

DELAWARE's "BAD-ACTOR" MOSQUITOES

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Approximately **57 species** of mosquitoes are found in Delaware, and about **19 species** can be aggressive biters of humans, as well as other mammals and birds too. These 19 species can be common or abundant enough to occasionally or frequently cause problems for:

- a) Delawareans' quality-of-life (i.e. **nuisance/annoyance issues**);
- b) Public health (i.e. **disease issues**), with primary concerns for West Nile virus (WNV) and eastern equine encephalitis (EEE), both which can affect not only humans but horses too;
- c) Local way-of-life (i.e. **socio-economic issues** affecting tourism, outdoor recreation, animal husbandry, property values).

The remaining approximate 38 species that do not feed on humans get their bloodmeals from a wide variety of other hosts, including their feeding upon amphibians, reptiles, birds or other mammals, although for any given mosquito species the preferred bloodmeal hosts can sometimes be quite specific. However, even some of these non-people biters can still indirectly become problematic for humans, either by their feeding upon our domesticated animals, or by their circulating or maintaining virus pools or reservoirs in other host animals (e.g. wild birds), for diseases that can eventually be transmitted to people by one of the 19 human-biters ("bridge vectors").

Depending upon local conditions, at certain times any of these problematic species might warrant and trigger mosquito control actions. Because of the diversity of aquatic habitats where these species breed, and because of their varied life history stages, times of occurrence and behaviors, on a statewide basis the Delaware Mosquito Control Section must use a mixture of control methods. Our approach involves using source reduction techniques (e.g. water management, fish stocking) along with the judicious applications of several types of insecticides, which fall into two broad categories -- larvicides to control immature mosquito stages, and adulticides to control adult mosquito populations.

To provide a feel for what the Mosquito Control Section faces in dealing with this range of species, Delaware's 19 "**bad-actor**" mosquitoes are listed below, along with some annotated comments about their breeding habitats, occurrences, behaviors and the problems they cause. Also provided is an accounting of 3 other mosquito species that are not problematic to humans in terms of their biting behaviors, but which can indirectly still cause us trouble by cycling disease viruses in other host animals; along with the description of another human-biter and disease vector of historic note in Delaware. Finally, mention is made of 4 other mosquito species found in Delaware that while not being problematic for humans, are interesting to note for other reasons. As you'll see below, we're not lacking for challenges.

- 1) **Ochlerotatus (Aedes) sollicitans** – Common Saltmarsh Mosquito
#1 pest breeding in temporary waters (“potholes”) of coastal wetlands, erupts after lunar tidal floodings or rainfall events, May-Oct, bites day/night, long-distance flyer; as with most *Ochlerotatus (Aedes)* species, overwinters in an egg stage, and can produce several generations during the warmer seasons, depending upon rainfall or flooding patterns; lays its eggs singly on moist muds, hatching after inundation; primary EEE vector, also found WNV-positive in the field.
- 2) **Ochlerotatus (Aedes) cantator** – Brown Saltmarsh Mosquito
Similar to *Oc. sollicitans*, but sometimes appearing as early as April, and not as abundant in late summer/fall, nor as active in day; EEE vector, also found WNV-positive in the field.
- 3) **Ochlerotatus (Aedes) taeniorhyncus** – Black Saltmarsh Mosquito
Also similar to *Oc. sollicitans*, but not as active in day, more of a problem downstate; found WNV-positive in the field.
- 4) **Ochlerotatus (Aedes) canadensis** – Woodland Pool Mosquito
#1 spring problem in temporary woodland pools, long-lived and usually associated with only one major spring brood, but sometimes a late summer brood too, relatively limited flight range; found WNV-positive in the field.
- 5) **Ochlerotatus (Aedes) grossbecki**
Early-season breeder in woodland pools and swamps, teams with *Oc. canadensis* in creating severe springtime nuisance problems near wet woodlands.
- 6) **Ochlerotatus (Aedes) triseriatus** – Eastern Treehole Mosquito
Container-breeder, often in natural water-holding structures such as treeholes, laying its eggs at the waterline or slightly above; Lacrosse Encephalitis vector in mid-West, found WNV-positive in the field.
- 7) **Aedes vexans** – Floodwater Mosquito or “Vexans”
Temporary waters of inland freshwater wetlands and wet woodlots, #1 summer woodland-pool pest, long-distance flyer, evening/night biter; EEE vector, found WNV-positive in the field.
- 8) **Aedes albopictus** – Asian Tiger Mosquito or “Albies”
Arrived in late 1980’s, container-breeder, now major urban problem, loves tire piles, aggressive daytime biter (especially in lower extremities), limited flight range; found WNV-positive in the field, and highly WNV-competent in the lab (in Far East, also dengue fever vector).

- 9) **Ochlerotatus (Aedes) japonicus** – Japanese or Rockpool Mosquito
First found in Delaware in 2000, container-breeder and in other isolated standing waters; not too numerous yet, but similar to the introduced *Ae. albopictus* could become urban/domestic nuisance problem; found WNV-positive in the field and also highly WNV-competent in the lab.
- 10) **Culex pipiens** – Common House Mosquito (northern subspecies = *pipiens* and southern subspecies = *quinquefasciatus*, with overlap of ranges in Delaware). Major problem in domestic environs, primarily takes avian bloodmeals but will also readily bite humans, container-breeder around houses, also likes sewer catch-basins and stormwater or wastewater lagoons, limited flight range, night biter; like most *Culex* species, lays its eggs in batches or clusters (“rafts”) in still or quiet water habitats; can continuously breed throughout the summer, producing several generations, and overwinters as a resting adult; found WNV-positive in the field, and the suspected primary WNV vector (and for St. Louis Encephalitis elsewhere too).
- 11) **Culex salinarius** -- Unbanded Saltmarsh Mosquito or “Little Sal”
Breeds in standing waters of coastal wetlands both salt and fresh, night biter, locally very abundant, seems to prefer mammalian blood meals more than other *Culex*; found WNV-positive in the field, and a probable WNV vector.
- 12) **Coquilletidia (Mansonia) perturbans** – Cattail or Irritating Mosquito
Freshwater marshes with thick vegetation, one generation per year emerging in late spring/early summer, characteristic of cattail marshes where overwintering larvae live in mud bottoms and get their oxygen supply from air channels in plant roots, long-distance flyers, aggressive evening and nighttime biters, sometimes in daytime too; EEE vector, found WNV-positive in the field
- 13) **Anopheles quadrimaculatus** – Common Malaria Mosquito or “Quads”
Permanent waters of freshwater wetlands, night biter, will enter houses, limited flight range; like most *Anopheles* species, overwinters as resting adult; notorious historic vector for malaria in southeastern U.S. (including latitudes as far north as Delaware up to Staten Island), found WNV-positive in the field.
- 14) **Anopheles punctipennis** – Mottled-Wing Mosquito or “Punkies”
Similar to *An. quadrimaculatus*, and although an aggressive outdoor biter, not as likely to enter houses, nor to be a malaria vector; found WNV-positive in the field.
- 15) **Anopheles bradleyi** – “Brads”
Breeds in permanent waters of coastal wetlands both salt and fresh, night biter, moderate flight range; *An. crucians* is its more inland ecological equivalent; *An. bradleyi/crucians* complex found WNV-positive in the field.

- 16) **Anopheles walkeri**
Similar in many ways to *An. quadrimaculatus*, will readily bite humans, and can transmit malaria in the lab, but its role in the field for malaria transmission is undetermined; unlike many other *Anopheles* that overwinter as resting adults, *An. walkeri* toward the northern edge of its range passes the winter in an egg stage.
- 17) **Psorophora columbiae (confinnis)** -- Dark Ricefield or Glades Mosquito
Temporary waters of freshwater wetlands or irrigated systems, long-distance flyers, aggressive day/night biter; like many *Psorophora* species, has egg-laying and overwintering habits similar to *Ochlerotatus (Aedes)* species; found WNV-positive in the field.
- 18) **Psorophora ciliata** – “Gallinipper”
Similar in breeding habitat to *Ps. columbiae* and *Ae. vexans*, a large-sized mosquito often noticeably alarming to public, aggressive day/night biter; found WNV-positive in the field. *Ps. howardii* is another large species very similar to *Ps. ciliata* in larval and adult behavior, but much rarer.
- 19) **Psorophora ferox** – White-footed Woods or Big Woods Mosquito
Temporary waters of woody swamplands, aggressive day/night biter, especially near woodland margins; found WNV-positive in the field.

Other mosquito species affecting humans in Delaware

- 1) **Culiseta melanura** -- Cedar Swamp or Black-tailed Mosquito
Not a problem biter for humans; it’s a species of wet woodlands, with larvae often found in stump holes of maple-gum swamps; adults feed in the forest’s upper canopy, and as such are a primary EEE vector among birds; also found WNV-positive in the field. *Cu. inornata* is another closely related species.
- 2) **Culex restuans** – White-dotted Mosquito
Similar in appearance and breeding habitats to *Cx. pipiens*, but not as likely to bite humans, in its much more preferring avian bloodmeals; found WNV-positive in the field, and as such possibly an important WNV vector among birds.
- 3) **Culex territans**
Another abundant *Culex* species that doesn’t readily bite man, but similar to *Cx. restuans* it might be an important WNV vector among birds; but not yet found WNV-positive in the field.
- 4) **Aedes aegypti** – Yellow Fever Mosquito
Of some historical interest -- breeds almost exclusively in man-made containers around human habitations, has a short flight range, strongly prefers human bloodmeals over other mammals; susceptible to cold winters, so not normally found north of the Carolinas, but during colonial times in summers could be found

in port cities as far north as New England, in association with coastal shipping; notorious vector for yellow fever (and in the tropics dengue fever too), with a 1793 yellow fever epidemic in Philadelphia killing about 10% of the city's population and sickening twice that many.

Other mosquitoes of interest in Delaware (but do not bite humans nor transmit disease)

- 1) ***Uranotaenia sapphirina***
A tiny mosquito with iridescent body and wings, breeding in ground pools, along grassy margins of ponds (often associated with duckweed), or sometimes in treeholes and other containers; often collected in adult mosquito light traps.
- 2) ***Wyeomyia smithii*** -- Pitcher Plant Mosquito
A rare species that breeds in the leaves of pitcher plants, and in other living or dead plants and treeholes.
- 3) ***Orthopodomyia signifera***
Highly ornamented species that breeds in treeholes, and is sometimes found in high larval numbers in artificial containers with *Culex* species.
- 4) ***Toxorhynchites rutilus septentrionalis***
Brightly colored mosquitoes that are not bloodsuckers as adults; its large larvae found in treeholes, old tires, and other containers where they prey upon mosquito larvae of other species ("cannibal mosquitoes").