Edith G. Read Wildlife Sanctuary
Natural Resource Management Plan

Revised and Updated by

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[DRAFT]

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Natural Resource Management Plan

1.0 Curator's Note

This revised and updated version of the Natural Resource Management Plan has a number of additional sections not included in the 2009 version produced by then Curator Jason Klein. These additions reflect some of the changes and improvements to the sanctuary that have been implemented since September of 2009. These include a 5-acre salt marsh habitat restoration project and new automatic tide gate system, various construction projects, alterations caused by Hurricane Sandy, the installation of a pollinator garden, and releases of a biological control organism. Change of administrations, change of attitudes, change in staffing, change in technology or procedures, change in wildlife and vegetation patterns, and of course climate change. All these and more combine to create a set of conditions that have required a revised approach to the management of resources at the sanctuary.

A guiding philosophy in the assessment of priorities and practices at the sanctuary has been to try and understand what the *landscape itself* needs and what natural forces are dictating the habits and behaviors of all its organisms. Since these forces are in control, going against them is futile in the long term. This approach must also reconcile that understanding with the limits of our capability and the multi-user nature of the sanctuary We employ, to the best of our ability and resources, appropriate management practices while keeping an eye on sustaining our efforts. The 24 species of "interfering vegetation" (aka invasive plants) that live here seek to own every inch of the landscape. We manage to keep them at bay, just barely, so that we have a more species-rich environment for wildlife and people to enjoy. This managed biological diversity (though somewhat native) is not naturally *occurring*, and so goes against the previous stated philosophy of understanding the way the landscape is evolving. So this is the challenge for present and future curators here – at least until the sea-level rises and puts the sanctuary under water.

The history of this piece of land reveals a recent period (late 1920's to early 1980's) of intermittent neglect and abuse. As such, the rehabilitation of this land is complicated, requiring a long-term commitment. It requires a more intensive sense of ownership and hands-on relationship with the land that not everyone who takes on the position of curator here in the future may be able to offer. As true stewards, we cannot force nature to be what it does not want to or cannot be. Likewise, we cannot force people to care enough, nor can we spend money on behalf of natural resource management that does not exist in the county's budget.

Despite such considerable challenges, it is still a worthwhile pursuit to demonstrate our love and stewardship for the plants and animals that inhabit this tiny piece of the earth right now.

2.0 Introduction

Of present county land holdings of more than 18,000 acres, approximately 16.5% are developed according to department development criteria, while 83.5% remain in their natural state in support of the department conservation mandate. That mandate requires the establishment of the following Natural Resource Management Plan (NRMP).

2.1 The Mission Statement of the Westchester County Department of Parks, Recreation and Conservation

The Westchester County Department of Parks, Recreation, and Conservation is committed to preserving the over 18,000 acres of parkland that has been entrusted to our care for future generations, and procuring new properties as they become available. Equally important is our duty to provide programs and services, designed and constantly updated to meet the ever-changing recreation and leisure needs of the Westchester community while practicing sound conservation ethic.

2.2 Objectives

The objectives of the Natural Resource Management Plan are to:

- Identify and inventory ecological communities, animals, plants, and significant habitats within each park in the Westchester County parks system
- Summarize the natural and cultural resource values of each park.
- Analyze the significance of natural resource management needs and rank them in importance.
- Propose specific actions, including funding and staffing requirements, for dealing with the most important issues.
- Present a multi-year approach to achieve measurable progress in accomplishing the proposed actions
- Identify and initiate needed scientific research leading to appropriate management actions.
- Provide for an annual review to amend, update, and continually assess accomplishments to measure the effectiveness of actions.
- Provide the forum for an interdisciplinary approach to the park's natural and cultural resource management and maintenance issues.
- Provide for transfer of information on the park's resource management program to the park staff.

Conservation division staff will prepare and periodically update a natural resources management plan. The plan will identify, define, and program the monitoring, inventory, research, mitigation, and enforcement activities required to protect the park natural resources and natural processes, and regulate the use of the park.

The Conservation Division staff is responsible for preparing the natural resources management plan. Input from all park divisions playing a role in the planning,

management, and protection of natural resources is necessary to ensure that all of the resource-impacting activities are considered and that the entire park staff understands and supports the action plan represented by the NRMP. Conservation Division staff should assure that involved divisions (e.g. maintenance, planning) have accurate information on resources and an adequate understanding of resource management goals and objectives and their rationale.

2.3 Nature Center Mission Statement

The Edith G. Read Wildlife Sanctuary provides wild flora and fauna an opportunity for refuge from the densely populated and developed areas that surround it. The Sanctuary provides visitors with opportunities to experience the beauty and healthful benefits of time spent in nature, as well as deepen their general understanding of nature. The Sanctuary staff is dedicated to protecting, preserving, and managing the area's habitats for diversity of flora and fauna in an environmentally sensitive manner.

The Nature Center at the Sanctuary provides education and inspiration to people of all ages, moving them towards a deeper respect for, and relationship with the natural world while fostering in them a personal responsibility to care for the earth. The Curator and Nature Center staff achieves this by providing interpretive educational programs and nature exhibits that promote a better understanding of the environment, insight into the intricate relationships between organisms, and the importance of biological diversity and conservation. This in turn provides visitors with an enhanced enjoyment and understanding of the natural world, and hopefully, an enduring respect for nature's wisdom. (Gambino, 2009)

3.0 Resource Description

The Edith G. Read Wildlife Sanctuary is a 179-acre park located adjacent to Playland Amusement Park on Manursing Island in Rye, New York. The northern edge of the park is defined by Manursing Way; the western edge by Playland and private properties; the southern edge by Long Island Sound; and the eastern edge by the Manursing Island Club and private properties. Most of the western boundary of the park is bordered by private property just outside of the buffer zone of the Lake, with two properties extending to the water's edge.

The topography of the park is highly uniform, with little variation throughout. The northern end of the park is slightly elevated from the southern end, creating a gradual slope from north to south. There are occasional depressions in the land allowing for wet areas, but no true vernal pools (determined by the lack of indicator species).

Three buildings are located on the property, and a new (2014) Lake View Observation Deck has been constructed along the lake shore trail that replaced the old duck blind. The nature center building is located at the southern end of the park along the access road from Playland. Across from the nature center are a small tool shed and a large metal garage for storing equipment. Power lines run from the eastern edge of the park to an electric box located within a chain link enclosure approximately 100 yards north of the nature center. Three tall lamp posts are located along the access road.

There are approximately 20 trail segments covering about 3 miles. Three segments lead south towards Long Island Sound (from the nature center), while the others

are located in the northern wooded area of the park. Most trails are ten to fifteen feet wide, with some having dense vegetation along the sides. Trails surfaces are comprised of some combination of grass, sand, clay, or soil. Several segments have had wood chips placed on them in wet areas or where many tree roots are exposed. A trail segment was formerly present along the northern edge of the Lake, accessed by Manursing Way, but has been abandoned due to the difficulty of maintenance. No path or trail currently exists (or is planned) that would enable hikers to walk around the entire perimeter of the lake.

The site was tested in 2000/2001 for hazardous materials. Results showed that no hazardous materials were present. As will be described in the history section of the plan, the park was used at one time as a dump for Playland. Large metal objects can still be seen protruding from the ground in many areas of the park. Since 2010, many tons of rusted metal, large hunks of broken concrete, numerous piles of discarded asphalt, automotive parts, steel cable, construction demolition debris, tires, metal drums, Chinese teapots, glass bottles, ceramic tile, and more were excavated, removed, and hauled away. Much of this work was done with the help of a backhoe operated by a volunteer who owned the machine. Still, occasional tires, swaths of broken glass, and a wide array of junk are present in the soil throughout the park. Volunteers and sanctuary staff continue to pick away at this junk each year. Volunteerism is a key factor in being able to maintain this sanctuary.

3.1 History of Read Sanctuary

Until the mid-1920s, about 85-acres of the current 179-acre park was a salt marsh created by the retreat of the Wisconsin Glacier. Aerial photos from the 1920s show that much of the marsh was submerged during high tides. Land that was not regularly inundated during this period appears to have been successional farm land. There is evidence of use by the local tribes of Native Americans, presumably the Siwanoy, and there was what is believed to be a village at the site of present-day Oakland Beach. Before the County acquired the land, there was also a hotel named Edward's Hotel on The Hill where the Ice Casino at Playland presently stands.

The County purchased the land in the 1920s for an unknown amount. The salt marsh was subsequently dredged during the late '20s to form Manursing Lake (a.k.a. Playland Lake) to allow recreational activities and boating concessions. As of this writing, a boating concession still uses the lake during the summer season. The lake is completely off-limits to all but a few authorized personnel. Dredge spoils were conveyed by barges and pumps and deposited on the islands of the lake, the area that is now Playland's main parking lot, and areas throughout Read Sanctuary. As a result, the hydrology (movement of water on the landscape) of the park was altered, leading to significant changes of habitats.

To contain the new lake, the Long Island Sound channel that fills and drains the lake was narrowed and bridged, and a manually operated tide gate was constructed. The construction of the Manursing Way road also acts to hold the lake water levels, and a large culvert permits some degree of tidal flow into "the Gut" which is just beyond the north end of the sanctuary. Once all this was in place, an access road was built leading to what is now the sanctuary, permitting Playland to use the property as a dump site for the next several decades as previously mentioned. Junk was discarded in excavated pits and sometimes covered with plastic or rubber sheets, or simply dumped on the ground. The

small mounds that are seen today throughout the sanctuary on an otherwise mostly flat topography are indicators of such dumping practices. These mounds are mostly covered by vegetation now.

The park was also the site of a nursery used for the propagation of plants for Playland landscaping. There was a small building with a few flowerbeds, and several greenhouses located in what is now Field 4 (aka the Chimney Field). The chimney from an old house of a bygone era is still present. Current research indicates the structure belonged to an outer building or perhaps summer house of the Van Rensselaer family during the early 1900's. It is believed that the seeds of many invasive species that we find in the park today were initially brought here as stowaways in shipments of potted plants delivered to the nursery.

The park was officially dedicated as "Edith G. Read Natural Park and Wildlife Sanctuary" in 1985. The name has since been unofficially shortened for practical usage to "Edith G. Read Wildlife Sanctuary", and further reduced for usage by local residents and departmental reference to simply "Read Sanctuary". A non-profit Friends Group was incorporated in 1990 and their name is officially "Friends of Read Wildlife Sanctuary, Inc.".

The 85-acre lake was included as park property with a clause stating that the boating concession could continue seasonal operation until the family-owned business was no longer owned by a family member. The original nature center was a trailer. In 1996 the current nature center building was built by the county's General Maintenance department. Since its inception as a wildlife sanctuary, there has been only one addition to the total acreage. This was a small parcel of land, including Fields 1 and 2, that were previously considered part of Playland.

3.2 Geology and Soils of Read Sanctuary

There are 4 associated soil types in the park, listed in Appendix E. These soil types were listed in the USDA's *Soil Survey of Putnam and Westchester Counties, NY* (USDA, 1994). The predominant soil type, covering approximately 70% of the park is Udorthents wet substratum. This soil is significantly altered by deposition of dredge spoils and is consequently and poorly drained.

There is little exposed bedrock in the park with most of it being visible on the lake's islands. The largest island (island 7 aka Bloomer Island) has a sizable outcrop of Fordham Gneiss measuring about 20 feet high, approximately 100 feet wide, and running in an east-west orientation. Any other large rock present is assumed to be glacial erratic, or present from the dredging of the lake.

There are 2 distinct layers in the soil in much of the park (approximately 70%). This is caused by the deposition of dredge spoils, consisting primarily of sand and silt. When a core sample is taken, there is an obvious horizon between the two different layers.

There is a rocky inter-tidal zone characterized by many different forms and sizes of rock. These were deposited as part of a recessional moraine from the Wisconsin Glacier. Other types of rocks are also scattered on the shoreline along with some hunks of broken concrete and bricks apparently dumped there at some point since Playland's operation began. Additionally, some large boulders were placed along the upper beach in 2003 to help stabilize the original dune installations that were completed in 2001. A

nor'easter in Spring of 2010 completely removed the dunes and vegetation for a second time. There are no current plans to replace the dunes.

3.3 Natural Communities of Read Sanctuary

Classification (from Reschke 1990):

I. Marine System
- A. Marine Sub-tidal
  - 1. Marine Deepwater Community
- B. Marine Intertidal
  - 1. Marine Intertidal Mudflats
  - 3. Marine Rocky Intertidal
- C. Marine Cultural
  - 3. Marine Riprap / Artificial Shore

II. Estuarine System
- B. Estuarine Intertidal
  - 4. Low Salt Marsh
  - x. Upper Salt Marsh or Scrub Marsh
- C. Estuarine Cultural
  - 1. Estuarine Channel / Artificial Impoundment

VI. Terrestrial System
- A. Open Uplands
  - 3. Maritime beach
  - 4. Maritime dunes (gone since 2010)
  - 23. Successional Shrub land
- C. Forested Uplands
  - 5. Appalachian Oak-Hickory Forest
  - 8. Oak-Tulip Tree Forest
  - 20. Successional Northern Hardwoods
  - 21. Successional Southern Hardwoods
- D. Terrestrial Cultural
  - 4. Flower Garden ("Pollinator Garden")
  - 4. Flower Garden (native, deer resistant plants in raised beds)
  - 4. Edith G. Read Memorial stone/bronze plaques with plantings
  - 12. Mowed Fields
  - 13. Mowed Roadside / Pathway
  - 16. Paved Road

3.3.1 The Forests of Read Sanctuary

Approximately 75 acres of the park are forested. The associated communities are listed above. The variation is due to changing soil conditions. Some areas of forest contain dredge spoil, and are therefore fairly new, while areas were historically wooded. There are natural (original, unmanaged) forested areas on the islands within the lake, as well areas behind the Playland parking lot, and within the lake buffer zone. Given the history of the park, most of the wooded areas centrally located within the park are considered successional. The predominant tree species in these sections are Black Locust

(*Robinia pseudoacacia*), Black Cherry (*Prunus serotina*), Cottonwood (*Populus deltoids*), Red Maple *(Acer rubrum),* and some Tree-of-Heaven (*Ailanthus altissima*). A few Gray Birch (*Betula populifolia)* trees remain standing in their twilight years within the forest, the rest have succumbed to old age, storms, and rot. In many areas, the forest is being adversely affected by invasive vine coverage, and since 2010, especially Mile-a-Minute Weed (*Persicaria perfoliata*). Even the relatively undisturbed lake islands have some invasive vines.

In addition to the vines and other invasive ("interfering") vegetation, nearly all of the understory is missing from the forest due to pressures of invasive plants and relentless deer browsing. The management recommendations discussed later in this report will address this issue. It should be noted that these forest community definitions will have to be reviewed in the future as the successional forests give way to mature stands, or as mature stands fall with no young trees to replace them. This change is evident in a few areas of the park and should be monitored.

Appalachian Oak-Hickory Forest: is present in some of the older forest areas of the sanctuary, especially: the area by Manursing Way, along the back of Playland's parking lot, and parts of the large island (Bloomer Island). White Oak (*Quercus alba*) and Black Oak (*Quercus velutina*) predominate, with Shagbark Hickory (*Carya glabra*), White Ash (*Fraxinus americana*), and Red Maple (*Acer rubrum*) present as well.

Oak-Tulip Forest: This community makes up the majority of the non-successional elements of Read Sanctuary. The community is located in the older sections of the forest, located in the northern and western region of the park, as well as on island #7. Tulip Tree (*Liriodendron tulipifera*), Black Birch (*Betula lenta*), Red Maple (*Acer rubrum*), Black Oak (*Quercus velutina*), and White Oak (*Quercus alba*) are all present in these areas. There is also Sassafras (*Sassafras albidum*) and Black Cherry (*Prunus serotina*).

Successional Northern Hardwood: This community is listed since it contains species not seen in the southern successional that are present within the park. These species include Black Cherry (*Prunus serotina*), White Pine (*Pinus strobus*), and White Ash (*Fraxinus americana*).

Successional Southern Hardwood: This is the predominant type of forest community in the sanctuary. The central area of the park where the trails are located is comprised almost entirely this community. The trees in these areas are relatively young, with former birch areas mostly overtaken by hardwoods. Although some of the listed dominant trees are present, the introduced species prevail. These include Black Locust (*Robinia pseudo-acacia*) and Tree-of-Heaven (*Ailanthus altissima*). There is also the presence of many Cottonwoods (*Populus deltoids*), and Norway Maple (*Acer platanoides*) in these areas.

3.3.2 The Fields of Read Sanctuary

There are seven fields of varying size within the park. All but one of these fields has been the site of habitat management projects. The fields have been managed in different ways in order to reduce invasive presence while adding native grasses, wildflowers, or both. All fields are mowed to suppress the growth of invasive plants to a height of about 3.5 inches early in the growing season to about 6 inches by mid-summer. Patches within the fields where invasive plant population is high may be mowed more aggressively. Spot removal by weed whacker may also be an option. In some of these areas, native grass seed is sown onto the newly exposed soil to help challenge regrowth of invasive species. This is especially obvious after mowing dense patches of mugwort. Grass creates a dense underground network of roots that help slow or deter invasive plant intrusion. This mowing, over time, leads to depletion of energies and resources in invasive plant root systems, any above ground re-growth results in fewer, shorter, and weaker plants. In many instances, the invasive plants are no longer present. Mowing needs to be consistent and persistent several times each season to be effective (for at least 5 consecutive years). After that an assessment should be made to see if mowing frequency can be reduced or plant height can be mowed higher.

Field 1 (the large field) is the closest to the Sound. The soil is fairly sandy, with the southwest corner being almost completely sand. This field has been managed since 1999 to improve coverage of native grasses and forbs that were planted in 1999. Originally the field was overgrown with Common Reed (*Phragmites australis*), Porcelain Berry (*Ampelopsis brevipedunculata*), and Mugwort (*Artemisia vulgaris*).

Field 2 (across the road from Field 1) is very similar to Field 1. The soil is sandy, and some similar species are found. This field, as well as Field 1 are both sites where American Woodcock (*Scolopax minor*) have been seen displaying. This field has been managed in a similar manner to Field 1.

Field 3 is located behind the nature center. It was previously overgrown with Mugwort. Much work has been done on this field, as three different methods were tried in order to restore it to a native meadow area prior to the spring of 2010. One third was mowed consistently for a few years. This method diminished the Mugwort presence very little. Another third was dug up and re-seeded. The final third had a black tarp placed over it for one year, then was seeded. These last two techniques originally showed some improvement in the field, but insufficient attention permitted Mugwort to retake large sections. Some native grasses are still doing well where they are established.

It should be noted that among the 64 species seeded prior to 2010, the Wingstem plant *(Verbesina alternifolia)* was the most successful wildflower. In fact, it has now become a threat to the field and surrounding areas as it grows aggressively in dense stands and to a height of 7 feet or more. Nothing else can grow within these stands except some small mugwort plants. These areas were first managed by cutting all the seed heads off before dispersal and after a few years of this, repeated hand-cutting of the entire plant had to be employed. This plant, while being a beautiful source of food for foraging bees and other insects, needs to be monitored to prevent overgrowth. It has since spread to other nearby areas of its own accord. It has been suppressed in this field, though it persists as a shorter expression.

Of special note is the Great St. John's Wort *(Hypericum pyramidatum)* which first appeared in this field in 2011 after a batch of native wildflower seed mix was sown in a variety of places throughout the sanctuary. Since then it has recurred each year and the height and population have been slowly increasing. Seeds from these plants have been distributed in various places in hopes of establishing this plant more securely. Seeds have been sown during winter months on snow for ideal cold stratification, and in spring and fall seasons to bracket the chances for germination success. This species status in New York State is listed as *Rare, S3*. There is no official record yet for Westchester County according to the NYS Floral Atlas (2018). We will be sending a voucher specimen to the state this year (2019) with other population data. Efforts to conserve and propagate the plant in the sanctuary continue.

Field 4 (Chimney Field) This field had been completely overgrown with Porcelain Berry, Mugwort, and Japanese Knotweed (*Polygonum cuspidatum*). The former Playland nursery was located here during the 1970's. The chimney and nearby foundation, and a stone wall lining the trail are most probably the remains of old summer cottaged and property owned by the (Peter) Van Rensselaer family who sold the property to the county in 1919.

There is one official (county) memorial tree with plaque along the outside trail. The field has a large Red Cedar (*Juniperus virginiana*) tree near its center, next to the chimney. In (?2001?) a landscaping firm was hired to clear the field. Tall native grasses and wildflowers such as New York Ironweed have since established themselves well.

Most of the field is left standing over the winter to provide food and cover for wildlife. The paths surrounding this field have been widened significantly to improve maintenance efforts and discourage phragmites, Japanese Knotweed, Porcelain Berry, and Mile-a-Minute Weed from easily spreading across the trail to this field. Tupelo *(Nyssa sylvatica*), Red Maple *(Acer rubrum)*, and Shadbush *(Amelanchier arborea)* trees have been planted in this widened area to eventually contribute suppression by shading to this border. There is currently a bat house on a post in the eastern side of the field.

Field 5 (the Ball field) borders the Manursing Island Club. The Club has mowed this area consistently every summer, as they use it for their summer camp. There is currently a baseball backstop there. The open field is covered with Sweet Vernal Grass (*Anthoxanthum odoratum*), and along the un-mowed border grows Purple Love Grass *(Eragrostis spectabilis)*, Dogbane, Multiflora Rose, some *Wineberry (Rubus phoenicolasius)* and a Sassafras sapling. This border is mowed every few years as needed to keep invasives and woody thickets from taking over. As with fields 1 and 2, the soil is predominantly sandy. The borders are successional forest with some areas burdened with invasive vines and *Aralia elata* saplings.

Field 6 (west side of nature center) There is one other small, roughly triangular field just to the west of the nature center. This area was previously overgrown with Common Reed and Purple Loosestrife (*Lythrum salicaria*). This field was first managed in 2001. The invasive plants were dug up, removing as much root material *as possible*. The field was then covered with 6" of sand and 6" of clean top soil. The field was then seeded and planted with a mix of native species.

Field 7 (Bamboo Grove field): This field is located between the grove of Golden Bamboo (*Phyllostachys aurea)* and the established trails. It is not far from the beach. The soil here contains a thinly stratified mix of organic matter, silt, sand, and gravel (glacial outwash).

In 2009 it was a tangled overgrown thicket rampant with Porcelain Berry vine, Mugwort, and thistle. In 2011, it was completely reduced using loppers and the DR Brush Hog. This left only stumps, stems, and bare soil exposed. Water drainage from the neighboring property during spring caused muddy areas and run off across the trail in several areas to persist into the growing season, hindering general mowing in this area. With the help of volunteers, the vine roots were dug up and as new sprouts formed, they were dug out as well. Once this was completed, the soil was loosened by raking and native grass seed was sown as a quick ground cover to help deter invasive plants returning. Mowing continued about every two weeks after grasses were established through the growing season to further suppress invasive plants. Each spring the bamboo shoots occurring in this reclaimed area were removed by hand, then the mowing would resume.

Starting in 2015 through 2017, native wildflower seed mix was sown with hopes of establishing some semblance of a meadow here. So far this has not been successful, but seeds often take years before they germinate so we keep monitoring. The area is not currently fenced to exclude deer.This may be necessary at some point to establish wildflowers in sufficient density as to survive voracious deer. Grasses are successful here, and with years of appropriate seasonal mowing, this area is very much improved.

In 2018, Several Chokeberry shrubs *(Aronia melanocarpa)* were planted and fenced to prevent deer browse. In the wet corner of the field, a Tupelo tree *(Nyssa sylvatica)* was also planted and fenced to aid in uptake of standing water.

3.3.3 Manursing Lake

About 85-acres of the sanctuary's 179-acre parcel is Manursing Lake. Originally, the area was a tidal salt marsh and mud flat. Westchester County dredged during the marsh the late 1920's to form a saltwater lake for recreational use by Playland Amusement Park. It is therefore defined as a Cultural Salt Lake. There are two places where the lake connects to the Long Island Sound (LIS). The primary spot for water exchange is a tide gate located along the entrance road to the park. There is also a 6' diameter culvert connecting the lake to what is referred to as the "Gut" or "Northern Impoundment", a small inlet which itself has only a small blocked opening to the Sound. There are several islands of varying size in the lake. These are show on the "Lake Islands Map" in Appendix B. All have at least a small amount of tree cover. Islands 1 and 2 are host to breeding birds such as the Black-Crowned Night Heron (*Nycticorax nycticorax*). Canada Geese nest there as well. County wildlife biologists have been successful in reducing the population of geese on the lake by oiling the eggs. In the past 4 years, natural predation of these nests has also helped keep the number of goslings to near zero. Island 6 is actually 2 islands separated by a just a few feet (labeled 6a & 6b on the map. There are large numbers of Wild Pink (*Silene caroliniana var. pensylvanica*), a threatened and rare species in this area.

There is a wide variety of life under the surface of the lake as well. There are a few types of algae present, but little research has been done to determine which species. Definitively, Water Gut (*Enteromorpha linza*), and Knotted Wrack (*Ascophyllum nodosum*) have been seen. In addition there are a large number of animal species in the lake, including:

Moon Jelly	*Aurelia aurita*
Leidy's Comb Jelly	*Mnemiopsis leidyi*
Hard-Tube Worm	*Hydroides dianthus*
Fragile Bubble Shell	*Hamindea solitaria*
Northern Rock Barnacle	*Balanus balanoides*
Blue Crab	*Callinectes sapidus*
Sand Shrimp	*Crangon septemspinosa*
Long-Clawed Hermit Crab	*Pagurus longicarpus*
Four-Spine Stickleback	*Apeltes quadracus*
Atlantic Menhaden	*Brevoortia tyrannus*
Sheepshead Minnow	*Cyprinodon variegatus*
Mummichog	*Fundulus heteroclitus*
Spotfin Killifish	*Fundulus lucrae*
Striped Killifish	*Fundulus majalis*
Three-Spine Stickleback	*Gasterosteus aculeatus*
Striped Bass	*Morone saxatilis*
Northern Puffer	*Sphoeroides maculatus*
Porgy	*Stenotomus chrysops*
Northern Pipefish	*Syngnathus fuscus*
Blackfish	*Tautoga onitis*

The lake also has an important function as the wintering site for many ducks. For many years during the winter months up to 10,000 ducks would be seen on the lake. About 10% of New York State's population of Greater Scaup (*Aythya marila*) over-winter on the lake during the winter months. (Wells, 1998) For this reason, as well as others, the National Audubon Society has recognized the park as an Important Bird Area (IBA). Since 2011, however, the dense populations have not been present, though most of the species are still represented.

Although the lake has contact with the Sound, it relies heavily upon rain, wave action, and photosynthesis to keep the salinity down and the oxygen levels up. Testing of temperature, oxygen, and salinity levels has been done on the lake from 1997 to about 2011. Between 1997 and 2009 results showed that during the hot summer months, hypoxic pits exist at depth. Surface waters occasionally reach a hypoxic state as well. *(Although no longer in use, a protocol for water monitoring was written by Jeff Main during the 1990's).*

With the construction of the salt marsh restoration and new computer-controlled tide gates, a greater exchange of nutrients occurred, helping to improve water conditions. More about the tide gate systems and track record, (including a 2019 assessment report on the lake health and the solution to improve the ecology of the lake) can be found later in this document. [See attachment]

3.3.4 Shoreline

There is approximately 1/2-mile of beach front within the park, and more extending towards Playland. It is a rocky intertidal zone, with sand both above high tide as well as in the sub-tidal region. Scattered through the beach are small tide pools and mud flats. We can break the shoreline to 3 distinct areas: a vegetated upper beach, intertidal zone, and sub-tidal zone, each with their own conditions and stewardship policies.

In 2001, a dune restoration project was completed and was damaged in 2003, then in 2010 was completely eliminated by a nor'easter. No trace of dune habitat remains today, and there are currently no plans to replace them. This has consequences to the fate of the salt marsh restoration just across the road.

3.3.4.2 Intertidal Zone

The intertidal zone at Read is rocky, extending from the entrance of the park, around the point, to a wall dividing the park from private property. It is sandy at the high tide line, becoming rocky from the middle down. It can be divided into 3 distinct communities. The first is Marine Rocky Intertidal. The rocks are glacial erratics. There are 18 different species of algae found in this area, as listed in the biodiversity report. Previously diverse with crabs such as the Green Crab (*Carcinus maenus*) and Black-Fingered Mud Crab (*Eurypanopeus depressus*), there is now one dominating crab, the Asian Shore Crab (*Hemigrapsis sanguinea*). First seen on the east coast in 1989 in New Jersey, this crab was first seen on the beach here in October of 1994. It has since taken over the intertidal zone, from the low tide line most of the way up to high tide. The crab is only present in the intertidal zone, and not the sub-tidal areas. The intertidal zone hosts a community of Salt Marsh Cord Grass (*Spartina alterniflora*). An ongoing study began in 2004 to determine the population trend of the Spartina.

The second community is the Marine Intertidal Mudflat. These are small areas scattered throughout the intertidal zone for much of the beach. These areas are seemingly devoid of life, although beneath the surface, they are teeming. Animals that inhabit these areas include:

Southern Clam Worm	*Nereis succinea*
Soft-Shelled Clam	*Mya arenaria*
Mud Snails	*Nassarius obsoletus*

Although not officially part of the park, there is an area of Low Salt Marsh in the "Gut". This community is exemplified by the presence of Salt-Marsh Cord Grass (*Spartina alterniflora*). This is a fragile system that acts to clean and oxygenate the water, as well as acting as a bed for mussels and fish.

3.3.4.3 Sub-tidal Areas

This area is not officially part of the park, as the areas below mean high tide are considered State waters. It is, however, important to consider this area when writing the management plan. There is a wide variety of plant and animal species that inhabit this area that would be affected by changes occurring on land, and vice versa. Defined as a

Marin Deepwater Community, the sub-tidal area of the park is home to hundreds of plant and animal species, listed in the biodiversity report.

3.3.5 Other Habitats of Note

On the largest of the islands, there is a large outcropping of bedrock. Part of this has been sheared off to form a small cliff. Therefore it has been defined as a Cliff Community, possessing some species of moss and plant considered to be a fundamental part of this community.

At the far eastern part of the beach, there is a hillside that has been eroded to form a soil cliff embankment. Evidence of breeding can be seen in the form of holes along the embankment. Kingfishers have been known to use these for breeding.

4.0 Species of Special Concern

4.1 Plants

Wild Pink (*Silene caroliniana var. pensylvanica)*

An island on the Lake at the Sanctuary is one of only 2 places this flower is known to exist in Westchester County. It dominates island number 6, which looks pink in early spring when this salt-marsh flower is in bloom. A count conducted in 2006 revealed that there are were 282 individuals of this species on island 6 alone. A subsequent survey in 2012 found more plants growing on the eastern edge of Bloomer Island.

Salt Marsh Cord Grass (*Spartina alterniflora)*

A plant of brackish and salt water, this saltgrass species needs to be submerged part of the time during tidal changes. There is a enduring population along the eastern edge of the beach. This saltgrass has spread naturally and slowly, as dictated by the tidal forces and wave dynamics at the shore. These areas where it exists should not be molested by the public during periods of low-tide.

American Fly Honeysuckle (*Lonicera canadensis)*

Although fairly common in Westchester County, this native shrub exists currently in only two locations in the Sanctuary where it is an early blooming plant with a pleasing scent. Steps should be taken to ensure that this plant remains.

Great St. John's Wort (*Hypericum pyramidatum)*

In 2011 a small population of this rare NYS plant appeared behind the nature center in the small field as mentioned in section 6.2.1 describing Field 3. Most likely from a native seed mix sown there in 2010. It is currently the only location in the sanctuary of this wildflower, though subsequent seeds were sown elsewhere collected from this population.

This plant is listed in the NYS Flora Atlas as Rare-State, S3 (State Rank), G4 (Global Rank). No voucher record appears to exist for Westchester County according to the organizations plant distribution map of New York State. (See weblink on this documents Sources page.)

It is recommended that a voucher specimen be prepared and sent to the NY Flora Association for inclusion in June of July of 2019. Seeds should also be sent in November to Ted Koslowski at Lasdon Park and Arboretum for propagation and public display.

4.2 Animals

Greater Scaup (*Aythya marila)*

Although common to the area, this species occurs in large numbers on Manursing Lake during the winter. It has been estimated that we host 8-10% of New York State's population of this species (Wells, 1998).

Since winter of 2011, the overall populations of wintering ducks on the lake have dropped. While still abundant in general, we have not seen recent winters with rafts of ducks numbering upwards of 10,000. Regionally, the populations of wintering species on other waterways seem to have lessened from previous decades. No one single cause seems attributable, but climate changes are likely contributing to this phenomenon.

Diamond-back Terrapin (*Malaclemys terrapin)* *** EXTIRPATED ***

The Diamond-back Terrapin has historically bred along the lake shores at Read Sanctuary. No evidence of breeding has been found recently. In June, 2004 a search was undertaken for signs of the turtle's presence in the lake and outlying "gut" area. None were discovered. While there are recent reports of a modest population of the turtle at Marshlands Conservancy nearby, it appears that the Diamond-backed Terrapin is extirpated from Read Sanctuary at this time. Last confirmed sighting in the lake was from 1989, and a yearling turtle was found dead on the entrance road in 2006, the very last documented sighting at the sanctuary.

Asian Shore Crab (*Hemigrapsis sanguinea)*

This is an introduced species that has had a tremendous effect on the beach. Although the crab itself is not a species of concern, the impact that it has had on other species is of concern. By 2017 there were almost no native shore crabs left on the beach. Periwinkle snails are also drastically reduced by *Hemigrapsis* predation. Professor George Kraemer of Purchase College has been studying this species and its impacts for over 20 years. His data also shows that the success of *Hemigrapsis* on the beach has declined from a peak in 2000 to a loss of 25% by 2017. The size of adults has also decreased during this interval.

While there is no management recommendation for this species or our native crabs, it would be advisable to follow this study into the future for any further negative impacts on the inter-tidal zone habitat.

5.0 Park Zones

5.1 Environmentally Sensitive Areas

5.1.1 Inter-tidal Zone

Areas along the inter-tidal zone that have the presence of Salt-Marsh Cord Grass (*Spartina alterniflora*) should be considered sensitive areas. This includes the north-eastern edge of the beach, around the point. Spartina is a valuable plant for Long Island Sound as it cleans the water, stabilizes the beach, as well as acts as home for a few different species of fauna.

5.1.2 Islands on Manursing Lake

These islands are different from the rest of the Sanctuary, and should be managed in order to keep them that way. These places have very few invasive species, and show qualities of successional and old-growth forests of the region. They should have no human traffic on them in order to keep them this way. They are home to a diverse community of plants and have little evidence of earthworms. There is an intact duff layer with much fungal mycorrhizae present. These islands are visited on occasion by deer, raccoon, coyote, mink, and nesting Canada Geese. Other gulls, egrets, herons, and Osprey also visit or use the islands.

6.0 Management Recommendations

6.1 Invasive Species

Read Sanctuary currently has no less than 34 species of invasive (interfering) plants. Many hours are spent each year in the suppression and removal of the most problematic of these species. The most common species *managed* are:

Porcelain Berry (*Ampelopsis brevipedunculata*)
Oriental Bittersweet (*Celastrus orbiculata*)
Mugwort (*Artemesia vulgaris*)
Japanese Knotweed (*Fallopia japonica* a.k.a. *Polygonum cuspidatum*)
Common Reed (*Phragmites australis*)
Garlic Mustard (*Alliaria petiolata*)
Mile-A-Minute Weed *(Persicaria perfoliata)*
Golden Bamboo (*Phyllostachys aurea)*
Wineberry (*Rubus phoenicolasius*)
Purple Loosestrife (*Lythrum salicaria*)

During the winter when there are no leaves on the trees, management efforts are concentrated on vine cutting. Volunteer help is critical in this ongoing effort. All vines growing up into tree should be cut at ground level and at eye level or above. The remaining vine can be left on the tree to decompose naturally. Each location should be managed at a minimum of once every 3 years, and preferably more often.

For perspective on the labor involved in managing these interfering plants, 350 hours were spent by nature center staff (2 people) and 972 hours by volunteers in 2018 alone. Methods included hand-pulling, mowing, weed whacking, hand-cutting, and biological control.

6.2 Biological Control Organisms

Mile-a-Minute Weed (MAMW) was first seen at the sanctuary in October of 2009 in the Reforestation Area restoration (2008) and likely arrived with the 100 trees that were planted there. Despite ongoing efforts of hand-removal by staff and volunteers during the years, MAMW has spread unchecked, touching nearly every corner of the park. In 2014, after volunteers removed and bagged 400 full trash bags of the plant in 6 weeks, it became clear we could not keep up with it and needed a more permanent solution. This research pointed to the use of biological control organisms, specifically, a

weevil *Rhinoncomimus latipes,* which had been tested and proven by the NJ Department of Agriculture and USDA Forestry Service. Weevils are reared and supplied by the NJ Department of Agriculture. Permits were applied for and in 2015, the first 500 weevils were released on MAMW infestations at the sanctuary. At $1.00 per weevil, cost can be prohibitive in bulk. Since 2015 weevils have been released in August and to date 3,500 have been released in several locations within the park. In 2019 we are scheduled to release 5,000 weevils to help boost their population and reproductive rates. Weevils are performing as described in scientific literature, dispersing well and reproducing. However, the population is currently too low to catch up with MAMW seed production and dispersal. This is why 5,000 should be ordered and released each year until noticible MAMW reduction is evident. The county has paid for the weevils so far, and the Friends of Read are funding this year's 5,000 shipment.

Monitoring this project has been done, though we are still looking to have a more use-friendly monitoring system in place. Interns from Purchase College may be available during the summer of 2019.

6.2 Recovery and Enhancement Projects

6.2.1 Fields: Habitat Management Projects

All seven fields or grass areas are managed to promote the growth of native grasses and abate the spread or incursion of invasive species such as Phragmites, Japanese Knotweed, mugwort, Porcelain Berry vine, and other aggressive, colonizing plants (i.e. White Snake Root, Wingstem, thistles). A variety of methods have been used in this effort and should be continued yearly and indefinitely. It is recommended to use the DR Brush Hog for cutting the previous year's tall dried grasses and plants prior to spring re-growth. After this is accomplished, thatch removal may be required as it can produce a heavy blanket that can delay or suppress some native species regrowth while aiding the invasive species initial progress. If possible, November mowing of at least 25% of each field is helpful in reducing spring thatch. The 25% might be rotated yearly or bi-annually to address woody or invasive growth.

Once the growing season is in full swing, mowing with the John Deere Z-Trak mower deck set to the highest setting should be done in fields with tall native plants. Mowing height of 3.5" for other grassy areas, trails and paths is recommended. Discretionary re-mowing or altering cut heights may need to be undertaken, and weed whacking can be used to spot-cut patches of invasive plants within fields of native plants.

Mowing at the sanctuary is done for habitat management purposes more than simply landscape grooming. Edges and contours are organic and may change from season to season or year to year.

Mowing is often hazardous to the wildlife that inhabits most vegetative areas taller than 8 inches. A variety of grasshoppers, butterflies, crickets, garter and brown snakes, native bees, Praying Mantises, and a lot of Meadow Voles are often present, and may or may not flee from the mower's path. Robins often "wake-hunt" in front of the mower and behind. They pick up the fleeing insects and those stunned as a result of mowing activity. Fields should be inspected regularly, especially in early spring, for ground-nesting birds such as Killdeer, Mallard ducks, and Wild Turkey. Rabbits routinely give birth in the tall, dense Indian and Switch Grass areas. Consideration should be given to this *every time* mowing is required to minimize accidental loss of wildlife. Driving the

mower at a slow pace can allow wildlife to move away from the cutting path in time. In some cases, physically picking up and moving escaping Praying Mantises, or a nest with eggs, or a warren of newborn rabbits may be required. Small rodents are especially fond of diving for cover in the thatch ejected by the mower, leading to their false sense of safety when the mower comes around for the next pass. Mindful mowing is important!

There should be some consideration given as well to the wildflowers, especially in spring and fall. In some areas it is fine to leave mowing until they have gone to seed.

Additionally, be on the lookout for rocks, branches, and bottles, etc. that the public wantonly tosses into the areas you may have to mow. Hitting a beer bottle with the blades can be dangerous to both the mower operator and pedestrians.

Field 1 (the large field): This field should be mowed a few times each growing season once the Phragmites has reached a height of 12-18". After that, patches of Switch Grass and Indian Grass should be left standing where possible. Raise the mower deck to avoid scalping the tussocks and dulling the blades when forced to drive over them. Check grass tussocks yearly and weed for Porcelain Berry, mugwort, and Purple Loosestrife.

Where possible, areas with a large amount of Common Milkweed should be left standing and occasionally weeded of the invasive species. While milkweed is important, large dense stands are a bit problematic. Here, they can also crowd out the native grasses and shorter wildflowers. Additionally, large, dense stands attract and are colonized by the orange-yellow aphids known as Oleander Aphids (*Aphis nerii*) or milkweed aphids. These aphids attack the milkweed in such huge numbers that the predacious, beneficial insects such as ladybugs and wasps can't keep up with aphid reproduction (cloning). Secreted honeydew causes accumulations of sooty mold on the plant that can be unsightly. In heavy aphid infestations, the plant can have stunted growth and malformation of new growth. This weakened, sticky, moldy condition of the milkweed colonies may hinder Monarch Butterfly caterpillar in their development. Maintaining smaller pockets of Milkweed with some distance between them may help limit intensity of aphid damage.

Mowed pathways in Field 1 are a compromise to accommodate a public that likes short-cuts and straight lines to and from the beach via the field. Pathways must be wide enough for police vehicles to reach the beach in an emergency, while additional width is to allow for inevitable leaning over of phragmites, milkweed, and tall grasses onto the path in late summer. Recommended width is three mower widths (three mowing passes).

The placement pattern that works best for these paths is: 1) a straight line from the parking area to the boardwalk; 2) a straight line from boardwalk to end of the field towards the sanctuary entrance and along the tree line thicket. This then continues to curve away from the tree line towards the road again at the entrance; 3) a slight serpentine from about the mid-point of the length of the field from the road to the boardwalk. The roadside of the field, like the pathways, is trimmed to 3.5". Roadside mowing width is about 1.5 widths.

This field is semi-annually used for the Friends of Read Fall Festival. In years when this event is scheduled, grass height should be kept moderately short throughout the summer with the exception of the roadside swath of grasses and the dense grass area towards the end of the field by the entrance. This is to facilitate late September mowing and minimize resulting thatch during festival preparations. Tents and activities are staged

in this field and late summer mowing allows time for short grasses to fill in bare areas and help stabilize soil in time for thousands of visitors who will be walking on and compacting the field. Indian Grass and Switch Grass growing along the road and end of the field are left standing during the festival and over the winter.

Field 2 (across the road from Field 1): This field consists of the area around the Osprey nesting platform viewing bench, the sandy area at the entrance, and the narrow section between the Osprey bench and the Edith G. Read Memorial area. Mowing principles remain the same here, but the sandy section near the entrance requires more attention. Mugwort is dense and the area should be mowed repeatedly as regrowth reaches 6" tall. Native grasses such as Switch Grass and Purple Love Grass are here and should be supported by mowing and weeding around them. Wildflowers including Ox-eye Daisies, Queen Anne's Lace, and others are present. Leave a buffer between this sandy section of the field and the beginning of the upper salt marsh vegetation.

Field 3 (behind the nature center): This field should be weeded regularly during the growing season for mugwort, Japanese Knotweed, and Cut-leaved Teasel. Areas that are over 60% mugwort should be mowed regularly. Alternatively, let the mugwort grow and have dedicated volunteers hand-pull the plant once the tender stems begin to turn woody, removing the plant and roots (mid- to late-summer). This method has proven most effective. The field should be mowed in November after plants are dormant to promote grasses and wildflowers.

This field is currently the area where the Great St. John's Wort grows. This native plant is designated as "rare" in New York State. Appropriate care must be given to this burgeoning colony, and seeds should be shaken from capsules and collected in late fall before the final mowing of this field. Staff must be able to recognize this plant when it is young. Once it flowers, it is unmistakable and beautiful.

It is recommended that a voucher specimen be prepared and sent to the NYS Flora Atlas for inclusion.

Field 4 (the "Chimney Field"): This field was a native plant restoration project completed in 2004. The northern part of the field has since seen high incursion of invasive species, especially Japanese Knotweed, Mugwort, and Porcelain Berry. This part of the field should be mowed a few times during the growing season and weeded whenever possible by hand with help from volunteers. The spread of invasive species in the field should be closely watched. The trees within and bordering the field should be checked for growth of invasive vines. Mowing half of this field in November can help reduce thatch from spring mowing and suppress mugwort in the colonized portions. Leaving 50% of the field unmowed over the winter allows animal cover and feeding. The 50% need not be contiguous. Overwintering insects may also persist in these unmowed areas.

Field 5 ("the Ball field")

This field is located adjacent to the Manursing Island Club property. There is a simple backstop as the only permanent ball field component. The field itself is quite sandy and most of the vegetation growing on it are low grasses and herbaceous plants. The field is

mowed only when the country club uses the area for its summer camp (two weeks) and this has been an agreement with the parks department for many years. The scrubby and little bluestem grass area at the west edge of the field along the trail should be monitored and mowed as needed for suppression of multiflora rose, mugwort and Mile-a-Minute weed, etc. Currently there are one or two small Sassafras saplings and a good amount of dogbane. This edge area was left unmaintained for years and the resultant dense multiflora thicket was reduced in 2015 by using the DR Brush Hog and loppers. It also had many dozens of tennis balls lost in the tangle, courtesy of the country club tennis players.

During the Friends of Read Fall Festivals, this field is prepared for use by falconers hired to present their birds of prey demonstrations to the audience.

Field 6 (just west of the nature center) This small field is managed by an initial mowing period in spring followed by regular hand removal of mugwort, Wineberry, Purple Loosestrife, and phragmites as time allows. Volunteers are easily assigned to this task, especially during the hotter months because they can cool off in the nature center a few feet away. When possible in early spring, volunteers may dig up any roots of Porcelain Berry vine before regrowth begins. Temporary fence support is put up with u-posts and string to support edge of the field where NY Ironweed and tall grasses tend to fall over towards the path. Other individual support stakes may be placed as well to keep strong winds from knocking the NY Ironweed down. Over the years, some new wildflowers have appeared in this area, though unless they are Bee Balm, mountain mints, or Rudbeckia sp., the deer usually find them and eat them.

Field 7 (the "Bamboo Grove Field") This is the area located between the grove of Golden Bamboo (*Phyllostachys aurea)* and the established trails. In 2009 it was a tangled overgrown thicket rampant with Porcelain Berry vine, Mugwort, and thistle. In 2011, it was completely reduced using loppers and the DR Brush Hog. This left only stumps and bare soil exposed. Water drainage from the neighboring property during spring caused muddy areas and run off across the trail in several areas to persist into the growing season, hindering general mowing in this area. With the help of volunteers, the vine roots were dug up and as sprouts formed, they were dug out as well. Once this was completed, the soil was loosened by raking and native grass seed was sown as a quick ground cover to help deter invasive plants returning. Mowing continued about every two weeks after grasses were established through the growing season to further suppress invasive plants. Each spring the bamboo shoots occurring in this reclaimed area were removed by hand, then the mowing would resume.

Starting in 2015 through 2017, native wildflower seed mix was sown with hopes of establishing some semblance of a meadow here. So far this has not been successful, but seeds often take years before they germinate, so we keep monitoring. The area is not currently fenced to exclude deer. This may be necessary at some point to establish wildflowers in sufficient density as to survive voracious deer. Grasses are successful here, and with years of appropriate seasonal mowing, this area is very much improved.

In 2018, Several Chokeberry shrubs *(Aronia melanocarpa)* were planted and fenced to prevent deer browse. In the wet corner of the field, a Tupelo tree *(Nyssa sylvatica)* was also planted and fenced to aid in uptake of standing water.

Note: All fields should be treated individually, and management methods will depend upon the species present within. All restoration projects at the sanctuary are under constant threat of incursion, re-incursion, and domination by invasive species and so needs constant and diligent management. Neglecting this commitment only favors the invasive species.

Reforestation Area:

In the summer of 2008 a grant-funded reforestation project was completed. This Reforestation Area is located just northwest from the nature center. Previously overgrown with many invasive species, the area was mowed and cleared of invasives through an herbicide application.

Within a year, the improper fencing installation (rebar and zip ties instead of sturdier posts) and lack of maintenance permitted enormous regrowth of weedy and invasive plants within the exclosure, threatening the newly planted trees. Deer would slide under the fencing through the 18-20" gap around the entire perimeter created as the fence was lifted by the growth of plants entwined in the deer fence mesh. No gate was included in the fence for mower or maintenance access. In 2010 the fencing and rebar was removed and an intensive effort made to eliminate all invasive and weed plants, some of which were 12 feet tall.

In 2019, the Reforestation Area has nearly 100% canopy closure from the planted trees which, together with 9 years of regular invasive species management of the area, has resulted in significant suppression of remaining invasive plants. Along the sunlit edges though, the invasive plants persist with vigor.

No understory shrubs were planted in the initial restoration project, and the relentless deer browse ensures there will never be an understory in this area without permanent fencing and additional restoration plantings. Should the funding become available for installation of a permanent fence around the forestation area, it might be worth considering as the existing trees are all of the same approximate age and should be producing acorns and seeds for re-seeding. Once a fence is installed, selecting girdling of some trees would be beneficial to allow light to penetrate to the ground so assist seed germination.

6.2.2 Diamond-Back Terrapin

The Diamond-back Terrapin has historically bred along the lake shores at Read Sanctuary. No evidence of breeding has been found recently. In June, 2004 a search was undertaken for signs of the turtle's presence in the lake and outlying "gut" area. None were discovered. While there are recent reports of a modest population of the turtle at Marshlands Conservancy nearby, it appears that the Diamond-backed Terrapin is extirpated from Read Sanctuary at this time. Last confirmed sighting was from 1989.

6.3 Manursing Lake

This wetland was a 85-acre salt marsh prior to construction of Playland Amusement Park. The lake was formed by dredging and installation of a manual tide gate at the Long Island Sound inlet (LIS). With the opening to the LIS much reduced from its original state, there is a limited amount of water exchange in the lake as controlled by the

narrow inlet created by the bridge and (any) tide gate system. The future ecological health of this lake and the salt marsh area (restoration) requires a greater volume of exchange and greater difference between high and low tides as nature dictates (

In 2010, construction of a 5-acre salt marsh restoration area along the north facing south-end of the lake shore along the access road was completed. The restoration plans included replacing the old manual gate with a computer controlled tide gate system. Though the 2010 tide gate system improved the volume of tidal water exchange compared to the prior, manual system, the current gate system is fraught with functionality issues. Sub-adequate tidal exchange coupled with malfunctioning components do not bode well for long-term ecological health of the lake & marsh habitat. In April 2019, an engineering report made recommendations for solutions to the problems with the existing systems and conditions. The stated primary goal is the restoration of the ecological health of the lake and salt marsh. The county has not made any decision at this time on which option to pursue, though the report clearly indicates that the best and only solution that would ensure the goal being met is the removal of the gate system altogether, letting nature do the restoration herself (Milone & MacBroom, Inc., 2019).

6.5 Other Recommendations

It might be worth investigating setting the islands of the Lake aside as a **biodiversity reserve area**. These meet all of the criteria of the reserves as they: have little or no invasive species present; are different from the surrounding areas; and have a species of concern to Westchester County. The islands have had very little contact with humans over the past 80 years since the dredging to form Playland Lake. They may represent old-growth forests of the area. In any case, these islands are a unique part of the Sanctuary.

Dead or fallen trees should be allowed to decompose. Trees that do not block trails and are not a threat to walkers should be allowed to stand. This will allow the energy used to create these trees to stay in the park. The decomposed tree will become soil needed for the next generation of trees. It is permissible to clear or move brush and logs from 6 to 10 feet from trails where possible. For toppled trees, the crowns should be cut and reduced to lay in contact with the ground to speed recycling of forest nutrients by the decomposers. Reducing fallen trees to lay close to the earth also keeps invasive vines from using these as avenues into the surrounding trees.

Monitor forest for signs of Emerald Ash Borer *(Agrilus planipennis)* . As of 2019 this insect is not present in the sanctuary forest, but is present in other parts of Westchester County. Locating ash trees on the property and inspecting them regularly may be helpful in slowing the spread to neighboring parcels where ash trees are present. Treat affected and dead trees according to DEC guidelines. Watch for hazard trees along trails and other public areas with ash trees if any are present.

Monitor spread of the Chinese Parasol tree *(Aralia elata)*. Similar to the native *Aralia spinosa*, or Devil's Walking Stick tree. No chemicals will be used in the sanctuary for its control, and mass-cutting has been advised against by staff at the New York

Botanical Gardens because of aggressive re-sprouting response. At the sanctuary, it has been observed that deer may be browsing the tender terminal buds prior to opening. Those that have been browsed seem to have growth stopped or attenuated. In early 2019, girdling – not cutting – of some larger trees (up to 3' diameter) is being tried as a solution that perhaps may not stimulate such an aggressive sprouting response. In other instances, the terminal buds have been cut, but the tree or sapling left unmolested. Also, not every tree or sapling in a patch has been treated this way. Perhaps the aggressive response issue is due to *mass-cutting an entire grove* rather than girdling less than 50% of individuals in a grove. Monitoring these treated individuals for a response is in process.

Plant new trees over time. Planting trees yearly can help establish a variety of age-ranges for the future. Planting new trees of about 2.5" to 3" diameter will help ease deer browse pressure on the tree crown. Bark protectors need to be installed every year in late summer before bucks develop antlers and damage or kill the new trees by scraping. Remove these protectors once the antlers are shed (usually by end of February) so that sunlight and air circulation can reach the bark and prevent rot or infection.

Select tree species that are suitable for the location and soil type, and that are not on the known list of species currently under attack regionally from pathogens or insect pests. *For example, planting ash trees may not be the ideal choice at this time.* The list of trees threatened keeps expanding so it is an important consideration in conserving both trees and department expense budgets.

Proper Dune Replacement. While not likely to occur, it would be useful to create a proper dune habitat in the correct location. The problem with both prior dune projects is that they were situated too low on the beach. This was not for a lack of science and engineering know-how, but rather a fault of an administrative directive not to sacrifice part of the adjacent field used for extra parking spaces during Playland's peak season dates.

A new double-dune construction would create an important coastal habitat and help protect the salt marsh from severe storms tidal surge.

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