



**Napa County  
Mosquito Abatement District**

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**Website: [www.napamosquito.org](http://www.napamosquito.org)**

## **YOUR COOPERATION IS NEEDED**

We are asking you for your assistance and cooperation so that our agency can more effectively reduce mosquito populations in your community. Please use our checklist and suggestions for home mosquito control (see last page). If you have any questions or would like further assistance please contact us. We will be glad to help.

### **INTRODUCTION**

Napa County Mosquito Abatement District (NCMAD) has been controlling mosquito populations for the citizens of Napa County since 1925. The District is governed by a Board of Trustees comprised of representatives from each incorporated City and the County-at-large. There are currently eight employees who are responsible for controlling mosquitoes throughout the County.

NCMAD works closely with other public agencies, park districts and wineries to provide an effective and environmentally sound mosquito control program. The District also works with planning agencies to minimize mosquito production in wetland restoration and enhancement projects.

### **YOUR MOSQUITO ABATEMENT DISTRICT DOES THESE THINGS**

- ❑ Assists landowners and agencies in eliminating mosquito sources and managing mosquito-breeding areas within the District, to reduce mosquitoes to a tolerable and healthful level.
- ❑ Responds to public complaints of mosquitoes in the District and determines the source of the problem.
- ❑ Provides mosquitofish free of charge (April - October only).
- ❑ Monitors mosquito populations and mosquito-borne diseases using sampling, service requests, traps and sentinel chicken flocks.
- ❑ Provides emergency control of larval (immature) mosquitoes until long-term preventative measures can be taken.
- ❑ Provides information to the public about mosquitoes, mosquito-borne disease and insects.

## MOSQUITO CONTROL

Your District controls mosquitoes by targeting the larvae, which are found in stagnant water. By preventing adult emergence, a more cost effective program can be conducted that has the least impact on the environment. Six methods are used in the District's integrated mosquito management program to control mosquitoes:

- **Surveillance** – Sampling and laboratory analysis of mosquito populations and mosquito-borne diseases
- **Public education** - information resource on mosquitoes and their relatives
- **Physical control** - exclusion or improved water circulation
- **Biological control** - use of natural predators, parasites, and hormones.
- **Vegetation management** – Reduction of protective plant cover and non-native or invasive plant species
- **Chemical control** - emergency control when pupae are present

## WHY DO WE ASK FOR A SPECIMEN?

A solution to your mosquito problem can be obtained much sooner if you have provided us with a specimen of the biting mosquitoes. There are 20 known species of mosquitoes in Napa County, each with its own unique characteristics and preference for certain breeding sites. Identification of the specimen assists us in efficiently finding their breeding sites. The sites will then be treated to prevent further mosquito production.

Another reason to ask for specimens is that there are many insects that look like mosquitoes that do not bite and are not health hazards (see the section titled "Mosquito-Like Insects"). Therefore, it is very important to provide a specimen of the insect that actually does the biting.

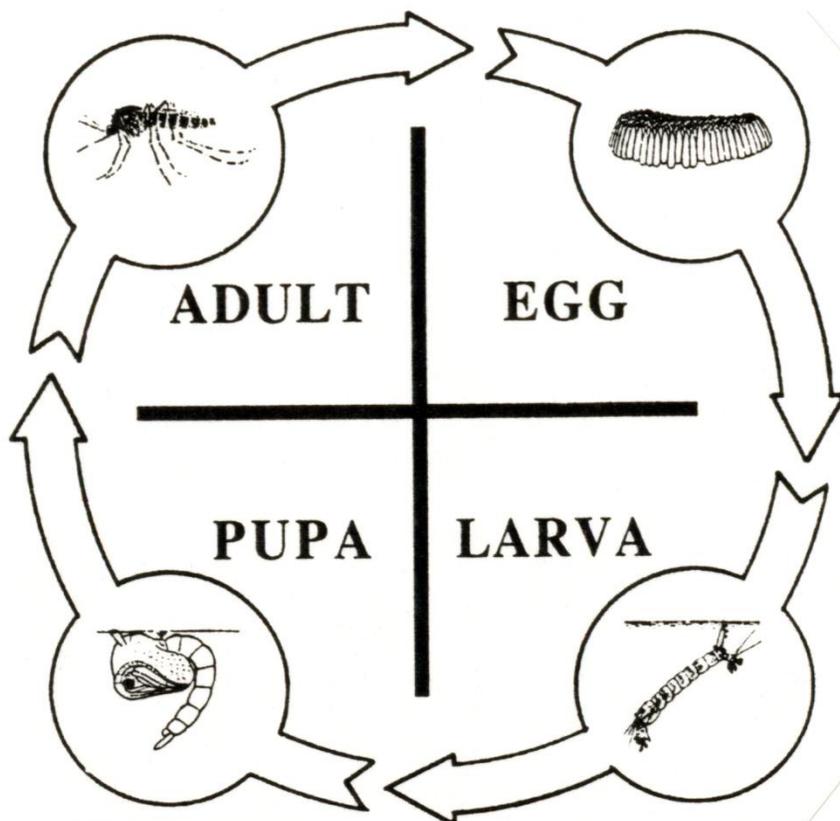
## DISEASES

There has been a lot of public concern and confusion about mosquitoes and AIDS. Several scientific studies conducted by the Centers for Disease Control and the World Health Organization have shown that mosquitoes **DO NOT** transmit AIDS.

In California mosquitoes are monitored and controlled primarily for public health reasons, such as malaria, West Nile virus, encephalitis, dog heartworm and sensitivity to bites. Some mosquitoes are also controlled because of their annoying habits.

Human mosquito-borne disease in California has significantly declined since the creation of mosquito and vector control agencies. Within Napa County, malaria was historically present and dog heartworm, West Nile virus and the encephalitis virus are still present.

## MOSQUITO LIFE CYCLE



# Mosquitoes must have standing water to develop!

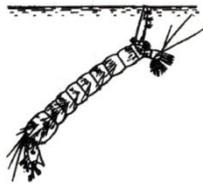


**Egg Raft**



Actual Size

**Eggs:** Females deposit eggs singly or in rafts on the water surface or in places where water will ultimately cover them, depending on the species. The eggs will then hatch into larvae.

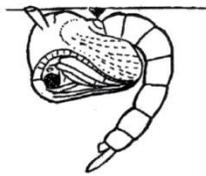


**Larvae**



Actual Size

**Larvae:** Because of their typical movement through the water, larvae are commonly called “wrigglers”. They are very active, feeding on microorganisms, and may be readily seen at the water surface. There are four larval stages with pupae developing from the last stage.



**Pupae**



Actual Size

**Pupae:** These are also active, but non-feeding, and can be seen resting at the water surface. Because of their method of swimming, they are often called “tumblers”. During this stage, the transformation to the adult occurs. Upon completion of this change, the pupal case splits open to allow emergence of the adult.



**Adult**

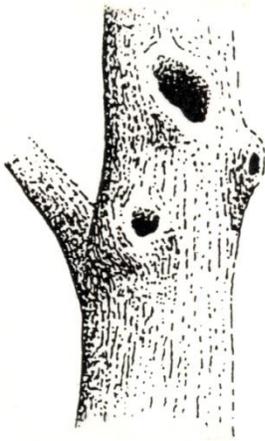
Actual Size

**Adults:** Only the adult mosquitoes live out of water. After biting to obtain a blood meal and mating, the females return to a water source to deposit eggs. Adult males do not bite or feed on blood but instead feed on plant juices and nectar.

# COMMON MOSQUITOES OF NAPA COUNTY

## **Summer Salt Marsh Mosquito** (*Aedes dorsalis*)

This species is found between March and October in the tidal salt marsh areas and brackish seasonal wetlands of Napa County. The eggs are laid on plants and muddy areas of these wetlands and hatch when the breeding site is filled by high tides or spring rains. Adults are an aggressive daytime biting species capable of flying many miles from the marshes in search of a blood meal.



## **Western Treehole Mosquito** (*Aedes sierrensis*)

This species breeds in tree holes, which are water filled rot cavities or depressions found in many species of trees, especially oaks, bay laurel, eucalyptus, sycamore and elm. Any container near trees, that is partially filled with water and leafy debris, may also produce this pest. The eggs hatch when the tree hole or container fills with water. The adults emerge in March and remain in the area until early summer. This mosquito has a short flight range, is an aggressive biter, and is the primary vector of dog heartworm in Napa County.

## **Winter Salt Marsh Mosquito** (*Aedes squamiger*)

This species breeds in the tidal and diked marshes of Napa County. The eggs are laid on plants and muddy areas in the marsh during the spring and hatch as soon as the marsh fills with rainwater in the fall. Adults emerge the following spring and are an aggressive daytime biting mosquito capable of flying more than 15 miles from their breeding site.

## **Woodland Pool Mosquito** (*Aedes washinoi*)

This mosquito breeds in woodland depressions that fill with water, especially those areas dominated by willow trees and berry vines. Eggs are laid on the mud and organic material along the edges of the receding water in these areas. Adults are generally present in the early spring and are very aggressive.

## **Woodland Malaria Mosquito** (*Anopheles punctipennis*)

This mosquito is the primary vector of human malaria in the woodland and foothill areas of California. Clear algal-laden shaded pools of creeks and streams and the heavily vegetated margins of slow flowing streams and rivers are the primary breeding sites for this mosquito.

**Little House Mosquito (*Culex pipiens*)**

This mosquito is generally an urban problem. They can be found all year and breed in storm drains, catch basins, utility vaults, septic tanks, flooded basements, sumps, and in just about any water container found near human habitation. Adults readily enter homes and bite at night. It can take many hours to locate the breeding site for this mosquito due to the wide variety and types of habitats that it utilizes. This mosquito is a primary vector of West Nile virus.

**Banded Foul Water Mosquito (*Culex stigmatosoma*)**

This species is most commonly found breeding in high organic content water sources such as winery waste, sewage, log, and dairy ponds. Adult females prefer to feed on birds but will also bite humans. This mosquito is a secondary vector of West Nile virus.

**Encephalitis Mosquito (*Culex tarsalis*)**

This mosquito breeds in rain pools, marshes, ponds, and other fresh water sources. Few service requests are caused by this mosquito, however, it does require a large part of our control effort to prevent the spread of the encephalitis virus that it carries. This species feeds primarily on birds and is only moderately aggressive towards humans. This mosquito is a primary vector of West Nile virus.

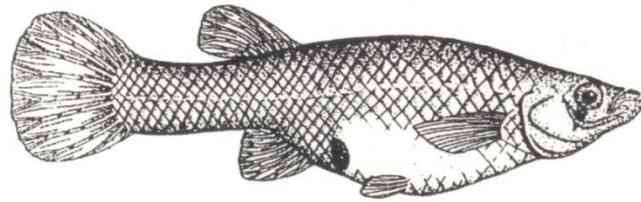
**Fish Pond Mosquito (*Culiseta incidens*)**

This mosquito is usually found breeding in fishponds, creeks, and containers and is the second leading cause of service requests for the District. Small sources, such as buckets, cans and tires, can produce sufficient numbers to cause discomfort in a neighborhood. This mosquito is moderately aggressive and bites in the evening or in shady places during the day. It is easily noticed because of its large size and dark spotted wings.

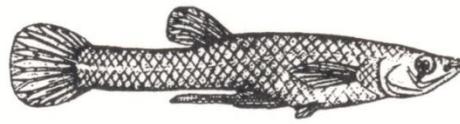
**Winter Marsh Mosquito (*Culiseta inornata*)**

Females of this species rest during the summer and become active in the fall after the first rains. Eggs are laid on the surface of rain filled ponds in the fall. Many generations can be produced in one season. This mosquito bites at dusk in the fall and spring and can be aggressive. This is our largest mosquito, measuring approximately 3/8 of an inch in size.

## FACTS ABOUT MOSQUITOFISH



♀  
female



♂  
male

*Gambusia affinis*, also called “mosquitofish”, are indispensable to our mosquito control program in Napa County. The fish eat mosquito larvae. Mosquitofish are furnished without charge for stocking ornamental ponds, unused swimming pools, and animal watering troughs. They require no feeding or care other than to protect them from garden sprays, chlorine or other chemicals, and predators such as raccoons. The District also stocks thousands of these fish each year in artificial lakes, reservoirs, wastewater ponds, and flood control canals to eliminate the need for frequent spraying.

These fish do not lay eggs but give birth to well-developed and very active young. Therefore, they require no special environment, as most other fish do, for depositing and hatching the eggs. Mosquitofish breed throughout the summer producing a new brood at monthly intervals. The young are approximately 1/2 inch in total length when born and are immediately ready to begin the work of eating mosquito larvae. *Gambusia* grow rapidly, reaching a maximum size of about two inches. The earliest broods of the season are born in April-May, become sexually mature and produce young when four to five months old.

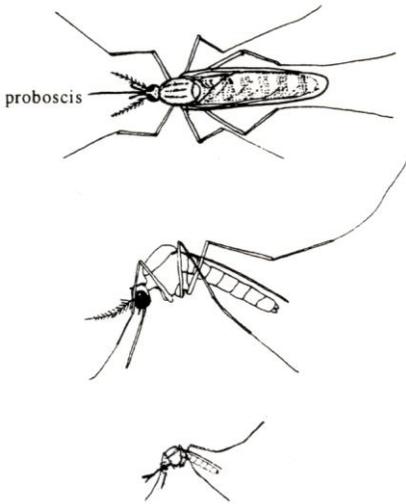
Fish may be picked up between 8:00 am and 12:00 pm at the District office, 15 Melvin Road, American Canyon, from April through October. **Please call prior to coming and be sure to bring a clean five-gallon bucket** or another type of large container when you visit our office for fish.

**FISH PREVENT MOSQUITOES!**

## MOSQUITO - MIDGE COMPARISON

There are instances when a homeowner calls to report problems with mosquitoes and what appears to be a mosquito is actually another type of insect. The most commonly encountered look-a-likes are midges (gnats). These insects frequently form swarms and are also attracted to lights in large numbers. These insects do not bite but can still be very annoying. For information on the biology and identification of insects that look like mosquitoes see below and on the Mosquito-Like Insects pages.

**Mosquito**

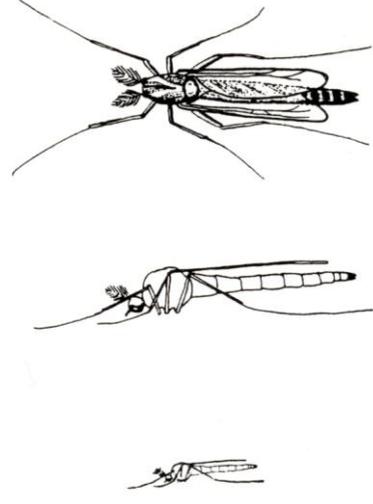


Actual sizes

**Typical Mosquito**

1. Uses its proboscis to bite (needle - like piercing mouthparts).
2. Wings are longer than body.
3. Always develops in water.
4. May carry diseases.
5. Rests on objects with its body not touching the surface.

**Midge**



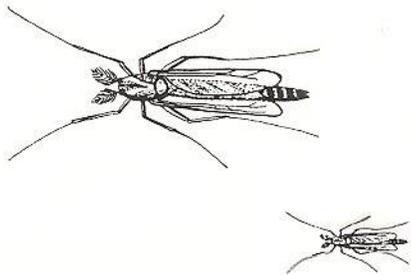
Actual sizes

**Chironomid Midge**

1. Cannot bite (has no proboscis).
2. Wings are shorter than body.
3. Develops in mud on the bottom of lakes and ponds.
4. Do not carry diseases.
5. Rests on objects with its body usually touching the surface.

# MOSQUITO-LIKE INSECTS

Midges (*Chironomidae*) are the most wide spread and numerous insects resembling mosquitoes. Adult Midges are commonly observed flying in swarms or “clouds”, or are seen resting on fences, walls, under eaves and in protected areas such as porches and entryways. Individual adults will live about seven days depending upon the species and weather conditions. The larvae develop in sources having extensive areas of standing water.

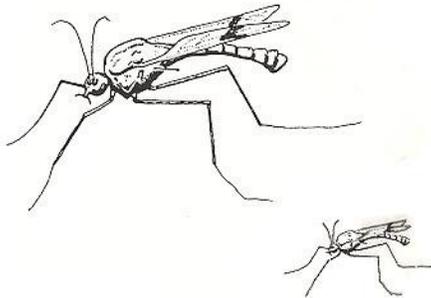


**Midges**

(harmless)

Actual Size

Dixid Midges (*Dixidae*) are common around moist areas where vegetation is abundant and may be seen swarming at dusk along the edges of streams and lakes. The adults are short lived, usually being active less than a week. The larvae are found in slow moving water, at the surface, and swim in a characteristic “U” shape.

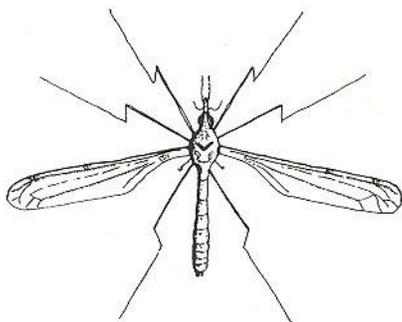


**Dixid Midges**

(harmless)

Actual Size

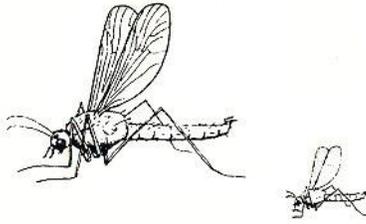
Crane Flies (*Tipulidae*) are delicate insects varying in size from 1/4 inch to as large as 1 1/2 inches in length. The largest crane flies are sometimes called “daddy-long-legs”, “gully nippers”, or “mosquito hawks”. They do not bite people and they do not eat mosquitoes. Some species of crane flies emerge from aquatic sources and others from terrestrial or decaying vegetation sources.



**Crane Flies**

(harmless)

Actual Size

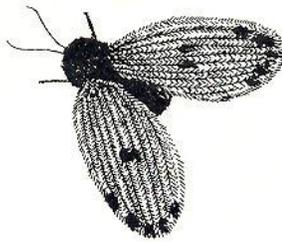


### Winter Crane Flies

(harmless)

Actual Size

Winter Crane Flies (*Trichoceridae*) are often quite abundant during winter and spring in Napa County. They so closely resemble mosquitoes that they are frequently mistaken for them and are reported to the District. Their larvae are found in roots, fungi, decaying vegetation, rotting leaves, manure, and other vegetative material. The adults are readily attracted to lights.

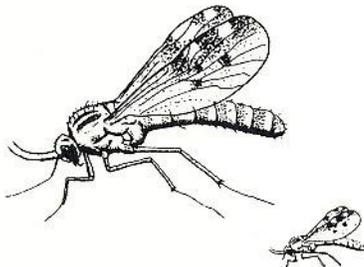


### Owl Midges

(harmless)

Actual Size

Owl Midges (*Psychodidae*) are small hairy flies that can move about very nimbly, but are weak fliers. The larvae are aquatic or semiaquatic and are very common in sewers and drains. The larvae are able to live in soapy water and are a good indicator of a leak in a shower/bath, sink, or laundry drain.



### Wood Gnats

(harmless)

Actual Size

Wood Gnats (*Anisopodidae*) larvae are found in or near decaying vegetation, fermenting sap, animal manure, tree trunks, mud and sometimes sewage. Adults are found on foliage in or near damp places, and can be found near flowing sap. They are sometimes seen in small swarms.

## HOMEOWNER CHECKLIST OF MOSQUITO SOURCES

|   |  |
|---|--|
| <input type="checkbox"/> <b>Fishpond</b>                        | Stock with mosquitofish (provided free by the District), remove excess vegetation and construct properly.  |
| <input type="checkbox"/> <b>Swimming Pool &amp; Spas</b>        | Chlorinate, cover tightly when not in use, and keep water off cover, or stock with fish if no longer in use.   |
| <input type="checkbox"/> <b>Bird Bath</b>                       | Change water frequently, at least once a week.   |
| <input type="checkbox"/> <b>Containers</b>                      | Empty, invert, dispose of, or cover to prevent mosquito entrance (boats, buckets, 55 gallon drums, etc.).  |
| <input type="checkbox"/> <b>Basement &amp; Under House</b>      | Drain the area; correct leaky plumbing, dripping air conditioning or refrigeration. Water in basements or under houses is a major source of mosquitoes in urban areas. |
| <input type="checkbox"/> <b>Catch Basins &amp; Storm Drains</b> | Do not dispose of litter or garden debris into these. Never pour used motor oil into them as the oil eventually goes into the bay.                                     |
| <input type="checkbox"/> <b>Sump</b>                            | Construct so that water does not stand or screen to prevent mosquito entrance.   |
| <input type="checkbox"/> <b>Standing Water</b>                  | Eliminate by draining or filling.  |
| <input type="checkbox"/> <b>Tires</b>                           | Dispose of properly, or cover so that water does not collect inside.   |
| <input type="checkbox"/> <b>Tree holes</b>                      | Consult with a licensed nursery or tree service before draining, filling, screening, or removal.   |
| <input type="checkbox"/> <b>Septic Tank</b>                     | Keep tightly covered. Septic tanks can produce very large numbers of mosquitoes.   |
| <input type="checkbox"/> <b>Watering Trough</b>                 | Stock with mosquitofish (provided by the District) or change water weekly.   |
| <input type="checkbox"/> <b>Creek</b>                           | Do not dump litter or garden debris into creek or create obstructions.   |