

# Envirotalk



GOVERNMENT OF BERMUDA

Department of Environment and Natural Resources

WINTER 2018  
VOLUME 82 No. 4

TO PROTECT BERMUDA'S ENVIRONMENT AND RESPONSIBLY MANAGE ITS NATURAL RESOURCES

## WELCOME

to our winter edition of Envirotalk.

In this issue –

- Dr. Sarah Manuel discusses **conservation issues in seagrass beds grazed by turtles**
- Learn about the **upcoming International Maritime Organisation audit** from Dr. Geoff Smith
- Thomas Sinclair explains the benefits of **adding manure to your vegetable garden**
- See the **Planting Calendar** to choose vegetables and flowers to plant this winter
- See upcoming events in our **winter Environmental Calendar**

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*Grazing Green Turtle (Photo: S.Manuel)*

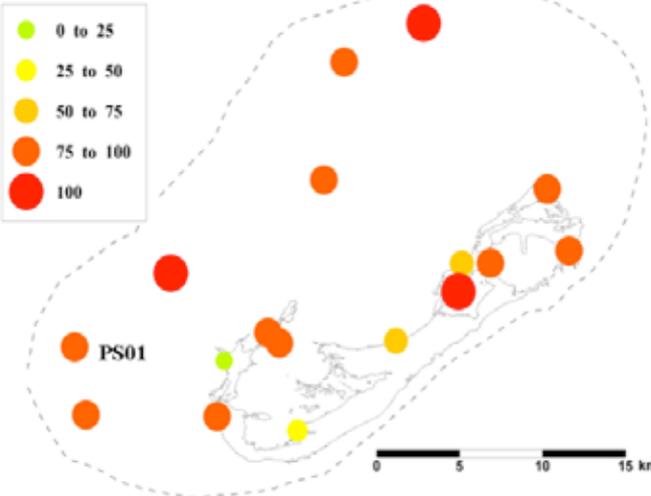
## A CONSERVATION DILEMMA: PROTECTED SEA TURTLES ARE SEVERELY IMPACTING BERMUDA'S MARINE ENVIRONMENT!

There are four fully marine species of seagrass present in Bermuda's waters, *Thalassia testudinum* (**turtle grass**), *Syringodium filiforme* (**manatee grass**), *Halodule sp.* (**shoal grass**) and *Halophila decipiens* (**paddle grass**). Seagrass meadows on the Bermuda Platform can include one, two or three of these species. Turtle grass is the largest plant, with long, strap-like leaves; manatee grass is the next largest, but with long, skinny, round (like spaghetti) leaves; shoal grass has leaves like a small form of turtle grass; and tiny, delicate, paddle grass has the smallest, paddle-shaped, leaves and root system.

### DECLINE OF SEAGRASS AROUND BERMUDA

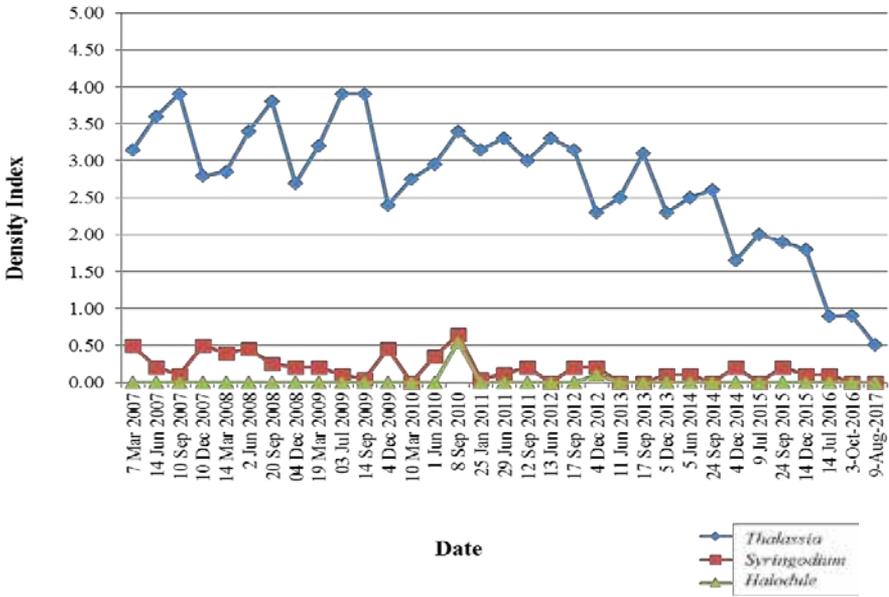
Murdoch et al (2007) estimated the total area of several seagrass meadows in 1997 and again in 2004 and reported a 25% loss of seagrass area. Seagrass loss was not equal at all meadows; differing in particular between offshore (higher loss) and inshore (lower loss) meadows. Studies by the Department of Environment and Natural Resources (DENR) from 2007 to 2017 at 17 seagrass meadow sites have shown habitat decline is ongoing, and also is high at many inshore sites. At the 17 DENR sites, seagrass cover disappeared completely at 3 and was reduced in density by 75% or more at another 10 (Figures 1, 2 and 3).

Percent loss of seagrass cover (%)  
at seagrass monitoring sites  
between 2007 and 2017



**Figure 1.** Net change in total seagrass abundance over the period 2007-2017 across the Bermuda Platform. Symbols are scaled to the observed net decline in seagrass abundance. Dashed line indicates the 10m isobaths that defines the top of the Bermuda platform.

**Figure 2.** Seagrass density index at permanent monitoring site 1 (PS01), an offshore site.



**Figure 3.** Before and after grazing at permanent monitoring site PS01 (photos S. Manuel).



## SIGNIFICANCE OF SEAGRASS MEADOWS AND IMPLICATIONS OF SEAGRASS LOSS

Seagrass meadows are a very important component of the Bermuda Platform coral reef ecosystem. Corals and seagrasses have protected status in Bermuda under the Bermuda Protected Species Act 2003. Loss of the seagrass meadows on the Bermuda Platform will have consequences for its water quality, biodiversity, fisheries, coral reefs and beaches. Some of the ecosystem services provided by seagrass meadows include:

- Seagrass beds protect and enhance biological diversity – seagrass beds are home to a diversity of animals, including endangered and endemic species and some found only in this habitat.
- The presence of seagrass beds increase the amount and kinds of food that are available for wildlife. Seagrasses are the basis of a complex marine food web and are essential for food security to many animals, and humans.
- Seagrass beds can reduce human illness and coral diseases. The filtering processes in the seagrass bed community are important to the reduction of disease-causing bacteria in the water column.
- Seagrass beds can prevent harmful algal blooms by utilizing nutrients from human pollution and other sources and trapping nutrients in sediments.
- Seagrass beds can reduce erosion along coastlines during storms because they protect the sediment surface and bind sediment in their roots and rhizomes.
- Seagrass beds can increase the pH levels of seawater enough to protect adjacent coral reefs from the effects of ocean acidification.
- Seagrass beds can decrease carbon in the atmosphere by removing carbon dioxide from seawater and converting it to stored, inactive, organic carbon.

### WHAT IS CAUSING THE SEAGRASS LOSS IN BERMUDA?

DENR monitoring studies of Bermuda's seagrass meadows assessed the environment and condition of seagrasses in order to determine the causes of damage to seagrass meadows on the Bermuda Platform (*Ref: Fourqurean et al. 2018 - in preparation*)

***Significant anthropogenic causes in Bermuda***

- Boat moorings, boat propellers, groundings and anchoring
- Nearshore and foreshore modifications –land reclamation and beach creation
- Marinas and docks
- Fisheries for top predators (sharks) in the Atlantic

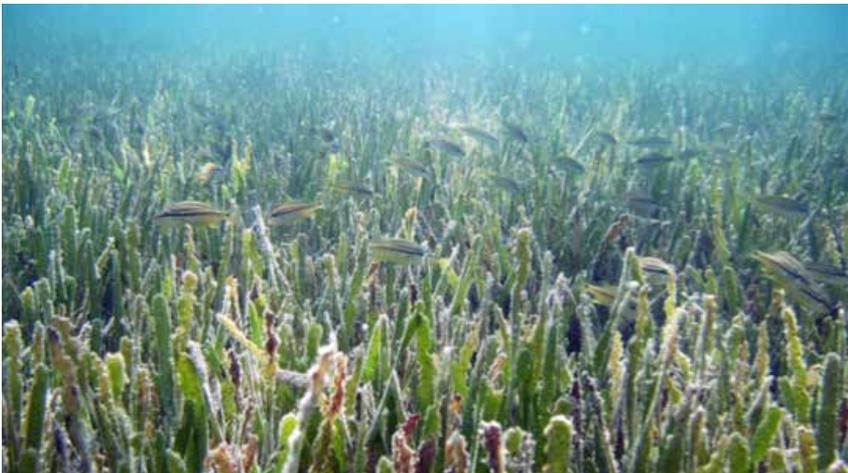
***Significant natural causes in Bermuda***

- Megaherbivore grazing – primarily green turtles

The DENR program indicates that, by far, the most significant recent cause of seagrass loss around Bermuda is turtle grazing. The link between this “natural” cause and anthropogenic activities is complicated – related to the conservation of one group of organisms – the grazers (sea turtles) and the decimation of another – the natural predator of the grazer (sharks) (Ref: Heithaus et al. 2014).

Small green turtles come to Bermuda from Mexico, Costa Rica, Cuba and Florida (Ref: Bermuda Turtle Project, 2004), stay for up to 20 years (Ref: Meylan et al. 2011) eating grass (Ref: Burgett et al. 2018), then leave Bermuda in search of a mate. There is evidence, albeit very limited, that the number of green turtles on the Bermuda Platform has been increasing, most likely due to conservation success at the nesting beaches to our south.

**Bailey’s Bay seagrass meadow in 2007, at inshore monitoring site (PS15) before turtle grazing**



## Bailey's Bay seagrass meadow in 2017, after turtles began grazing



### HOW CAN WE PROTECT THE MARINE ECOSYSTEMS OF THE BERMUDA PLATFORM?

In order to save our seagrass and keep the coral reef ecosystem of the Bermuda Platform healthy and productive, human intervention appears to be necessary.

Overseas seagrass experts agree that conservation of seagrass meadows is a priority as it is the most practical and economical approach to maintaining seagrass ecosystems. Seagrass meadows can be restored but the process is costly and success rates have been highly variable and often low (*Refs: Fonesca et al. 1998; Ganassin and Gibbs 2008; Cunha et al. 2012*). Recovery is slow and may take decades (*Ref: Fonesca et al. 2000*) and this is likely to be an issue in Bermuda where the lower light levels and temperatures in the winter months substantially reduce seagrass growth.

Pilot seagrass transplant studies in Bermuda have been unsuccessful. Additionally, for this to occur seagrass shoots and rhizomes must be harvested from a meadow to be planted at the restoration site resulting in another seagrass meadow being impacted. Studies by the DENR show that if green turtles are excluded from plots within a grazed seagrass meadow the protected areas recover very quickly (*Ref: Fourqurean et al. 2010*) (Figures 4a and 4b).



**Figure 4a: Grazed seagrass bed with newly installed turtle exclusion cage (Photo: J. Fourqurean)**



**Figure 4b: Turtle exclusion cage 1 year after initiation of experiment (Photo: J. Fourqurean).**

## POSSIBLE ACTIONS

- Determine the carrying capacity of Bermuda's seagrass meadows for green turtles.
- Protect remaining seagrass meadows from direct anthropogenic impacts.
- Ameliorate anthropogenic impacts, e.g., removal of moorings from sensitive areas, use environmental friendly moorings.
- Manage turtle access to seagrass meadows.
- Re-establish and protect populations of sea turtle predators, e.g., sharks

*Dr Sarah Manuel, Senior Marine Conservation Officer and Dr Kathryn Coates, Senior Associate Research Scientist*

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## **INTERNATIONAL MARITIME ORGANIZATION (IMO) MANDATORY AUDIT IN 2020**

The UK, Bermuda and other Overseas Territories (OTs) are currently preparing for a mandatory audit by the International Maritime Organization (IMO) in 2020 that will assess how well the various IMO legislative instruments that address ships' safety and pollution from ships are being followed. The Implementation of IMO Instruments is known as the 'Triple I' audit.

### **How is Maritime Legislation Applied in Bermuda?**

The IMO is a specialist agency of the United Nations (UN) that is responsible for setting safety and security standards for international shipping and preventing marine pollution from ships. The IMO has developed Conventions that establish and maintain common standards and these are applied within the framework of the 'UN Convention on the Law of the Sea' (UNCLOS), which governs the rights and responsibilities of Flag and Coastal States. The UK is a signatory to the IMO Conventions and it extends these obligations to the OTs to ensure that local legislation is established, via Acts and Regulations, to implement them. Under the Bermuda Merchant Shipping Act 2002 a total of 48 local Regulations, Rules and Orders have been enacted that address the IMO Conventions.

## **What will the Mandatory Audit Address?**

The 'Triple I' audit will focus on maritime safety and environmental protection programs for the 170 member states, the UK and OTs constitute just one member state. The audit will cover the following:

- (i) Common Areas – checking that all IMO laws extended from the UK have been implemented in Bermuda.
- (ii) Flag state – checking that all ships registered under the Bermuda flag are compliant with the many safety and environmental standards.
- (iii) Port State – checking that ships entering Bermuda's waters and ports are managed and monitored as per IMO Guidelines, and ensuring that necessary port services are available for these ships if required.
- (iv) Coastal State – checking that the safety of ships and their crew/passengers is being addressed in addition to the requirements to address pollution of the environment. These legislative requirements include: Bermuda's search and rescue capability, aids to navigation (buoys, lights, Bermuda Radio, etc.), provision of suitable charts/hydrography of the coastal environment, oil spill response, waste management, waste and ballast treatment systems and monitoring emissions and discharges.

## **What are the Implications of Not Performing Well in the Audit?**

Bermuda has been registering ships since 1789 and currently the Bermuda Shipping and Maritime Authority (BSMA), a quango under the Ministry of Tourism and Transport, has approximately 170 Commercial Vessels and 260 Yachts equating to over 12,000,000 Gross Tonnage of registered shipping. The revenue received from this sustainable resource for FY14/15 was \$5,332,000. Bermuda's Shipping Registry is currently rated Category #1 by the UK Red Ensign Group (REG) Policy, which means it can register all types and sizes of ships. Bermuda will want to do well in the 'Triple I' audit in order to preserve existing ships in its registry and to also grow this revenue stream going forward. Furthermore, ensuring that Bermuda's maritime practices meet the international and local requirements will help to preserve Bermuda's pristine environment by controlling and limiting potential pollution from visiting ships. There are also other implications of not meeting the requirements of the audit but these are beyond the scope of this article.

## **Who are the Main Stakeholders?**

Preparation for the 'Triple I' audit is underway by a range of stakeholders, including; BSMA, Bermuda's ports, oil receiving companies (i.e. SOL Petroleum and RUBIS Energy) and the Departments of Marine & Port Services (M&P), Environment & Natural Resources (DENR), Health and the Ministry of Public Works (MPW). There are a total of seven registered ports in Bermuda including: Hamilton Cargo and Cruise Docks, Corporation of St George's, WEDCO, Oil Docks Ferry Reach, BLDC - Southside, Caroline Bay Marina and Morgan's Point.

## **What processes of DENR – Pollution Control Section will be addressed by the audit?**

The Pollution Control Section of the Department of Environment and Natural Resources (DENR) already undertakes a measurable number of tasks that are legislated under the various pollution-related IMO instruments. In order to understand what processes need to be improved further in order to meet the requirements of the IMO auditors, DENR is working towards getting an independent gap analysis completed.

Currently, the tasks undertaken by the Pollution Control of DENR include:

- (i) Maintaining the Marine Pollution Contingency Plan (MPCP) and its processes, call-out list contact details, etc.
- (ii) Maintaining links with the US Coast Guard and International Oil Spill Response organisations in the event that overseas assistance is required for a major oil spill.
- (iii) Maintaining the local oil spill response equipment with M&P that are located at seven locations around Bermuda including: Penno's Wharf, St Georges, Hamilton Cargo and Cruise Docks, Government Quarry and M&Ps Dockyard.
- (iv) Pollution response exercises with out-sourced training.
- (v) Operating the 24-hour advanced waste notification system for visiting ships to state what types and amounts of wastes they propose to deposit in Bermuda. Wastes received are subsequently reconciled using the waste transfer note receipt system with MPW Waste Management Section.
- (vi) Licensing the pollution emitting equipment under the Clean Air Act 1991 that are operated by the regular visiting ships (i.e. Hotel load engines, wastewater treatment plants, oily water separators).

- (vii) Requiring emission monitoring from ships exhausts if automated monitoring equipment are not already installed.
- (viii) Maintaining a Visiting Ship Environmental Policy document that is received by all ships and provides the full environmental requirements that are legislated by all relevant Government Departments.

In preparation for the 2020 IMO audit a range of gap analyses will be completed by the United Kingdom's Maritime Coastguard Agency (MCA) and other specialist organisations in addition to a practice audit by the MCA in 2019. Government, quango's, oil receipting companies and the various port management companies will need to work quickly and efficiently towards the common goals identified in the gap analyses in order to ensure that Bermuda, the UK and other OTs maintains its current status with the IMO.



Copyright: Aurel E. Smith from Royal Gazette (8th April 2013)

*Queen Mary 2: One of the many ships registered to the Bermuda Flag State  
(Photo: Aurel E. Smith, Royal Gazette)*

*Dr Geoff Smith  
Environmental Engineer  
DENR - Pollution Control Section*

## MANURE HAPPENS!

I remember one of my Science Professors describing the animal digestive system as a long story with lots of twists and turns that finishes with a crappy ending! Thankfully there is a great use for the by-product of this system that usually ends up on the ground.

Animal manure is still one of the best and least expensive ways to add organic material and nutrients back into the soil. This can be very beneficial in helping your plants and vegetables thrive and produce abundantly.

Generally, when talking about manure for the garden, we are talking about manure from barnyard animals such as cows, horses, goats, sheep, chickens and rabbits. You should never use manure from household pets or animals that are fed meat or meat products as this can lead to the introduction of potentially harmful pathogens to your garden.

Manure is usually rich in nitrogen as well as other nutrients and soluble salts. Fresh manure normally has the highest nutrient content, however, is not the safest to use on plants. Using fresh manure on your plants may result in damage or injury to the roots and tender plant tissue. As manure breaks down it generates considerable heat and therefore can be 'too hot' to use in the early stages of decomposing. You can add fresh manure to your fallow garden but should let it rot down before planting the field out.

Perhaps the best practice is to compost manure. You can compost manure by itself or by adding a combination of garden clippings, vegetable waste, soil or the compost available from the horticultural waste facility at Marsh Folly. If properly composted, the manure won't have an obnoxious smell and the heat generated in the composting process should destroy any weed seeds not digested by the donating animal.



Manure should be relatively easy to acquire. For an island the size of Bermuda we have an extraordinary amount of animals and yes, they all poop! Bags of chicken manure are available for purchase from Bermuda's main egg farm. There are dairies and horse stables around the island that have manure pits and piles being replenished every day. Many places will let you take it for free if you bag it or load it yourself. Try to avoid manures with lots of shredded paper or wood shavings used as bedding material, as they require more energy, nutrients and time to break down.

Our vegetable growing season is in full swing. It's not too late to start adding rotted or composted manure to your garden or collecting fresh manure to compost for the next crop. Adding manure will ultimately improve your soil structure and soil health by returning much needed organic matter and nutrients.

One helpful hint, if collecting manure in your private car, make sure to put down a good tarpaulin or plastic barrier and use bags or containers that are not going to leak, rip or rupture. As the title suggests....it happens!

*Thomas Sinclair,  
Agricultural Officer*



**Wild Poinsettia (*Poinsettia cyathophora*), a Bermuda native**

### December 2018

#### **December 5th World Soil Day.**

<http://www.un.org/en/events/soilday/>

The theme of this day for 2018 is ‘**Be the Solution to Soil Pollution**’. Soil Pollution degrades our soils, poisons our food and water, and pollutes the air we breathe. The UN estimates that 1/3 of our global soils are already degraded, and the expanding human population continues to put pressure on them.



### February 2019

#### **February 2nd World Wetlands Day**

February 2nd each year is World Wetlands Day, marking the date of the adoption of the Convention on Wetlands in 1971, in the Iranian city of Ramsar on the shores of the Caspian Sea. Each year since 1997, government agencies, non-governmental organizations, and groups of citizens at all levels of the community have taken advantage of the opportunity to undertake actions aimed at raising public awareness of wetland values and benefits in general, and the Ramsar Convention in particular. The theme for 2019 is “**Wetlands and Climate Change**”: **we are not powerless against climate change: wetlands help us cope**. World Wetlands Day materials are available here: <https://www.worldwetlandsday.org/documents>.



Bermuda has 7 ‘Ramsar Sites’ or ‘Wetlands of International Importance’ designated under the Ramsar Convention. They are Pembroke Marsh, Somerset Long Bay Pond, Warwick Pond, Paget Marsh, Hungry Bay Mangrove Swamp, Spittal Pond and Lover’s Lake. Read more here:

<https://environment.bm/ramsar-sites>.

## PLANTING CALENDAR – WHAT TO PLANT IN THE WINTER...

### VEGETABLES

#### **December**

Beans, Beets, Broccoli, Brussels Sprouts, Cabbage, Carrots, Cauliflower, Celery, Chard, Chives, Kale, Leeks, Lettuce, Mustard Greens, Onions, Potatoes, Radish, Rutabaga, Spinach, Squash, Strawberry, Tomato, Turnip.

#### **January**

Beans, Beets, Broccoli, Brussels Sprouts, Cabbage, Carrots, Cassava, Cauliflower, Celery, Chard, Christophine, Kale, Leeks, Lettuce, Mustard Greens, Potatoes, Radish, Rutabaga, Spinach, Squash, Tomato, Turnip.

#### **February**

Beans, Beets, Broccoli, Cabbage, Carrots, Cassava, Cauliflower, Celery, Chard, Christophine, Corn, Cucumber, Kale, Leeks, Lettuce, Mustard Greens, Potatoes, Pumpkin, Radish, Rutabaga, Spinach, Squash, Sweet Potato, Tomato, Turnip.

### FLOWERS

#### **December**

Ageratum, antirrhinum (snapdragon), aster, aubrieta, begonia, bells of ireland, candytuft, carnation, centaurea, chrysanthemum, cineraria, dahlia, dianthus, geranium, gerbera, gypsophila, impatiens, larkspur, lathyrus, nasturtium, nicotiana, pansy, petunia, phlox, rudbeckia, salpiglossis, salvia, statice, snow-on-the-mountain, spider flower/cleome, star-of-the-veldt, stock, sweet william, verbena and viola.

#### **January**

Agratum, antirrhinum, aster, aubrieta, begonia, bells of ireland, candytuft, carnation, centaurea, chrysanthemum, cinerariam, dahlia, dianthus, geranium, gerbera, gypsophila, impatiens, larkspur, lathyrus, nasturtium, nicotiana, pansy, petunia, phlox, rudbeckia, salpiglossis, salvia, statice, snow-on-the-mountain, spider flower/cleome, star-of-the-veldt, stock, sweet william, verbena and viola.

## February

Acrolinium, ageratum, alyssum, antirrhinum, aster, aubrieta, baby blue eyes, bachelor's buttons, bird's eyes, blanket flower, begonia, bells of ireland, calendula, candytuft, carnation, centaurea, chrysanthemum, cineraria, coreopsis, dahlia, Africa daisy, dianthus, forget-me-not, geranium, gerbera, globe amaranth, globe gilia, godetia, gypsophila, hollyhock, impatiens, larkspur, lathyrus, marigold (African), marigold (French), nasturtium, nicotiana, pansy, petunia, phlox, phlox (annual), red tassel flower, rose everlasting, rudbeckia, salpiglossis, salvia, scabiosa, statice, snow-on-the- mountain, spider flower (cleome), star-of-the-veldt, stock, sweet pea, sweet william, verbena and viola.

# ON HER MAJESTY'S SERVICE



GOVERNMENT OF BERMUDA

**Department of Environment and Natural Resources**