

C

Appendix



Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

26 June 1996

Carol Ridley
115 Kendrick Rd.
East Harwich, MA 02645

Re: Pleasant Bay ACEC Rare Species List

Dear Ms. Ridley,

Thank you for contacting the Natural Heritage and Endangered Species Program for information regarding state-listed rare species in the vicinity of the above referenced site. I have reviewed the site and would like to offer the following comments.

Our database indicates that the following state-listed rare species are found within or in close proximity to the Pleasant Bay ACEC:

<u>Animals</u>	<u>Status</u>
✓ Short-eared Owl (<i>Asio flammeus</i>)	Endangered
✓ Piping Plover (<i>Charadrius melodus</i>)	Threatened (State & Federal)
✓ Diamondback Terrapin (<i>Malaclemys terrapin</i>)	Threatened
✓ Water-willow Stem Borer (<i>Papaipema sulphurata</i>)	Threatened
✓ Eastern Box Turtle (<i>Terrapene carolina</i>)	Special Concern

<u>Plants</u>	<u>Status</u>
✓ Plymouth Gentian (<i>Sabatia kennedyana</i>)	Special Concern
✓ Bushy Rockrose (<i>Helianthemum dumosum</i>)	Special Concern
✓ Strignose Knotweed (<i>Polygonum setaceum</i>)	Special Concern
New England Blazing Star (<i>Liatrus scariosa</i> var. <i>novae-angliae</i>)	Special Concern

These species are protected under the Massachusetts Endangered Species Act (M.G.L. c.131A) and its implementing regulations (321 CMR 10.00). I have enclosed fact sheets on these species for your information (fact sheets are not available for Strignose Knotweed and New England Blazing Star). I have also enclosed the State's guidelines for Piping Plover management. If you have questions



Natural Heritage & Endangered Species Program

Route 135, Westborough, MA 01581 Tel: (508) 792-7270 x 200 Fax: (508) 792-7275
An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement

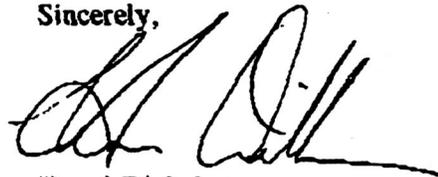


Page 2
Pleasant Bay ACEC
26 June 1996

concerning management guidelines for rare species in the Pleasant Bay ACEC I suggest that you contact Henry Barbour (508 792-7270 x.166), our Habitat Protection Specialist, at the Natural Heritage Program.

This evaluation is based on the most recent information available in the Natural Heritage database, which is constantly being expanded and updated through ongoing research and inventory.

Sincerely,

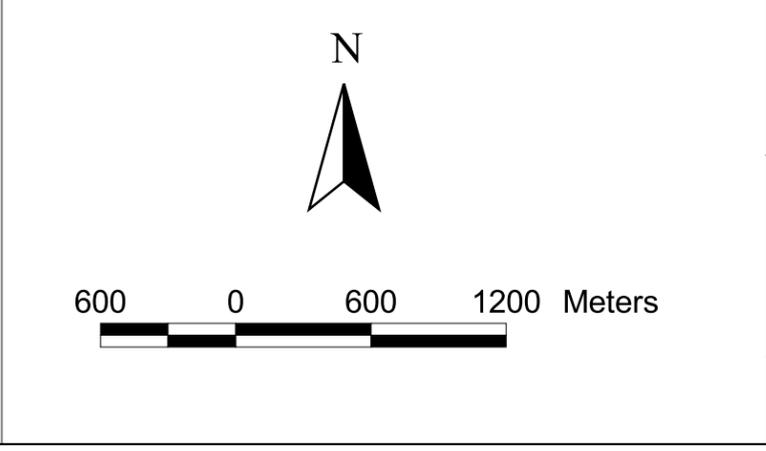
A handwritten signature in black ink, appearing to read 'Hanni Dinkeloo', written over a horizontal line.

Hanni Dinkeloo
Environmental Reviewer

cc. Leslie Luchonok, ACEC Program



-  Area of Critical Environmental Concern
-  NHESP 1999-2001 Estimated Habitats of Rare Wildlife: Use with Wetlands Protection
-  NHESP 1999-2001 Priority Habitats of State-Listed Rare Species: NOT equivalent to 'Significant Habitat' as designated under the Massachusetts Endangered Species Act





Horsley & Witten, Inc.
 phone: 508-833-6600,
www.horsleywitten.com

Pleasant Bay
 Area of Critical Environmental Concern
 Orleans and Chatham, Massachusetts
 Natural Heritage and Endangered Species Program
 Estimated and Priority Habitats

9/26/02 JLC
 File: x://2048Pleasant Bay/gis/acec.apr

Figure 13.



MASSACHUSETTS THREATENED SPECIES

Piping Plover
(Charadrius melodus)

DESCRIPTION: The Piping Plover is a small, stocky shorebird with pale brownish gray or sandy-colored plumage on its backside, with a white breast, forehead, cheeks, and throat, a black streak on the forecrown extending from eye to eye, and a black breastband which may not always form a complete circle. Its coloration gives it excellent camouflage in sandy areas. The average Piping Plover is 15 to 17 cm (6 to 7 in.) long, with a wingspan of 35 to 40 cm (14 to 16 in.). The tail is white at the base and tip, but dark in the middle. It has yellow-orange legs and its short bill is yellow-orange with a black tip in the summer, but turns completely black during the winter. In general, females have darker bills and lighter plumage than males. The Piping Plover runs in a pattern of brief starts and stops; in flight, it displays a pair of prominent white wing stripes. Its call is a series of piping whistles.

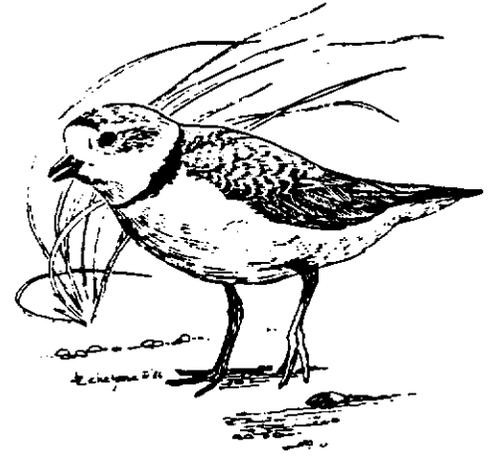


Illustration by J. Zickefoose, 1986

SIMILAR SPECIES IN MASSACHUSETTS: The Piping Plover is similar to the Semipalmated Plover (Charadrius semipalmatus) in size, shape, and coloration; both also share the same general habitat. However, the Semipalmated Plover is a darker brown in color, and has much more black on its head than the Piping Plover. The Semipalmated Plover does not breed in Massachusetts but passes through in large numbers from late July to early September during its southward migration.

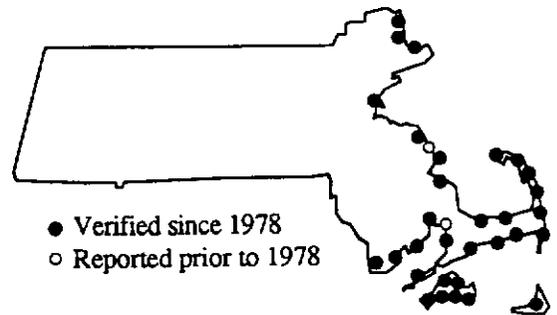
RANGE: During the summer, the Atlantic Coast population of Piping Plovers nests from the coast of Massachusetts north to Newfoundland, and south to Virginia and North Carolina. In winter they migrate farther south, from South Carolina to Florida, the Gulf of Mexico, and the West Indies. Other populations of Piping Plovers nest along rivers on the Northern Great Plains and along the shores of the Great Lakes, migrating to the Gulf of Mexico in the winter.

(continued overleaf)



Range of Piping Plover

- Winter range
- Summer (breeding) range



Massachusetts Distribution by Town

- Verified since 1978
- Reported prior to 1978

(Piping Plover, continued)

HABITAT: Piping Plovers in Massachusetts require sandy coastal beaches which are relatively flat and free of vegetation. They prefer the dry, light-colored sand found along the outer coastal shores. Piping Plovers often build their nests in a narrow area of land between the high tide line and the foot of the coastal dunes; they also nest in Least Tern colonies. Water is a critical necessity for Piping Plover habitat, since the birds feed exclusively on organisms which live along the shoreline.

LIFE CYCLE / BEHAVIOR: As soon as Piping Plovers return to their breeding grounds in Massachusetts in late March or April, the males begin to set up territories and attract mates. Territorial rivalry between males is very strong; adjacent male Piping Plovers mark off their territories by running side by side down to the waterline. Each bird takes turns, one running forward a few feet, then waiting for the other to do likewise. Nests are usually at least 200 feet apart; the nesting pair will confront any intruding Piping Plover which approaches the nest. Male Piping Plovers also defend feeding territories encompassing beach front adjacent to the nesting territory.

Courtship consists of a ritualized display by the male, who flies in ovals or figure-eights around a female, then displays on the ground by bowing his head, dropping his wings, and walking in circles around the female. The male also scrapes shallow depressions in the sand at potential nest sites. The female then chooses one of these nesting sites, usually in a flat, sandy area. The nest itself is a shallow depression which is often lined with shell fragments and small pebbles, which may aid in camouflaging the eggs. Female Piping Plovers typically lay four eggs per clutch, one egg every other day over a week's time. The eggs are sandy gray in color with dark brown or black spots, and all hatch within 4 to 8 hours of each other. Both parents take part in incubating the eggs until they hatch 3 to 4 weeks later.

The young chicks leave the nest within 2 to 3 hours after hatching and may wander several hundred meters before they become capable of flight. When threatened by predators or human intruders, the young run or lie motionless on the sand while their parents often pretend to have broken wings in an effort to attract the intruder's attention away from the chicks. Young Piping Plovers are brooded by their parents for 3 to 4 weeks and finally fledge 4 to 5 weeks after hatching, at which time they leave the nesting area.

Piping Plovers feed on marine worms, molluscs, insects, and crustaceans. They forage along the waterline, on mudflats at low tide, and in wrack along the beach. Foraging behavior consists of running a short distance, then staring at the ground with the head tilted to one side, often standing on one foot while vibrating the other foot on the ground, and finally pecking at the food item it has detected in the sand.

Piping Plovers begin to migrate southward between late July and early September, although occasional stragglers remain behind until late October. Adult birds often return to the same nesting area every spring, although they frequently change mates from year to year. Young birds may nest anywhere from a few hundred feet to many miles from where they were hatched.

POPULATION STATUS IN MASSACHUSETTS: The Atlantic Coast population of Piping Plovers is listed as Threatened at both the state and federal levels. In 1990, 139 breeding pairs from 58 sites in Massachusetts were documented. Massachusetts has the second largest population of Piping Plovers along the Atlantic Coast.

Habitat loss due to development of coastal areas and waterways has caused a catastrophic decline in the Piping Plover population over the last 50 years. Predation on eggs and young has also increased due to the growing number of foxes, skunks, raccoons, and other predators that thrive in suburban areas. Due to their cryptic coloration, the nearly invisible eggs and chicks are often unintentionally crushed by off-road vehicles (ORV's) and pedestrians on the beach. Continual disturbance of nest sites from recreational use of the state's beaches may lead some breeding pairs to abandon their nests. Severe storms can wash away and destroy eggs.

In recent years, the placement of wire enclosures surrounding Piping Plover nest sites has drastically reduced predation at many nest sites. Protection of essential habitat from development and restriction of ORV use in these areas is crucial in order to maintain a healthy population of Piping Plovers in Massachusetts.



Piping Plover

(*Charadrius melodus*)

Piping plovers have been described as everything from wind-up toys to tennis balls rolling along the sandy beaches of the coast. Sometimes they blend into the beach so thoroughly that they are almost impossible to see. Like other plovers, they run in short starts and stops.

The piping plover's name comes from its call-notes, plaintive bell-like whistles that are often heard before the birds are seen. When sitting still, their buff-colored plumage, black necks, and black forehead bands make them virtually invisible in the sand. From a distance, the scrapes in the sand that are their nests and their buff-colored eggs speckled with tiny black dots are indistinguishable from the beach. But although these adaptations protect plovers from natural predators, they do not help protect them from human activities, which have become the greatest threat to their survival.

Life History

The piping plover breeds on coastal beaches from Newfoundland and the Gulf of Maine to North Carolina. They winter primarily on the Atlantic Coast from the Carolinas to Florida, but also as far south as the Yucatan Peninsula, the Bahamas, and the West Indies. Between March and April, piping plovers make the long flight from these wintering grounds to the beaches of the mid- and north Atlantic. They establish territories on these beaches, mate, and scratch out shallow nests in the unvegetated sand above the high tide line. Nests are no more than shallow depressions lined with shell fragments or pebbles.

Adults tend to return to beaches where they previously nested, arriving at breeding grounds on Gulf of Maine beaches in early April. Mating involves courtship displays that include mock nest scraping, pebble-tossing, tilts, and low, shallow flights. Incubation responsibilities are shared by both the male and the female. Their four eggs hatch after approximately 28 days, and the hatchlings soon follow their parents to forage for marine worms, crustaceans, and insects on the beach.

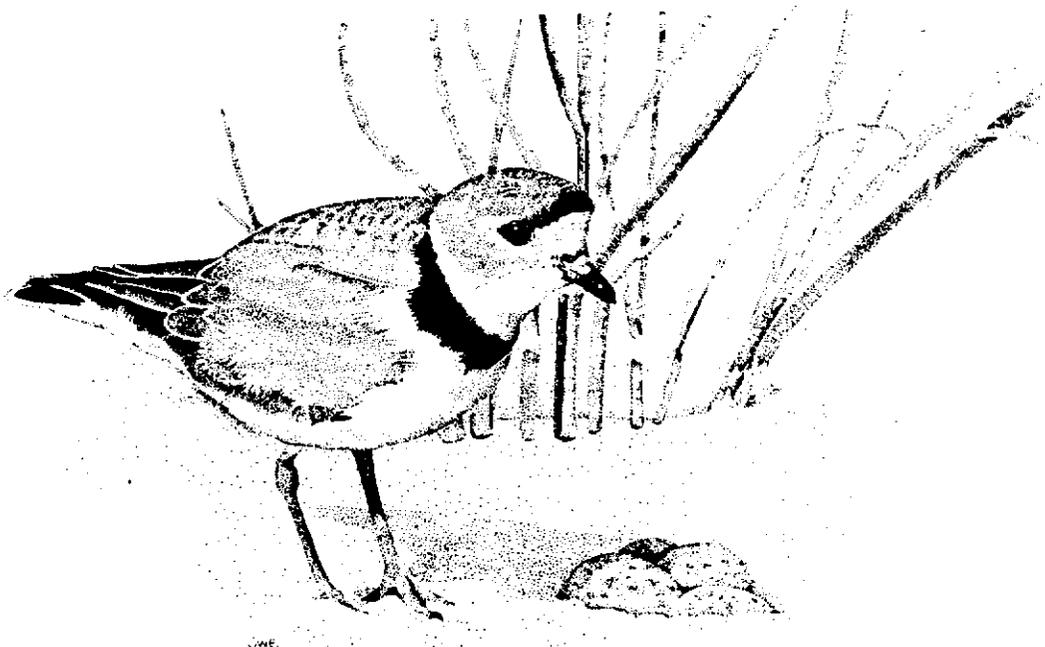
Once the hatchlings emerge, it generally takes about 30 to 35 days for them to learn to fly. If a predator or intruder approaches, the young become motionless while their parents try to divert the intruder's attention to themselves, often by pretending to hobble around with a broken wing.

Distribution, Abundance, and Threats

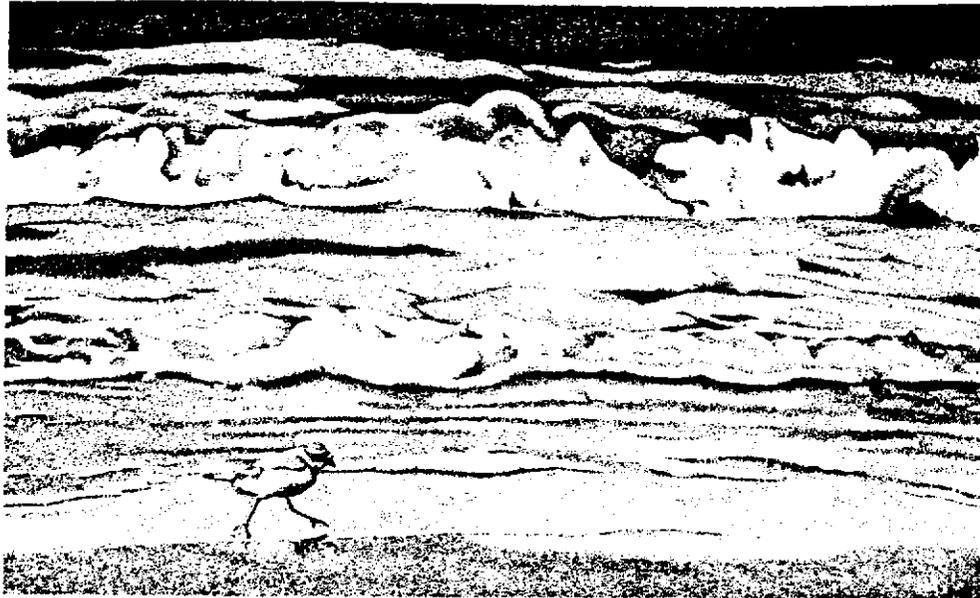
Historically, piping plovers were abundant in sandy coastal habitat throughout their range. But by the late 1800s, commercial hunting for feathers—primarily to decorate hats—nearly wiped out the species. Federal protection by the Migratory Bird Treaty Act of 1918 allowed piping plovers to recover to record numbers in the 1940s, but recent habitat loss and disturbance on beaches has caused a new and serious decline in their population. Most recent surveys count the entire Atlantic population at less than 1,000 pairs. Two other breeding populations of piping plovers exist in the United States; one on the Great Plains and the other in the Great Lakes region.

Human disturbance currently is the greatest threat to the piping plover's survival. People may intentionally or accidentally destroy nests and eggs by walking or driving over them on the beach. Hatchlings may often seek shelter in tire tracks left on beaches. This further camouflages them and makes them especially vulnerable to beach vehicles. Pets can harass adults off their nests long enough to cause overheating or chilling of eggs or even complete abandonment of chicks, exposing them to natural predators such as crows, gulls, red foxes, skunks, or rats.

Both human activities and natural changes in the piping plover's habitat have had serious impacts on the future of this species in the Gulf of Maine. Recently, beach erosion between breeding seasons



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eliminated nesting sites along the Morse River in Phippsburg, Maine. In the 1960s, construction of a housing development in Scarborough, Maine, completely eradicated a prime nesting area for piping plovers and least terns. Summer storms with high winds or tides can bury or wash out nests. Vegetation can encroach and crowd out plovers, and even dune restoration programs must remain sensitive to the dune characteristics plovers need for their nests.

Protecting the Piping Plover

The piping plover came under the protection of the Endangered Species Act in January of 1986. It is listed as a threatened species, which means that without protection the remaining population would continue to decline. The Endangered Species Act prohibits taking, harassing, or harming piping plovers and assists in efforts to protect their habitat.

Piping Plover Facts

- Plovers have been recorded making as many as 5 nesting attempts in a single season, laying a total of 18 eggs.
- If left unattended long enough on sunny days when beachgoers often share plover habitat, plover eggs can actually cook on the hot sand.
- Piping plovers are one of several species of shorebirds nesting in Maine. Others are killdeer, willets, spotted sandpipers, snipe, and woodcock.

Since listing the piping plover, the U.S. Fish and Wildlife Service has formed recovery teams for the inland and Atlantic coast populations. These U.S. and Canadian research teams establish conservation priorities and procedures for restoring populations. Several projects are underway in the Gulf of Maine to protect the plover's breeding and wintering range. Nest exclosures (wire mesh fences around nest sites to exclude predators) and extensive use of informational signs to inform the public about sensitive areas are helping to protect plover habitat. Negotiations for purchase, easements, and consent agreements are underway with landowners. In some cases, predator control and habitat creation have kept nesting areas intact.

U.S. Fish and Wildlife Service

Protection of migratory birds, seabirds, anadromous fish, and endangered species in the Gulf of Maine is the responsibility of the U.S. Fish and Wildlife Service. The Service established the Gulf of Maine Project in Portland, Maine, to protect and restore the watershed's ecosystems and habitats by providing a bridge between all Service programs in the Gulf of Maine and by building partnerships among state and federal agencies, local organizations, and private citizens working to improve coastal habitats. The Gulf of Maine Project participates in EPA's National Estuary Programs in Massachusetts Bays and Casco Bay, Maine, providing information on fish and wildlife habitat needs in order to promote thorough consideration of living resources in the management planning process. The Project has brought together state, federal, and non-governmental representatives from each jurisdiction in the watershed to conduct a priority habitat identification process as part of the international initiative of the Gulf of Maine Council on the Marine Environment, and has developed a GIS (Geographic Information System) that includes data-sharing and coordination with state fish and wildlife agencies. The Project has established partnerships with local conservation groups and land trusts, and is conducting wetland trends analyses in the watershed to target specific areas for local action. For more information, contact the Gulf of Maine Project in Portland, Maine, at (207) 828-1080.

MASSACHUSETTS RARE AND ENDANGERED WILDLIFE

The Northern Diamondback Terrapin Malaclemys terrapin terrapin

Description

The Northern Diamondback Terrapin is a medium sized salt marsh turtle. It has a wedge shaped carapace (top shell) variably colored in ash greys, light browns, and blacks. Concentric rings pattern the pronounced shell plates often forming ridges and bumps. The bottom of the shell, the plastron, also varies in color from yellowish-gray and orange to greenish yellow. Both sexes have grayish to black skin spotted with dark green flecks. This turtle has very large, paddlelike hind feet that are strongly webbed. The adult females are much larger than the males ranging from 6-9 inches (15-23 cm). Adult males reach a length of 4-6 inches (10-15 cm). Hatchlings range from two and a half to five centimeters in length.

Range

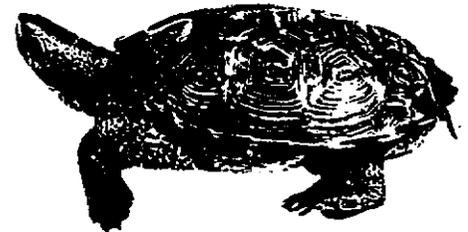
The Northern Diamondback Terrapin is distributed along the Atlantic coast from Cape Cod, Massachusetts south to Cape Hatteras, North Carolina. Other subspecies are found along the southern Atlantic and Gulf coasts to Texas.

Habitat

Northern Diamondback Terrapins inhabit marshes which border quiet salt or brackish tidal waters. They can also be found in mud flats, shallow bays, coves, and tidal estuaries. Adjacent sandy dry upland areas are required for nesting. During the winter, the Northern Diamondback Terrapin hibernates on the bottoms of ponds, streams, and estuary channels.

Feeding Habits

The Northern Diamondback Terrapin feeds on fish, crustaceans, mollusks, insects, and succulent marsh plants. It forages while floating.



Laell, James Jr. Reptiles and Amphibians in Massachusetts, p. 25, 1972.

Continued Overleaf



Distribution of Northern Diamondback
Terrapins



- Verified since 1978
- Reported prior to 1978

Distribution in Massachusetts by Town

Breeding and Nesting Habits

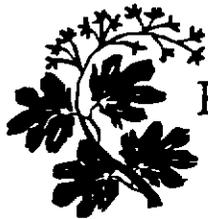
The Northern Diamondback Terrapin is polygamous (each individual may breed with several others), and mates in the water. Females are capable of retaining viable spermatozoa for up to four years without subsequent matings. After breeding, females start the trip from the water during periods of high tides to their nesting sites which are usually located on high dunes. The journey may reach up to 1600 meters and take as long as 48 hours. The female digs a nest about 5 inches deep and then deposits a clutch of approximately 10 eggs. Laying occurs twice a year, usually in May and again in August. Incubation of the eggs lasts between 87 and 108 days depending on the temperature. When the climate is unseasonably cold, hatchlings may overwinter in their nest waiting until the following April and May to erupt from the sand. It may take from 2 to 11 days after the eggs hatch for the young turtles to emerge and start the hazardous trip from the nest to the water. Part of this time is spent rotating towards the sun in what is thought to be an orientation behavior.

Comprehensive studies of Massachusetts Northern Diamondback Terrapins have revealed nesting behavior and practices atypical of more southern terrapins. On Cape Cod, Northern Diamondback Terrapins were observed nesting during both day and night and on both vegetated and unvegetated dunes in contrast to southern turtles that were reported nesting only during the day and only on vegetated dunes. Eggs laid in unvegetated areas (although more susceptible to wind erosion), receive more heat thereby decreasing incubation time. The few hatchlings that survive the immense risks of early life mature at 5 or 6 years of age.

Population Status

There are only 17 known current occurrences of the Northern Diamondback Terrapin in Massachusetts. Presently, this species is listed as Threatened by the Massachusetts Division of Fisheries and Wildlife. There are a number of factors contributing to the decline of Northern Diamondback Terrapins in the state. Originally, this species was nearly wiped out by gourmet consumption around the turn of the century. Today, the harvest of diamondbacks is illegal in Massachusetts but the species continues to experience a high nest mortality and decline in numbers caused by human made disruptions and environmental impacts. The Northern Diamondback Turtle's strongest population is located on Cape Cod where recreational activity disrupts nesting turtles and hatchlings. Off road vehicles create ruts deep enough so that the chances of migrating hatchlings getting crushed by vehicles is increased as well as their vulnerability to predation by gulls and crows. These predators have been observed standing on the edges and simply scooping up the turtles as they get caught in the ruts. Off road vehicles also interfere with nesting patterns to such an extent that the females will engage in false nesting. They head for the dunes with the intention of egg laying but turn around and go back to the water at any detection of threatening activity. This disrupts the egg laying processes and reduces the viability of the clutch by prolonging the length of time that the eggs are retained by the females. Beach goers and people walking on the dunes also have this effect as well as disrupting the sand substrate so deeply that nests are impaired due to the increased erosion which results.

An additional cause of mortality observed on Cape Cod is the infiltration into nests and eggs of rootlets from the rhizomes of dune grass. In 1978, the grass Ammophila breviligulata penetrated and surrounded half of the nests that were located on vegetated dunes. Parasitism by maggots of a Sarcophagidea fly also adversely impacts eggs and hatchlings as do mammalian predators like skunks. Reduction of salt marsh habitat and alteration of water composition due to dredging and channelization, loss of sandy beach habitats, and destruction of dune areas continue to contribute to the decline of the Northern Diamondback Terrapin in Massachusetts.



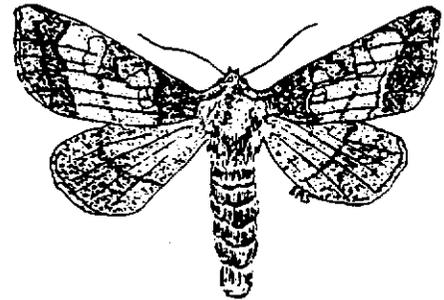
Natural Heritage &
Endangered Species
Program

Commonwealth of Massachusetts
Division of Fisheries & Wildlife
Route 135
Westborough, MA 01581
(508) 792-7270 ext. 200

MASSACHUSETTS THREATENED WILDLIFE

Water-willow Borer
(Papaipema sulphurata)

DESCRIPTION: The Water-willow Borer is a nocturnal moth of the Noctuidae Family, with a wingspan of 3 to 4 cm (1.25 to 1.5 inches). The coloration of its forewings is predominantly chrome-yellow to ochre, shaded with purple at the base and outer edges. Reniform (kidney-shaped) spots and orbicular spots are present, but are the same color as the rest of the wing. The hindwings are much duller, brown with ochre shading and a medial band.

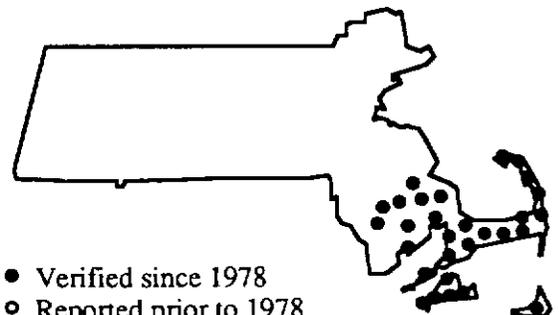


SIMILAR SPECIES: The Water-willow Borer is almost indistinguishable from the Burdock Borer Moth (Papaipema cataphracta), which is slightly less rusty in color. The larvae of P. cataphracta bore into and feed on many different species of plants, but rarely if ever utilize water-willow (Decodon verticillatus), which is the only plant used by P. sulphurata. In addition, P. cataphracta is absent from the coastal plain and therefore the ranges of the two species do not overlap.

Eileen Sonnenberg, Cape Naturalist, Summer 1988

RANGE: The Water-willow Borer is found only in southeastern Massachusetts and nowhere else in the world; it is Massachusetts' most globally restricted species of Lepidoptera.

HABITAT IN MASSACHUSETTS: Water-willow Borers are found only on Massachusetts' coastal plain, in the shallowest portions of vernal ponds and seasonally flooded swamps, and along upland edges of streams, ponds, and other permanent bodies of water. Only wetlands with an significant amount of water-willow within a restricted shallow water zone are inhabited by P. sulphurata.



- Verified since 1978
- Reported prior to 1978

Massachusetts Distribution by Town

BEHAVIOR / LIFE HISTORY: Adult female Water-willow Borers mate and lay eggs in late September or early October, presumably at the base of a clump of water-willows. The eggs lie dormant through the winter, and the larvae hatch in mid to late May. They must immediately find a fresh willow shoot and then bore into the stem, where they feed for most of the summer. A water-willow stem occupied by a larva can be recognized by a large round hole on the lower end of the stem, through which the larva removes its droppings. Pupation occurs inside the stem in mid-August, and the adult Water-willow Borer finally emerges from the stem in mid to late September. Adult Water-willow Borers are excellent fliers, and have a relatively long life span (three weeks) compared to many other moths, during which the adult Water-willow Borers must find a mate and reproduce before they die in early October.

POPULATION STATUS: The Water-willow Borer is listed as a Threatened Species in Massachusetts, due to its extremely small global distribution and low population size. There are 2 historical sites and 59 current sites in 29 towns in Massachusetts. Populations of Water-willow Borers at any given site appear to be unstable; local extinctions may commonly occur, followed by recolonization of the site by Water-willow Borers from other nearby areas. It is unknown why P. sulphurata is restricted to southeastern Massachusetts despite its excellent flying ability and the abundance of water-willow in the eastern United States. There are some possible explanations, however. It may be that the water-table fluctuations in Massachusetts' coastal plain are different from any other area in the Northeast; P. sulphurata may only be able to survive in these very specific water-table conditions, which partially expose the lower stems of water-willows above water in summer, but still leave them in enough water to deter predation by rodents. It is recommended that the water level of P. sulphurata habitats not be changed by damming, draining or other activities, as this could adversely affect the moths. In addition, pesticides should not be used in these areas, and trails should not be established along the upper edges of P. sulphurata ponds to prevent trampling of the water-willow.



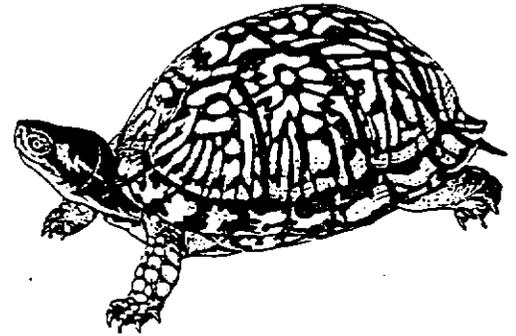
Natural Heritage &
Endangered Species
Program

Commonwealth of Massachusetts
Division of Fisheries & Wildlife
Route 135
Westborough, MA 01581
(508) 792-7270

MASSACHUSETTS SPECIES OF SPECIAL CONCERN

Eastern Box Turtle
(Terrapene carolina carolina)

DESCRIPTION: The Eastern Box Turtle is a small, terrestrial turtle ranging from 11.4–20.3 cm (4.5–8 in.) in length. It is so named because it is the only North American turtle that when threatened is able to enclose head, legs, and tail completely within the protective armor of its upper (carapace) and lower (plastron) shells. The adult box turtle has a short, broadly oval, high dome shell with variable markings and coloration. The carapace is usually dark brown or black with numerous irregular yellow, orange, or reddish spots, blotches, or stripes in each carapace shield. The plastron may be tan to dark-brown or black, patternless or variably patterned light and dark—almost a mottled pattern of dark brown/black or tan/yellow; its surface either concentrically ridged or smooth; and divided into two movable portions by a strong hinge. The head, neck, and legs also vary in color and markings but are generally dark with orange or yellow mottling. The Eastern Box Turtle has four toes on its hind feet; a short tail; and an upper jaw ending in a down-turned beak.



DeGraaf, Richard M. and Rudis, Deborah D.
Amphibians and Reptiles of New England.
Amherst, Massachusetts: The University of
Massachusetts, 1983.

Although there are no striking sexual differences between the male and female Eastern Box Turtles, there are, however, external features that generally distinguish between the male and female. The male box turtle usually has bright-red to red-orange eyes, with those of the female being gray-brown, yellowish-brown or very dark-red. The rear lobe of the male plastron is concave, and that of the female is flat or slightly convex. The hind legs of the male are heavier and the claws stouter, shorter and more curved than the female. Males have longer, thicker tails, with the vent located farther from the shell and closer to the tip of the tail than the female. Both sexes are generally mild-mannered.



Range of the Eastern Box Turtle



Distribution in Massachusetts
Since 1978

Hatchlings have a flat, brownish-gray carapace with a yellow spot on each large scute; and yellow along the outer rim of the carapace, the mid-dorsal keel, and the lower mandible. The plastron is yellow to cream-colored with a black central blotch and yellow margining along the outside edge. The plastral hinge is not functional and poorly developed. The tail is long in comparison with that of the adult. Hatchlings, if molested, emit a strong odor to repel predators; an adaptation that is lost later on.

SPECIES SIMILAR IN MASSACHUSETTS: The Blanding's Turtle (*Emydoidea blandingi*) is the only species of turtle in Massachusetts that resembles the Eastern Box. Often referred to as the "semi-box turtle," the Blanding's Turtle has a hinged plastron enabling the turtle to pull its exposed part upwards towards its carapace but with less closure than in the Eastern Box Turtle. Outside of this specific adaptation, there is little or no similarity either in appearance or behavior between the two species. The Blanding's Turtle is essentially aquatic whereas the Eastern Box Turtle is terrestrial.

RANGE: The range of the Eastern Box Turtle is from southeastern Maine; south to northern Florida; and west to Michigan, Illinois, and Tennessee. Although the Eastern Box Turtle occurs almost statewide in Massachusetts, the majority of the population occurs in the southeastern section of the Bay State, just west of Cape Cod.

HABITAT IN MASSACHUSETTS: The Eastern Box Turtle is a woodland species, although in the northeast it also occurs in pastures and marshy meadows. It is found in both dry and moist woodlands, brushy fields, thickets, marshes, bogs, stream banks, and well-drained bottomland. It prefers open deciduous forests but has also been found on mountain slopes in Massachusetts. In optimal habitats in Cape Cod pine barrens and oak thickets, the species is generally associated with cranberry dominated swales interspersed with bearberry ground cover, low bush blueberries, and thickets of bracken fern.

LIFECYCLE/BEHAVIOR: The Eastern Box Turtle usually hibernates in the northern parts of its range from late October or November until sometime in April. In the deep south, it may remain semiactive throughout the winter. Hibernation generally begins at the time of the first killing frost. As many as four box turtles may share the same winter quarters, which range in type from loose soil, sand, vegetable debris and mud bottoms of ponds or streams to animal burrows or stump holes. As soil temperatures drop, the turtles burrow into the soft ground for a depth of from three inches to two feet. Females tend to hibernate first, with the males lingering to ensure that all females have been fertilized. They normally emerge from hibernation in April, but some individuals may emerge prematurely during warm spells in winter and early spring and perish from exposure.

Mating may take place as soon as the turtles emerge from hibernation or at any time until they enter hibernation again. Courtship begins with the male circling the female and biting at her shell, head, and legs, before mounting. Females nest from May to July and can lay fertile eggs up to four years after a single mating. Nesting areas may be in hay fields, roadsides, cultivated gardens, lawns, beach dunes, and woodland, and around house foundations. The eggs are deposited in a flask-shaped nest dug by the female's hind feet in loose soil at an elevated site, usually in an open area in close proximity to the previous years' nest. Egg laying occurs during the late afternoon-early evening and continues for up to five hours. Three to eight (usually four or five) thin, white, elliptical eggs are deposited by the female at intervals of one to six minutes; arranged in the nest by the hind feet; and then covered with soil by the hind legs and plastron. After the eggs are covered, the female crawls away, leaving the eggs unattended to incubate. The incubation period depends on soil temperature but generally the hatchlings emerge about 87-89 days after laying, usually in September. They may overwinter in the natal nest and emerge the following spring.

During the first four or five years of life, box turtles may grow at a rate of from half an inch to about three-quarters of an inch a year. Sexual maturity is thought to occur later in New England than in its southern range and may take up to 10 years to attain. It is believed that full growth is reached in about 20 years. The average life expectancy of a box turtle is between 40 and 50 years, but evidence shows that they can live as long as 80 to 123 years.

The Eastern Box Turtle is omnivorous, showing marked changes in food preferences from youth to maturity and from season to season. When young, it is chiefly carnivorous, feeding on insect larvae, slugs, earthworms, snails, spiders, crayfish, millipedes, fish, frogs, salamanders, a small percentage of vegetable material, and even carrion. At

approximately six years of age, box turtles develop a fondness for fungi (primarily mushrooms), berries, fruits, leafy vegetables, roots, stems, leaves and seeds. The adults take animal food with less frequency than young turtles.

In summer, adult box turtles are most often encountered in open woodlands in morning or evening, particularly after a rainfall. To avoid the heat of the day, they often seek shelter under rotting logs or masses of decaying leaves, in mammal burrows, or in mud. Though known as "land turtles", in hottest weather they frequently enter shaded shallow pools and puddles and remain there for periods varying from a few hours to a few days. In the cooler temperatures of spring and fall, box turtles forage at any daylight hour. They are diurnal, and scoop out a "form" (a small domelike space) in leaf litter, grasses, ferns, or mosses where they spend the night. These forms are often used on more than one occasion over a period of weeks. Juvenile box turtles are rarely seen. Immediately after hatching they seek a swamp or pond and immerse themselves in sphagnum moss or mud, remaining well hidden.

The home ranges of box turtles of all ages and both sexes overlap. The turtles frequently occur together and show no antagonism over territorial domain. Movements within the home range vary from random meanderings to fairly direct traverses. Occasional trips outside the range are made by some individuals; these trips include searches for nesting sites. Most adults show some homing tendency over short distances, such as a kilometer or two, but long distances as a result of human interference usually kills them. They orient themselves by the sun and rely on their vision for guidance and mobility. They have very defined home ranges averaging about 100 to 225 meters (100 to 750 ft.) in diameter. Some individual are transient and do not establish home ranges.

POPULATION STATUS: The Eastern Box Turtle has been declining in numbers throughout its range in Massachusetts and is presently listed as a "Species of Special Concern" in this state. Since 1978, only 187 sightings have been reported to the Natural Heritage and Endangered Species Program, with heaviest concentrations in the southeastern part of the state and Cape Cod. Many of the sightings are road crossings or single individuals making it difficult to estimate the size of the population. There are several reasons for this decline: habitat destruction resulting from residential and industrial development and concurrent dissection of the landscape with roads; deliberate and inadvertent highway mortality; collection by individuals for pets; destruction of nests and young by skunks, coyotes, foxes, crows, dogs, and raccoons; and genetic degradation of the native stock by imported captives that escape or are released.

MANAGEMENT RECOMMENDATION: The greatest threat to the survival of the Eastern Box Turtle in Massachusetts is the fragmentation and destruction of its habitat. The bisection of its habitat by roads can reduce or destroy populations. Due to the decline of farming in Massachusetts, agricultural land is being returned to woodland. A mixture of regeneration, selective cutting and even selective burning of woodland may be beneficial to the Eastern Box Turtle. Large roadless areas of optimal habitat need to be preserved, especially in the Box Turtle's stronghold of Cape Cod. Though a law exists to protect against the importation, transportation, and release of wild animals in Massachusetts, this law, and the biological reasoning behind it, need exposure and publicity in the community at large, as well as enforcement. To ensure the long term survival of the Eastern Box Turtle, protection of its habitat is needed, as is education of the public about the detrimental affects of removing turtles from their natural habitats and keeping them as pets. Enforcement of the Massachusetts Endangered Species Act prohibiting the killing, molestation, and possession of the Eastern Box Turtle must also be improved. People should be encouraged to help box turtles across roads (always in the direction the animal is heading), and should be made aware that box turtles should never be transported or captured as pets. Finally, the practice of releasing non-native box turtles must be discouraged to protect the genetic integrity of native populations.

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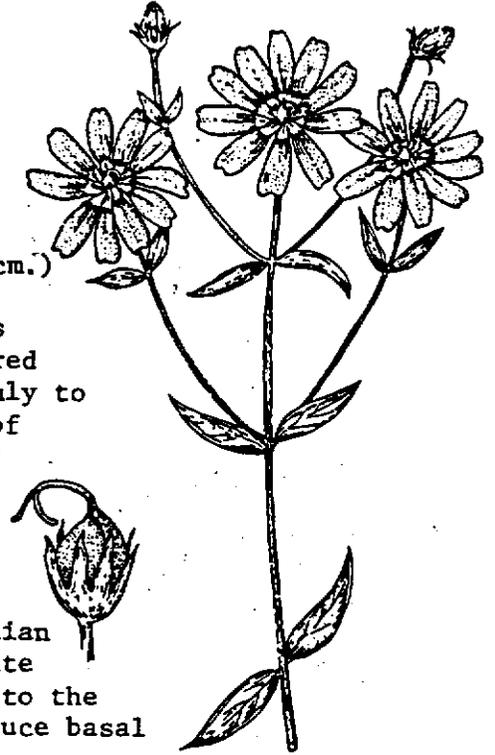
MASSACHUSETTS RARE AND ENDANGERED PLANTS

PLYMOUTH GENTIAN

(Sabatia kennedyana Fern.)

DESCRIPTION

The Plymouth Gentian is a perennial herb, 12-25" (30-65cm.) tall, with narrowly lanceolate leaves 1-2" (2-5cm.) long. Its stems often bear a few alternating branches which terminate in long-pediceled flowers. The flowers are about 2" (5cm.) across, with a yellow center bordered with red and have 9-11 petals. It blooms from early July to mid September, depending on water levels. As a means of reproduction, it sends horizontal branches (or stolons) at or near the base of the plant that take root and develop into new plants.



SIMILAR PLANTS IN MASSACHUSETTS

Pink Tickseed (Coreopsis rosea) resembles Plymouth Gentian in this habitat except that Pink Tickseed has a composite flower that is much smaller and without the red border to the yellow center. It has linear leaves, and does not produce basal leaf clusters.

HABITAT IN MASSACHUSETTS

This species is found only on sandy to peaty shores of freshwater ponds on the coastal plain. It grows in large linear patches along the shore when water level drops. The water level of these ponds must fluctuate periodically to inundate the margins and stop invading shrubs. Species found in association with Plymouth Gentian include Eleocharis melanocarpa (Black-fruited Spike-rush), Drosera filiformis (Threadleaf Sundew), Fuirena pumila (Umbrella-grass), Gratiola aurea (Golden-pert), and Coreopsis rosea (Pink Tickseed).

Crow, G.E. New England's Rare, Threatened, and Endangered Plants. U.S. Fish and Wildlife Service, 1987.

(continued overleaf)



Distribution of Plymouth Gentian



● Verified since 1978
○ Reported prior to 1978
Distribution in Massachusetts by Town

PLYMOUTH GENTIAN (continued)

RANGE

Plymouth Gentian has a disjunct range, occurring only in small areas of southern Nova Scotia, southeastern Massachusetts, Rhode Island, North and South Carolina.

POPULATION STATUS

Plymouth Gentian is considered a species of "Special Concern" in Massachusetts. Currently, 1978 to present, 112 occurrences have been verified; historically 37 other occurrences have been reported. This species is rare because of its limited range. Additionally, development and recreational use of coastal plain ponds leads to trampling and destruction of this habitat, and pond contamination from run-off and faulty septic systems.

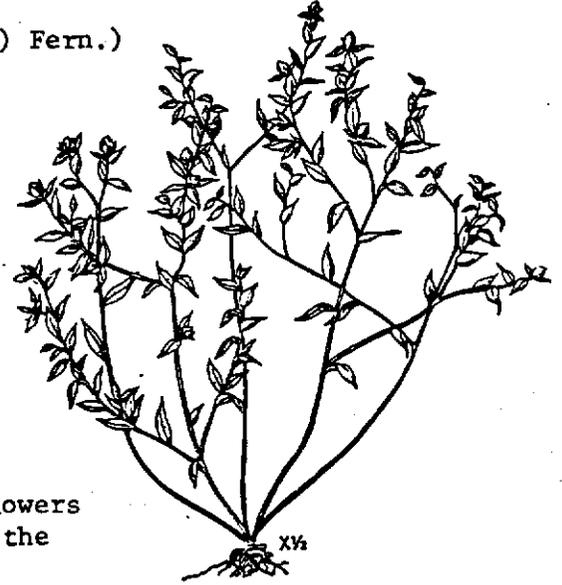
MASSACHUSETTS RARE AND ENDANGERED PLANTS

BUSHY ROCKROSE

(Helianthemum dumosum (Bickn.) Fern.)

DESCRIPTION

Bushy Rockrose is a perennial herb, loosely branched spreading to reddish stems that form low mounds from 1-10" (2.5-25cm.) high. Stems are covered with short coarse hairs. Leaves are elliptic to narrowly oblong, usually 1/3-2/3" (8-15mm.) long, green above and pale below; very densely pubescent with simple and stellate (branched in star-like pattern) hairs. Bushy Rockrose has two kinds of flowers, maturing at different times during the season and at different positions on the plant. In late May to mid-June flowers with yellow petals appear singly and terminally on the main branches. Along branches produced in July to September grow self-pollinating flowers which lack petals and do not open.



Gleason, H.A. The New Britton and Brown Illustrated Flora of the Northeastern U.S. and Adjacent Canada. New York Botanical Garden, 1952.

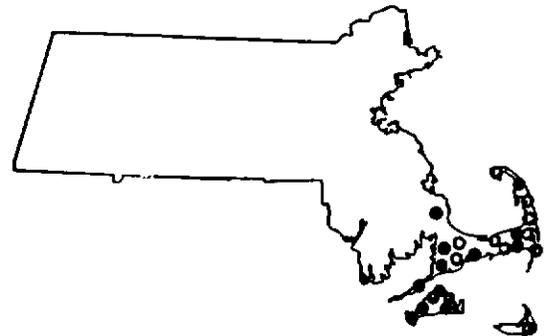
SIMILAR SPECIES IN MASSACHUSETTS

There are three other look-alike Rockrose species that occur within the habitat and range of Bushy Rockrose and could be easily mistaken for this species. Canadian Rockrose (H. canadense) is always erect, not as branched as Bushy Rockrose and is much less hairy. Low Rockrose (H. propinquum), a very uncommon species, has short ascending branches, prolific asexual flowers and only stellate hairs on the leaves and sepals. Hoary Frostweed (H. bicknellii) is usually unbranched, much taller, and covered with white fine stellate hairs.

(continued overleaf)



Distribution of Bushy Rockrose



● Verified since 1978
○ Reported prior to 1978

Distribution in Massachusetts by Town

BUSHY ROCKROSE (continued)

HABITAT IN MASSACHUSETTS

Bushy Rockrose inhabits dry, open sandplains, low-shrubby moors, and grassy openings in pine barrens. This plant seems to be intolerant of shade and moisture. Human altered habitats include cemeteries and golf course roughs. Species often found in the same habitat with Bushy Rockrose include Myrica pensylvanica (Bayberry), Arctostaphylos uva-ursi (Bearberry), Gaylussacia baccata (Black Huckleberry), and Andropogon scoparius (Little Bluestem).

RANGE

This species is endemic to southern New England and ranges from southeastern Massachusetts to Rhode Island and Long Island, New York.

POPULATION STATUS

Bushy Rockrose is considered a species of "Special Concern" in Massachusetts. Forty-nine occurrences have been verified from 1978 to the present; twenty-four other historical occurrences have also been recorded. This species has a very limited range. In addition, succession of its habitat to shrubs and forests, as well as loss of habitat to development, have contributed to its decline.



Natural Heritage &
Endangered Species
Program

Commonwealth of Massachusetts
Division of Fisheries & Wildlife
Route 135
Westborough, MA 01581
(508) 792-7270, ext. 200

MASSACHUSETTS PLANTS OF SPECIAL CONCERN

New England Blazing Star
(*Liatris scariosa* var. *novae-angliae*)

Description: New England Blazing Star, a member of the composite family, Asteraceae, is an attractive herbaceous perennial plant with tall purple spikes of flower heads in late summer. Particularly striking in mass, blazing stars are cultivated in gardens and for florists. The flower spike of New England Blazing Star has from 3 to 30 tufted, rose-purple heads of 35-60 flowers on smooth or weakly hairy, unbranched stems. The axis of the inflorescence is hairy and is 3 to 35cm (1 to 14 inches) long. The floral bracts are reddish, broad, and rounded, with narrow, almost petal-like margins. The fruits are hard and dry, and are 0.6 - 0.7cm (about a quarter inch) long. New England Blazing Star blooms from late- August through October, down from the top of the stem. The plants grow to 30 - 100cm (12 to 39 in) tall and arise from an underground corm. The stem has 20 to 60 densely crowded long narrow leaves below the flower spike; the leaves become smaller above the base of the stem. The basal leaves are 0.5 - 2.5cm wide.



Rickett, H.W. 1963. New Field Book of American Wild Flowers. G.P.Putnam's Sons. New York.

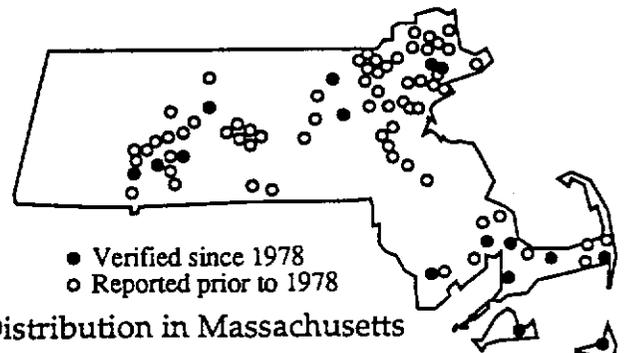
Similar Species in Massachusetts: New England Blazing Star, or Northern Blazing Star, is the only Blazing Star native to Massachusetts. It is part of a complex of species that is typified by a high degree of variation, the occurrence of hybrids where distributions overlap, and poor representation in most herbaria - all of which have rendered classification difficult. Several features distinguish this plant from other taxa, including numerous smooth, narrow basal leaves and numbers of flowers and flower heads. The most common scientific synonym for New England Blazing Star is *Liatris borealis*, the name that is used in the Federal register.

Range: Historically, New England Blazing Star occurred along the coastal plain from southwestern Maine to eastern New York and south to northern New Jersey and inland to central Pennsylvania. No plants have been seen recently in the western New York sites. Unfortunately, it no longer occurs naturally in New Jersey; the last site now has a highway on it. Because of hybridization, the status is confused in Pennsylvania, with the northeastern sites being closest to New England Blazing Star.

Habitat in Massachusetts: New England Blazing Star occurs in open areas with dry, sandy, low nutrient soils that are supporting early to mid-successional communities, usually sandplain grasslands or coastal heathlands. These rare and local plant communities are scattered along New England coast, persisting where human land use practices and natural stresses from salt spray, fire and storms inhibit the growth of woody shrubs and trees. These conditions are encountered in southeastern areas of Massachusetts, and on sand terraces along the Connecticut River.



New England Blazing Star
Historic Range



● Verified since 1978
○ Reported prior to 1978
Distribution in Massachusetts

New England Blazing Star can also grow in maintained or disturbed areas such as road edges and powerline openings as long as trees are excluded. Species found co-occurring with New England Blazing Star include species of coastal grassland, heathland, and dune systems: Little Bluestem (*Schizachyrium scoparium*), Pennsylvania Sedge (*Carex pensylvanica*), Sweet Fern (*Comptonia peregrina*), Bayberry (*Myrica pensylvanica*), Golden Aster (*Chrysopsis falcata*), and Stiff Aster (*Aster linariifolius*). Sandplain grassland communities generally include Little Bluestem, Pennsylvania Sedge, Hair Grass (*Deschampsia flexuosa*), Wild Indigo (*Baptisia tinctoria*), Bush Clover (*Lespedeza* spp.), and Goat's Rue (*Tephrosia virginiana*). Symbiotic nitrogen fixation aids the survival of the legumes in the highly leached, nutrient poor soils characteristic of grasslands and heathlands; then the litter from these species provides some nitrogen to other species. Also characteristic of grasslands are other low, broadleaved herbs such as asters, Bird's foot Violet (*Viola pedata*), dewberries (*Rubus* spp.) and Bushy Rockrose (*Helianthemum dumosum*). Coastal heathlands, limited to the coast from Maine to northern New Jersey, are dominated by ericaceous shrub communities but have many of the same species occurring in sandplain grasslands. These communities are characterized by the dominance of Bearberry (*Arctostaphylos uva-ursi*), golden heather (*Hudsonia ericoides*), huckleberry (*Gaylussacia baccata*), lowbush blueberry (*Vaccinium angustifolia*), or scrub oak (*Quercus ilicifolia*). Heathlands occur as openings within pitch pine scrub oak communities, as parts of mosaics with pine barrens or grasslands, and other places extend over large areas. Community composition in these areas is in part defined by land use history and fire patterning.

Population Status in Massachusetts: New England Blazing Star is currently listed as a Species of Special Concern in Massachusetts and is a candidate species for federal listing. As with all species listed in Massachusetts, individuals of the species are protected from unauthorized collection, picking or killing, and sale under the Massachusetts Endangered Species Act. This species clearly prefers frequent disturbance and shows intolerance of shade or competition from encroaching woody plants; it has lost habitat to widespread succession of open grasslands and heathlands to forests. Changes in human land use practices have had a major part in changing the amount of open land. In the past, grazing, agriculture and fire opened up abundant suitable habitat for this species, as indicated by MNHESP records of historical occurrences from 62 towns and current records from 16 towns (35 documented sites within those 16 Massachusetts towns). Currently it persists in the Southern Connecticut Valley, near Fort Devens, and Middlesex and Essex Counties, but the Cape and the Islands support the largest populations.

Most populations are small and have fewer than 200 individuals. Only a few coastal and inland populations have numbers near or greater than 1000 individuals. Nantucket may have the greatest number of occurrences but the number of individuals per colony is low (<200). Presently, the species is undergoing a significant decline throughout most of its range with recruitment of juvenile plants into wild populations occurring at a very nominal rate. Throughout its entire range, with 67 known (1991) sites, only 20 sites had more than 50 individuals.

MANAGEMENT RECOMMENDATIONS: As with most rare plants, exact needs for the management of New England Blazing Star have not been clearly identified. The following comes from observations of the populations in Massachusetts and studies done with populations in heathlands in southern Maine.

The research conducted in southern Maine demonstrated that prescribed fire increased the number of seeds per flowerhead, possibly as a result of increased nutrient availability for perennial plants whose roots remain viable after a fire. The populations of seed-eating insects immediately after a fire was dramatically less than in unburned plots, or those plots in later years. For sprouts and seedlings, fire removed a thick organic litter layer and left an exposed substrate that maximized the contact between seeds and the soil, which increased germination, and improved light and moisture conditions for the germinated seeds.

While the plant fares well in early to mid-successional communities its ability to compete lessens as shrubs and trees invade the communities. The relationship between the success of New England Blazing Star and the role of fire as a disturbance mechanism indicates that the fire tolerant plants will display more vigorous growth in those periods following a fire. The fire serves to maintain the communities at earlier successional stages and lessens competition. Prescribed burns might be experimentally incorporated into management practices while concurrently serving as a vehicle for research. Mowing, timed to avoid the growing season, would provide some of the benefits seen from fire: woody plants would be reduced and kept from maturing. However, mowing increases thatch layers, so would not have the benefits of increasing seed contact with mineral soil, and probably would not effect the seed predators.

Preservation of sandplain grasslands and heathlands is of the utmost importance as they are being threatened by lack of fire, human caused disturbance such as off-road vehicle use, and complete loss due to development. With the active suppression of fire in moderately natural areas and development on much of the flat, easily drained sandplain soils, the available habitat for New England Blazing Star and other associated species has been disappearing.

Liatris scariosa var. *novae-angliae*

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