



## GOVERNMENT OF THE UNITED STATES VIRGIN ISLANDS

### DEPARTMENT OF PLANNING AND NATURAL RESOURCES

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**TO:** Permittee

**FROM:** Division of Fish and Wildlife, Department of Planning and Natural Resources

**RE:** Sargassum Management Brief for Onshore Removal Permits - MEMO

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As the issue of sargassum inundations continues to affect the Territory's natural resources, tourism industry, fishery, and the community at large, The Department of Planning and Natural Resources (DPNR) began accepting and issuing permits to allow for mechanized removal of the seaweed from specified shorelines. At present, the Division of Coastal Zone Management (CZM) has issued (3) permits for sargassum removal operations in St. Thomas. While the scope and conditions of each permit have been tailored to site-specific needs and goals, all permits require the applicant and removal personnel to receive training from the Division of Fish and Wildlife (DFW). The purpose of this training is to familiarize those who will be handling and removing the sargassum with any threatened, endangered, and indigenous species of concern that may be residing, breeding, foraging in, or otherwise using the seaweed. In this way, DPNR can assure sargassum removal in the Territory is responsible, ecologically sound, and consistent with Virgin Islands Code.

To meet this identified training requirement, DFW has developed the attached guidance document entitled *Sargassum in the U.S. Virgin Islands: A Management Brief*. It is required that those seeking sargassum removal permits must review this document in full with a DFW representative. If satisfactory, the two parties may sign the endorsement page providing proof of training which can then be submitted to CZM for final permit approval.

It is the hope of DFW that this management brief may remain a living document, to be continuously adjusted to the ever-changing nature of this issue. We plan to continue our review of the best available science regarding sargassum and its implications for the local community and natural resources of the Virgin Islands. In the coming months, we will be developing an index of observed species using sargassum in the Territory and updating the management brief document accordingly. It is important to add that this brief is multi-objective and can be used by various stakeholders seeking general guidelines for managing nuisance sargassum in the Territory. Please share widely.

For questions, comments, or concerns kindly contact the Division of Fish and Wildlife at 340-773-1082.

### **Sargassum in the U.S. Virgin Islands: A Management Brief**

The Department of Planning and Natural Resources (DPNR) Division of Fish and Wildlife (DFW) recognizes that *Sargassum spp.* is a free-floating pelagic seaweed occurring historically in the Sargasso Sea and naturally reaching the shorelines of the U.S. Virgin Islands (USVI) by way of currents and tides. The Division also recognizes that the unprecedented blooming of sargassum since 2011 has resulted in mass inundations of beaches and bays in the Territory with negative impacts on the USVI community, environment, fishery, and tourism industry. In understanding the importance of sargassum as essential habitat for a variety of fish and wildlife while considering the negative impacts of sargassum influxes in the USVI, DFW has created the attached brief to guide sustainable management of sargassum in the Territory by meeting the following objectives:

- To provide ecologically sound solutions for the collection, removal, and disposal of sargassum in the U.S. Virgin Islands;
- To train permit seekers and recipients in sargassum best practices in order to meet permit compliance;
- To present all stakeholders with site-specific guidance and relevant resources for the present and future management of sargassum in the Territory.



*Sargassum reaching the shores of Sapphire Beach, St. Thomas.*

I certify that I have read and understood this document. I certify that I will only work within the scope of my sargassum removal permit. I certify that I will practice the wildlife guidelines outlined in this document to protect the threatened, endangered, and indigenous species of the U.S. Virgin Islands.

Provided To: \_\_\_\_\_ Date: \_\_\_\_\_  
Applicant

Provided By: \_\_\_\_\_ Date: \_\_\_\_\_  
DFW Representative



### **Sargassum as an Ecosystem**

Sargassum is historically found in the Sargasso Sea, a large floating aggregation of the brown seaweed contained by four ocean currents in the North Atlantic. Floating mats of sargassum form biodiversity hotspots by providing food and shelter to over 250 species of fish and wildlife. Some of these species such as the sargassum fish, *Histrionicus histrionicus*, are found only in sargassum (Figure 1.0). Sargassum serves as juvenile fish habitat for commercially important pelagic species such as tuna, wahoo, and mahi-mahi. Seabirds such as terns and boobies forage for food in the floating seaweed since it houses an array of invertebrates. Additionally, endangered sea turtle hatchlings such as leatherbacks and hawksbills depend on floating sargassum as a rest stop during their long journey to adulthood.

As sargassum dies it sinks to the ocean floor where it contributes to nutrient cycling and carbon storage. On land, beached sargassum stabilizes sand and prevents erosion while providing nutrients for coastal plant growth and foraging grounds for shorebirds. In natural amounts, oceanic and coastal sargassum creates rich ecosystems for a diversity of life as well as provides ecosystem services such as carbon sequestration and erosion control. Therefore, sustainable management of nuisance sargassum must consider its high social and ecological value.

### **Sargassum as a Nuisance**

Beginning in 2011, unprecedented quantities of sargassum began smothering the shores of the U.S. Virgin Islands. Using satellite imagery and modeling, scientists have traced back this new influx of sargassum to the North Equatorial Recirculation Region (NERR) not the historical Sargasso Sea which is just northeast of the Bermuda Triangle (Figure 2.0). This novel sargassum source has been termed the Great Atlantic Sargassum Belt or GASB and is most likely seeded by the Sargasso Sea but fueled by localized resources (Wang et al., 2019). Rising sea surface temperatures driven by global climate change combined with increased nutrient runoff driven by upland uses such as agriculture are providing optimal growing conditions for the GASB. The GASB continues to grow from these resources as it moves nearshore, eventually reaching Caribbean bays and beaches in massive quantities (Figure 2.0). In the U.S. Virgin Islands, large sargassum landings typically begin in April and continue through September, resulting in damages to a variety of local sectors.

#### *Sargassum impacts on USVI fisheries*

Sargassum in the water can limit boat access to fish landing sites and may disrupt the boat's cooling system and cause significant engine damage if caught in a motor. Maneuverability can also become difficult as it may cause loss of steerage and speed due to soiled propellers and rudders. Sargassum can damage gear and inhibit trolling and nets, directly impacting fishers who rely on these practices. Finally, sargassum creates anoxic conditions (low oxygen) in shallow bays as it decomposes which may result in large fish kills and significantly decrease bait fish populations.

#### *Sargassum impacts on USVI tourism*

There has been increasing concern with the abundance of sargassum on beaches and how it impacts USVI tourism. With a displeasing smell and unsightly appearance, large influxes of sargassum are unpleasant to be around. Sargassum can also be a hazard in the water, restricting swimming and snorkeling zones. The cost of removal is also a factor as it can become expensive to clean up and if heavy machinery is used and it can alter/jeopardize the beach ecosystem. However, choosing to ignore the issue of the sargassum accumulating on the beach can lead to a loss in revenue due to lower bookings and poor reviews.

### *Sargassum impacts on the USVI environment*

In its natural state, sargassum can be an important ecosystem for many organisms. However, massive sargassum inundations may have adverse effects on the environment. Decaying sargassum consumes significant oxygen, creating anoxic conditions in shallow waters. These conditions are toxic to many marine organisms including fish and turtles. Anoxic conditions paired with physical blocking of sunlight by sargassum can cause seagrass, coral reefs, and mangrove roots to suffocate. This may lead to erosion and alteration of the structure of these coastal zones. Further, some organisms may become disoriented and trapped in the sargassum when trying to navigate through dense mats. Once on the shore, the decaying sargassum may contain high levels of heavy metals which can seep into the sand and soil.

### *Sargassum impacts on human health*

Decaying sargassum releases hydrogen sulfide, which even low concentrations can have adverse effects on human health. The negative effects include headaches, dizziness, irritation of the eyes, and even irritation of the respiratory system. The fumes especially impact people with existing respiratory problems, such as asthma.

### **Permitting**

DPNR is authorized to issue permits on a case-by-case basis for the removal and management of nuisance sargassum in the Territory. Permits are required given that sargassum is recognized as an indigenous species to the U.S. Virgin Islands (Endangered and Indigenous Species Act of 1990, 12 V.I.C. § 101) as well as essential fish habitat by the National Oceanic and Atmospheric Administration (NOAA) (South Atlantic Sargassum Fishery Management Plan). Further, large-scale removal practices can be very damaging to the coastal zone. Removal of sargassum is only permitted onshore once the seaweed has reached land. In-water collection and removal of sargassum is prohibited at this time. Those seeking a sargassum removal permit must present their scope of work to the Division of Coastal Zone Management (CZM) who, in consultation with DFW, will determine if the proposal is consistent with the VI Coastal Zone Management Act (12 V.I.C. § 21). Additional conditions may be required before permit authorization, including signed proof of review of this management brief and associated training.

Note: Manual removal of sargassum by hand or by hand raking does not require permitting at present. Workers should be aware, however, of protected species and/or species of concern that may be residing in the sargassum, as well as human health risks when handling the seaweed. For additional information on listed species and health hazards, continue to *Sargassum Removal Best Practices*.

### **Sargassum Removal Best Practices**

#### *To Remove or Not to Remove*

The most ideal action when it comes to sargassum is no action at all. By letting nature run its course the sargassum will eventually degrade and get washed away or buried by the continued wave action and sand deposition. In the process, it will also serve to stabilize the beach and cycle nutrients back into the environment. However, this option may only be feasible for small quantities of sargassum or hard-to-access beaches that are not critical for public use or recreation. While small quantities are best left alone, larger inundations may benefit from low-impact manual removal or in extreme cases, from large-scale mechanical removal. It is imperative to prioritize beaches based on the need for sargassum removal. Often it is not necessary or desirable to remove sargassum from the

entirety of a beach and instead only clean up the worst of it, leaving small amounts in their natural state. See below for a visualization of beaches in need and not in need of sargassum removal (Figure 3.0)

### *Threatened and Endangered Species*

Before any removal of sargassum onshore, the area must be surveyed for signs of wildlife. Native species are locally protected under 12 VIC Chapter 2: Endangered and Indigenous Species Act of 1990, and listed species under the Endangered Species Act are Federally protected. Endangered sea turtle nests and hatchlings are of particular concern in sargassum mats both in the water and onshore. Surveyors should look for signs of nests, such as swept sand mounds, eggs, and female turtles that may be laying (Figure 4.0). Additionally, native and protected shorebirds might be found foraging in the sargassum. Although unlikely to directly nest in sargassum, surveyors must be wary of bird nests, eggs, hatchlings, and even trapped or injured animals (Figure 4.0). If during the initial wildlife survey any signs of listed species or injured species are observed, mark the area if possible and contact the Division of Fish and Wildlife immediately. Touching or handling of any protected species, their young, or their eggs is prohibited and subject to penalty.

### *Worker Safety*

Workers performing low-impact manual removal are advised to wear closed-toed shoes, gloves, and sun protection when removing and handling sargassum. Eye protection and face masks are also advised to mitigate the smell of hydrogen sulfide if present. Note: Strong hydrogen sulfide fumes are toxic to humans and may irritate eyes, noses, and throats. If the smell is strong and/or has negative impacts on human health, it is best to cease removal operations as a safety precaution and proceed with clean-up when the smell has subsided.

### *Manual Removal*

Manual removal is always preferred as it substantially lessens beach erosion and disturbance to wildlife. Manual removal can be conducted in many forms onshore. Gathering sargassum by hand or rake is best for small amounts while larger amounts may be removed by multi-person operated entrapments. Wheelbarrows are also convenient for transporting sargassum from the beach to a larger collection container. **Manual removal does NOT require a DPNR-issued permit however use of a utility task vehicle (UTV) on the beach to assist in manual removal does require a permit.**

### *Mechanical Removal*

**If the amount of sargassum is overwhelming, mechanical removal by machine or assisted removal by a UTV may be used after the appropriate DPNR permit is obtained.** Machines with claws or rakes are best and tires must be large and soft to minimize the impact (Figure Equipment is best operated on compacted sand in the tidal zone. Machine use should always be supervised with continued surveying for wildlife. Machinery should never go over sand dunes or vegetation.

### *Containment Booms*

Offshore or nearshore containment booms may be a feasible option for holding off small amounts of sargassum from reaching the shore or for channeling sargassum to a designated shoreline area for collection and removal (Figure 6.0). However, any permanent boom installations involving



alterations to the ocean floor will require additional permitting through the Army Corps of Engineers (Rivers and Harbors Act of 1899, 33 U.S.C. § 403; Clean Water Act, 33 U.S.C. § 404).

### *Disposal*

Disposal of sargassum should never be on sand dunes or vegetation. Sargassum should be disposed of in designated and permitted locations if on-site, or in the Bovoni Landfill on St. Thomas or the Anguilla Landfill of St. Croix. If disposing of sargassum near the collection site, consider an area that receives high levels of sunlight for quick-drying and expedited decomposition which in turn decreases the smell. Note: Sargassum disposal at public landfills may be limited to certain days, it is your responsibility to understand which days sargassum will be accepted at your local landfill.

### *In-water Manipulation*

Intercepting and re-directing offshore or nearshore sargassum may be the best way to deal with the sargassum issue. Two main methods exist. First, slowly trawling smaller mats of living sargassum out of inundated areas back to the open ocean where currents pass and can pick up the seaweed. This may be effective in multiple places and can be accomplished by boat and small net, so no benthic alteration is needed and therefore no permit is required from Army Corps of Engineers. A second and still experimental option is pumping of sargassum from the surface and shallow waters to deep waters. The increased pressure of deep water bursts the air pockets of the seaweed, allowing it to sink permanently. However, additional considerations for this option are needed for 1) identifying a viable place for the sargassum to sink that does not impact benthic habitats and 2) minimizing environmental impacts associated with operating an in-water pump.

### *Helpful Tips for Removing Sargassum*

- Remove sargassum at low tide for easy access
- Removing fresh sargassum onshore prevents rotting and beach erosion
- Always leave some sargassum for beach nourishment
- Remove sargassum from high-use areas first and reassess the need for removal in other areas
- Rake sargassum into small piles to sun dry and remove later. This decreases the weight and smell of the seaweed while allowing for sand to remain on the beach.

### **Conclusion**

While sargassum is no stranger to the shores of the U.S. Virgin Islands, massive inundations observed in the last decade have had negative impacts on the local community, the local environment, and local industries. The sargassum solution is not an easy one and removal practices that are successful at one location may not be successful in another. The Division of Fish and Wildlife encourages all those seeking best management practices for the collection and removal of nuisance sargassum to consult this document and associated agencies before acting. Remember, direct or assisted removal of sargassum by mechanized equipment requires a CZM permit and may require additional conditions to be met for permit approval. Finally, it is important to note that this is a living document and is subject to change due to the nature of the sargassum issue. In considering the ecological value, social implications, and economic impacts of sargassum in the Territory, stakeholders involved in management efforts must be adaptable. The Division of Fish and Wildlife thanks you for your cooperation in reviewing this document and adhering to its recommendations.



### **Additional Resources**

Report on the development of a best practice guide for Caribbean fishers coping with sargassum influx events - [BestPracticeGuideforCaribbeanFishersSargassum.pdf](#) (FAO - Food and Agriculture Organization of the United Nations)

Sargassum Management Brief - [CERMESSargassumManagementBrief2016.pdf](#) (CERMES - Centre for Resource Management and Environmental Management, University of the West Indies)

Sargassum: A Resource Guide for the Caribbean - [SargassumResourceGuideFinal.pdf](#) (CAST - Caribbean Alliance for Sustainable Tourism)

Sargassum Uses Guide: A resource for the Caribbean researchers, entrepreneurs, and policy makers - [SargassumResourceGuideFinal.pdf](#) (CERMES – Centre for Resource Management and Environmental Management, University of the West Indies)

Pelagic Sargassum Influx in the Wider Caribbean Fact Sheet - [GCFISargassumFactsheet2015En.pdf](#) (GCFI – Gulf and Caribbean Fisheries Institute, Inc.)

Responding to Sargassum Influx Poster - [SargassumResponsePoster.png](#) (GCFI – Gulf and Caribbean Fisheries Institute, Inc.).

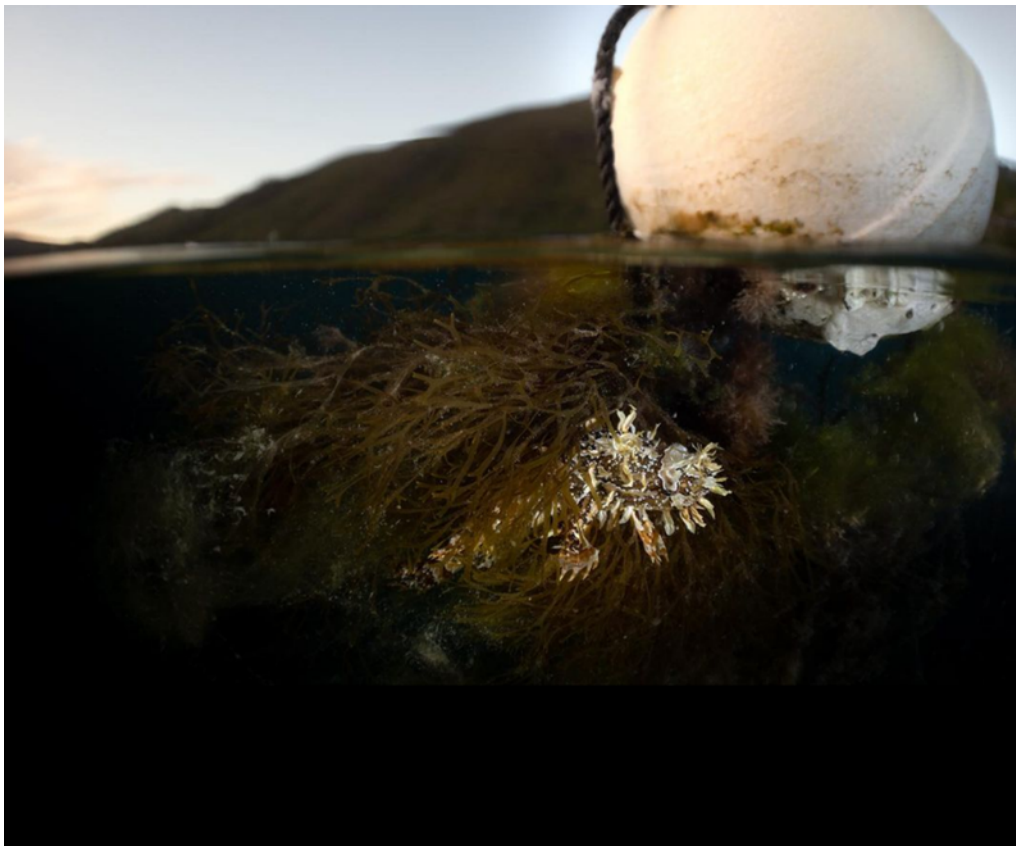


Figure 1.0 A sargassum fish in Brewer's Bay, St. Thomas. Dan Mele Photography 2021.



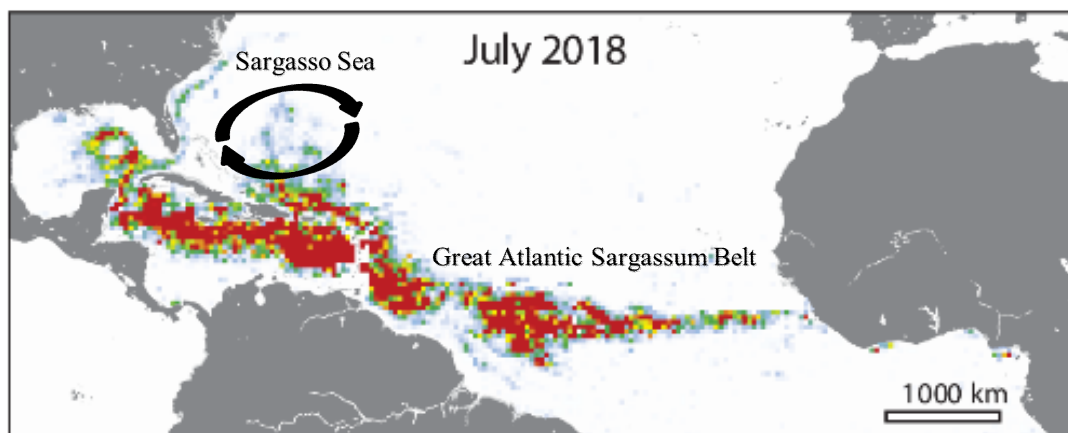


Figure 2.0 The Great Atlantic Sargassum Belt as compared to the historic Sargasso Sea. July 2018. Florida Atlantic University Harbor Branch Oceanographic Institute.






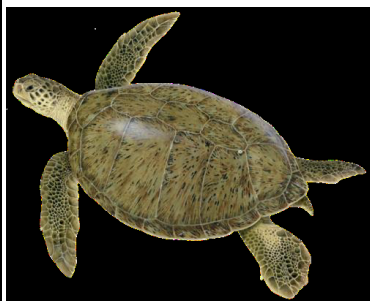


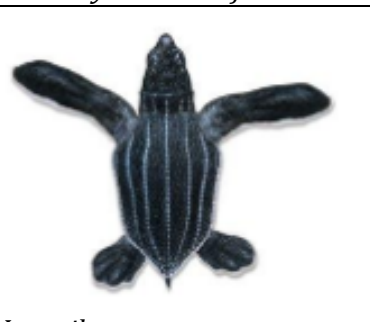






|   |   |  |
|---|---|--|
|   |    |    |
| Coki Beach, St. Thomas  | Lindquist Beach, St. Thomas   | Sapphire Beach, St. Thomas   |
| Small inundation that is mostly dry at Coki Point Beach. No management action needed. If additional influx became problematic for beach side businesses, small manual removal is recommended. | Small to medium inundation of dry and fresh sargassum at Lindquist beach. Manual removal or UTV assisted removal in the more frequented beach and swim areas recommended. Medium-large quantities in relatively unused areas may be left alone. | Large inundation of fresh and rotting sargassum at Sapphire Beach. Large scale mechanized removal with machinery outfitted with claws recommended. May benefit from strategic booming to navigate the seaweed into a designated collection area. |

Figure 3.0 Various levels of sargassum inundations around St. Thomas, Virgin Islands and appropriate removal recommendations.

| <b>Hawksbill Sea Turtle (<i>Eretmochelys imbricata</i>)</b>                         |   |  |
|---|---|--|
|  |  | <b>ADULTS</b><br>Length 75-90 cm; Mass up to 150 kg<br><b>HATCHLINGS</b><br>Length ~30 mm; Mass approximately 5 gm |
| Adult   |   |  |

|   |   |   |
|---|---|---|
|   | <i>Juvenile</i>   |   |
| <b>Green Sea Turtle</b> ( <i>Chelonia mydas</i> )                                   |   |   |
|    |    | <b>ADULTS</b><br>Length 80-120 cm; Mass up to 300 kg<br><b>HATCHLINGS</b><br>Length 30-40 mm; Mass 25-30 gm     |
| <i>Adult</i>  | <i>Juvenile</i>   |   |
| <b>Leatherback Sea Turtle</b> ( <i>Dermochelys coriacea</i> )                       |   |   |
|   |   | <b>ADULTS</b><br>Length 140-180+ cm; Mass up to 300-640 kg<br><b>HATCHLINGS</b><br>Length ~50 mm; Mass 40-50 gm |
| <i>Adult</i>  | <i>Juvenile</i>   |   |
| <b>Signs of Sea Turtles</b>   |   |   |
|  |  |                             |
| <i>Sea turtle tracks</i>  | <i>Hatchlings in sargassum</i>  | <i>Sea turtle in sargassum</i>  |
|  |  |                             |
| <i>Sea turtle nest</i>  | <i>Hatched sea turtle eggs</i>  | <i>Trapped sea turtle</i>   |
| <b>Roseate Tern</b> ( <i>Sterna dougallii dougallii</i> )                           |   |   |








|   |   |  |
|---|---|--|
|  |  | <b>ADULTS</b><br>Length 33-36 cm; Mass 90-140 gm<br>*slightly smaller than a Mourning Dove |
| <i>Adult</i>  | <i>Juvenile</i>   |  |
| <b>Signs of Terns</b>   |   |  |
|  |  |          |
| <i>Roseate nesting on 2 eggs</i>  | <i>Group of terns</i>   | <i>Terns and gulls in sargassum</i>  |

Figure 4.0 Endangered Species in Sargassum



Figure 5.0 Mechanical rake at the Ritz-Carlton, St. Thomas.





Figure 6.0 Boom channeling sargassum influx to the left side of the bay for mechanical collection at the Ritz-Carlton, St. Thomas.



Two black-necked stilts in the sargassum at the Ritz-Carlton

