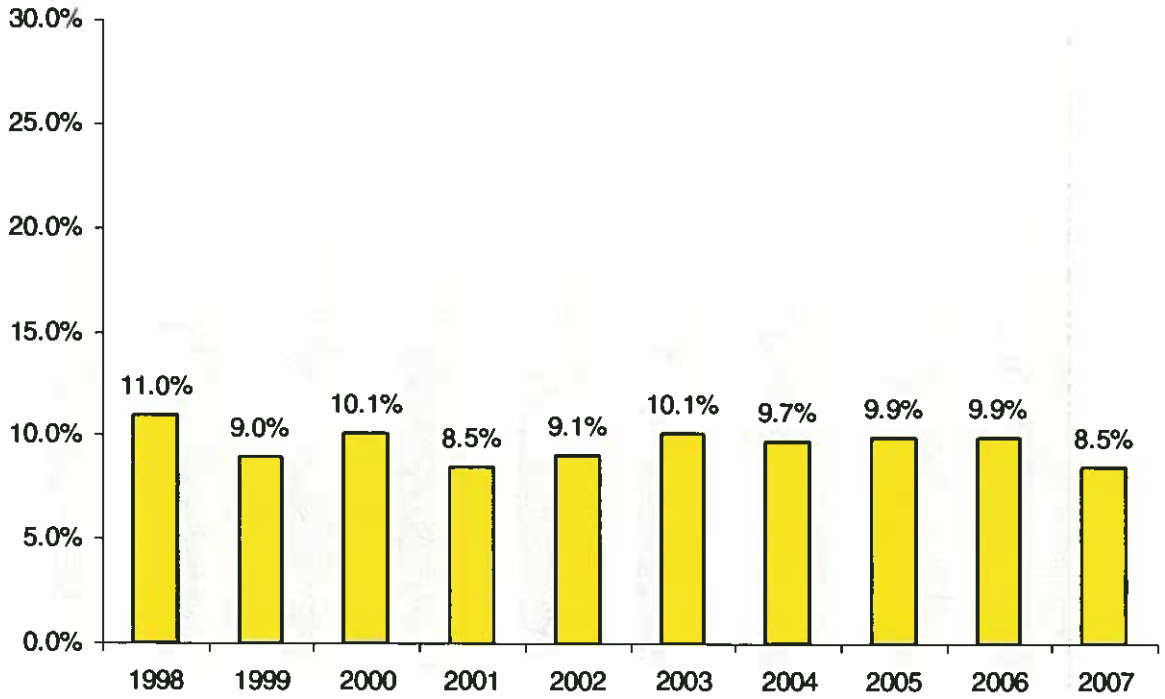


Figure 1.2 – Life Jacket Wear Among Adult Boaters Excluding PWC



Page purposely left blank

Age.

Table 1.1 presents information by the different age groupings used in the study. For youth we continue to see increases in wear rates for the 6 to 12 year old group of boaters. The 2007 wear rate for this group is the highest it has ever been at 84.1% wearing. On the other hand there are small dips in the wear rates in 2007 compared to 2006 for under 6 year olds (92.2% vs 94.4%) and teens (31.5% vs 33.5%).

For adults ages 18 to 64 and 65+ there are no noticeable trends overall across the ten years of data collection. In 2007 there was a small decrease in overall wear rates for the 18 to 64 year old group, from 10.0% the previous year to 8.4%. For older boaters (65+) the wear rates were higher compared to the previous year (8.3%) to a 2007 rate of 11.7%. Additional years of data will have to be gathered before it is known if these changes are trends or happenstance fluctuations.

Table 1.1 Life Jacket Wear Rates by Age Excluding Boaters on PWC*

Age	1998 % (N's)	1999 % (N's)	2000 % (N's)	2001 % (N's)	2002 % (N's)	2003 % (N's)	2004 % (N's)	2005 % (N's)	2006 % (N's)	2007 % (N's)
0-5 yrs	81.4% (672)	80.6% (500)	89.1% (716)	91.7% (703)	90.1% (676)	90.3% (658)	94.9% (743)	93.1% (714)	94.4% (921)	92.2% (930)
6-12 yrs	** **	69.1% (2104)	72.1% (2696)	76.6% (3122)	79.2% (2752)	79.7% (2627)	81.6% (27411)	80.6% (2487)	79.1% (2403)	84.1% (2819)
13-17 yrs	** **	24.1% (2244)	30.5% (2725)	31.2% (2893)	32.4% (2575)	32.0% (2767)	29.8% (2572)	32.8% (2230)	33.5% (2403)	31.5% (2652)
6-17 yrs	53.7% (4061)	46.1% (4348)	51.1% (5421)	54.7% (6015)	56.5% (5327)	55.1% (5394)	56.5% (5313)	60.2% (4717)	56.0% (4806)	58.5% (5471)
0-17 yrs	56.4% (4677)	52.1% (4624)	55.6% (6094)	59.1% (6695)	60.0% (5924)	60.1% (5970)	60.6% (5955)	63.5% (5414)	60.4% (5713)	62.2% (6401)
18-64 yrs	10.9% (25470)	8.8% (24321)	10.1% (27100)	8.5% (32528)	9.2% (31742)	10.1% (28551)	9.7% (33319)	9.9% (30176)	10.0% (29591)	8.4% (32108)
65+ yrs	13.6% (1203)	12.9% (1147)	9.9% (1040)	6.9% (1276)	6.8% (922)	9.4% (1106)	8.3% (1331)	11.0% (823)	8.3% (803)	11.7% (881)

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
*Factor controlled for: Age & Boat Type.
**In 1998 observations were recorded as 6-17yrs and therefore cannot be subdivided.

Power Boats for Adults.

Table 1.2a presents information for the various types of power boats for adults. Averaging across these types of boats (not including PWC's) for 2007, we see a slight increase over the 2006 data (4.3% vs. 3.9%). However, when comparing rates for individual types of power boats, there are mixed results. Skiffs increased from 7.3% to 8.5% but runabouts stayed essentially the same (3.7% vs 3.6%). For cabin cruisers there was also a slight increase in wear rates (1.7% to 2.0%), but in this case the 2.0% represents the highest wear rate for this type of boat among adults across the ten years of data. Pontoon boats also increased slightly from 2.4% to 2.7%. PWC's continued as usual to have almost universal wear rates. For powered inflatables there was an increase from 11.0% to 19.1% but for a relatively small number of boaters.

Table 1.2a Life Jacket Wear Rates by Power Boats for Adults (18 years or older)*

Boat Type	1998 % (N's)	1999 % (N's)	2000 % (N's)	2001 % (N's)	2002 % (N's)	2003 % (N's)	2004 % (N's)	2005 % (N's)	2006 % (N's)	2007 % (N's)
All Power Boats (no PWC's)	5.6% (20813)	4.4% (19894)	5.2% (22448)	4.2% (27864)	3.9% (26304)	4.9% (24190)	3.9% (28285)	4.4% (25741)	3.9% (25412)	4.3% (27623)
Skiff/Utility	13.2% (2032)	10.0% (1867)	10.3% (1903)	9.7% (2469)	5.9% (3177)	10.4% (4214)	7.9% (4429)	7.2% (5038)	7.3% (4091)	8.5% (5340)
Runabout/Speedboat	5.5% (13196)	4.2% (13195)	5.3% (14463)	4.5% (16985)	4.3% (14066)	4.6% (13057)	3.9% (16633)	4.7% (13643)	3.7% (14512)	3.6% (14414)
Cabin Cruiser	1.3% (4012)	1.8% (3396)	1.6% (4391)	1.2% (6222)	1.9% (7111)	1.7% (5119)	1.0% (5242)	1.1% (5054)	1.7% (4280)	2.0% (5353)
Houseboat	0.8% (252)	0.0% (151)	0.0% (216)	0.6% (162)	0.8% (124)	0.0% (328)	5.6% (216)	0.4% (219)	0.0% (112)	0.0% (43)
Pontoon	4.7% (1359)	4.0% (1231)	6.2% (1458)	1.9% (1929)	2.7% (1796)	2.9% (1610)	2.9% (1770)	4.1% (1849)	2.4% (2276)	2.7% (2150)
PWC	96.5% (1959)	94.2% (1899)	97.4% (1761)	96.0% (2091)	95.8% (1798)	94.7% (1589)	95.5% (1721)	95.3% (1858)	97.1% (1962)	96.1% (1736)
Powered Inflatable/Raft	25.6% (214)	15.7% (205)	22.3% (233)	13.5% (259)	27.2% (154)	14.8% (190)	9.0% (211)	1.9% (157)	11.0% (253)	19.1% (366)

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
*Factors controlled for: Age & Boat Type.

Power Boats for Youth.

Table 1.2b presents data for each type of power boat for the three age groups of youth averaged together (everyone under 18 years old). For all power boats (excluding PWC's), we find a small increase in 2007 (60.8%) from 2006 (58.7%). Extrapolating from the age results reported on page 24, this change is probably driven by the increase in wear rates for the 6 to 12 year old group of boaters. When inspecting the information for specific types of power boats, we see gains among the most frequently used boats by this age group. For skiffs the increase is from 58.4% in 2006 to 63.1% in 2007. For runabouts it is 60.9% in 2006 to 61.7% in 2007. And for cabin cruisers it is 50.7% in 2006 to 52.0% in 2007. We also see increases in wearing on pontoon boats from 50.3% to 64.1%. Again, PWC wear rates are almost universal.

Table 1.2b Life Jacket Wear Rates by Power Boats for Youth (17 years or younger)*

Boat Type	1998 % (N's)	1999 % (N's)	2000 % (N's)	2001 % (N's)	2002 % (N's)	2003 % (N's)	2004 % (N's)	2005 % (N's)	2006 % (N's)	2007 % (N's)
All Power Boats (no PWC's)	53.5% (3857)	51.0% (3834)	54.3% (5179)	58.6% (5717)	58.2% (5162)	58.7% (5170)	58.8% (5191)	62.5% (4737)	58.7% (5043)	60.8% (5583)
Skiff/Utility	55.5% (373)	52.7% (338)	49.5% (369)	68.2% (441)	54.9% (557)	63.2% (768)	60.7% (641)	63.3% (781)	58.4% (661)	63.1% (947)
Runabout/Speedboat	55.6% (2777)	51.6% (2744)	55.2% (3776)	58.8% (3987)	59.4% (3479)	60.0% (3369)	60.0% (3574)	63.5% (2966)	60.9% (3348)	61.7% (3517)
Cabin Cruiser	42.2% (438)	42.6% (418)	48.2% (587)	48.3% (774)	50.7% (690)	45.3% (659)	49.6% (529)	54.6% (528)	50.7% (501)	52.0% (639)
Houseboat	20.5% (39)	8.7% (46)	12.7% (64)	25.7% (44)	30.3% (30)	17.8% (63)	24.7% (35)	12.9% (38)	28.2% (40)	37.6% (5)
Pontoon	61.6% (238)	38.3% (272)	46.3% (379)	54.8% (455)	55.6% (399)	51.8% (338)	48.5% (394)	64.6% (440)	50.3% (505)	64.1% (414)
PWC	98.0% (497)	96.0% (551)	99.1% (649)	99.1% (691)	98.8% (502)	98.0% (562)	98.5% (543)	98.3% (652)	99.2% (580)	98.7% (522)
Powered Inflatable/Raft	54.4% (31)	59.3% (62)	69.7% (68)	79.5% (60)	72.8% (37)	66.8% (36)	65.8% (53)	71.2% (22)	70.6% (28)	71.1% (66)

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
*Factors controlled for: Age & Boat Type.

Paddle Craft for Adults.

In Table 1.3a, results are given for adults in paddle craft. Overall there is a sharp decline in wear rates from 62.8% in 2006 to 40.1% in 2007. This decline reflects lower rates in all of the paddle craft boat types for adults. However, the bulk of the decline is driven by the huge decrease in wear rates observed for inflatable rafts from 77.8% the year before to 23.9% in 2007. Upon closer inspection, we found that this decline in large measure was caused by results from one site—a narrow, shallow, slow river in Oklahoma in which the temperature on the observation day was 101 degrees. Almost no one was wearing a life jacket in this situation. Furthermore, there were an unusually large number of boaters observed that day at this site. In fact, this one site accounts for over half of the adult, inflatable raft users observed in 2007.

It is still true, however, that the other paddle craft also showed declines this year. Rowboats/dinghies went from 26.7% to 15.0%; Canoes from 29.2% to 19.4% and Kayaks from 77.9% to 72.0%. Additional years of data will need to be collected to determine whether these are trends or happenstance fluctuations.

Table 1.3a Life Jacket Wear Rates by Paddle Craft for Adults (18 years or older)*

Boat Type	1998 % (N's)	1999 % (N's)	2000 % (N's)	2001 % (N's)	2002 % (N's)	2003 % (N's)	2004 % (N's)	2005 % (N's)	2006 % (N's)	2007 % (N's)
All Paddle Craft	43.7% (2300)	46.2% (1676)	50.7% (1676)	51.9% (1816)	50.7% (1864)	55.4% (1672)	56.7% (1637)	47.0% (1616)	62.8% (1456)	40.1% (2065)
Paddled Inflatable/Raft	46.3% (456)	71.8% (174)	13.0% (198)	65.1% (250)	65.6% (307)	60.5% (290)	57.8% (283)	76.0% (225)	77.8% (308)	23.9% (526)
Rowboat/Dinghy	20.0% (50)	24.4% (82)	37.2% (118)	18.7% (119)	27.3% (193)	22.8% (117)	10.1% (38)	59.2% (71)	26.7% (78)	15.0% (92)
Canoe	** **	17.7% (809)	33.8% (714)	23.6% (750)	15.4% (701)	30.4% (607)	26.7% (622)	14.8% (679)	29.2% (364)	19.4% (764)
Kayak	** **	82.7% (611)	85.7% (646)	84.4% (697)	85.7% (663)	81.4% (658)	87.0% (694)	74.1% (675)	77.9% (706)	72.0% (683)
Canoe/Kayak	44.2% (1794)	45.9% (1420)	58.6% (1360)	53.1% (1447)	49.7% (1364)	56.8% (1265)	58.6% (1316)	44.4% (1354)	61.2% (1070)	44.3% (1447)

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
*Factors controlled for: Age & Boat Type.
**The 1998 observations were recorded as Canoe/Kayak and therefore cannot be subdivided.

Paddle Craft for Youth.

Table 1.3b shows results for youth in paddle craft. As for adults, we find an overall decline in wear rates between 2006 and 2007 from 80.5% to 73.5%. In contrast to the adults, however, this overall decline is almost entirely due to the reduction in wear rates for the paddled inflatable rafts, which again was primarily due to the one site in Oklahoma. For some other types of paddled craft there were actually gains in wear rates: a small increase in kayaks from 89.0% in 2006 to 90.1% in 2007 but a notable increase in canoe wear rates from 68.9% to 81.0%. The 81.0% reading for all youths in canoes is the highest rate observed over the ten year period, albeit with a small number of boaters of this age in this type of boat.

Table 1.3b Life Jacket Wear Rates by Paddle Craft for Youth (17 years or younger)*

Boat Type	1998 % (N's)	1999 % (N's)	2000 % (N's)	2001 % (N's)	2002 % (N's)	2003 % (N's)	2004 % (N's)	2005 % (N's)	2006 % (N's)	2007 % (N's)
All Paddle Craft	76.6% (446)	64.3% (317)	68.9% (457)	66.3% (457)	82.4% (312)	77.7% (372)	70.2% (360)	77.4% (281)	80.5% (225)	73.5% (520)
Paddled Inflatable/Raft	84.4% (149)	62.4% (82)	45.8% (124)	52.3% (153)	90.3% (136)	68.9% (113)	68.4% (118)	77.5% (79)	77.9% (87)	58.4% (244)
Rowboat/Dinghy	71.4% (14)	11.1% (9)	47.1% (15)	60.3% (32)	54.7% (31)	88.6% (21)	58.0% (11)	77.1% (17)	67.3% (26)	61.0% (21)
Canoe	** **	57.7% (142)	74.6% (222)	62.4% (181)	71.1% (98)	75.0% (130)	60.3% (146)	69.4% (101)	68.9% (49)	81.0% (123)
Kayak	** **	83.3% (84)	89.2% (96)	94.3% (91)	83.7% (47)	91.6% (108)	91.2% (85)	88.7% (94)	89.0% (63)	90.1% (132)
Canoe/Kayak	72.1% (283)	67.3% (226)	78.9% (318)	73.1% (272)	74.5% (145)	82.9% (238)	71.3% (231)	79.6% (195)	82.2% (112)	85.7% (255)

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
*Factors controlled for: Age & Boat Type.
**The 1998 observations were recorded as Canoe/Kayak and therefore cannot be subdivided.

Sailboats for Adults.

Table 1.4a shows results for adults in sailboats. Overall there was a small reduction in wear rates from the previous year of 28.0% in 2006 to 24.7% in 2007. The results from this group of boats are primarily driven by the cabin sailboat category because nationwide we observe many more adults in this type of boat compared to day sailors. The cabin sailboat rate declines from 19.1% to 17.1%. The day sailor rate actually declines more from 59.1% in 2006 (the highest wear rate across the ten years for this type of boat) to 50.4% in 2007. However, the relatively small numbers of adults observed in day sailors mitigates the effect of this decline on the total average decline for the sailboat category.

Table 1.4a Life Jacket Wear Rates by Sail and Other Craft for Adults (18 years or older)*

Boat Type	1998 % (N's)	1999 % (N's)	2000 % (N's)	2001 % (N's)	2002 % (N's)	2003 % (N's)	2004 % (N's)	2005 % (N's)	2006 % (N's)	2007 % (N's)
All Sail Craft	10.5% (2912)	13.6% (3420)	17.1% (3565)	17.0% (3843)	18.4% (4087)	16.7% (3149)	19.5% (4149)	24.8% (3084)	28.0% (3279)	24.7% (3217)
Sailboard	100% (55)	16.4% (46)	94.0% (30)	80.6% (15)	83.2% (55)	96.7% (27)	92.9% (40)	53.0% (20)	92.1% (12)	83.7% (18)
Day Sailor	27.7% (975)	30.7% (739)	35.6% (791)	37.9% (604)	46.7% (1124)	38.4% (815)	49.7% (984)	56.4% (736)	59.1% (607)	50.4% (397)
Cabin Sailboat	5.6% (1882)	9.1% (2635)	11.3% (2744)	10.2% (3224)	9.5% (2908)	10.2% (2307)	10.1% (3125)	15.4% (2328)	19.1% (2660)	17.1% (2802)
Other Boats	64.5% (88)	63.8% (96)	27.4% (36)	0.0% (38)	23.3% (75)	28.5% (66)	25.6% (15)	17.6% (51)	19.7% (52)	60.3% (38)

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
*Factors controlled for: Age & Boat Type.

Sailboats for Youth.

Table 1.4b shows the overall wear rates declined for this group of boats, and again this decline is driven largely by the numbers of youth observed on cabin sailboats, which is much larger than the number of youths observed in day sailors. In 2006 the boat group average was 75.0% and this declined to 69.2% in 2007. Caution should be used in drawing any conclusions from these findings not only because it is a one year decline, but also because of the relatively small number of this age boater observed in this group of boats.

Table 1.4b Life Jacket Wear Rates by Sail and Other Craft for Youth (17 years or younger)*

Boat Type	1998 % (N's)	1999 % (N's)	2000 % (N's)	2001 % (N's)	2002 % (N's)	2003 % (N's)	2004 % (N's)	2005 % (N's)	2006 % (N's)	2007 % (N's)
All Sail Craft	67.6% (285)	59.7% (347)	65.7% (329)	66.2% (424)	68.4% (381)	68.9% (323)	71.6% (323)	71.6% (327)	75.0% (371)	69.2% (270)
Sailboard	100.0% (1)	0.0% (3)	100.0% (7)	66.7% (6)	75.0% (4)	n/a (0)	92.1% (48)	100% (1)	100% (4)	82.2% (8)
Day Sailor	80.3% (117)	71.1% (114)	81.6% (81)	92.0% (85)	82.1% (113)	84.3% (107)	87.5% (83)	73.4% (67)	93.2% (122)	86.5% (54)
Cabin Sailboat	64.1% (167)	58.3% (230)	61.5% (241)	58.2% (333)	63.5% (264)	60.6% (216)	68.3% (192)	69.4% (259)	65.7% (245)	62.4% (208)
Other Boats	100.0% (21)	82.8% (64)	82.3% (21)	70.2% (7)	59.8% (9)	44.9% (26)	79.5% (10)	59.2% (17)	37.5% (13)	97.6% (23)

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
*Factors controlled for: Age & Boat Type.

Summary of Wear Rate Changes Nationally

In 2007 there were small increases in power boat wear rates for adults, particularly for skiffs, but these increases were mitigated by one year declines in rates for paddle craft and sailboats. In 2007 for youth the results are a little more encouraging. Youth rates continued to increase in the 6 to 12 year age category, and for all youth the wear rates increased slightly for powered boats (which is primarily the type of boat in which youths are found). There were also small increases for kayaks and a notable increase in canoes for this age group, although - again - caution should be used given the small number of youth observed in these types of boats.

2. BOATER CHARACTERISTICS

In the next three sections we present aggregated information from the ten years of observations by showing wear rates for different features of boater characteristics, boat characteristics (Section 3) and characteristics of the observation sites (Section 4). Each table is divided into two columns...a column for youth (0 to 17 years old) and a column for adults (18 or older).

2.1 Gender

There are small gender differences among observed youth boaters (57.5% for boys and 60.9% for girls) and negligible gender differences among adults (8.7% for men and 9.1% for women).

Table 2.1

Table 2.1 Life Jacket Wear by Gender Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Male	57.5%	32,481	8.7%	197,322
Female	60.9%	23,733	9.1%	105,067

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007
Data for persons when gender was not ascertained is not shown

2.2 Age and Gender Combined

The combined age and gender table allows for an analysis of how gender influences life jacket wear within each age category. As age increases, life jacket wear decreases for both males and females. There is no gender difference for the youngest children (90.6% for both males and females under the age of six); however, girls show slightly higher wear rates than boys among 6-12 year olds (80.5% vs. 75.7%) and for 13-17 year olds (32.3% vs 28.4%).

Table 2.2

Table 2.2 Life Jacket Wear Age by Gender Excluding Boaters on PWCs

	Male		Female	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
0-5 yrs	90.6%	4,107	90.6%	2,744
6-12 yrs	75.7%	13,395	80.5%	9,951
6-17 yrs	50.8%	2,359	56.0%	1,526
13-17 yrs	28.4%	12,838	32.3%	9,674
18-64 yrs	8.7%	191,028	9.1%	101,990
65+ yrs	9.5%	6,948	9.2%	3,553

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007
Data for persons when gender was not ascertained is not shown

3. BOAT CHARACTERISTICS

3.1 Length of Boat (original categories)

The analysis of life jacket wear by the length of the boat may demonstrate the effect of boaters' perceived stability and risk of falling overboard and its impact on life jacket wear, especially among adult boaters. Life jacket wear declines as boat length increases for both youth and adults. On boats less than 16 feet, the youth had a wear rate of 65.8%, compared to 49.9% for boats over 25 feet in length. For adults on boats of less than 16 feet, a wear rate of 23.5% was found, compared to 3.6% for adults on boats over 25 feet.

Table 3.1

Table 3.1 Life Jacket Wear by Length of Boat Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Under 16ft	65.8%	10,765	23.5%	53,297
16 - 25ft	58.8%	40,352	6.3%	195,414
Over 25ft	49.9%	5,856	3.6%	54,002

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

3.1A Length of Boat (expanded categories)

In 2004, the observation forms subdivided the 16 to 25 feet size category into 16 to 20 feet and 21 to 25 feet. Data from the 2004 - 2007 observations are shown in Table 3.1A. As future data are added to this new size category division, it will further enable analysis on the impact of size of boat on life jacket wear. For youth there was not much difference in the 16-20 foot category (61.8%) versus the 21-25 foot category (62.9%), but it did go against the trend of decreased wear with increased length. For adults, there was a big decline in life jacket wear moving from under 16 feet (27.5%) to 16-20 feet (6.7%) and then consistently smaller wear rates as boat length further increased: 21-25 (5.3%) and over 25 feet (4.4%).

Table 3.1A

Table 3.1A Life Jacket Wear by Length of Boat Expanded Categories Excluding Boaters on PWC, 2004-2007 Only*

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Under 16ft	69.6%	3,104	27.5%	16,531
16 - 20ft	61.8%	12,364	6.7%	59,062
21 to 25	62.9%	5,854	5.3%	32,151
Over 25ft	54.5%	2,074	4.4%	20,490

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
*2004 was the first year that boat size was subdivided into 4 categories

3.2 Type of Propulsion and Engine

Type of propulsion can also be viewed as a rough indicator of type of boat and stability of the boat. Over the ten years of observations, life jacket wear rates by type of propulsion mirror the wear rate patterns for types of boats. Youth life jacket wear rates varied somewhat across propulsion type, but differences in wear rates were most likely moderated somewhat by mandatory laws for younger age groups. Highest wear rates for youth were seen on "sail only" sailboats (83.9%) and almost as high for paddle craft (73.4%).

Adult life jacket wear rates showed somewhat different patterns compared to youth, and also greater variation. The highest wear rates for adults were seen on boats using paddles (50.6%), followed by sail only boats (48.8%). Substantially lower rates were observed on larger boats powered by mechanical propulsion, (11.8% on auxiliary powered sail boats, 6.4% on outboard powered boats, and 2.8% on inboard/stern driven boats).

Table 3.2

Table 3.2 Life Jacket Wear by Propulsion Type on Boats Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Power boat-Outboard	58.4%	19,814	6.4%	102,150
Inboard/Sterndrive	56.8%	29,017	2.8%	144,189
Sail only	83.9%	934	48.8%	7,111
Sail & motor	62.5%	2,350	11.8%	26,853
Other boat-Outboard	66.2%	542	18.4%	2,723
Paddles/Oars	73.4%	3,693	50.8%	17,330
Other	57.5%	318	39.5%	478

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

3.3 Type of Operation

For youth, life jacket wear rates have been higher on boats that were under power as opposed to drifting or anchored. Wear rates were particularly high on boats under sail (74.5%) and rowing/paddling craft (75.2%). For motoring boats (including auxiliary sailboats running on their engines) the rates were 58.1%. Even for drifting and anchored boats in which wear rates were lower, the youth wear rates were reasonably high (51.1% and 42.4% respectively).

For adult boaters the pattern is similar to the youth. The highest wear rates were seen on boats that were rowing/paddling (52.5%), followed by a distant second among all sailing boats (30.4%). Wear rates on boats motoring excluding PWC's (but including auxiliary sailboats running on their engines) were considerably lower at 4.6%. As might be expected, the lowest rates were seen for anchored/moored boats (3.5%).

Table 3.3

Table 3.3 Life Jacket Wear by Movement of Boat Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Motoring	58.1%	49,202	4.6%	256,224
Sailing	74.5%	1,704	30.4%	17,283
Rowing/Paddling	75.2%	3,424	52.5%	16,245
Drifting	51.1%	1,862	10.2%	8,744
Anchored/Moored	42.4%	436	3.5%	2,678

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

3.4 Type of Boating Activity

Wear rates vary by the type of activity that the boat is engaged in. The data that are presented in Table 3.4 exclude PWC's from the results. For youth, the highest wear rates are found for youth involved in water-skiing. The wear rates for the person or persons being pulled by the boat are almost universal (99.0%). Interestingly, other youth that are in the ski boat and not at the moment being pulled have lower wear rates (58.2%). Youth that are in boats which are in whitewater conditions also have extremely high wear rates (97.1%). All other activity types for youth show wear rates near the overall national average. One word of caution in looking at these results: the age mixture may be quite a bit different in various activities and this may account for differences across activity. For instance, fishing may have a higher proportion of teenagers than pleasure boating. These differences in ratios of different age groups may affect the results. The number of youth in some of these categories is not that great and this precludes breaking up this table by the different youth age groups.

Wear rates for adults show similar patterns for being pulled as the water-skier (94.0%) compared to being in the ski boat (6.6%). Also, white water conditions also increase wear rates (98.3%). All other categories are closer to the national average wear rate for adults.

Table 3.4

Table 3.4 Life Jacket Wear by Operation of Boat Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Fishing	45.2%	1,127	7.8%	9,372
Fishing Tourney	39.7%	136	15.5%	1,177
Intent to Fish	54.4%	511	6.0%	3,947
Waterskier	99.0%	1,739	94.0%	989
Non-Waterskier on waterskiing boat	58.2%	1,683	6.6%	5,116
White Water	97.1%	275	98.3%	1,666
Racing/High Speed	51.5%	1,588	5.6%	11,152
Swimming	45.6%	351	7.9%	777
Pleasure	58.6%	44,742	7.9%	239,961
Other	61.5%	182	17.8%	1,099

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

4. SITE CHARACTERISTICS

4.1 Type of Water

The type of water in which the boat is operating does not have a big impact on wear rates for youth. Those rates seem to be largely determined by age factors, types of boats and legal mandates. The highest overall rates for youth were seen in harbors (63.1%) followed by rivers, streams, creeks or canals (59.7%) whereas the lowest rates were found on the intracoastal waterways (51.1%).

For adults, fresh water venues showed the highest overall rates (11.2% on rivers, 12.3% on the Great Lakes, and 9.3% on other lakes or reservoirs) while substantially lower rates were seen on saltwater venues (7.5% on bays, 5.6% on harbors, and 2.1% on intra-coastal waterways). These patterns probably reflect the differences in size and types of boats that are most typical in these venues.

Table 4.1

Table 4.1 Life Jacket Wear by Type of Water Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Bay, inlet, or sound	59.0%	10,578	7.5%	80,377
Harbor	63.1%	2,276	5.6%	19,431
Intracoastal waterway	51.1%	1,845	2.1%	10,615
River, stream, creek, or canal	59.7%	13,094	11.2%	70,903
Lake pond, or reservoir	59.3%	28,848	9.3%	115,161
Great Lake	59.5%	981	12.3%	7,678

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

4.2 Time of Day

Relatively little variation was seen among youth or adults according to the time of day of the observations for youth. For adults the highest rates are observed in the 12 to 2 pm time frame (11.3%).

Table 4.2

Table 4.2 Life Jacket Wear by Time of Day Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
8 to 10 AM	57.6%	7,266	9.5%	39,958
10 to 12 PM	60.3%	15,472	8.1%	79,784
12 to 2 PM	59.3%	8,632	11.3%	44,820
2 to 4 PM	58.2%	16,380	9.0%	85,244
4 to 6 PM	59.8%	8,880	7.2%	49,861
6 PM+	68.2%	516	7.8%	3,348

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

4.3 Water Temperature (Fahrenheit)

Life jacket wear rates tend to be higher as water temperatures decrease for both youth and adults. Wear rates for youth are 55.5% in waters at 80° or above and rise to 70.6% in water temperatures below 60°. A similar pattern for adults is seen, although the overall levels are much lower. In waters of 80° or more, adult wear rates average 5.0% and climb to an average of 19.0% for waters less than 60°. This pattern indicates that boaters may be considering the consequences of falling into cold water when deciding whether to wear a life jacket.

Table 4.3

Table 4.3 Life Jacket Wear by Water Temperature Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
below 60	70.6%	2,198	19.0%	15,322
60-69	64.4%	7,953	16.9%	44,276
70-79	59.8%	24,151	8.1%	119,042
80 or above	55.5%	21,531	5.0%	114,017

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

4.4 Air Temperature (Fahrenheit)

Air temperatures also have an effect on both youth and adult wear rates. For adults there is a sizeable and very clear trend that higher air temperatures are associated with lower wear rates. At temperatures of 100° or greater, adult wear rates average 4.3%, while in air temperatures below 60° adult wear rates climb to 19.9%. Comfort of life jackets may be playing a role at both temperature extremes. At high temperatures most life jackets may be perceived as too "hot" to wear, whereas in colder air temperatures the additional warmth from wearing a life jacket may be seen as beneficial. There is a similar pattern for youth although the relative change is smaller than for adults. At temperatures over 100°, the youth rate is 56.6% and rises to 72.2% as temperatures decrease to below 60 degrees. It is interesting to note that adults, however, still enforce mandatory regulations to ensure life jacket wear among many children no matter how warm the air temperature.

Table 4.4

Table 4.4 Life Jacket Wear by Air Temperature Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Below 60	72.2%	446	19.9%	3,611
60-69	66.0%	3,242	16.0%	22,918
70-79	61.7%	14,386	11.2%	77,774
80-89	58.1%	22,336	7.4%	117,371
90-99	56.9%	13,335	6.2%	64,705
100 or above	56.6%	2,895	4.3%	13,068

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

4.5 Wind Speed

Life jacket wear rates among youth remain fairly consistent across the wind speed categories and there appears to be no clear pattern in wear rates by wind speed.

For adults, however, there are small but consistent indications that wear rates go up slightly as wind speed increases (8.5% at wind speeds under 5 knots to 10.4% at wind speeds higher that 10 knots).

Table 4.5

Table 4.5 Life Jacket Wear by Wind Speed Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
<5 knots	58.9%	39,518	8.5%	198,894
5-9.9 knots	61.4%	13,950	9.2%	82,379
10+ knots	55.5%	2,968	10.4%	19,140

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

4.6 Wave Height

As might be expected, as wave heights increase (i.e., boats become less stable) the wear rates increase for adults, indicating that perceived likelihood of falling in the water plays a significant role in the decision to wear a life jacket among adults. The average wear rate for adults in rough water is 28.2% and falls to an average of 8.2% in calm water across all types of boats, excluding PWC's.

The change in wear rates for youth as wave height increases is not as much as for adults. This is probably due to high wear rates induced by mandatory laws. However, the same effect is seen. When waters are calm youth wear rates are 58.8% and climb to 63.6% when the water is rough.

Table 4.6

Table 4.6 Life Jacket Wear by Wave Height Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Calm	58.8%	43,003	8.2%	216,767
Choppy	60.5%	13,450	9.8%	81,960
Rough	63.6%	527	28.2%	3,674

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

4.7 Strength of Water Current

For both youths and adults, as boating activities move into "strong" current conditions, wear rates increase. The increase for youths is comparatively modest, rising to 62.7% in strong currents, compared to 56.9% in moderate currents and 60.0% in weak currents.

For adults, the effect is more dramatic with wear rates increasing to 20.5% in strong currents compared to 7.5% and 8.7% in moderate or weak current conditions, respectively.

Table 4.7

Table 4.7 Life Jacket Wear by Strength of Water Current Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Strong	62.7%	2,404	20.5%	15,461
Moderate	56.9%	16,601	7.5%	111,066
Weak/None	60.0%	37,840	8.7%	174,460

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

4.8 Visibility

Across the years there have been relatively few boats observed in poor visibility conditions. This is probably a product of fewer boats going out in such conditions and our attempts to avoid sending observers to sites that are in the midst of very bad weather circumstances as an efficiency control for the study. This relative lack of variation in visibility in the observation data set may then contribute to the lack of a clear pattern emerging in relation to wear rates among youth.

Among adults there is a slight trend from 8.8% wearing in good weather to 10.8% wearing in poor weather.

Table 4.8

Table 4.8 Life Jacket Wear by Visibility Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Good	59.4%	53,429	8.8%	275,626
Fair	57.2%	3,254	9.3%	24,345
Poor	51.0%	382	10.8%	2,526

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

4.9 Weather Conditions

There is a similar lack of variability in weather conditions within the observational data set. There are relatively few boaters observed in rainy or stormy conditions; this is particularly true for youth. This fact may then also limit the ability to uncover any clear patterns for wear rates based on weather. For youth there is no evidence that poor weather increases wear. This finding is tempered by the fact that wear rates for youth are relatively high in good weather conditions and that a very low number of youth are observed in rainy or stormy conditions.

For adults, there is a reduction in numbers of boaters observed in rainy conditions, but the numbers are large enough to identify what seems to be a modest association with wear rates. In sunny conditions, overall wear rates for adults are 8.8%, whereas in rainy conditions it rises to 11.9% and climbs to 13.6% in stormy conditions.

Table 4.9

Table 4.9 Life Jacket Wear by Overall Weather Conditions Excluding Boaters on PWC

	Youth		Adult	
	Wore Life Jacket	Valid N	Wore Life Jacket	Valid N
Sunny	59.1%	34,099	8.8%	166,230
Partly cloudy	59.4%	15,790	8.3%	90,757
Cloudy	59.0%	6,091	9.6%	37,559
Raining	58.5%	803	11.9%	6,360
Stormy	60.9%	276	13.6%	1,546

JSI Research and Training Institute, Inc.
2007 National Observational Life Jacket Wear Rate Study
Data aggregated from 1998-2007

5. IMPACT OF BOAT CHARACTERISTICS AND ENVIRONMENT ON LIFE JACKET WEAR RATES

Figures 5.1, 5.2, 5.3 and 5.4 demonstrate the power of the aggregated data set, data from 1998 to 2007, to analyze life jacket wear rates under very specific circumstances. In particular, these figures show the impact of boat characteristics or environmental characteristics on wear rates. In all of these figures, the factors presented represent - at some level - a measure of risk made by the boater of either capsizing or seriousness of capsizing. Figure 5.1 shows how adult wear rates on small boats (less than 16 feet) are influenced by type of propulsion in combination with water temperature and wave height. Figures 5.2 and 5.3 illustrate how life jacket wear rates for adults on day sailor boats are effected by size of boat and whether the day sailor is involved in a race or not. Finally, Figure 5.4 shows how wear rates for adults on canoes are affected by boat size and water temperatures.

In Figure 5.1, the overall average wear rate for adults on all boats less than 16 feet is 23.5% (excluding PWC's). This figure shows the dramatic influence of type of propulsion on wear rates. Note, of course, type of propulsion is a good proxy measure for types of boats (paddle-craft, sailboats, and power boats). In the categories of "drifting" or "anchored" clearly these represent a mixture of types of boats. Adults on boats that were anchored, presumably mostly while fishing or passengers were swimming off of the boat, had a very low wear rate (5.0%). At the other extreme, adults on boats that were being paddled showed a very high wear rate (66.9%). Adults on boats that were being sailed also showed a relatively high wear rate (62.7%). In contrast, adults on boats that were motoring showed a relatively low wear rate (8.4%). In between was the wear rate among adults on boats that were drifting (16.8%).

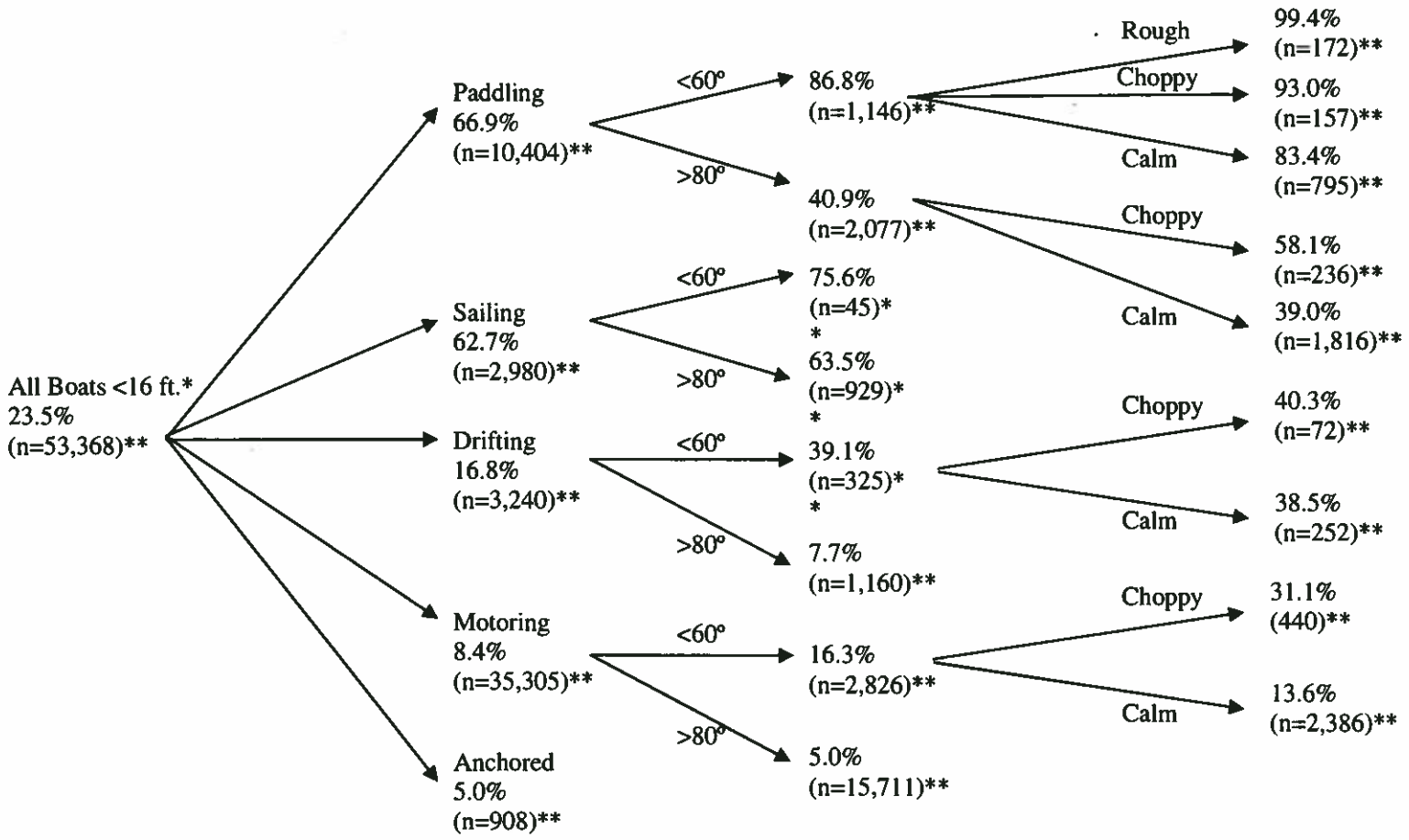
However, water temperature was then added to the analysis to measure the effect on wear rates within each of these propulsion categories. The figure shows two contrasting water temperature conditions: very cold water (less than 60 degrees Fahrenheit and hence dangerous if capsizing) and very warm water (over 80 degrees Fahrenheit and hence little danger of hypothermia if capsizing). In each propulsion category, water temperature makes an additional significant influence on wear rates. Cold water always produces an increase in wear rates. For boats being paddled, there is a doubling of wear rates in very cold water compared to warm water circumstances (40.9% wear rates increasing to 86.8% in very cold water). For boats that are sailing, again there is an increase in wear rates as water gets colder, but a more modest level of increase from 63.5% in warm waters to 75.6% in very cold water. For boats that are drifting there is a fairly large influence of water temperatures on wear rates increasing from 7.7% in warm waters to 39.1% in very cold waters. For boats that are motoring, an effect of water temperature is still observed, but again at modest levels. The rates go from 5.0% in warm waters to 16.3% in very cold waters. For boats that were anchored, neither water temperature nor wave height made any impact on the very low wear rates to begin with in this category.

In the final stage of the chart the further impact of wave height is shown, above and beyond propulsion (i.e., type of boat) and water temperature. Three levels of wave height were coded by the observers; calm with waves less than six inches in height, choppy with waves between six inches and two feet, and rough with wave heights greater than two feet. For boats that were being paddled in very cold waters, when the water was choppy or rough, wear rates increased almost to universal levels (93.0% and 99.4% respectively). However, even though the boat was being paddled in very cold water, if the waves were calm there was a slight decrease in wear rates to 83.4%. Likewise for boats paddled in warm waters, wave heights altered wear rates in the expected directions (39.0% for calm conditions and 58.1% for choppy waters).

These findings suggest that boaters' wear rate behaviors are the product of an assessment of risk of falling overboard, or capsizing, plus an assessment of the seriousness of the consequences of falling overboard, or capsizing.

Figure 5.1 Life Jacket Wear by Adults on Boats Under 16 Feet*

Effects of Type of Operation, Water Temperature and Wave Height
1998-2007 Data



* Includes boats <16 ft., excluding PWC
** Indicates the number of adults (18 or older) observed.

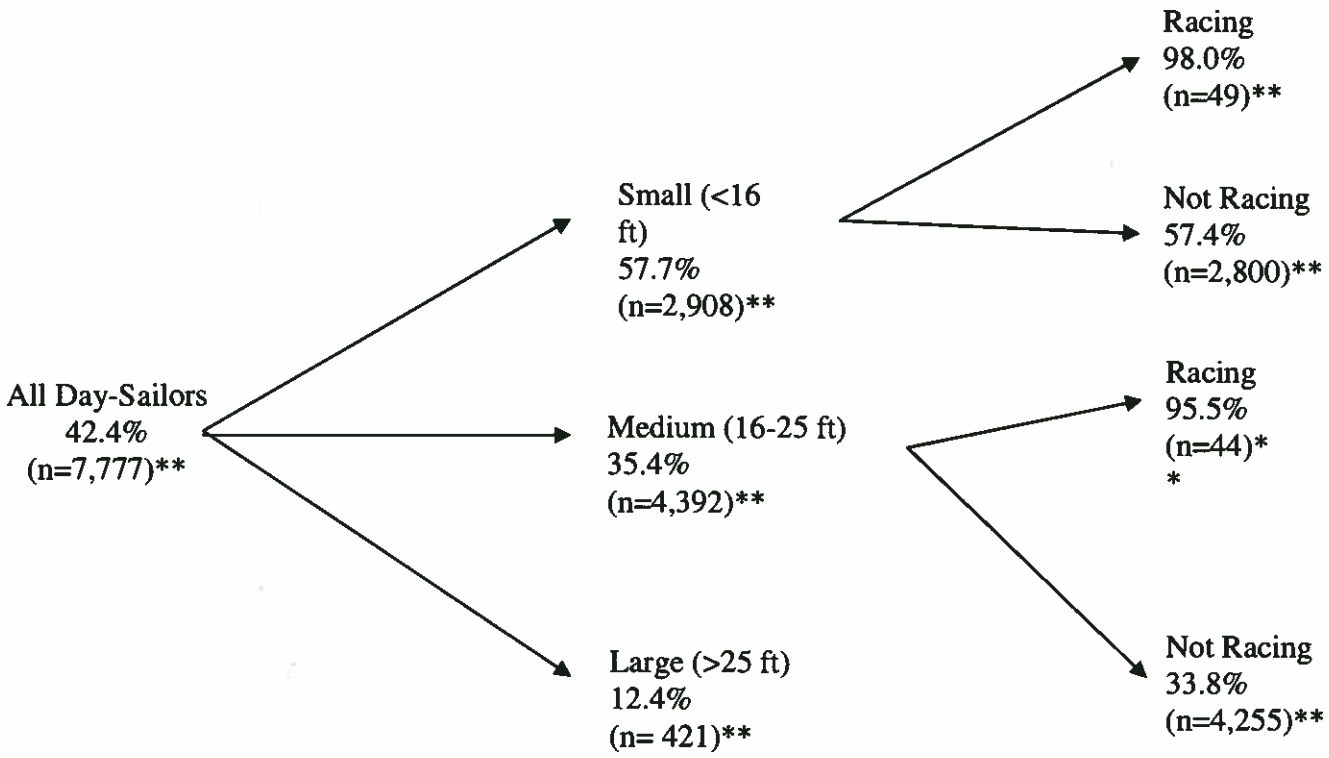
Adults on Day Sailors – Racing.

Figure 5.2 shows the effects of boat length on wear rates for day-sailor sailboats. However, in addition, the impact of whether the sailboat was involved in a "race" is also shown. For the ten years of data, the average wear rate for all day-sailors observed was 42.4%. The very strong effect of boat length is seen in this figure; 57.7% for sailboats under 16 feet, 35.4% for those in the 16 to 25 foot category, and 12.4% of those greater than 25 feet in length. What is interesting to note, however, is the impact of race participation on the smaller day-sailors, even though the number of observations was low. Wear rates rise to almost universal levels with those under 16 feet who were racing showing a 98.0% wear rate, and those in the 16 to 25 foot category and involved in a race were observed at 95.5% wear rates.

Figure 5.2 Life Jacket Wear Rates for Adults on Day Sailors

Impact of Size of Boat and Racing Status

1998-2007 Data



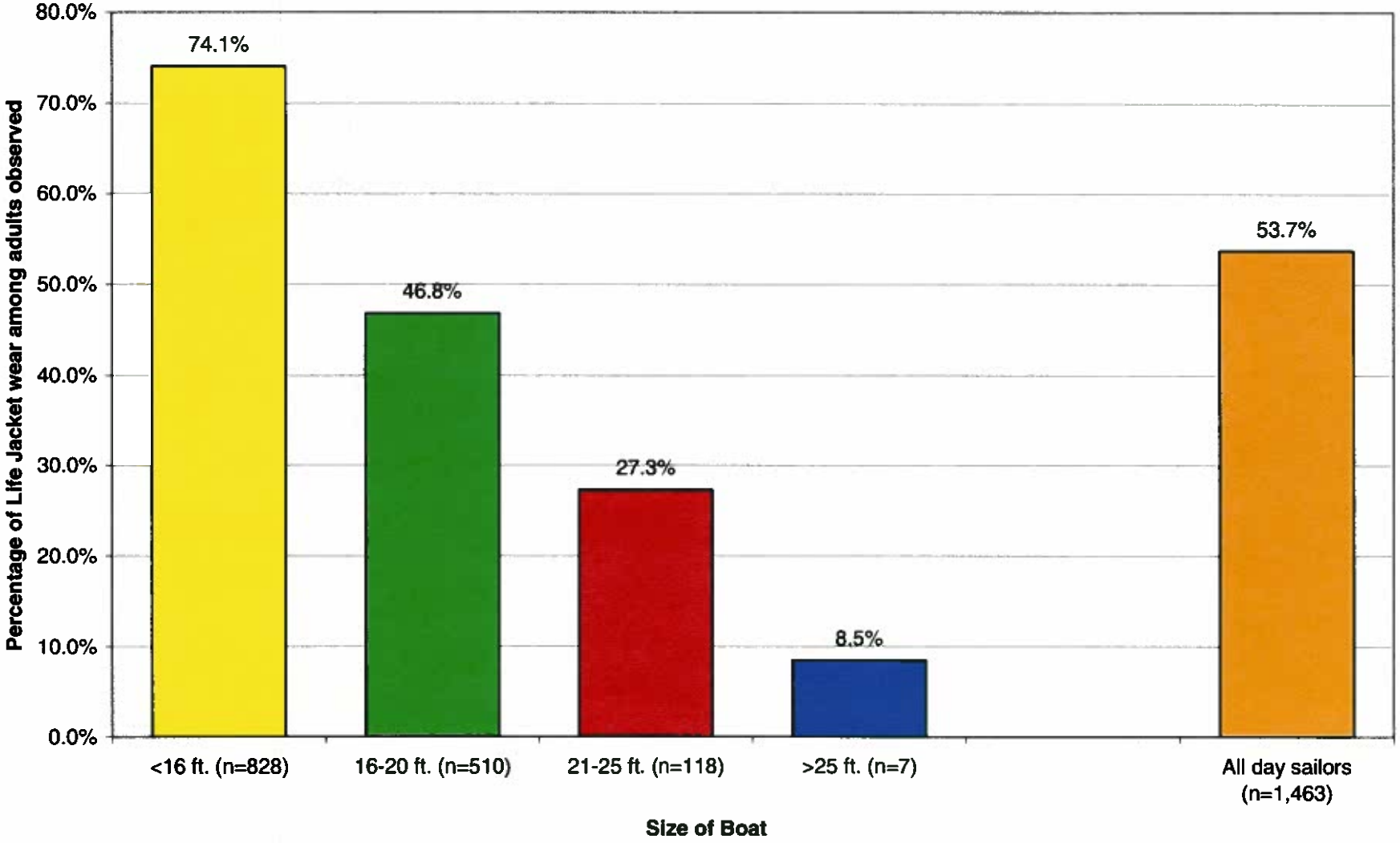
** Indicates the number of adults (18 or older) observed.

Adults on Day Sailors – Size of Boat.

Figure 5.3 has a more detailed breakdown of length with data available since 2004. The same trend is seen: increasing length of boat corresponds to decreasing wear rates.

Figure 5.3 Life Jacket Wear by Adults on Day Sailors

Effects of Size of Boat, 2004-2007 Data Only



Adults on Canoes.

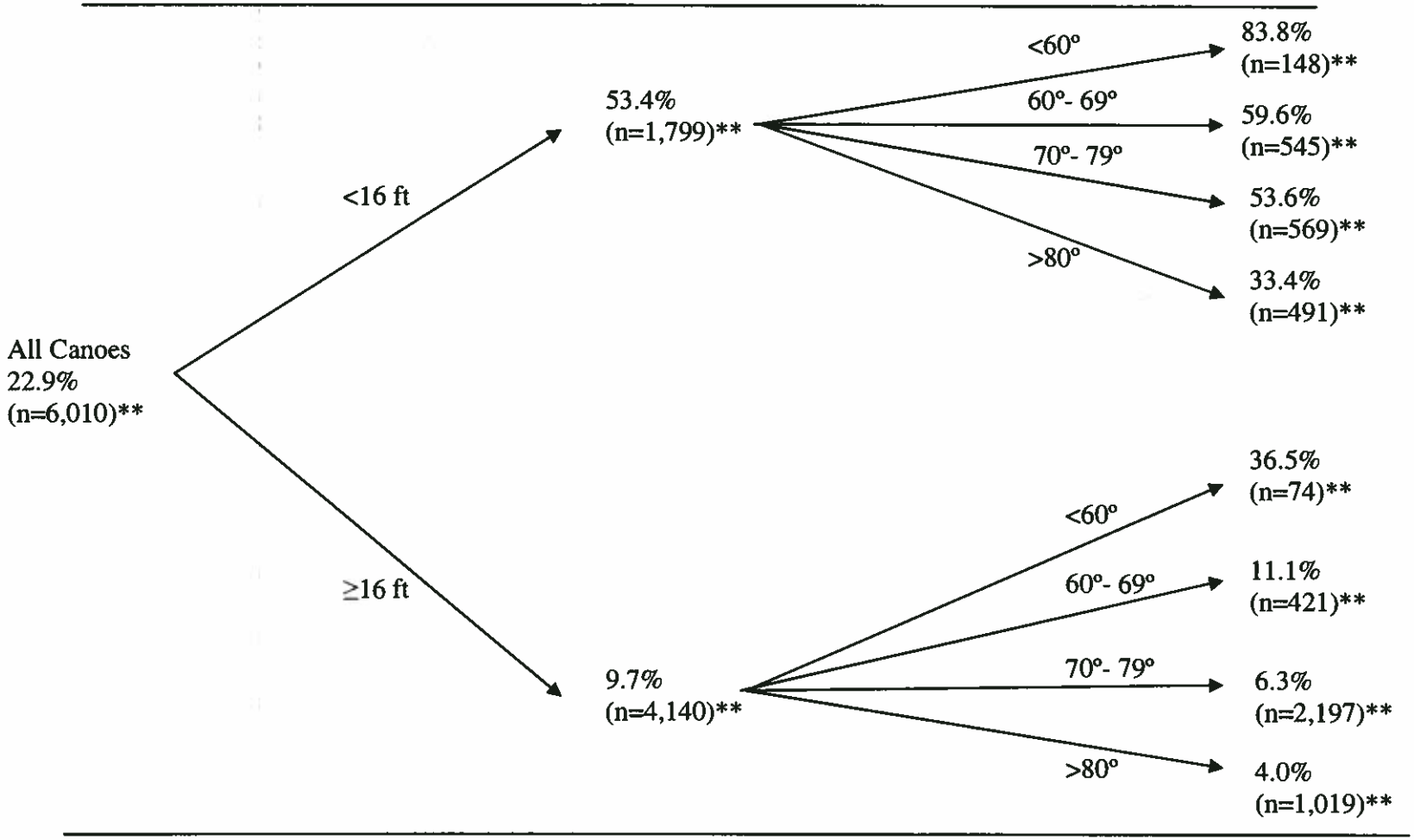
Figure 5.4 demonstrates the impact that boat size and water temperature have on life jacket wear rates among adults on canoes. Note the size category was collapsed from the original three options (less than 16 feet, 16-25 feet and over 25 feet), to two groups (less than 16 feet and 16 feet and over). The overall ten year average wear rate for all canoes was 22.9%. For smaller canoes (those less than 16 feet) wear rates rise to 53.4% while on larger canoes (over 16 feet) the wear rates drop to 9.7%. However, again it is seen that water temperature makes a significant impact on wear rates within these groups. For the smaller canoes, in cold waters less than 60 degrees, wear rates climb to 83.8%, whereas in warm waters (more than 80 degrees) the wear rates drop to 33.4% for these smaller canoes. Likewise among the larger canoes, those operating in colder waters show wear rates up to 36.5% from the average of 9.7%, and fall down to 4.0% for larger canoes in warm waters (over 80 degrees).

Again each of the Figures 5.1, 5.2 and 5.3 suggest that boaters take into consideration the risk of the boat capsizing as well as the seriousness of the consequences of being forced into the water.

Figure 5.4 Life Jacket Wear by Adults on Canoes

Effects of Size of Canoe & Water Temperature

1999 – 2007 Data Only



** Indicates the number of adults (18 or older) observed.

6. CONCLUSIONS FOR NATIONAL TREND DATA

This report covers observational data collected from 1998 to 2007. In this year's report: (1) trends in wear for types of boats and for various age groups were displayed; (2) data were aggregated across the ten years to assist in analyzing the impact of boater, boat and environmental characteristics on wear rates of adults compared to wear rates of youth; (3) data were presented showing the impact of environmental and boat characteristics on small boats under 16 feet in length; day-sailor sail boats, and canoes. A summary of key findings are:

1. Adult wear rates continue to be relatively low with a few exceptions—PWC's, kayaks, inflatable/rafts and day-sailors.

2. The overall adult wear rates in power boats have shown a small increase, particularly among boaters on skiffs. Future data collection will test whether this develops into trend.

3. Wear rates on PWC's for both adults and children are almost universal. In all likelihood, this is a reflection of legal mandates.

4. Children's wear rates are relatively high, particularly for younger children under six years of age.

5. Children's wear rates have increased about 10% over the ten years of data collection. The largest increases across the ten year period are for children in the 6 to 12 year old category. This in all likelihood is a reflection of changing legal mandates at the state and federal level.

6. Adults increase their wear of life jackets under conditions that seemingly increase their risks (e.g. boating in small boats, rough water, strong current, cold water and cold air temperatures).

Given these findings, general conclusions can be made. There is evidence in the data that adults do alter their wear of life jackets when they perceive themselves at risk. For instance, wear rates are higher for small (unstable) boats, when water conditions are rough, and when water temperatures are cold. Additionally, an apparent barrier to wearing life jackets is their perceived bulky nature and discomfort in warm weather; thus, newer inflatable life jackets may be promoted as a viable option to increase safety in a comfortable and stylish manner.

7. EVALUATION OF CALIFORNIA'S DELTA CAMPAIGN

Introduction

Given the general lack of notable changes in wear rates for adults after several years of the national media campaigns to encourage voluntary wearing of life jackets, the U.S. Coast Guard and the State of California along with two national boating associations combined forces to implement an intensive educational and promotional campaign in one limited geographical market. The intent was to determine, with a large amount of resources invested, whether an educational campaign could actually produce notable and sustainable changes in wearing behavior. In the next part of this report we present evidence from an expanded observational database to assess the effectiveness of such a campaign.

The Delta Campaign

The campaign included a variety of elements. The following description is taken from materials published by the California Delta Campaign team.

"Wear It!" Targeted Marketing Campaign. "The Wear It California initiative represents a first-time collaborative effort which includes: the U.S. Coast Guard, the California Department of Boating and Waterways, BoatU.S. and the National Safe Boating Council. Designed to reach "trailer boaters", this campaign was implemented in accordance with a key marketing principle: frequency + diversity = success. Thus, the "Wear It! California" initiative was designed to deliver the message – "wear your life jacket" – many times through multiple means including venues where the boater would be most likely to hear it – and listen.

Toward that end, one of the most visible and unique strategies was the campaign's "experiential marketing" approach, which was accomplished by featuring a "Campaign Tour Boat", visually represented by a colorful wrap that profiles the "Wear It!" logo. Cruising the Delta throughout the summer months, the boat was staffed with campaign "ambassadors" who engaged boaters in conversations about the importance of wearing a life jacket, provided demonstrations, and distributed educational materials. In addition, the ambassadors distributed free of charge over 1400 inflatable life jackets and obtained pledge cards from the recipients to "Wear It".

The Tour Boat dates and locations, as well as the boat itself was debuted at a scheduled Press Conference during National Safe Boating Week, and continually publicized via mass media, partner outreach, local celebrities, and Web venues throughout the summer months. As of Labor Day weekend, the campaign boat had visited 15 different marinas over 16 weekends.

To reach boaters beyond the water – but still in environments or through means where the boater was most likely to "ingest" the message – the campaign featured third party sponsorships with such entities as: marine retailers and shops, including West Marine®, Fisherman's Warehouse, and local marinas; and community organizations that shared a mutual goal to make the Sacramento area a safe community. These partners helped to raise the visibility of the campaign and promote life jacket safety messages through in-store displays, company/organizational promotional material, and their own individual public relations initiatives. Through this strategy, the campaign greatly expanded not only its reach, but also its variety in message distribution.

From these sources as well as information distributed by the campaign boat ambassadors, it was estimated that over 10,000 Delta boaters were reached with boating safety material."

Methods

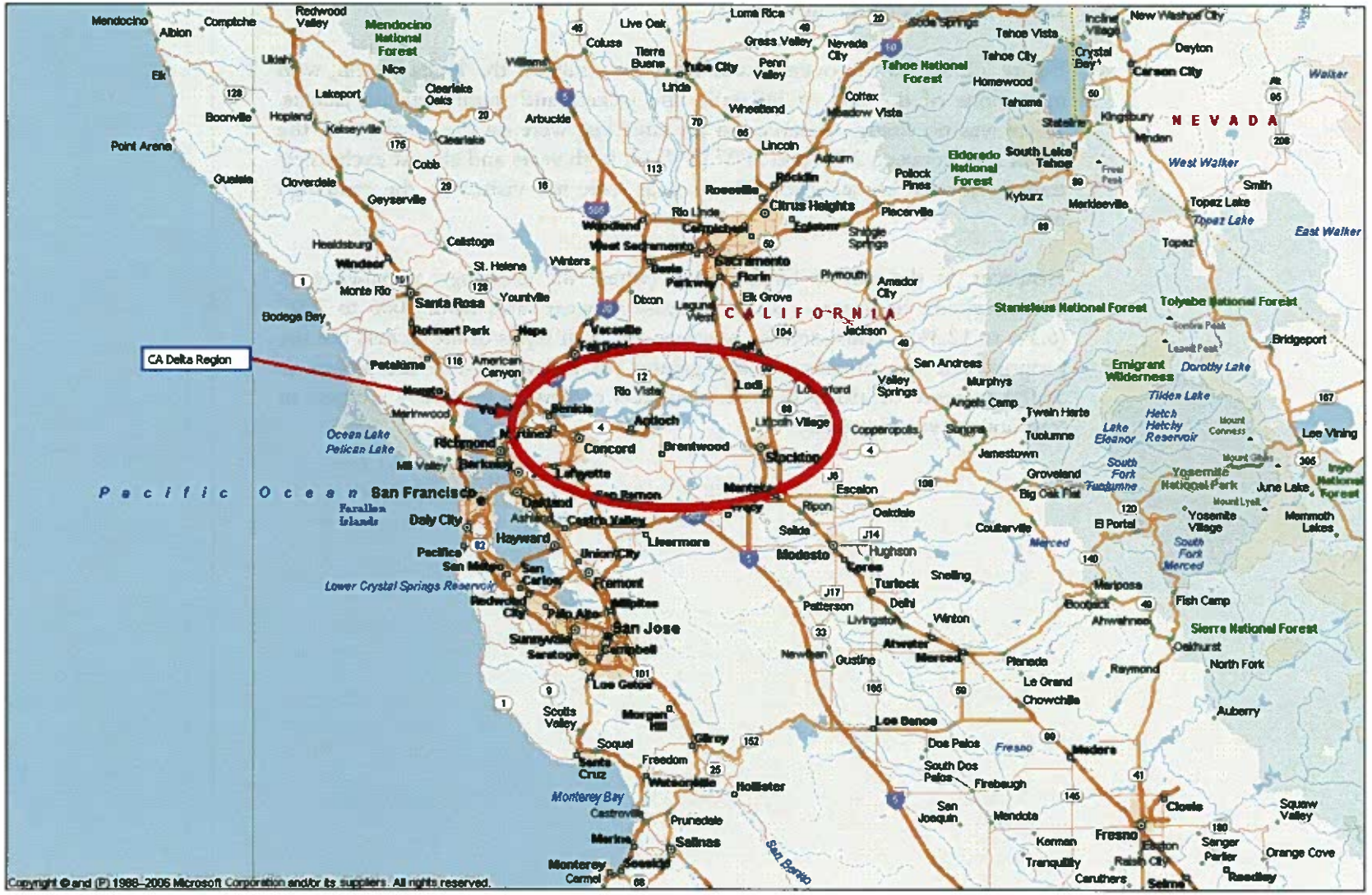
The observation methods used to evaluate the Delta campaign were identical to those used in the national observation study. Possible water venues that were suitable for viewing were identified by the California Department of Boating and Waterways. For 2006, JSI staff visited the most likely water venues from among those nominated and made a final selection of four new sites in the Delta to complement two sites that had traditionally been included in the national observation study. See Figure 7.1 for an indication of the location of the Delta region in California. These sites were each observed four times during the summer of 2006. The Campaign team was not made aware of the specific locations of the observation sites so that a fairer test of the generalizability of the changes could be ascertained.

The other slight modification to traditional study methods was to start observations at 6am, so as to better make observations of wear rate behaviors by boaters who are fishing.

In 2007, as the Campaign was unfolding, and it became known to the evaluators where the campaign stops would be (the central Delta not the outskirts of the Delta), in midsummer JSI added four more central Delta sites that were each observed once. Also two of the central delta sites that had been included were visited more frequently by our observation teams to maximize our ability to capture any changes in wear rate behaviors.

In the Delta a total of 4,328 boaters were observed in 2006 and 6,102 in 2007.

Figure 7. 1 California Delta Region (in red)



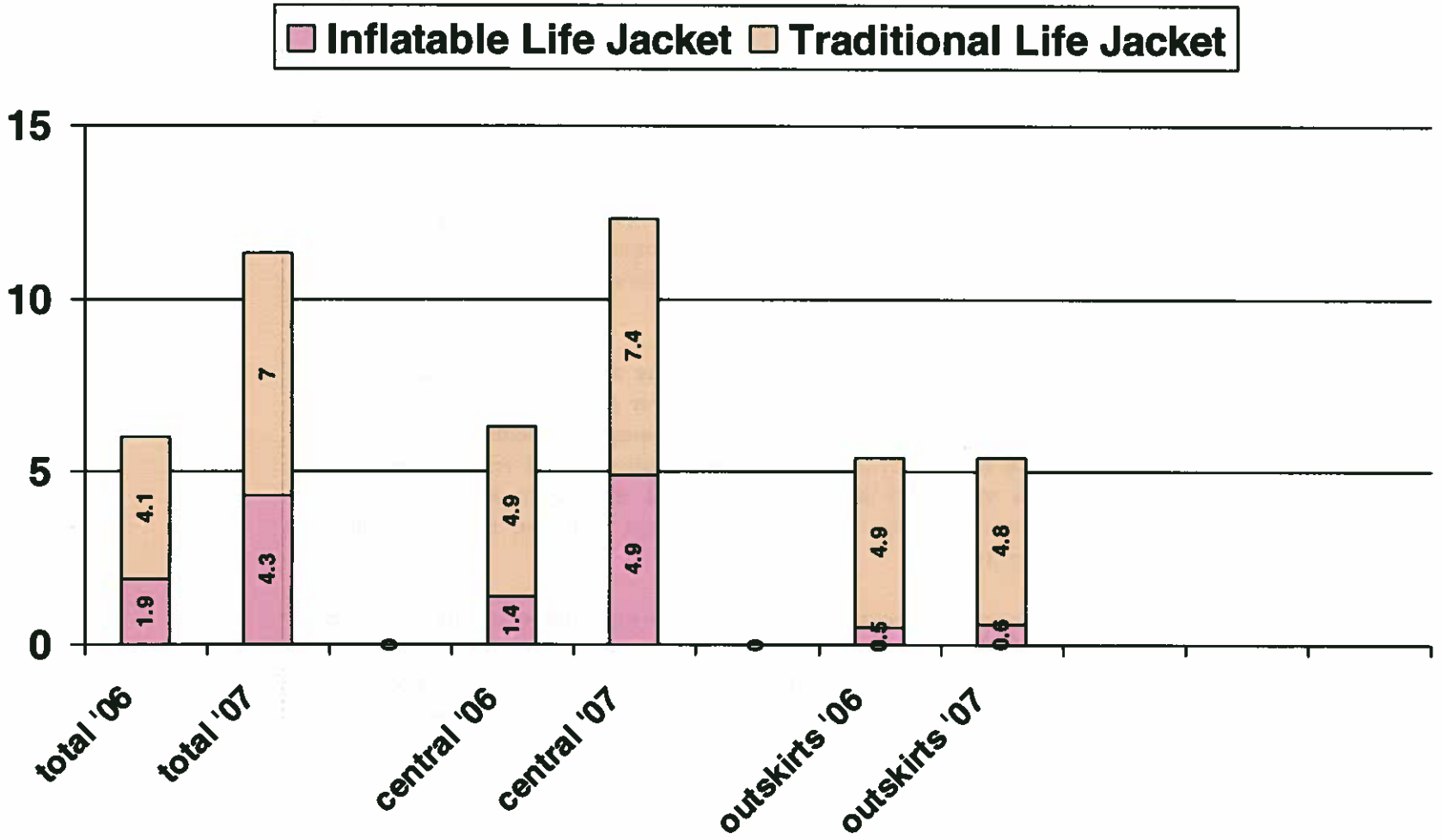
Results

Delta Wear Rates by Subregion

Figure 7.2 shows the overall wear rates for adults in the Delta region, with indications of the mix of inflatable life jackets and traditional life jackets. There was no change observed in the sites that were on the outskirts of the Delta area between 2006 and 2007 (5.4% in both years and almost exclusively traditional style life jackets). These areas were not visited by the campaign boat.

However, in the central Delta region (where the campaign activities were concentrated), there was a sharp increase in wear rates from 2006 to 2007 (6.3% to 12.3%). This increase was seen for both styles of life jackets but the proportional rate of increase was greater for inflatable style life jackets (a 35.0% increase of inflatable style lifejackets compared to a 50% increase in traditional style lifejackets).

Figure 7.2
2006 versus 2007 Delta Adult Wear Rates by Geographic Subregions – Percent Wearing



The "Tournament Effect"

Figure 7.3 gives more insight as to the causes of these increases. There are two factors that seem to be affecting wear rates in the Delta region across these two years. There seems to be a "fishing tournament" effect and also a campaign effect.

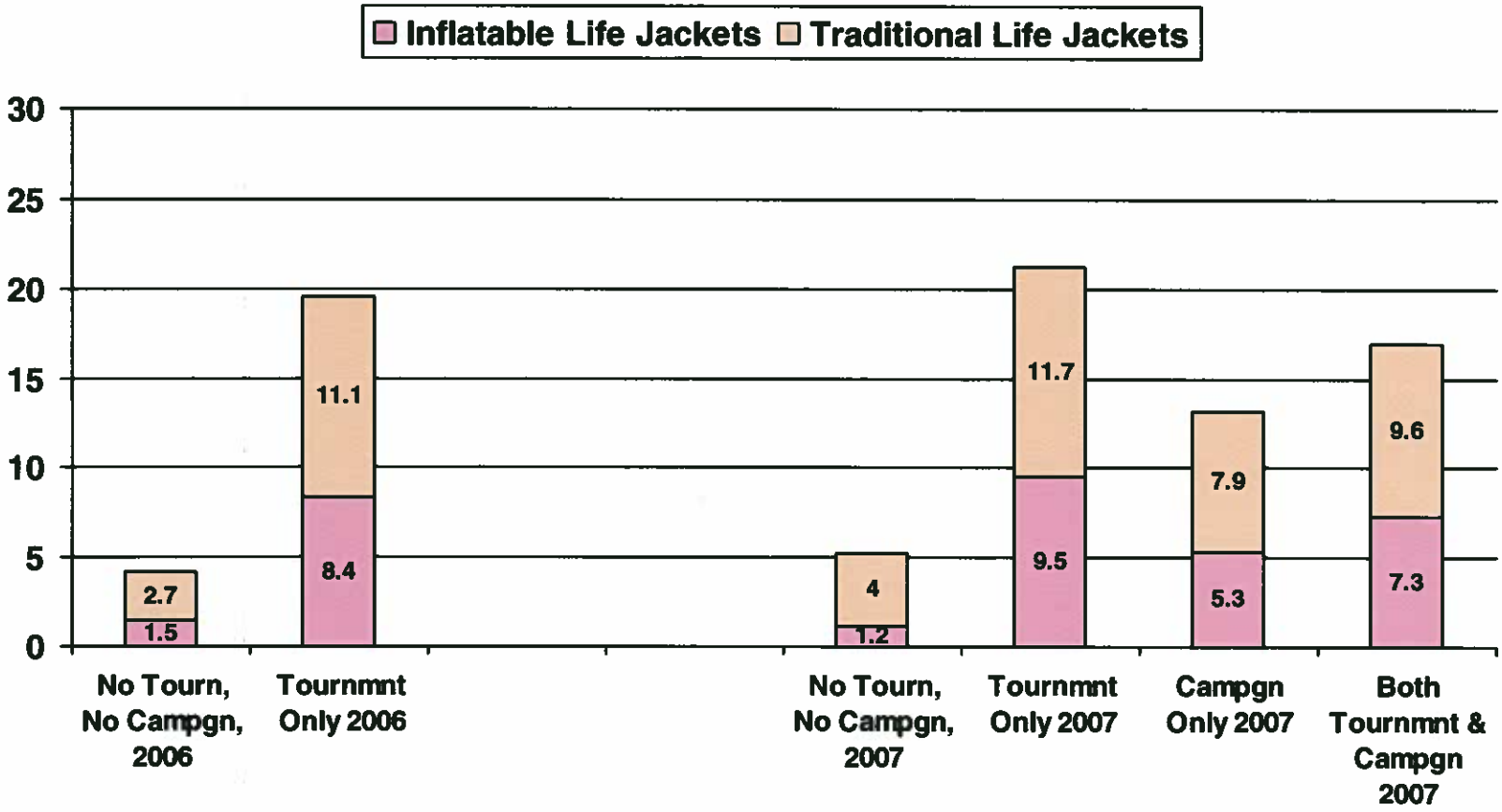
In the summer of 2006, before the campaign existed, there was a clear difference in wear rates at sites where a fishing tournament was in progress compared to sites where there were no fishing tournaments (19.5% versus 4.2%).

In the summer of 2007, the summer the campaign began, there is evidence that the tournament effect continues to increase wear rates, but also that there was a campaign effect. We classified sites as "Tournament" if observations took place on the day the tournament was taking place. We classified sites as "Campaign" sites if the campaign boat had visited that site the weekend before, or the day before, or the same day as the observations were being made.

When observations were made at sites where no tournament was going on and where there was no campaign, the wear rates were 5.2%. However, when a tournament was in place (but no campaign happening) the rates were again much higher (21.2%). When the campaign had visited recently the wear rates were also higher (13.2%) and they were higher if both a tournament was going on and the campaign boat had recently made an appearance (16.9%).

The other apparent fact is that when either a tournament was in place or the campaign boat had made a recent appearance, a much higher proportion of those wearing were wearing inflatable style lifejackets (approximately 40% of the wearers compared to only about 20% of the wearers when neither a tournament nor campaign was present).

Figure 7.3
2007 Adult Wear Rates in CENTRAL Delta Sites by Campaign versus Fishing Tournament – Percent Wearing



Fishing

Table 7.4 gives further evidence that the fishing tournaments make an impact on wear rates. Data are shown for boaters who are actually fishing or who intend to fish (motoring with fishing gear visible) compared to all other activities. In the Central Delta region where both the campaign and tournaments were active, there is a great increase in the proportion wearing between 2006 and 2007 for those who "intend to fish" but a decline for those actually fishing. This finding is consistent with the "rules" of the tournaments that require participants to wear life jackets when a boat is underway but not when anchored or drifting (although many keep their lifejackets on instead of taking it on and off each time the boat is underway; particularly if they are using the inflatable type lifejacket).

Table 7.4 Delta Adult Wear Rates for Type of Activity: 2006 versus 2007

Areas Observed	Fishing				Intent to Fish				Any Other Activity			
	2006	2007	Change	Sig	2006	2007	Change	Sig	2006	2007	Change	Sig
Total Delta				*				****				*
Number of Boaters	187	282			597	1209			3544	4641		
% Wearing Traditional Style	10.2%	4.6%	-5.6%		10.7%	20.5%	9.8%		2.7%	3.6%	0.9%	
% Wearing Inflatable Style	7.0%	5.7%	-1.3%		4.8%	15.6%	10.9%		1.2%	1.3%	0.1%	
% Wearing Either Style	17.2%	10.3%	-6.9%		15.5%	36.1%	20.7%		3.9%	4.9%	1.0%	
Central Delta												
Number of Boaters	131	249		**	249	997		***	2813	4072		**
% Wearing Traditional Style	12.2%	4.4%	-7.8%		18.1%	24.0%	5.9%		2.2%	3.5%	1.3%	
% Wearing Inflatable Style	9.9%	6.4%	-3.5%		11.2%	18.8%	7.6%		1.3%	1.4%	0.1%	
% Wearing Either Style	22.1%	10.8%	-11.3%		29.3%	42.8%	13.5%		3.5%	4.9%	1.4%	
Delta Outskirts												
Number of Boaters	56	33		ns	348	212		ns	731	569		ns
% Wearing Traditional Style	5.4%	6.1%	0.7%		5.5%	4.3%	-1.2%		4.5%	4.9%	0.4%	
% Wearing Inflatable Style	0.0%	0.0%	0.0%		0.0%	0.9%	0.9%		0.8%	0.5%	-0.3%	
% Wearing Either Style	5.4%	6.1%	0.7%		5.5%	5.2%	-0.3%		5.3%	5.4%	0.1%	

Significance levels: ns = not significant; * = .05; ** = .01; * = .001; **** = .0001**

Delta Wear Rates by Boat Type.

In Table 7.5 additional evidence is found that the tournaments and the campaign both affected those who were more likely involved in fishing activities than general recreation. A sizeable increase in wear rates is seen in the Central Delta region for skiffs (23.7% increasing to 37.0%) but not for runabouts or speedboats (2.9% versus 3.8%). Skiff type boats are more likely to be used in fishing and may also be the type of boat for which the logic of wearing a lifejacket is more apparent than a speedboat. It is also interesting to note that there were increases in wear rates on skiffs even in the outskirts of the Delta region where the Campaign boat did not make any appearances and for which there were not tournaments on the days we observed.

Table 7.5 Delta Adult Wear Rates for Specific Boat Types: 2006 versus 2007

Areas Observed	Skiff				Runabout/Speedboat				Pontoon			
	2006	2007	Change	Sig	2006	2007	Change	Sig	2006	2007	Change	Sig
Total Delta				****				ns				ns
Number of Boaters	954	1608			2511	3668			247	241		
% Wearing Traditional Style	9.6%	18.4%	8.8%		2.5%	2.9%	0.4%		2.4%	2.9%	0.5%	
% Wearing Inflatable Style	5.5%	14.1%	8.6%		1.0%	0.9%	-0.1%		0.0%	0.4%	0.4%	
% Wearing Either Style	15.1%	32.5%	17.4%		3.5%	3.8%	0.3%		2.4%	3.3%	0.9%	
Central Delta				****				ns				*
Number of Boaters	550	1350			2015	3239			136	143		
% Wearing Traditional Style	14.2%	20.4%	6.2%		1.9%	2.8%	0.9%		0.0%	3.5%	3.5%	
% Wearing Inflatable Style	9.5%	16.6%	7.1%		1.0%	1.0%	0.0%		0.0%	0.7%	0.7%	
% Wearing Either Style	23.7%	37.0%	13.3%		2.9%	3.8%	0.9%		0.0%	4.2%	4.2%	
Delta Outskirts				***				ns				ns
Number of Boaters	404	258			496	429			111	98		
% Wearing Traditional Style	3.5%	7.8%	4.3%		5.0%	3.3%	-1.7%		5.4%	2.0%	-3.4%	
% Wearing Inflatable Style	0.0%	1.2%	1.2%		0.6%	0.2%	-0.4%		0.0%	0.0%	0.0%	
% Wearing Either Style	3.5%	9.0%	5.5%		5.6%	3.5%	-2.1%		5.4%	2.0%	-3.4%	

Significance levels: ns = not significant; * = .05; ** = .01; * = .001; **** = .0001**

Delta Wear Rates by Type of Activity

In Table 7.6 wear rates are shown separately for males and females in both the central delta area and the outskirts of the delta. The increasing wear rates are again only seen in the central delta area where the campaign boat was used. Also, the increases in wear rates are higher for males than females, which is also consistent with the effects being seen more strongly for boaters that were in boats commonly used for fishing and less strongly for those boat types commonly used for pleasure boating.

Table 7.6 Delta Adult Wear Rates for Type of Activity: 2006 versus 2007

Areas Observed	Adult Males				Adult Females			
	2006	2007	Change	Sig	2006	2007	Change	Sig
Total Delta				****				***
Number of Boaters	2977	4244			1343	1890		
% Wearing Traditional Style	4.9%	8.3%	3.4%		2.2%	4.1%	1.9%	
% Wearing Inflatable Style	2.5%	5.5%	3.0%		0.7%	1.6%	0.9%	
% Wearing Either Style	7.4%	13.8%	6.4%		2.9%	5.7%	2.8%	
Central Delta								
Number of Boaters	2104	3651		****	1085	1669		****
% Wearing Traditional Style	5.0%	8.9%	3.9%		1.7%	4.0%	2.3%	
% Wearing Inflatable Style	3.3%	6.3%	3.0%		0.8%	1.8%	1.0%	
% Wearing Either Style	8.3%	15.2%	6.9%		2.5%	5.8%	3.3%	
Delta Outskirts				ns				ns
Number of Boaters	873	593			258	221		
% Wearing Traditional Style	4.8%	4.7%	-0.1%		4.7%	5.0%	0.3%	
% Wearing Inflatable Style	0.6%	0.7%	0.1%		0.4%	0.5%	0.1%	
% Wearing Either Style	5.4%	5.4%	0.0%		5.1%	5.5%	0.4%	

Significance levels: ns = not significant; * = .05; ** = .01; * = .001; **** = .0001**

Summary of the Initial Delta Campaign Evaluation.

There are positive signs that the intensive, multi-message approach is having an effect to increase life jacket wear rates. There was also even stronger evidence that there is also a fishing tournament effect which changes wear rate behaviors (at least on the day of the tournament).

One reason the campaign effect may not have appeared as strongly as it could, is the fact that the campaign rolled out during the summer and hence needed time to build momentum. During the summer of 2008, it will be possible to see whether the campaign has even greater impact as the campaign moves into its second summer.

In order to be able to statistically and reliably distinguish between the tournament effect and the campaign effect, an increase in observations to include all weekends should be made.