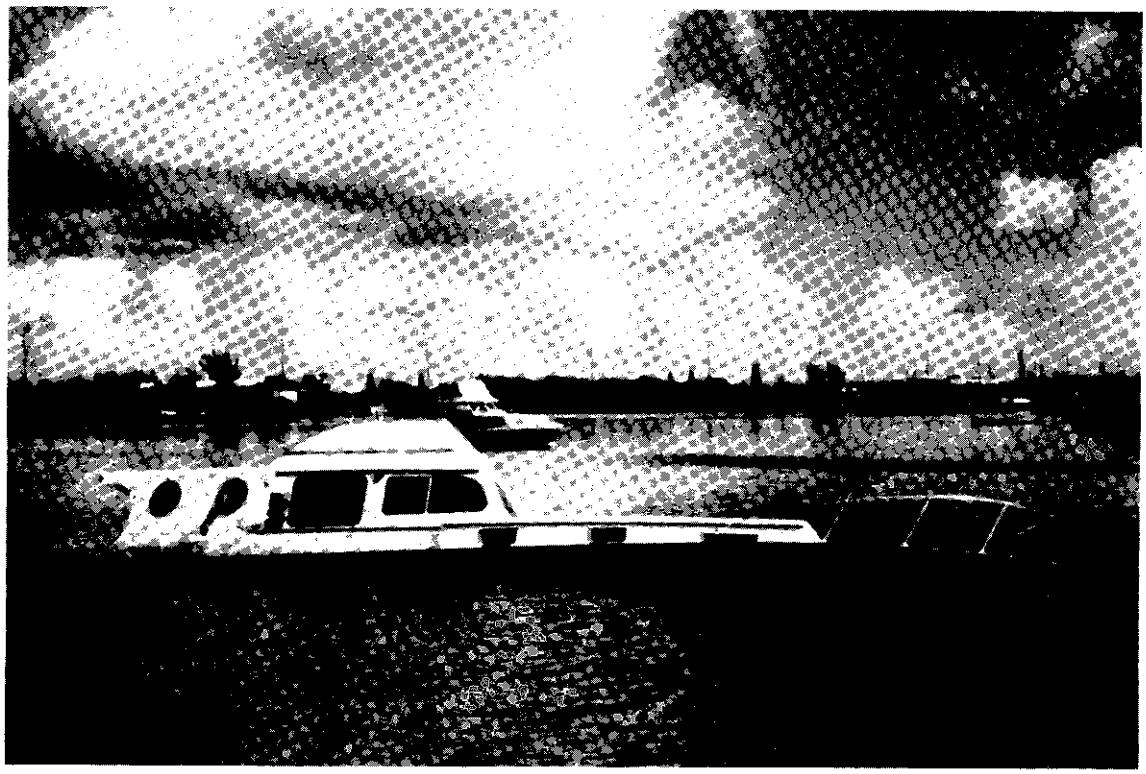
Technical Paper No. 56

A Method for Siting and Prioritizing the Removal of Derelict Vessels in Florida Coastal Waters:

Test Applications in the Florida Keys



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FLORIDA SEA GRANT COLLEGE PUBLICATION

FLORIDA SEA GRANT COLLEGE PROGRAM

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Cover Photograph: Fishing vessel, half submerged, partially broken-up, obstructing navigation, threatening environment and health, and polluting Key Colony Beach.

ABSTRACT

Increased boating activities and new waterfront developments have contributed an estimated 3,000 dismantled, abandoned, junked, wrecked, derelict vessels to Florida coastal waters. This report outlines a method of siting and prioritizing derelict vessel removal using the Florida Keys as a test area. The data base was information on 240 vessels, obtained from Florida Marine Patrol files. Vessel location was plotted on 1:250,000 regional and 1:5,000 and 1:12,000 site maps. Type of vessel, length, hull material, engine, fuel tanks, overall condition, afloat and submerged characteristics, and accessibility, were used to derive parametric site indices of removal priority and removal difficulty.

Results indicate 59 top priority cases which should be the focus of immediate clean up efforts in the Florida Keys. Half of these cases are rated low to moderate in removal difficulty; the remainder are difficult to remove. Removal difficulty is a surrogate for removal cost: low difficulty - low cost, high difficulty - high cost. The rating scheme offers coastal planners options of focusing removal operations either on (1) specific areas with clusters of high priority derelict vessels or on (2) selected targeted derelicts at various, specific locations.

Acknowledgements

The authors wish to thank Vicente Lopez, Florida Marine Patrol Officer, Marathon, for responding to our request for a sketch map of derelict vessels in Boot Key Harbor. The Northeast Regional Data Center provided computing facilities. Camera-ready text and tables were prepared by Jackie Whitehouse and Susan Rodgers, Florida Sea Grant Office.

INTRODUCTION

The phenomenal growth of commercial, residential and recreational waterfront developments in Florida has led to a rise in boat traffic, waterfront congestion, boating accidents and wrecks. There are an estimated 3,000 dismantled, abandoned, junked, wrecked, derelict vessels (DVs) in Florida coastal waters; 240 are situated in the Florida Keys, where they pose an additional threat to delicate natural ecologies already affected by increased water-related activities.

The State Department of Natural Resources (DNR), through its Florida Marine Patrol (FMP), carries out a DV reporting program. This includes marking DVs by painting an identification number on the hull and filing a DNR 20-012-FMP report. A title search is included in the reporting process to determine DV ownership and responsibility for removal. Vessel removal falls upon the shoulders of the DNR if the owner cannot be located. Growth in the number of DVs has led the State of Florida to establish a program for DV removal. This program is funded at $400,000 for fiscal year 1989. While most DVs are small recreation and fishing type vessels, limited resources preclude removing all of them.

Some DVs impact the environment, people and navigation more than others. Further, site conditions vary from place to place and make the removal process easy or more difficult. As a result, the Florida Sea Grant (FSG) Extension Director, Monroe County, requested assistance from the University of Florida (UF) in developing and applying an indexing system to locate and prioritize derelict vessel removal based on (1) actual impact or potential threat to people, the environment and navigation, and (2) ease of removal. The Monroe County Commission has approved a Port Advisory

Committee recommendation to remove derelict vessels. The County's plan calls for a phased approach. This report by the UF Cartographic Research Laboratory provides for such a phased approach and is illustrative of FSG immediate response initiatives.

VESSEL INFORMATION

Derelict vessel reportings are concentrated in coastal areas subject to heavy recreational and commercial uses. Correspondingly, the distribution of documented DVs, in the case of the Florida Keys, is limited to the heavily trafficked Intracoastal Waterway (ICW), Hawk Channel and adjoining harbors and estuaries. Other abandoned or wrecked vessels situated along the Florida Reef, in the Marquesas and Dry Tortugas, or in Florida Bay, for example, are not included in the FMP derelict vessel logs which provide the basis of this report.

Data Structure

DNR 20-012/083-FMP reports are available for 240 DV cases in the Florida Keys. Each report contains a description of the DV, its condition and location, effects on environment and navigation, and removal characteristics. Additional information includes color photographs, history of ownership, citations, and coastal chart with vessel location. A sample form is in Appendix A. The data analyzed in this report are listed in Appendix B. An outline of the data structure (Table 1) shows the 19 variables classified as, general information (1-5), vessel characteristics (6-9), impact on locale (10-13), and removal characteristics (14-19).

General Information

1- University of Florida Identification Number: numerical code used to pinpoint DV location on 1:250,000 regional maps (Figures 1-4) and 1:5,000 and 1:12,000 locale

Table 1. Data Structure.

A. General Information

1. University of Florida Identification Number (UF_ID)[1]
2. Department of Natural Resources Identification Number (DNR_ID)
3. Date (MONTH, DAY, YEAR)
4. Location (LOCAT)*
5. Homeport (HOMEPORT)

B. Vessel Characteristics

6. Type of Vessel (TYVES)**
7. Hull Material (HULLMATL)
8. Vessel Length (VESLENG)
9. Engine Aboard (ENGABRD)

C. Impact on Locale

10. Potential Threat to Environment (ENTHREAT)
11. Potential Health Hazard (H HAZARD)
12. Actual Obstruction or Potential Threat to Navigation (NAVIGAT)***
13. Actual Pollution (POLLUT)

D. Removal Characteristics

14. Vessel Condition (VESLCOND)****
15. Beached (BEACHED)****
16. Afloat (AFLOAT)****
17. Degree Submerged (SUBMERGE)****
18. Accessibility by Sea (DEPTH)***
19. Accessibility by Land (LAND ACC)*

* by chart inspection only
** by photo inspection only
*** from FMP form and by chart inspection
**** from FMP form and by photo inspection

[1] Column heading abbreviations in Appendix B

maps (Figures 5 & 6), interpreted from "x" marking DV location on coastal chart accompanying FMP report. Ex., OBS 1, UF_ID (001), Appendix B.

2- Department of Natural Resources Identification Number: DV number painted on vessel which appears on corresponding FMP report and attachments. Ex., OBS 1, DNR_ID (9650), Appendix B.

3- Date: month, day, year when FMP report filed. Where several updated versions cover a single DV, the most recent date is used. Table 2 indicates the chronology of DV reports. Older (pre-1986) cases may be more difficult to locate; they have been subjected longer to wind and water erosion and may be in a more disintegrated state. The increase in DV cases over the last two years reflects more vigorous FMP enforcement of DNR policy. Ex., OBS 1, MONTH (6) DAY (2) YEAR (88), Appendix B.

4- Location: place name where DV is situated. The 240 DV cases are sited in 41 locations and Table 3 presents case tallies for each location. Place names appear on the 1:250,000, 1:5,000 and 1:12,000 scale maps (Figures 1-6). Highway U.S. 1 separates bayside (Florida Bay) from oceanside (Hawk Channel) sites. Ex., OBS 1, LOCAT (16), Appendix B, Conch Keys bayside (Table 3).

5- Homeport: reported as vessel owner's city of residence on the boat registration verification portion of the FMP report. This is condensed into Lower (L), Middle (M), Upper (U) Keys, and Other Areas (O). Ex., OBS 1, HOMEPORT (M), Appendix B.

Vessel Characteristics

6- Type of Vessel: interpreted from site photographs taken by FMP and described as: P (power, recreation), S (sail), H (houseboat), B (barge), T (float), F (fishing).

Table 2. **Chronology of Derelict Vessel Reports.**

Year	Derelict Vessel Cases
1981	3
1982	27
1983	1
1986	1
1987	23
1988	168
1989*	17
Total	240

* Reporting through 1/19/89

Table 3. Derelict Vessel Listing by Location.

Map Code	Location	Number of Derelicts	Percent	Map Code	Location	Number of Derelicts	Percent
1	Tarpon Basin	1	0.4	22	Key Colony/Coco Plum	5	2.1
2	Largo Sound	6	2.5	23	Vaca Key Bight oceanside	2	0.8
3	Key Largo oceanside	14	5.8	24	Marathon bayside	10	4.2
4	Community Harbor	34	14.2	25	Boot Key Harbor	63	26.3
5	Plantation Key oceanside	1	0.4		MIDDLE KEYS SUBTOTAL	93	38.8
6	Blackwater Sound	5	2.1	26	Bahia Honda Key bayside	1	0.4
7	Buttonwood Sound	2	0.8	27	Bahia Honda Key oceanside	2	0.8
8	Card Sound Bridge	2	0.8	28	Big Pine Key bayside	5	2.1
9	Snake Creek oceanside	2	0.8	29	Big Pine Key oceanside	3	1.3
10	Holiday Isle bayside	11	4.6	30	Little Torch Key bayside	4	1.7
11	Islamorada oceanside	1	0.4	31	Ramrod Key bayside	1	0.4
12	Islamorada bayside	4	1.7	32	Summerland Key bayside	2	0.8
13	Lower Matecumbe oceanside	1	0.4	33	Summerland Key oceanside	2	0.8
14	Lower Matecumbe bayside	2	0.8	34	Knockemdown Keys bayside	2	0.8
	UPPER KEYS SUBTOTAL	86	35.7	35	Sugarloaf Key oceanside	4	1.7
15	Long Key bayside	1	0.4	36	Boca Chica Channel oceanside	20	8.3
16	Conch Keys bayside	1	0.4	37	Cow Key	10	4.2
17	Conch Keys oceanside	1	0.4	38	Garrison Bight	2	0.8
18	Duck Key bayside	3	1.3	39	Jewfish Basin bayside	1	0.4
19	Duck Key oceanside	1	0.4	40	Christmas Tree Island	1	0.4
20	Grassy Key oceanside	3	1.3	41	Northwest Channel	1	0.4
21	Fat Deer Key bayside	3	1.3		LOWER KEYS SUBTOTAL	61	25.4
					FLORIDA KEYS TOTAL	240	100.0

Seventy-eight cases (33.0)[1] cannot be determined and are reported as missing data. Ex., OBS 1, TYVES (H), Appendix B.

7- Hull Material: four types of hull material which characterize DVs are: F (fiberglass), W (wood), S (steel), A (aluminum). Only 1 case is unreported. Ex., OBS 1, HULLMATL (F), Appendix B.

8- Vessel Length: estimated by FMP inspection and reported in feet (ft.), ranging from 10 to 108 ft. Ex., OBS 1, VESLENG (24), Appendix B.

9- Engine Onboard: estimated by FMP inspection, reported as Yes or No, and whether inboard or outboard if Yes. Twenty-two cases (9.0), mostly submerged and/or wrecked DVs, are unreported.

Impact on Locale

10- Potential Threat to Environment: reported as either Yes or No on the FMP form, with an explanatory note, including possible impact on mangroves, bottom grasses, and bay bottoms. In some cases, DVs possibly may contain fuel in tanks, either completely or partially submerged, that may contaminate water and threaten marine life. There is only 1 unreported case. Ex., OBS 1, ENTHREAT (N), Appendix B.

11- Potential Health Hazard: reported as either Yes or No on the FMP form, with an explanatory note, including hazards to children playing on DVs, openings in deck where people or children can fall through, and hazardous diving conditions. There are isolated cases where hazards may result from DVs breaking free and drifting under conditions of high winds and tides. There is only 1 unreported case. Ex., OBS 1, H_HAZARD (Y), Appendix B.

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[1]Figures in parenthesis are percentages unless stated otherwise.

12- Actual Obstruction or Potential Threat to Navigation: reported as either Yes or No on the FMP form, but must be qualified by perusal of coastal chart to determine degree and nature of threat. Actual obstructions to navigation include blocking navigable channels or obstructing access to docks. Potential threats include unlighted DVs in congested basins and along narrow channel wideners. There is only 1 un-reported case. Ex., OBS 1, NAVIGAT (N), Appendix B.

13- Actual Pollution: reported as Yes or No on the FMP form with explanatory note, including predominantly, vessel-derived flotsam, and occasionally, fuel oil in water. This is an actual condition, not a potential threat. There is only 1 unreported case. Ex., OBS 1, POLLUT (Y), Appendix B.

Removal Characteristics

14- Vessel Condition: description of DV status by FMP at time of last citation, but must be qualified by perusal of photographs, reported as: I (intact), P (partially broken-up), W (wrecked). Ex., OBS 1, VESLCOND (I), Appendix B.

15- Beached: reported for some cases as a vessel condition on the FMP report, but based mainly on photo inspection, and adjusted to mean low water (mlw) conditions (see Data Adjustments, below). Ex., OBS 1, BEACHED (N), Appendix B.

16- Afloat: reported for some DV cases as a vessel condition on the FMP report, but based mainly on photo inspection and adjusted to mlw conditions. Any DV afloat is considered not submerged (0.0), even though a portion of its hull may lie below the water surface. An afloat DV presents less severe restrictions in salvage and removal operations. Ex., OBS 1, AFLOAT (N), Appendix B.

17- Degree Submerged: reported as a percent of DV submerged, but qualified by photo inspection and adjusted to mlw conditions. Cases range from 0.0 to 100.0 (all 0.0 submerged cases are considered either beached or afloat). Ex., OBS 1, SUBMERGE (35), Appendix B.

18- Accessible by Sea: derived from depth of water (ft.) at DV site reported on the FMP form, adjusted to mlw, and expressed as Yes or No, where No is less than 3 ft. and is considered inaccessible because shallow water restricts salvage and removal operations, and where Yes is equal to or greater than 3 ft. and considered accessible because sufficient water depth is present to facilitate DV removal. Ex., OBS 1, DEPTH (N), Appendix B.

19- Accessible by Land: derived by chart inspection of DV site in relation to road access and expressed as Yes or No, where Yes signifies possible removal overland, and No means that removal may be possible only by water. Ex., OBS 1, LAND_ACC (Y), Appendix B.

Photographs 1-10 illustrate the types of DVs, their impact on locale and removal characteristics.

DATA ADJUSTMENTS

Information pertaining to DV conditions and location are reported by FMP officers using low, mid, or high tide conditions. Mean tidal range varies in the Florida Keys from 0.0 ft. to 2.0 ft. Adjustment for inconsistencies in reporting procedures and standardization to a common mean low water (mlw) datum is accomplished in this report in the following manner.

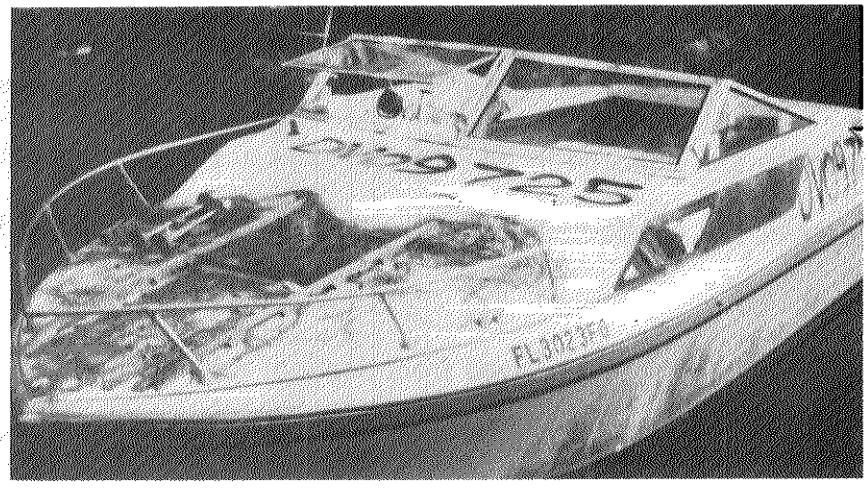

Photo 1. Recreation power DV, intact, obstructing navigable canal, considered health hazard since children may be injured playing on vessel, at Big Pine Key bayside.

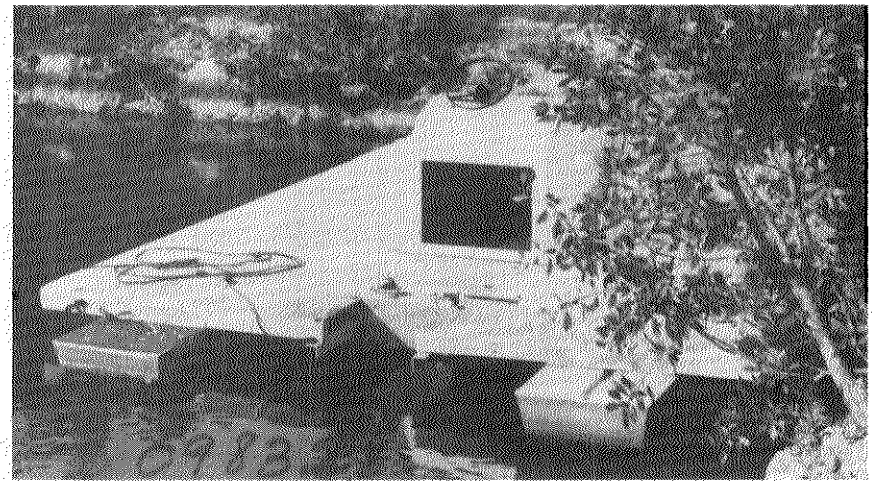

Photo 2. Float DV, intact, afloat, used as dock which may result in injuries, at Big Pine Key bayside.

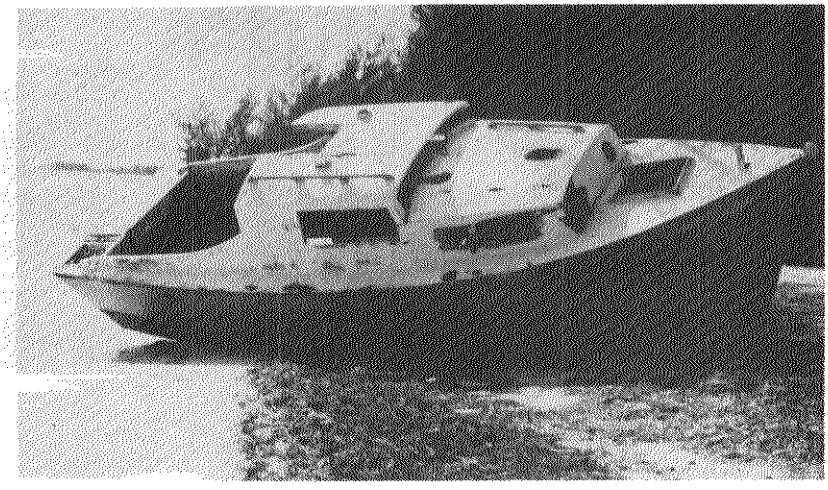

Photo 3. Sail DV, wood, beached, partially broken-up, at Coco Plum Beach.

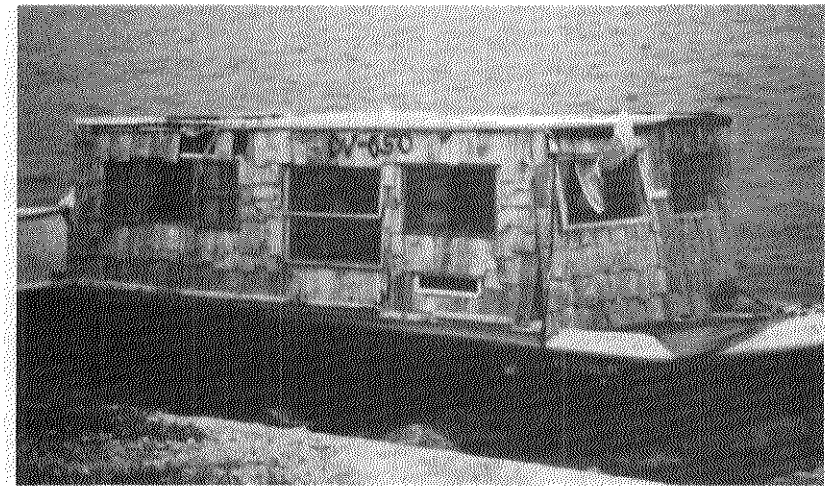

Photo 4. Houseboat DV, intact, accessible by land, creating flotsam, polluter, at Conch Keys bayside.

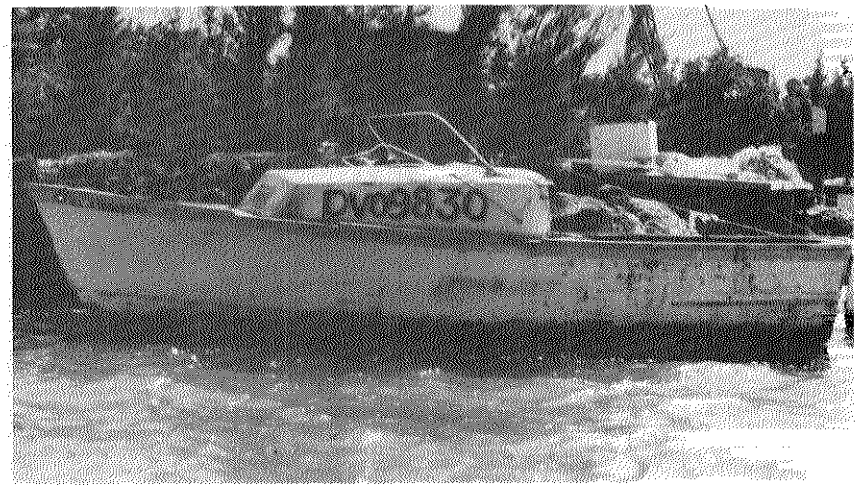

Photo 5. Fishing DV, afloat, navigation threat as may break adrift in channel, at Marathon bayside.

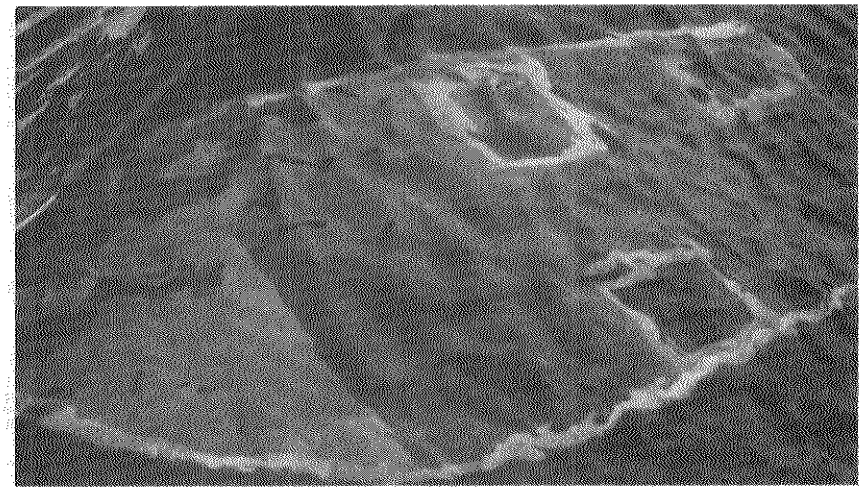

Photo 6. Completely submerged DV, 16' length, fiberglass, at Boot Key Harbor.

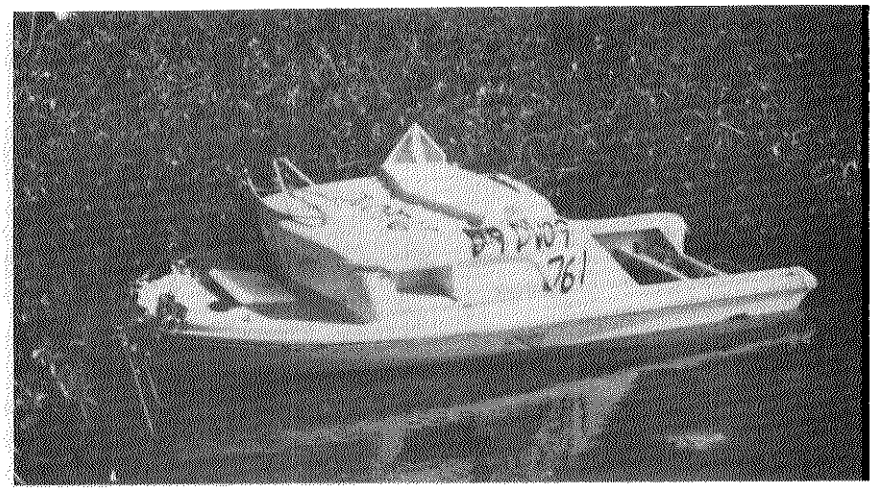

Photo 7. Fishing DV, on bay bottom damaging mangroves, threat to environment, at Sugarloaf Key oceanside.

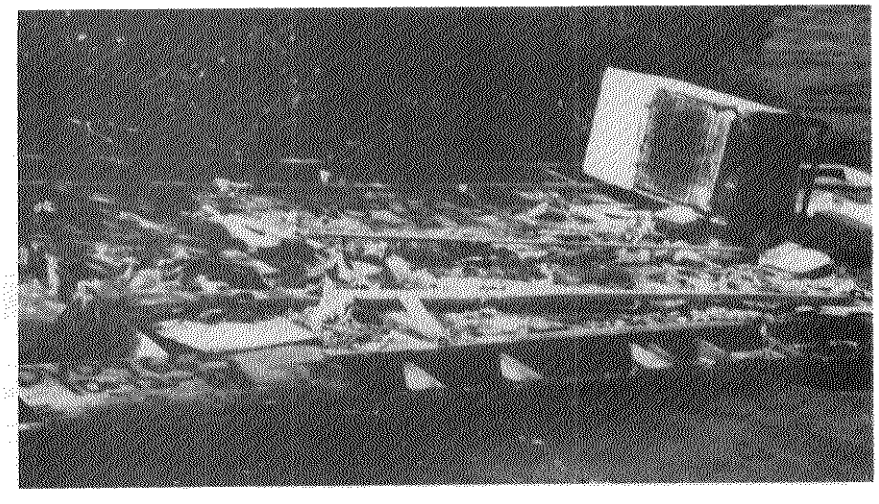

Photo 8. Barge DV, beached, polluter, potential threat to environment, at Islamorada bayside.

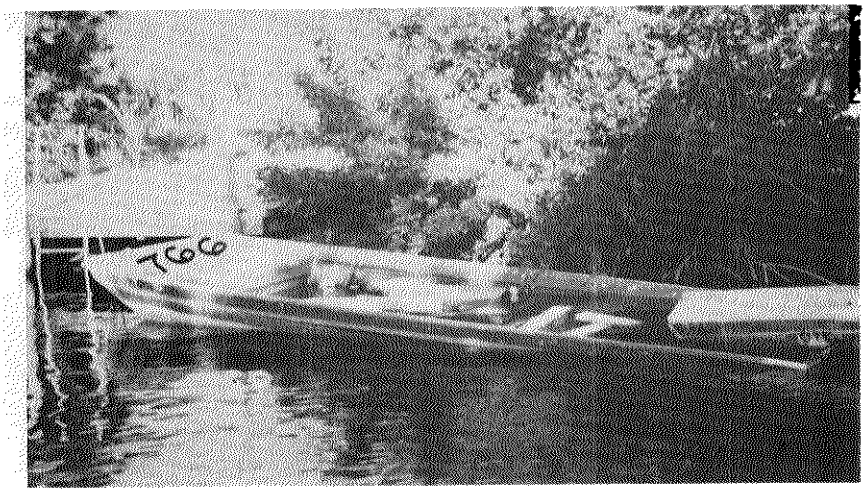

Photo 9. Fishing DV, afloat, aluminum shards constitute health hazard, canal obstruction creates navigation threat, at Little Torch Key bayside.

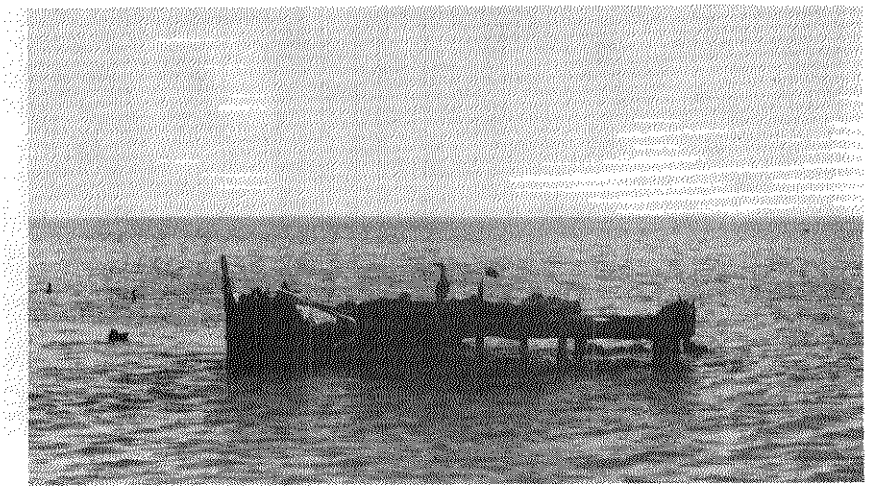

Photo 10. Steel DV, wrecked, at Boot Key Harbor.

1- Tide Tables are perused to determine the mean tidal range for central locations in the Florida Keys (Table 4).

2- All FMP reportings using mid and high tide values are adjusted using mean tidal range at cited locations (Table 4).

3- Water depth a surrogate for accessibility by sea (SEA_ACC), is adjusted for case reportings (Table 5).

4- Tidal adjustments are made also for the degree submerged (Table 1, variable 17), where mid and high tide conditions are reported. Values are diminished considering water depth and type of vessel. No change is made if degree submerged is reported for low tide condition. Adjustments are critical where a case is recorded completely submerged at mid or high tide, or where the DV is slightly more than half submerged at mid or high tide. Under these conditions, the DV can be re-classified from completely submerged (100.0), to less than completely submerged (50.0 to less than 100.0), or from less than completely submerged to partially submerged (greater than 1.0 to less than 50.0). These submerged nominal classes are used to determine degree of removal difficulty.

Table 4. Mean Tidal Range for Florida Keys Locations.

Region	Location	Mean Tidal Range (ft.)
Lower Keys	All	1.0
Middle Keys	Vaca/Grassy Keys, Hawk Channel	1.6
	Florida Bay	1.0
Upper Keys	Hawk Channel	2.0
	Florida Bay	0.0

Table 5. Standardization of Reported Water Depth to MLW Datum

Reported Tide Level*	Reported Water Depth	
	0.0 ft.	>0.0 ft.
HIGH	No Adjustment	Subtract entire Mean Tidal Range
MID	No Adjustment	Subtract 50% of Mean Tidal Range
LOW	No Adjustment	No Adjustment

* if tide level is not expected, mid-tide range is assumed.

MAPPING PROCEDURES

Compilation

Project maps are compiled from U.S. Geological Survey (USGS) and National Ocean Service (NOS) maps and aerial photographs. The regional (1:250,000) maps of the Florida Keys (Figures 1-4) are compiled from USGS-NOS maps, Key West (1972) and Miami (1988) and 7.5' quadrangles of the area. The Community Harbor map (1:5,000) and Boot Key Harbor map (1:12,000) are compiled from enlargements of 1981 NOS color aerial photographs using a Zoom Transferscope.

Siting

Each DV is sited on the 1:250,000 maps using the "x" chart marked location on the FMP report. Concentrations of DVs at Community Harbor, Holiday Isle bayside, Boot Key Harbor, and Boca Chica Channel oceanside, require larger-scale field mapping than is available from NOS charts. Large-scale DV sketch maps exists for Community Harbor and Boot Key Harbor and are replotted on the photo-controlled 1:5,000 and 1:12,000 base maps (Figures 5 and 6).

Thematic Mapping

A proportional symbol distribution method is used to represent DV locations in the Florida Keys (Figure 1). Individual DVs are represented by a single closed dot and identified by a number (1-240). A proportional circle is used where multiple DVs are situated close together and cannot be individually distinguished at the 1:250,000 scale. In these cases, the radius of the circle is proportional to the number of DVs. A listing of UF_ID numbers is provided for each multiple case.

High, medium and low removal priority and removal difficulty classes for individually distinguishable DV locations, are symbolized in Figures 2-6 as: high (asterisk), medium (square), low (dot). The relative frequency of class values for DV concentrations are shown by proportional circle diagrams.

VESSEL CHARACTERISTICS

Profile

Mean DV length is 27.9 ft. and 64.1 percent of all DVs are less than 30 ft. overall (25.8 less than 20 ft., 38.3 between 20 and 30 ft.). Eighty percent of the DVs are fishing type (54.3) and recreation power (25.3) vessels; the remainder consist of houseboat (11.1), sail (5.6), float (2.5) and barge (1.2) types. Most are either wood (49.8) or fiberglass (44.8) construction; steel (3.8) and aluminum (1.7) account for the remaining fraction. Three-quarters of all reportings indicate no engine (inboard/outboard) aboard (Table 6).

Location

The distribution of 240 DVs in the Florida Keys is shown in Figure 1 and listed in Table 3. Upper Keys accounts for 86 (35.7), Middle Keys for 93 (38.8), and the Lower Keys for 61 (25.4). A noteworthy characteristic is the clustered pattern: 3 locations, one in each of the above areas, account for 118 DVs (49.3). These concentrations, in descending order, are: 63 cases (26.3), Boot Key Harbor, Middle Keys; 34 cases (14.2), Community Harbor, Upper Keys; and 20 cases (8.3), Boca Chica Channel oceanside, Lower Keys.

Table 6. Vessel Profile.

Characteristic		Derelict Vessel Number	Percent
Length (ft.)	Less than 20	62	25.8
	20 - 29	92	38.3
	30 - 40	59	24.6
	more than 40	27	11.3
	Cases reported	**240**	**100.0**
Type	Recreational (power)	41	25.3
	Fishing	88	54.3
	Houseboat	18	11.1
	Sail	9	5.6
	Float	4	2.5
	Barge	2	1.2
	Cases reported	**162**	**100.0**
	Unreported	**78**	
Hull Material	Wood	119	49.8
	Fiberglass	107	44.8
	Steel	9	3.8
	Aluminum	4	1.7
	Cases reported	**239**	**100.0**
	Unreported	**1**	
Engine Onboard	Engine	53	24.2
	No engine	165	75.3
	Cases reported	**218**	**100.0**
	Unreported	**22**	

Impact

DVs may impact a site in 4 ways: potential threat to environment, potential health hazard, actual obstruction or potential threat to navigation, and actual pollution. Table 6 tallies the number of DV cases reporting impact by location in the Florida Keys.

There are 74 cases (31.0) of potential threat to the environment. The Lower Keys leads with 39 (52.7) reportings and principal locations are Boca Chica Channel (18 cases) and Cow Key (7 cases). The Upper Keys accounts for 29 (39.2) reportings; these include Community Harbor (14 cases) and Largo Sound (5 cases). The Middle Keys has only 6 dispersed cases (8.1).

Potential health hazards are reported in 20 cases (8.4); half are in the Middle Keys concentrated at Key Colony - Coco Plum. The Lower Keys accounts for 9 cases and there is a cluster at Big Pine Key bayside (4 cases).

Fifty-one cases (21.3) of actual or potential navigation hazards are reported for DVs in the Florida Keys. The Upper Keys accounts for 21 cases (41.2) and Community Harbor leads with 14 reportings. The Middle Keys has 16 cases (31.4) and Boot Key Harbor accounts for 9 cases. The Lower Keys includes 14 cases (27.5) with a cluster at Big Pine Key bayside (4 cases).

There are 55 cases (23.0) of actual pollution from DVs in the Florida Keys, 36 of which (66.5) come from the Upper Keys, principally Community Harbor (9 cases), Key Largo oceanside (7 cases), Largo Sound and Holiday Isle bayside (5 cases, each). Another 13 cases (23.6) are found in the Lower Keys, principally at Cow Key (5 cases).

Summaries of these findings are tallied in Table 6 as number of vessel reportings. These total 199, with 87 from Upper, 74 from Lower and 38 from Middle Keys

Table 7. Derelict Vessel Impact on Environment, Health, Navigation and Pollution.

Map Code	Location	Potential Threat to Environment		Potential Health Hazard		Actual Obstruction or Threat to Navigation		Actual Pollution		Number of Vessel Reportings +	Number of Derelict Vessels
1	Tarpon Basin		0		0		0		0	0	1
2	Largo Sound		5		0		0		5	10	6
3	Key Largo oceanside		1		0		1		7	9	14
4	Community Harbor		14		0		14		9	37	34
5	Plantation Key oceanside		0		0		1		0	1	1
6	Blackwater Sound		2		0		1		3	6	5
7	Buttonwood Sound		1		0		0		2	3	2
8	Card Sound Bridge		0		0		0		2	2	2
9	Snake Creek oceanside		0		0		0		0	0	2
10	Holiday Isle bayside		2		0		4		5	11	11
11	Islamorada oceanside		1		0		0		0	1	1
12	Islamorada bayside		1		0		0		1	2	2
13	Lower Matecumbe oceanside		2		0		0		2	4	3
14	Lower Matecumbe bayside		0		1		0		0	1	2
	UPPER KEYS SUBTOTAL	(39.2)	29	(5.0)	1	(41.2)	21	(66.5)	36	87	86
15	Long Key bayside		0		0		0		1	1	1
16	Conch Keys bayside		0		1		0		1	2	1
17	Conch Keys oceanside		0		1		0		0	1	1
18	Duck Key bayside		2		0		0		2	4	3
19	Duck Key oceanside		1		0		1		0	2	1
20	Grassy Key oceanside		1		0		1		0	2	3
21	Fat Deer Key bayside		0		1		2		0	3	3
22	Key Colony/Coco Plum		1		4		2		1	8	5
23	Vaca Key Bight oceanside		0		1		0		1	2	2
24	Marathon bayside		0		1		1		0	2	10
25	Boot Key Harbor		1		1		9		0	11	62
	MIDDLE KEYS SUBTOTAL	(8.1)	6	(50.0)	10	(31.4)	16	(10.9)	6	38	92
26	Bahia Honda Key bayside		1		0		0		0	1	1
27	Bahia Honda Key oceanside		1		0		0		0	1	2
28	Big Pine Key bayside		2		4		4		0	10	5
29	Big Pine Key oceanside		0		1		1		0	1	3
30	Little Torch Key bayside		1		1		1		0	3	4
31	Ramrod Key bayside		0		0		0		0	0	1
32	Summerland Key bayside		0		0		0		0	0	2
33	Summerland Key oceanside		2		1		1		1	5	2
34	Knockemdown Keys bayside		2		0		0		0	2	2
35	Sugarloaf Key oceanside		3		0		0		3	6	3
36	Boca Chica Channel oceanside		18		2		3		1	24	21
37	Cow Key		7		0		2		5	14	10
38	Garrison Bight		0		0		0		1	1	2
39	Jewfish Basin bayside		1		0		1		0	2	1
40	Christmas Tree Island		0		0		0		1	1	1
41	Northwest Channel		1		0		1		1	3	1
	LOWER KEYS SUBTOTAL	(52.7)	39	(45.0)	9	(27.5)	14	(23.6)	13	74	61
	FLORIDA KEYS TOTAL	(100.0)	74	(100.0)	20	(100.0)	51	(100.0)	55	199	239 *

* Frequency missing = 1

\+ Vessel reportings include multiple threats by a single derelict as well as cases of solitary threats.

locations. The largest number of reportings by location are for Community Harbor (37), Boca Chica Channel (24) and Cow Key (14). Vessel reportings include multiple threats by a single DV as well as cases of solitary threats.

Removal

The ability to remove a derelict vessel depends upon its accessibility and condition. Three accessibility types, unique to removal operations, are: accessible by land, accessible by sea, and neither accessible by land nor by sea. Examples of these respective situations are: a DV that can be removed using a bulldozer and truck, a DV situated in water deep enough to permit barge and towboat operations, and a DV far from land access and in water too shallow to permit barge and tow operations.

A derelict vessel in each accessibility type indicated above, may be found in one of several conditions, as beached, afloat, partially submerged, less than completely submerged, and fully submerged. Combinations of these two parameter sets are presented in Tables 8, 9 and 10.

Table 8 tallies 37 DVs accessible by land, as beached, afloat, partially submerged, less than completely submerged and completely submerged. These conditions, in most instances, are mutually exclusive. There are, however, 4 cases of beached DVs that register on the low end of the partially submerged class. UF_ID 159 at LOCAT 36 (Boca Chica Channel Oceanside) is an example.

Only 15 cases are beached and accessible by land. Half are in the Middle Keys. Concentrations are at Marathon bayside (4 cases) and Grassy Key oceanside (2 cases). Community Harbor, Upper Keys, has 2 beached DVs. There are only 5 afloat cases of land accessible DVs and 4 are situated in the Big Pine - Little Torch Keys area.

Table 8. Land Accessible Derelict Vessels.

Map Code	Location	Beached	Afloat	Partially Submerged (1 - 49%)	Less Than Completely Submerged (50 - 99%)	Completely Submerged (100%)	Case Totals by Location
1	Tarpon Basin	0	0	0	0	0	0
2	Largo Sound	0	0	0	0	0	0
3	Key Largo oceanside	0	0	0	0	0	0
4	Community Harbor	2	0	0	5	0	7
5	Plantation Key oceanside	0	0	0	0	0	0
6	Blackwater Sound	0	0	0	0	0	0
7	Buttonwood Sound	0	0	0	0	0	0
8	Card Sound Bridge	2	0	(2*) 0 (1+)	0	0	(2*) 2 (1+)
9	Snake Creek oceanside	0	0	0	0	0	0
10	Holiday Isle bayside	0	0	0	0	0	0
11	Islamorada oceanside	1	0	0	0	0	1
12	Islamorada bayside	0	0	0	0	0	0
13	Lower Matecumbe oceanside	1	0	0	0	0	1
14	Lower Matecumbe bayside	0	0	0	0	0	0
	UPPER KEYS SUBTOTAL	**6**	**0**	**(2*) 0 (1+)**	**5**	**0**	**(2*) 11 (1+)**
15	Long Key bayside	0	0	0	0	0	0
16	Conch Keys bayside	0	0	1	0	0	1
17	Conch Keys oceanside	0	0	0	0	0	0
18	Duck Key bayside	0	0	0	0	0	0
19	Duck Key oceanside	0	0	0	0	0	0
20	Grassy Key oceanside	2	0	0	0	0	2
21	Fat Deer Key bayside	0	0	0	0	0	0
22	Key Colony/Coco Plum	0	0	0	0	0	0
23	Vaca Key Bight oceanside	1	0	0	0	0	1
24	Marathon bayside	4	1 (1+)	(1*) 0	1 (1+)	0	(1*) 6 (2+)
25	Boot Key Harbor	0	0	0	1 (1+)	0	1 (1+)
	MIDDLE KEYS SUBTOTAL	**7**	**1 (1+)**	**(1*) 1**	**2 (2+)**	**0**	**(1*) 11 (3+)**
26	Bahia Honda Key bayside	0	0	0	0	0	0
27	Bahia Honda Key oceanside	1	0	(1*) 0	0	0	(1*) 1
28	Big Pine Key bayside	0	2 (1+)	0	1 (1+)	0	3 (2+)
29	Big Pine Key oceanside	0	1 (1+)	0	0	0	1 (1+)
30	Little Torch Key bayside	1	1 (1+)	1 (1+)	0	0	3 (2+)
31	Ramrod Key bayside	0	0	0	1 (1+)	0	1 (1+)
32	Summerland Key bayside	0	0	2	0	0	2
33	Summerland Key oceanside	0	0	0	0	0	0
34	Knockemdown Keys bayside	0	0	0	0	0	0
35	Sugarloaf Key oceanside	0	0	0	0	0	0
36	Boca Chica Channel oceanside	0	0	2	2	0	4
37	Cow Key	0	0	0	0	0	0
38	Garrison Bight	0	0	0	0	0	0
39	Jewfish Basin bayside	0	0	0	0	0	0
40	Christmas Tree Island	0	0	0	0	0	0
41	Northwest Channel	0	0	0	0	0	0
	LOWER KEYS SUBTOTAL	**2**	**4 (3+)**	**(1*) 5 (1+)**	**4 (2+)**	**0**	**(1*) 15 (6+)**
	FLORIDA KEYS TOTAL	**15**	**5 (4+)**	**(4*) 6 (2+)**	**11 (4+)**	**0**	**(4*) 37 (10+)**

(+) There are 10 derelict vessel cases which are both accessible by land and by sea (± 3'mlw depth): cases, 74, 127, 167, 180, 224, 227, 230, 231, 236, 237.
(*) There are 4 derelict vessel cases of both partially submerged and beached conditions.

Table 9. Sea Accessible Derelict Vessels.

Map Code	Location	Afloat		Partially Submerged (1-49%)		Less Than Completely Submerged (50-99%)		Completely Submerged (100%)	Case Totals by Location	
1	Tarpon Basin	0		1		0		0	1	
2	Largo Sound	0		0		4		0	4	
3	Key Largo oceanside	0		0		4		0	4	
4	Community Harbor	1		2		5		2	10	
5	Plantation Key oceanside	0		0		1		0	1	
6	Blackwater Sound	0		2		1		0	3	
7	Buttonwood Sound	0		0		1		0	1	
8	Card Sound Bridge	0		1	(1+)	0		0	1	(1+)
9	Snake Creek oceanside	0		0		0		0	0	
10	Holiday Isle bayside	1		1		2		1	5	
11	Islamorada oceanside	0		0		0		0	0	
12	Islamorada bayside	0		0		2		0	2	
13	Lower Metecumbe oceanside	0		0		0		0	0	
14	Lower Matecumbe bayside	0		0		0		0	0	
	UPPER KEYS SUBTOTAL	2		7	(1+)	20		3	32	(1+)
15	Long Key bayside	0		0		0		0	0	
16	Conch Keys bayside	0		0		0		0	0	
17	Conch Keys oceanside	0		1		0		0	1	
18	Duck Key bayside	0		0		0		0	0	
19	Duck Key oceanside	0		0		1		0	1	
20	Grassy Key oceanside	0		0		1		0	1	
21	Fat Deer Key bayside	0		0		3		0	3	
22	Key Colony/Coco Plum	0		1		2		0	3	
23	Vaca Key Bight oceanside	0		0		0		0	0	
24	Marathon bayside	2	(1+)	1		1	(1+)	0	4	(2+)
25	Boot Key Harbor	1		3		10	(1+)	1	15	(1+)
	MIDDLE KEYS SUBTOTAL	3	(1+)	6		18	(2+)	1	28	(3+)
26	Bahia Honda Key bayside	0		0		0		0	0	
27	Bahia Honda Key oceanside	0		0		1		0	1	
28	Big Pine Key bayside	1	(1+)	0		2	(1+)	1	4	(2+)
29	Big Pine Key oceanside	2	(1+)	0		0		0	2	(1+)
30	Little Torch Key bayside	1	(1+)	1	(1+)	0		0	2	(2+)
31	Ramrod Key bayside	0		0		1	(1+)	0	1	(1+)
32	Summerland Key bayside	0		0		0		0	0	
33	Summerland Key oceanside	0		1		0		0	1	
34	Knockemdown Keys bayside	0		1		0		0	1	
35	Sugarloaf Key oceanside	0		0		0		0	0	
36	Boca Chica Channel oceanside	0		0		1		1	2	
37	Cow Key	0		1		0		0	1	
38	Garrison Bight	0		0		1		0	1	
39	Jewfish Basin bayside	0		1		0		0	1	
40	Christmas Tree Island	0		0		0		0	0	
41	Northwest Channel	0		0		0		0	0	
	LOWER KEYS SUBTOTAL	4	(3+)	5	(1+)	6	(2+)	2	17	(6+)
	FLORIDA KEYS TOTAL	9	(4+)	18	(2+)	44	(4+)	6	77	(10+)

(+) There are 10 derelict vessel cases which are both accessible by sea (±3'mlw depth) and accessible by land: cases 74, 127, 167, 180, 224, 227, 230, 231, 236, 237.

Table 10. Non-Accessible Derelict Vessels.

Map Code	Location	Beached	Afloat	Partially Submerged (1-49%)	Less Than Completely Submerged (50-99%)	Completely Submerged (100%)	Case Totals by Location
1	Tarpon Basin	0	0	0	0	0	0
2	Largo Sound	1	0	1	0	0	2
3	Key Largo oceanside	4	0	2	4	0	10
4	Community Harbor	0	0	3	13	1	17
5	Plantation Key oceanside	0	0	0	0	0	0
6	Blackwater Sound	0	0	0	2	0	2
7	Buttonwood Sound	0	0	0	1	0	1
8	Card Sound Bridge	0	0	0	0	0	0
9	Snake Creek oceanside	1	0	1	0	0	2
10	Holiday Isle bayside	2	0	2	2	0	6
11	Islamorada oceanside	0	0	0	0	0	0
12	Islamorada bayside	0	0	0	0	0	0
13	Lower Matecumbe oceanside	1	0	1	0	0	2
14	Lower Matecumbe bayside	0	0	1	1	0	2
	UPPER KEYS SUBTOTAL	**9**	**0**	**11**	**23**	**1**	**44**
15	Long Key bayside	1	0	0	0	0	1
16	Conch Keys bayside	0	0	0	0	0	0
17	Conch Keys oceanside	0	0	0	0	0	0
18	Duck Key bayside	0	3	0	0	3	3
19	Duck Key oceanside	0	0	0	0	0	0
20	Grassy Key oceanside	0	0	0	0	0	0
21	Fat Deer Key bayside	0	0	0	0	0	0
22	Key Colony/Coco Plum	1	0	1	0	0	2
23	Vaca Key Bight oceanside	1	0	0	0	0	1
24	Marathon bayside	1	0	1	0	0	2
25	Boot Key Harbor	0	9	21	15	3	48
	MIDDLE KEYS SUBTOTAL	**4**	**12**	**23**	**15**	**3**	**57**
26	Bahia Honda Key bayside	0	0	0	1	0	1
27	Bahia Honda Key oceanside	0	0	0	0	0	0
28	Big Pine Key bayside	0	0	0	0	0	0
29	Big Pine Key oceanside	0	1	0	0	0	1
30	Little Torch Key bayside	1	0	0	0	0	1
31	Ramrod Key bayside	0	0	0	0	0	0
32	Summerland Key bayside	0	0	0	0	0	0
33	Summerland Key oceanside	0	0	1	0	0	1
34	Knockemdown Keys bayside	0	0	1	0	0	1
35	Sugarloaf Key oceanside	0	0	2	1	0	3
36	Boca Chica Channel oceanside	3	0	10	2	0	15
37	Cow Key	1	0	4	4	0	9
38	Garrison Bight	0	0	1	0	0	1
39	Jewfish Basin bayside	0	0	0	0	0	0
40	Christmas Tree Island	0	0	1	0	0	1
41	Northwest Channel	0	0	1	0	0	1
	LOWER KEYS SUBTOTAL	**5**	**1**	**21**	**8**	**0**	**35**
	FLORIDA KEYS TOTAL	**18**	**13**	**55**	**46**	**4**	**136**

Six land accessible DV cases report partially submerged conditions and 5 are in the Lower Keys, at Summerland Key bayside (2), Boca Chica Channel oceanside (2) and at Little Torch Key bayside (1).

There are 11 cases of less than completely submerged DVs accessible by land and the largest single concentration is at Community Harbor (5 cases); Boca Chica Channel, Lower Keys has 2 cases. No completely submerged land accessible cases are reported.

Table 9 lists 77 DVs accessible by sea, in water depths 3 ft. or greater (mlw), as afloat, partially submerged, less than completely submerged and completely submerged. Overall case sums are 9 afloat, 18 partially submerged, 44 less than completely submerged and 6 completely submerged. Note that 10 DV cases are accessible by land and by sea (Tables 8 and 9, footnote). It can be assumed that the remainder (240 total - 37 land accessible - 77 sea accessible + 10 accessible by land and by sea) consists of 136 shallow water cases situated in water less than 3 ft. deep (mlw). These shallow water sited DVs include 18 beached, 13 afloat, 55 partially submerged, 46 less than completely submerged and 4 completely submerged cases (Table 10). Concentrations occur at Boot Key Harbor (48), Community Harbor (17) and Boca Chica Channel oceanside (15).

PRIORITIZING SCHEME

Indexing

The principal objective of this study is to derive site ratings of removal priority and removal difficulty for DVs in the Florida Keys. The ratings are based on numerical indices, oftentimes referred to as parametric indices, which are computed from scores assigned to vessel attributes related to environmental quality, navigation and access-

ibility. Numerical indices have been applied by scientists for many years but their utility has become enhanced recently with the proliferation of computers, the development of geographic information systems and the creation of geo-coded data bases (Riquier, 1974; McRae and Burnham, 1981; Burrough, 1986; Davidson, 1986). These indices, however, have not been applied, heretofore, to vessel siting and classification.

Standard site evaluation methodology is applied in the computation of the indices: identification of vessel characteristics relevant to environmental quality and vessel removal procedures, classification of ranges of values of vessel characteristics, selection of a model for index computation, definition of scores to be assigned to classes, computation of index values, conversion of numerical index values to nominal ratings, cartography of ratings. The computations and conversion to nominal ratings were performed on the University of Florida mainframe computer using the Statistical Analysis System (SAS, 1983).

Removal Priority Index

The Removal Priority Index, R, is derived from four impact variables listed above in Table 1.

Impact Variable	Number in Table 1
Potential threat to environment	10
Potential health hazard	11
Actual obstruction or potential threat to navigation	12
Actual pollution	13

Index values are computed from scores which were related on the basis of consultation with the Monroe County Sea Grant Extension Director. The scores are related to the relative importance of each impact variable. The index value ranges from

1.0 which represents maximum priority for removal to 0.0 which symbolizes the lowest priority. The algorithm for index computation is described as follows:

If d = 1, then R = 1,

else R = a + b + c

where:

R = removal priority index

a = potential threat to environment

b = potential health hazard

c = obstruction to navigation

d = actual water pollution

The appropriate scoring system is:

Variable	Yes	No
Potential threat to environment	0.4	0.0
Potential health hazard	0.4	0.0
Obstruction to navigation	0.2	0.0
Actual water pollution	1.0	0.0

The values of R are converted into nominal removal priority ratings (high, medium, low) as follows:

Score	Rating
1.0	High
0.8	High
0.6	Medium
0.4	Medium
0.2	Low
0.0	Low

The number of cases reported for each strata in the three nominal priority ratings are listed in Table 11.

Removal Difficulty Index

The five characteristics considered for the removal difficulty index are:

Removal Characteristics	Number in Table 1
Beached	15
Afloat	16
Degree submerged	17
Accessible by sea	18
Accessible by land	19

On the basis of information provided by the Monroe County Sea Grant Extension Director, 14 scenarios were defined and ranked in decreasing order of removal difficulty as illustrated in Table 12. The scenarios were subsequently classified into 3 nominal classes of removal difficulty. The class of low removal difficulty consists of DVs with the land access. Vessels in the moderate class are only accessible by sea. The high removal difficulty class is composed of vessels with neither land nor sea access.

Each scenario was assigned a specific value of removal difficulty index D. The value of this index ranges from 1.00 which represents maximum difficulty of removal to 0.00 which symbolizes least difficulty. The numerical index values were selected for future refinements of methodology. A salvaging company might be prepared to face the cost of derelict vessel retrieval if it has relatively high scrap value. Consequently, the numerical value of index D could be decreased by an appropriate amount for such vessels. This simple cost/benefit adjustment might, in some cases, lead to re-classification of the derelict vessel into a more favorable nominal priority class e.g. from

Table 11. Number of Derelict Vessels by Strata in Three Nominal Removal Priority Classes.

Nominal Priority of Class R	Value	Potential Threat to Environment	Hazard	Potential Health to Navigation	Obstruction Water Pollution	Actual of Cases	Number Totals		
High	1.0		Y*	-	-		Y	24	
(0.7-1.0) 1.0	-		-	-	Y		20		
	1.0		-	-	Y		Y	4	
	1.0		Y	-	Y		Y	4	
	0.8		Y	Y	-		-	3	
	1.0		Y	Y	Y		Y	2	
	1.0		-	Y	-		Y	1	
	1.0		Y	Y	Y		-	1	
									59
Medium 0.4	Y		-	-	-		33		
(0.3-0.7) 0.4	-		Y	-	-		7		
	0.6		Y	-	Y		-	7	
	0.6		-	Y	Y		-	6	
									53
Low	0.2		-	-	Y		-	27	
(0.0-0.3) 0.0	-		-	-	-		101		
									128
									240

*Y= Yes response

Table 12. Number of Derelict Vessels by Strata in Three Nominal Difficulty of Removal Classes.

Nominal Priority Class	Value of D	Land Access	Beached	Afloat	Sea Access (Water 3')	Degree Submerged (%)	Number of Cases	Totals
High	1.00	N	Y		N	0	18	
(0.7-1.0)	0.95	N			N	1 - 49	57	
	0.90	N			N	50 - 99	47	
	0.85	N			N	100	04	
	0.80	N		Y	N	0	10	
								136
Moderate	0.60	N			Y	100	06	
(0.25-0.7)	0.50	N			Y	50 - 99	40	
	0.40	N			Y	1 - 49	16	
	0.30	N		Y	Y	0	05	
								67
Low	0.20	Y				100	00	
(0.0-0.25)	0.15	Y				50 - 99	11	
	0.10	Y				1 - 49	10	
	0.05	Y		Y		0	05	
	0.00	Y	Y			0	11	
								37

moderate to low.

Results

Removal priority ratings (high, medium, low) are listed for each location in Table 13 and plotted for each DV in Figure 2. DVs rated high priority, having the greatest impact or threat to people and the environment, are concentrated at Key Largo (9 at Community Harbor, 7 at Key Largo oceanside). DVs rated medium priority are clustered at Boca Chica Channel (15) and also at Community Harbor (9). The largest low priority rated DV concentrations are at Boot Key Harbor (61), Community Harbor (16), Key Largo oceanside (7), and Marathon bayside (9).

Removal difficulty ratings (high, medium, low) are listed in Table 14 for each location. The map in Figure 3 identifies removal difficulty for each DV. Over half (56.7) of all DVs rate a high score. The pattern is fairly evenly distributed over the Upper (32.4), Middle (41.9) and Lower (25.7) Keys. Most DVs in the Key Largo area (17 at Community Harbor, 10 at Key Largo oceanside) and those at Boca Chica (15) in the Lower Keys rate high difficulty of removal. Most DVs in Boot Key Harbor (48 out of 63) rate high removal difficulty but their removal priority ratings are low.

Community Harbor, with 34 derelict vessels and 37 reported vessel impacts on environment, health, navigation and pollution, is the worst case scenario in the Florida Keys. A site assessment is mapped at large-scale (1:5,000) in Figure 5. DVs ring the harbor: greatest concentrations are along the mangrove western shore and adjacent to Campbell's Marina in the southeast (Map A). Over one-half are medium to high removal priority vessels (Map B): 25 percent are actual polluters and 38 percent pose environmental and navigation hazards. Community Harbor presents a dilemma since 50 percent of the DVs are rated high and 29 percent are medium in removal difficulty; only

Table 13. Removal Priority Ratings at Derelict Vessel Locations.

Map Code	Location	Removal Priority Ratings: High		Medium		Low		Case Totals by Location	
1	Tarpon Basin	-		-		1		1	
2	Largo Sound	5		1		-		6	
3	Key Largo oceanside	7		-		7		14	
4	Community Harbor	9		9		16		34	
5	Plantation Key oceanside	-		-		1		1	
6	Blackwater Sound	3		-		2		5	
7	Buttonwood Sound	2		-		-		2	
8	Card Sound Bridge	2		-		-		2	
9	Snake Creek oceanside	-		-		2		2	
10	Holiday Isle bayside	5		1		5		11	
11	Islamorada oceanside	-		1		-		1	
12	Islamorada bayside	3		-		1		4	
13	Lower Matecumbe oceanside	-		1		-		1	
14	Lower Matecumbe bayside	-		1		1		2	
	UPPER KEYS SUBTOTAL	(61.0) **36**		(26.4) **14**		(28.1) **36**		**86**	(35.8)
15	Long Key bayside	1		-		-		1	
16	Conch Keys bayside	1		-		-		1	
17	Conch Keys oceanside	-		1		-		1	
18	Duck Key bayside	2		-		1		3	
19	Duck Key oceanside	-		1		-		1	
20	Grassy Key oceanside	-		1		2		3	
21	Fat Deer Key bayside	-		1		2		3	
22	Key Colony/Coco Plum	1		3		1		5	
23	Vaca Key Bight oceanside	1		1		-		2	
24	Marathon bayside	-		1		9		10	
25	Boot Key Harbor	-		2		61		63	
	MIDDLE KEYS SUBTOTAL	(10.2) **6**		(20.8) **11**		(59.4) **76**		**93**	(38.8)
26	Bahia Honda Key bayside	-		1		-		1	
27	Bahia Honda Key oceanside	-		1		1		2	
28	Big Pine Key bayside	2		2		1		5	
29	Big Pine Key oceanside	-		1		2		3	
30	Little Torch Key bayside	-		2		2		4	
31	Ramrod Key bayside	-		-		1		1	
32	Summerland Key bayside	-		-		2		2	
33	Summerland Key oceanside	1		1		-		2	
34	Knockemdown Keys bayside	-		2		-		2	
35	Sugarloaf Key oceanside	4		-		-		4	
36	Boca Chica Channel oceanside	2		15		3		20	
37	Cow Key	5		2		3		10	
38	Garrison Bight	1		-		1		2	
39	Jewfish Basin bayside	-		1		-		1	
40	Christmas Tree Island	1		-		-		1	
41	Northwest Channel	1		-		-		1	
	LOWER KEYS SUBTOTAL	(28.8) **17**		(52.8) **28**		(12.5) **16**		**61**	(25.4)
	FLORIDA KEYS TOTAL	**59**	(24.6)	**53**	(22.1)	**128**	(53.3)	**240**	(100.0)

Table 14. Removal Difficulty Ratings at Derelict Vessel Locations.

Map Code	Location	Priority of Removal Ratings: High		Medium		Low		Case Totals by Location	
1	Tarpon Basin		-		1		-	1	
2	Largo Sound		2		4		-	6	
3	Key Largo oceanside		10		4		-	14	
4	Community Harbor		17		10		7	34	
5	Plantation Key oceanside		-		1		-	1	
6	Blackwater Sound		2		3		-	5	
7	Buttonwood Sound		1		1		-	2	
8	Card Sound Bridge		-		-		2	2	
9	Snake Creek oceanside		2		-		-	2	
10	Holiday Isle bayside		6		5		-	11	
11	Islamorada oceanside		-		-		1	1	
12	Islamorada bayside		2		2		-	4	
13	Lower Matecumbe oceanside		-		-		1	1	
14	Lower Matecumbe bayside		2		-		-	2	
	UPPER KEYS SUBTOTAL	(32.4)	44	(46.3)	31	(29.7)	11	86	(35.8)
15	Long Key bayside		1		-		-	1	
16	Conch Keys bayside		-		-		1	1	
17	Conch Keys oceanside		-		1		-	1	
18	Duck Key bayside		3		-		-	3	
19	Duck Key oceanside		-		1		-	1	
20	Grassy Key oceanside		-		1		2	3	
21	Fat Deer Key bayside		-		3		-	3	
22	Key Colony/Coco Plum		2		3		-	5	
23	Vaca Key Bight oceanside		1		-		1	2	
24	Marathon bayside		2		2		6	10	
25	Boot Key Harbor		48		14		1	63	
	MIDDLE KEYS SUBTOTAL	(41.9)	57	(37.3)	25	(29.7)	11	93	(38.8)
26	Bahia Honda Key bayside		1		-		-	1	
27	Bahia Honda Key oceanside		-		1		1	2	
28	Big Pine Key bayside		-		2		3	5	
29	Big Pine Key oceanside		1		1		1	3	
30	Little Torch Key bayside		1		-		3	4	
31	Ramrod Key bayside		-		-		1	1	
32	Summerland Key bayside		-		-		2	2	
33	Summerland Key oceanside		1		1		-	2	
34	Knockemdown Keys bayside		1		1		-	2	
35	Sugarloaf Key oceanside		3		-		1	4	
36	Boca Chica Channel oceanside		15		2		3	20	
37	Cow Key		9		1		-	10	
38	Garrison Bight		1		1		-	2	
39	Jewfish Basin bayside		-		1		-	1	
40	Christmas Tree Island		1		-		-	1	
41	Northwest Channel		1		-		-	1	
	LOWER KEYS SUBTOTAL	(25.7)	35	(16.4)	11	(40.5)	15	61	(25.4)
	FLORIDA KEYS TOTAL		136 (56.7)		67 (27.9)		37 (15.4)	240	(100.0)

7 DVs (21) are easy to remove. Map C shows the locations of vessels characterized by low removal difficulty adjacent to Campbell's Marina and clustered in an embayment in the mangroves on the south coast. Map D focuses on the 9 high priority DVs and classifies their difficulty of removal.

Boot Key Harbor, with 63 derelict vessels, has the largest concentration of all sites in the Florida Keys. Figure 6 maps this site assessment at large-scale (1:12,000). DVs are situated in the inner, eastern harbor near the old Colpac Fisheries docks, in the mangroves adjoining the canal leading to Becher Marine, and on Boot Key's north shore on both sides of the bascule bridge. There are fewer DVs in the outer western harbor (Map A). Sixty-one vessels are typed low removal priority since they have limited impact on the environment, health and navigation (Map B). However, many of these are a visual blight on the seascape, particularly in the inner harbor. They are used periodically as shelters by street people. Most DVs are either moderate to high removal difficulty (Map C).

CONCLUSIONS

The site indexing method, application and results provide a basis for developing a two-step approach to derelict vessel removal in the Florida Keys.

Step 1 prioritizes DV removal based on impact or threat to people and the environment. Four parameters are scaled with maximum value assigned to actual water pollution, intermediate value to health hazard and environmental threat, and least value to obstruction to navigation. The combined score of the four parameter set represents the removal priority index value (R) for each DV, which is converted into high, medium, low nominal ratings.

Results of Step 1 analysis indicate:

l- 128 DVs (53.3) rate a low priority; these may be eliminated from further consideration.

2- 53 cases (22.1) rate medium priority; these may be considered for removal at a later date.

3- 59 cases (24.6) are top priority rated and should be the focus of immediate efforts to clean up the environment and reduce hazards to people and navigation.

An important consideration in any vessel removal program is the determination of ease or difficulty of removal. The removal difficulty index uses 5 parameters related to accessibility and degree of submergence to scale high, medium and low difficulty. The removal difficulty index is a rough surrogate for removal cost: low difficulty equates with low cost and high difficulty with high cost.

Results of Step 2 analysis provide a means for narrowing down the process of removal selection. Roughly half of the 59 top priority cases are rated low to moderate in removal difficulty. The other half are difficult to remove (Table 15). Budget

Table 15. Removal Priority - Difficulty Matrix.

Removal Priority Ratings	Removal Difficulty Ratings High	Medium	Low	Totals
High	30	21	8	59
Medium	28	11	14	53
Low	78	35	15	128
TOTALS	**136**	**67**	**37**	**240**

restrictions may limit removal to a relatively small number. Selecting DVs from the low to moderate end of the removal difficulty scale may increase the number of DVs that can be removed, thus widening the scale of removal operations and maximizing the impact.

Table 16 lists the high removal priority vessels by difficulty class and by location. The map in Figure 4 plots the 59 DV high priority cases. This information provides for additional planning options, namely, ability to focus removal operations on specific areas where high priority DV concentrations are situated, such as Key Largo, or to selectively target individual DVs at various, specific locations.

RECOMMENDATIONS

This report summarizes an initial test of a DV siting and removal rating scheme. There are a number of improvements that should be made in future applications.

1- Redundancies in answers to questions on the FMP form, e.g., actual pollution, threat to environment, health hazard, can be eliminated by providing FMP officers with answer keys.

2- Questions on beached, afloat, water depth and degree of submergence should be answered using a standard datum, mlw.

3- DV siting can be made more precise, especially at locations where DV concentrations are found, by using large-scale aerial photographs to fix vessel location. Latitude-longitude reckoning, in degrees, minutes and seconds with provision for recording tenths and hundredths of seconds, should be adopted so that DNR reports can be linked to the NOS Automated Wreck and Obstruction Information System (AWOIS). The latter system provides a basis for updating the nation's hydrographic charts. There is no link between NOS and DNR systems at present, and, as a result, valuable DV

Table 16. Derelict Vessels With a High Priority of Removal Rated by Removal Difficulty.

Map Code	Location	Derelict Vessel (UF) I.D. Number	Removal Difficulty: High		Medium		Low		Case Totals by Location	
1	Largo Sound	105			M					
		106			M					
		107			M					
		108	H							
		110			M				5	
3	Key Largo oceanside	96	H							
		99	H							
		109			M					
		112			M					
		113			M					
		114	H							
		115	H						7	
4	Community Harbor	131	H							
		133			M					
		134			M					
		135	H							
		136	H							
		137	H							
		138	H							
		139			M					
		140			M				9	
6	Blackwater Sound	120	H							
		121	H							
		122			M				3	
7	Buttonwood Sound	123	H							
		125			M				2	
8	Card Sound Bridge	127					L			
		128					L		2	
10	Holiday Isle bayside	80	H							
		81			M					
		83	H							
		85	H							
		90			M				5	
12	Islamorada bayside	4			M					
		78	H							
		79	H						3	
	UPPER KEYS SUBTOTAL		(60.0)	18	(76.2)	16	(25.0)	2	36	(61.0)
15	Long Key bayside	63	H						1	
16	Conch Keys bayside	1					L		1	
18	Duck Key bayside	29	H							
		30	H						2	
22	Key Colony/Coco Plum	56			M				1	
23	Vaca Key Bight oceanside	32					L		1	
	MIDDLE KEYS SUBTOTAL		(10.0)	3	(4.8)	1	(25.0)	2	6	(10.2)
28	Big Pine Key bayside	62			M					
		74					L		2	
33	Summerland Key oceanside	57			M				1	
35	Sugarloaf Key oceanside	157	H							
		163	H							
		164	H							
		162					L		4	
36	Boca Chica Channel oceanside	71					L			
		72					L		2	
34	Cow Key	87	H							
		88	H							
		102	H							
		124			M					
		126	H						5	
38	Garrison Bight	129			M				1	
40	Christmas Tree Island	111	H						1	
41	Northwest Channel	97	H						1	
	LOWER KEYS SUBTOTAL		(30.0)	9	(19.0)	4	(50.0)	4	17	(28.8)
	FLORIDA KEYS TOTAL			30 (50.8)		21 (35.6)		8 (13.6)	59	(100.0)

information on obstructions to navigation in Florida waters is unavailable for chart correcting purposes.

4- Information on vessel characteristics can be made more precise in determining removal costs. Condition criteria should be standardized: intact, partially broken-up, wrecked, or similar descriptive terms, should be explicitly defined in the report and not left solely to photo inspection. Type of vessel and vessel specifications (length, beam, draft) should be included to aid in estimating gross tonnage. Bulk, weight and condition of DV are key elements in estimating removal cost.

5- A question should be added to the FMP form to determine DV impact on the visual seascape. Maintenance of scenic beauty, important in recreation destination areas and nature preserves, can be seriously blighted by DVs without their contributing to actual water pollution or threatening the environment. We surmise this is the case at Boot Key Harbor where the largest DV concentration is situated in close proximity to a wildlife sanctuary, residential and boating communities.

6- Form revisions, as recommended above, should be pretested at various locations to assure proper coverage of local conditions throughout Florida.

7- Adoption of standardized reporting procedures statewide by FMP personnel can be facilitated by in-service training using the FSG extension program.

8- The removal difficulty index could be developed into a cost of removal index but this will require additional information from other sources, as salvagers, waste collectors, municipal and county public works departments. Costs will vary statewide because of local conditions. Disposal problems, unique to the Florida Keys, as limited landfill, shallow water restrictions, and land access restrictions along Highway U.S. 1, are

examples. Statewide applications of a cost removal index should reflect such regional disparities.

9- Finally, DVs are situated in a dynamically changing environment subject to the natural forces of coastal erosion and deposition. Storm occurrence may dramatically affect the DV inventory of a given area by removing some vessels and creating others. A DV siting program should be an ongoing process where periodic updating of the inventory incorporates changes in condition and location of existing DVs, addition of new wrecks and deletion of those eliminated by removal operations. Such a planned approach can aid in safeguarding Florida's unique coastal habitat.

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APPENDIX A: SAMPLE DATA FORM
Florida Department of Natural Resources
Division of Law Enforcement
Derelict Vessel Report

Derelict Vessel # _____
Date _____

FMP District _____ County _____ Chart Code No. _____

I. Description of Vessel
Registry Number _____
Vessel's Owner _____ Vessel's Name _____
Address _____ Approx. Length _____ Approx. Width _____
City _____ Hull Material _____
Motor: Yes _____ No _____ Type: Inboard _____ Outboard _____

II. Condition and Location of Vessel
Vessel Condition: Stored _____ Wrecked _____ Junked _____ Abandoned _____ Dismantled _____
Water Depth _____ ft. Permit granted for abandonment? Yes ____ No ____
By Whom? _____
Degree Submerged _____ at _____ tide level
Vessel Location: (a) Upon public waters at _____ (b) at a port which is located at _____. If at a port, has the agency having jurisdiction given consent? _____ (c) at a private dock which is located at _____. If docked at private property, has the owner given consent? _____ Name/Address of Owner _____
_____.

III. Vessel's Effect on Environment/Navigation
A. Obstructs or threatens to obstruct navigation? Yes ____ No ____ How? _____
_____
B. Contributes to air pollution? Yes ____ No ____ How? _____
_____
C. Contributes to water pollution? Yes ____ No ____ How? _____
_____
D. Constitutes a danger or a potential danger to the environment? Yes ____ No ____ In what way? _____
_____
E. Constitutes a potential health hazard? Yes ____ No ____ Type or nature of hazard? _____
_____

IV. Vessel's Removal
Can it be towed without repair? Yes ____ No ____ Recommend Disposition: (a) Landfill _____
(b) Artificial Reef _____ (c) Leave as is for marine habitat _____ Estimated cost of removal _____

V. ***NOTE: TAKE AT LEAST TWO (2) COLOR PHOTOGRAPHS OF VESSEL FOR SUBMISSION ALONG WITH THIS REPORT. MARK THE PHOTOGRAPHS WITH THE DATE, TIME, PLACE AND SIGNATURE/TITLE OF THE PHOTOGRAPHER.

VI. COMMENTS (Use additional page if necessary) _____
_____
_____
_____

_____ _____
Investing Officer & ID # District Captain Date

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FLORIDA DEPARTMENT OF NATURAL RESOURCES
Division of Law Enforcement

01 Page of Pages

1. Date

2. Originating Office

3. 10-29 CHECK ☐ POS ☐ NEG 4. OTHER AGENCY CASE NUMBERS 5. FMP CASE/COMPLAINT NUMBER

6. INFORMATION TOPIC

7. INFORMATION HAS BEEN RECEIVED THAT:

ADMINISTRATIVE INFORMATION BELOW FOR FLORIDA MARINE PATROL USE ONLY

8. SOURCE NAME OR NUMBER 9. DATE AND TIME INFORMATION RECEIVED

10. SOURCE ADDRESS

11. SIGNATURE OF OFFICER RECEIVING INFORMATION 12. REVIEWING OFFICER(S) DATE

13. INFORMATION EVALUATION
☐ RELIABLE ☐ PLAUSIBLE ☐ IMPROBABLE
☐ CLOSE ☐ INDEX

14. INVESTIGATION RECOMMENDATION
☐ IMMEDIATE ☐ NORMAL ☐ OPEN

15. CASE ASSIGNED TO:

16. ASSIGNED BY: DATE

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APPENDIX B: DATA LISTING

OBS	UF ID	DNR ID	ENTHREAT	HAZARD	NAVIGAT	POLLUT	BEACHED	SUBMERGE	AFLOAT	DEPTH	LAND ACC	TYVES	HULLMAT	VESLENG	VESLCOND	HOMEPORT	ENGABRD	MONTH	DAY	YEAR	LOCAT	R	RP	D	DR
1	1	9650	N	Y	N	Y	N	35	N	2	Y	H	F	24	I	M	N	6	2	88	16	1.0	H	0.10	L
2	2	9169	N	N	Y	N	N	50	N	2	N	F	W	36	P	M	Y	0	28	81	25	0.2	L	0.90	H
3	3	9170	N	N	Y	N	N	70	N	2	N	F	W	25	P	M	Y	9	28	81	25	0.2	L	0.90	H
4	4	9218	Y	N	N	Y	N	75	N	3	N		W	18	W	U	Y	10	21	81	12	1.0	H	0.50	M
5	5	9220	N	N	N	N	N	20	N	5	N	F	W	57	P	U	N	2	2	81	1	0.0	L	0.40	M
6	6	9222	N	Y	N	N	Y	0	N	0	N		W	20	W	O	N	4	19	82	23	0.4	M	1.00	H
7	7	9225	N	N	N	N	N	5	N	1	N	H	F	40	I		N	4	20	82	22	0.0	L	0.95	H
8	8	9226	N	Y	N	N	N	80	N	4	N	S	W	21	W	M	Y	4	20	82	22	0.4	M	0.50	M
9	9	9227	N	Y	N	N	Y	0	N	0	Y		F	18	W	U	N	4	20	82	24	0.4	M	0.00	L
10	10	9228	N	N	N	N	N	30	N	9	N	F	F	30	P	O	N	4	20	82	24	0.0	L	0.40	M
11	11	9229	N	Y	Y	N	N	40	N	3	N	S	W	40	P	M	N	4	20	82	22	0.6	M	0.40	M
12	12	0230	N	N	Y	N	N	1	N	1	N	P	W	25	I	O	Y	4	20	82	25	0.2	L	0.95	H
13	13	9232	N	N	N	N	N	40	N	1	N	F	W	25	I	M	N	4	20	82	25	0.0	L	0.95	H
14	14	9237	Y	N	N	N	N	5	N	0	N	P	W	27	I	O	Y	4	19	82	33	0.4	M	0.95	H
15	15	9238	Y	N	Y	N	N	33	N	3	N	P	W	30	I	O	Y	4	20	82	39	0.6	M	0.40	M
16	16	9260	Y	N	N	N	Y	0	N	0	N	F	F	10	P		N	4	20	82	2	0.4	M	1.00	H
17	17	9262	N	N	N	N	N	70	N	1	N	F	W	43	P	O	N	4	19	82	3	0.0	L	0.90	H
18	18	9264	N	N	N	N	N	10	N	2	N	F	W	21	P	O	N	4	20	82	24	0.0	L	0.95	H
19	19	9269	Y	N	N	N	Y	0	N	0	Y	P	F	18	P	O	Y	4	19	82	4	0.4	M	0.00	L
20	20	9277	N	Y	N	N	N	50	N	2	N	B	S	75	W		N	4	20	82	14	0.4	M	0.90	H
21	21	9278	N	N	Y	N	N	70	N	6	N		W	32	P	O		4	19	82	5	0.2	L	0.50	M
22	22	9326	Y	N	N	N	Y	0	N	0	N		W	25	W	L	Y	4	30	82	30	0.4	M	1.00	H
23	23	9333	N	N	Y	N	N	50	N	2	N		W	16	W		N	6	5	82	25	0.2	L	0.90	H
24	24	9337	Y	N	N	N	Y	0	N	0	Y	P	W	31	I	O	Y	9	23	82	13	0.4	M	0.00	L
25	25	9338	N	N	N	N	N	75	N	25	N		F	24	P	O	Y	8	15	82	6	0.0	L	0.50	M
26	26	9329	Y	N	Y	N	N	70	N	3	N	F	W	40	P	O	N	6	2	82	25	0.6	M	0.50	M
27	27	9342	Y	N	N	N	N	60	N	2	N	F	W	24	P	L	Y	11	27	82	26	0.4	M	0.90	H
28	28	9343	Y	N	N	N	N	60	N	3	N	P	W	29	P	O	Y	11	27	82	27	0.4	M	0.50	M
29	29	9344	Y	N	N	Y	N	10	N	2	N	F	W	31	P	O	Y	11	28	82	18	1.0	H	0.95	H
30	30	9345	Y	N	N	Y	N	10	N	2	N	F	W	35	P	O	Y	11	28	82	18	1.0	H	0.95	H
31	31	9346	N	N	Y	N	N	75	N	10	N	F	W	18	P	L	Y	11	7	82	28	0.2	L	0.50	M
32	32	9351	N	N	N	Y	Y	0	N	0	Y		W	17	P	M	N	3	18	83	23	1.0	H	0.00	L
33	33	9508	N	Y	Y	N	N	100	N	8	N	P	W	13	P	M	Y	1	20	88	25	0.6	M	0.60	M
34	34	9509	N	N	Y	N	N	50	N	5	N	P	W	35	I	M	N	1	20	88	21	0.2	L	0.50	M
35	35	9510	N	Y	N	N	Y	0	N	0	N	S	W	24	P	O	N	6	3	86	22	0.4	M	1.00	H
36	36	9511	N	N	N	N	Y	10	N	1	Y		W	20	W	O	Y	1	20	88	32	0.0	L	0.10	L
37	37	9592	Y	N	Y	N	N	80	N	2	N		W	30	W		N	1	11	87	4	0.6	M	0.90	H

OBS	UF_ID	DNR_ID	ENTHREAT	H_HAZARD	NAVIAGAT	PLAUTED	BEACHED	SUBMERGE	AFLOAT	DEPTH	LAND_ACCS	TYVALES	HULLMAT	VESSLENG	VESLCOND	VHOMEPORT	ENGABRD	MONTH	DAY	YEAR	LOCAT	R	RP	D	DR
38	38	9593	N	N	Y	N	N	95	N	2	N		W	24	W			1	11	87	4	0.2	L	0.90	H
39	39	9594	N	N	Y	N	N	50	N	2	N	F	W	30	P	U	N	1	11	87	4	0.2	L	0.90	H
40	40	9595	N	N	Y	N	N	20	N	2	N	F	W	37	P		N	1	29	87	4	0.2	L	0.95	H
41	41	9595	N	N	Y	N	N	20	N	2	N	F	W	40	P		N	1	29	87	4	0.2	L	0.90	H
42	42	9596	N	N	Y	N	N	50	N	2	N	F	W	30	P		N	1	11	87	4	0.2	L	0.90	H
43	43	9597	N	N	Y	N	N	50	N	2	N	F	W	35	P		N	1	11	87	4	0.2	L	0.90	H
44	44	9599	N	N	Y	N	N	50	N	3	N		W	20	W	U	N	1	15	87	4	0.2	L	0.50	M
45	45	9600	N	N	Y	N	N	75	N	2	N	F	W	16	W	U	N	1	15	87	4	0.2	L	0.90	H
46	46	9601	Y	N	N	N	N	50	N	2	N	H	W	20	W		N	1	15	87	4	0.4	M	0.90	H
47	47	9602	Y	N	N	N	N	50	N	2	N	S	W	36	P	U	N	1	15	87	4	0.4	M	0.90	H
48	48	9603	Y	N	N	N	Y	0	N	1	Y		W	28	W	U	N	1	15	87	4	0.4	M	0.00	L
49	49	9604	N	N	N	N	N	50	N	2	N	F	W	35	W		N	1	15	87	4	0.0	L	0.90	H
50	50	9605	N	N	Y	N	N	100	N	2	N		W	20	W		N	1	15	87	4	0.2	L	0.85	H
51	51	9606	N	N	N	N	N	50	N	0	Y	F	F	16	P		N	1	15	87	4	0.0	L	0.15	L
52	52	9607	N	N	N	N	N	50	N	1	Y		F	16	W		N	1	15	87	4	0.0	L	0.15	L
53	53	9608	Y	N	N	N	N	50	N	1	Y		W	20	W	U	N	2	3	87	4	0.4	M	0.15	L
54	54	9609	Y	N	N	N	N	50	N	1	Y	F	W	18	W		N	2	3	87	4	0.4	M	0.15	L
55	55	9610	Y	N	N	N	N	80	N	1	Y	F	W	30	W		N	2	3	87	4	0.4	M	0.15	L
56	56	9619	Y	Y	Y	Y	N	50	N	5	N	F	W	37	P	O	Y	10	9	87	22	1.0	H	0.50	M
57	57	9620	Y	Y	Y	Y	N	25	N	3	N	F	F	35	P	L	Y	1	30	87	33	1.0	H	0.40	M
58	58	9626	N	N	N	N	N	10	N	5	N	P	W	30	P		N	6	12	88	6	0.0	L	0.40	M
59	59	9627	Y	N	N	N	Y	0	N	1	Y	P	F	26	I	M	Y	1	20	88	20	0.4	M	0.00	L
60	60	9629	N	N	Y	N	N	50	N	10	N	F	F	16	I	M	N	6	12	88	25	0.2	L	0.50	M
61	61	9630	N	Y	Y	N	N	50	N	5	N	P	A	18	I	U	Y	12	22	87	21	0.6	M	0.50	M
62	62	9633	Y	Y	Y	N	N	100	N	8	N	P	F	24	I	M	Y	2	3	88	28	1.0	H	0.60	M
63	63	9636	N	N	N	Y	Y	0	N	0	N	P	W	28	I	M	N	2	5	88	15	1.0	H	1.00	H
64	64	9637	N	N	N	N	N	20	N	1	N	F	W	26	I	O	N	2	12	88	18	0.0	L	0.95	H
65	65	9638	N	N	Y	N	N	50	N	8	N	P	W	30	I		N	6	12	88	25	0.2	L	0.50	M
66	66	9646	N	N	Y	N	N	90	N	5	N		W	37	P	L	N	5	9	88	36	0.2	L	0.50	M
67	67	9647	N	Y	N	N	N	20	N	5	N	F	W	35	I		N	5	23	88	17	0.4	M	0.40	M
68	68	9649	N	N	N	N	Y	0	N	0	Y	P	F	24	I	M	Y	6	1	88	20	0.0	L	0.00	L
69	69	9275	N	N	N	N	N	30	N	1	N		F	22	W		N	10	10	88	3	0.0	L	0.95	H
70	70	9512	N	N	N	N	Y	25	N	1	Y	F	F	27	P	M	N	11	16	88	24	0.0	L	0.10	L
71	71	9640	Y	Y	N	N	N	50	N	2	Y	P	A	21	P	L	Y	11	25	88	36	0.8	H	0.15	L
72	72	9641	Y	Y	N	N	N	75	N	2	Y		F	27	P	L	N	11	25	88	36	0.8	H	0.15	L
73	73	9651	N	N	N	N	Y	20	N	1	Y	P	F	17	I	O	N	11	18	88	27	0.0	L	0.10	L

OBS	UF_ID	DNR_ID	ENTHREAT	HHAZEARD	NAVIGATE	POLLUTED	BEACHED	SUBMERGE	AFLOAT	DEPTH	LAND_ACCESS	TYVEK	HULLMATL	VESSLENG	VESLCONDT	HOMEPORT	ENGABRD	MONTH	DAY	YEAR	LOCATR	R	RP	D	DR
74	74	9654	Y	Y	N	N	N	80	N	20	Y		F	24	P	L	Y	8	2	88	28	0.8	H	0.15	L
75	75	9660	N	N	N	N	N	25	N	2	N		F	15	P		N	10	5	88	38	0.0	L	0.95	H
76	76	9662	Y	N	N	N	Y	0	N	0	Y	F	W	25	P	U	Y	10	10	88	11	0.4	M	0.00	L
77	77	9663	N	N	N	N	N	25	N	1	N	F	W	18	P	O	Y	10	10	88	9	0.0	L	0.95	H
78	78	9664	N	N	N	Y	N	20	N	2	N		W	34	W			10	12	88	12	1.0	H	0.95	H
79	79	9665	Y	N	N	Y	Y	0	N	0	N	B	W	30	W		N	10	12	88	12	1.0	H	1.00	H
80	80	9666	N	N	N	Y	N	5	N	2	N	H	W	30	P			10	12	88	10	1.0	H	0.95	H
81	81	9667	N	N	N	Y	N	50	N	3	N	P	W	33	P			10	12	88	10	1.0	H	0.50	M
82	82	9668	N	N	N	N	N	100	N	4	N		W	30	W		N	10	12	88	10	0.0	L	0.60	M
83	83	9669	N	N	N	Y	N	20	N	1	N	P	F	22	W			10	12	88	10	1.0	H	0.95	H
84	84	9670	N	N	N	N	N	50	N	2	N	H	W	36	P	U	N	10	12	88	10	0.0	L	0.90	H
85	85	9671	Y	N	N	Y	N	50	N	2	N		W	28	P		Y	10	12	88	10	1.0	H	0.90	H
86	86	9673	N	N	N	N	N	60	N	1	N	F	W	25	W	L	N	10	14	88	37	0.0	L	0.90	H
87	87	9674	Y	N	Y	Y	N	60	N	1	N	F	W	25	P		N	10	14	88	37	1.0	H	0.90	H
88	88	9676	Y	N	Y	Y	N	75	N	1	N	P	W	27	P	L	N	10	14	88	37	1.0	H	0.90	H
89	89	9677	N	N	Y	N	N	70	N	4	N		W	30	W			10	18	88	10	0.2	L	0.50	M
90	90	9678	N	N	Y	Y	N	0	Y	4	N		F	16	W		N	10	18	88	10	1.0	H	0.30	M
91	91	9679	N	N	Y	N	N	20	N	3	N	S	W	28	I	U		10	18	88	10	0.2	L	0.40	M
92	92	9680	Y	N	N	N	Y	0	N	1	N	S	W	18	P		N	10	18	88	10	0.4	M	1.00	H
93	93	9681	N	N	Y	N	Y	0	N	1	N	S	W	40	I			10	18	88	10	0.2	L	1.00	H
94	94	9682	N	N	N	N	Y	0	N	0	N	F	F	15	I	U	N	10	18	88	9	0.0	L	1.00	H
95	95	9683	N	N	Y	N	N	70	N	2	N			26	W		N	10	18	88	3	0.2	L	0.90	H
96	96	9684	N	N	N	Y	Y	0	N	0	N	F	F	30	P		N	10	18	88	3	1.0	H	1.00	H
97	97	9685	Y	N	Y	Y	N	10	N	1	N	P	W	60	I	O	Y	10	18	88	41	1.0	H	0.95	H
98	98	9687	N	N	N	N	N	50	N	5	N		S	100	P		N	10	19	88	3	0.0	L	0.50	M
99	99	9688	Y	N	N	Y	N	35	N	1	N	F	A	24	P	L	N	10	19	88	3	1.0	H	0.95	H
100	100	9690	Y	N	N	N	N	30	N	1	N	F	W	40	W	O	N	10	20	88	37	0.4	M	0.95	H
101	101	9691	Y	N	N	N	Y	0	N	0	N	F	S	48	P		N	10	20	88	37	0.4	M	1.00	H
102	102	9692	Y	N	N	Y	N	25	N	1	N	F	W	50	W	L	N	10	21	88	37	1.0	H	0.95	H
103	103	9693	N	N	N	N	N	20	N	1	N	P	W	27	P	L	N	10	21	88	37	0.0	L	0.95	H
104	104	9694	N	N	N	N	N	50	N	1	N	F	W	20	W		N	10	21	88	37	0.0	L	0.90	H
105	105	9695	Y	N	N	Y	N	75	N	3	N	F	F	17	W	U	N	10	21	88	2	1.0	H	0.50	M
106	106	9696	Y	N	N	Y	N	75	N	3	N		F	35	W			10	21	88	2	1.0	H	0.50	M
107	107	9697	N	N	N	Y	N	50	N	3	N	F	F	18	P	O	Y	10	21	88	2	1.0	H	0.50	M
108	108	9698	Y	N	N	Y	N	10	N	1	N	F	W	21	W	U	N	10	21	88	2	1.0	H	0.95	H
109	109	9699	N	N	N	Y	N	75	N	3	N		W	23	W		N	10	21	88	3	1.0	H	0.50	M

OBS	UF_ID	DNR_ID	ENTHREAT	H_HAZARD	NAVIGATE	PLAUTE	BEACHED	SUBMERGE	AFLOAT	DEPTH	LAND_ACCESS	TYVEL	HULLMAT	VESSLENG	VESLCOND	HOMEPORT	ENGABRD	MONTH	DAY	YEAR	LOCAT	R	RP	D	DR
110	110	9700	Y	N	N	Y	N	75	N	4	N	P	W	22	W		N	10	21	88	2	1.0	H	0.50	M
111	111	9701	N	N	N	Y	N	15	N	1	N	F	F	18	P		N	10	21	88	40	1.0	H	0.95	H
112	112	9702	N	N	N	Y	N	90	N	3	N		F	21	W	O	Y	10	24	88	3	1.0	H	0.50	M
113	113	9703	N	N	N	Y	N	90	N	3	N		W	27	W	U	Y	10	24	88	3	1.0	H	0.50	M
114	114	9704	N	N	N	Y	N	50	N	1	N	F	W	40	W		N	10	21	88	3	1.0	H	0.90	H
115	115	9705	N	N	N	Y	Y	0	N	0	N	F	W	26	P		N	10	24	88	3	1.0	H	1.00	H
116	116	9706	N	N	N	N	Y	0	N	0	N		F	14	W		N	10	24	88	3	0.0	L	1.00	H
117	117	9707	N	N	N	N	N	90	N	2	N		S	30	W			10	24	88	3	0.0	L	0.90	H
118	118	9708	N	N	N	N	Y	0	N	0	N		F	28	W		Y	10	24	88	3	0.0	L	1.00	H
119	119	9709	N	N	N	N	N	75	N	3	N		W	30	W		Y	10	12	88	12	0.0	L	0.50	M
120	120	9710	N	N	N	Y	N	50	N	2	N	P	W	34	W		N	10	24	88	6	1.0	H	0.90	H
121	121	9711	Y	N	Y	Y	N	50	N	2	N	F	F	23	P	O	Y	10	24	88	6	1.0	H	0.90	H
122	122	9712	Y	N	N	Y	N	40	N	4	N	S	W	50	P			10	24	88	6	1.0	H	0.40	M
123	123	9713	N	N	N	Y	N	90	N	2	N		W	35	W		N	10	24	88	7	1.0	H	0.90	H
124	124	9714	Y	N	N	Y	N	40	N	5	N	F	W	108	P	O	N	10	25	88	37	1.0	H	0.40	M
125	125	9715	Y	N	N	Y	N	95	N	7	N	F	F	18	W		N	10	25	88	7	1.0	H	0.50	M
126	126	9716	Y	N	N	Y	N	10	N	1	N	H	W	30	I		N	10	25	88	37	1.0	H	0.95	H
127	127	9717	N	N	N	Y	N	40	N	3	Y	F	W	34	P	O	Y	10	26	88	8	1.0	H	0.10	L
128	128	9718	N	N	N	Y	N	30	N	2	Y	H	F	35	P			10	27	88	8	1.0	H	0.10	L
129	129	9722	N	N	N	Y	N	50	N	4	N	F	W	27	P	L	N	10	31	88	38	1.0	H	0.50	M
130	130	9725	N	Y	Y	N	N	0	Y	0	Y	P	F	27	I	L		11	10	88	28	0.6	M	0.05	L
131	131	9726	Y	N	N	Y	N	10	N	1	N		W	35	W		N	11	1	88	4	1.0	H	0.95	H
132	132	9727	N	N	N	N	N	0	Y	3	N	F	F	17	I	U	N	11	1	88	4	0.0	L	0.30	M
133	133	9728	N	N	N	Y	N	95	N	4	N		W	18	W		N	11	1	88	4	1.0	H	0.50	M
134	134	9729	N	N	Y	Y	N	90	N	4	N		F	35	W		Y	11	1	88	4	1.0	H	0.50	M
135	135	9730	Y	N	N	Y	N	45	N	1	N		W	30	W		N	11	1	88	4	1.0	H	0.95	H
136	136	9731	Y	N	N	Y	N	95	N	2	N		W	32	W		N	11	1	88	4	1.0	H	0.90	H
137	137	9732	Y	N	N	Y	N	95	N	2	N		F	40	W		N	11	1	88	4	1.0	H	0.90	H
138	138	9733	Y	N	N	Y	N	95	N	2	N	P	W	35	P		N	11	1	88	4	1.0	H	0.90	H
139	139	9734	N	N	Y	Y	N	100	N	3	N		F	21	W		N	11	1	88	4	1.0	H	0.60	M
140	140	9735	N	N	Y	Y	N	100	N	3	N		W		W			11	1	88	4	1.0	H	0.60	M
141	141	9737	N	N	N	N	N	50	N	4	N		F	23	P	U	Y	11	1	88	4	0.0	L	0.50	M
142	142	9738	N	N	N	N	N	40	N	4	N		F	26	P	U	Y	11	1	88	4	0.0	L	0.40	M
143	143	9739	N	N	N	N	N	40	N	4	N	T	F	23	I	U	Y	11	1	88	4	0.0	L	0.40	M
144	144	9741	Y	N	N	N	N	40	N	2	N		W	25	W		N	11	3	88	36	0.4	M	0.95	H
145	145	9742	N	N	N	N	N	40		2	N		F	20	W		N	11	3	88	36	0.4	L	0.95	H

OBS	UF_ID	DNR_ID	ENTHREAT	H_HAZARD	NAVIGATE	POLLUTED	BEACHED	SUBMERGE	ALOFT	DEPTH	LAND_ACC	TYVEST	HULLMAT	VESSLEN	VESSCOND	HOMEPORT	ENGABRD	MONTH	DAY	YEAR	LOCATR	R	RP	D	DR
146	146	9743	N	N	N	N	N	20	N	2	N		F	20	W		N	11	2	88	36	0.0	L	0.95	H
147	147	9744	Y	N	Y	N	Y	0	N	0	N	F	F	40	I		N	11	3	88	36	0.6	M	1.00	H
148	148	9745	Y	N	N	N	N	40	N	2	N		F	17	P		N	11	3	88	36	0.4	M	0.95	H
149	149	9747	Y	N	N	N	N	30	N	1	N	H	F	23	P	L	Y	11	3	88	36	0.4	M	0.95	H
150	150	9748	Y	N	N	N	N	30	N	1	N	F	W	28	P	O	N	11	3	88	36	0.4	M	0.95	H
151	151	9749	Y	N	N	N	N	20	N	1	N	F	F	16	P		N	11	3	88	36	0.4	M	0.95	H
152	152	9750	Y	N	N	N	Y	0	N	0	N	F	F	18	P		N	11	3	88	36	0.4	M	1.00	H
153	153	9751	Y	N	N	N	N	20	N	1	N	F	F	18	P		Y	11	3	88	36	0.4	M	0.95	H
154	154	9752	Y	N	N	N	N	20	N	1	Y	P	W	31	I	L	N	11	3	88	36	0.4	M	0.10	L
155	155	9753	Y	N	N	N	N	60	N	2	N	P	F	20	P		N	11	3	88	36	0.4	M	0.90	H
156	156	9754	Y	N	Y	N	N	100	N	7	N		F	26	W		N	11	3	88	36	0.6	M	0.60	M
157	157	9756	Y	N	N	Y	N	10	N	1	N		S	100	W		N	11	7	88	35	1.0	H	0.95	H
158	158	9757	Y	N	N	N	N	50	N	1	N	F	F	16	W		N	11	7	88	36	0.4	M	0.90	H
159	159	9758	Y	N	N	N	Y	25	N	0	N	F	F	18	P		N	11	7	88	36	0.4	M	1.00	H
160	160	9759	Y	N	N	N	N	50	N	1	N	F	W	26	W		N	11	7	88	36	0.4	M	0.90	H
161	161	9760	Y	N	N	N	N	40	N	1	N	F	F	16	W		N	11	7	88	36	0.4	M	0.95	H
162	162	9761	Y	N	N	Y	N	10	N	1	Y	F	F	18	P		N	11	6	88	35	1.0	H	0.10	L
163	163	9762	Y	N	N	Y	N	50	N	1	N	F	F	20	W			11	7	88	35	1.0	H	0.90	H
164	164	9763	Y	N	N	Y	N	20	N	2	N		W	40	W		N	11	6	88	35	1.0	H	0.95	H
165	165	9764	Y	N	N	N	N	20	N	2	N	H	F	23	P	O	N	11	9	88	34	0.4	M	0.95	H
166	166	9765	Y	N	N	N	N	10	N	3	N	F	S	65	I	U	Y	11	9	88	34	0.4	M	0.40	M
167	167	9766	N	Y	Y	N	N	0	Y	8	Y	F	A	19	I		N	11	22	88	30	0.6	M	0.05	L
168	168	9768	N	N	N	N	N	60	N	4	N		F	30	W		N	11	14	88	25	0.0	L	0.50	M
169	169	9769	N	N	N	N	N	60	N	6	N		F	20	W		N	11	15	88	25	0.0	L	0.50	M
170	170	9770	N	N	N	N	N	50	N	3	N	F	F	32	P	O	N	11	15	88	25	0.0	L	0.50	M
171	171	9771					N	30	N	3	N	P	F	35	P	M	N	11	15	88	25	0.0	L	0.40	M
172	172	9772	N	N	N	N	N	75	N	3	N	F	F	35	W		N	11	15	88	25	0.0	L	0.50	M
173	173	9773	N	N	N	N	N	40	N	3	N	F	F	40	P	M	N	11	15	88	25	0.0	L	0.40	M
174	174	9774	N	N	N	N	N	40	N	3	N	F	F	20	P		N	11	15	88	25	0.0	L	0.40	M
175	175	9775	N	N	N	N	N	25	N	2	N	F	F	20	P			11	15	88	25	0.0	L	0.95	H
176	176	9776	N	N	N	N	N	0	Y	2	N	T	F	35	I		N	11	15	88	25	0.0	L	0.80	H
177	177	9777	N	N	N	N	N	100	N	2	N	F	F	20	P		N	11	16	88	25	0.0	L	0.85	H
178	178	9778	N	N	N	N	N	90	N	2	N		W	30	W		N	11	16	88	25	0.0	L	0.90	H
179	179	9779	N	N	N	N	N	75	N	2	N		F	20	W		N	12	3	88	25	0.0	L	0.90	H
180	180	9783	N	N	Y	N	N	90	N	10	Y		W	35	W		Y	1	18	89	25	0.2	L	0.15	L
181	181	9785	N	N	N	N	N	80	N	4	N		S	90	W			1	19	89	25	0.0	L	0.50	M

OBS	UF_ID	DNR_ID	ENTHREAT	H_HAZARD	NAVIGATE	POLLUTE	BEACHED	SUBMERGE	AFLOAT	DEPTH	LAND_ACCESS	TYVEC	HULLMAT	VESSLEN	VESSCOND	VHOMEPORT	ENGABRD	MONTH	DAY	YEAR	LOCAT	R	RP	D	DR
182	182	9786	N	N	N	N	N	10	N	1	N		S	35	W		N	1	19	89	25	0.0	L	0.95	H
183	183	9787	N	N	N	N	N	35	N	2	N	F	F	12	P		N	1	19	89	25	0.0	L	0.95	H
184	184	9788	N	N	N	N	N	30	N	2	N	F	F	27	P	O	Y	12	3	88	25	0.0	L	0.95	H
185	185	9789	N	N	N	N	N	60	N	2	N	F	W	28	P	O	N	12	4	88	25	0.0	L	0.90	H
186	186	9790	N	N	N	N	N	10	N	2	N		F	28	W		N	12	3	88	25	0.0	L	0.95	H
187	187	9791	N	N	N	N	N	0	Y	6	N	P	W	28	I	O		12	3	88	25	0.0	L	0.30	M
188	188	9792	N	N	N	N	N	10	N	2	N	P	F	32	I		N	12	3	88	25	0.0	L	0.95	H
189	189	9793	N	N	N	N	N	10	N	2	N	H	F	20	I			12	3	88	25	0.0	L	0.95	H
190	190	9794	N	N	N	N	N	10	N	2	N	P	F	18	I	L	N	12	3	88	25	0.0	L	0.95	H
191	191	9795	N	N	N	N	N	10	N	2	N	P	W	36	I		N	12	3	88	25	0.0	L	0.95	H
192	192	9796	N	N	N	N	N	100	N	2	N		F	18	W		N	12	3	88	25	0.0	L	0.85	H
193	193	9797	N	N	N	N	N	80	N	2	N	P	F	21	W		Y	12	3	88	25	0.0	L	0.90	H
194	194	9798	N	N	N	N	N	10	N	2	N	F	F	24	I	M	Y	12	3	88	25	0.0	L	0.95	H
195	195	9799	N	N	N	N	N	10	N	2	N		F	24	W		N	12	3	88	25	0.0	L	0.95	H
196	196	9801	N	N	N	N	N	50	N	2	N		F	19	W	N		11	16	88	25	0.0	L	0.90	H
197	197	9802	N	N	N	N	N	0	Y	0	N	H	F	18	I		N	11	16	88	25	0.0	L	0.80	H
198	198	9803	N	N	N	N	N	0	Y	0	N	P	F	10	I		Y	11	16	88	25	0.0	L	0.80	H
199	199	9804	N	N	N	N	N	9	Y	0	N	P	F	10	I		N	11	16	88	25	0.0	L	0.80	H
200	200	9805	N	N	N	N	N	50	N	1	N	P	F	14	I	M		11	16	88	25	0.0	L	0.90	H
201	201	9806	N	N	N	N	N	100	N	2	N		F	16	W		N	12	3	88	25	0.0	L	0.85	H
202	202	9807	N	N	N	N	N	20	N	2	N	F	W	38	P		N	12	3	88	25	0.0	L	0.95	H
203	203	9808	N	N	N	N	N	20	N	2	N	F	W	35	P		N	12	3	88	25	0.0	L	0.95	H
204	204	9809	N	N	N	N	N	90	N	2	N		F	20	W		N	12	3	88	25	0.0	L	0.90	H
205	205	9810	N	N	N	N	N	10	N	1	N	F	F	18	I		Y	12	3	88	25	0.0	L	0.95	H
206	206	9811	N	N	N	N	N	10	N	1	N		F	18	W		Y	12	3	88	25	0.0	L	0.95	H
207	207	9812	N	N	N	N	N	20	N	2	N	F	W	40	P		N	12	3	88	25	0.0	L	0.95	H
208	208	9813	N	N	N	N	N	50	N	2	N		F	18	W		N	12	3	88	25	0.0	L	0.90	H
209	209	9814	N	N	N	N	N	20	N	2	N	H	W	65	I		N	12	3	88	25	0.0	L	0.95	H
210	210	9815	N	N	N	N	N	40	N	2	N	F	W	35	P	O	N	12	3	88	25	0.0.	L	0.95	H
211	211	9816	N	N	N	N	N	50	N	2	N	S	W	35	P	M	N	12	3	88	25	0.0	L	0.90	H
212	212	9817	N	N	N	N	N	80	N	2	N	S	W	28	W		N	12	3	88	25	0.0	L	0.90	H
213	213	9818	N	N	N	N	N	25	N	2	N	H	F	25	W		N	11	16	88	25	0.0	L	0.95	H
214	214	9819	N	N	N	N	N	0	Y	2	N	H	F	18	W		N	11	16	88	25	0.0	L	0.80	H
215	215	9784	N	N	N	N	N	80	N	4	N		S	80	W		N	1	19	89	25	0.0	L	0.50	M
216	216	9820	N	N	N	N	N	0	Y	2	N	H	F	18	P		N	11	16	88	25	0.0	L	0.80	H
217	217	9822	N	N	N	N	N	0	N	1	N	P	F	18	I		N	12	2	88	25	0.0	L	0.80	H

OBS	UF_ID	DNR_ID	ENT_HEART	H_HAZD	NAVIGAT	PLAUT	BEACHED	SUBMERG	ALOFT	DEPTH	LAND_ACC	TYVEC	HULLMAT	VESSLEN	VESLCOND	HOMEPORT	ENGABRD	MONTH	DAY	YEAR	LOCAT	R	RP	D	DR
218	218	9823	N	N	N	N	N	0	Y	1	N	H	F	20	P		N	12	2	88	25	0.0	L	0.80	H
219	219	9824	N	N	N	N	N	0	Y	1	N	H	W	14	I		N	12	2	88	25	0.0	L	0.80	H
220	220	9825	N	N	N	N	N	80	N	2	N	P	W	12	W		N	12	2	88	25	0.0	L	0.90	H
221	221	9826	N	N	N	N	N	95	N	2	N		W	.	W		N	12	2	88	25	0.0	L	0.90	H
222	222	9829	N	N	N	N	N	60	N	3	N		F	23	W		N	11	24	88	21	0.0	L	0.50	M
223	223	9830	N	N	Y	N	N	0	Y	8	N	F	W	30	P	O	Y	1	18	89	24	0.2	L	0.30	M
224	224	9832	N	Y	Y	N	N	0	Y	6	Y	T	F	22	I		N	11	25	88	28	0.6	M	0.50	L
225	225	9834	N	N	N	N	N	0	Y	1	N	F	F	17	I	M	N	11	28	88	29	0.0	L	0.80	H
226	226	9835	N	N	N	N	N	20	N	1	Y	F	F	16	W		N	11	28	88	32	0.0	L	0.10	L
227	227	9836	N	N	N	N	N	50	N	8	Y		F	20	W	L	N	12	2	88	31	0.0	L	0.15	L
228	228	9838	N	N	N	N	N	10	N	1	N	F	W	24	W	M	N	1	18	89	24	0.0	L	0.95	H
229	229	9839	N	N	N	N	Y	0	N	0	N	F	F	18	W		N	1	19	89	24	0.0	L	1.00	H
230	230	9840	N	N	N	N	N	0	Y	4	Y	H	W	50	I	O	N	1	18	89	24	0.0	L	0.05	L
231	231	9841	N	N	N	N	N	60	N	4	Y		F	18	W		N	1	19	89	24	0.0	L	0.15	L
232	232	9842	N	N	N	N	Y	0	N	1	Y	P	F	15	P	M	N	1	18	89	24	0.0	L	0.00	L
233	233	9843	N	N	N	N	Y	0	N	1	Y		W	24	P		N	1	19	89	24	0.0	L	0.00	L
234	234	9844	N	N	Y	N	N	0	Y	6	N		F	16	W		N	1	18	89	29	0.2	L	0.30	M
235	235	9845	Y	N	Y	N	N	90	N	4	N		F	23	W		N	12	25	88	19	0.6	M	0.50	M
236	236	9846	N	N	N	N	N	40	N	3	Y	P	F	28	P		Y	1	18	89	30	0.0	L	0.10	L
237	237	9847	N	Y	N	N	N	0	Y	8	Y	T	W	25	I		N	1	19	89	29	0.4	M	0.05	L
238	238	9848	N	N	N	N	Y	0	N	1	Y	F	F	18	P		N	1	18	89	30	0.0	L	0.00	L
239	239	9851	N	N	Y	N	N	80	N	6	N	F	F	28	W	M	Y	1	19	89	20	0.2	L	0.50	M
240	240	9591	Y	N	Y	N	N	50	N	2	N		W	28	W		N	1	11	87	4	0.6	M	0.90	H