



photo: Don Lewis

# **The Northern Diamondback Terrapin Habitat, Management and Conservation**

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## **Preface**

Salt marshes, estuaries, bays, sounds and adjoining uplands are picturesque features of the coastline. Their warm, protected, brackish waters serve as nursery or home to many species of plants and animals. However, there is only one reptile that is completely dependent on this habitat for its survival: the diamondback terrapin, *Malaclemys terrapin*. Those of us who study diamondback terrapins and are concerned about their fate have started an organization: the Diamondback Terrapin Working Group (DTWG). Our meetings focus on the ecology, status and conservation of diamondback terrapins throughout their range, from Cape Cod, Massachusetts to Corpus Christi, Texas.

Some of the issues that affect terrapin populations are regional in nature. Therefore, members of the northeastern contingent of the DTWG have identified the most serious threats to diamondback terrapins in our region and have put together some background, ideas and recommendations that may be useful to cities and towns along the New England and New York coastline where terrapins have historically been found. For individuals, town boards or committees that would like to know more about terrapins or how they can be protected in your area, we offer the names and contact information of individuals who can serve as a resource.

Our first attempt to provide the guidelines outlined in this manual also includes guidelines to protect fragile coastal habitats. Protection of the terrapin goes hand-in-hand with protection of its home. This manual is a living document. We welcome your suggestions for its improvement, distribution and usage.

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## What is a Diamondback terrapin?

The diamondback terrapin, *Malaclemys terrapin*, is the only brackish water turtle in the United States. It can be found in sheltered coastal locations such as bays, sounds, estuaries, salt marshes and mangrove swamps. Unlike other turtle species that are exclusively fresh water or marine, the diamondback terrapin prefers an environment with intermediate salinity. The diamondback terrapin is confined to the Atlantic and Gulf coasts of the continental United States and can be found from Cape Cod, Massachusetts, the northernmost range of the species, to Corpus Christi, Texas. Seven subspecies have been identified. *Malaclemys terrapin terrapin*, the northern diamondback, is the subspecies that inhabits the northeastern states of New Jersey, New York, Connecticut, Rhode Island and Massachusetts.



Salt Marsh: Typical Diamondback terrapin habitat

The diamondback terrapin gets its name from the raised concentric rings formed on the subsections of the upper shell or carapace. The resulting grooves give the shell a sculpted appearance, resembling the facets on a cut diamond. Adult females are approximately the size of a dinner plate while adult males are much smaller. Approximate sizes for adult male and female terrapins from Cape Cod are displayed in Table 1. The size and weight of terrapins from other locations will vary somewhat. Due to the fact that adult females are almost twice the size of adult males, the species is said to be sexually dimorphic.



Adult female diamondback terrapin

Table 1. Approximate sizes of adult terrapins from Wellfleet Harbor, MA

	Upper shell (carapace) length	Lower shell (plastron) length	Weight
Females	19 cm (7.5 inches)	16 cm (6 inches)	1000 grams (2.2 lbs)
Males	13 cm (5 inches)	10 cm (4 inches)	275 grams (0.6 lbs)

Terrapins are a long-lived, late maturing species. No one knows the life span of diamondback terrapins but these turtles are known to live at least 20 years and perhaps up to 40 or more. In the northeast, the males mature when they reach 5-7 years while females mature later, 8-10 years. Terrapins are a seasonally active species. In the north, they typically hibernate in mud under creeks or in salt marshes from October to March, emerging again in April as the water warms. Males typically spend nearly all of their time in the water. Females make brief forays onto the land as many as three times each year during nesting season in late spring or early summer. Diamondback terrapins are carnivores; their main prey consists of small crabs, snails, insects and various mollusks.

Similar to many other turtles, diamondback terrapins exhibit temperature dependent sex determination. When eggs incubate below 82 degrees F (28 degrees C), the turtles will develop into males. When incubation temperatures reach 86 degrees F (30 degrees C) or above, females will develop. Intermediate temperatures will produce mixtures of males and females.

## **Threats to Diamondback terrapins**

Although the number of terrapins has increased or remains stable in some locations, long-term scientific studies have pointed to dramatic declines in most areas. The reasons for these declines vary with geographic region. Historically, the most serious threat to diamondback terrapins was their harvest for the preparation of terrapin soups and stews. Commercial harvest resulted in the near extinction of the species by the late 1800s and early 1900s. It is still legal to harvest terrapins in some states but the fishery is not extensive in the northeast. Currently, Chesapeake Bay remains the only area with a significant commercial harvest of terrapins.

In the mid and south Atlantic states (from New Jersey south), commercial and recreational crabbing continues to impact terrapin populations. Terrapins enter crab traps (or crab pots as they are called in the central and southern states) and can easily drown if they can't find their way out. It is possible to attach wire or plastic frames to the entrance of crab traps so that larger terrapins cannot enter. The use of such terrapin excluder

devices (TEDs) or by-catch reduction devices (BRDs) can significantly lower the number of terrapins that can enter crab traps (Wood, 1997; Roosenburg and Green, 2000; Guillory and Prejean, 1998; Butler and Heinrich, 2004).

In the northeast, terrapins are dramatically affected by loss of marsh habitat. Salt (*Spartina*) marshes are critical foraging, nursery and overwintering areas for diamondback terrapins but marshes have been disappearing rapidly over the last 100 years. Many of these losses occurred in the 19<sup>th</sup> and first half of the 20<sup>th</sup> Century. Early colonists grazed their livestock in salt marshes and salt marsh hay was later harvested for animal feed. Marshes were ditched and drained and dikes were built to limit the tidal flow of coastal rivers for mosquito control purposes. Urbanization, development and dredging along the coast changed water and nutrient flow into marshes resulting in a decrease and degradation of salt marshes along the entire Atlantic coast.

Pollution has also caused the degradation of salt marsh habitat. Although the effect of chemical pollutants on diamondback terrapin populations has not been documented, scientists have found high levels of toxins such as mercury and organochlorine pesticides in terrapin eggs and tissues (Kannan et al., 1998; Burger, 2002). There have also been significant oil spills in diamondback terrapin habitats that have had impacts on terrapins as well as other species.

Human alterations to the shoreline interfere with the ability of female terrapins to find suitable nesting substrate. Shoreline hardening or armoring, interferes with the deposition of sand in traditional diamondback terrapin nesting areas. Bulkheads and seawalls form obstacles in the path of egg-bearing females that must leave the water to dig a nest. Females whose movement inland is thus blocked must often resort to laying eggs in suboptimal locations and in areas that can be flooded at high or spring tides.

Female terrapins prefer open, sandy areas for nesting. Such areas are often at a premium or must be accessed by crossing busy roadways. Road mortality is a serious problem for female terrapins in many areas. Not only will the female be lost, but her potential progeny will be lost as well. Coastal development has resulted in the loss of many terrapin nesting areas; construction of roads adds to the problem.

As we have become more attracted to coastal locations for living and recreation, we have attracted terrapin predators, chief among which is the raccoon. Raccoons have

been known to kill and eviscerate nesting females (Feinberg and Burke, 2003). In many terrapin nesting areas, raccoons account for more than 90% of nest failure; they eat eggs as well as hatchlings.

Other human uses of terrapin habitat have the potential to harm terrapins. Commercial and recreational boating sometimes requires the deepening of channels to allow passage of boats. Dredging operations during winter may dislodge or crush hibernating terrapins. The use of mudflats near marshes for shellfish aquaculture may also affect terrapins. Shellfish gear that gets dislodged during storms may block creeks or prevent terrapins from coming up to breathe. Recreational use of dunes and upland areas by hikers or individuals launching kayaks and small craft may disturb nesting females or degrade nesting areas.



## Protection of diamondback terrapins

The federal government has not taken any measures to protect terrapins. Protection and conservation is in the hands of individual states. In some cases, terrapins are regulated as a fishery; in other states, they are protected by the Department of Natural Resources. There is great variation in the status and protection of diamondback terrapins but the general trend is for increase in protection. In states where crabbing is a serious threat to terrapins, regulations often mandate the use of terrapin excluder devices on crab traps. The state-by-state regulations for harvest or capture of diamondback terrapins in the northeast are described in Table 2.

**Table 2. Diamondback Terrapins: Regulations in the Northeastern States**

<b>State</b>	<b>Current Regulatory Status and Brief Summary of Regulations</b>
Massachusetts	<i>Threatened</i> Illegal to disturb, harass, hunt, fish, trap or take adults, eggs, or young by any means
Rhode Island	<i>Endangered</i> Illegal to buy, sell or in any way traffic any terrapin or part thereof, either living or dead
Connecticut	<i>State Regulated Species</i> Illegal to take terrapins or eggs
New York	<i>No Listing</i> Open season August 1-April 30; terrapins may only be taken by dip nets, hand capture, authorized seine nets and special traps, labeled with the identity of the owner; license required for take; terrapins 4-7 inches allowed; sale allowed May 5-July 31 or year round if killed and processed for consumption before May 5; illegal to take eggs
New Jersey	<i>Species of Special Concern and Game Species</i> Permit required for possession; open season November 1-March 31; illegal to take eggs;. 2 x 6" TEDs required on some crab traps and biodegradable panels required on all traps Illegal to possess >10 without a non-game collection or dealer permit; non-game collection or dealer's permit required for sale or trade; hunting license required for collection

Note: Some states protect terrapins explicitly while others protect terrapins under more general wildlife regulations. Measurements are given in inches to comply with state regulations. (Information adapted from Watters, 2004).

# **Why should we care about diamondback terrapins and their habitat?**

## **1. Uniqueness**

The diamondback terrapin is a most unusual creature. It is the only United States turtle that lives in brackish water. It is so elusive that it is seldom seen, yet it is a very important member of salt marsh ecosystems.

## **2. An unsustainable fishery**

Females mature late and depend on a long reproductive life in order to replace themselves. Removal of reproductive females from a population will lead to declines in population numbers if younger terrapins are not being recruited into the population. Due to very high egg and hatchling mortality in every population, there is at best a precarious balance, replacing adults in sufficient numbers to maintain populations. This scenario is not unique to diamondback terrapins. Heavy declines in sea turtle populations resulted from harvest of these creatures over many years. It is very difficult and expensive to rebuild populations after they fall very low, but easier to stop declines before they become too serious.

## **3. Web of Life**

Salt marshes are extremely productive areas and serve as nurseries for a variety of species. Diamondback terrapins are top marsh predators. In some respects, they are indicators of the health of the marsh ecosystem. Periwinkle snails are a significant food item for diamondback terrapins. If their numbers are not checked, snails may overgraze on salt marsh grasses, leading to the death of sections of the marsh (Bertness, 1984).

## **4. Buffer**

Marshes and estuaries serve as buffers to protect inland areas from storm surges. Recent meteorological events such as hurricanes have highlighted the importance of marshes in mitigating coastal damage caused by storm surges.

## **5. Aesthetics**

Waving expanses of salt marsh grasses are a picturesque feature of the coastal landscape. These marshes are important staging areas for migrating birds and are destinations for bird watchers and naturalists.

## What Can We Do?

### 1. Protect Fragile Habitat:

a. **Land Acquisition:** To protect sensitive areas, many towns and environmental organizations have pushed land acquisition to the top of their list of conservation strategies. Town-owned land or land owned by an environmental group or non-profit conservation agency will be less likely to deteriorate and can be protected from development and other alterations that destroy marsh areas and upland habitat. This strategy will not only protect diamondback terrapins, but it will also preserve ecosystems.



Protected Diamondback terrapin habitat within the Cape Cod National Seashore

**b. Mitigate damage and disturbance caused by recreational use:**

Recreational uses of the protected areas can be restricted so that minimal damage occurs. For example, areas can be specifically designated for parking, launching for windsurfing, kayaking, etc

**c. Restore nesting areas:**

Use the strategy of the Terrapin Institute's Living Shorelines Project (<http://www.terrapininstitute.org>) and encourage shoreline homeowners to "Garden, Don't Harden." Sand replenishment and planting of native vegetation to protect shorelines should be used in place of armoring with bulkheads, riprap, etc.

**d. Restore natural nutrient and water flow:**

Planting native hardwoods near shore lines captures excess nutrients that would otherwise flow into salt marshes. Research shows that unusually high nutrient flows harm native *Spartina* marshes and causes them to be replaced with dense *Phragmites* stands, harmful to most wildlife including terrapins. Tidal flow should be restored in areas that have been subject to tidal restrictions by the placement of dams and dikes. *Phragmites* is encouraged over *Spartina* when freshwater surges dilute saltwater marshes.

**e. Review proposed development activities within habitat areas:**

Residential and commercial development of sensitive habitats within and abutting resource areas (for example, salt marshes, estuarine coasts, dunes, coastal banks, protected coves and bays) can have a major, cumulative negative impact on the survival of terrapin populations. Such projects can also have a positive effect in enhancing the habitat with often minimal alteration. Prior to approval by local and state authorities, these projects should be reviewed by a knowledgeable biologist/ecologist with an eye to minimizing short-term disturbance to the resource area, and to enhancing long-term viability of the habitat.

**f. Review proposed dredging of estuaries and coastal systems:**

Boats yards, marinas, landings, piers and docks – residential, commercial and municipal – are usually located directly in diamondback terrapin habitat. Turtles select these protected sites for the same reasons we do. Mating aggregations, foraging and hibernation occur in and under these protected waterways. Consequently,

dredging to maintain navigable channels poses the potential to seriously impact terrapin populations by disturbing their most critical water habitat. Because terrapins often hibernate in large aggregations under the soft bottom mud, a single dredging incident can have disastrous effects on a local population. Disposal of dredge spoils also has the potential for negatively impacting the resource, or for enhancing aspects of the upland habitat. Prior to approval by local and state authorities, dredging plans should be reviewed by a knowledgeable terrapin expert to ensure that timing of the activity and appropriate recovery protocols are included. The expert can also advise in disposing dredge spoils in an ecologically sound manner which might improve the long-term viability of terrapin habitat.

## **2. Ban harvest and/or capture:**

In those states where legal harvest or capture is permitted, ban or place a moratorium on harvest/capture until population size and health can be addressed. Harvest is a very small industry where it does occur, and terrapins simply do not have the life history characteristics of a species that can withstand harvest.

## **3. Prevent Drowning in Crab Traps:**

In areas where commercial or recreational crabbing occurs, mandate the use of TEDs/BRDs. Research has shown that specific types of inexpensive TEDs/BRDs are highly effective in preventing drowning of mature females without compromising the capture of blue crabs.

#### 4. Decrease Road Mortality:

a. Identify areas where terrapins cross roads and are killed in large numbers. Roadkills are devastating to terrapin populations because they kill nesting females-the most important and hard-to-replace members of the population.



b. Recruit and train volunteers to monitor roadways where heavy terrapin mortality occurs. Have a system in place to contact a wildlife veterinarian who may be able to save injured turtles and perhaps extract the eggs from road-killed females. If they are incubated under proper conditions in a laboratory or in protected locations within the nesting area, the eggs may develop into hatchlings that can then be released or possibly headstarted by an authorized individual or group.



Diamondback terrapin hatchlings

c. Construct by-pass tunnels that terrapins can cross safely where possible. Research shows that if barriers are constructed to guide turtles to tunnels, and tunnels are short enough to see the light at the other end, turtles will use them.

### **5. Education:**

Incorporate information about terrapins and their habitat requirements into local school and nature programs. Have a phone number of an individual or agency that can be contacted when a terrapin is sighted or found so that local researchers can follow up on the observations. **Terrapins are part of our local natural resource. They should be valued and protected.**

### **Bibliography**

Bertness, M. D. 1984. Habitat and community modification by an introduced herbivorous snail. *Ecology* 65 (2) 370-381

Butler, J. A. and G.L. Heinrich, 2004. Effectiveness of a by-catch reduction device on crab pots in Florida. Third Workshop on the Ecology, Status and Conservation of the Diamondback Terrapin. Jacksonville, FL.

Guillory, V. and P. Prejean. 1998. Effect of a terrapin excluder device on blue crab, *Callinectes sapidus*, crab catches. *Mar. Fisheries Rev.* 60 (1) 38-40.

Roosenburg, W.M. and J.P. Green. 2000. Impact of a bycatch reduction device on diamondback terrapin and blue crab capture in crab pots. *Ecol. Appli.* 10 (3) 882-889.

Watters, C. F. 2004. A review of rangewide regulations pertaining to diamondback terrapins. Third Workshop on Ecology, Status and Conservation of Diamondback terrapins, Jacksonville, FL

Wood, R.C. 1997. The impact of commercial crab traps on Northern Diamondback terrapins, *Malaclemys terrapin terrapin*. In *Conservation, Restoration and Management of Tortoises and Turtles-An International Conference*. pp.21-27. New York, NY: State University of New York, New York Turtle and Tortoise Society.

### **Further Reading**

Brennessel, B.A. 2006 , *Diamonds in the Marsh: A Natural History of the Diamondback Terrapin*. University Press of New England. Lebanon, NH.

**Contact information:** Resources for terrapin conservation.

**National Diamondback Terrapin Working Group**

<http://www.dtwg.org/>

**New England Area**

The Turtle Conservation Project: <http://www.newenglandturtles.com/>

Partners in Amphibian and Reptile Conservation (PARC-Northeast)

<http://www.parcplace.org/northeast.html>

**Massachusetts**

New England Aquarium: Boston, MA

<http://www.neaq.org/index.flash4.html>

Wellfleet Bay Wildlife Sanctuary, South Wellfleet, MA (508) 349-2615

[http://www.massaudubon.org/Nature\\_Connection/Sanctuaries/Wellfleet/index.php](http://www.massaudubon.org/Nature_Connection/Sanctuaries/Wellfleet/index.php)

Massachusetts Natural Heritage and Endangered Species Program (NHESP):

<http://www.mass.gov/dfwele/dfw/nhesp/nhturtle.htm>

SouthCoast Group; Cape Cod Consultants, 7 Vine Street, Marion, MA 02738  
(508-748-2130)

**Rhode Island**

Barrington Land Conservation Trust, Box 324, Barrington, RI 02896

<http://www.blct.org>

Rhode Island Natural History Survey. P.O. Box 1858, Kingston, RI 02881-1858

<http://www.rinhs.org>

**Connecticut**

Julie Victoria

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Wildlife Division, Wildlife Diversity Program

Franklin Swamp WMA, 391 Route 32, N. Franklin, CT 06254 (860-642-7239)

**New York**

NOAA Office of Ocean and Coastal Resource Management

<http://coastalmanagement.noaa.gov/mystate/ny.html>

The Nature Conservancy

<http://www.nature.org/wherewework/northamerica/states/newyork/preserves/art13656.html>