CONSERVATION MANAGEMENT PLAN

SPITTAL POND NATURE RESERVE

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Bermuda National Trust

Contents

PROPERTY DETAILS

Spittal Pond is Bermuda's largest nature reserve at 64 acres comprising numerous habitats, including saltwater marsh and coastal forest/woodland. Important geological and cultural heritage features can also be found at the site (see Figure 1). It was declared a Ramsar site in 1999 and is considered Bermuda's most important wetland for wintering waterfowl.

The Bermuda National Trust (BNT) owns 24 acres, all zoned Nature Reserve. Much of the space is also zoned as a water resource protection area and on the southern coast, an acknowledged historic protection area (see Figure 2). The remainder of this National Park is public property, under the stewardship of the Bermuda Government. A significant portion of the Government-owned section is zoned for agricultural use and is operated as a dairy farm.

Centuries of severe storms and hurricanes have caused coastal flooding, which has affected the biology of the pond and woodland areas. Hot summers have resulted in evaporation events – and anoxia (total oxygen deprivation) when biomass is at its greatest in the pond. At times the pond has become an active freshwater environment because of extreme wet weather. Natural changes are to be expected in this dynamic coastal area.

Human activities, including building development and introduction of invasive species in and around the catchment area, have also had a significant impact on the ecology of the pond. Most significant is the adjacent farm which results in a considerable nitrate supply to the pond.

The purpose of this Conservation Management Plan (CMP) is to address the impact the adjacent cattle farm is having on the health of the pond. We also propose increasing the carbon sequestering by planting more native and endemic trees, shrubs, and ground covers to increase biodiversity and further protect the pond.

The subject of this CMP is the entirety of the site outlined in red in Figure 3.

Site Plans

Figure 1 Aerial view site plan.

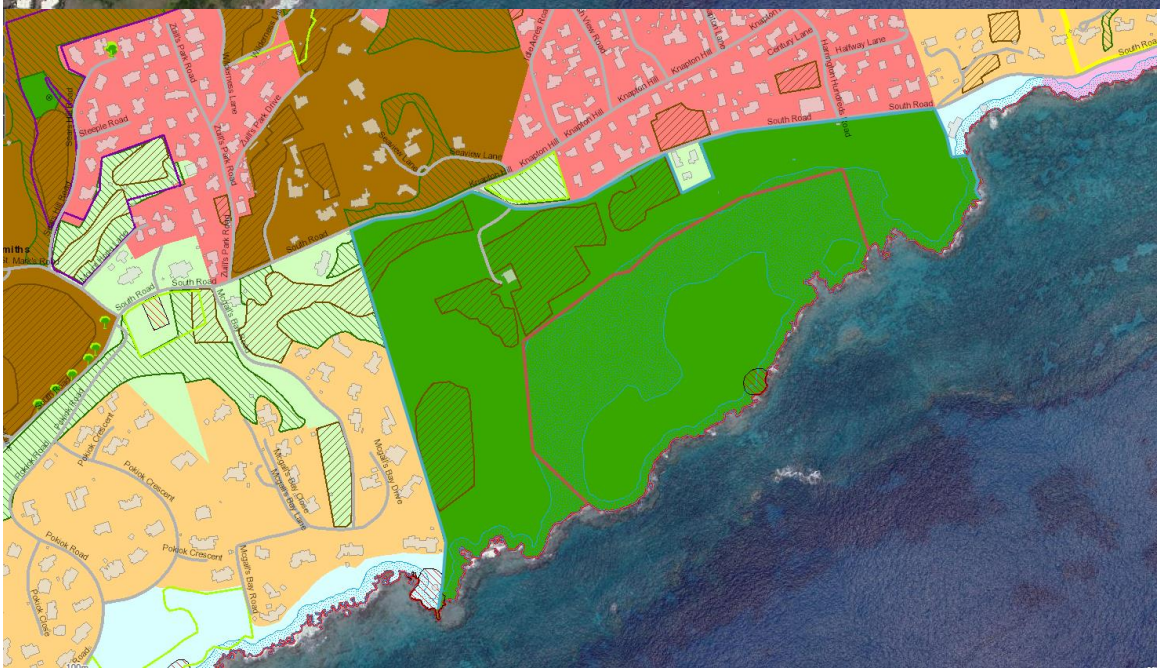

Figure 2 Site Plan taken from the Department of Planning website.

Figure 3 Project location within the reserve demarked in red. It should be noted that some of the work will take place on the Government of Bermuda owned part of the Nature reserve. Permission has been provided by the appropriate minister and the Department of the Environment and Natural Resources (see letter inclusive of a map provided).

Existing Vegetation

Description of the project location

Throughout the project site, the dominant species are Mexican Pepper, Shrubby Fleabane, Chinese Fan Palms and many mature Casuarina trees. The mid-storey and ground cover areas are dominated by Shrubby Clerodendrum and wire weed amongst a mix of what is mostly invasive species.

Existing species list

Mature Plants		**Invasive Category**	**Approximate count**
Common name	**Botanical name**		
Fiddlewood	*Citharexylum spinosum*	Invasive II	>20 specimens
Mexican Pepper	*Schinus terebinthifolius*	Invasive I	>30 specimens
Black Mangrove	*Avicennia germinans*	Native	>30 specimens
Casuarina	*Casuarina equisetifolia*	Invasive I	>20 specimens
Chinese Fan Palm	*Livistona chinensis*	Invasive I	>20 specimens
Umbrella Tree	*Schefflera actinophylla*	Invasive I	<5 specimens
Indian Laurel	*Ficus microcarpa*	Invasive I	<5 specimens
Pride of India	*Melia azedarach*	Invasive II	<5 specimens
Shrubby Clerodendrum	*Clerodendrum*	Invasive I	>30 specimens
Saplings			
Shrubby Clerodendrum	*Clerodendrum*	Invasive I	>30 specimens
Mexican pepper	*Schinus terebinthifolius*	Invasive I	>30 specimens
Chinese fan palms	*Livistona chinensis*	Invasive I	>20 specimens
Ground covers			
Asparagus fern	*Asparagus densiflorus*	Invasive I	>30 specimens
Wire weed	*Sida acuta*	Invasive I	>30 specimens
Rouge plant	*Rivina humilis*	Invasive II	>30 specimens
Horse weed fleabane	*Conyza canadensis*	Invasive II	>30 specimens
Goosegrass, Wire grass	*Eleusine indica*	Invasive II	>30 specimens
Bull Grass	*Sporabolus poiretii*	Invasive II	>30 specimens
American bullrush	*Schoenoplectus validus*	Native	>20 specimens
Jamaican vervain	*Strachytarpheta jamaicaensis*	Native	<10 specimens

Table 1 Existing flora found at the project location on the northern embankment of Spittal Pond.

Category Key

Invasive Category I: High Level. Exotic plants that are altering Bermuda's native plant communities by displacing native species, changing ecology and/or hybridising with native plants. These plants should never be planted or propagated and should be removed at every opportunity.

Invasive Category II: Watch List. Exotic plants that have increased in abundance or frequency but have not yet altered Bermuda plant communities to the extent shown by Category I species and are being watched. The plants should only be propagated under controlled conditions and planted into managed landscapes. They should never be planted in native habitats and consideration must be given for proximity and escape into natural habitats.

Non-invasive: No threat to existing plant communities, e.g. native, endemic, introduced and controlled. Wherever possible, all non-invasive species will be maintained in situ.

Photographs

Figure 4 Farm shed and point source location of pollutants entering Spittal Pond.

Figure 5 A view from the farm to the pond. On rainy days one can see a torrent of contaminated water flowing to the pond.

Figure 6 Damage to existing fence from trees impacted by recent hurricane activity.

Figure 7 Chinese Fan Palms can be seen well established at the existing fence line between the farm the nature reserve.

Figure 8 Fiddlewood and Clerodendrum can be seen over the old fence which was damaged in recent hurricanes. Repairs will take place once invasive management is complete.

Figure 9 Black mangroves are flourishing alongside native grass where there is a physical barrier stopping cattle from entering.

Figure 10 Shows Casuarina, Shrubby Clerodendrum and various other invasive species where the proposed ditch and berm would be established.

Figure 11A Cow only 10 - 15 feet from the pond's edge. The fencing that keeps them out was impacted by recent hurricane activity and will be repaired.

Figure 12 Fecal matter can be seen through the northern boundary of the pond as the cattle have full access to the water and surround which is negatively impacting the pond's health.

Figure 13 Black Mangroves at the edge of the pond cannot establish as the cows typically eat it at the juvenile stages. This project will prevent further decimation of this important native tree.

OBJECTIVES

The primary objective is to protect Spittal Pond from pollutants. Ultimately the proposed project is focused on "improving the condition and protection of the natural environment", specifically the pond and its surround. It is designed to reduce point source pollution from the neighbouring dairy farm and at the same time boost carbon sequestering capacity (process by which carbon dioxide is removed from the atmosphere and stored in vegetation) . This will involve the development of a berm and swale or ditch, which will be planted with native and endemic species. This project is in response to consistent concern shared across Bermuda's environmental community and by users of the reserve.

GOALS

The goal for this project is to provide protection to Spittal Pond from pollutants associated with the adjacent dairy farm, improve the health of the pond and increase the presence of native and endemic flora at the reserve. This will be achieved by the following actions.

1. Remove or prune as required invasive species plaguing the site, causing damage to the eco-system and infrastructure (boundary fence).
2. Complete repairs to the existing fence to keep cattle out of the pond.
3. Create a ditch and berm to prevent pollutants from the adjacent farm entering the pond.
4. Plant native and endemic flora to increase biodiversity, stabilise the newly developed berm and increase carbon sequestration.

Once created, the berm, planted with native and endemic flora, will increase carbon sequestering while stabilising the habitat. The ditch partially filled with local, lime based, clean fill, should slow and limit nitrate access to the pond during periods of heavy rain. The ditch and berm will also add another barrier to cattle accessing the pond if they do escape the boundary fence.

Implementation Plan

PHASING

Phase 1: The felling and clearance of invasive species. All clearance and felling to be carried out manually and chipped on site where possible. The removal of large horticultural debris, as well as unstable uprooted mature trees where necessary by a qualified contractor.

Phase 2: Excavate ditch and create berm. Bring in clean fill and soil where necessary, in as limited a quantity as is possible. Place biodegradable anti-erosion matting on berm. The lime in the berm will chemically manage the nitrate filled run-off from the farm and the plants will also help by using the nitrogen for their growth ultimately bettering the health of the pond.

Phase 3: Repair existing fence to prevent cattle from accessing the pond. This will involve replacing some of the posts and top rail with seasoned allspice harvested from Sherwin Nature Reserve. The fence is 5 feet high and will have strain galvanized stock fence over the whole length to ensure cattle cannot pass.
Phase 4: Plant berm with native and endemic plants and trees.

Phase 5: The ongoing management of previous works to ensure invasive or unwanted species are prevented from re-establishing and new plantings are establishing well.

Invasive species management

All invasive species management will be carried out by qualified professionals and overseen by the Trust's Head of Natural Heritage. Some trees and shrubs will be left on site to provide protection and a wind break for the newly planted trees, shrubs, and ground covers. These species will be removed as the new plants mature and can fend for themselves.

Ditch and Berm Development

The ditch and berm will be constructed as much as possible from materials on site and where necessary the best available lime-based rubble/fill, soil, compost, and mulch will be purchased from local suppliers and brought on site by the chosen contractor. The depth of the ditch will be approximately 24 inches and the height of the berm will not exceed two feet above the existing ground level. A diagram of the intended result can be seen below (Figures 14 and 15). The total length of the proposed ditch and berm is approximately 200 feet, (see Figure 16).

Figure 14 Ditch and Berm design to capture nitrates and reduce point source pollution of Spittal Pond. Image retrieved from https://sporastudios.org/greenstudio/earthworks-swale-and-berm-construction/.

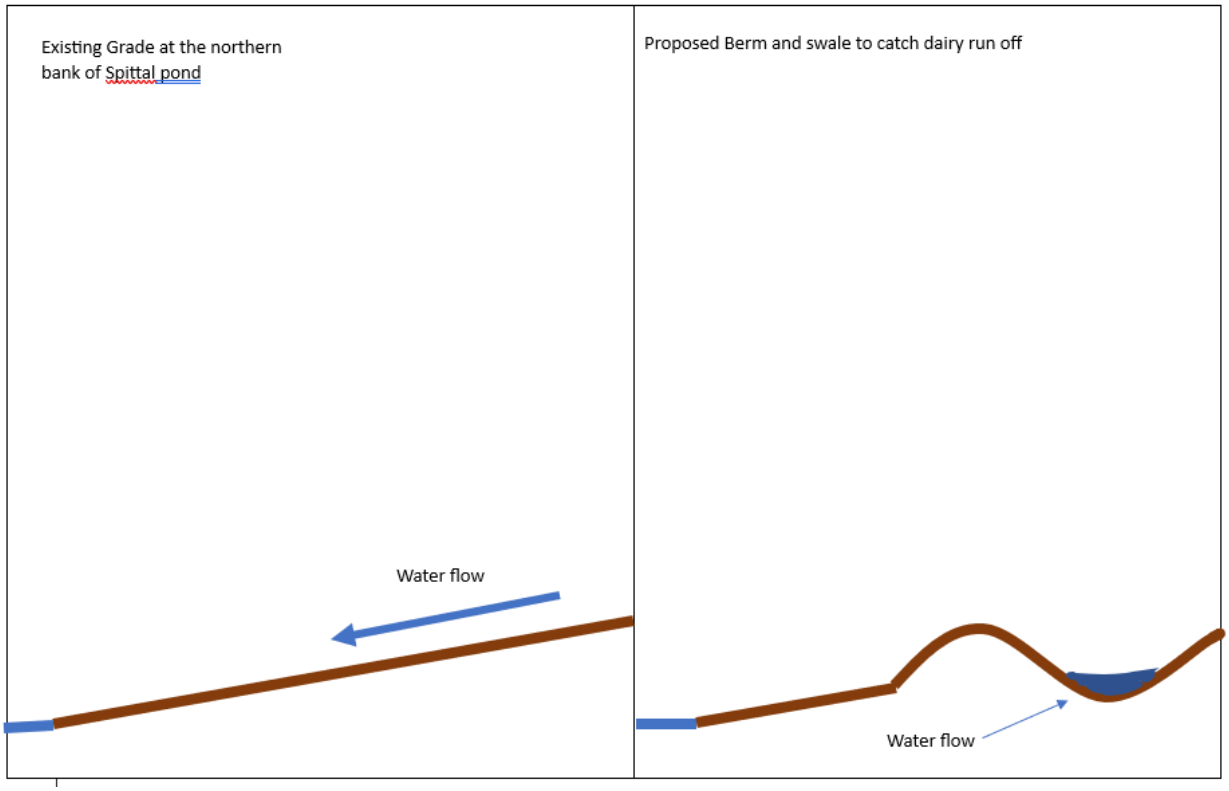

Figure 15 Shows the existing grade of the northern bank of Spittal Pond and the proposed berm and ditch to catch nitrates associated with the adjacent dairy farm. The berm will be constructed of local lime-based aggregate and soil. Once constructed it will be covered with a burlap weed mat and planted with native and endemic trees, shrubs, and ground covers.

Figure 16 The area marked in aqua shows the length and location of the proposed ditch and berm. The area marked in green shows the area to be planted in native and endemic flora. It should be noted that some of the work will take place on the Government of Bermuda owned part of the Nature reserve. Permission has been provided by the appropriate minister and the Department of the Environment and Natural Resources (see letter inclusive of a map provided).

Figure 17 Shows the area of land owned by government that is designated as nature reserve that will be included in the proposed work. Repair of fencing, some invasive removal and all the berm and ditch marked in blue will be developed on this section of land owned by the government of Bermuda. A letter has been provided by the appropriate minister and the department of the Environment and Natural Resources.

Preparation and Planting

As is common practice with Bermuda National Trust projects, much of the work will be carried out by volunteers. That said, all work will be overseen by the Trust's Head of Natural Heritage to ensure best horticultural practices are being carried out.

The Trust's Head of Natural Heritage will ensure plant stock is pest, disease and disorder free, with strong vigorous growth and healthy roots that aren't pot-bound. All planting pits will be excavated to at least three times the size of the container the plant is in and back filled with quality soil mixed with compost to the top of the root collar. These new plantings will be firmly healed in and watered thoroughly.

Proposed Planting

Trees & Palms	**No.**	**Size**	**Spacing**

2023 CMP Spittal Pond - Darwin Plus Grant

Common Name	**Botanical Name**			
Bermuda Cedar	*Juniperus bermudiana*	25	3 gallon	12'c.c.
Seven Year Apple	*Casasia clusiifolia*	7	3 gallon	12'c.c.
Bermuda Olivewood	*Cassine laneana*	25	3 gallon	12'c.c.
Southern Hackberry	*Celtis laevigata*	10	3 gallon	12'c.c.
Bermuda Palmetto	*Sabal bermudiana*	25	3 gallon	12'c.c.
Shrubs		**No.**	**Size**	**Spacing**
Bermuda Snowberry	*Chiococca bermudiana*	40	1 gallon	6'c.c.
Jamaica Dogwood	*Dodonaea viscose*	50	1 gallon	6'c.c.
Turkey Berry	*Callicarpa americana*	20	1 gallon	6'c.c.
Dock Bush	*Baccharis glomeruliflora*	30	1 gallon	6'c.c.
Tassell Plant	*Suriana maritima*	20	1 gallon	6'c.c.
Salt Marsh Oxeye	*Barrichia frutescens*			
Bay Bean	*Canavalia rosea*	40	4" plug	6'c.c.
Wild Bermuda Bean	*Phaseolus lignosus*	40	4" plug	6'c.c.
Green Buttonwood	*Conocarpus erectus*	30	1 gallon	6'c.c.

Aftercare

New plantings will be watered twice a week for the first month after planting, or as required if dry or wet weather demonstrates a greater or lesser need. Maintenance will be carried out bi-monthly to prevent the establishment of invasive species that could out-compete the newly planted native and endemic species. New plantings will receive light pruning in the early years to encourage healthy, vigorous growth and good structure. These works will be part of an ongoing maintenance programme and will be undertaken until the new plantings are well established.