

HURRICANE MARINE DEBRIS LESSONS LEARNED

FROM THE

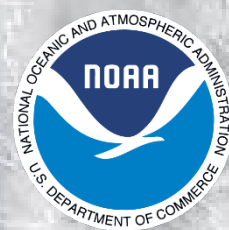
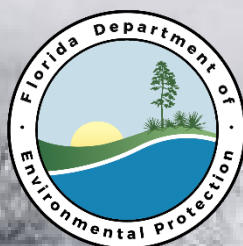
2016 AND 2017 HURRICANE SEASONS

July 2018

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The Florida Department of Environmental Protection
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Prepared by



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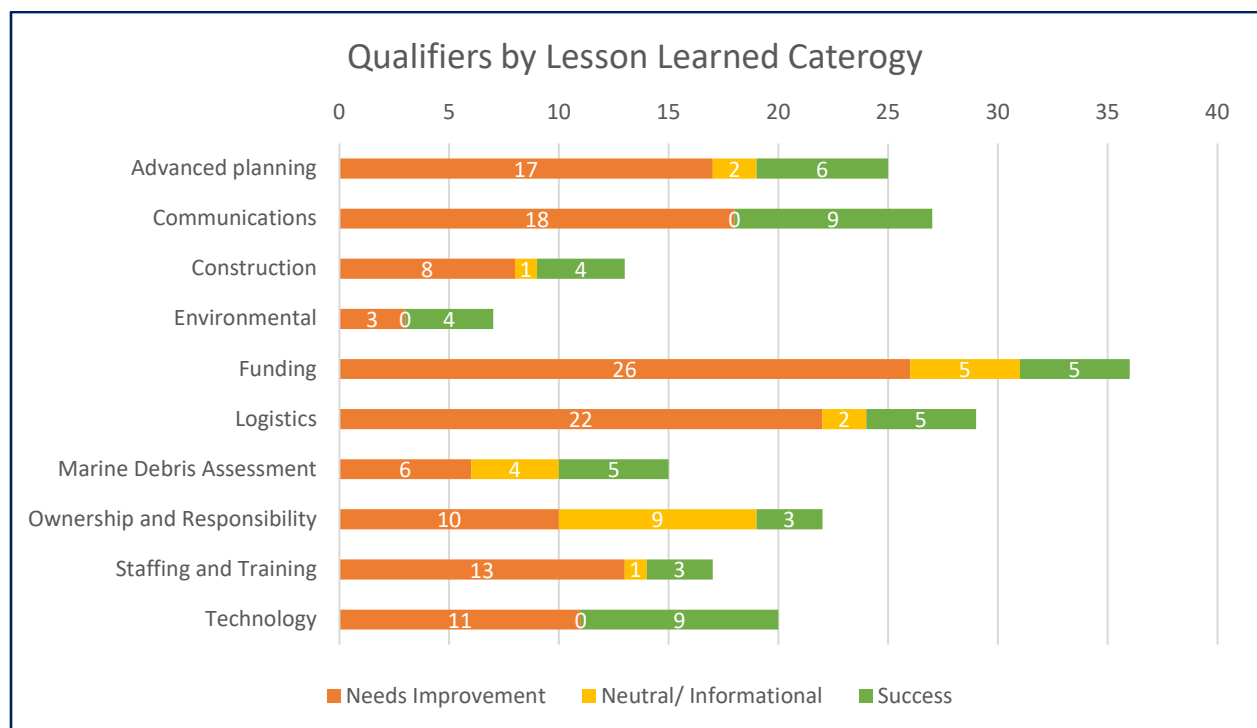
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Executive Summary

Following a hurricane there are many priorities to restore and ensure human health and public safety, housing, business as usual and transportation pathways. Marine debris caused by hurricanes also presents a significant threat to priority objectives. Marine debris from storms can pose significant danger to public health and safety, our environment, and our economy. In 2016 following Hurricane Matthew, the Florida Department of Environmental Protection (FDEP) reported removal of more than 78,000 cubic yards of debris from state waters at a cost of nearly \$15 million. Following Hurricane Irma in 2017, more than 2,600 displaced and damaged vessels were identified across Florida of which 1,824 were found in the waters of the Florida Keys. As of the time of this study, more than 250,000 cubic yards of marine debris had been reported removed at an estimated cost of \$43 million.

Marine debris removal following these hurricanes was a considerable endeavor that involved federal, state and local governments as well as non-governmental agencies and civilians coming together in their common goal to restore safety, retrieve assets and protect wildlife and their habitats from environmental hazards. The success and efficiency of such an undertaking is directly related to the ability to have a well-coordinated response, a clearly defined mission, unified communications and sufficient resources. To better understand the efficacy of these operations, FDEP appointed a consultant to collect lessons learned through interviews with staff from several agencies and organizations directly involved in these hurricane marine debris response efforts.

In all, 23 staff from various agencies and organizations were interviewed. From these interviews more than 200 lessons were garnered and distributed across ten main themed topics that arose from conversations. Each was determined to be an observation that was either a success, an informational reference, or an area in need of improvement.



From areas identified as those in need of improvement, recommendations were made for future action on topics that were mentioned with frequency, considered actionable, and could be completed within a year. From the top five categories, a priority for action was selected according to the identified criteria as follows:

Funding Priority: Identify and confirm criteria, requirements and associated documentation necessary for Federal Emergency Management Agency (FEMA) reimbursement for marine debris removal.

Logistics Priority: Develop protocols and methods for post-storm marine debris assessments.

Communications Priority: Develop a public information system that provides information to the public and allows the public to report marine debris with a quality control check.

Advanced Planning Priority: Identify waterside access and upland staging areas and provide for advance use agreements.

Staffing and Training Priority: Identify and train staff across agencies who can serve in the role of Natural Resource Advisors (NRA).

1. Introduction

Following a hurricane, human health and public safety, restoration of homes, businesses and transportation pathways are of highest priority. Often an afterthought are our oceans and waterways and the havoc caused by copious amounts of marine debris resulting from the storm event. The Florida Division of Emergency Management (FDEM) in their 2018 State Hazard Mitigation Plan recognizes marine debris as “...event generated debris impacting waterway navigation and submerged wetland habitats.” Similarly, the National Oceanic and Atmospheric Administration (NOAA) identifies an acute waterway debris incident as “An incident that results in the release of large amounts of waterway debris.”

Hurricanes Matthew and Irma impacted Florida in 2016 and 2017 respectively, causing acute waterway debris incidents by depositing marine debris into Florida’s wetlands, waterways and marine habitats. This marine debris included vegetation, displaced and damaged vessels, fishing gear, and other personal property. Marine debris originated from both land and water-based sources and once in the water, the debris often traveled long distances.

Marine debris in our waterways can present a hazard to human life or safety, safe navigation, and the natural environment. Marine debris often includes personal property that may retain some or all its value if recovered quickly enough after a storm. For example, recovery of spiny lobster traps allows fishermen to resume their livelihood by re-deploying their assets. Vessels may be salvageable, returned to their rightful owner and put back into service. However, for the useful recovery of assets it is important that recovery take place as quickly as possible. To restore safe navigation and ensure impacts to natural wetland and marine resources are avoided and minimized, a rapid and organized response is most effective.

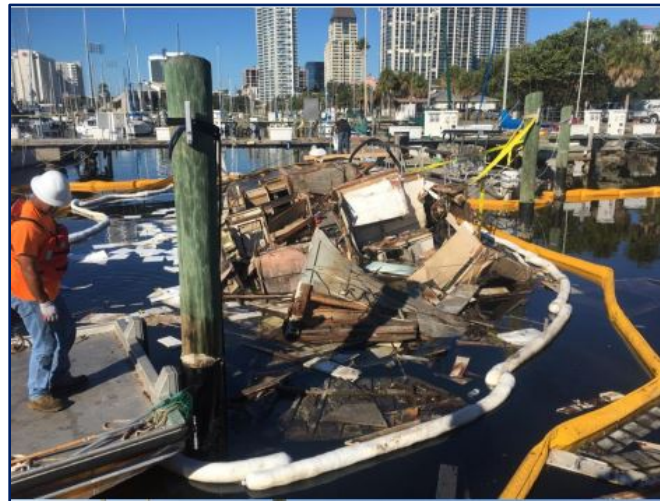


Figure 1 Remnants of a vessel in the Tampa Bay area after Hurricane Irma, photo by USCG

2. Project Objective

The purpose of this project was to collect lessons learned from the 2016 and 2017 hurricane seasons as it relates to marine debris removal. Lessons learned have been gathered from those directly involved in planning for and executing marine debris removal from Florida waters. Federal, state and local agencies, as well as non-governmental entities have contributed their lessons learned. This document gathers and summarizes their experiences in an effort to better prepare for and carry out marine debris removal in the future.

3. Methods

The best resource for knowledge on improving marine debris response efforts lies within the memories of staff who were on the front lines during the 2016 and 2017 hurricane seasons. The basic approach to this project was to sit down with some of these people and talk through their experiences. Representatives from federal, state and local agencies as well as non-governmental organizations involved in hurricane marine debris removal in 2016 and 2017 were interviewed. In all, 23 people contributed lessons learned based on their experiences. Two rounds of interviews were conducted during March and April of 2018. During the initial round of interviews, the interviewee was asked to recommend others for interview in the second round. The interviews began with broad questions to initiate conversation and allow each interviewee to steer the dialog based on their individual experiences. Each interview was prompted by the following questions:

1. What was your role regarding marine debris management following the 2016/2017 hurricanes?
2. Regarding marine debris management, what issues or problems did you have?
3. What are your recommendations for marine debris removal?
4. What would you do differently next time?
5. Are there others you would recommend we interview?

The questions allowed open-ended responses and if needed, the interviewers asked more pointed questions to gather details. The interviewees were forthcoming with their responses and willing to share experiences to provide information on what worked well in addition to areas in need of improvement.

During each interview, there was an interviewer and a note taker. A summary of the lessons learned from each interview were gleaned and noted. The project was also represented at the 3rd Annual Florida Coastal Management Program Meeting held in Clearwater Beach on May 16 and 17, 2018. The consulting firm attended the meeting and gathered additional comments for the project. Once the input was compiled, lessons were categorized into the ten common themes that emerged.

A draft of the lessons learned document was distributed to the interviewees for their review and feedback. Interviewees were also invited to provide any feedback during a webinar in which the document was reviewed. Comments and feedback from interviewees were incorporated into the final report.

4. Roles and Responsibilities

The focus of the project and associated interviews was the 2016 and 2017 hurricane seasons. Lessons shared by those interviewed primarily represent recent experiences with Hurricanes Matthew and Irma. The project interviewed a cross section of individuals from agencies at federal, state, local, and non-governmental organizations. To better appreciate the context of the lessons shared, a high-level overview of the roles and responsibilities of agencies interviewed is provided in this section.

4.1 Federal Agencies and Hurricane Irma Emergency Support Function Response

The U.S. Department of Homeland Security maintains a National Response Framework (NRF) that provides guidance for responding to all disasters and emergencies. The NRF manual describes authorities and best management practices (BMP) for incident management, including principles, roles, responsibilities and the coordinating structure for service delivery. The framework provides for 15 primary Emergency Support Functions (ESF).

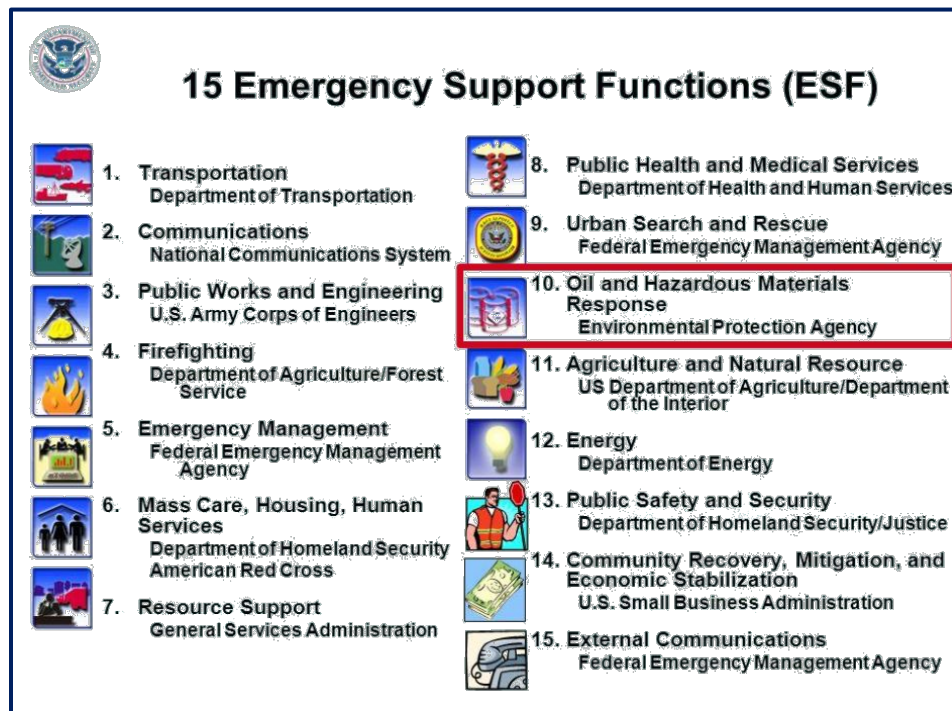


Figure 2 Emergency Support Functions

ESF-10 is the framework under which federal support is coordinated with state agencies in response to actual or potential for oil or hazardous material release into the environment. Following Hurricane Irma, a Unified Command was stood up under ESF-10 with an Incident Command Post established in Miami, FL on September 18, 2018 to oversee the assessment, mitigation and removal of hazardous materials from Florida's waterways. The Incident Command Post was organized into four Branches based on traditional U.S. Coast Guard (USCG) Sector boundaries including Jacksonville, Miami, Florida Keys and St. Petersburg. The Unified Command was a multi-agency coordinated effort that included the USCG, the Environmental Protection Agency (EPA), FEMA, the U.S. Army Corps of Engineers, NOAA, the U.S. Fish and Wildlife Service (USFWS), the Florida Keys National Marine Sanctuary (FKNMS), FDEP, the Florida Fish and Wildlife Conservation Commission (FWC) and Monroe County. The activities performed under the ESF-10 response are described below.

It should be noted that ESF-3 activities also included marine debris, but to a lesser extent than ESF-10. ESF-3 operations are headquartered in Tallahassee and typically involve the Florida Department of

Transportation as the State of Florida lead agency and the U.S. Army Corps of Engineers as the Federal lead agency.

Displaced Vessels

Once displaced vessels were assessed and prioritized according to environmental risk, the USCG tagged displaced vessels with a sticker requesting the owner contact the FWC of the USCG. Once the majority of the assessments were completed, the USCG undertook the task of divesting vessels of fuel, oil and any other hazardous materials that could cause adverse environmental impacts. If the vessel owner could not recover, or was not interested in recovering their vessel, they had had the option to relinquish ownership through a signed waiver that allowed the FWC to dispose of the vessel. If an owner could not be reached, the vessel was removed, stored in a staging area and given a limited time in which an owner could claim their vessel. If not claimed, the vessel would be destroyed and properly disposed of by the FWC.



Figure 3 USCG 'stickering' displaced vessel, photo by USCG

The USCG reports that across Florida, 2,679 displaced vessels were identified with more that 1,800 of those located in and around the Florida Keys.

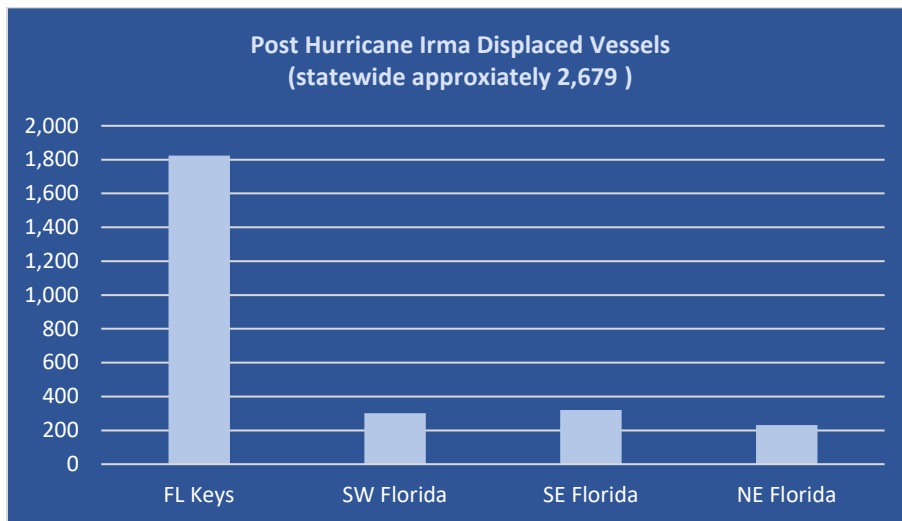


Figure 4 Post Hurricane Irma Number of Displaced Vessels from USCG

Environmental Unit

An Environmental Unit was created to prioritize displaced vessels for removal according to the potential for environmental impacts. Using aerial photography along with field surveys to initially identify displaced vessel ‘targets’, a grid system was developed to manage the vessel removal program. Grid packages were developed for vessel assessment and removal packages for contractors. Each grid packages included all targets within the grid laid over benthic habitat maps. Any resources at risk were identified and the package also contained BMPs to minimize environmental impacts. All data was managed under a central data platform.

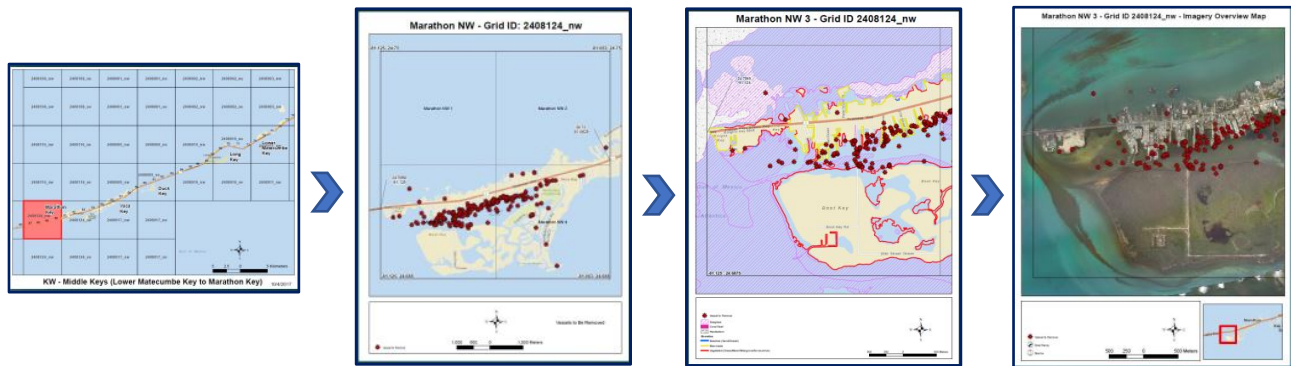


Figure 5 Example Grid Package Elements

Natural Resource Advisor Program

Environmental staff with expertise in Florida’s coastal and marine resources were enlisted as NRAs to provide oversight and guidance for the removal of displaced vessels and other marine debris. As grid packages were distributed and targets for removal identified, NRAs were deployed to monitor removal activity in sensitive habitats to help ensure that regulatory requirements and BMPs were followed. NRAs were responsible for photo documentation and preparation of monitoring reports to document removal activity. The effectiveness of the NRAs was such that only one significant marine resource impact was reported.

Florida Keys National Marine Sanctuary

Over and above ESF-10 involvement, the FKNMS created an advisory council working group to work with various agencies and the public to engage scuba diving operators to conduct underwater marine debris removal. The advisory council is a group of citizens from various user groups within the FKNMS. The group determined the best way to enlist and educate dive operators on how to collect spiny lobster trap remnants from the protected waters within the FKNMS.

4.2 State Agencies

4.2.1 Florida Department of Environmental Protection

FDEP Division of State Lands

The FDEP's Division of State Lands (DSL) provides oversight for the management of activities on more than 12 million acres of public lands including lakes, rivers and islands. Within the DSL, state lands records are maintained with many being mappable and accessible through the Board of Trustees Land Document System.

After Hurricanes Matthew and Irma, the DSL provided oversight and secured funding to contribute to the removal of marine debris removal from state waters. DSL fielded continuous inquiries regarding the ownership of submerged lands to guide marine debris removal across the state. DSL also served in the role of local sponsor for some counties that had exhausted their financial resources.

FDEP Aquatic Preserves

Approximately 2.2 million acres of Florida's coastal waters and coastlines are protected within the boundaries of 41 Aquatic Preserves (AP). The program is managed by the FDEP's Florida Coastal Office (FCO) and many include staff that help ensure the protection of the AP.

In north Florida, the focus of staff from the Big Bend Seagrass AP was primarily locating and removing derelict traps and fishing gear debris. In southwest Florida, staff from multiple APs were enlisted as NRAs for vessel removals. The vessel removals were directed from the Incident Command Post in Miami under ESF-10.

FDEP Northeast District

FDEP has six district offices, located regionally throughout the state. These district offices review permit applications, conduct inspections of permitted facilities, respond to reports of environmental damage and conduct compliance assistance and enforcement activities.

The Northeast District (District) encompasses 19 counties and includes the St. Johns, Nassau, Tolomato and historic Suwannee and Santa Fe rivers. After the hurricanes they were involved in an Ombudsmen role handling calls from concerned citizens and counties within the District about what to do about debris. The District oversaw efforts of subject matter experts to develop marine debris sites. Generally, the District was involved in the overall community response. The District provided environmental administration guidance and participated in the NRA program as well as the ESF-10 response.

4.2.2 Florida Fish and Wildlife Conservation Commission

The FWC Division of Law Enforcement, Boating and Waterways Section maintains a derelict, abandoned, and at-risk vessel removal program through which vessels of concern to the safety of the boating public are catalogued, mapped, and observed. Once vessels are deemed derelict, FWC works cooperatively with local governments and other officials to remove the vessels from state waters and have them properly

disposed of. With this expertise gained from years of managing the derelict and at-risk vessel program, the FWC was called upon to support the removal of displaced vessels post Irma. The FWC identified upland staging sites, created agreements with site owners, coordinated temporary storage of displaced vessels and monitored storage facilities until the vessels were either retrieved by owners or owner rights were waived. Often, owners did not claim their vessels and then FWC was responsible for proper disposal of the abandoned assets.

Additionally, the FWC State Scientific Support Coordinator was the ESF-10 Environmental Unit Leader. Many different regulatory units within FWC provided consultations, advice, and expedited permit review for vessel and spiny lobster trap removals.

4.2.3 Florida Department of Agriculture and Consumer Services

The Florida Department of Agriculture and Consumer Services (FDACS) coordinates and assists in the development of aquaculture and regulates aquaculture facilities. Aquaculture leases can include the bottom or the full water column over state owned submerged lands. Clams, oysters, and live rock are examples of species farmed within aquaculture leases. FDACS provides training, outreach and BMPs for farmers on how to prepare before a storm, including proper anchoring and securing of aquaculture equipment. The lease agreement requires that aquaculture gear is properly marked and labeled and that lease holders retrieve gear if it becomes dislodged. FDACS staff reported little to no lost gear following hurricanes Matthew and Irma and stated they had no role in marine debris response.

4.2.4 Local Governments

City of Jacksonville and Duval County

The City of Jacksonville is the largest consolidated city in the U.S. and includes 200 miles of waterways and tributaries with the St. Johns River running through the middle of the City. The St. Johns River is a north flowing river so debris from places south flowed north into Jacksonville. Emergency response actions in waterways within the limits of the City of Jacksonville fall within the purview of the local Emergency Operations Center (EOC). And while the City and County are not responsible for the debris, they are responsible for emergency response planning.

For Hurricane Matthew, 1 million cubic yards of marine debris was removed at a cost of \$26 million. In the first three weeks following Hurricane Irma, more than 1.5 million cubic yards of marine debris had identified. Irma caused historic flooding with surge levels four to five feet above Mean High Water. Nearly every dock in the City was underwater with an estimated 50 to 60% of private docks along the St. Johns River and associated tributaries damaged or destroyed in Hurricane Irma. Marine debris removal was still ongoing when the City and County participated in the project interviews, more than 6 months after the passage of Irma.

St. Johns and Monroe Counties

St. Johns and Monroe County coordinated local efforts pertaining to marine debris through their respective Emergency Management Offices. FDEP provided funding and hired vendors, and the Counties coordinated and directed on the ground removal efforts. The Counties interacted with the media, residents, and stakeholders, coordinated between departments within the Counties, sought funding, identified staging sites, equipment needs, and negotiated agreements with FEMA and FDEP. St Johns County staff coordinated with various agencies on marine debris removal from the St. Johns River. Monroe County staff coordinated with various agencies on marine debris removal from more than 500 canals as well as the removal of fishing trap debris, displaced vessels and locating upland staging sites.

4.3 Non-Governmental Organizations

Florida Keys Commercial Fisherman's Association

The Florida Keys Commercial Fisherman's Association (FKCFA) reports that of the 473,000 lobster trap certificates issued each year in Florida, 350,000 are fished in Monroe County and adjacent waters. The FKCFA maintains that every lobster trap which was deployed during the passage of Hurricane Irma was impacted in some way. On the ocean side of the Keys, trap movement was on the order of 8 to 15 miles and on the bay side 3.5 to 5 miles. Hundreds of thousands of commercial traps were displaced, some carried away as far as 18 miles. The uncontrolled displacement of so many lobster traps has potential for significant environmental impact if left unaddressed. Beyond the environmental impact, these traps are a key asset which commercial fisherman require for their livelihood. Timely retrieval is necessary to prevent further major impact to the environment and regional economy.

In conjunction with Florida Sea Grant, the FKCFA provided planes, staffing and advocacy in efforts to photo document the location of displaced spiny lobster traps, buoys, and debris within two weeks after Hurricane Irma. The group also worked with the FKNMS to coordinate underwater debris removal and reached into its membership who provide vessels to help transport debris back to land.

Florida Sea Grant

Immediately after Hurricane Irma, Florida Sea Grant approached the FKCFA asking how they could help the spiny lobster fishery. The groups determined that two spotter planes were needed to fly the entire length of the Florida Keys and across the entire FKNMS to photograph spiny lobster buoys to locate and document trap movement. Florida Sea Grant provided monetary and staffing support as well as developed maps to identify the location of spiny lobster trap debris. The maps were widely distributed and used by others to identify other debris types.

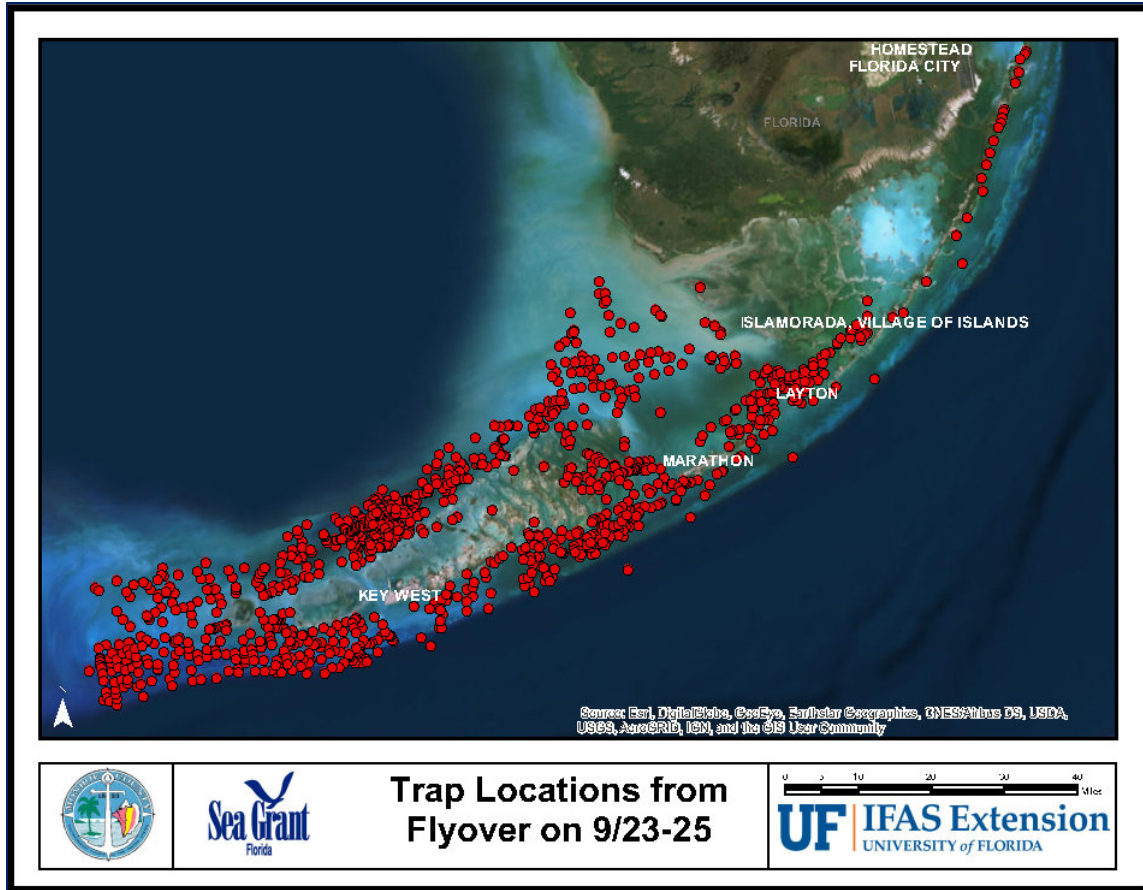


Figure 6 Displaced trap locations in Florida Keys from aerial photography by Florida Sea Grant.

5. Lessons Learned

From the interviews, more than 200 distinct comments were assembled and categorized into the following major lessons themes and topics:

1. Advanced planning
2. Communications
3. Construction
4. Environmental
5. Funding
6. Logistics
7. Marine Debris Assessment
8. Ownership and Responsibility
9. Staffing and Training
10. Technology

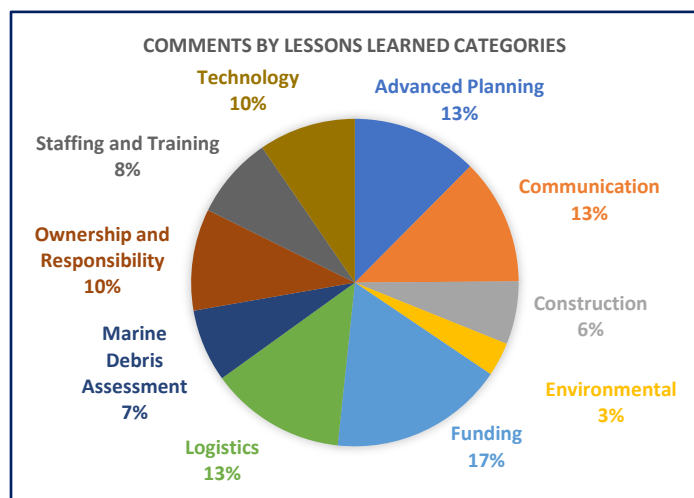


Figure 7. Comments by Lessons Learned Categories

Each lesson was assigned a qualifier and labeled as either a success, a neutral or informational comment, or an area in need of improvement. Of the 211 lessons shared, 53 (25%) were successes, 24 (11%) were neutral or informational lessons, and 134 (64%) were areas in need of improvement.

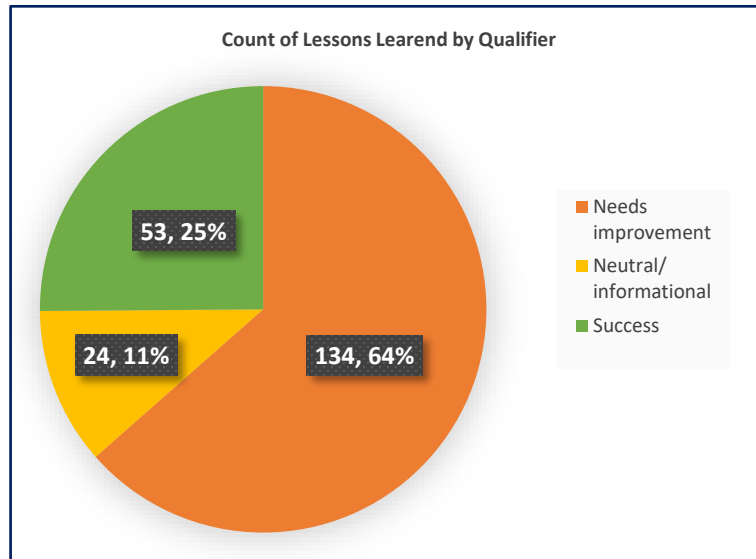


Figure 9 Count of Lessons Learned by Qualifier (Success, Informational or Needs Improvement)

The distribution of qualifiers by lesson category is presented in Figure 10 below.

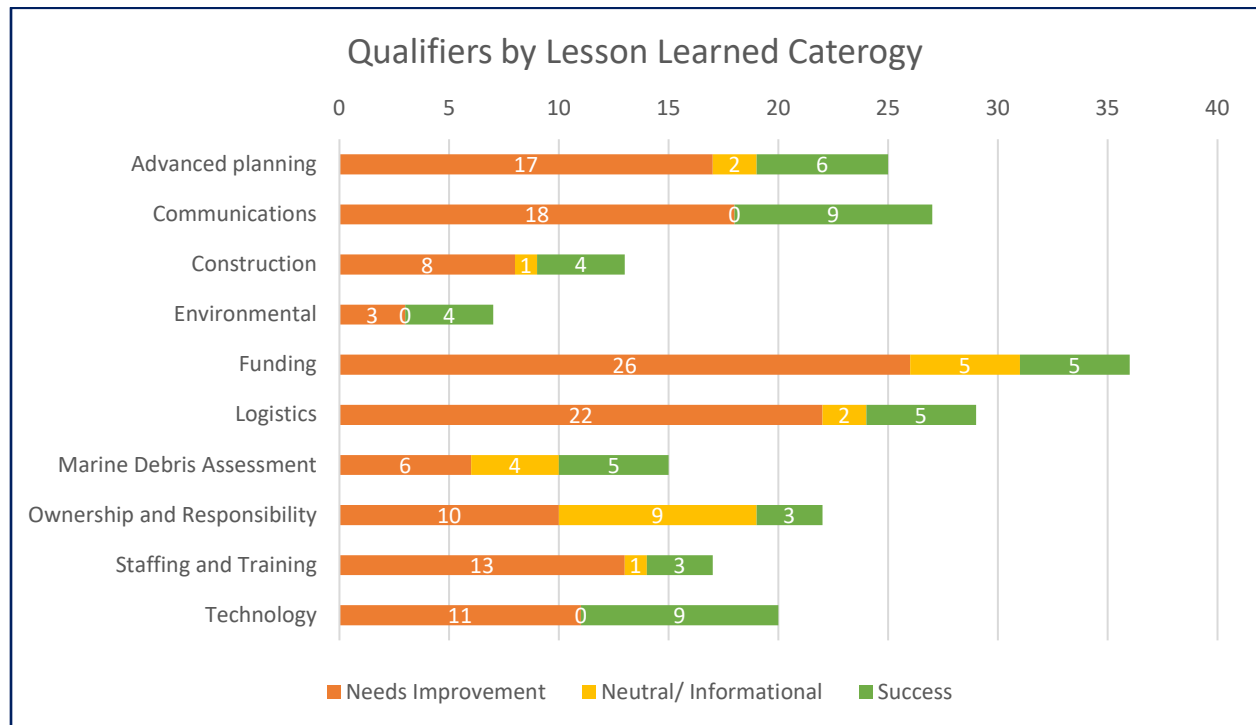


Figure 10 Qualifiers by Lessons Learned Categories

The following sections present a discussion of the lessons learned grouped by topic. It is important to note and keep in mind that the interviewees cross a broad spectrum of responsibilities and therefore their comments come from their own unique perspectives. For example, some focused entirely on the removal of displaced vessels while others focused more on removal of vegetative and other debris. Collectively, however, the sum of the lessons learned speak well to the spectrum and will benefit future planning considerations. For the purposes of this document, each lesson learned is only presented once, although several lessons were shared more than one time by different interviewees.

5.1 Advanced Planning

Advanced planning and an understanding of expectations allows managers to respond and proceed with debris removal as soon after the storm as safe conditions allow. Each storm is different, as is the variety of marine debris; therefore, not all contingencies may be planned. Having an advanced storm recovery plan in place that includes removal of marine debris would facilitate immediate implementation, when appropriate. The lessons learned contained within this category provide insight into specific areas that may be beneficial to advanced planning for marine debris removal.

Advanced Planning Successes

- Having worked with FDEP after Hurricane Matthew, contracting and project start up went more quickly after Irma because everyone already knew the roles and what needed to be done.
- Having prepared agreements that can be quickly executed for boat launch and landside access areas for debris removal expedites mobilization and avoids delays in deploying resources.
- Good preparation includes establishing an approach, identifying appropriate agency contacts and knowing where the potential for the highest concentration of marine debris will be located.
- Having debris identification mapping in place, understanding jurisdictional boundaries and having knowledge of submerged lands ownership facilitates successful marine debris removal.
- Having a good understanding of what is going to happen when a contractor arrives on site works well for local governments.

Advanced Planning Informational

- Make sure there is enough financial backing in advance, so contractors don't have to start, leave and then come back again to a project site.
- Local Governments (and taxing districts) routinely remove vessels and their guidance might have helped avoid some of the problems encountered.

Advanced Planning Areas in Need of Improvement

- ESF-10 provides contingency plans for staging sites for storing oil and gas emergency response materials, but not short (or long) term storage of marine debris/vessels.
- Staging areas in the Keys are difficult to find due to limited supply of open, vacant, large tracts of land. Most were being used as staging sites for land-based debris.

- Need to identify locations for upland storage of marine debris and arrange to have agreements and authorizations in place before a storm hits.
- Educate agencies on post-storm needs. Have conversations with agency heads so that they are prepared to authorize staff to go into field after a storm.
- A large amount of time was spent developing protocols and figuring out what could and could not be done, what permits would be required, what regulations applied, etc. Having procedures in place prior to the storm would have saved time.
- The work to conduct investigations on hurricane displaced vessels is different than routine derelict vessels investigations. There is a need to have these protocols in place prior to a storm.
- Misunderstandings between agencies regarding land management needs for staging and storage resulted in substantial delays.
- Removal of displaced vessels and storing on land may not be the best approach. Consider allowing vessels to remain in place after ESF-10 work (removal of oil and gas/hazardous materials) is complete and handle according to standard derelict vessel protocols.
- A marine debris management plan regarding removal of debris on land owned by the state in place prior to the storm could address many of FEMA's initial questions.
- DSL recognizes the need to work with the FDEM and with Governor's office before a storm, rather than after the fact.

5.2 Communication

Agencies and groups involved with marine debris clean up after Hurricanes Matthew and Irma included the following, at a minimum: FEMA, USCG, EPA, NOAA Marine Debris Program, USFWS, FKNMS, FDEM, FDEP, FWC, FDACS, Florida Sea Grant, counties, cities, special taxing districts, contractors, non-governmental organizations, and citizens. Considering the number of parties involved in marine debris management projects after a hurricane, clear communication is important so that everyone understands the mission, hierarchy and official sources of information. The following highlights the lessons learned regarding communications.

Communication Successes

- It was very helpful to have contractors come to county EOC, introduce themselves and discuss their strategy and approach to debris removal.
- There were few problems recovering spiny lobster traps due to exceptional relationship between commercial fishermen and FWC law enforcement.
- The Keys are small island communities where everyone interacts daily with their neighbors and fishermen have developed excellent relationships with their communities over the years.
- Law enforcement and state agencies relaxed rules and regulations for an appropriate time to allow rapid recovery and redeployment of fishing traps and gear.
- Establishing NRA coordinators helped assign the right NRA staff and allowed for integration of staff schedules.

- Once NRAs were authorized to use their own vessels, work became more efficient and productive since they did not have to rely on others.
- Direct communications with counties allowed FWC to progress in the mission to secure vessel storage sites.
- The Big Bend Seagrasses AP recommends partnerships with local land managers (regional Sea Grant agent, state parks, etc.) to assist with cleanups. Without these partnerships, the Big Bend Seagrasses AL recognizes they wouldn't have been able to retrieve the number of traps they did this past year.

Communication Areas in Need of Improvement

- The State's EOC Taskforce in Tallahassee is focused mostly land based debris and including marine debris would be beneficial.
- The State EOC Taskforce in Tallahassee did not coordinate or had limited coordination with ESF-10 and ESF-3 staff.
- ESF-10 and ESF-3 programs had competing goals and processes and could have worked better together through improved communications.
- A description of the FDEP's roles and responsibilities and a clear understanding of what debris they will and will not remove would be helpful.
- Local government conversations with state agencies with jurisdiction over submerged lands and marine debris removal should begin ahead of the storm.
- Those involved in the storage of marine debris on upland sites need to know if sites are permitted Disaster Debris Management Sites, and understand which activities are authorized on permitted and unpermitted sites.
- Some homeowners didn't understand what debris was authorized for collection by a contractor. Tying debris to docks to prevent additional hazards renders the debris ineligible for removal. Many examples like these were given which underscores the importance of more public outreach.
- NRAs were told that an FWC Officer would provide transport to each target. However, FWC wasn't getting the message through their chain of command. From the beginning, be sure direction from decision makers reaches those in the field.
- Local government staff are knowledgeable about their waters and waterways and can provide valuable information if included in communications.
- Conflicting information and direction coming from multiple agencies and from multiple levels of authorities within individual agencies was reported. Recommendations were made for communications to come through a central clearinghouse.
- Disseminating information such as agreements and requirements of the various agencies involved would be best served and helpful through a centralized clearinghouse/database.
- Contractors from around country were not familiar with the area and often did not have the right equipment. Contracts should communicate depth of water and vessel requirements.

5.3 Construction

For the purposes of this document, construction includes the removal of marine debris as well as related activities including the staging of construction equipment (boats, cranes, vehicles, etc.), temporary upland debris staging areas, and the transportation of debris to final disposal sites. The following highlights the lessons learned regarding construction.

Construction Successes

- Once everything was in place the operations went very smoothly
- Fishermen were active in the retrieval and removal of lobster traps, ropes and buoys, but also recovered other debris encountered, particularly in mangrove areas.
- The USCG and contractors that removed hazardous material did a great job and did the work the right way.
- NRAs identified displaced vessels that if removed would cause environmental damage. They further recommended strategic removal later to coincide with the highest tides to avoid damage to resources.

Construction Areas in Need of Improvement

- After Irma, many contractors authorized under Federal contracts were from out of state and lacked the local knowledge and relationships that local contractors possess. A contract mechanism to allow use of local contractors familiar with local waters and marine resources would be useful.
- If another hurricane hits another area of the country (or Caribbean), contractors may be pulled away from their work in Florida and the contractor pool from which the Federal government can authorize work will be stretched thin.
- It was difficult to identify and receive authorization for the use of sites for offloading marine debris to the upland.
- In the case of two rivers, debris removal efforts resulted in the rivers being 'opened' more than before the storm. Some of the clearing should have been kept to just enough for navigation purposes leaving natural debris in place for continued enjoyment by kayakers, canoers and nature enthusiasts. Understanding the waterways historical use is beneficial ahead of debris removal efforts.

5.4 Environmental

This category includes the lessons learned related to marine debris removal and interaction with the natural environment. Debris may be discovered in a seagrass bed, mangroves, or shoal known for nesting birds. As vessels decompose, fuel and oil tanks, batteries, engines, hazardous chemicals, electronics, or paint may leach out and contaminate the water. When vessels and other marine debris sink in the water, there is also shading of critical habitats, smothering and crushing of benthic habitats, and bottom scouring. Fishing gear and other debris may also be dispersed causing the entanglement of marine

mammals and waterfowl (including protected species). Projects to remove debris from sensitive areas should include special considerations of the possible interactions of the debris and the environment in which it occurs. The following highlights the lessons learned regarding the environment.

Environmental Successes

- Although the Lemon Bay AP suffered damage to seagrass beds from removal of a displaced vessel, mitigation to stabilize and repair grass beds was provided through ESF-10.

Environmental Areas in Need of Improvement

- Eventual removal of displaced vessels from upland staging areas often required the contractor to ‘break up’ the vessel into manageable pieces to be hauled away. In some cases, the upland staging areas did not have the necessary authorization (Disaster Debris Management Sites) for the vessel to be broken up on site on the ground. As such, after the fact soil sampling and analysis was required to confirm no leaching of toxins, fuels or contaminants that if found, would trigger the need for mitigation.
- Some hazardous materials were found when vessels were destroyed on land. The presence of hazardous materials should be checked on the land prior to vessel storage and destruction.

5.5 Funding

Acquisition of funding to remove and properly dispose of marine debris can be difficult, especially considering the level of funding first required in the aftermath of a hurricane for higher priority actions to protect human life and safety and deal with land-based debris. Following Hurricane Matthew, DSL was charged with identifying funding for marine debris removal from state waters and ultimately provided \$15 million to address debris from Brevard to Nassau County. DSL was called on again to assist with Hurricane Irma debris removal. In the case of Monroe County, DSL was able to put agreements in place with the local government for funding so that work to progress with the understanding that full reimbursement back to the state would be required. The FDEP reports the preliminary volumes and the associated costs of marine debris removed from state waters resulting from Hurricanes Matthew in 2016 and Irma in 2017 in Tables 1 and 2 below.

FEMA may provide funding for marine debris cleanups under specific conditions and with proper documentation. Documentation protocols are extensive and are subject to revision at any time. When eligible, FEMA funding is provided as reimbursement after work is completed, so agencies are required to completely fund the work in advance. During the interviews for this project in the Spring of 2018, local governments reported they had yet to be reimbursed for the cleanups following Hurricane Matthew in 2016.

The U.S. Department of Agriculture’s Natural Resources Conservation Service (NRCS) administers the Emergency Watershed Protection (EWP) program to respond to emergencies created by natural disasters. The EWP program offers financial assistance up to 75 percent cost share to relieve such hazards that threaten life and property, particularly as it relates to flooding. Indicated in Table 1 above, Putnam County

successfully received support from the NRCS's EWP program to remove 1,200 cubic yards of hurricane debris from inland waterways, creeks and tributaries.

Table 1 Marine Debris Volumes and Costs for Removal of Marine Debris following Hurricane Matthew

County	FDEP Actual Expenditures	Volume of Marine Debris Removed (cubic yards)	Cost/cy
Brevard	\$5,411,104	31,711	\$170.64
Clay	\$1,922,805	11,417	\$168.42
Duval	\$2,293,105	12,765	\$179.64
Nassau	\$1,425,880	8,408	\$169.59
Putnam*	\$235,908	1,200	\$196.59
St. Johns	\$1,718,498	10,197	\$168.53
Volusia	\$523,658	3,188	\$164.26
* Natural Resources Conservation Services Project			
Total Monitoring Costs:	\$1,413,806		
Project Totals:	\$14,944,764	78,886	\$189.45

Table 2 Marine Debris (estimated) Volumes and Costs for Removal of Marine Debris following Hurricane Irma (May 2018)

County	Costs Incurred (as of May 2018)	Volume of Marine Debris Removed (cubic yards)	Cost/cy
Brevard	\$8,082,900	48,140	\$167.90
Clay	\$5,903,000	35,820	\$164.80
Duval	\$5,780,230	33,690	\$171.57
Lee	\$4,174,500	24,290	\$171.86
St. Johns	\$8,604,300	50,000	\$172.09
Marion	\$5,371,900	30,180	\$178.00
Putnam	\$3,760,000	22,465	\$167.37
Collier	\$1,323,500	7,480	\$176.94
Project Totals (rounded):	\$43,000,000	252,000	\$170.63

At the local level, counties, cities and special taxing districts with jurisdictions over local waterways often have significant experience dealing with debris such as derelict vessels. However, they lack the funding to respond to an acute marine debris incident following a hurricane.

With many challenges identifying funding for marine debris removal, it is not surprising that the highest number of comments received indicating areas in need of improvement were in the funding category. The following highlights lessons learned regarding funding.

Funding Successes

- Aerial photography, from which concentrations of spiny lobster trap buoys could be identified, allowed for a reliable volume estimate of assets. Associated costs to retrieve and remove could be calculated from volumes.
- FWC provided significant financial considerations by waiving lobster trap fees for the season which saved fishermen approximately \$473,500 (\$1 per tag/trap).

- Under Emergency Orders, FDEP did not have to follow the customary procurement process which allowed for expedited contracting.
- In Monroe County, most canals were dredged from uplands and therefore are not state-owned lands. As such, the state cannot pay for debris removal from canals. However, DSL was able to act as sponsor and develop agreements that provided the County money to proceed with debris removal with the understanding the County will reimburse the funds in full within two years.

Funding Informational Comments

- According to the FKCFCA, the second largest economic engine in the Florida Keys is the commercial fishing industry (\$900M). The total population of the Keys is 79,000 out of which 4,500 hold jobs related to the fishing industry, making commercial fishing the second largest employer. Recovery and redeployment of fishing gear can rapidly restart the local economy.
- FEMA's required monitoring and documentation requirements increase marine debris removal costs, in some cases on the order of nearly three times more than an NRCS cleanup.
- The NRCS may fund up to 75% of the construction cost for emergency measures that relieve imminent hazards to life and property caused by natural occurrences that impair a watershed. NRCS reimburses faster than FEMA and has fewer requirements for documentation and on-site monitors.
- FEMA had a lot of lessons learned from Matthew and asked for more information up front in Irma than they did for Matthew.
- FEMA has their own restrictions for reimbursement of funding and originally limited removal of marine debris in canals to vessels that draw four feet of water. At FEMA's suggestion, the county documented the average draft of the five largest vessels (14.7 feet) and submitted the information for reconsideration. As of the time of the interviews, the county is still waiting for written approval from FEMA for the marine debris removal to qualify for reimbursement.

Funding Areas in Need of Improvement

- The primary challenge has been funding. The county has been receptive to waiving disposal fees which has been helpful, but it's a consistent challenge and there is a limit to the amount of fees people are willing to waive.
- At present, there is no funding to hire professional salvage divers to remove the large bundles of spiny lobster traps that present submerged entanglement hazards.
- DSL solicited bids from marine contractors and as appropriate, selected the lowest bid. However, local contractors could not meet the same price as lowest bid. Bid rates are always an issue, whether they are too low or too high. The contractor bid process should be reevaluated to consider what kind of rates work and when the work should be advertised. It may be better to wait until after storm when prices are more realistic and conditions are known.
- For FEMA reimbursement, debris must be documented to have occurred from a specific storm. This is complex and requires a lot of documentation. Counties should be aware that documenting the condition of the waterways ahead of storms may be necessary if they will be relying on FEMA reimbursement.

- Determine agencies that offer funding and do research in advance to understand requirements. Assemble the required funding documentation and have it all ready to go, to the extent possible, when a storm hits.
- When waiting for funding, floating debris may become submerged. Finding and removing floating debris is easier than removing submerged debris.
- Need to get funding more quickly. Fishermen are desperate to recover their gear and begin to generate revenue. In post hurricane situations they often go many months without a paycheck.
- Displaced vessels not claimed by their owners would be destroyed and moved to an authorized disposal facility. In total, these costs were around \$56 million. FWC was responsible for 25%, or \$12.7M. which came out of FWC trust funds causing a significant financial burden for the agency.
- It is difficult to plan without knowing how much money there is to distribute. If the responsible agencies knew how much money there would be to distribute, they could figure out how much each county would receive based on how many cubic yards need removing. But funding doesn't work this way.
- Since the FEMA reimbursement process is adjusted after each storm, learning from the previous event, it is difficult to know what information will be needed for the process.
- Managers should be aware of the different process for waterways that fall under the guidance of NRCS projects. NRCS projects are not eligible for FEMA reimbursement and areas eligible for NRCS projects vary.
- Difficult to find funding for rapid response. The longer debris is in the water the more damage it does and the more difficult it is to remove at a later date.

5.6 Logistics

Post hurricane marine debris removal can be a complex operation involving multiple agencies each with their own cadre of staff, specialized equipment often in high demand and short supply, and come with a sense of urgency to act to prevent environmental impacts. Without a clear path, operations, as was expressed by several during the interview process, are prone to delays and increased costs that are potentially significant. For example, the USCG under ESF-10 had a process by which displaced vessels were assessed and tagged. The FWC also had protocols for notifying vessel owners that allowed 30 days for owners to act. Had these two processes been combined, it would have resulted in significant time and cost savings and would have reduced the need for upland staging areas that were very hard to come by. The following highlights the lessons learned regarding logistics.

Logistics Successes

- According to the FKCFR, of the more than 1,700 vessels removed from Monroe County waters, only 14 were commercial vessels.
- Hurricane Irma impacted some of the same places as Hurricane Matthew so DSL had knowledge of staging and disposal areas.

- When a county has exhausted their financial resources, and needs to identify for FEMA reimbursement applications a “responsible party” as a sponsor, counties have turned to DSL to fill this role.
- When staging areas with waterside access were available, it enhanced speed of operations, decreased the amount of equipment required, and reduced safety risk.
- The USCG liaison officer reached out to City of Miami officials in the real property office and located water accessible city properties that could be used for offloading.

Logistics Informational Comments

- Allow BMP, manuals, guidebooks, or other documents to be living. After a storm, conditions will change, and documents will need change to adapt to new processes and information.

Logistics Areas in Need of Improvement

- The best staging areas will have waterside access for offloading. At some locations, vessels were offloaded onto trucks, driven to a staging area and offloaded by crane. Without waterside access, the extra work increases: 1) complexity; 2) time and expense with double (or more) handling, and; 3) safety concerns.
- The USCG first identified displaced vessels on the water and ‘stickered’ them (orange sticker with tracking numbers). It often took up to 30 days for the USCG to return and pull the boat from the water. FWC operations began when the vessel arrived at the upland staging area and was taken into custody by FWC. Then, FWC has a notification period in which vessel owners are informed in writing and given 30 days to collect their boat, otherwise it would be disposed of. Not many vessel owners claimed their boats and eventually most were destroyed and disposed of. If FWC could have initiated owner notification at the same time the USCG ‘stickered’ the vessel, the 30-day notification period would have expired by the time the USCG was prepared to remove the vessel from the water. This would have helped to:
 - Speed up the entire process
 - Reduce double and triple handling (and associated equipment requirements)
 - Alleviate much of the burden associated with identifying, securing, permitting, etc. the upland staging areas
 - Provide significant cost savings (the State bought thousands of boat stands for staging)
- In Miami there were a lot of boats and the State struggled to find appropriate staging areas which caused significant delays.
- It took too long to secure land based staging sites to store marine debris which led to a slower response in the field due to lack of storage sites.
- Contact information is needed ahead of time for specific needs so that no time is wasted trying to find correct person to allow field authorizations. For example, a mangrove trimming contact at FDEP.
- It took a significant amount of time to: 1) understand the laws and regulations to remove spiny lobster trap debris; 2) put protocols in place so people aren’t further damaging the resource with removal, and; 3) get the necessary permits to do removals.

- Process of carefully dry docking, tracking down the owners, and destroying the vessels that the USCG decontaminated became overwhelming and a large cost to FWC.
- In the Keys, land based and marine debris removal could not have taken place at the same time because staging and storage sites were full of upland/dry debris. Private sites are prohibitively expensive in the Keys.
- Counties and cities need to work together to determine where debris can go in future. Need to have debris sites available with an active list of sites knowing what they are licensed for. For each storm, sites must be registered through FDEP as debris management sites and that takes time.
- The largest constraint throughout the entire (displaced vessel) response was staging areas.
 - FWC was responsible for locating staging areas and originally planned for security fences and guards, but soon realized nobody wanted the vessels and therefore no security was needed.
 - Originally, state lands were sought with the assumption vessels could be stored for an extended period if necessary. But authorization for use of many state lands, such as state parks, was not authorized by FDEP.
 - There were legal issues with signing leases for staging areas.
 - There were legal issues with private land owners.
 - Eventually FWC expanded their scope to find staging areas.
- Some counties have pre-qualified contractors for post-disaster cleanups but the scale of the cleanup may exceed their budgets. The scale of the cleanup will dictate when additional help will be needed. State and federal agencies should be aware that these pre-existing contracts exist.
- It took significant time following Hurricane Irma for agencies to determine how the marine debris removal would occur; which entities would be responsible for each element; and where the funding would come from.

5.7 Marine Debris Identification and Assessment

The physical identification of marine debris can be difficult. Factors such as weather, water clarity, debris buoyancy, water depth and site navigability all combine to aid or impede identification. Waters within Florida vary naturally from crystal clear to dark water, freshwater to saltwater, sandy bottoms to vegetated bottoms, still waters to strong currents, and from very shallow to deep water. Hurricane marine debris can be almost any type of material of any size which may all be acted upon differently by the various properties of the waters into which the marine debris is deposited. Clear waters allow for multiple methods of identification while dark or unclear waters make assessment, identification and quantification difficult. Waters with currents may move marine debris each day in unexpected ways. Marine debris in shallow waters may be difficult to access while marine debris in deep waters may not need to immediately be removed. There are many methods to evaluate, and questions that must be asked when conducting marine debris identifications and assessments. The following highlights the lessons learned regarding marine debris identification and assessment.

Marine Debris Assessment Successes

- Four days after the Hurricane Irma passed, staff at Florida Sea Grant contacted the FKCF and asked how they could help. The FKCF worked with Florida Sea Grant to arrange aerial reconnaissance and to identify locations of lobster trap buoy clusters.
- Commercial fishermen have connections with pilots that are knowledgeable both of water, land, and where traps are traditionally deployed in spiny lobster fishery. Commercial fishermen had contacts for planes, but needed GIS experts and GPS enabled cameras from Florida Sea Grant to document where movement had taken place.
- Flyovers were conducted over Monroe County waters within two weeks of the storm to identify spiny lobster traps locations. In the future, assessments that cover such large areas could also include identification and location of other debris types.
- Aircraft can assess some locations, such as the Keys, sooner after a storm than people can assess marine debris on the ground. Immediately after Hurricane Irma, people in the Keys were not allowed to return to assess damage for some time, but flights were allowed.

Marine Debris Assessment Informational Comments

- When in the mangroves, it is difficult to discern spiny lobster traps, but ropes and buoys are often visible.
- To qualify for reimbursement an assessment is required and should include all affected areas. For example, after Hurricane Matthew there were flights on the St. Johns River to estimate debris volumes. Later, additional flights that captured over the side creeks increased the initial river assessment. The estimate went from \$5M for the river alone to \$15M with the additional areas.

Marine Debris Assessment Areas in Need of Improvement

- Local governments were asked to identify locations of marine debris but not all local governments have the means.
- As time passes and debris sinks, it remains a hazard to navigation and may influence flooding. Once sunk, specialized equipment (i.e. side scan sonar) may be needed to locate debris, particularly in dark water.
- It is difficult to document from which storm debris is generated. In some cases, bathymetric survey data and aerial photography were successfully used to identify new debris that could be definitively associated with Hurricane Irma.

5.8 Ownership and Responsibility

Most submerged lands in Florida are owned by the State, but many areas are privately or locally owned. The waters owned by the State, or Sovereign Submerged Lands (SSL), are those lands including, but not limited to, tidal lands, islands, sand bars, shallow banks, and lands waterward of the ordinary or mean high water line, beneath navigable fresh water or beneath tidally-influenced waters, which the State of Florida acquired title to on March 3, 1845, by statehood, and which have not been conveyed to another. For the purposes of this document SSLs shall include all submerged lands title to which is held by the

Board of Trustees (BOT) of the Internal Improvement Fund (Chapter 18-21.003, Florida Administrative Code).

During marine debris removal activities, it was widely reported that the lines of SSL ownership and responsibility were not always understood. It is clear to property owners and local governments who to contact when a permit is needed to fish on SSL, or to build a dock, but it is not clear who to contact, or who will take ownership or responsibility, for hurricane marine debris. Interviewees frequently requested a map that could identify the boundaries privately owned and SSL. The following are the lessons learned regarding ownership and responsibility.

Ownership and Responsibility Successes

- FWC authorized fishermen to recover each other's traps encountered in the field and then distribute the assets to the appropriate owners on land. This allowed work to proceed with greater efficiency and without fear of law enforcement or being fined.
- FDACS did not experience any issues with marine debris due to aquaculture leaseholders having a strong financial incentive to know where their assets are located before and after a storm, retrieve them quickly, document losses, fix, replace, or put gear back into service as quickly as possible.

Ownership and Responsibility Informational Comments

- The FKNMS created an advisory council working group to enlist and educate scuba diving operators to conduct marine debris removal operations.
- In most cases, lobster trap gear was damaged to the extent it's rendered non-harvestable (no animals or animals can freely move in and out of trap). Of great concern to fishermen is to recover gear that may be harvestable and returned to rightful owners.
- Marine debris may be defined differently by agency.
- DSL's #1 priority is public safety after a storm hits.
- Aquaculture equipment is not marine debris, it's personal property.
- Before Hurricane Matthew, the DSL had rarely had been involved in marine debris. Counties and local governments had, in the past, taken removal on themselves or the debris stayed in the water.
- DSL anticipates they will be involved in marine debris cleanup in the future.

Ownership and Responsibility Areas in Need of Improvement

- Monroe County has at least 500 canals, the ownership of which has never been documented by the County. FEMA required modification of an ordinance that said the County could enter all canals, despite ownership, if it was related to emergency management and debris removal.
- Understanding clear lines of responsibilities with respect to addressing hazards to navigation and all other types of debris is important. There was an expectation that such hazards would be addressed by local governments.

- It was suggested, for future events, instead of removing vessels from water and storing them, it may be better to tag vessels place in water. FWC could work with the USCG using their in-water identification system and allow the USCG to proceed with decontamination. Then the investigation can more closely follow normal derelict vessel protocols to notify owners who could retain the option to recover or remove the vessel or have FWC dispose of it. This process would avoid the double or triple handling of the vessel and significantly reduce costs.
- Knowing what waters are private and state owned is difficult. No maps or database exist with the complete information. Only vessels in state waters can be removed by FWC and after Hurricane Irma it was difficult to know if some vessels were in private or state waters.
- DSL understands the desire for a map showing state and privately-owned waters. However, generating a map for some areas is difficult and requires research of many factors including, but not limited to, ownership history, case law, dredging history and navigability.
- DSL needs to determine their role and if debris removal is part of their jurisdictional responsibilities. A clear delineation of responsibilities for marine debris removal after storm events needs to be agreed upon.

5.9 Staffing and Training

The number of agencies involved in marine debris projects and the various roles each plays requires an in depth understanding of the intricacies of debris and risk assessment, in-water operations and construction, associated logistics, the environment and, above all, safety. Projects like these are difficult to schedule, require long hours and require staff mobilization on short notice. Working in an emergency deployment environment is challenging at best and further taxing when local staff are personally affected by the storm. Understanding staffing needs and providing for training in advance of a hurricane enhances project safety, efficiency and success. The following are the lessons learned shared with respect to staffing and training.

Staffing and Training Successes

- Monroe County has learned to review internal team readiness and is making changes to internal staffing to handle long term recovery.
- Many FDEP staff became involved in the NRA program including those in the environmental permitting, compliance and emergency response programs. Emergency Response staff were particularly effective as they are used to working on-call and odd hours.
- FDACS has statutory requirements and conducts training on marking/tagging assets, proper gear anchoring, and retrieving assets if they become dislodged.

Staffing and Training Areas in Need of Improvement

- There are a lot of very strict laws surrounding removal of spiny lobster traps. FKNMS is training on what can and cannot be removed and helping dive operators through the permitting process so they can be permitted to go out and remove the traps.

- The clear delineation of legal authorities, responsibilities and delegation of appropriate decision-making authority in emergency marine debris removal after a storm event would aid in the expedited removal of the debris for human and environmental safety. This clarity is especially important at any Incident Command or similar emergency coordination locations.
- Recruit and train staff for NRA field work before a storm hits with the understanding that these staff will be called upon during hurricane season. These staff could be FDEP staff from APs or local offices, NOAA staff, FKNMS staff, etc. Understand that staffing for on-call situations may be difficult. State employee pool capable of this type of work is understaffed and after a storm may have been personally affected and unable to respond.
- Staffing for emergency should take into account that hurricane work requires long days in conditions that are not ideal. Staffing levels should insure that staff involved in marine debris removal are not getting burned out.
- NOAA staff were originally located at the Incident Command Post but then moved to a remote location (daily office location). On reflection, NOAA staff thinks it would have been better to remain in the Incident Command Post and not work remotely. Much more is accomplished working face to face.
- Before hurricane season it would be helpful to have enhanced training for local government staff who directly deal with debris removal.
- The NRA group was new to Irma and initially was understaffed. As time went on and the program was better understood, staffing caught up to the need.
- For NRA monitoring reports, a completed example of the report should be provided as a go-by to everyone doing the work. There weren't any examples as a part of the training at the start of work.
- Each organization should provide clear definition of roles for each team member prior to deploying. After Hurricane Irma roles seemed to change each day based on what was needed and who was available. Defining responsibilities and having the tools needed to accomplish the role is important.
- If FWC were to repeat the dry storage of displaced vessels in the future, FWC should determine if FWC Officers suffice as on-site project managers. If yes, then training should be conducted prior to hurricane season. If no, then staffing the sites should be evaluated with a plan in place prior to the start of hurricane season.
- OSHA regulations and use of volunteers has been an issue, especially for the Federal government. Safety concerns regarding vessel operations mean dive volunteers can't participate because the activities are considered "working dives." With limited personnel and staffing, dive operations for debris recovery in the FKNMS has been an issue.

5.10 Technology

The interviews provided insight into the methods and types of data collected during marine debris cleanups after hurricanes and the importance of managing that data. Leaning on their expertise with the derelict and at-risk vessel program, FWC wanted to take advantage of their long-standing derelict vessel

database for tracking and managing displaced vessels. Immediately following Hurricane Irma, FWC explored several options for collecting extensive additional field data beyond that for which they are normally equipped. Valuable time was spent vetting options that would be compatible with their existing database and they were concerned that developing an application would take too long. However, it soon became obvious that the existing database was not sufficiently robust to accept, store and manage the mass influx of additional data from Hurricane Irma.

The USCG employed Survey 123 for field data collection, uploaded and housed the data in a central repository where it linked to NOAA's Emergency Response Map Application (ERMA) system. The USCG could create the grid packages (maps) that were distributed to field teams to inform contractors and NRAs of daily assignments and keep track of progress in addressing displaced vessels.

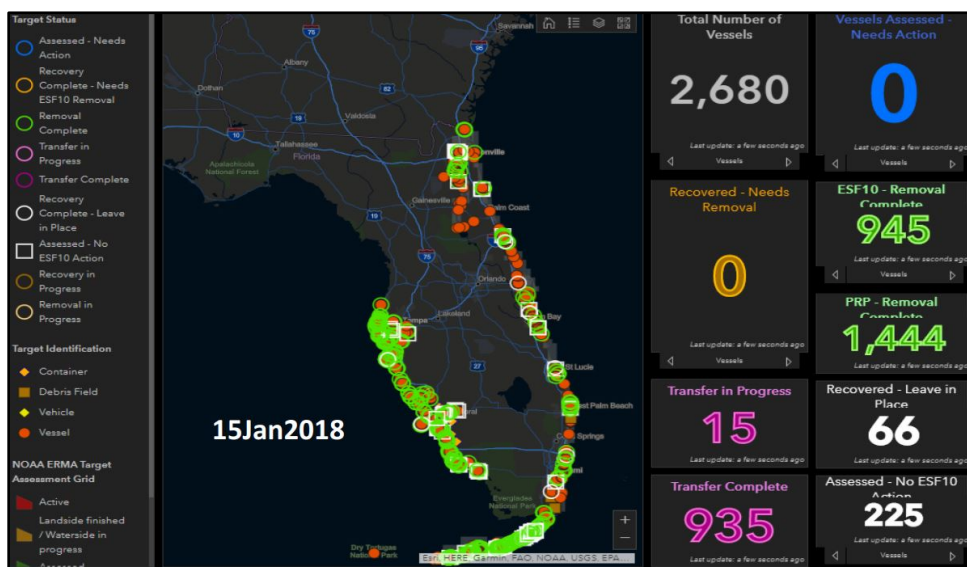


Figure 11 ERMA Display at Completion of ESF-10

FDEM's State Emergency Response Team (SERT) provided an online portal where the public could report marine debris via email and an online application. These reports were very useful to managers tracking debris and debris removal. However, the data did not go through any quality review process and, at times, vetting the information to obtain the most relevant data was time consuming. Additionally, the system required submittal of an accompanying photo which excluded participation by members of the public without the proper technical skills.

These are just some of the examples that came from the interviews and emphasizes how the right technology can facilitate many aspects of marine debris removal. The following highlights the technology related lessons learned.

Technology Successes

- The USCG brought in an EPA contractor with access to an ESRI database using the platform Survey-123 to create a database to track displaced vessels. The goal was to create the best tool to collect, manage, archive and present data in a map display, or what the USCG calls a common operating

picture. ERMA is a map with overlay capabilities. The USCG could import Survey-123 data into ERMA and display locations of boats, sensitive habitats, and other relevant information. The ESRI database is spreadsheet based, the data was archived daily and always accessible. This allowed sharing of data with the State in a compatible format.

- Having photography made into maps that identified the location lobster trap buoys accelerated the cleanup process. Commercial fishermen saved manhours and fuel because these aerials were available. Within two weeks, fishermen recovered approximately 60,000 out of an estimated 154,000 lobster traps severely displaced or lost.
- After Hurricane Matthew, there were different methods (GIS maps, spreadsheets, etc.) used to provide contractors all the information necessary to locate the marine debris targeted for removal. After Hurricane Irma, the information was consolidated into one report from the State. This was helpful compared to getting it from multiple sources.
- Following Hurricane Irma, the aerial photography provided by the USCG through ESF-10 helped contractors perform assessments, identify types of debris and estimate volume of debris that needed to be removed.
- The Big Bend Seagrasses AP discussed using drone technology to obtain before and after photos, but drones come with requirements for use. Logistically, for the Big Bend Seagrasses AP it is better to use an airboat to get “boots on the ground” during a low tide to document debris areas.
- The St. Johns River flows north, the debris moved with the flow and tracking the debris became necessary. The St. Johns County EOC worked with FDEP and established an email address where residents could send pictures and information, a single place where information could be reported. The email system was used during Hurricanes Matthew and Irma and was not specific to St. Johns County. One of the contractors (CDR McGuire) set it up on a web page. St Johns County did a public relations and social media blitz, and included it on their Emergency Management webpage. This gave residents a way to share their information and this is important. Next time, the photo should be strongly encouraged but not required.

Technology Areas in Need of Improvement

- The State has an emergency management reporting website where the public could report debris, but it was open source and not robust enough to use for manipulating data or transferring data into other programs, so the USCG decided against using it.
- It is important to track debris removal progress for overall planning and deployment of resources as the debris removal projects continue. Methods of gathering the information may have to vary by user group.
- Maps were made to identify locations of spiny lobster buoy concentrations, but once traps were retrieved or redeployed, the information was not reported and therefore could not be tracked and ‘marked off’ the map. As a result, Florida Sea Grant thinks at least 10% of lobster traps were not recovered (approximately 35,000).
- ERMA housed the data, work progress and status of all displaced vessels (targets). However, the NRAs did not have access to the ERMA system to confirm the most current information. They were provided ‘grid packages’ with their target assignments, but often contractors would arrive

at the target and some condition had changed. If NRAs had live access to the ERMA, they would be better informed and could assist contractors to operate more efficiently.

- Texting ability was necessary for NRA work, much of which could not have been done without texting. Normally, FDEP phones do not have texting abilities, but some were given the ability during the response effort. In the future, everyone on the team needs to have texting ability.
- The FWC's existing derelict vessel database needs to include a hurricane layer so they can differentiate what existed before and after the storm. The layer should include mapping capabilities as well as ability to include documentation as vessel moves towards destruction or recovery by owner.
- The database used by FWC to record data for vessel recovery was overwhelmed resulting in data migration to another database during vessel recovery operations. The new database also became overwhelmed by the volume of data.
- All agencies should work from same technical/digital systems (GIS, databases, web based applications, etc.).
- SERT had a website and corresponding smartphone app that allowed the public to report debris locations with pictures. There seemed to be no QC of data from public submittals and all reports of debris in water were sent to DSL regardless of debris location. DSL would rather work with counties and communities to find debris. It took time to address the reports from the app including the debris that didn't fall under purview of DSL.

6. Conclusions and Recommendations

Several federal and state agencies as well as local governments and non-governmental organization came together to respond to the acute marine debris incidents following Hurricanes Matthew and Irma. Throughout the interview process, appreciation was frequently expressed for the collaborative support received by each other's agencies in the common goal to restore public safety, safe navigation and remove threats to Florida's valuable marine resources. However, each entity had a unique perspective and their own mission and it is therefore not surprising that areas in need of improvement were identified most often. At the same time, the number of successes shared was reassuring and reinforces the opportunities for a collaborative approach to plan for future acute marine debris incidents.

One of the goals for the Marine Debris Lessons Learned project was to develop actionable priorities for areas in need of improvement. The criteria for selection includes priorities that are:

1. mentioned with frequency;
2. from interviewees with various backgrounds;
3. considered actionable; and
4. can be completed within a year.

Categories were sorted to determine the top five with the highest number of comments received in areas in need of improvement.

Table 3 Number of Comments Received by Category in Areas in Need of Improvement

Category	Number of Comments Received for Areas in Need of Improvement
Funding	26
Logistics	22
Communications	18
Advanced planning	17
Staffing and Training	13
Technology	11
Ownership and Responsibility	10
Construction	8
Marine Debris Assessment	6
Environmental	3

From each of the top five categories, a priority for action was selected according to the remaining criteria as follows.

- Funding Priority: Identify and confirm criteria, requirements and associated documentation necessary for FEMA reimbursement for marine debris removal
- Logistics Priority: Develop protocols and methods for post-storm marine debris assessments
- Communications Priority: Develop a public information system that provides information to the public and allows the public to report marine debris with a quality control check.
- Advanced Planning Priority: Identify waterside access and upland staging areas and provide for advance use agreements.
- Staffing and Training Priority: Identify and train staff across agencies who can serve in the role of Natural Resource Advisors (NRA).

7. References

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8. Appendices

- 8.1 List of Acronyms
- 8.2 Marine Debris Readiness Checklist
- 8.3 Regulatory Requirements and Best Management Practices: Hurricane Irma USCG ESF-10 Response Florida
- 8.4 FDEP Guidance for Disaster Debris Management Sites
- 8.5 Florida Marine Debris Reduction Guidance Plan (FCO 2017)
- 8.6 Florida Marine Debris Emergency Response Guide (NOAA 2017)

Appendix 8.1
List of Acronyms

Appendix 8.1 List of Acronyms

AP – FDEP Aquatic Preserve

BMP – Best Management Practices

District – FDEP Northeast District

DSL – FDEP Division of State Lands

EOC – Emergency Operations Center

EPA – Environmental Protection Agency

ERMA – NOAA Environmental Resource Management Application

ESF – Emergency Support Function

EWP – Emergency Watershed Protection

FCO – Florida Coastal Office

FDACS – Florida Division of Agriculture and Consumer Services

FDEM – Florida Division of Emergency Management

FDEP - Florida Department of Environmental Protection

FEMA – Federal Emergency Management Agency

FKCFA – Florida Keys Commercial Fisherman’s Association

FKNMS – Florida Keys National Marine Sanctuary

FWC – Florida Fish and Wildlife Conservation Commission

NOAA – National Oceanic and Atmospheric Administration

NRA – Natural Resource Advisor

NRCS – USDA Natural Resources Conservation Service

NRF – National Response Framework

OSHA – Occupational Safety and Health Administration

SERT – FDEM State Emergency Response Team

SSL – Sovereign Submerged Lands

USCG – United States Coast Guard

USFWS – United States Fish and Wildlife Service

Appendix 8.2
Marine Debris Readiness Checklist

Appendix 8.2 Marine Debris Readiness Checklist

The following is a list of key points or items revealed during the hurricane marine debris lessons learned interviews that would be helpful to have in place prior to the start of a new hurricane season.

- Pre-determined water access areas (boat ramps, marinas, ports, etc)
 - In-place user agreements with owners of water access areas (boat ramps, marinas, ports, etc)
- Pre-determined upland staging areas (tracts of land, park land, boat ramps, marinas, ports, etc)
 - In-place user agreements with owners of upland staging areas (tracts of land, park land, boat ramps, marinas, ports, etc)
- In-place permits, as needed, for use of water access and upland staging areas including approval as Disaster Debris Management Sites (DDMS)
- 'State-owned' submerged lands map
- Coordination with Florida Department of Emergency Management's Emergency Operations Center and Governor's Office in Tallahassee (a seat at the table)
- List of State and Federal agency responsibilities for marine debris cleanup
 - Up to date communications tree with responsible parties for various departments within local, state, and federal government agencies
- Process for displaced vessel removal (beyond normal Derelict Vessel program)
- Funding for rapid response
- Potential funding opportunities
- Training or guidance on the requirements and documentation needed for funding sources
- Guidelines for estimating the volume and cost of debris removal
- Identify and train Natural Resource Assessment (NRA) staff. Staff can be from various State and Federal agencies (and private firms). Training should include data needed for monitoring reports with examples given.
- Up to date on-call list of trained NRAs (includes approval from managers that NRAs staff may be called up as needed.)
- Best Management Practices for performing rapid assessment to identify, locate, and quantify different types of marine debris in various scenarios
- Have staffing and equipment needs available for marine debris assessment based on BMP's for marine debris assessment
- Best Management Practices for removal of different types of marine debris in various scenarios (for example: lobster traps in coral, seagrass, or mangroves; vessels in shallow water, seagrass beds, or partially on private property; vegetation in a scenic river; etc.)
- Assessment and tracking system (technology) consistency among agencies to ensure data can be shared easily
- Public reporting system that allows access by people with all ranges of technical abilities (public reporting of debris location, photos, etc.)

- Ability to vet the reports submitted to a public reporting system before sending to party responsible for cleanup coordination.
- List of required permits/authorizations/understanding of permit needs for marine debris removal activities (including assessment, removal, and disposal)
 - List of modifications to permits/authorizations or leniencies provided after a storm (fee waivers, additional time, waiver of notification requirements, emergency orders, etc)
- Contract mechanism in place to use local contractors, not contractors only brought in under Federal or State contracting
- Documentation of existing conditions prior to a storm in order to determine what marine debris a particular storm is responsible
- Understanding of a local government's (County/City) ability to perform assessments (not all have appropriate vessels or equipment)
- In-place rapid assessment protocols including equipment needs (drones, vessels, side scan sonar, divers, rapid bottom contouring, planes and pilots for flyovers, etc.)
 - Database loaded with pre-storm aerial photos and the ability to drop in post storm photos
- Understand FEMA's documentation requirements to ensure debris removal from waterways is eligible
- Prepared community outreach documents describing what a contractor can and cannot clean up (cannot remove debris tied to a dock, cannot enter private property, etc.)
- Texting ability as a communication tool after storm
- Develop a debris removal plan that does not include planned assistance from contractors
- Enhanced training for local government staff who directly deal with debris removal.

Appendix 8.3

**Regulatory Requirements and Best Management
Practices: Hurricane Irma USCG ESF-10 Response
Florida**

**REGULATORY REQUIREMENTS AND BEST MANAGEMENT PRACTICES (BMPs)
HURRICANE IRMA USCG ESF-10 RESPONSE FLORIDA**

Sensitive Habitats, Wildlife, and Fisheries Resources

- Avoid and minimize disturbance to sensitive shoreline and benthic habitats including: mangroves, salt marshes, beaches, tidal flats, natural rocky shorelines, seagrasses, hard-bottom reefs, coral reefs, and oyster beds.
- Avoid and minimize disturbance to all wildlife and fisheries species and their habitats including: nesting and migratory birds (seabirds, shorebirds, wading birds, etc.), marine mammals, land mammals, marine and coastal reptiles, fish, shellfish, and other marine and coastal invertebrates.

USACE Section 404 Clean Water Act and Section 10 Rivers and Harbors Act Permits

- No significant disturbance of sediment required for the removal of debris or vessels (permit required otherwise, contact the Environmental Unit/EU).

Florida DEP Environmental Resource Permit

- No filling of wetlands or other surface waters, or dredging that creates or expands surface waters (permit required otherwise, contact EU). All material removed must be deposited on self-contained uplands and managed in accordance with FDEP rules or provisions of the current Emergency Order.

NOAA Florida Keys National Marine Sanctuary General Permit

- All above and below resource protection requirements and BMPs apply.
- All materials associated with the response must be removed from the seafloor within 15 days of the completion of operations.

Florida SHPO Section 106 National Historic Preservation Act

- Cease all activities involving subsurface disturbance, and immediately contact the EU, if prehistoric/historic artifacts, such as pottery or ceramics, projectile points, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, or American settlement are encountered at any time (and leave all artifacts in place). Response activities shall not resume without verbal and/or written authorization. In the event that unmarked human remains are encountered during response activities, stop all work immediately and report to the Unified Command (UC) and EU through your chain of command.
- Contact the EU prior to conducting any removal or recovery efforts that require substantial ground disturbance beyond the initial disturbance caused by the disaster event (additional SHPO coordination required).

Tribal Coordination

- Seminole Tribe of Florida – the same BMPs above from the Florida SHPO apply for the Seminole Tribe of Florida’s THPO (coordinate with both).
- Seminole Nation of Oklahoma – no recommendations/concerns.
- Miccosukee Tribe of Indians of Florida - additional guidance may be forthcoming.

NOAA NMFS Endangered Species Act (ESA), Marine Mammal Protection Act (MMPA), and Essential Fish Habitat (EFH)

- All vessel operators must watch for and avoid collision with species protected under the ESA and MMPA.
- All vessels associated with emergency response activities shall operate at “Idle Speed/No Wake” at all times while operating in water depths where the draft of the vessel provides less than a 4-ft clearance from the bottom, and after a protected species has been observed in and has departed the area.
- All vessels will follow marked channels and/or routes using the maximum water depth whenever possible.
- Stop operating mechanical construction equipment, including vessels, immediately if a protected is observed within a 50-ft radius of construction equipment and resume after the species has departed the area of its own volition.
- If the detection of species is not possible during certain weather conditions (e.g., fog, rain, wind), then in-water operations will cease until weather conditions improve and detection is again feasible.

NOAA NMFS ESA, MMPA, EFH - continued

- All Vessels:
 - a. Sea turtles: Maintain a minimum distance of 150 ft.
 - b. North Atlantic right whale: Maintain a minimum 1,500-ft distance (500 yards). Right whales are particularly important to consider in the Sector Jacksonville AOR for operations in the Atlantic Ocean.
 - c. Vessels 65 ft in length or longer must comply with the Right Whale Ship Strike Reduction Rule (50 CFR 224.105) which includes reducing speeds to 10 knots or less in Seasonal Management Areas.
 - d. Mariners shall check various communication media for general information regarding avoiding ship strikes and specific information regarding right whale sightings in the area.
 - e. Marine mammals (i.e., dolphins, whales [other than North Atlantic right whales], and porpoises): Maintain a minimum distance of 300 ft.
 - f. When these animals are sighted while the vessel is underway (e.g., bow-riding), attempt to remain parallel to the animal's course. Avoid excessive speed or abrupt changes in direction until they have left the area.
 - g. Reduce speed to 10 knots or less when mother/calf pairs or groups of marine mammals are observed, when safety permits.
- Anchor in unconsolidated sediment only and avoid all hard-bottom and seagrass beds.
- Turbidity must be monitored and controlled; prior to in-water work turbidity curtains should be installed as per below. Turbidity curtains may be waived if minimal turbidity will be generated during marine debris removal or if the current is too strong for curtains to stay in place.
- Turbidity Control Measures:
 - 1. Install floating turbidity barriers with weighted skirts that extend to within 1 ft of the bottom around all work areas that are in, or adjacent to, surface waters.
 - 2. Use these turbidity barriers throughout construction to control erosion and siltation and ensure that turbidity levels within the project area do not exceed background conditions (i.e., the normal water quality levels from natural turbidity).
 - 3. Position turbidity barriers in a way that does not block species entry to or exit from designated critical habitat.
 - 4. Monitor and maintain turbidity barriers in place until the authorized work has been completed and the water quality in the project area has returned to background conditions.
 - 5. In the range of ESA-listed corals (St. Lucie Inlet, Martin County south to the Dry Tortugas and the U.S. Caribbean) and Johnson's seagrass (Turkey Creek/Palm Bay south to central Biscayne Bay in the lagoon systems on the east coast of Florida): all turbidity controls identified above shall be followed, except turbidity barriers should be secured to the seafloor, but avoid contact with all corals or seagrasses, if feasible.
- Entanglement:
 - 1. All turbidity curtains and other in-water equipment must be properly secured with materials that reduce the risk of entanglement of marine species (described below). Turbidity curtains likewise must be made of materials that reduce the risk of entanglement of marine species.
 - 2. In-water lines (rope, chain, and cable, including the lines to secure turbidity curtains) must be stiff, taut, and non-looping. Examples of such lines are heavy metal chains or heavy cables that do not readily loop and tangle. Flexible in-water lines, such as nylon rope or any lines that could loop or tangle, must be enclosed in a plastic or rubber sleeve/tube to add rigidity and prevent the line from looping and tangling. In all instances, no excess line is allowed in the water.
 - 3. Turbidity curtains and other in-water equipment must be placed in a manner that does not entrap species within the construction area or block access for them to navigate around the construction area.

NOAA NMFS ESA, MMPA, EFH - continued

- Measures to avoid:
 - 1. Use of in-water explosives.
 - 2. Trawling for debris removal.
 - 3. Deployment of anchored items that do not employ stiff, taut, and non-looping anchor lines.
 - 4. Dragging derelict vessels, debris, or other items across coral, hard-bottom, or seagrass areas - Items should be hoisted or refloated if possible.
- Any collisions with and/or injury or impacts to any protected species (sea turtles, sawfish, whales, dolphins, sturgeon, corals, Johnson's seagrass, etc.) shall be reported to the EU as soon as possible. Likewise, report any stranded, injured, trapped, entangled, or dead protected species to the EU as soon as possible. The EU will make further notifications to the appropriate agency contacts. Contact the EU through your chain of command or directly at (305) 523-3595.

USFWS Endangered Species Act**Birds:**

- Avoid known bird nesting and/or aggregation areas, to the extent possible. Do not enter sites with nesting birds without resource agency or conservation area landowners present. If removal/recovery operations are likely to impact nesting birds, contact EU for further guidance.
- Avoid aircraft disturbance to bird nesting and aggregation areas. If roosting or resting birds, such as egrets, herons, eagles, frigatebirds, are observed, limit lower or repetitive flight to minimize stress to those birds.
- If using airboats, maintain a distance of 1000' from nesting bird sites to limit disturbance.
- To limit disturbance to birds and other sensitive wetland- and intertidal-associated species, work crews should be limited in size and number to the minimum number of personnel and equipment required to complete removal in an efficient time frame. Equipment and personnel should work as closely together as is feasible during recovery operations to minimize disturbance.
- On beaches, if it is necessary to excavate the sand to remove targets, return the beach to its original profile at the end of each day.
- Check under and around vehicles and heavy equipment parked on the beach before they are moved. Shorebirds (piping plover and red knot) are especially vulnerable when they are roosting at night, and extra care should be taken at these times.
- Avoid deliberately flushing birds.

Manatees:

- All work must be in accordance with USFWS/FWC Standard Manatee Conditions for In-Water Work (2011).
- All response personnel shall be instructed about the presence of manatees and manatee speed zones, and the need to avoid collisions with and injury to manatees. Advise all response personnel that there are civil and criminal penalties for harming, harassing, or killing manatees.
- All vessels associated with the response shall operate at "Idle Speed/No Wake" at all times while in immediate work areas and while in water where the draft of the vessel provides less than a 4-ft clearance from the bottom. All vessels will follow routes of deep water whenever possible.
- Siltation/turbidity barriers and containment/sorbent boom shall be made of material in which manatees cannot become entangled, shall be properly secured, and shall be regularly monitored to avoid manatee entanglement or entrapment. Barriers/booms must not impede manatee movement.
- All on-site project personnel are responsible for observing water-related activities for the presence of manatee(s). All in-water operations, including vessels, must be shut down if a manatee(s) comes within 50 feet of the operation. Activities will not resume until the manatee(s) has moved beyond the 50-foot radius of the project operation, or until 30 minutes elapses if the manatee(s) has not reappeared within 50 feet of the operation. Animals must not be herded away or harassed into leaving.

USFWS Endangered Species Act - continued**Manatees** (continued):

- Any collisions with or injury to a manatee shall be reported to the EU as soon as possible. Likewise, report any stranded, injured, trapped, entangled, or dead manatee to the EU as soon as possible. The EU will make further notifications to the appropriate agency contacts. Contact the EU through your chain of command or directly at (305) 523-3595.
- Temporary signs concerning manatees shall be posted prior to and during all in-water project activities. All signs are to be removed by the permittee upon completion of the project. Temporary signs that have already been approved for this use by the FWC must be used. One sign which reads "Caution: Boaters" must be posted. A second sign measuring at least 8½ " by 11" explaining the requirements for "Idle Speed/No Wake" and the "Shut Down" of in-water operations must be posted in a location prominently visible to all personnel engaged in water-related activities. These signs can be viewed and downloaded at <http://www.myfwc.com/wildlifehabitats/managed/manatee/education-for-marinas/sign-vendors>.

Nesting Sea Turtles:

- Be aware of the potential for sea turtle nesting activity on all Ocean and Gulf-facing sand beaches, including mixed sand and gravel (shell, coral rubble) beaches, throughout Florida.
- Adult sea turtles, crawls, nests, eggs, and hatchlings should be protected during vessel removal activities on sea turtle nesting beaches, including hatchling turtles as they emerge from the nest and crawl to the sea.
- During sea turtle nest laying and hatching season (which can span nearly all year in some locations), no vessel/debris removal activities, including no equipment access, may commence on nesting beaches until a sea turtle nesting survey has been completed each morning by the FWC Marine Turtle Permit Holder (Permittee). Prior to operations on beaches, please contact the EU who will contact FWC (mtp@myfwc.com or 850-922-4330) to identify and obtain contact information for the Permittee for specific beaches to arrange for nesting surveys.
- Entry onto the beach will occur only after the Permittee for that particular beach has completed the morning surveys. Surveys are typically completed by 09:00; all staging on the beach should be conducted after 09:00 and before sunset.
- After the beach has been surveyed, the Permittee will direct the response crew along the established travel corridor.
- If an unmarked sea turtle crawl is encountered during or prior to response activities, the response crew will not disturb the integrity of the crawl or follow the crawl up the beach or into the dune, and will contact the Permittee to inform them of the location of the crawl.
- Any marked nests within the areas where vessel/debris removal will occur (including access areas) shall be left in place. Marked nests shall be delineated by stake and survey tape or string around the nest. A circle with a 10-ft radius centered at the nest is recommended for nest protection. Marked nests and areas with unmarked nests must be avoided during vessel/debris removal.
- It is the responsibility of the Permittee to ensure that all nesting surveys and nest marking are conducted only by persons with prior experience and training in these activities and who is duly authorized to conduct such activities through a valid permit issued by the FWC.
- If activity will occur near a marked nest or in the wrack line, the Permittee or their authorized personnel shall be onsite during all vessel/debris removal.
- Equipment and work crews will only transit the beach seaward of the nesting area on the hard-packed sand.
- Work shall only occur during daylight hours.
- If a sea turtle (either adult or hatchling) is observed maintain at least 200 ft between the turtle and response personnel and contact the Permittee.
- If sea turtle hatchlings are encountered, maintain at least 200 ft between the hatchlings and response personnel, allow the hatchlings to crawl unobstructed to the water. Do not carry the hatchlings to the water. Contact the Permittee to inform them of the hatchlings.
-

USFWS Endangered Species Act - continued**Nesting sea turtles (continued):**

- All response actions, equipment, and personnel shall observe a 10-ft buffer from marked sea turtle nests. Care should be taken to avoid walking or driving equipment over a crawl so that a potential nest is not damaged.
- If altered, beach topography shall be restored in all areas to the natural beach profile by 20:00 each day. Restoring beach topography includes raking of tire ruts, filling pits or holes where debris were removed, etc. Any potential obstructions such as containment or sorbent boom, equipment, etc. should also be removed from the beach by 20:00 each day.
- In the event a sea turtle nest is excavated during vessel/debris removal activities, all work shall cease in that area immediately and the Permittee will be contacted to either rebury the eggs or relocate the clutch to a safe location. Contact the EU for assistance with contacts, (305) 523-3595.
- Upon locating a dead, injured, or sick sea turtle, or if eggs or nests are disturbed during response activity, initial notification must be made to the Permittee and the EU as soon as possible. The EU will make further notifications to the appropriate agency contacts. Contact the EU through your chain of command or directly at (305) 523-3595.
- Equipment and material staging areas should be located outside of areas of native vegetation and known endangered species habitats. Contact the EU for assistance, (305) 523-3595.
- All vessel and debris removal should occur within or as close as possible to the footprint of the vessel/debris and the associated disturbance area.
- Minimize the impact footprint of equipment by working from one location to the extent possible by grappling, hoisting, or lifting vessels and marine debris.
- Where possible, equipment should be operated from existing hard top or impacted sites to remove vessels/debris from natural habitats.
- Vessel/debris removal activities should be accomplished with the smallest equipment needed, including hand crews where possible, to minimize disturbance of habitat (especially when working within critical habitats). Remove and transport vessels/debris to storage areas rather than using traditional methods of land clearing and pushing debris into piles.
- Ingress and egress corridors for vehicle and equipment operations and vessel/debris removal should minimize impact to natural habitats.
- Care should be taken to restrict equipment/vehicles to roadways and roadbeds and off of vegetated areas or areas of buried vegetation.
- When vessels/larger debris are collected from debris piles on less developed lands, natural shorelines, or in mangroves and marshes, the debris piles should be lightly disturbed and/or small portions removed first, to allow any protected species (e.g., small mammals) hiding in the debris to escape. Consider having an NRA stationed to alert the equipment operator if protected species are observed, and to avoid collecting protecting species.
- To the degree possible, the removal of forested vegetation should be limited to fallen trees only, and only if required to remove vessels/debris; otherwise, leave fallen trees in place (also applies to mangroves).
- Trimming of standing native trees during vessel/debris removal should be minimized (also applies to mangroves).
- The removal of healthy trees to remove embedded vessels/debris should be avoided or minimized (also applies to mangroves).
- All trash resulting from the response should be removed from the area as appropriate or disposed of properly in covered trash receptacles.

USFWS Endangered Species Act - continued**Florida Keys Species:**

Key Deer: occur in all habitats, including mangroves and marshes, on Bahia Honda Key, Big Pine Key, No Name Key, Summerland Key, Cudjoe Key, Sugarloaf Key, Saddlebunch Keys, Big Coppit Key, and surrounding keys.

- If silt fencing is to be used, it is recommended that wattles are used in place of silt fence. Wattles do not create a barrier to key deer movement.
- Obey all roadway speed limits with particular precautions given to the areas of Big Pine Key and No Name Key.
- Do not feed key deer, do not leave any food items in areas that are accessible to key deer.
- Prior to vessel/debris removal with mechanical equipment, check all vessels/large debris to be removed from less developed lands, natural shorelines, or mangroves to ensure no key deer are using the vessel/large debris as refuge.
- If key deer are present in a work area, wait until they leave the area before conducting vessel/debris removal.

Lower Keys Marsh Rabbit, Silver Rice Rat: occur in mangroves, salt marsh, and beach berm habitats from Big Pine Key and Little Pine Key through Boca Chica Key.

- Avoid or minimize disturbance to mangrove, salt marsh, and beach berm habitats.
- When vessels/larger debris are collected from debris piles on less developed lands, natural shorelines, or in mangroves and marshes, the debris piles should be lightly disturbed and/or small portions removed first, to allow protected species hiding in the debris to escape. Consider having an NRA stationed to alert the equipment operator if protected species are observed, to avoid collecting protecting species.

Miami Blue butterfly: occurs in coastal dune and berm habitats in the Snipe Keys, Boca Grande Key, Marquesas Keys, Gull Keys, and Mooney Harbor Key.

- Avoid or minimize disturbance to coastal berm and dune habitats and plants.
- Leave any clipped or pulled vegetation in place in coastal berm and dune habitats.

USFWS Florida Keys National Wildlife Refuges Complex (Aerial Ops only; all other BMPs apply for water and land operations)

- Aerial operations must be conducted from fixed wing aircraft flying at or above 1000'. Periodic excursions to lower altitudes are permitted but must be minimized.
- Minimize disturbance to nesting/roosting birds during aerial operations, by avoiding repeat passes and excursions to lower altitudes in those areas.

For further guidance and assistance with BMPs, please work with the on-site Natural Resource Advisor (NRA) or contact the Environmental Unit (EU) through your chain of command or directly at (305) 523-3595.

Version Tracking: v2 adds USFWS BMPs for nesting sea turtles and Florida Keys species; and tribal BMPs from the Seminole Tribe of Florida
v3 adds USFWS BMPs for birds and aerial operations in the Keys complex NWRs

Appendix 8.4

FDEP Guidance for Disaster Debris Management Sites



*Florida Department of Environmental Protection
Guidance for Establishment, Operation, and Closure of
Disaster Debris Management Sites (DDMS)
May 4, 2018*

General Information

1. Pursuant to 403.7071, Florida Statutes (F.S.), solid waste generated as a result of a storm event that is the subject of an emergency order issued by the Department of Environmental Protection (Department) may be managed with field authorizations for disaster debris management sites (DDMSs).
2. Field authorizations for DDMSs may only be issued by the Department subsequent to an Executive Order by the Governor declaring a state of emergency and an Emergency Final Order¹ by the Secretary of the Department authorizing DDMSs. In addition, DDMSs must be authorized by the Department in order for the owner/operator of the DDMS to receive public assistance funds from the Federal Emergency Management Agency (FEMA).
3. The Department strongly encourages local, state and federal government officials responsible for disaster debris management (government official) to use the Department's pre-authorization process to establish and pre-authorize new DDMSs or to complete annual pre-authorization of previously pre-authorized DDMSs. Typically, the Department sends out reminders each year, before the start of hurricane season.

Process for Pre-Authorization of New DDMSs

- The government official submits a request to the Department for a new DDMS. If the local, state or federal government (ex., Leon County, Duval County Schoolboard, FDOT) already has one or more existing DDMSs, evaluation of a new DDMS may be requested through the Department's Business Portal at the following link: <http://www.fldepportal.com>. If the local, state or federal government does not have any existing DDMSs, then a request may be submitted via e-mail to their local District or delegated County office.
- In either case, the requestor will be asked to provide the information identified in Item 5 below, for each proposed DDMS.
- The local District or delegated County will review the information, request clarification if necessary and may conduct an inspection of the proposed site(s);
- Upon approval, the local District or delegated County will issue a pre-authorization letter for each DDMS.
- In the event of an Emergency Final Order that includes the county where the DDMS(s) is/are located, the government with responsibility for the DDMSs must

¹Emergency Final Orders can be obtained from the Department's website at the following address: <https://floridadep.gov/hurricane>. The Emergency Final Orders also include information on the management of domestic wastewater residuals.

- notify the Department or delegated County regarding which pre-authorized DDMSs it intends to use.
- The Department or delegated County activates each of the identified DDMSs by issuing a Field Authorization.

Process for Annual Pre-Authorization for Existing DDMSs

- On an annual basis, government officials are asked to review their existing DDMSs. This can be accomplished through the Department’s Business Portal at the following link: <http://www.fldepportal.com>
 - The government official is asked to provide any necessary updates for each DDMS through their local District or delegated County contact, including information in Item 5, below, not previously provided;
 - The government official identifies the DDMSs that it would like to have pre-authorized for that year.
 - Once the DDMSs are selected and submitted, the portal will issue a pre-authorization letter for each DDMS.
 - In the event of an Emergency Final Order, the government official must notify the Department regarding which pre-authorized DDMSs it intends to operate.
 - The Department or delegated County activates each of the identified DDMSs by issuing a Field Authorization.
4. Verbal requests will only be accepted in an emergency situation and must be followed by a submittal of the information in Item 5.
5. The following information should be provided with all new DDMS requests. For previously approved DDMSs, this information must be provided, if not previously submitted, and/or updated as appropriate. This information is not necessary if it was previously provided for site pre-authorization:
- a. A map that illustrates the site layout and key features on or near the property. The map should show, as applicable:
 - Site boundary and boundary of the area within the site that will be used for debris management and processing;
 - Structures, such as paved areas or buildings;
 - Sensitive features on the property or nearby, including wetlands, water bodies, potable wells, etc.
 - Debris management area(s) that are labeled as to the nature of the debris that will be placed there;
 - Processing area(s); and
 - Traffic flow, including entrance, exit and roadways within the site.
 - b. A plan for operation of the DDMS. The plan should describe, as applicable:
 - Function of the site – management of debris, processing of debris, or both;

- Type of processing that will be conducted;
 - Types of wastes that will be managed;
 - Process for managing unexpected or unauthorized waste;
 - Entities that are authorized to bring debris to the site;
 - Location where site records will be kept; and
 - Days and hours of operation.
- c. The location of the DDMS including the address and, if possible, its latitude and longitude or directions from major roadways.
- d. The name, telephone number, and e-mail address of the site contact/manager.
- e. If the proposed DDMS location is not owned by the government requesting the DDMS, provide a copy of a lease/approval for use by the legal owner of the property.
6. Requests for authorization of DDMSs should be made by a local, state or federal government official responsible for disaster debris management within the jurisdiction (e.g., county, city, DOT District, school district, etc.) where the DDMS is located. Such DDMSs do not need to be owned by the government but must have oversight by the government with jurisdiction (or it's designated contractors). The government that requested the DDMS will have ultimate responsibility for compliance with statutes and rules.
7. The owner or operator of each DDMS should keep records of the amount and type of waste received, waste sent off-site for disposal or recycling, and waste left on-site. Such records can be very valuable for demonstrating that the DDMS has been operated in accordance with applicable regulations and orders. These records should be kept at a location designated by the site manager and made available for review by Department staff upon request.

Location of DDMSs

8. If possible, it is advisable to test the soil, groundwater, and/or surface water at a proposed DDMS prior to receipt of storm debris to establish pre-existing conditions.
9. DDMSs for debris other than yard trash and uncontaminated vegetative debris must not be located within 500 feet of a potable water well, unless otherwise approved by the Department. DDMSs for yard trash and uncontaminated vegetative debris must not be located within 100 feet of a potable water well, unless otherwise approved by the Department.
10. DDMSs for debris other than yard trash and uncontaminated vegetative debris must not be located within 200 feet of a natural or artificial body of water, unless otherwise

approved by the Department. DDMSs for yard trash and uncontaminated vegetative debris must not be located within 50 feet of a natural or artificial body of water, unless otherwise approved by the Department.

11. In no case should a DDMS be located in a water body or wetlands.
12. If prehistoric or historic artifacts, vessel remnants, or any other physical remains that could be associated with Native American cultures, early colonial or American settlement, or maritime history are encountered at any time within the project area, the project should cease all activities involving disturbance in the immediate vicinity of such discoveries. The owner or operator, or other designee, should contact the Florida Department of State, Division of Historical Resources, Compliance and Review Section at (850) 245-6333, as well as the appropriate authorizing agency. The project activities should not resume in the vicinity of the discovery without verbal and/or written authorization from the Department of State.

Operation of DDMSs

13. DDMSs should have:
 - a. Stormwater controls, such as silt fences, to prevent discharge of contaminated runoff into water bodies where such discharge may cause violations of Department standards (example: turbidity);
 - b. Control methods for the offsite migration of dust, wood chips or other debris residuals from vehicular traffic and from the handling of debris and ash;
 - c. Access control to prevent unauthorized dumping and scavenging; and,
 - d. Spotters to correctly identify and segregate waste types for appropriate management.
14. All reasonable steps must be taken to minimize the release of contaminants from the disaster debris at the DDMS. If contaminants are released into the environment, the entity operating the DDMS must take immediate steps to contain the release and notify the Department within 24 hours.
15. Only construction and demolition debris, land clearing debris, yard trash, vegetative debris, or Class III waste may be stored at a DDMS. Class I waste (such as household garbage, putrescible waste, or mixed wastes containing these materials) must be removed from a DDMS and disposed of as soon as practicable to prevent odor, vectors and sanitary nuisances. Again, spotters should be used at the DDMSs to correctly identify and segregate waste types for appropriate management. The following instructions must be used, as applicable:

- a. Class I wastes, including all mixed wastes, must be disposed of at a Class I landfill or, except for asbestos-containing materials, in a waste-to-energy facility that is authorized to accept such wastes.
- b. Non-recyclables and residuals generated from segregation of disaster debris must also be disposed of in a Class I landfill or waste-to-energy facility.
- c. Uncontaminated yard trash may be disposed of in permitted lined or unlined landfills, permitted land clearing debris facilities, or permitted construction and demolition debris disposal facilities.
- d. Uncontaminated yard trash and clean wood may be processed at a registered yard trash processing facility.
- e. Construction and demolition debris that is mixed with other disaster debris need not be segregated from other solid waste prior to disposal in a lined landfill. Construction and demolition debris that is either source-separated or is separated from other disaster debris at an authorized DDMS, may be managed at a permitted construction and demolition debris disposal or recycling facility upon approval by the Department of the methods and operational practices used to inspect the waste during segregation.
- f. Unsalvageable refrigerators and freezers containing solid waste such as rotting food that may create a sanitary nuisance may be disposed of in a Class I landfill; provided, however, that chlorofluorocarbons and capacitors are removed and recycled to the greatest extent practicable using techniques and personnel meeting the requirements of 40 CFR Part 82.
- g. Boats must have all hazardous materials, batteries, and petroleum products removed prior to any debris processing, and all engines and bilge areas must be thoroughly cleaned, drained, and/or removed prior to arrival at a DDMS. Once these items have been removed, the remaining debris must be disposed of at a Class I or Class III landfill. Grinding debris from the dismantling of a boat, where unconfined particulate emissions or public nuisances are created, is prohibited.
- h. Burning of disaster-generated yard trash, other vegetative debris, and untreated wood from construction and demolition debris is allowed in air curtain incinerators (ACIs) if the conditions of the appropriate Emergency Final Order are followed. The following additional information is provided for operation of ACIs:
 - i. The ACI burn area should have a minimum setback distance of 50 feet from the debris piles, any wildlands, brush, combustible structure, or paved public roadway, and 300 feet from the nearest occupied building, unless otherwise specified by the local Fire Department.

- ii. As required in the Emergency Final Order, ash residue from the combustion of vegetative debris may be disposed of in an appropriately permitted disposal facility, or may be land spread in any areas approved by local government officials except in wellfield protection areas, wetlands, or water bodies.
 - iii. As required in the Emergency Final Order, ash from the combustion of other disaster debris shall be disposed of in a Class I landfill.
 - iv. Open pile burning of disaster-generated vegetative debris must receive prior authorization from the Florida Forest Service. Piles should have a minimum setback of 300 feet from registered Source-Separated Organics Processing Facilities (SOPF). Ash from this burning may be disposed or used as described above for ACIs. Open pile burning of debris is prohibited at DDMSs located at permitted landfills or, unless otherwise/specifically approved by the Department.
- i. Chipping and/or grinding of uncontaminated disaster-generated vegetative debris is encouraged to help reduce the volume of the material. The Department recommends the following guidelines for managing the volume reduced material:
- i. In accordance with National Fire Protection Association², mulch and chip piles should not exceed 25 feet in height, 150 feet in width, and 250 feet in length. A clear space of not less than 15 feet shall be maintained between piles and exposing structures, yard equipment, or stock, and piles should be subdivided by fire lanes having at least 30 feet of clear space at the base around each pile. These piles should not be compacted.
 - ii. Smoking should only be allowed in designated areas well away from the combustible material.
 - iii. Possible uses of the size reduced material include: (1) a soil amendment where it is disked into the soil or mixed with potting soil; (2) as mulch for weed control, moisture retention, soil temperature control, erosion control, or slope stabilization; (3) fuel; (4) feedstock for composting operations; (5) animal bedding material; and (6) pulp wood.
 - iv. Use of the size reduced material as a soil amendment must be at normally accepted agronomic rates as determined by industry practice. Recommendations for appropriate application rates by the Institute of Food and Agricultural Sciences³ (IFAS) may be used, and can be obtained from the

²NFPA 1, 31.3.7.2, 31.3.6.4.2, 31.3.6.4.3

³The web address for IFAS is <http://www.ifas.ufl.edu/>

local IFAS Agricultural Extension agent.

- v. The use of mulch must be considered beneficial rather than disposal. Mulch must not be placed in water bodies or wetlands.

Closure of DDMSs

16. DDMSs are temporary locations that can be used for the duration of an Emergency Final Order or as otherwise approved by the Department. The following guidelines apply to the closing of temporary DDMSs:
17. Owner/operators of the DDMSs must contact the Department prior to closing a DDMS to discuss and coordinate what will be required for closure including environmental sampling, if needed.
18. All disaster debris must be removed by the expiration of the Emergency Final Order, unless otherwise approved by the Department.
19. Requests to beneficially use mulch produced from processing uncontaminated vegetative debris on-site, may be made in writing to the Department. The Department will consider these requests on a case-by-case basis.
20. Areas that were only used to manage uncontaminated vegetative debris, or ash from burning solely vegetative debris, will not require any environmental sampling after the debris or ash is removed unless there is reason to believe that the area may have become contaminated (e.g., significant visible staining or known contaminant releases in the area).
21. Areas that were used to manage mixed debris or ash from burning mixed debris will normally require environmental sampling after the debris or ash is removed unless there is reason to believe that no contamination of the area occurred (e.g., the area is paved with asphalt or concrete and there is no visible evidence of staining or known contaminant releases). See Attachment 1 for details on environmental sampling.
22. The Department must be informed in writing when all closure activities at the DDMS are completed. If environmental sampling was conducted as part of the closure activities, then the closure notice should include the results of this sampling, unless otherwise approved by the Department.

Attachment 1

Florida Department of Environmental Protection Sampling Protocols for Disaster Debris Management Site (DDMS) Closure

- If required, initial soil sampling shall be analyzed for the following:
 - Resource Conservation and Recovery Act (RCRA) metals as defined in 40 CFR 261.24, Table 1*, using USEPA Test Methods 6010 and 6020
 - Volatile Organic Compounds (VOC's), using USEPA Test Method 8260
 - Semi-Volatile Organic Compounds (SVOC's), using USEPA Test Method 8270

Note: If the analyses above exhibit concentrations above the applicable leachability-based soil CTLs, then the following additional analyses should be completed: direct leachability testing by USEPA Test Method 1312, Synthetic Precipitation Leaching Procedure (SPLP) extraction, or USEPA Test Method 1311, Toxicity Characteristic Leaching Procedure (TCLP) extraction if the contamination is derived from used oil or similar petroleum products, followed by the appropriate analyses of the leachate. In addition, sampling of groundwater for RCRA metals, VOC's, and SVOC's may be required depending upon the results of soil samples. The same USEPA Test Methods used for soils listed above shall be used for groundwater.

- Initial sampling collection shall be conducted in accordance with 62-160, Florida Administrative Code and the Department's Standard Operating Procedures for field activities or equivalent procedures:

<https://floridadep.gov/dear/florida-dep-laboratory/content/dep-laboratory-quality-assurance-manual-and-sops>

<https://floridadep.gov/dear/quality-assurance>

- Sampling must be taken from the suspected contaminated area(s) of the site or at the discretion of the Department.
- The following sampling frequency is based on the area(s) of debris management or storage that require sampling:
 - Less than 1/3 acre: 3 samples
 - Between 1/3 acre and 1 acre: 4 samples
 - Greater than 1 acre: 4 samples plus 1 sample for each additional ½ acre of area

*40 CFR 261.24, Table 1 defines Toxicity Characteristic Contaminants as Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver

Appendix 8.5

Florida Marine Debris Reduction Guidance Plan (FCO 2017)

To download please visit the FDEP's Florida Coastal Office program website at:

<https://floridadep.gov/fco/fcmp/documents/fcmp-program-guide-2017>

Appendix 8.6

Florida Marine Debris Emergency Response Guide (NOAA 2017)

To download please visit the NOAA Marine Debris Programs website at:

[https://marinedebris.noaa.gov/sites/default/files/publications-files/FL Marine Debris Emergency Response Guide Field Reference Guide 0.pdf](https://marinedebris.noaa.gov/sites/default/files/publications-files/FL%20Marine%20Debris%20Emergency%20Response%20Guide%20Field%20Reference%20Guide%200.pdf)