Sound UPDATE
Newsletter of the Long Island Sound Study - Summer 2012

Aquatic invasions

By Nancy Balcom

Alien…invader…exotic…nuisance…invasive… These are all words used to describe non-native species of plants and animals that have been introduced into a new ecosystem. But are all introduced non-native species truly invasive? For many years, these terms were applied in an interchangeable and confusing manner. However, in 1999, President Clinton issued Executive Order 13112, which established the National Invasive Species Council. The Order defined invasive species as "a species that is non-native to the ecosystem under consideration and whose introduction does or is likely to cause economic or environmental harm or harm to human health." This definition has helped focus attention and limited resources on the much smaller sub-set of introduced non-native species that have the potential to cause harm.

Tessa Getchis, CT Sea Grant

Biofouling organisms, so called because they cover aquaculture cages, dock pilings, boat hulls, and the like, are a large commercial nuisance.

Invasive species that affect the marine environment are specifically called aquatic invasive species (AIS). The introduction and spread of AIS in Long Island Sound (LIS) pose serious threats both to the ecology and biodiversity of native marine, estuarine, and brackish ecosystems, and to the health and economic interests of the citizens of Connecticut and New York. How do introductions of species like the Asian shore crab or the red alga, *Grateloupia*, occur? Humans most often play a role, intentionally or inadvertently. Organisms from one part of the world are transported to another by pathways such as hull fouling, ballast water, aquaculture, live bait, live seafood, and the aquarium trade. Introduction through these pathways does not always result in survival. If a sea squirt attached to the hull of a docked ship in New Haven harbor is knocked off, it may survive; but, more likely, it will not. The same species may be introduced to the same habitat many times before some actually survive and become established.

Characteristics such as a broad diet and tolerance for varying environmental conditions and diverse habitats better equip some organisms to survive in new ecosystems. These species tend to mature quickly and produce large numbers of offspring, frequently. Most AIS have these "ideal invader" characteristics, enabling them to find acceptable shelter and food resources in a new habitat. For a useful analogy, compare a child that eats only pasta with butter and chicken nuggets to another who eats a variety of fruits, vegetables, and meat – who would more easily find acceptable food if they moved to another country?

"Aquatic invasions pose difficult challenges to natural resource managers," says Nancy Murray, with the Connecticut DEEP, Bureau of Natural Resources, and co-chair of the Connecticut AIS working group. She adds, "To minimize the impact and spread of AIS, effective management requires a sustained effort devoted to the prevention of new introductions and to the control or eradication of existing populations." In marine systems, spread prevention, control, and eradication are often considered infeasible, yet optimistically, there are an increasing number of case studies where eradication has either been successfully undertaken or is underway in marine or estuarine waters.

In 1990, Congress passed the Nonindigenous Aquatic Nuisance Prevention and Control Act (NANPCA), which created a Federal Aquatic Nuisance Species (ANS) Task Force in response to the introduction and subsequent rapid spread of zebra mussels throughout much of the U.S. This legislation authorized and provided guidance for the Continued on page 5.

Sound Invaders Issue

Sound Update provides readers with news about the Sound and the Long Island Sound Study.

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Long Island Sound... invaders!

Healthy native ecosystems are constantly changing but what happens when a non-native species is introduced and begins to wreak havoc? Non-native species are called "invasive" species when they outcompete native species living in our coastal habitats. We have many invasive species in Long Island Sound and this issue focuses on some of the invaders that are now calling the Sound home.

The Asian shore crab invades Long Island Sound

By George P. Kraemer, Ph.D.

George Kraemer

Asian shore crabs are believed to have come to the US in the ballast water of cargo ships and, since the first discovery in 1998, this crab has spread along the Atlantic coast of the US.

If you have visited the rocky intertidal zone in Long Island Sound, and have overturned any rocks, you have undoubtedly seen one or more non-native species. Perhaps the most conspicuous is the Asian shore crab, *Hemigrapsus sanguineus*. Researchers believe it arrived in the ballast water of commercial cargo ships coming from the coast of the western Pacific Ocean. Since its initial discovery near Cape May, NJ in 1998, this prolific crab has spread north and south. Long Island Sound has been described as the "*Hemigrapsus* hotspot;" though numbers vary from year to year, this crab averages more than 100 per square meter in many places. Because the native range of Asian shore crabs encompasses the Ryukyu Islands in Japan to Sakhalin Island off of Russia, the thermal environment of its new milieu provides potential habitat from the southern tip of Florida into Nova Scotia. Whether these opportunities are realized depends, in part, on other physical and biological factors that may constrain its distribution. Currently, Asian shore crabs can be found from North Carolina to Maine.

The successful introduction and subsequent spread were aided by ecological characteristics common to many invaders: broad environmental tolerances, occurring in waters with temperatures between 5-30°C; an expansive diet, consuming wide range of plants and animals, probably both dead and alive; and fast growth to sexual maturity along with prolific reproduction as female *Hemigrapsus* may reproduce two-three times per year, each time releasing tens of thousands of embryos.

These crabs have presented ecologists with an opportunity to study the ecological interactions that determine success, abundance, and spread of a species. We now know that, as a better competitor and predator, Asian shore crabs have reduced the abundance of native crabs by as much as 99% from northern New Jersey through New York and Connecticut. It's likely that other fauna have been affected, either directly or indirectly. Asian shore crabs have caused a sharp decline in intertidal green crabs (*Carcinus maenas*) in Long Island Sound. This is ironic since the green crab is another non-native, introduced from Europe in the early 1800s.

These changes in diversity and population abundance have all been reported from studies in the intertidal zone. Asian shore crabs migrate into the subtidal zone in the fall to escape sub-freezing air temperatures, returning in force during late spring. The abundance, activities, and impacts of this crab in the subtidal zone are largely unknown. Several studies have related the type of substrate in the intertidal zone to the abundance of Asian shore crabs. Larger cover such as rocks and boulders, versus pebbles and sand, and multiple layers of rocks provide habitat for more crabs, and larger ones. While the predominance of sandy beaches south of the mid-Atlantic region would appear to limit the range expansion by Asian shore crabs, several scientific and anecdotal reports have the Asian shore crab inhabiting fiddler crab burrows, though presumably not in conjunction with the original owners.

The reaction to the appearance of invaders of any kind is often "how can we eliminate them?" This is practically impossible in a marine environment like Long Island Sound. Asian shore crabs are part of what marine ecologists call an open system, meaning that all parts – biotic and abiotic – freely interact. The millions of Asian shore crabs residing in Long Island Sound release billions of larvae that drift and disperse with the currents before settling into intertidal and benthic subtidal habitat. Asian shore crab populations from Maine through North Carolina, probably numbering in the billions, is to a degree one, large population of constantly exchanging individuals. Unless the crab is eradicated everywhere simultaneously, the effort is doomed to failure.

Larissa Graham, NY Sea Grant

The Asian shore crab is now the dominant crab species in the upper intertidal zone since the Sound's rocky cobble resembles its native habitat in Japan.

Clearly, the natural controlling mechanisms of predation, competition, and disease have not been effective in Long Island Sound. Fish in the Sound, like blackfish (*Tautoga onitis*) for example, eat Asian shore crabs, yet the crabs remain numerous. Human control of Asian shore crabs would also likely be unsuccessful, judging from results with other invasive marine species, due to the openness of marine ecosystems. One approach, in which another competitor, parasite, or predator is intentionally introduced, is sometimes proposed. This strategy, known as biocontrol, has a checkered past, failing in many instances due to unexpected consequences; for example, the control agent may attack another, desirable organism or become an invasive species itself.

With the advent of ship travel for conquest and commerce, humans began to inadvertently move marine species from place to place. And the pace of biological homogenization has increased over the past century. A number of these arrivals have established themselves in Long Island Sound. Experience reveals that marine non-natives are likely here to stay, and that we will live with the altered biological landscape.

Kraemer is a professor of biology and the chair of the Environmental Studies program at Purchase College, State University of New York.

Squirts in the Sound

By Stephan G. Bullard, Ph.D.

Stephan Bullard

Sea squirts account for all of the organisms in the photograph, except the branching material and the green plants. At least four different species are visible.

People are often amazed at the large amount of "stuff" they find growing on the side of a dock. Most assume that they are seeing barnacles and seaweed. Few realize that in many areas of Long Island Sound, about 80% of the "stuff" is actually a type of animal known as a sea squirt.

Sea squirts are soft bodied marine invertebrates that grow on hard surfaces and feed by filtering particles, such as phytoplankton and bacteria, from the water column. Some live as solitary individuals, while others form blob-like colonies. They are called sea squirts because large ones shoot water from their filtering siphons when they are picked up.

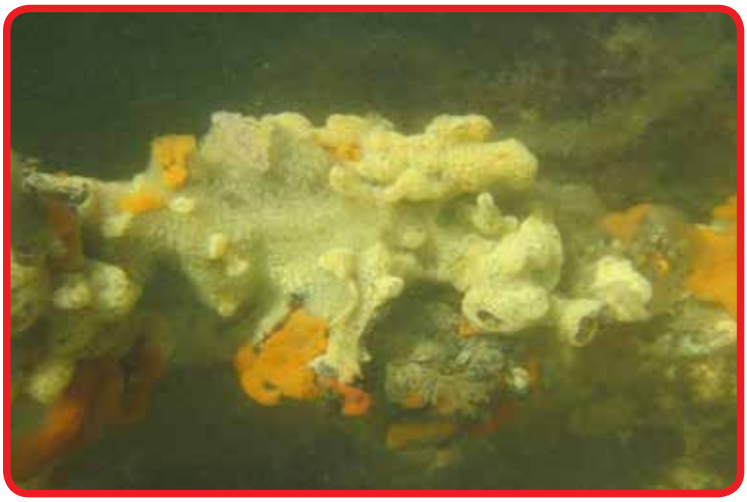
Although sea squirts look soft and squishy, they are quite capable of defending themselves. Many produce defensive chemicals and others concentrate heavy metals, like vanadium, in their bodies. Some exude acid. As a result, few predators are willing to consume them. Similarly, sea squirts are aggressive and effective competitors. In the hard bottom communities in which they live, space for attachment is the most valuable commodity. Sea squirts grow rapidly and use various biological mechanisms, such as toxins, to dominate space in these areas.

To grow, all sea squirts need is a hard surface to attach to and plankton-rich waters to feed from. Because they have such simple biological requirements, sea squirts are ideal invasive species. Not surprisingly, they have recently become major pests in many areas of the world. Unfortunately, once sea squirts have invaded an area, they are almost impossible to remove. In Long Island Sound, there are nine common species of sea squirts, seven of which are invasive. Additional invasive sea squirts will likely arrive in the near future.

Invasive sea squirts pose a threat to Long Island Sound, its organisms, and people living near the Sound. In terms of people, the main problem is that sea squirts heavily foul man-made marine structures such as docks and pilings and boat hulls. During outbreaks, invasive sea squirts reach incredible densities, and there can be hundreds per square foot. Because sea squirts are water-filled and often large (a few inches long), they add a tremendous weight to the structures they cover. For example, *Ciona intestinalis* has become so abundant in parts of Maine that it can add more than 2.5 pounds of fouling to an area about the size of a human hand. This added weight dramatically increases the weight of lines and gear, and also adds massive drag to ships and, subsequently, increases fuel costs.

Invasive sea squirts are particularly nasty when they infest aquaculture facilities. They readily foul aquaculture gear and sometimes the aquacultured organism themselves (e.g., they easily grow on bivalve shells). Their weight makes hauling gear much more difficult and it is very hard and time consuming to separate invasive sea squirts from animals like mussels and oysters (see the photo on the front cover of this issue). Because they filter particles from the water, sea squirts can also compete with aquacultured organisms for food. This can cause the desired species to grow more slowly and can lower the value of the crop.

In terms of ecology, invasive sea squirts can easily outcompete native species. Unfortunately, the exact impacts that they have on native Long Island Sound organisms is often unknown. This is because the sea squirts have been in the Sound long enough (decades) so that it is unclear how they affected native communities, or because they infest deeper parts of the Sound where few people go and few studies are conducted. For example, *Didemnum vexillum* sometimes forms thick mats on the bottom of Long Island Sound. On Georges Bank these mats cover hundreds of square miles and similar large-scale infestations may occur in the Sound. Efforts have been made to study these mats and determine how they affect bottom dwelling organisms. Interestingly, preliminary work suggests that they may actually increase the abundance of worms and snails. Though this might be positive, significant changes to the bottom community could change Long Island Sound food webs. More work is needed to determine exact effects of *Didemnum vexillum*, and other invasive sea squirts because economically important species such as fish and lobsters may be affected by their presence or their effect on the ecosystem.



Stephan Bullard

Sea squirts, such as *Didemnum vexillum,* the blob-like, light colored sea squirt that dominates most of this photograph, are common in the Sound.

It is too late to remove the invasive sea squirts that are already in the Sound, but we can try to prevent additional species from arriving. You can help. Boat owners can make sure their boat hulls are clean, so that undetected invaders are not accidently moved from place to place. Beachgoers and waterfront visitors can report large groupings of unfamiliar creatures attached to marine structures (see the back cover of this issue for details), especially if the animals start to become very common or spread.

Bullard is an Associate Professor of Biology at the University of Hartford.

The invasion of an all-too-common reed

By Kelly Hines

Phragmites australis, also known as common reed, is aptly nicknamed as it can be found in marshes across the world. According to leading experts in the field, two genetically different types of *Phragmites* can be found across the East Coast of the US: one native and the other an invasive form believed to have been transported from Europe in the 1700s or 1800s. The invasive form has spread widely and can be found across most of North America, displacing native *Phragmites* and other native wetland plants. Native *Phragmites* is becoming harder and harder to find on the East Coast, though populations do exist near the Chesapeake Bay and on the Connecticut River.

Human caused disturbances create enabling conditions that put the odds in favor of invasive *Phragmites* over our native flora. Many of the marshes on the east coast were historically ditched to manage mosquito populations to protect humans from diseases like malaria. However, these ditches have changed the way tidal flooding impacts marshes. *Phragmites* spreads rapidly in brackish and freshwater tidal areas where salinity is lower than 18 parts per thousand (ppt); Long Island Sound is between 25-30 ppt. Mosquito ditches have the potential to act as pathways for invasive plants, like *Phragmites*, to spread deeper into our marshes.

Ariana Newell

Invasive Phragmites has spread widely across the US and can be found in many areas, including this site at Sunken Meadow State Park in Kings Park, NY.

Phragmites' purple-brown summer flowers produce seeds that are spread by the wind. Fortunately, seeds of the invasive form of *Phragmites* have a low germination rate; instead it spreads mostly through its underground rhizomes (horizontal part of the root system). Pieces of rhizome can break free when soils are disturbed during storms, or even restoration projects, and can survive and float around for a long time before coming to rest in a new spot that is suitable for invasion. Once established, *Phragmites* plants can grow much taller than most native marsh grasses, out-competing those plants by blocking the sunlight.

Phragmites is an aggressive invasive that, once established, has the ability to engineering its surroundings to favor its own success. Its thick rhizomes and dense stands help to build up sediments and increase the elevation of the marsh. This reduces the amount of time that the *Phragmites* stands, and surrounding marsh, are inundated by the tides, favoring the *Phragmites* plant that prefers slightly fresher and drier conditions than our native marsh plants.

Development, such as paving roads and building homes, creates hard surfaces that prevent rainwater from penetrating into the ground – this water can then be redirected to our marshes, increasing the amount of fresh water that enters them and creating conditions that favor this invader. Since it prefers areas that have been heavily impacted by humans, such as marshes that have higher nutrient contents and altered hydrologic regimes, invasive *Phragmites* is often used as an indicator of marsh health – marshes with thick stands of *Phragmites* are considered stressed.

Phragmites stands have been viewed in a favorable light for their ability to build up marshes to help keep up with sea level rise and to remove nutrients; however, with these short-term benefits come long-term consequences. Changing the species composition of our salt and brackish marsh plant communities impacts the multitude of fish and bird species that rely on those marshes. *Phragmites* stands are often so thick that fish species find fewer places with open water where they can lay their eggs. Salt marshes have been credited with providing nursery habitat to nearly 70% of our commercially important finfish species, so these changes in habitat could have cascading effects on our economy. Many birds that would normally nest in native high marsh grasses are forced to look elsewhere for the grasses they prefer; they are gradually replaced by other birds that do not mind the change in plant life.

The Long Island Sound Study and its multitude of partners are working hard to stop invasive species from overtaking our marshes. A grant was awarded to the Westchester County Department of Planning to restore tidal flow (and thereby healthy wetland flora), remove invasive species, and replant native marsh vegetation on Manursing Lake, part of the Edith G. Read Natural Park and Wildlife Sanctuary in the City of Rye, NY. Through a combination of hand-pulling and targeted herbicide application, the project removed 0.8 acres of invasive species, largely *Phragmites australis*; it is expected that the increase in tidal flow to the area will prohibit its reintroduction and minimize future management needs.

A similar project is proposed for Sunken Meadow State Park in Kings Park, NY. Tidal flow to nearly 110 acres of marsh has been severely restricted by a berm and, consequently, the area has been widely invaded by thick stands of *Phragmites australis*. The proposed project will remove the berm and restore tidal flow to the area with the aim of restoring fish passage and eradicating the invasive *Phragmites* by restoring ideal conditions for our native marsh species. This project stands to be the largest habitat restoration project to take place within the New York portion of the Long Island Sound Study in terms of acres of tidal wetlands restored since the launch of the Long Island Sound Habitat Restoration Initiative in 1998.

There are a multitude of factors contributing to the success of *Phragmites australis*, making it a particularly difficult species to manage; however, by following the tips on the back cover of this issue, you can help make a difference.

Hines is the NY Habitat Restoration Coordinator for the Long Island Sound Study.

Continued from page 1.

development of state or interstate aquatic nuisance species management plans. These management plans identify priority local actions to prevent new introductions, control existing introductions, and minimize any associated environmental and public health risks in an environmentally sound manner.

New York and Connecticut each have management plans for invasive species and in 2007 a bi-state group was formed to draft an interstate AIS plan for Long Island Sound. The project was managed by Connecticut Sea Grant, and funded by the US Environmental Protection Agency, Long Island Sound Study (LISS) through the New England Interstate Water Pollution Control Commission. The goal of the bi-state work group is for the states of Connecticut and New York, in collaboration with relevant federal agencies, academic institutions, and non-governmental organizations, to adopt and implement the LIS Interstate Aquatic Invasive Species Management Plan. The objectives are to prevent new introductions while minimizing the ecological, socioeconomic, and public health impacts of existing AIS in LIS.

Balcom is the Associate Director and an Extension Educator for Connecticut Sea Grant.

Preventing the spread of aquatic invasive species in Connecticut freshwaters

By Gwendolynn Flynn

The ecosystem of each waterbody in Connecticut has a delicate balance. Native species of plants and animals provide habitat, protection for small fish, act as a source of food, and help recycle oxygen and carbon dioxide. When Aquatic Invasive Species (AIS) are introduced, the equilibrium of the waterbody can be disrupted. With no natural predators, AIS often adapt well to new environments, making them better competitors for food and space, thereby enhancing their ability to thrive. Some invasive plants and animals can form dense, floating mats making boating, fishing, swimming, and other recreational activities nearly impossible.

Methods used to control AIS include winter draw downs (lowering the level of a lake or pond) and chemical treatments; however the Connecticut Department of Energy and Environmental Protection (CT DEEP) Boating Division believes that empowering boaters with the knowledge to prevent the spread of AIS, commonly referred to by boaters as aquatic hitchhikers is the most proactive way to prevent the spread of AIS. The CT DEEP is working hard to get this information out to boaters.

In 2003, the CT DEEP stopped collecting fees to park at state boat launches because it was not cost effective at most sites and deducted from federal monies which could be spent at the launches. Resources dedicated to hiring fee collectors were instead used by CT DEEP Boating Division to provide a valuable new service to boaters, known as the Boating Education Assistant Program. Boating Education Assistants inform boaters about clean and safe boating practices, including how to contain the spread of aquatic invasive species.

With the 2010 discovery of zebra mussels, a highly invasive freshwater shellfish in Lakes Lillinonah and Zoar, the CT DEEP initiated the Invasive Investigator Program to expand the education of boaters to privately held ramps. This volunteer-based program is designed specifically to help educate people on ways to keep our waters clean and to prevent the spread of aquatic hitchhikers into the lakes and rivers of Connecticut. At the boat launch, Invasive Investigators monitor and interact with boaters, familiarize them with the invasive species present at the waterbody, conduct a voluntary vessel inspection to check for visible plant fragments or zebra mussels, and show the boaters the steps needed to ensure they are not spreading unwanted plants and animals.

Through CT DEEP's programs, signage, and publications, all boaters are encouraged to be a part of preventing the spread of AIS by using the **Clean, Drain, Dry** method when they are boating. Before leaving a boat launch, boaters are encouraged to **Clean** all visible plant, fish, and animals as well as mud or other debris at the boat launch and **Drain** all water from every space and item that may hold water. At home or prior to their next launch, boaters are encouraged to **Dry** anything that comes in contact with water (boats, trailers, anchors, propellers, etc) for a minimum of one week during hot/dry weather or a minimum of four weeks during cool/wet weather. If drying is not possible, they should clean their boat prior to the next launch.

The techniques for decontaminating a vessel are: Wash the boat with hot, pressurized water; Dip equipment in 100% vinegar for 20 minutes prior to rinsing; Wash with a 1% salt solution (2/3 cup to 5 gallons water) and leave on for 24 hours prior to rinsing; and Wet with bleach solution (1oz to 1 gallon water) or soap and hot water (Lysol, boat soap, etc) for ten minutes prior to rinsing.

Gwendolynn Flynn

Plants may tangle on your trailor (as shown in the photo above) so be sure to remove all vegetation when launching and retrieving your vessel to prevent their spread.

When fishing, boaters should not dump bait buckets or release live bait! This will avoid the accidental introduction of unwanted plants and animals. Unless the bait was obtained on site, dispose of it in a suitable trash container or give it to another angler. Remember to not transport fish, other animals, or plants between water bodies. Release caught fish, other animals, and plants only into the waters from which they came.

Flynn is an Environmental Analyst for the Connecticut Department of Energy & Environmental Protection.

Terrestrial perennial pepperweed attacks our coast

By Anthony Graves

Bill Jacobs, GEI

Perennial pepperweed is native to Europe and Asia but has invaded the western US, with some infestations in New England.

The West Meadow Beach peninsula located in Stony Brook, NY is one of the largest and most diverse coastal ecosystems on the north shore of Long Island. The peninsula is about 7,000 feet long and lies between Long Island Sound on the west and West Meadow Creek on the east. The creek side of the peninsula has extensive tidal wetlands and is divided into various parcels that are owned by Suffolk County; the Town of Brookhaven; the Ward Melville Heritage Organization, a non-profit; and the Old Field Club, a private business. In 2004 the Town began to develop a master plan for the area designed to increase public access, provide enhanced educational opportunities, and protect the native fauna and flora. This dovetailed with preservation and management efforts by the Ward Melville Heritage Organization and Suffolk County.

In 2006, as part of the master plan development, an ecological resources survey was conducted that resulted in the identification of perennial pepperweed (*Lapidium latifolium*) growing at the site. Perennial pepperweed, which is native to Europe and Asia, is an herbaceous perennial that is found mainly in the western US, with some infestations in New England. It forms large, dense monotypic stands that crowd out native species. It can grow in a variety of habitats including both wetlands and uplands. It occurred primarily on Town land, but also occurred in patches on the land of all four property owners. It was along the roadside and at the edge of high marsh growing in stands mixed with common reed (*Phragmites* sp.), poison ivy (*Toxicodendron radicans*), and high tide bush (*Baccharis* sp.). The distribution of perennial pepperweed was patchy, and stands tended to be interspersed with other plants.

In 2009, the Town, with support from Suffolk County received a grant from the Long Island Sound Futures Fund to attempt to eradicate perennial pepperweed from West Meadow Beach. In 2012 the Town and the Ward Melville Heritage Organization received grants from the Long Island Invasive Species Management Area to address the pepperweed. The Town worked with a consulting firm, EEA, Inc. (now a part of GEI, Inc.) to craft a plan for eradication. Prior to this the Town had reached out to Suffolk County to cooperate on the project, but had not contacted the other landowners where the Pepperweed occurred.

The literature on pepperweed indicated that application of herbicide was the most effective method of control, and that manual removal was effective only when addressing small isolated populations. Suffolk County bans pesticide use on their parklands with exemptions issued by a County Pesticide Citizens Advisory Committee (CAC). The Town and EEA approached the County Pesticide CAC to request permission to use herbicide at West Meadow Beach, but in a targeted manner using hand application on individual plants. Permission was granted for this approach with the condition that all landowners approve the use of herbicide.

Initially the condition that all landowners grant permission for the application of herbicide was seen as an obstacle to the project. However, in retrospect, it was a valuable addition because it increased cooperation and communication which enhanced the probability of the project's success. Through the summer and fall of 2011, there was extensive communication between all landowners. These communications were facilitated by the NYS Department of Environmental Conservation, the National Fish and Wildlife Foundation, and the Long Island Sound Study. They included meeting with the board of the Ward Melville Heritage Organization, and information sharing among all landowners.

The meetings and information sharing resulted in changes in the approach, in particular it was recognized that an artesian spring on the land of the Ward Melville Heritage Organization had been used for generations as a source of drinking water by community members and that there should be no use of herbicide in this area. This was driven more by public perception and respect for the sensitivity of the site than by any dangers posed by the herbicide (Aquamaster, a formulation of glyphosate) that was proposed for use. However, it was recognized that in projects of this sort public perception is extremely important, and that the artesian spring was viewed as pristine, a view that could be affected if herbicide were used nearby.

A plan has been crafted that is site specific and that takes an integrated approach which includes hand pulling, mowing, and herbicide application. The site-specific plan accounts for unique features of the site including sensitive wetlands and the artesian spring that is a community resource. In addition, all of the landowners are participating in discussions and, through this process, the lines of communication between the various entities are much better than in the initial stages of the project. A second grant was received for the project from the Long Island Invasive Species Management Area. It is our hope is to report interim results in the fall of 2012 and continue the eradication effort in 2013.

Bill Jacobs, GEI

Perennial pepperweed (foreground) is being controlled at West Meadow Beach in Stony Brook, NY, thanks to a grant from the Long Island Sound Futures Fund.

Graves works for the Division of Environmental Protection at the Town of Brookhaven.

Water Chestnut Removal in Mill Pond

By Monica Williams

Water chestnut *(Trapa natans)* is a highly invasive aquatic plant, native to Europe, Asia, and Africa, and was introduced to North America in the late 1800s. This annual floating plant has green, glossy, triangular leaves, with stems that can grow up to 16 feet in length. Water chestnut produces a black nut with sharp spines, which contains a fleshy seed that forms a white flower in mid-summer. Water chestnut can be found in the northeastern United States, where it invades ponds, lakes, and rivers. It forms dense, floating mats that clog the water in shallow areas and along shorelines. It also limits light and reduces oxygen levels for plants and animals that live in the water column. This non-native, invasive plant competes with native vegetation, is of little value to wildlife, and impacts recreational activities such as boating, fishing and swimming.

One water chestnut seed can produce up to 15 rosettes and each rosette can produce just as many seeds, with the potential to generate 200 or more new seeds in a single year. Seeds can remain viable in the sediment for up to 12 years and, while most seeds germinate within the first two years, management efforts must be conducted for several years to ensure erradication. Water chestnut can spread to new locations naturally by water and birds, but also accidentally by boats, trailers, and fishing gear.

US Fish and Wildlife Service

Water chestnut was first discovered in Mill Pond in Oyster Bay, NY in 2005 and has since been almost entirely removed.

Water chestnut recently invaded Mill Pond, an eight acre freshwater pond that drains into Oyster Bay Harbor, NY and is a part of the Oyster Bay National Wildlife Refuge (NWR), which is administered by the US Fish and Wildlife Service. The Oyster Bay NWR is 3,204 acres in size and is unique as a marine refuge consisting primarily of sub-tidal habitats (bay bottom) and intertidal salt marsh, with lesser extents of high marsh and freshwater wetlands. The refuge provides important habitat for marine wildlife, reptiles, amphibians, and more than 100 species of birds.

Between 2005 and 2007, neighbors first noticed water chestnut in Mill Pond and NWR staff confirmed the infestation in 2008. Refuge Staff along with Friends of the Bay, The Nature Conservancy, and several other partners including the North Shore Land Alliance, The Town of Oyster Bay, Huntington/Oyster Bay Audubon Society, local neighbors, and many volunteers, have been working together to remove water chestnut from Mill Pond. Special workdays are conducted in the late spring and summer with staff and volunteers going out on Mill Pond in canoes, kayaks, and small boats to hand pull water chestnut. Plants pulled from the pond are collected in the boats and in baskets and are counted, estimated, and/or weighed. Small amounts of water chestnut that have not set seed are disposed of in an upland area along the western boundary of Mill Pond to decompose, while larger amounts of plant material are transported to the Town of Oyster Bay, Bethpage Landfill.

Since water chestnut control efforts began in July 2008, more than 112,214 plants have been removed from Mill Pond with approximately 900 hours of volunteer effort. In 2011, there was a noticeable decrease in water chestnut in Mill Pond. The intensive work done in previous years seemed to have reduced its abundance and distribution. In 2011 and 2012, hand-pulling efforts started earlier in the season (late May) and, with less water chestnut, most plants can be removed from the pond before new seeds are dispersed in July and August.

Even though hand-pulling is labor intensive, it was the best control method for this particular infestation as it avoided the use of chemicals and expensive, mechanical equipment. Staff and interns mapped the water chestnut infestations in 2010 and 2011 at various stages during the summer. It is amazing to see how the initial infestation that once covered approximately three quarters of Mill Pond has now been reduced to a few plants along the shore and throughout the pond.

Williams is a Wildlife Biologist at the Long Island NWR Complex in Shirley, NY.

The Long Island Sound Study is sponsored by the states of NY and CT and the USEPA. The LISS Management Committee consists of representatives from the USEPA, NYSDEC, NYSDOS, CTDEEP, NYCDEP, USDOI, IEC, NEIWPCC, NY and CT Sea Grant Programs, and the co-chairs of the Science and Technical Advisory Committee and Citizens Advisory Committee.

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www.dec.ny.gov

"What Can I Do" to control aquatic and terrestrial invaders?

1 Don't set it free! Don't release any animal, plant, or seed into the wild. This includes reptiles, insects, aquarium plants or fish, and mammals. Many of our aquatic pets and plants are not native to our area and should not be released into the environment. For more information, go to www.habitattitude.net.

2 Don't move firewood! When you transport firewood, you could be spreading invasive forest pests. New restrictions to protect our forests from insects and disease prohibit moving firewood, visit http://www.dontmovefirewood.org/ for more details.

3 Be smart about your boat and bait! Read the article on page 5 to learn how to check, clean, and disinfect your boat and equipment. Do not move bait or other fish from one waterbody to another, and don't release unused baitfish and worms. Instead, dispose of them in the garbage in a closed container.

4 Plant native plants! Always use native or non-invasive plants for gardens, landscapes, and ponds. Ask your local nursery for plants that are native to your area and, if they don't carry native plants, encourage them to.

5 Do not disturb! Disturbance of habitat often allows invasive plants to take hold so minimize impacts of development on your property by building your driveways and decks only as large as you really need them to be and by using pervious building materials, which allow water to filter through.

6 Limit those nutrients! Excess nutrients can allow invasive plants to thrive. Maintain your septic systems and cesspools by checking with your local Health Department or maintenance company to make sure you are on schedule for pump-outs. Remember to use slow-release fertilizer and other "Sound" gardening methods.

7 Help map it! Help managers find and stop invasive species through iMapInvasives New York at www.nyimapinvasives.org or USGS's Web site at http://nas.er.usgs.gov/SightingReport.aspx. Both sites allow you to report invasive species in order to help track the spread in our area.

8 Help stop the spread! Volunteer your time to habitat restoration projects by linking up with local environmental groups. There are lots of opportunities at www.LISvolunteer.net.

On the Web...

A photographic tour of some common invasive species of LIS: http://seagrant.uconn.edu/whatwedo/ais/listour.php

Info for teachers and students: http://www.iiseagrant.org/nabinvader/

The LIS Interstate Aquatic Invasive Species Management Plan: http://seagrant.uconn.edu/whatwedo/ais/lismgmtplan.php

Aquatic and terrestrial invasive species are attacking the Sound. The photo below shows *Phragmites*, a dominant species in many wetlands.

CT DEEP

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