Long Island Botanical Society

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Eelgrass (*Zostera marina* L.) on Long Island: Yesterday, Today, and Tomorrow (Part I)

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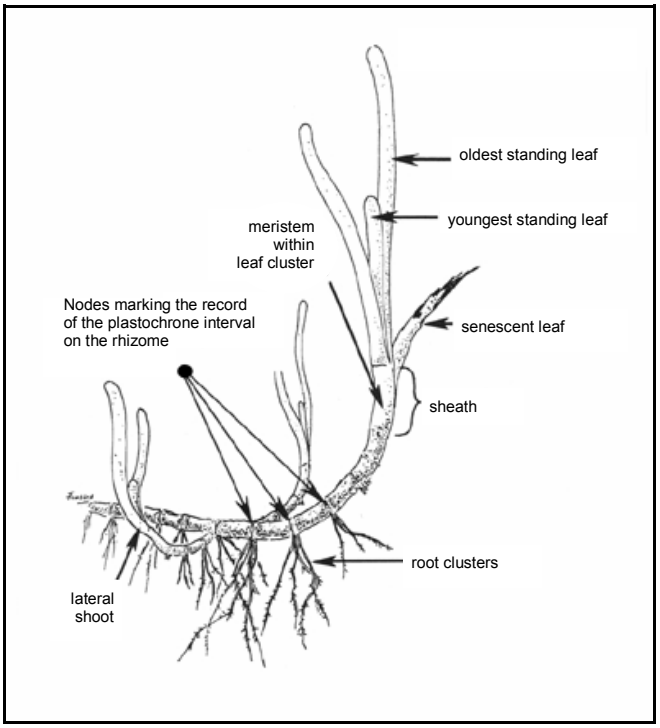
Although virtually unknown to most Long Islanders, eelgrass (*Zostera marina* L.) is probably the most significant subtidal plant in local waters. Growing in underwater meadows that can best be compared to the grasslands that once covered the Hempstead Plains, eelgrass provides food and shelter to numerous species of fish and shellfish. In addition to the obvious commercial and recreational values in support of species such as the bay scallop, winter flounder, summer flounder, scup, and striped bass, eelgrass meadows contribute to overall species diversity, near-shore productivity, and protect beaches from excessive erosion. Although various macroalgae can provide some of these functions, this submerged marine angiosperm does it all and persists year round.

For those with a taxonomical interest, *Zostera* is a member of the Zosteraceae family that includes three genera: *Zostera*, *Heterozostera*, and *Phyllospadix*. The Zosteraceae are all monocotyledenous marine plants that have ribbonlike leaves and prominent creeping rhizomes. *Zostera* is believed to have originated during the Tertiary period in the Western North Pacific Ocean (McRoy, 1968; den Hartog, 1970). This species and a number of other marine organisms most likely invaded the North Atlantic Ocean through the Bering Strait and the Arctic Ocean during the late Tertiary (Durham and MacNeil, 1967). *Zostera marina* can be found on both coasts of the United States as well as throughout Europe. Although typically thought of as a coldwater species, it grows as far south as the Carolinas on the East Coast and the Baja Peninsula on the West Coast. In Mexico, *Z. marina* grows as an annual, possibly an adaptation to the heat of summer.

The growth habit of *Z. marina* is much like that of a garden iris, just a little more involved. Leaves originate from a meristem located at the end of a narrow rhizome. The meristem is hidden at the base of the leaves in a sheath that holds the leaves together. As the eelgrass shoot grows across the bottom, new nodes are formed each time a new leaf is initiated (approximately every 10–14 days during the summer). As a new leaf emerges from between the older ones, the outermost (usually heavily fouled) leaf is sloughed off, not unlike deciduous tree leaves in fall. In an elegant energy conserving mechanism, the shoot resorbs a portion of the nutrients in the old leaf before it is allowed to float away. The roots of *Z. marina* grow in small bundles at the nodes and usually alternate successively from each side of the rhizome.



Anatomy of an eelgrass shoot (Mark Fonseca, NOAA).

(Continued on page 3)

Long Island Botanical Society

Founded: 1986
Incorporated: 1989

The Long Island Botanical Society is dedicated to the promotion of field botany and a greater understanding of the plants that grow wild on Long Island, New York.

Visit the Society's Web site
www.libotanical.org

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Society News

Members are reminded to submit their 2007 membership dues as soon as possible.

If you have an e-mail address, please send it to Donald House (webmaster@libotanical.org). That way we can notify you if a program has to be canceled in case of snow.

Marilyn Jordan reported on the efforts of the Long Island Invasive Species Task Force to produce a list of plants that should not be sold by nurseries in New York. The working list includes 141 invasive plants.

John Potente announced that Suffolk County has purchased the Scully Estate as a preserve and will manage it in conjunction with the Seatuck Environmental Association.

Congratulations to John Potente, who was recently awarded the Dennis Puleston Conservation Award for 2006 from the Open Space Council in recognition of his "inspired and dedicated pursuit of protection and preservation of open space on Long Island." John has contributed greatly to saving the Hauppauge Springs, one of the headwaters of the Nissequogue River, and fought to save the Grandifolia Sandhills, a globally rare dwarf beech forest in Baiting Hollow, Riverhead Township. Additionally, as a member of the Suffolk County Council on Environmental Quality, John has raised public awareness of the significant negative environmental impacts of digging deep ponds out of the county's high salt marshes as a means of mosquito control included in the Open Marsh Water Management plan (see page 7).

Carol Johnston and Bill Titus visited the herbarium at Planting Fields and report that work on rehousing the specimens is well along and that metal herbarium cabinets (see page 5) are available for purchase.

Lois Lindberg and Eric Lamont expressed concern that bike paths are being planned through both the Garvies Point Preserve and the Long Pond Greenbelt.

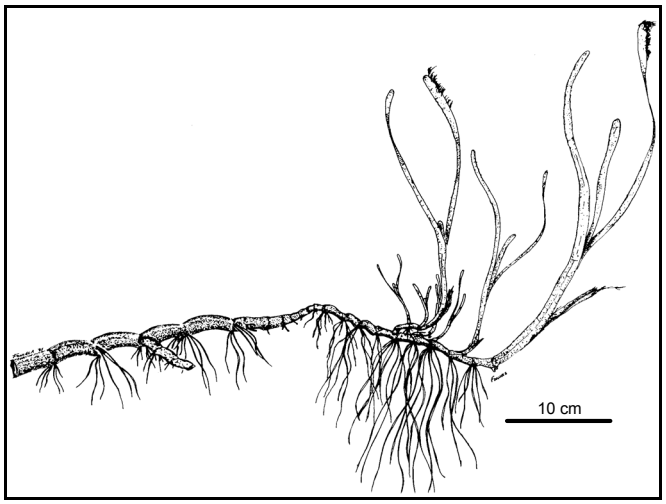
At the November meeting, Treasurer Carol Johnston summarized LIBS's financial position. For the first 10 months of the year, revenue exceeded expenses by about $300. However, the cost of producing the newsletter averages $4 per issue per member, which remains a concern.

Back issues of the LIBS *Newsletter* will be available on our Web site as soon as technical matters are resolved.

(Continued from page 1)

Depending on environmental conditions, lateral branching can occur at the nodes (while they are still in the sheath) forming secondary shoots. In this way, there can be numerous individual shoots physiologically integrated by a single branched rhizome in one "clone." Given this growth habit, vegetative spread is the most common means of meadow maintenance. Within a year, the lateral shoots normally break free from the parent plant and begin the whole process over again. It is not clear exactly how and when differentiation of flowering shoots occurs, but in early spring, a branched inflorescence containing a series of alternating spathes begins to emerge from up to 10% of two-year-old shoots. Reproductive shoots are typically taller than the leaf canopy and are recognizable by their light green/yellow to white coloration. Pollination is not unlike terrestrial plants except that the threadlike pollen is adapted for transport in water. Negatively buoyant seeds are released approximately one month following anthesis and usually fall to the bottom in the vicinity of the parent plant. Following the release of seeds, the reproductive shoot detaches from the parent plant and the meristem dies. It is interesting to note that the two-year life cycle of eelgrass, with reproduction occurring in the second year, is nearly identical to that of the bay scallop. Seedlings begin to germinate in the winter when the water is cold and can grow into full size shoots with multiple lateral shoots by midsummer, only to repeat the cycle.

The story of eelgrass abundance is a complicated one in that meadows have fluctuated wildly over the last century. Although we have no real documentation of the extent of eelgrass meadows around Long Island, anecdotal reports indicate that in some areas the species was considered a nuisance. An account of the first regularly scheduled side-wheeler ferry service between Oak



Typical creeping habit of eelgrass showing rhizome extension and lateral branching (Mark Fonseca, NOAA).

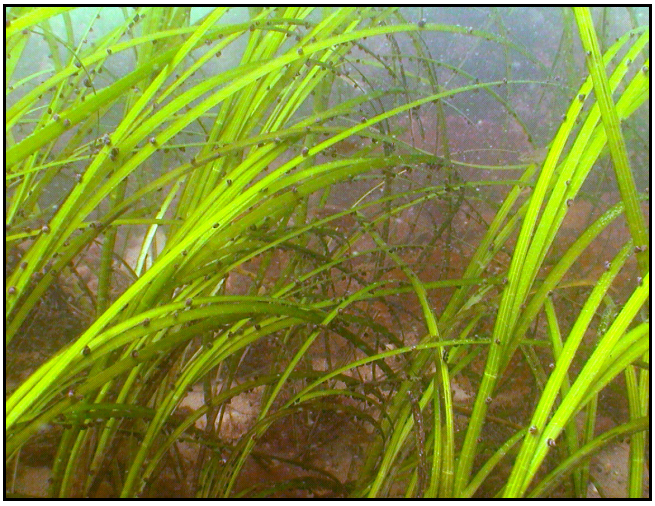


Photo by Chris Pickerell

Eelgrass growing at a restoration site in Long Island Sound. Note the small snails (*Lacuna vincta*) grazing on epiphytes.

Island Beach and the mainland of Babylon (1900–1911) indicates that the ferry had to negotiate the narrow, winding channels of Great South Bay through heavy beds of eelgrass (Meade, 1982). Aerial photos from 1930 hint at the magnitude of some of the meadows that surrounded Long Island prior to the wasting disease. Although the photos are difficult to interpret in many cases, where they are clear it is apparent that eelgrass flourished in almost every cove and harbor and on most shallow sandy flats. According to one author, in the late 1930s "it became necessary for the ferries to have to reverse their engines two or three times during a crossing [Great South Bay] to clear their wheels of grass and weeds" (Meade, 1982). The extent of the problem was not lost on the engineers at Columbian Bronze Co. (formerly in Freeport, NY) when they created the "weedless wheel" designed to shed the masses of floating leaves that often choked the Bay in late summer. The same company produced strainers for inboard water intake lines to prevent grass from clogging the cooling system and overheating the engines. It is for this reason and the fact that the grass inhabited the flats where boaters are often grounded that many on the South Shore still harbor resentment for this species.

As they did with almost all things in our natural environment, the first European colonists on Long Island looked at eelgrass as a resource to be utilized. The large windrows of dead leaves that washed up on the beaches during the summer and fall were gathered by farmers for use as bedding for farm animals, mulch for gardens, and as an insulation material in many early homes. The same characteristics that made eelgrass a good insulator in colonial homes, including its high silica content that helped to retard fires, was not forgotten

(Continued on page 4)

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some 100 years later when a young industrialist was looking for a use for the mounds of dead grass that were a nuisance to boaters and bathers alike. In 1893, Samuel Cabot (the founder of what is now Cabot's Stains) created a prototype insulation with layers of eelgrass stitched between sheets of heavy paper. The product, Cabot's Quilt, quickly found a ready market in the Northeast (including Long Island) and became one of the company's primary products until the mid-1940s.

Between 1930 and 1933, *Zostera* almost completely disappeared from the shores of the North Atlantic on a scale never before witnessed as a result of what has been called the "wasting disease" (Rasmussen, 1977). With the loss of the grass also came dramatic declines in migratory waterfowl populations, collapse of the bay scallop fishery and changes in near-shore sediment texture (Rasmussen, 1977). Despite the near complete extirpation of *Zostera* from these areas, it is believed that low-salinity areas (e.g., estuarine creeks and coves) may have provided refugia for persistent populations allowing for a subsequent recovery of the species to many areas (Short *et al.,*1986). However, some regions such as the north shore of Long Island seem to have never recovered from this epidemic. This may be linked to propagule limitations. Following the initial epidemic, there were several more outbreaks (Addy and Aylward, 1944) and in many areas, it was not until about 1960 that eelgrass beds began to truly recover (Blois *et al.*, 1961; Rasmussen, 1977). It is of special interest to note that the decimation of eelgrass in the high salinity waters of the North Atlantic was so complete that it led to the first and only known post-pleistocene extinction of a marine invertebrate (Carlton *et al.*, 1991). The eelgrass limpet (*Lottia alveus*) was so specialized that it fed exclusively on the epithelial cells of eelgrass shoots growing in saline waters. When the wasting disease killed off the eelgrass in these areas, so to went the limpet, never to be seen again (Carlton *et al.*, 1991).

The cause of the "wasting disease" is mostly blamed on a micro-organism, *Labyrinthula*, which was often associated with the declines in the Atlantic, but other factors including water temperature, extremes in precipitation, and other factors have been suggested (Short *et al.*, 1988). The true cause of the 1930s epidemic may never be known, but is safe to say that the chronic stresses that may have exacerbated the epidemic continue to this day.

Following the wasting disease, there was a slow recovery of eelgrass into many areas of Long Island, but this rebound was coincidental with an upturn in coastal development, boating, and navigational dredging, all of which took a toll on recovery. The arrival of duck farms and all the organic matter and nutrients they brought with them in the early first half of the 20th century was another environmental insult. More recently, the "brown tide" (*Aureococcus anophagefferens*) caused catastrophic losses of grass to many areas in the Peconic Estuary as well as some areas of the South Shore Estuary Reserve during the mid to late 1980s. Not unlike the "wasting disease," the true cause of the brown tide was never really established and may be another case of multiple stressors affecting our fragile coastal environment.

The most recent die-offs of eelgrass were noted by many baymen in the early to mid 1990s when many of our creeks, in the Peconics in particular, lost the last remaining grass. The grass that remains exists mostly east of Shelter Island in the Peconic Estuary, near Orient Point and ringing Fishers Island in Long Island Sound and at several areas along in the South Shore Estuary Reserve from Hempstead to Southampton.

During the later part of the 20th century, widespread losses of extant meadows, combined with an appreciation of the ecological and commercial value of this species, helped to foster a conservation ethic. In Part II of this article, the issues of eelgrass conservation and restoration will be addressed.

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To learn more about eelgrass ecology and onging restoration efforts on Long Island, visit our Web site at www.seagrassli.org. Click on the "Current Projects" link to view recent photos of work in progress.

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The Herbarium Collection at Planting Fields

Vincent Simeone

Director, Planting Fields Arboretum State Historic Park

Since 2000, The Haybarn at Planting Fields has been undergoing major renovations to create a state of the art facility to better serve patrons who visit the park. This $8 million project is a partnership between New York State Parks, The Hoffman Foundation, and the Planting Fields Foundation. The new facility will include a new visitor center featuring exhibits, an information desk, gift shop, and a café. In addition, visitors will have access to two new classrooms and a renovated horticultural library. On the north end of the Haybarn, a secure and climate-controlled area will accommodate the Long Island Regional Archives and the herbarium collection.

The archive area is equipped with new compressible shelving units and a reading room for research. The archives, featuring a photographic and written history of Long Island State Parks and Robert Moses's development of the parks, as well as Planting Fields Archives, will be housed in a portion of the shelving units.

A section of the archive facility has been reserved for the herbarium collection. The herbarium, the result of decades of work from members of the Long Island Botanical Society, has been transferred to acid-free archival boxes and placed on the new compressible shelving units. During the transition, careful attention has been paid to organizing the collection in proper taxonomic order. While the organization of the collection is still in process, progress is being made thanks to the efforts of David Papayanopulos, herbarium curator. David has found that the new archival boxes hold the herbarium sheets much more securely than when they were stored in the metal cabinets. In addition, it is much easier to keep them sorted and to handle specimens in boxes rather than piles of loose and bulky sheets.

Once the organization of all of the collections is complete, the herbarium collection will benefit from the efforts of this collaborative project in several ways. The herbarium collection, under David's care, will be more accessible and better cared for in its new accommodations. New security and fire alarms, as well as humidity controlled mechanical systems, allow for better maintenance and protection of the herbarium collections. This truly important resource for Long Island and New York State will have a safe and comfortable home in the archives at Planting Fields. Also, the herbarium database will be integrated with the database for the New York State Parks Archives, which will make it more widely available to any and all interested parties.

Herbarium specimens are housed in acid-free archival boxes and stored on compressible shelving units.

We look forward to welcoming our supporters and dedicated patrons to this new facility in Spring 2007, when the building reopens. There is no doubt that The Hoffman Visitor Center and Long Island Regional Archives will be a destination for horticulturists, nature lovers, researchers, and educators throughout the country.

Plant Sightings

Guy Tudor reported that colonies of Virginia stickseed (*Hackelia virginiana*) and spikenard (*Aralia racemosa*) are still extant at Forest Park, Queens, as well as two very tall individuals of European hogweed (*Heracleum sphondylium*), originally identified by Karl Anderson. From the North Channel Bridge parking lot in the Jamaica Bay area of Queens, Guy reported that a small population of prostrate vervain (*Verbena bracteata*) continues to thrive and is actually spreading a little. Guy and John Lawrenson found six plants of hoary vervain (*Verbena stricta*) in dry sandy soil adjacent to the LIRR tracks where they cross North Street in Manorville, Suffolk County; in 2005, Guy also observed *V. stricta* along railroad tracks in central New Hampshire.

In early September 2006, Laura Schwanof located a population of broadleaved pepperweed (*Lepidium latifolium*) from the upper border of the salt shrub zone at West Meadow Beach on the eastern side of Smithtown Bay, Suffolk County. This plant is considered a serious invasive weed but has not yet become well established on Long Island.

Betsy Gulotta led a tour of the Hempstead Plain Preserve on September 16. Sand plain gerardia (*Agalinis acuta)* was in bloom.

On November 3, 2006, Eric and Mary Laura Lamont revisited the Flanders site where Skip and Jane Blanchard had located in 2000 several hundred plants of autumn coral-root (*Corallorhiza odontorhiza*); previously, this native orchid had not been reported from Long Island since 1932. In the early 2000s, many local field botanists visited the Flanders site and consistently counted over 300 individuals. In 2006, Eric and Mary Laura observed no *C. odontorhiza* (but they did find 24 individuals of *Epipactus helleborine*).

Guy Tudor reported that New York's only known population of the crane-fly orchid (*Tipularia discolor*) in Moore's Woods, Greenport, produced only two flowering stalks on July 24, 2006.

Jim Ash and Eric Lamont reported that the South Fork's only known population of white baneberry (*Actaea pachypoda*) was still extant at the southeast end of The Great Swamp, just southwest of Sag Harbor. The population appeared to be stressed by deer browsing; plants were stunted and did not produce flowers in 2006. In the eastern white pine forest just north of The Great Swamp, Jim and Eric located (and removed) a small population of mile-a-minute weed (*Polygonum perfoliatum*).

On September 30, 2006 during a LIBS and Torrey field trip to Caumsett State Park, Andy Greller and Al Lindberg added three new species to the park's flora: purple giant hyssop (*Agastache scrophulariaefolia*), burcucumber (*Sicyos angulatus*), and *Quercus* x *saulii* (a hybrid between *Q. alba* and *Q. prinus*).

Skip Blanchard reported water lettuce (*Pistia stratioides*) from Westbury Pond, Nassau County where he had seen it once before but presumes it will die over the winter.

On the way to Cedar Beach on the North Fork's Great Hog Neck (October 8, 2006), Guy Tudor stopped at a new Peconic Land Trust property, "Wolf Reserve," on Bayview Road. He was "appalled to see that horrid invasive black swallowwort (*Vincetoxicum nigrum*) was completely infesting everything … in the fields, over nearby trees, everywhere!"

Steve Young of New York Natural Heritage Program reported that Ralph Tiner of UMass Amherst has tentatively located wax-myrtle (*Myrica/Morella cerifera*) from the west end of Long Island on a town conservation area. This southern species reaches its northern range limit in New Jersey, but has been repeatedly reported since the 1800s from Long Island; however, all previous reports have been based upon misidentifications of northern bayberry (*Myrica/Morella pensylvanica*).

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Suffolk County Long-Term Mosquito and Marsh Management Plan

ABSTRACT. The Suffolk County Department of Public Works Vector Control Management Plan includes the proposal for the ultimate ponding of thousands of acres of high tidal marsh along the coast of Suffolk County. It will be voted on in January by the Suffolk County Council on Environmental Quality.

This summary of the issues surrounding the proposed technique of Open Marsh Water Management (OMWM) was prepared by LIBS member Karen Blumer, vice president of the Open Space Council. She based it, in part, on John Potente's recent presentation to the Open Space Council.

What is the efficiency of the Open Marsh Water Management (OMWM) technique? OMWM increases the amount of water on the marsh through ditch plugging and the introduction of artificial ponds and creeks. For the past 40 years, OMWM has been imposed upon many saltwater marshes along the Atlantic Coast to reduce the numbers of mosquitoes. While the Suffolk County Division of Vector Control claims that this technique reduces mosquito populations on tidal wetlands, its efficacy was shown to be unsupported in the scientific literature. Moreover, a recent comprehensive study performed by the U.S. Fish and Wildlife Service revealed that there is no difference in mosquito populations after OMWM.

Does OMWM restore tidal wetlands? A pilot project was conducted by the Division of Vector Control at Wertheim National Wildlife Refuge. A comparison of historic aerial photographs from the 1930s against recent aerials taken after nearly two dozen OMWM ponds were dug in an 80-acre area of Wertheim shows little similarity between the original, largely unditched and intact salt marsh, and what would be considered a "restored" salt marsh that was fragmented by OMWM. The current condition of the ponded portion of the Wertheim marshes appeared, despairingly, to approach an unhealthy disintegrating system, comparable to the inundated marshlands of Gilgo Island that are being diminished partially by past ditching and partially by a rising sea level.

Does OMWM increase biodiversity? There is no evidence that either new species are appearing at OMWM sites, nor that existing species are thriving any better. Moreover, the issue of habitat alteration and fragmentation by flooding for mosquito control was associated with the extinction of the dusky seaside sparrow in Florida. The analogy caused concern for the uncertain fate of Long Island's saltmarsh sharp-tailed sparrow and the seaside sparrow in OMWM treated sites.

What is the response from the scientific community? On November 5, a group of concerned scientists sent a letter to Suffolk County Executive Steve Levy that reads in part:

> We, the undersigned estuarine scientists and botanists, have reviewed Suffolk County's Long-Term Mosquito and Marsh Management Plan … and are writing to voice concern with regard to the proposed wetlands management scheme.
>
> We are intimately involved in efforts to research and restore coastal marshes on the eastern seaboard. Our experience teaches us that tidal wetlands are inherently complex systems with elaborate and often misunderstood hydrological regimes.
>
> Of particular concern to us is the plan's reliance on the practice known as Open Marsh Water Management … especially the suggestion that it will "restore" Long Island's coastal marshes. OMWM, which involves artificial pond excavation, unnatural creek construction and the leveling of high marsh terrain through back-blading … is not synonymous with marsh restoration….
>
> The fact is that despite the widespread application of OMWM, we know very little about its long-term impacts. The scientific literature contains no comprehensive, scientific studies of OMWM. The only multiyear study of OMWM, a recent assessment of the technique on several national wildlife refuges, found mixed and less than persuasive results, even with regard to impacts on mosquito populations.
>
> Based on our current understanding of marsh hydrology and ecology, there is nothing to suggest that OMWM restores lost ecological functions. In fact, there are concerns that the structural changes created by this technique lead to unnatural alterations of salt marsh ecosystem function. In the long run, OMWM may even do more harm than good to your irreplaceable salt marshes.

The letter is signed by Dr. Mark D. Bertness, Robert Brown Professor of Biology & Chair, Department of Ecology & Evolutionary Biology, Brown University; Dr. Michelle Dionne, Research Director, Wells National Estuarine Research Center; Dr. Caitlin Mullan Crain, Department of Ecology & Evolutionary Biology, Brown University; Dr. Patrick Ewanchuck, Assistant Professor of Biology, Department of Biology, Providence College; Dr. Ray Konisky, Program Manager, Gulf of Maine Council on the Environment; Dr. Richard Stalter, Professor of Biology, Dept. of Biology, St. John's University; Dr. Eric Lamont, Honorary Research Associate, Institute of Systematic Biology, New York Botanical Garden.

Thank You, LIBS Supporters!

In June 2006, an appeal was sent to all LIBS members requesting financial support for the Society's activities, especially publication of *The Newsletter*. The extremely generous response of the membership is sincerely appreciated. A total of $6,000 was received. Thank you, everyone! (Official receipts for tax reporting purposes will be mailed in January 2007.)

We especially thank **Barbara Conolly** and **Andrew Sabin** for their generous donations of $1000 each, and **Ray Welch** for his generous donation of $500. We also express our sincere gratitude to **Mary Mulvihill** and **Dolores Zebrowski** for their generous gifts in memory of **Bill Mulvihill**, a long-time LIBS member and environmentalist (LIBS was very pleased to work with Bill in preserving The Great Swamp, a region of high biodiversity southwest of Sag Harbor.)

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Upcoming Programs

January 9, 2007* Tuesday, 7:30 p.m.

MEMBERS' NIGHT: Members are welcome to bring slides, stories, specimens, and tales of peculiar sightings of favorite plants. A great opportunity to show what you have found while exploring on Long Island or elsewhere (no Newfoundland). Please call Rich Kelly in advance to advise as to the approximate number of slides/images that you would like to show and preferred medium. Thanks.

Location: Bill Paterson Nature Center
Muttontown Preserve, East Norwich

February 13, 2007* Tuesday, 7:30 p.m.

STEVEN CLEMANTS: "WILDFLOWER STORIES." A discussion of the ecology and biology of wildflowers. Steve is VP of Science at the Brooklyn Botanic Garden and first author of the *Wildflowers in the Field and Forest*.

Location: Bill Paterson Nature Center
Muttontown Preserve, East Norwich

March 13, 2007* Tuesday, 7:30 p.m.

MEGAN SHEREMATA: "THE HEAT ISLAND EFFECT AND THE ROLE PLANTS MAY PLAY IN MITIGATION." Megan is an Urban Forest Health Forester in the NYC Region of NYS DEC. This program will cover a project with NYSERDA, the energy research authority, on the impacts of green spaces in NYC on energy requirements. We may even get an Asian long-horned beetle update.

Location: Bill Paterson Nature Center,
Muttontown Preserve, East Norwich

April 10, 2007* Tuesday, 7:30 p.m.

JOHN POTENTE: "THE CARNIVOROUS PLANTS OF LONG ISLAND." John will give a preview of an inventory and photographic summary of insectivorous plants that he and Eric Lamont are working on. The program will cover slides and images of these unique plants in action. Attendees are warned not to get too close to the screen. John is the director of Native America, an LIBS Board member, and a member of the Suffolk County Council on Environmental Quality.

Location: Museum of Long Island Natural Sciences
Earth and Space Science Building
Gil Hanson Room (Room 123)
SUNY at Stony Brook, Stony Brook

* Refreshments and informal talk begin at 7:30 p.m.
Formal meeting starts at 8:00 p.m.