



**Commonwealth of Massachusetts**  
State Reclamation and Mosquito Control Board



## **NORTHEAST MASSACHUSETTS MOSQUITO CONTROL & WETLANDS MANAGEMENT DISTRICT**

### **NORTH SHORE GREENHEAD FLY CONTROL PROJECT**

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[www.nemassmosquito.org](http://www.nemassmosquito.org)

Introduction of mosquito control district and greenhead program

## PROGRAM HISTORY

### Organized in 1955

- Coastal regions of Essex County
- Aerially sprayed for control
- Reduce nuisance from biting adults on beaches
- Early 1960's- program discontinued

### Re-organized in 1965

- Researched larval chemical control
- Ruled out due to non-target mortality

### 1968-Present

- Experiments with adult trapping
- Manitoba trap (Maine Forest Service)
- Many design modifications
- Current Box trap design 1971
- Octenol bait added after 1992
- Scent baiting = 3x more adults
- Environmentally friendly



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Greenhead flies are produced from our coastal marshes. Early settlers of the area reported their problem with biting insects and had to protect their stock.

Greenheads are usually found in healthy salt marsh areas and some studies have shown greenheads can be bioindicators of negative impacts and recovery to these environments, for example after oil spills. Marsh water management by ditching may also enhance greenhead production. Their eggs and larva are also a food source for wasps, coastal birds and fish. However, they are notorious pests with significant economic effects due to their aggressive and painful blood-feeding.

While total elimination of the greenhead problem is impossible and ecologically undesirable. The most sensible approach is to reduce the number of flies available to harass the public in areas of high intensity recreation such as beaches, marinas and summer residences.

The north shore greenhead fly control project was organized in 1955 to bring a measure of relief to the coastal areas of the North Shore. Each year the marshes were sprayed from the air resulting in a marked decrease in the number of greenhead flies during the height of the summer season.

In the early 60's, because of the decline in shellfish production in the area and the increased apprehension on the affect of these sprays on the shellfish by local residents, the program was discontinued.

The organization of the Essex County Mosquito Control Project in 1965 brought on the reorganization effort for the greenhead program. For several years research was oriented toward control of the insect prior to emergence from the sod. While several chemicals were found partially effective, they also harmed many non-target organisms. The chemical approach was ruled out and more environmentally friendly options were researched.

In 1968, the project began to experiment with different devices designed to trap the adult greenhead fly. A Manitoba trap from the Maine State Forest Service was modified and adapted for use here in Essex county.

Manitoba fly traps, sometimes referred to as canopy-style fly traps, are used to help reduce the number of horseflies active in an area. The Manitoba-style trap uses basic fly behavior rather than insecticides or chemical bait. Flies attracted to the placement, reflected heat, shape and color will fly into the device then typically try to fly directly up to escape confinement where they become trapped in a jar and die. Our current trap design works in a similar manner but is modified for coastal greenheads and for use in unpredictably harsh salt marsh conditions. After 1992, Octenol a bait that mimics human and animal breath, was added to the inside to lure more females into the trap. Baiting with Octenol was found to capture up to 3 times more females than non-baited traps. About 30,000 flies can be found in each trap at the end of the season.

## THE GREENHEAD FLIES OF ESSEX COUNTY

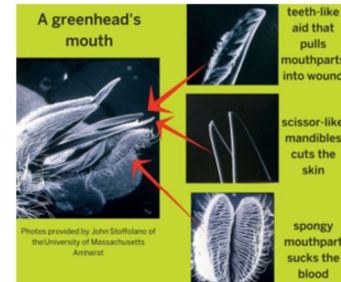
### Biology

- Coastal marsh habitat
- Bioindicator for coastal tide marsh health
- Food sources for birds and fish
- Belong to the same family as horseflies and deerflies- Tabanidae
- 2 species *Tabanus nigrovittatus* and *T. conterminous*
- Flight range of ~15 miles
- Bite predominantly domestic mammals and humans during the day
- Not known to spread disease to humans but causes severe discomfort: inflammation, allergic reactions, pain, swelling, itching, tissue damage
- Can transmit some diseases to animals (e.g., Tularemia in rabbits)



### Appearance

- Can be up to ½ inch in length
- Large iridescent dark green compound eyes
- 1 eye band
- Light buff to yellowish brown body and legs, transparent wings
- pale stripe running down abdomen
- Cutting, sponging mouthparts



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The salt marsh horse fly, often called the greenhead fly, actually describes two species of Tabanids, *Tabanus nigrovittatus* and *Tabanus conterminous*. Both species of flies are found on salt marshes along the Atlantic Coast from Nova Scotia to Florida. In Essex County, adult flies are most abundant from July through mid-August. There is only 1 emergence of greenheads in a year.

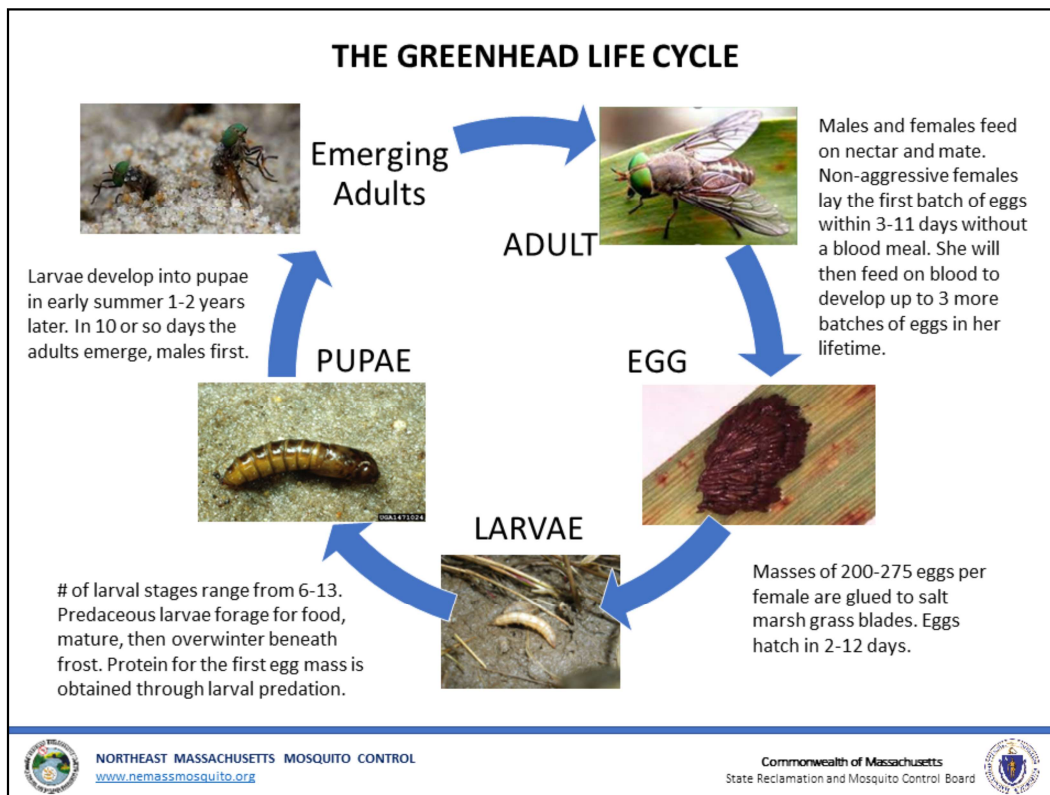
Greenheads are fairly easy to identify. They have large iridescent green compound eyes with one band running through the center of each eye. The rest of their body is a light buff or yellowish brown with a pale stripe running down their abdomen. Their wings are transparent and can be up to ½ inch long.

The entire lifecycle takes place on and around the salt marsh, although females will migrate, up to 15 miles, to seek human and mammal blood meals. Greenheads predominately feed on the blood of humans and large mammals during the day. Although some tabanid species can transmit disease, our greenhead species are not known to cause disease in humans, just pain and discomfort.

Greenhead mouthparts include two sharp tools that look much like a pair of scissors. In seconds, they inject their mandibles into exposed flesh. These mandibles flex outwards severing every capillary and vein they encounter. Just like the female mosquito, the female greenhead injects her saliva into your blood when she first bites. The saliva is injected using

a salivary pump that coats the wound with a burning antiseptic and anticoagulant chemical keeping the blood flowing without scabbing. This all causing intense pain to the victim. They quickly use spongy mouthparts to suck up the stimulated blood flow then fly off...all before being swatted.

Unfortunately, female greenhead flies are present and searching for blood on beaches of Essex county when most visitors are using our beaches for recreation.



Adult greenheads emerge in June to feed on nectar then mate on the open marsh in early summer. Within a few days the non-aggressive female lays her first fertilized egg mass consisting of 100 to 200 eggs on marsh grasses. After this first batch of eggs is deposited, she becomes extremely aggressive. She will migrate from the marsh areas through gaps in the vegetation into wooded and open landscapes along the marsh edge to seek blood-meal hosts, including humans and livestock. The blood meals provide her with protein that is used to produce and develop these additional eggs. She will produce up to 3 more batches of eggs thorough out her summer lifespan of 3 to 5 possibly up to 12 weeks.

The eggs mature and may stay on blades of salt marsh grass until hatching. The eggs hatch within a week into worm-like larvae. There can be as many as 80 mature larvae in a single square meter of marsh sod. Developing larvae concentrate along the upper vegetational zone reached by daily high tides.

After hatching, larvae either crawl down, or get washed off the blade of grass then start foraging around for food in surface muck, wet vegetation and thatch reached by daily high tides. The predaceous larvae attack and eat a variety of invertebrates, including other greenhead larvae. This predation is for larval growth, pupation and to acquire the storage of proteins the adult female will need to make her first batch of eggs after she hatches. Larvae can be seen on the grassy edges of tidal pools during the season, but they can bite if

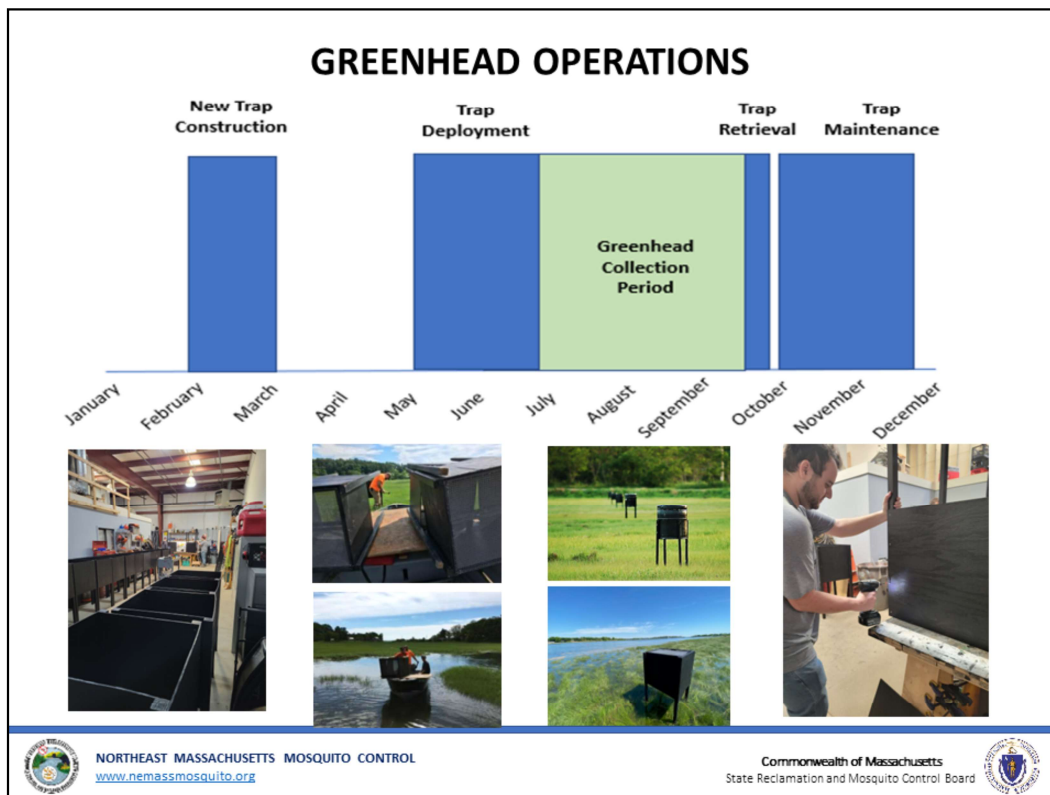
handled.

The larvae grow in the warm months, mature to overwinter under the marsh frostline for 1 to 2 years.

In late spring to early summer, the warming soil triggers the mature larvae to form into pupae. Depending on environmental conditions such as light, temperature, and tides, flying adults emerge from the pupae in about 10 days and often after a salt marsh flooding. Emergence is usually associated with a corresponding full moon, which has given rise to folklore about greenheads' arrival and departure based on the full-moon cycle. Salt marsh soils up and down the coast warm at slightly different times and hatches can be staggered with more southern areas hatching first. It is not unusual to have a heavy early summer peak then a second smaller late summer peak in one year.

If the soils warm too late, the greenheads will remain as larvae and stay on the marsh for another winter.

The highest densities of adult female biting greenheads occur in the last 2 weeks of July and the first week of August.



This is one of the districts most physically demanding activities.

In February we work on new trap construction. Every year we cycle out severely damaged traps that can't be repaired and build entirely new traps. We will also build traps for any new municipalities that join the program. We construct new panels, legs, inner framework, screens and tops. All pieces are coated with 2 coats of black paint prior to assembly. After traps are assembled, they are finished off with a final coat of black paint then dry stored.

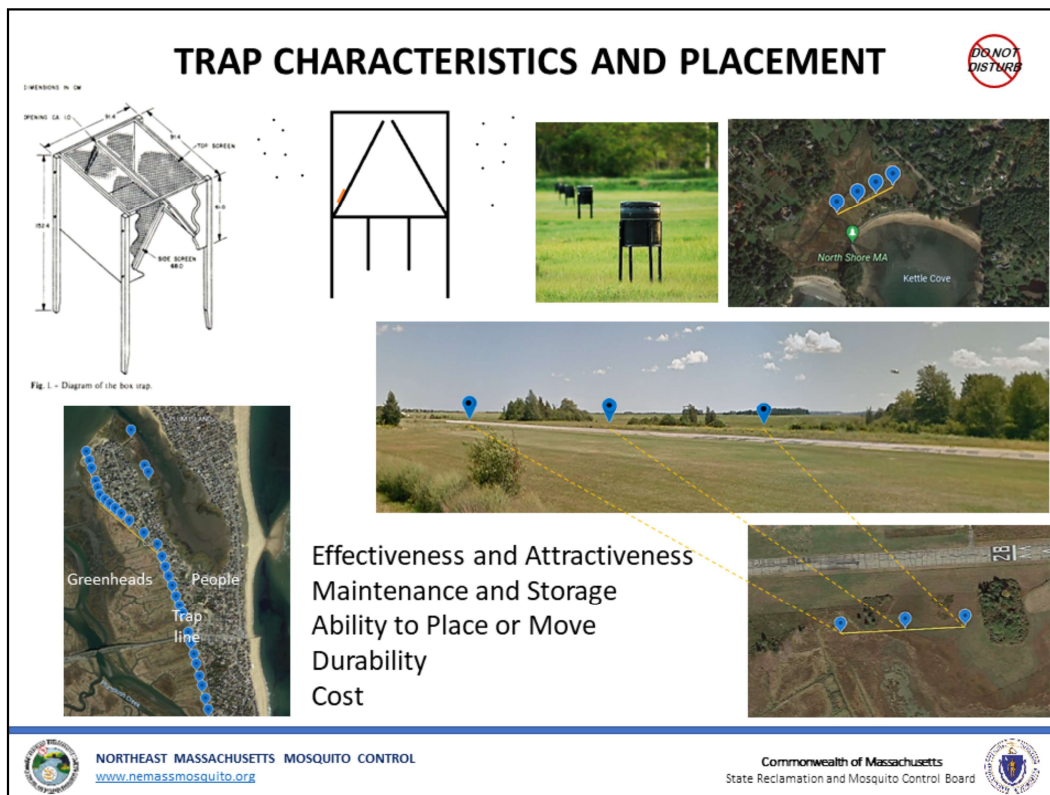
In late May we begin to deploy traps for the season in subscribing communities. We take them out of storage, bait each one with an Octenol lure and transport them to site on our trailer. Since we have over 450 traps it takes multiple loads to transport the traps to their historic destinations. Many of our sites are only accessible by boat. The rest can be driven to and placed by hand. Traps are then staked into the ground and left for the season.

In June through Late September our traps are collecting flies during this period.

We retrieve all our traps in late September through early October after the greenhead season has ended. Many of the traps contains hundreds of thousands of dead flies. The traps are brought back to our facility for cleaning and maintenance.



October through November all the traps are vacuumed out to remove dead flies and other debris, the outside is cleaned and inspected to determine whether they need repair or replacement. When repairs are made its as simple as patching a hole in a screen or as complicated as replacing half a damaged trap. All repaired traps are painted again and dry stored on site. We designed our traps to be stackable to minimize storage space.



A good trap should attract greenheads from a distance, entice them to circle, land on and investigate the trap then direct them into a compartment where escape is difficult. Traps should create a highly visible silhouette against an open area as greenheads are moving along the coastal waterways searching for blood meals. Typical flight paths follow tidal creeks up through open “breaks” in the upper salt marsh vegetated boundary into populated areas. For this reason, the traps are always placed in lines on the marsh where greenheads are active.

All traps are placed on the salt marsh and in historic locations that create barriers for the greenheads along our coastal waterways to intercept these biting females. These traps are not as effective when placed in yards because most greenheads complete their lifecycle on or around the salt marsh. Greenheads are attracted by long-range scent cues including carbon dioxide and short-range visual cues of movement, warmth, shape and size of warm-blooded animals. We don’t want the traps competing for attraction with any other structures. Cars, boats and garages can make better greenhead traps.

Traps are painted glossy black to contrast with surroundings and absorb solar heat. We have both round and square traps. The shape isn’t as important for attractiveness as the size, color and height of the trap from the ground. The color and size mimics larger warm-blooded mammals and the greenheads prefer to fly at ground level and heights less than 10 feet to get around barriers rather than over them; so, the trap bottom, where the greenheads

fly in, is no more than 2 feet from the ground. Also, vegetation under the trap should be less than 4 to 6 inches high.

The traps are securely staked into the ground with 2 wooden stakes attached with galvanized nails at opposing corners set at a 45 degree angle. This helps prevent high tidal water and strong winds from moving the trap from its original location.

Each trap is baited with an octenol lure. Female greenhead flies not only see you but are attracted to you by your scent. They can smell the carbon dioxide and other chemicals that come out of you every time you exhale. That's why we add the octenol to each trap.

The greenheads fly into the bottom of the trap, land on the metal insect screening that forms an upside-down V shape with a slit opening at the top, crawl upward towards the light. The screened lid on the top of the trap prevents them from flying out. The slit then guides them into the collection chambers on each side. Once the flies are in this chamber escape is impossible. The high summer temperatures dry out the trapped flies and they die within a few days. The dead flies fall down the sides of the screening and decompose. All screens should be free of any holes prior to use.

The top screen should contain 2 types, a metal insect screen on the inside and an animal control metal mesh screen on the outside to prevent birds from damaging the screening to get to the trapped flies. The top is removable for trap cleaning and is fastened with galvanized wing nuts on each side of the box. The process of cleaning the traps is enhanced by spiders and preying mantids, so at the end of the season there is just a mass of undecomposed hard protein material. The nice feature of this trap is that it doesn't require periodic emptying.

Although the wooden traps are fairly large and bulky, they are durable and light enough to be picked up by one person and placed on the marsh. The barrel traps are plastic, very durable and much easier to place. All traps are made to nest into each other for stacking during storage and transporting.

The cost to build and maintain the wooden box traps can vary from year to year. The barrel traps will no longer be built as these were made from recycled plastic product barrels that we no longer get.

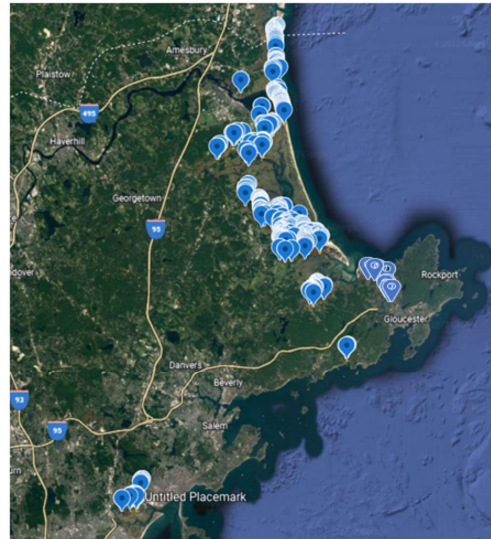
Female greenhead flies not only see you but are attracted to you by your scent. They can smell the carbon dioxide and other chemicals that come out of you every time you exhale. That's why we add the octenol bait to each trap.

We have trap lines= short grass under    nesting for storage

## OUR CURRENT SERVICE AREA- 2022

Essex- 40 Traps  
Ipswich- 200 Traps  
Manchester- 4 Traps  
Newburyport- 13 Traps  
Newbury- 87 Traps  
Salisbury- 40 Traps  
Saugus- 25 Traps  
Gloucester- 20 Traps

429 Active Greenhead Traps Placed  
Annually in Essex County



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While most of our greenhead communities have been with us from the beginning. Essex re-joined in 2016, Manchester newly joined in 2020 and Gloucester in 2022.

We have a total of 409 active traps collecting greenheads every season in our district.

Funding for the North Shore Greenhead Fly Program comes from the municipalities that are part of this program.

## PREVENTION/PERSONAL PROTECTION



- Wear repellant
- Wear light-colored clothing.
- Wear long sleeves and pants when possible
- Take advantage of windy days
- Avoid outdoor activity from 10 am to dusk
- Dry off after coming out of the ocean and
- Avoid perfumes and heavy exercise
- Use screens
- Keep vehicle windows up and turn off vehicle when not driving

Scientists: Murder hornets!  
Greenheads: LOL OK



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Just because the greenheads are here, doesn't mean you need to entirely avoid our coastal area. There are many ways you can protect yourself from annoying local celebrities.

Apply a CDC recommended repellent containing DEET and reapply per label instructions.

Greenheads prefer dark over light-colored objects. Wear appropriate clothing with this in mind.

Dry off after being in the water, greenheads are attracted to sweet and salty scents.

Wear long Sleeved shirts for protection.

Greenheads bite from 10am to dusk and are not as active in windy conditions, so time your activities appropriately.

Screen in porches, pools and patios.

Keep vehicle windows closed and stop to brush out any that get into your vehicle before driving. Turn off an idling engine as they are attracted to the emissions and heat.

Sprays, perfumes and increased metabolic activity attracts the biting female.



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# **QUESTIONS**

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