



**RUTGERS**  
THE STATE UNIVERSITY  
OF NEW JERSEY

August 13, 2024

# **MOSQUITOES AREN'T A BARREL OF FUN: WAYS TO REDUCE MOSQUITO LARVAE IN RAIN BARRELS**

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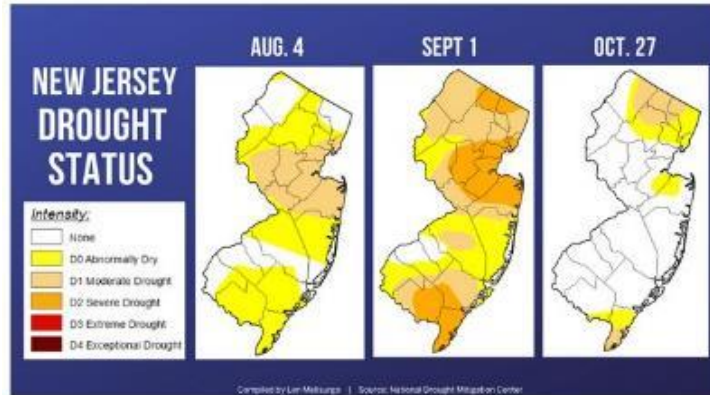
## INTERACTIVE MAP: NEW JERSEY'S THIRSTY -- WATER USE ON RISE IN GARDEN STATE

COLLEEN O'DEA | AUGUST 14, 2015

Between 2000 and 2010 the total amount of water used by homes, businesses, and the state's two nuclear plants surged by 40 billion gallons a year

## N.J. weather: Recent heavy rain wasn't enough to wash away drought concerns

Updated: Oct. 27, 2022, 8:41 p.m. | Published: Oct. 27, 2022, 2:00 p.m.



WEATHER

## Lehigh Valley weather: Moderate drought spreads across Pa. More of N.J. is 'abnormally dry.'

Updated: Jun. 15, 2023, 3:39 p.m. | Published: Jun. 15, 2023, 11:06 a.m.



## Moderate drought expands in Central New Jersey and in regions in Northern New Jersey

News 12 Jul 18, 2024



With the recent rain being abrupt and intense, it is difficult for the ground to absorb the water that runs off.

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NEW JERSEY

## NJ Drought Watch: Residents, Businesses Urged to Conserve Water

The Murphy administration is urging residents and businesses to limit water use as dry and hot conditions stress water supply in the state

By Nicole Rosenthal • Published August 9, 2022 • Updated on August 9, 2022 at 11:46 pm



ENVIRONMENT

IN BRIEF

## New Jersey declares drought watch, first since 2016

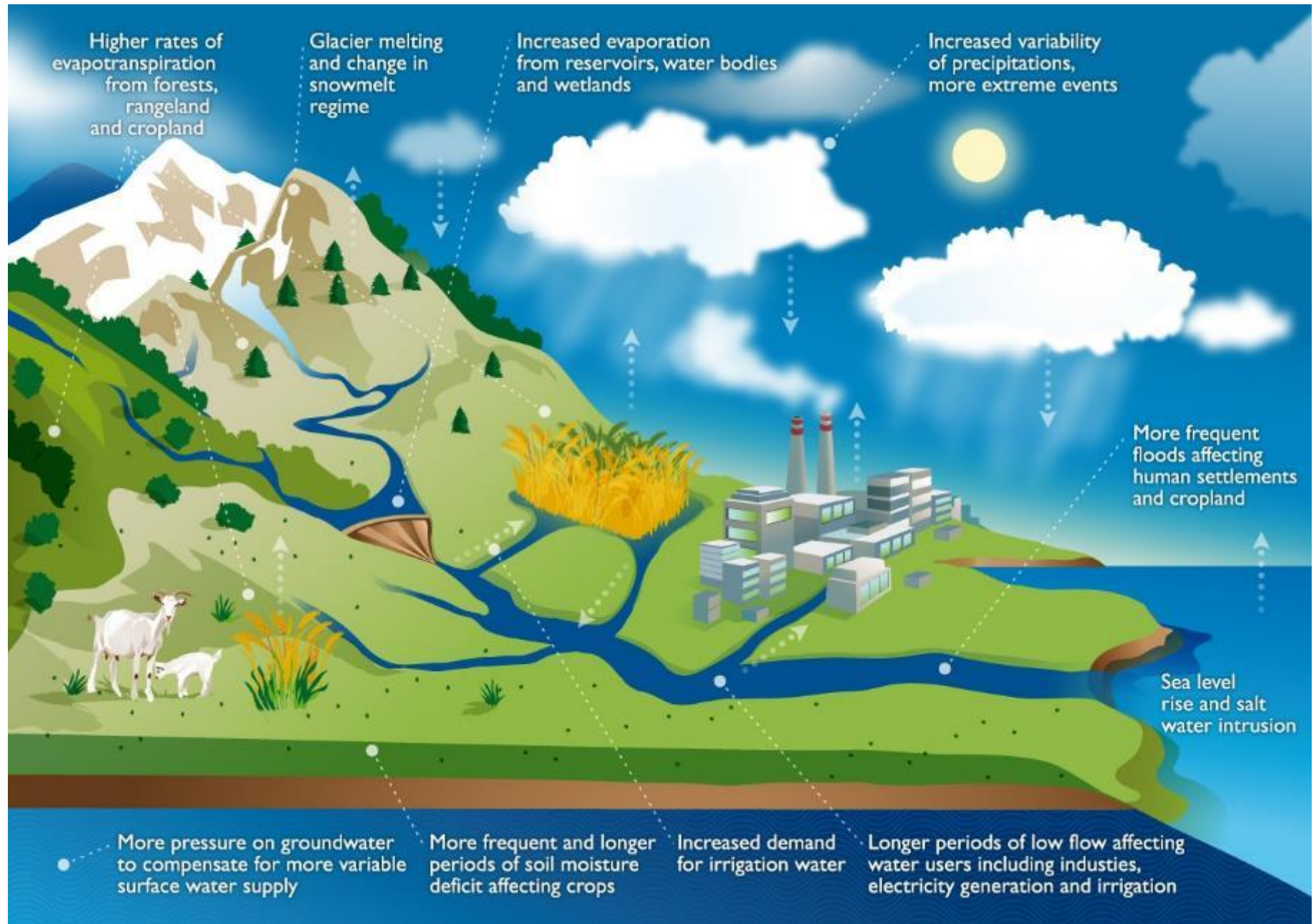
By: SOPHIE NIETO-MUNOZ - AUGUST 8, 2022 6:23 PM



Weather

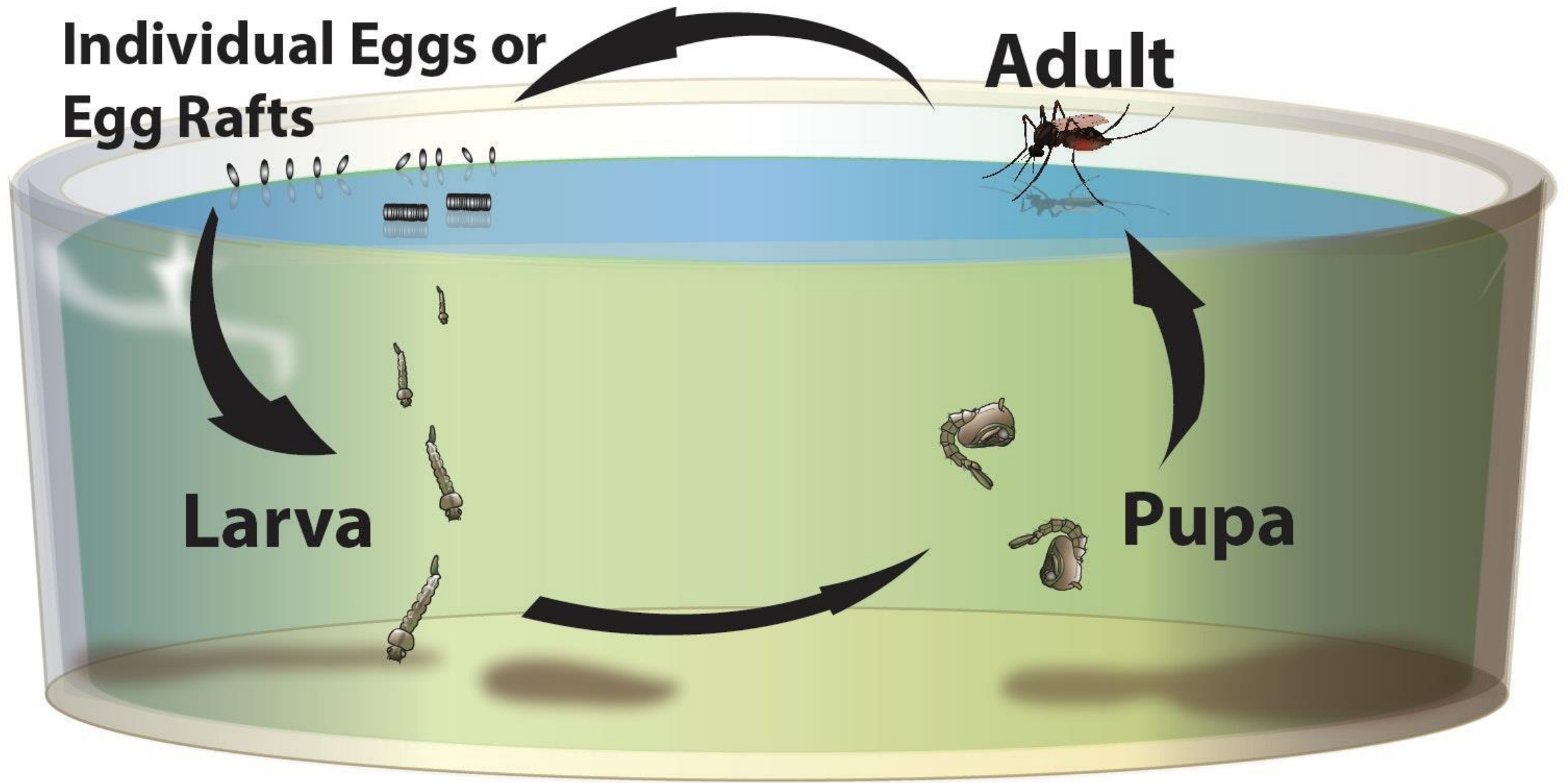
## N.J. weather: Long stretch of dry conditions ahead after much-needed rain ends

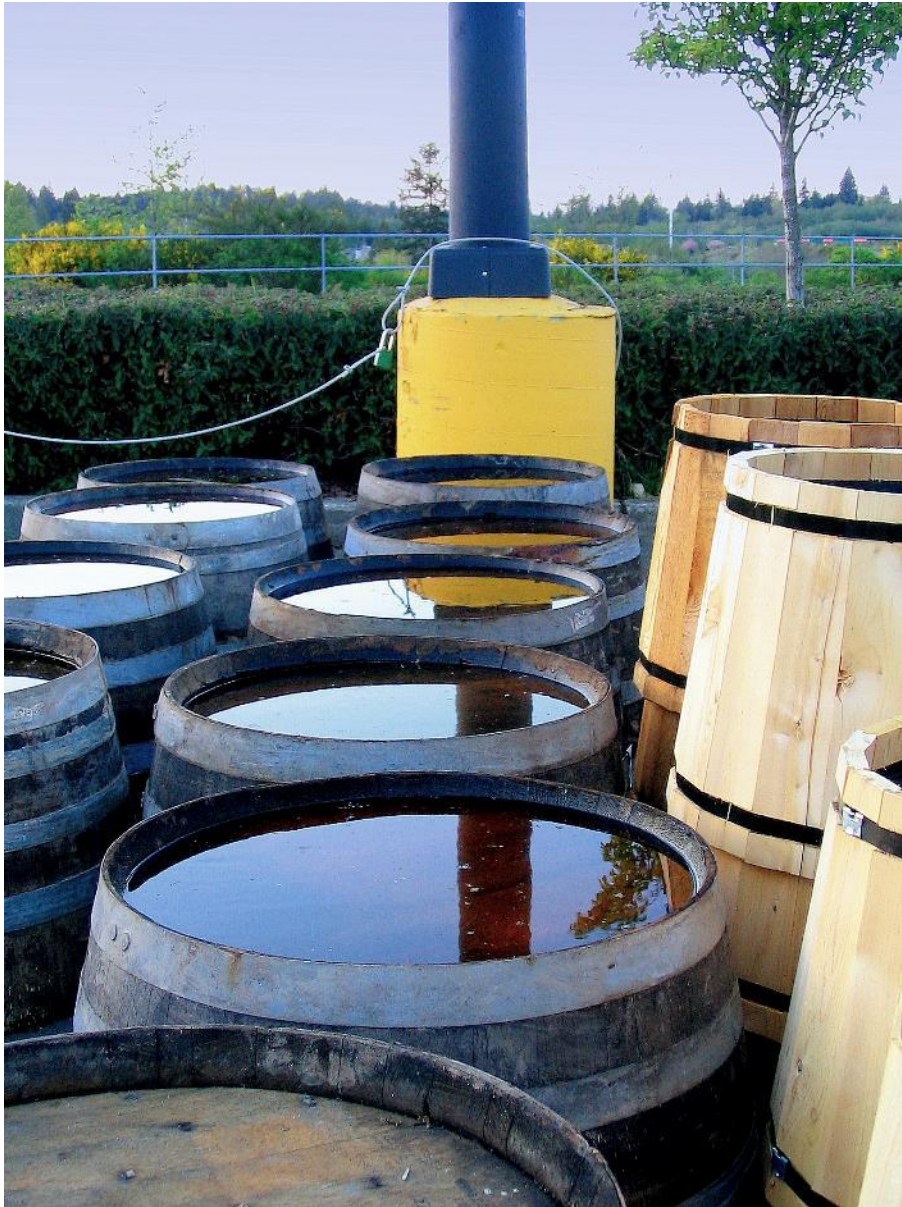
Published: Sep. 13, 2022, 7:18 a.m.













# M O S Q U I T O - B O R N E D I S E A S E S

## What are mosquito-borne diseases?

Mosquito-borne diseases are illnesses that are spread to humans by the bite of an infected mosquito. In New Jersey, the most common mosquito-borne diseases people can get from local mosquitoes are:

- ❖ West Nile virus
- ❖ Eastern equine encephalitis

In other areas, mosquito-borne diseases include:

- ❖ Chikungunya
- ❖ Dengue
- ❖ Jamestown Canyon virus
- ❖ La Crosse encephalitis
- ❖ Malaria
- ❖ St. Louis encephalitis
- ❖ Yellow Fever
- ❖ Zika

## How do mosquito-borne diseases spread?

Mosquitoes become infected when they feed on birds or mammals carrying the disease. Infected mosquitoes can then spread the disease to people and other animals such as horses.

Rarely, some mosquito-borne diseases can be spread through blood transfusion, organ transplantation, unprotected sex, breastfeeding and pregnancy.



## What are the symptoms of mosquito-borne diseases?

Most people infected with a mosquito-borne illness do not show any symptoms. Depending on the disease, if symptoms do appear, they may be mild. However, symptoms can sometimes be severe and result in death. Symptoms of a mosquito-borne disease typically appear 2-14 days after exposure.

### Mild Illness

Fever	Joint pain
Chills	Body aches
Headache	Rash

### Severe Illness

High fever	Paralysis
Stiff neck	Coma
Seizures	Heavy bleeding
Confusion	Brain swelling



## Who is at risk for mosquito-borne diseases?

Anyone can get a mosquito-borne illness, but people who spend more time outside have a higher risk of becoming infected. Older adults and people with weak immune systems may develop more severe illness.



## How are mosquito-borne diseases diagnosed?

Visit a healthcare provider if you develop any symptoms of a mosquito-borne illness. Make sure to mention recent travel and outdoor activities. A healthcare provider can order blood tests to look for infection based on your symptoms and exposure.



## What is the treatment for mosquito-borne diseases?

There are no vaccines or specific treatments for most mosquito-borne diseases. Mild cases usually improve on their own. In severe cases, patients may need to be hospitalized. If you think you or a family member may have a mosquito-borne disease, call or visit a healthcare provider.



Source: <https://www.nj.gov/health/cd/documents/topics/vectorborne/C2506--Mosquito-borne%20Diseases%20Brochure.pdf>

# Florida Under 'Malaria Alert' as More Cases of Mosquito-Borne Virus Found

The disease has reemerged after Florida managed to eliminate it 70 years ago

Published 07/07/23 10:13 AM ET | Updated 23 min ago

Dan Gooding



## U.S. Sees First Cases of Local Malaria Transmission in Two Decades

Five people, four in Florida and one in Texas, have acquired malaria in the United States in recent months.

By [Emily Anthes](#)

Published June 27, 2023 Updated July 3, 2023

[Miami Herald](#)

## Dengue fever confirmed in Florida Keys as U.S. on watch for rise in mosquito illness

Michelle Marchante

Mon, July 1, 2024 at 11:04 AM CDT · 3 min read



## Dengue fever cases in Mass. are on pace to break local records, according to CDC data

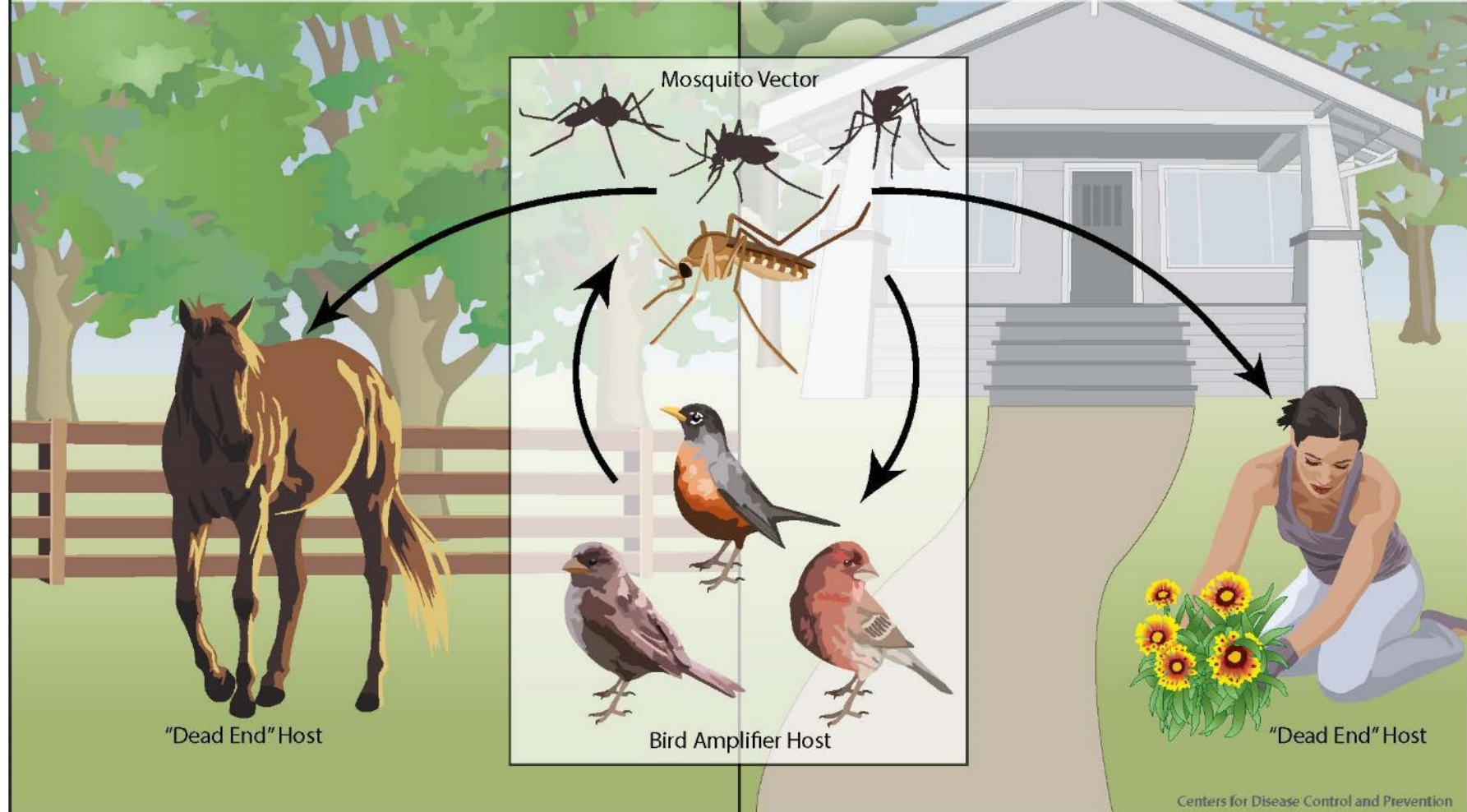
By [Adam Piore](#) Globe Staff. Updated June 29, 2024, 3:04 p.m.



# West Nile Virus Transmission Cycle

In nature, West Nile virus cycles between mosquitoes (especially *Culex* species) and birds. Some infected birds, can develop high levels of the virus in their bloodstream and mosquitoes can become infected by biting these infected birds. After about a week, infected mosquitoes can pass the virus to more birds when they bite.

Mosquitoes with West Nile virus also bite and infect people, horses and other mammals. However, humans, horses and other mammals are 'dead end' hosts. This means that they do not develop high levels of virus in their bloodstream, and cannot pass the virus on to other biting mosquitoes.



## **Remove sources of water from around your home. . .**

**An important part of mosquito control around homes is making sure that mosquitoes don't have a place to lay their eggs. Because mosquitoes need water for two stages of their life cycle, it's important to monitor standing water sources.**

- Get rid of standing water in rain gutters, old tires, buckets, plastic covers, toys or any other container where mosquitoes can breed.**
- Empty and change the water in bird baths, fountains, wading pools, rain barrels and potted plant trays at least once a week to eliminate potential mosquito habitats.**
- Drain temporary pools of water or fill with dirt.**
- Keep swimming pool water treated and circulating.**

Source: [Success in Mosquito Control: An Integrated Approach | US EPA](#)

*Clean your gutters!*



The #1 practice you can do to keep mosquitoes out of your rain barrel is to *use the water from your rain barrel.*



## Cooperative Extension

Pat Rector, Environmental and Resource Management Agent, RCE of Morris/Somerset Counties  
Teresa Duckworth, Senior Wetlands Specialist, County of Morris Division of Mosquito Control  
Dina Fonseca, Professor, Department of Entomology

Storage of rainwater for later use, or "rainwater harvesting," is a sustainable or low impact development practice currently in use to conserve water resources and to treat stormwater runoff. Rainwater harvesting treats stormwater as a resource, rather than the more conventional approach of treating it as waste and removing stormwater from a site as quickly as possible. Rainwater can be harvested by simply capturing water during a rainfall event for reuse, such as watering the garden, the lawn, washing the dog, or other purposes. It is important to note harvested rainwater is not potable and should not be used for drinking or cooking.



Fig. 1. Five-thousand gallon cistern to collect rainwater and reuse for street sweeping and truck washing at Pamippany-Troy Hills. Department of Public Works facility. Photo credit: Pat Rector.

Rainwater harvesting can be a large-scale collection of thousands of gallons of water in a cistern (Fig. 1) or underground tanks. In New Jersey, however, it is most commonly associated with the small-scale use of rain barrels which come in all shapes and sizes. Although rain barrel design may vary in small ways, the primary concept is the same. The focus of this fact sheet is on the closed top lid or screw-on lid rain barrels described

in the Rutgers Bulletin [E329 Rain Barrels Part I: How to Build a Rain Barrel](#), or similar type rain barrels that are built or purchased. This information therefore will be applicable to many of the rain barrels generally in use in New Jersey. This design concept is simple, it includes drilling two holes in the barrel, one for a faucet and one to screw in an overflow hose adapter. Both are then secured by attaching an electrical conduit locknut to the hardware on the interior of the rain barrel (Fig. 2). When using the screw top lid type barrel a piece of fiberscreen is placed on the top of the barrel and then held on by screwing on the lid (Fig. 3). If using the closed top barrels it is suggested that the screen be placed over the top of the barrel, hanging over the sides and held in place with a bungee cord. The rain barrels discussed in the fact sheet are reconditioned 50–60 gallon food grade



Fig. 2. Parts of a rain barrel. Poster by Teresa Duckworth and Pat Rector.

# Screen the barrel, add a Mosquito Dunks<sup>®</sup>, or add a layer of vegetable oil or liquid soap





**The American Mosquito Control Association (AMCA) does not recommend the use of oil or soap as a mosquito repellent/deterrent in rain barrels.**

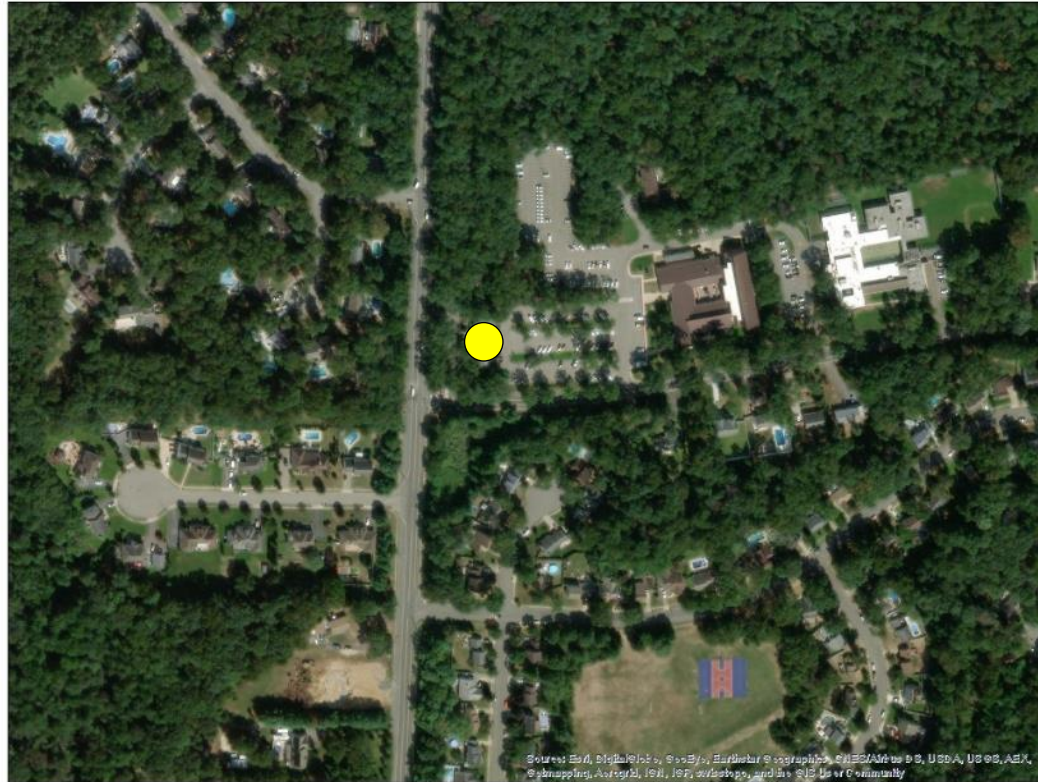
**It is the policy of the AMCA to advise the use of screening and/or an appropriate larvicide only.**

## ***Project Goal***

**To date, no known studies have looked at the effectiveness of Extension-recommended methods of keeping mosquitoes from breeding in rain barrels.**

**The goal of this project is to determine how effective these various treatments are in buckets acting as simulated rain barrels.**





## *Study Area*

- **Rutgers Cooperative Extension's Agriculture Building on Whitesville Road in Toms River, NJ**
- **Surrounding neighborhood is a mix of residential, commercial, and forested areas**
- **Primarily single-family houses and age-restricted developments**

## *Sampling*

- Mosquito larvae were sampled from July to September in 2021, June to September of 2022, and July to September in 2023
- Sampling was conducted by filling a 5-gallon bucket with ~1 gallon of water and applying one of the treatment options (nothing [control], screen, oil, soap, and ½ of a Mosquito Dunks® [Summit Company, U.S.A.]); sampled in triplicate
- Each bucket was left out for approximately 3 weeks to ensure that sufficient time was allowed for egg deposition, development, and hatching; buckets monitored daily



## ***Sampling***

- **After the sampling period, each sample was poured through a 150um sieve**
- **Large organic debris (twigs, leaves, and the like) were rinsed off into the sieve and removed from the sample**
- **Samples were then transferred to a 500mL or 1L container, with water, for transport to the Ocean County Mosquito Commission laboratory in Barnegat**

## *Sampling*

- Identification and counts of larvae were conducted by staff of the Ocean County Mosquito Commission
- Weather data was downloaded from the Rutgers NJ Weather Network site's Toms River station (<https://www.njweather.org/>)
- Daily weather data (daily maximum and minimum temperatures, and precipitation) were downloaded to correspond to each sampling period

## **Results**

- **Fourteen (14) rounds conducted in from 2021 – 2023**
  - **173 samples collected**
- **1,927 mosquito larvae collected**
  - **379 larvae collected in 2021; 961 in 2022; 587 in 2023**
  - **1,920 from the control buckets (no treatment)**
  - **64.3% of larvae collected were Culex pipiens (common house mosquito)**
  - **27.9% of larvae were Aedes albopictus (Asian tiger mosquito)**
- **52 adult mosquitoes were collected**
  - **41 from the control**

## Results

Sample	Total Number of Larvae	% Reduction in Larvae*	Total Number of Adults	% Reduction in Adults
Control	1,920	--	41	--
Dunk	2	99.9%	0	100.0%
Oil	0	100.0%	3	92.7%
Screen	1	99.9%	0	100.0%
Soap	4	99.8%	8	80.5%**

\*No statistical difference between % reductions in larvae.

\*\*Slight statistical difference between % reduction in soap and other control methods ( $p=0.057$ ).



## Results

<b>Year*</b>	<b>Ave Daily Temp (Max)</b>	<b>Ave Daily Temp (Min)</b>	<b>Total Precipitation</b>	<b>Ave Daily Relative Humidity (Max)</b>	<b>Ave Daily Relative Humidity (Min)</b>
<b>2021</b>	<b>83.3 °F</b>	<b>64.7 °F</b>	<b>19.6 in</b>	<b>97.6%</b>	<b>52.5%</b>
<b>2022</b>	<b>83.0 °F</b>	<b>62.4 °F</b>	<b>14.0 in</b>	<b>96.4%</b>	<b>45.5%</b>
<b>2023</b>	<b>80.8 °F</b>	<b>61.3 °F</b>	<b>18.6 in</b>	<b>97.3%</b>	<b>48.9%</b>

\*Year = the study period for that year (July-September for 2021 and 2023; June-September for 2022)

## Results

Sample	<i>Culex pipiens</i>	<i>Toxorhynchites rutilus</i>	<i>Aedes albopictus</i>	<i>Aedes japonicus</i>	<i>Anopheles punctipennis</i>	<i>Anopheles quadrimaculatus</i>	Unknown species
2021	103	1	206	33	33	0	3
2022	735	8	175	43	0	0	0
2023	401	7	157	18	0	4	0
2021	27.2%	0.3%	54.4%	8.7%	8.7%	0.0%	0.8%
2022	76.5%	0.8%	18.2%	4.5%	0.0%	0.0%	0.0%
2023	68.3%	1.2%	26.7%	3.1%	0.0%	0.7%	0.0%
All Years	64.3%	0.8%	27.9%	4.9%	1.7%	0.2%	0.2%

## ***Preliminary Conclusions***

- All the methods were effective at preventing larval development
- However, there are some issues that homeowners need to be aware of when choosing a method to use:
  - The Mosquito Dunks<sup>®</sup> proved messy when broken down in water; clogged the sampling equipment; dosing based off larger rain barrels (~55 gallons)
  - Oil developed a rancid smell after days in the heat; created an oily film on equipment; may be difficult to add/change throughout the rain barrel's life
  - Soap sinks in water and adults still try to lay eggs in it; may be difficult to add/change throughout the rain barrel's life
  - Screen keeps debris and mosquitoes out; seems to be the best overall choice for homeowners using rain barrels





***Thank you!***

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