Species Status Assessment

Class: Reptilia
Family: Dermochelyidae
Scientific Name: *Dermochelys coriacea*
Common Name: Leatherback sea turtle

Species synopsis:

The leatherback turtle is unique among sea turtles in that it has no hard, bony shell (NMFS and USFWS 1992). It is the only member of the family Dermochelyidae (NMFS and USFWS 1992, ALTRT 2006). Two subspecies, an Atlantic leatherback (Dermochelys coriacea coriacea) and a Pacific leatherback (Dermochelys coriacea schlegelii) have been described; however, genetics (Dutton et al. 1996) and morphology (Pritchard 1979) do not support the separation and thus, only one species is currently recognized. The leatherback is the most pelagic species of sea turtles (Morreale and Standora 1998). The species has the ability to regulate its body temperature, allowing it to travel farther north than other species (NMFS and USFWS 1992). It is found relatively often from May – November in the New York Bight region. The leatherback is most often seen along the south shore of Long Island and within Long Island Sound (Sadove and Cardinale 1993). Trends for the species in New York are unknown, although nesting data suggests a stable to increasing population (NMFS and USFWS 2007).

I. Status

a. Current and Legal Protected Status

i. **Federal** ___Endangered__________________ **Candidate?** ___N/A___

ii. **New York** ___Endangered; SGCN___________________________________

b. Natural Heritage Program Rank

i. **Global** ___G2____

ii. **New York** ___S1N__________________ **Tracked by NYNHP?** __Yes___

Other Rank:
IUCN: Critically Endangered

CITES: Appendix I
Canadian Species at Risk Act (SARA): Endangered

Status Discussion:
Leatherback turtles are listed as Endangered throughout their range, and have been listed under the Endangered Species Act since 1970. In the U.S., the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) have joint jurisdiction of this species.

Because the leatherback is a wide-ranging pelagic species, it is also protected by numerous international treaties including the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), the Convention on Migratory Species, Specially Protected Areas and Wildlife Protocol of the Cartagena Convention, and the Inter-American Convention for the Protection and Conservation of Sea Turtles (NMFS 2013).

II. Abundance and Distribution Trends

a. North America

i. Abundance

____ declining __X__ increasing ______stable _____unknown

ii. Distribution:

____ declining ____increasing ______stable __X__ unknown

Time frame considered: __Data from the last 20-30 years indicate that all nesting populations in the U.S./Central America/Caribbean are stable to increasing, with the notable exception of Tortuguero in Costa Rica, which declined ~68% from 1995-2006 (Troeng et al. 2007)__________

b. Regional

i. Abundance

____ declining __X__ increasing ____stable _____unknown

ii. Distribution:

____ declining ____increasing ____stable __X__ unknown

Regional Unit Considered: __U.S. Atlantic nesting population (FL)____________
Time Frame Considered: ___Avg. annual growth rate of >1.0% since 1989.___

c. Adjacent States and Provinces

CONNECTICUT Not Present _______ No data _______

i. Abundance

__X__ declining ____ increasing ____ stable ____unknown

ii. Distribution:

____ declining ____ increasing ____ stable __X__ unknown

Time frame considered: ___Not specified______________________________
Listing Status: ___Endangered________________________ SGCN? __Yes_____

MASSACHUSETTS Not Present _______ No data _______

i. Abundance

____ declining ____ increasing ____ stable __X__ unknown

ii. Distribution:

____ declining ____ increasing ____ stable __X__ unknown

Time frame considered: ___Trends not analyzed________________________
Listing Status: ___Endangered________________________ SGCN? __Yes___

NEW JERSEY **Not Present** _______ **No data** _______

i. Abundance

____ declining ____ increasing ____ stable __X__ unknown

ii. Distribution:

____ declining ____ increasing ____ stable __X__ unknown

Time frame considered: ___Trends not analyzed_____________________________
Listing Status: ___Endangered_______________________________ SGCN? __Yes___

QUEBEC **Not Present** _________ **No data** _______

i. Abundance

____ declining ____increasing _____stable __X__ unknown

ii. Distribution:

____ declining ____increasing ______stable __X__ unknown

Time frame considered: ___Trends not analyzed.____________________________
Listing Status: ___Endangered____

VERMONT **Not Present** **__X__** **No data** _______

ONTARIO **Not Present** **__X__** **No data** _______

PENNSYLVANIA **Not Present** **__X__** **No data** _______

d. NEW YORK **No data _______**

i. Abundance

____ declining ____ increasing ____ stable __X__ unknown

ii. Distribution:

____ declining ____ increasing ____ stable __X__ unknown

Time frame considered: Trends not analyzed

Monitoring in New York.

None. The only monitoring that occurs for the species is entanglement and stranding response provided by Riverhead Foundation.

Trends Discussion:

Sadove and Cardinale (1993) gave a rough estimate of 500 – 800 leatherback turtles using the New York Bight region each year. Trends of leatherback turtles in New York are poorly understood. Strandings of leatherbacks are highly variable from year to year, with no significant patterns reported (DiGiovanni 2009; Figures 3 and 4). As a highly migratory marine species that is not sighted with any real frequency, it is difficult to evaluate trends. Most trend data that do exist come from nesting beaches. Unfortunately, there is still uncertainty as to where leatherbacks sighted in New York waters nest. One individual that was flipper-tagged on a nesting beach in French Guiana was recovered in New York waters (Morreale and Standora 1998). Whether all leatherbacks seen in the area nest in French Guiana is unknown, but unlikely. Leatherbacks off of Atlantic Canada have been found to nest in French Guiana, Suriname, Trinidad, Costa Rica, Panama, Colombia, Grenada and Puerto Rico (Turtle Expert Working Group 2007).

The Turtle Expert Working Group (2007) identified seven main populations of nesting leatherbacks throughout the Atlantic Ocean. All of these populations are stable or increasing, with the exception of the western Caribbean and West Africa. There are no data for the West African population (NMFS and USFWS 2007). In Florida, the number of leatherback nests has increased from 98 nests in 1988 to 800-900 nests in the early 2000s (Stewart and Johnson 2006, NMFS and USFWS 2007). Standardized nest counts done from 1989 – 2006 found that leatherback nesting in Florida has increased by about 1.17% each year (Turtle Expert Working Group 2007). The growth rate in Puerto Rico from 1978 – 2005 was estimated to be around 1.10, as was the growth rate in the U.S. Virgin Islands (Turtle Expert Working Group 2007). Dutton et al. (2005) estimated that the leatherback population in this area increased 13% per year from 1994 – 2001. The annual growth rate at the British Virgin Islands was estimated to be 1.2 from 1994 – 2004 (Hastings 2003, Turtle Expert Working Group 2007).

Troeng et al. (2007) estimated that the nesting population of leatherbacks using Costa Rica's Atlantic Coast declined by over 67%. The probability of growth in the nesting population was only 0.03 at the most important nesting beach in the central Caribbean from 1995 - 2005.

About 40% of the entire world population of leatherbacks is believed to nest in French Guiana and Suriname. The population is believed to be stable or slightly increasing. The probability that the nesting population was growing from 1967 – 2005 was about 0.95 (Turtle Expert Working Group 2007). Leatherback nesting populations were also believed to be increasing in Guyana, Trinidad, and Brazil (Turtle Expert Working Group 2007).

Figure 1. Range of the leatherback turtle in the U.S. Atlantic coast (USFWS 2013).

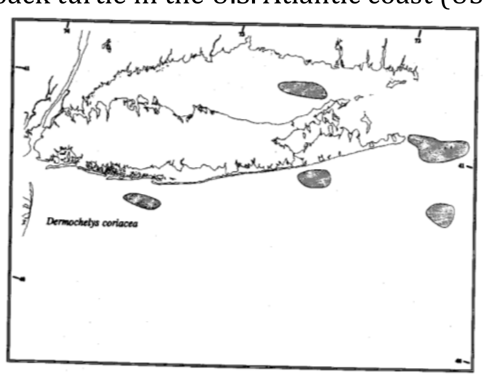

Figure 2. Areas of sightings of leatherback sea turtles in New York by Okeanos Foundation (Sadove and Cardinale 1993).

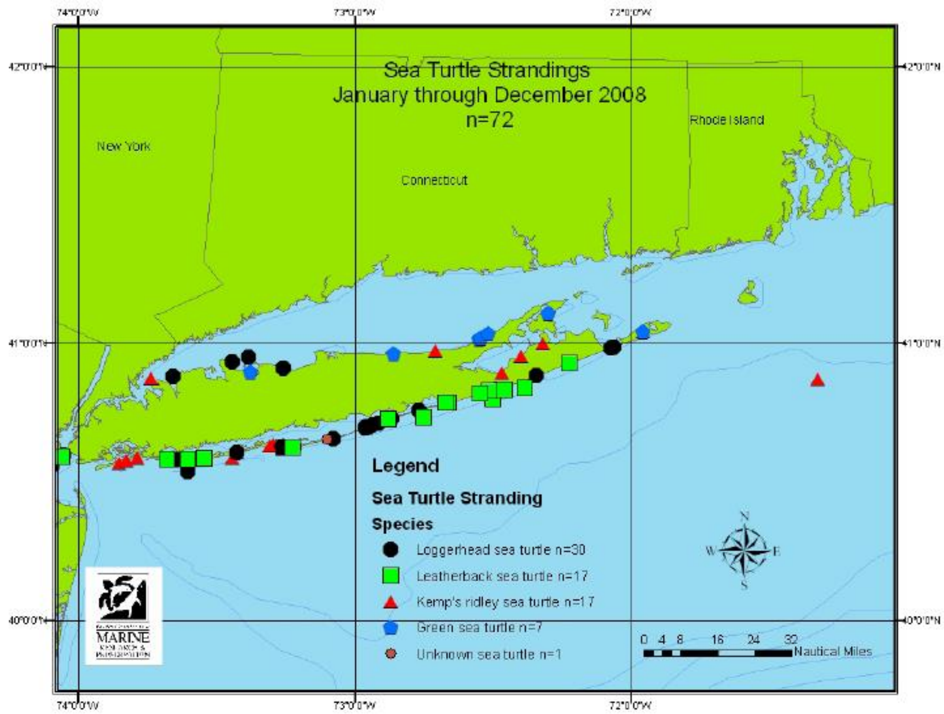

Figure 3. Location of sea turtle strandings responded to by Riverhead Foundation from January through December 2008. Leatherback strandings are represented by green squares (DiGiovanni 2009).

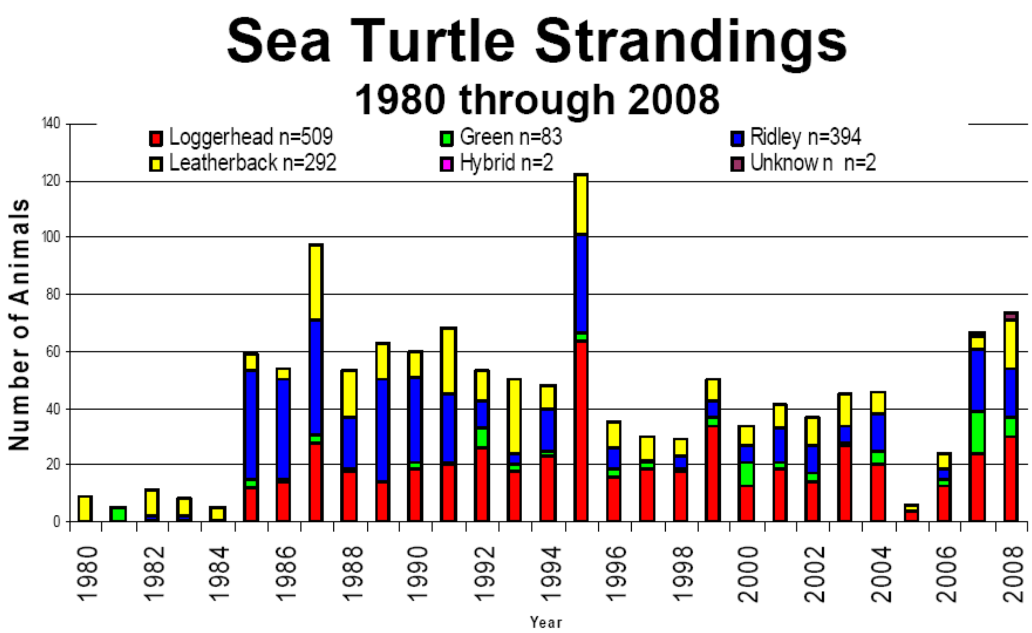

Figure 4. Sea turtle strandings responded to by Riverhead Foundation from 1980-2008 (DiGiovanni 2009).

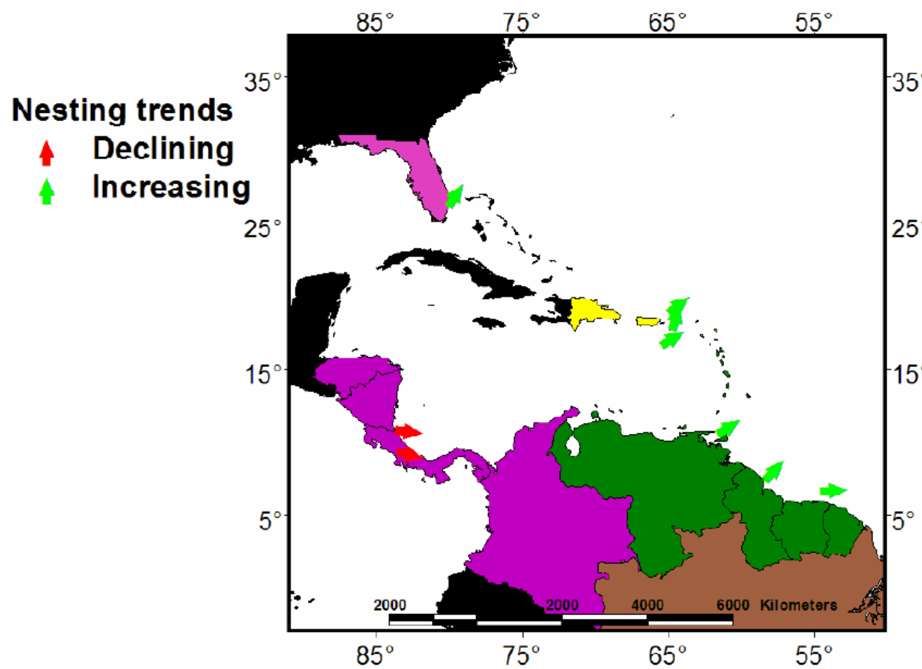

Figure 5. Nesting population trends for leatherbacks in the western North Atlantic. Values of λ were scaled against the angle of an arrow with λ=1.20 corresponding to the arrow pointing straight up and λ=0.80 pointing straight down (Turtle Expert Working Group 2007).

III. New York Rarity, if known:

Historic	# of Animals	# of Locations	% of State
prior to 1970	_________	_________	_________
prior to 1980	_________	_________	_________
prior to 1990	_________	_________	_________

Details of historic occurrence:

Unknown for New York. Sadove and Cardinale (1993) gave a rough estimate of 500-800 leatherbacks using the New York Bight region annually, based on surveys from the 1970s – 1990s.

Current	# of Animals	# of Locations	% of State
	_________	_________	_________

Details of current occurrence:

Unknown for New York.

New York's Contribution to Species North American Range:

% of NA Range in New York	Classification of New York Range
____ 100 (endemic)	____ Core
____ 76-99	__X__ Peripheral
____ 51-75	____ Disjunct
____ 26-50	Distance to core population:
__X__ 1-25	__________

IV. Primary Habitat or Community Type:

1. Pelagic
2. Estuarine, Brackish Shallow Subtidal
3. Estuarine, Brackish Deep Subtidal
4. Marine, Deep Subtidal

5. Marine, Shallow Subtidal

Habitat or Community Type Trend in New York:

____ Declining ____Stable ____ Increasing __X__ Unknown

Time frame of decline/increase: ____

Habitat Specialist? _____ Yes __X__ No

Indicator Species? __X__ Yes _____ No

Habitat Discussion:

The leatherback turtle has the largest range of any reptile species (ALTRT 2006). Because of the ability to regulate their body temperature, leatherbacks can tolerate colder waters than other species of sea turtles (ALTRT 2006, NMFS and USFWS 1992, NMFS and USFWS 2007). They have been documented as far north as 70°15'N (Gulliksen 1990) and as far south as 27°S (Boulon et al. 1988).

The major nesting assemblages of leatherback turtles are described above (See Trends Discussion). Researchers are uncertain about where newly hatched leatherbacks travel to, but it is believed that juveniles with a curved carapace length of <100cm remain in water that is at least 26°C (NMFS and USFWS 2007). An unknown proportion of adult leatherbacks travel into temperate waters after each nesting season (ALTRT 2006). While in these waters, leatherbacks appear to prefer continental shelf waters (Lazell 1980, Shoop and Kenney 1992, James 2000, Lawson and Gosselin 2003). While offshore, leatherbacks are found along thermal fronts and the edges of oceanic gyre systems (Collard 1990, Lutcavage 1996). All of these areas concentrate prey. Indeed, while foraging along the east coast of the U.S. and Canada, the distribution and movements of leatherbacks are believed to correlate with seasonally abundant prey (Bleakney 1965, Goff and Lien 1988, Shoop and Kenney 1992, James and Herman 2001).

In New York, leatherbacks are observed most frequently off the south shore of Long Island, and also occasionally in Long Island Sound (Sadove and Cardinale 1993).

V. New York Species Demographics and Life History

______ Breeder in New York

_____ Summer Resident

_____ Winter Resident

_____ Anadromous

__X__ Non-breeder in New York

__X__ Summer Resident

_____ Winter Resident

_____ Catadromous

_____ Migratory only

_____Unknown

Species Demographics and Life History Discussion:

The life expectancy of leatherbacks is unknown, but is at least thirty years (NMFS and USFWS 1992). They are believed to reach sexual maturity around 29 years of age (Aven and Goshe 2007). The longest observed reproductive lifespan is 18 years, observed in South Africa (Hughes 1996).

Females nest nocturnally on beaches from March – July (NMFS and USFWS 1992). They exhibit some degree of site fidelity to their natal beach, but do not appear to be as strict as other species of sea turtles (NMFS and USFWS 2007). This may make them more able to colonize new beaches. Male leatherbacks appear to exhibit some degree of site fidelity at breeding grounds (James et al. 2005). Mating is believed to occur near the nesting beach, although it is rarely observed (Godfrey and Barreto 1998, Reina et al. 2005).

Females deposit around 100 eggs in each of 5-7 nests a nesting season (NMFS and USFWS 1992). The interval between each nesting event is about 9-10 days (NMFS and USFWS 1992). The nesting events can occur on beaches hundreds of km apart; leatherbacks from Gabon traveled 2,000 – 4,500 km during the entire nesting season (Witt et al. 2008). Females reproduce every 2-3 years (NMFS and USFWS 1992). The nests incubate for 55-75 days. The sex of the hatchlings is dependent on the incubation temperature (NMFS and USFWS 1992).

Once eggs hatch, hatchlings travel into the pelagic environment. Very little is known about these "lost years." The survival in the first year of life has been estimated to be 0.0625 (Spotila et al. 1996).

Adult leatherbacks are known to travel long distances between nesting and foraging grounds. During the first year after nesting, leatherbacks have been observed traveling continuously and adjusting foraging behavior based on local conditions (Hays et al. 2006). Satellite-tracked leatherbacks nesting in Atlantic Costa Rica and Panama traveled into the Gulf of Mexico, along the east coast of North America to Nova Scotia, and over to the Azores Islands (Troeng et al. 2004, 2007; Evans et al. 2007). Those tagged in Florida tended to remain in North American continental shelf waters until winter, when they moved off the shelf. One traveled to the Mauritanian Coast and another to the north equatorial Atlantic (Eckert et al. 2006). Females, males and subadults who forage in the North Atlantic have been shown to make return migrations to key feeding areas (James et al. 2005).

Feral pigs, dogs, mole crickets, raccoons, armadillos, monitor lizards, mongoose, civets, genets, ghost crabs, jackals, dipteran larvae, and army ants have all been documented to prey on leatherback eggs (NMFS and USFWS 2007). Fish and birds are known to prey on hatchlings (Vose and Shank 2003). Jaguars, killer whales, and sharks occasionally prey on adults (Long 1996, Pitman and Dutton 2004).

The role of disease on natural mortality of leatherbacks is poorly understood. Fibropapillomatosis has been documented in leatherbacks, although it is not as common as in other sea turtle species (Huerta et al. 2002). Fibropapillomatosis causes tumors that can hamper swimming, vision, feeding, and escape from predators (Herbst 1994).

VI. Threats:

One of the major threats to sea turtle populations in New York is fisheries interactions. Leatherback turtles can become trapped in pound nets, longline fisheries, trap fisheries, trawl fisheries, purse seines, and gill nets. Entanglements in fixed gear are known to be a threat in temperate coastal foraging habitats (James et al. 2005a). 92 leatherbacks were documented as entangled in fixed pot gear from New York to Maine from 1990 – 2000 (Dwyer et al. 2002). Turtles trapped in gear can drown or suffer serious injuries as a result of constriction by lines (NMFS and USFWS 1992) and prolonged entanglements may affect their ability to feed, dive, swim and reproduce (Balazs 1985). Trawlers that are not outfitted with Turtle Excluder Devices (TEDs) can entrap and drown sea turtles. Additionally, dredges can destroy habitat and crush or entrap sea turtles (NMFS and USFWS 1992).

Longline and gill net fisheries appear to be major problems for leatherbacks throughout their range (NMFS and USFWS 2007). The decline of the Mexican population of leatherbacks is believed to coincide with the growth of longline and coastal gill net fisheries in the Pacific (Eckert and Sarti 1997). An estimated 50,000 leatherbacks were taken as bycatch by the pelagic longline fishery in 2000 (Lewison et al. 2004). An estimated 3,000 leatherbacks are entangled in coastal gill nets annually off of Trinidad; about 1/3 of these are believed to die as a result (Lee Lum 2006). While bycatch rates vary widely between areas, Lewison et al. (2004) suggested that the overall bycatch levels are not sustainable.

Climate change is believed to have major effects on sea turtles throughout their range. Climate change is expected to extend the foraging range of leatherback turtles north into higher latitude waters (NMFS and USFWS 2007). Additionally, climate change is believed to be associated with rising water temperatures, as well as changes in ice cover, salinity, oxygen levels and circulation (IPCC 2007). These changes are likely to cause shifts in range and abundance of different species of algae, plankton and fish (IPCC 2007). These shifts could alter the suitability of New York habitat (as well as habitat in other parts of sea turtles' ranges) for occupancy by sea turtles. Changing currents as a result of climate change could affect sea turtle migration and survival of oceanic-stage juveniles (NMFS and USFWS 2007).

Climate change could have significant effects on leatherback turtles in other parts of their range as well. More nests could be destroyed as a result of the increasing abundance and severity of storms along the nesting range. Severe storms and rising sea levels could cause major problems on low-lying nesting beaches. Additionally, there is concern that rising temperatures could skew hatchling sex ratios towards a strong female bias (Mrosovsky et al. 1984; Hawkes et al. 2007). Rising sand temperatures have been documented at at least one nesting site (Hays et al. 2003). Leatherbacks do have a tendency to have individual nest placement preferences, and often deposit some clutches in the cooler tide zone of beaches, so this may not be a severe issue (Kamel and Mrosovsky 2004).

Coastal development can lead to destruction or degradation of sea turtle habitat, particularly on their nesting grounds. The construction of buildings, pilings, seawalls, rock revetments, groins, jetties, and sand bags degrades sea turtle nesting habitat (NMFS and USFWS 2007). Additionally, bright lighting near beaches can disorient hatchlings, and cause them to move towards the light rather than the ocean (McFarlane 1963, Philibosian 1976, Mann 1977, Ehrhart 1983). This misorientation can lead to increased risk from predators, entrapment in vegetation, dessication, and being hit by vehicles (NMFS and USFWS 1991). Some countries do have regulations on lighting by the beach, but the majority do not (NMFS and USFWS 2007). Unfortunately, the effects of development on turtles in the marine environment are difficult to monitor (NMFS and USFWS 2007).

Organochlorine contaminants, cadmium, copper, zinc, and toxic metals have all been identified in leatherbacks (Godley et al. 1998b; McKenzie et al. 1999; Caurant et al. 1999; Storelli and Marcotrigiano 2003). The effects that these contaminants may have on leatherbacks are currently unknown. High levels of organochloride pesticides have been found in the sand of a French Guiana nesting beach (Guirlet 2005); there is some speculation that this could explain low hatching success on the beach (Girondot et al. 2007). Offloading of contaminants from nesting females to eggs has been documented in leatherbacks (Stewart et al. 2007). Oil spills are known to directly affect marine turtles (Yender and Mearns 2003), and could also lead to immunosuppression and chronic health issues (Sindermann et al. 1982).

Sea turtles could ingest or become entangled in marine debris, which can reduce food intake and digestive capacity and cause injury or mortality (Bjorndal et al. 1994; Sako and Horikoshi 2002). Leatherback turtles may be more at risk than other species, as debris tends to concentrate in convergence zones where turtles feed (Shoop and Kenney 1992, Lutcavage et al. 1997). The species feeds primarily upon jellyfish, and may mistake plastics and balloons as prey and ingest them, causing blockages, starvation, absorption of toxic byproducts and other health issues (Plotkins and Amos 1989, ALTRT 2006). There have been reports of leatherbacks ingesting plastic bags, balloons, plastic and Styrofoam pieces, tar balls, plastic sheeting, and fishing gear (Hartog and Van Nierop 1984, Sadove and Morreale 1989, Lucas 1992, Starbird 2000). Sea turtles may occasionally be hit by vessels, which can cause mortality and severe injury. In Florida, over 17% of all stranded leatherbacks have evidence of vessel collisions, although it is possible that these collisions occur post-mortem (NMFS and USFWS 1992). Vessel collisions are believed to happen more often than reported throughout the range of this species (NMFS and USFWS 2007).

While not included as a threat by the Recovery Plan or 5-Year Review, the Canadian Recovery Plan (ALTRT 2006) lists anthropogenic noise as a potential threat. Studies have shown that sea turtles exposed to certain levels of low frequency sound may spend more time at the surface and/or move out of the area (Lenhardt et al. 1983, O'Hara and Wilcox 1990). This could lead to the displacement of turtles from preferred foraging areas (O'Hara and Wilcox 1990; Moein et al. 1994). Additionally, sea turtles have been found to change swimming patterns and orientation in response to air guns, which are frequently used in oil and gas exploration (O'Hara 1990). Unfortunately, researchers do not have a good idea about the hearing capabilities of leatherback turtles, so many of the effects of anthropogenic noise on sea turtles are largely unknown.

The harvesting of adult leatherbacks and eggs is a problem throughout their range. While this is not a problem in the U.S., the wide-ranging nature of leatherbacks means that those that forage along the east coast of the U.S. may be threatened by exploitation in their nesting grounds. Poaching of adults for meat and/or oil and/or the collection of eggs for sale in local and foreign markets occurs in the British Virgin Islands, Dominican Republic, Jamaica, Puerto Rico, U.S. Virgin Islands and the Bahamas (Fleming 2001).

Are there regulatory mechanisms that protect the species or its habitat in New York?

_______ No ____ Unknown

__X__ Yes

The leatherback turtle is listed as an endangered species in New York and is protected by Environmental Conservation Law (ECL) section 11-0535 and the New York Code of Rules and Regulations (6 NYCRR Part 182). A permit is required for any proposed project that may result in a take of a species listed as Threatened or Endangered, including, but not limited to, actions that may kill or harm individual animals or result in the adverse modification, degradation or destruction of habitat occupied by the listed species. It is also protected as a federally-listed endangered species.

In addition, Article 17 of the ECL works to limit water pollution, and Article 14 presents the New York Ocean and Great Lakes Ecosystem Conservation Act. This act is responsible for the conservation and restoration of coastal ecosystems "so that they are healthy, productive and resilient and able to deliver the resources people want and need." Both of these help to protect the habitat of the leatherback turtle. Whether they are adequate to protect the habitat is currently unknown.

Describe knowledge of management/conservation actions that are needed for recovery/conservation, or to eliminate, minimize, or compensate for the identified threats:

Riverhead Foundation should continue to carry out stranding and entanglement response for sea turtles. The Foundation rescues and rehabilitates injured and ill individuals. Before being released, rehabilitated sea turtles are sometimes given a satellite tag, which helps expand our knowledge on movements and habitat use. Placing PIT tags and/or satellite tags on as many individual turtles as possible will help to further our knowledge on leatherback turtle life history, and this practice should be encouraged. It is critical to determine where New York leatherback turtles travel and nest to help reduce the threats to the population during other stages of its life.

Long-term surveys to monitor the population of leatherback turtles in New York should be implemented. Sea turtle use of state waters was fairly well established by studies throughout the 1980s and 1990s, but not much work has been done in recent years. Monitoring would allow researchers to garner a better idea of population trends and habitat use of this species in the State, and see if shifts in use have occurred. Additionally, further research into the effects of the various threats listed above on the leatherback turtle population in the State should be encouraged. Bycatch rates should be closely monitored, and research into reducing these rates would be beneficial.

Education on this species and the importance of reporting ship strikes and entanglements is encouraged. Conservation actions following IUCN taxonomy are categorized in the table below.

Conservation Actions	
Action Category	**Action**
Education & Awareness	Awareness & Communications
External Capacity Building	Alliance & Partnership Development

The Comprehensive Wildlife Conservation Strategy (NYSDEC 2005) includes recommendations for the following actions for sea turtles.

Curriculum development:

____ To provide public outreach programs about local species and their environment within the Long Island Sound and the New York Bight. Partnering with agencies such as the New York State Marine Mammal and Sea Turtle Rescue Program, NYSDEC, NOAA, U.S. Coast Guard and local law enforcement, will allow the Riverhead Foundation to adhere to the actions listed in the sea turtle recovery plans more efficiently and effectively.

Fact sheet:

____ To provide literature for local communities, as well as law enforcement agencies, regarding sea turtles and their environment within the Long Island Sound and the New York Bight. The information distributed by the Riverhead Foundation to these people will provide a more effective response to strandings and sightings of animals.

Population monitoring:

____ Mark recapture studies will provide data on the diet composition of these animals between bodies of water. These results can be compared to historical studies to identify any shifts in prey species.

____ Determine sex composition of NY sea turtle populations. As the New York region is a critical developmental habitat for sea turtles it is important to understand if there is a sexual bias for this area. Historical studies were unable to obtain the sex of many live animals.

- ___ Radio and satellite tags can be combined with aerial and shipboard survey work to study abundance, distribution, and movements associated with seasonal changes.
- ___ Genetic studies should be conducted to identify stock structure and possibly understand broad scale movements.
- ___ Mark recapture studies will provide data on size class, and population structure. With these data comparisons can be made within years, between years and between bodies of water (e.g. Long Island Sound, Peconic Bay, Great South Bay, offshore waters) and also compared to stranded animals to understand how and if stranded animals can be used as a representative of the current population or a proxy for ecosystem health.

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Date last revised: July 30, 2013