

ANALYSIS OF SEA TURTLE BITTEN MARINE DEBRIS

INTRODUCTION:

Created by the Congress of the United States in 1962, Padre Island National Seashore consists of approximately 130,000 acres of lands and water and is located on Padre Island; a barrier island located adjacent to the southeastern coast of Texas. The National Seashore is bordered on the east by the Gulf of Mexico and is separated from the Texas mainland, to the west, by the Laguna Madre, a shallow, hypersaline body of water. Padre Island National Seashore (PAIS) is approximately 70 miles-in-length and from ½ to 3 miles-in-width.

PAIS encompasses tens-of-thousands of acres of pristine wetlands that are critically important habitat for 322 bird species. Included in these bird species are three listed threatened or endangered (T&E) species and seven State of Texas protected species, 21 species of Colonial nesting waterbirds, and 120 species of neotropical migratory birds. The park also serves as a nesting area for three species of threatened or endangered sea turtles.

Unfortunately, PAIS has the unflattering reputation of having more marine debris (e.g. trash in the ocean--any manufactured object accidentally or purposely put into the marine environment that, subsequently, washes onto the beach) on its' beaches than any other area located on the periphery of the Gulf of Mexico. It has been reported that, at certain times of the year, this National Seashore is inundated with as much as one ton of debris per linear mile. While this statement is true only for the infrequent occurrence of atypical events, such as storms and flooding, long-term marine debris research has shown that many days, weeks and even months of tidal marine debris accumulation can be very minimal and the beaches pristine.

The prevailing winds are from the southeast during the summer and fluctuate from north to southeast during the winter. The predominant Gulf currents that parallel the park's boundary change direction bi-yearly; from south-to-north in April and north-to-south in October. Long-term marine debris research conducted at PAIS has indicated that environmental factors, including winds, tides and currents, have a direct affect on the amount of marine debris deposited on park beaches. PAIS is unique as a marine debris survey area because the Gulf of Mexico (GOM) currents converge at PAIS. Because of these convergent currents, any debris item discarded into the GOM has the potential of being washed onto PAIS beaches.

PAIS is one of eight National Park Service seashore parks that participated in the 1988-93 National Park Marine Debris Monitoring Program. This multi-agency cooperative effort was initiated to... "provide a quantitative assessment of the abundance, composition, and accumulation of marine debris on national park beaches..."

Besides the concerns of beach aesthetics, marine debris accounts for numerous impacts to a variety of marine creatures due to entanglement and ingestion. According to one study (Balasz and Choy, 1985), sea turtle populations are most harmed by consuming manmade debris floating in open seas worldwide. A worldwide sea turtle literature review identified 79 reports of sea turtles ingesting plastics and 60 reports of sea turtle entanglements, many of which came from the Gulf of Mexico (and Wider Caribbean) area (Balasz, 1985). The National Marine Fisheries Service and University of Texas scientists have examined the stomach contents of stranded (dead) sea turtles and found that one-third to one-half of the endangered and threatened species are ingesting plastic products (EPA, 1991).

In an attempt to determine the accumulative impacts of marine debris ingestion to sea turtles, researchers at Padre Island National Seashore inventoried the number of marine debris items that contained "turtle bites" (eg. diamond shaped pieces missing from debris items) that could have been ingested by sea turtles. The survey was conducted from August 1994 through January 1995. A total of 1285 debris items were collected that had one or more turtle bites on the item. Appendices 1 and 2 are listings of debris items that were collected.

****The abbreviation RG, used in Appendices 1 and 2, refers to rubber gloves.**

Appendix 1

Date	Item	Color	No. of Items	No. of Bites	Avg. No. of Bites
8/2/94	BLEACH BOTTLE	GREEN	2.00	10.00	5.00
8/2/94	BLEACH BOTTLE	WHITE	2.00	6.00	3.00
8/2/94	QT OIL CONTAINER	BLACK	1.00	1.00	1.00
8/2/94	SALT BAG	GREEN	1.00	24.00	24.00
8/4/94	BLEACH BOTTLE	GREEN	2.00	53.00	26.50
8/4/94	SHEETING	CLEAR	1.00	9.00	9.00
8/11/94	BALLOON	RED	1.00	30.00	30.00
8/11/94	PLAS. COND. BOTT.	CLEAR	1.00	2.00	2.00
8/11/94	RG	BLACK	1.00	30.00	30.00
8/11/94	RG	TAN	32.00	1,054.00	32.94
8/18/94	BLEACH BOTTLE	GREEN	2.00	10.00	5.00
8/18/94	SCOOP	WHITE	1.00	20.00	20.00
9/23/94	BLEACH BOTTLE	GREEN	2.00	27.00	13.50
9/23/94	RG	RED	1.00	29.00	29.00
9/23/94	RG	TAN	7.00	212.00	30.29
9/23/94	SALT BAG	WHITE	2.00	270.00	135.00
10/4/94	BLEACH BOTTLE	GREEN	1.00	1.00	1.00
10/6/94	PAP. MILK CARTON	WHITE	1.00	14.00	14.00
10/6/94	RG	ORANGE	2.00	6.00	3.00
10/6/94	RG	TAN	15.00	599.00	39.93
10/8/94	RG	BLACK	1.00	47.00	47.00
10/11/94	BLEACH BOTTLE	GREEN	1.00	1.00	1.00
10/11/94	EGG CARTON	WHITE	1.00	11.00	11.00
10/11/94	RG	TAN	1.00	70.00	70.00
10/13/94	BLEACH BOTTLE	GREEN	1.00	12.00	12.00
10/13/94	RG	RED	6.00	146.00	24.33
10/13/94	RG	TAN	7.00	96.00	13.71
10/18/94	RG	TAN	3.00	62.00	20.67
10/20/94	BLEACH BOTTLE	BLUE	1.00	2.00	2.00
10/20/94	BLEACH BOTTLE	GREEN	1.00	3.00	3.00
10/20/94	BLEACH BOTTLE	WHITE	1.00	14.00	14.00
10/20/94	EGG CARTON	BLUE	1.00	8.00	8.00
10/20/94	EGG CARTON	PINK	1.00	2.00	2.00
10/20/94	RG	RED	3.00	199.00	66.33

Appendix 1

Date	Item	Color	No. of Items	No. of Bites	Avg. No. of Bites
10/20/94	RG	TAN	12.00	491.00	40.92
10/20/94	SALT BAG	BLUE	1.00	6.00	6.00
10/22/94	EGG CARTON	GREEN	1.00	1.00	1.00
10/22/94	EGG CARTON	WHITE	1.00	6.00	6.00
10/22/94	RG	RED	1.00	23.00	23.00
10/22/94	RG	TAN	4.00	183.00	45.75
10/23/94	BLEACH BOTTLE	GREEN	1.00	5.00	5.00
10/23/94	RG	ORANGE	2.00	81.00	40.50
10/23/94	RG	RED	3.00	60.00	20.00
10/23/94	RG	TAN	7.00	218.00	31.14
10/24/94	BLEACH BOTTLE	GREEN	1.00	10.00	10.00
10/24/94	BLEACH BOTTLE	WHITE	1.00	13.00	13.00
10/24/94	RG	RED	1.00	67.00	67.00
10/24/94	RG	TAN	4.00	37.00	9.25
10/24/94	SALT BAG	BLUE	1.00	8.00	8.00
10/25/94	RG	BLUE	1.00	98.00	98.00
10/25/94	RG	RED	2.00	41.00	20.50
10/25/94	RG	TAN	6.00	158.00	26.33
10/26/94	RG	BLUE	1.00	91.00	91.00
10/26/94	RG	RED	2.00	24.00	12.00
10/26/94	RG	TAN	12.00	274.00	22.83
10/27/94	RG	TAN	3.00	46.00	15.33
10/28/94	RG	RED	2.00	38.00	19.00
10/28/94	RG	TAN	43.00	943.00	21.93
10/28/94	RG	YELLOW	2.00	106.00	53.00
10/29/94	RG	YELLOW	1.00	136.00	136.00
10/30/94	RG	TAN	1.00	25.00	25.00
10/31/94	RG	TAN	39.00	1,216.00	31.18
11/1/94	EGG CARTON	WHITE	1.00	2.00	2.00
11/1/94	RG	TAN	1.00	36.00	36.00
11/2/94	RG	RED	2.00	116.00	58.00
11/2/94	RG	TAN	9.00	227.00	25.22
11/2/94	RG	WHITE	2.00	18.00	9.00
11/3/94	RG	TAN	4.00	67.00	16.75
11/4/94	RG	TAN	8.00	285.00	35.63

Appendix 1

Date	Item	Color	No. of Items	No. of Bites	Avg. No. of Bites
11/5/94	RG	TAN	1.00	50.00	50.00
11/6/94	BLEACH BOTTLE	GREEN	1.00	1.00	1.00
11/6/94	RG	TAN	1.00	10.00	10.00
11/7/94	RG	TAN	8.00	215.00	26.88
11/7/94	RG	YELLOW	1.00	63.00	63.00
11/8/94	PAPER MILD CONT.	WHITE	1.00	21.00	21.00
11/8/94	RG	RED	1.00	22.00	22.00
11/8/94	RG	TAN	21.00	483.00	23.00
11/9/94	RG	ORANGE	1.00	1.00	1.00
11/9/94	RG	RED	7.00	96.00	13.71
11/9/94	RG	TAN	27.00	536.00	19.85
11/11/94	RG	RED	2.00	21.00	10.50
11/11/94	RG	TAN	35.00	350.00	10.00
11/12/94	BLEACH BOTTLE	WHITE	1.00	3.00	3.00
11/12/94	RG	TAN	7.00	111.00	15.86
11/12/94	SCOOP	CLEAR	1.00	3.00	3.00
11/12/94	SCOOP	GREEN	2.00	3.00	1.50
11/14/94	RG	BLACK	1.00	12.00	12.00
11/14/94	RG	TAN	40.00	519.00	12.98
11/14/94	RG	YELLOW	1.00	7.00	7.00
11/15/94	RG	TAN	10.00	182.00	18.20
11/16/94	RG	TAN	8.00	373.00	46.63
11/17/94	RG	TAN	15.00	225.00	15.00
11/18/94	RG	TAN	35.00	594.00	16.97
11/18/94	RG	TAN	1.00	12.00	12.00
11/19/94	RG	TAN	39.00	818.00	20.97
11/20/94	RG	TAN	33.00	366.00	11.09
11/22/94	BLEACH BOTTLE	GREEN	1.00	2.00	2.00
11/22/94	EGG CARTON	WHITE	1.00	7.00	7.00
11/22/94	GAL. MILK JUG	CLEAR	2.00	38.00	19.00
11/22/94	GAL. MILK JUG	YELLOW	1.00	21.00	21.00
11/22/94	RG	TAN	27.00	637.00	23.59
11/22/94	RG	YELLOW	3.00	173.00	57.67
11/23/94	RG	TAN	38.00	538.00	14.16
11/24/94	RG	TAN	104.00	1,437.00	13.82

Appendix 1

Date	Item	Color	No. of Items	No. of Bites	Avg. No. of Bites
11/25/94	RG	TAN	55.00	782.00	14.22
11/25/94	RG	TAN	1.00	8.00	8.00
11/27/94	RG	TAN	4.00	310.00	77.50
11/27/94	RG	YELLOW	1.00	115.00	115.00
11/28/94	RG	TAN	59.00	1,207.00	20.46
11/29/94	RG	TAN	16.00	180.00	11.25
12/1/94	RG	TAN	2.00	61.00	30.50
12/2/94	RG	TAN	78.00	1,525.00	19.55
12/2/94	RG	TAN	1.00	34.00	34.00
12/3/94	RG	TAN	7.00	89.00	12.71
12/5/94	RG	BLACK	1.00	3.00	3.00
12/5/94	RG	RED	1.00	2.00	2.00
12/5/94	RG	TAN	35.00	430.00	12.29
12/5/94	RG	YELLOW	1.00	3.00	3.00
12/6/94	BLEACH BOTTLE	GREEN	1.00	2.00	2.00
12/6/94	EGG CARTON	BLUE	1.00	6.00	6.00
12/6/94	RG	TAN	4.00	55.00	13.75
12/7/94	EGG CARTON	BLUE	1.00	7.00	7.00
12/7/94	EGG CARTON	WHITE	1.00	8.00	8.00
12/7/94	RG	TAN	1.00	26.00	26.00
12/8/94	RG	BLACK	1.00	12.00	12.00
12/8/94	RG	ORANGE	1.00	32.00	32.00
12/8/94	RG	RED	1.00	15.00	15.00
12/8/94	RG	TAN	9.00	163.00	18.11
12/9/94	RG	BLACK	1.00	21.00	21.00
12/9/94	RG	RED	1.00	6.00	6.00
12/9/94	RG	TAN	17.00	85.00	5.00
12/10/94	RG	TAN	1.00	1.00	1.00
12/11/94	RG	TAN	1.00	14.00	14.00
12/12/94	RG	BLACK	1.00	6.00	6.00
12/12/94	RG	RED	1.00	2.00	2.00
12/12/94	RG	TAN	40.00	613.00	15.33
12/13/94	RG	TAN	1.00	2.00	2.00
12/14/94	RG	BLACK	1.00	8.00	8.00
12/14/94	RG	ORANGE	1.00	9.00	9.00

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Date	Item	Color	No. of Items	No. of Bites	Avg. No. of Bites
12/14/94	RG	RED	2.00	25.00	12.50
12/14/94	RG	TAN	13.00	175.00	13.46
12/14/94	SALT BAG	YELLOW	1.00	15.00	15.00
12/15/94	BLEACH BOTTLE	GREEN	1.00	6.00	6.00
12/15/94	PLS. COND. BOTTLE	WHITE	1.00	12.00	12.00
12/15/94	RG	BLACK	1.00	8.00	8.00
12/15/94	RG	PINK	1.00	4.00	4.00
12/15/94	RG	RED	1.00	15.00	15.00
12/15/94	RG	TAN	16.00	395.00	24.69
12/15/94	RG	YELLOW	3.00	131.00	43.67
12/15/94	SALT BAG	BLUE	1.00	3.00	3.00
12/16/94	RG	TAN	5.00	117.00	23.40
12/16/94	RG	YELLOW	1.00	89.00	89.00
12/17/94	EGG CARTON	WHITE	1.00	6.00	6.00
12/17/94	RG	TAN	1.00	14.00	14.00
12/19/94	RG	TAN	9.00	67.00	7.44
12/20/94	BLEACH BOTTLE	GREEN	2.00	21.00	10.50
12/20/94	BLEACH BOTTLE	WHITE	1.00	1.00	1.00
12/20/94	EGG CARTON	BLUE	1.00	7.00	7.00
12/20/94	EGG CARTON	WHITE	1.00	6.00	6.00
12/20/94	QT OIL CONTAINER	WHITE	1.00	1.00	1.00
12/20/94	RG	GREEN	1.00	10.00	10.00
12/20/94	RG	TAN	2.00	28.00	14.00
12/21/94	RG	TAN	1.00	27.00	27.00
12/23/94	BLEACH BOTTLE	GREEN	1.00	41.00	41.00
12/26/94	BLEACH BOTTLE	GREEN	1.00	5.00	5.00
12/27/94	EGG CARTON	WHITE	1.00	5.00	5.00
12/27/94	QT OIL CONTAINER	WHITE	1.00	15.00	15.00
12/27/94	RG	BLUE	1.00	21.00	21.00
12/27/94	RG	RED	3.00	15.00	5.00
12/27/94	RG	TAN	10.00	101.00	10.10
12/27/94	RG	YELLOW	1.00	29.00	29.00
12/30/94	RG	RED	1.00	2.00	2.00
12/30/94	RG	TAN	1.00	2.00	2.00
12/31/94	RG	TAN	2.00	10.00	5.00

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Date	Item	Color	No. of Items	No. of Bites	Avg. No. of Bites
1/7/95	RG	TAN	6.00	28.00	4.67
1/8/95	RG	TAN	3.00	16.00	5.33
1/9/95	RG	TAN	2.00	5.00	2.50
1/10/95	BLEACH BOTTLE	BLUE	1.00	1.00	1.00
1/10/95	BLEACH BOTTLE	GREEN	3.00	3.00	1.00
1/10/95	RG	TAN	2.00	12.00	6.00
1/14/95	RG	WHITE	2.00	31.00	15.50
1/14/95	RG	YELLOW	1.00	7.00	7.00
1/16/95	RG	PINK	2.00	21.00	10.50
1/16/95	RG	TAN	6.00	59.00	9.83
1/17/95	BLEACH BOTTLE	GREEN	1.00	16.00	16.00
1/17/95	RG	BLACK	1.00	3.00	3.00
1/17/95	RG	BLUE	1.00	24.00	24.00
1/17/95	RG	ORANGE	3.00	37.00	12.33
1/17/95	RG	RED	2.00	21.00	10.50
1/17/95	RG	TAN	6.00	103.00	17.17
1/17/95	RG	WHITE	1.00	8.00	8.00
1/19/95	RG	TAN	1.00	4.00	4.00
1/20/95	RG	TAN	8.00	54.00	6.75
1/21/95	RG	PINK	1.00	10.00	10.00
1/21/95	RG	RED	2.00	18.00	9.00
1/21/95	RG	TAN	1.00	15.00	15.00
1/22/95	BLEACH BOTTLE	GREEN	1.00	3.00	3.00
1/22/95	GALLON MILK CONT.	CLEAR	3.00	12.00	4.00
1/22/95	RG	TAN	2.00	67.00	33.50
1/23/95	RG	TAN	2.00	8.00	4.00
1/24/95	RG	RED	1.00	34.00	34.00
1/25/95	GALLON MILK CONT.	CLEAR	1.00	1.00	1.00
1/25/95	RG	RED	1.00	44.00	44.00
1/25/95	RG	TAN	3.00	47.00	15.67
1/26/95	EGG CARTON	BLUE	1.00	1.00	1.00
1/26/95	EGG CARTON	GREEN	1.00	1.00	1.00
1/26/95	GALLON MILK CONT.	CLEAR	2.00	5.00	2.50
1/26/95	PLAS. COND. BOTT.	CLEAR	1.00	5.00	5.00
1/26/95	RG	TAN	2.00	120.00	60.00

Appendix 1

Date	Item	Color	No. of Items	No. of Bites	Avg. No. of Bites
1/27/95	RG	BLACK	1.00	3.00	3.00
1/27/95	RG	TAN	3.00	8.00	2.67
1/28/95	RG	TAN	1.00	10.00	10.00
1/29/95	GALLON MILK CONT.	CLEAR	1.00	1.00	1.00
1/29/95	SALT BAG	BLUE	2.00	57.00	28.50
1/31/95	BLEACH QT	GREEN	1.00	1.00	1.00
1/31/95	RG	BLACK	2.00	13.00	6.50
1/31/95	RG	RED	2.00	41.00	20.50
1/31/95	RG	TAN	3.00	40.00	13.33
1/31/95	RG	YELLOW	1.00	14.00	14.00
1/31/95	SALT BAG	BLUE	1.00	23.00	23.00
2/1/95	RG	TAN	1.00	12.00	12.00

Appendix 2

Item	Color	No. of Items	No. of Bites	Avg. No. of Bites
BALLOON	RED	1.00	30.00	30.00
BLEACH BOTTLE	BLUE	2.00	3.00	1.50
BLEACH BOTTLE	GREEN	27.00	232.00	8.59
BLEACH BOTTLE	WHITE	6.00	37.00	6.17
BLEACH QT	GREEN	1.00	1.00	1.00
EGG CARTON	BLUE	5.00	29.00	5.80
EGG CARTON	GREEN	2.00	2.00	1.00
EGG CARTON	PINK	1.00	2.00	2.00
EGG CARTON	WHITE	8.00	51.00	6.38
GAL. MILK JUG	CLEAR	2.00	38.00	19.00
GAL. MILK JUG	YELLOW	1.00	21.00	21.00
GALLON MILK CONT.	CLEAR	7.00	19.00	2.71
PAP. MILK CARTON	WHITE	1.00	14.00	14.00
PAPER MILD CONT.	WHITE	1.00	21.00	21.00
PLAS. COND. BOTT.	CLEAR	2.00	7.00	3.50
PLS. COND. BOTTLE	WHITE	1.00	12.00	12.00
QT OIL CONTAINER	BLACK	1.00	1.00	1.00
QT OIL CONTAINER	WHITE	2.00	16.00	8.00
RG	BLACK	13.00	166.00	12.77
RG	BLUE	4.00	234.00	58.50
RG	GREEN	1.00	10.00	10.00
RG	ORANGE	10.00	166.00	16.60
RG	PINK	4.00	35.00	8.75
RG	RED	52.00	1,122.00	21.58
RG	TAN	1,109.00	20,830.00	18.78
RG	WHITE	5.00	57.00	11.40
RG	YELLOW	17.00	873.00	51.35
RG	TAN	3.00	54.00	18.00
SALT BAG	BLUE	6.00	97.00	16.17
SALT BAG	GREEN	1.00	24.00	24.00
SALT BAG	WHITE	2.00	270.00	135.00
SALT BAG	YELLOW	1.00	15.00	15.00
SCOOP	CLEAR	1.00	3.00	3.00
SCOOP	GREEN	2.00	3.00	1.50
SCOOP	WHITE	1.00	20.00	20.00
SHEETING	CLEAR	1.00	9.00	9.00