

Luzerne County's Mosquito-borne Disease Control (MDC) Program

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PA Mosquito-borne Disease Control Program Multi-Agency Cooperative Effort



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Mosquito-borne Disease Control (MDC) Program in Luzerne County



 **The goal of the program is to reduce human exposure**, health care costs, and financial impacts that mosquito-borne disease outbreaks would have on the Commonwealth.

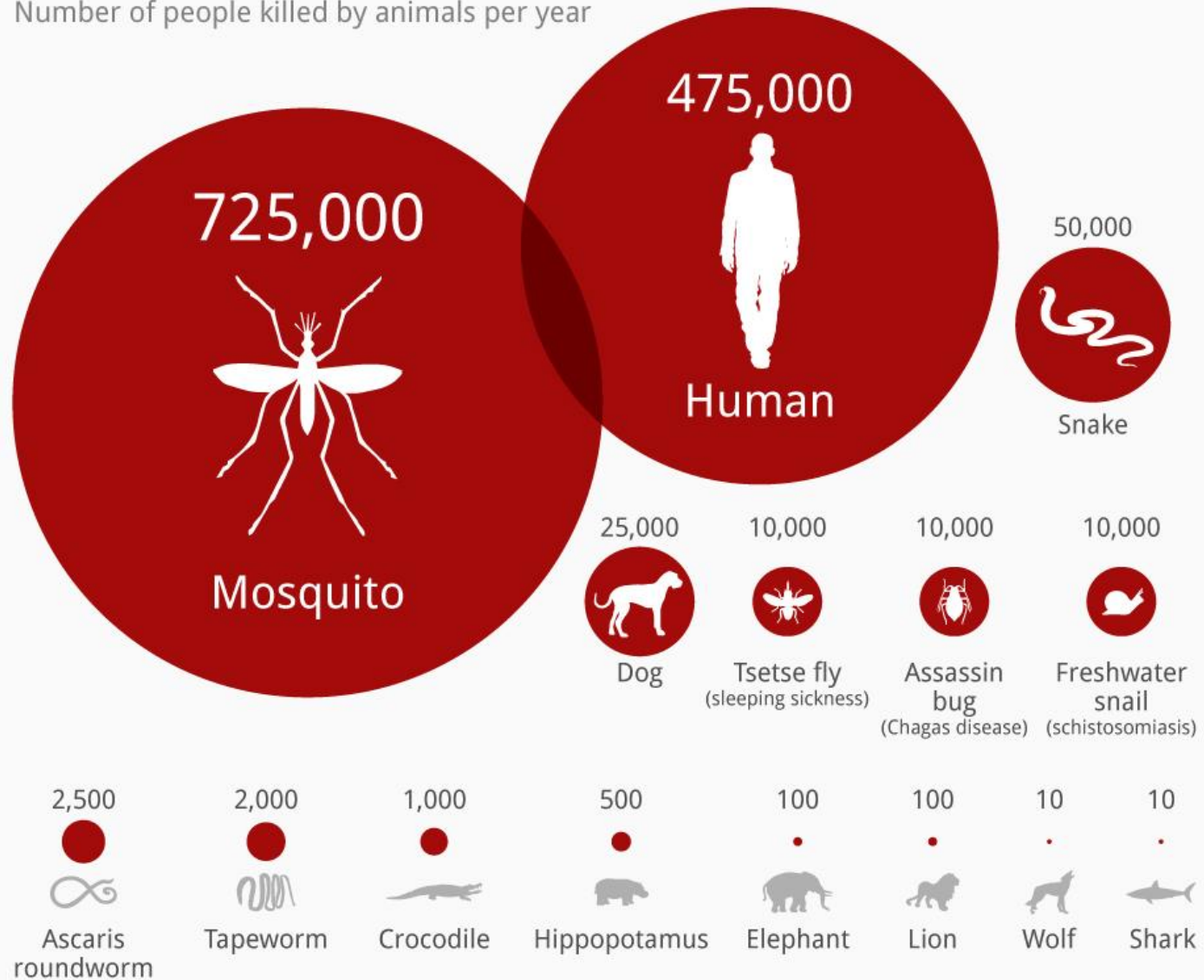
 The Luzerne Conservation District has administered the MDC Program (formerly called West Nile Virus program) in Luzerne County since 2010.

 The program is funded through a grant under DEP's Vector Management Program.

 The MDC County Coordinator works with DEP on mosquito surveillance and control programs.

The World's Deadliest Animals

Number of people killed by animals per year



@StatistaCharts

Source: Gatesnotes

Mosquito-borne Diseases

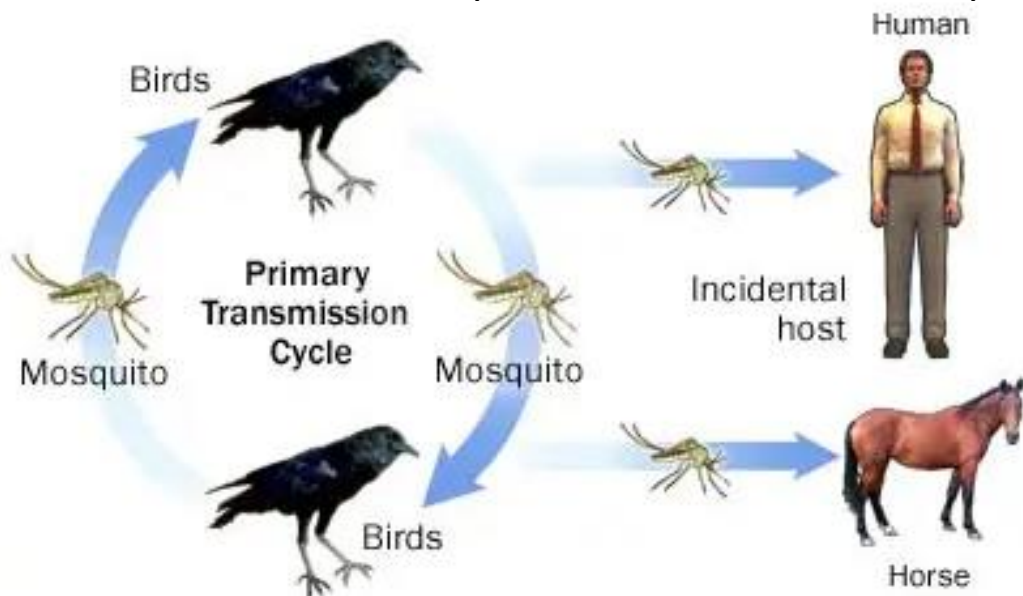


	West Nile Virus (WNV)	Jamestown Canyon Virus (JCV)	Saint Louis Encephalitis (SLE)
Mild Case	<ul style="list-style-type: none"> • Fever • Fatigue • Headache • Body aches • Joint pain • Vomiting, diarrhea 	<ul style="list-style-type: none"> • Fever • Fatigue • Headache • Body aches • Nausea, vomiting • Runny nose, congestion • Sore throat 	<ul style="list-style-type: none"> • Fever • Fatigue • Headache • Body aches • Nausea, vomiting
Severe/Neuroinvasive Case	<ul style="list-style-type: none"> • High fever • Neck stiffness • Disorientation, coma, tremors, seizures • Encephalitis • Meningitis • Paralysis • Death 	<ul style="list-style-type: none"> • High fever • Neck stiffness • Disorientation, loss of coordination, difficulty speaking, seizures • Encephalitis • Meningitis • Death (rare) 	<ul style="list-style-type: none"> • High fever • Neck stiffness • Disorientation, coma, tremors, seizures • Encephalitis • Paralysis • Death
	Most infections are asymptomatic or mild	Most infections are asymptomatic or mild	Most infections are asymptomatic or mild

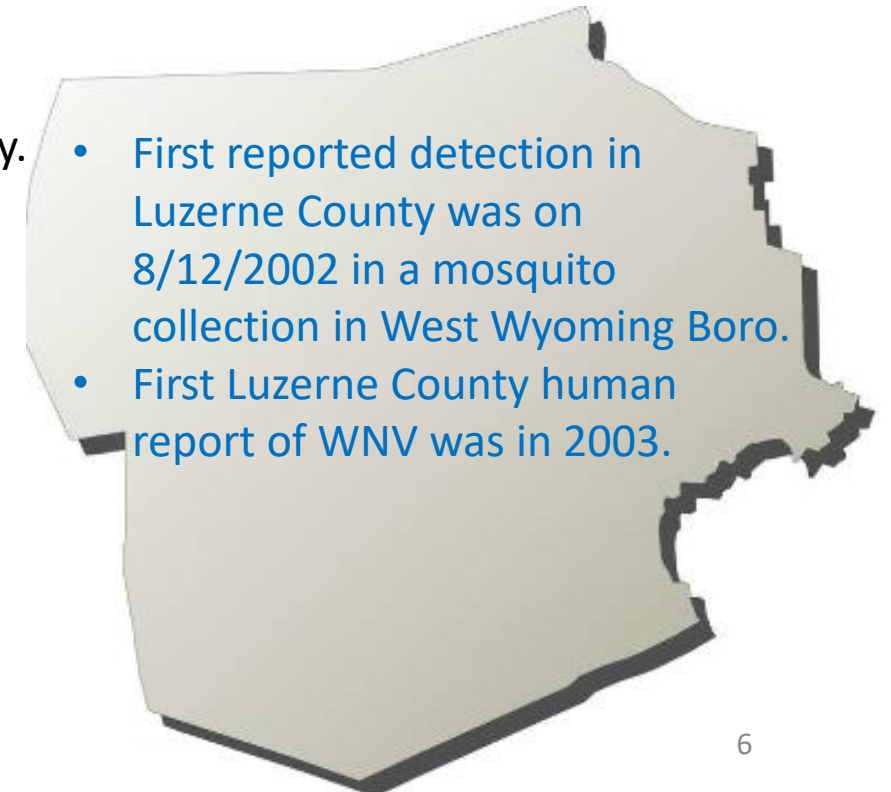
West Nile Virus (WNV)



- Transmitted through the bite of an infected mosquito. Mosquitoes become infected when they feed on infected birds.
- No human vaccine
- People >50 years of age or people with weakened immune systems are at a greater risk.
- WNV was first detected in the United States in NYC in 1999.
- First reported detection in PA was on August 29, 2000 in a mosquito collection in Schuylkill County.
- First PA human report of disease was on Sept. 12, 2001 in Fayette County.



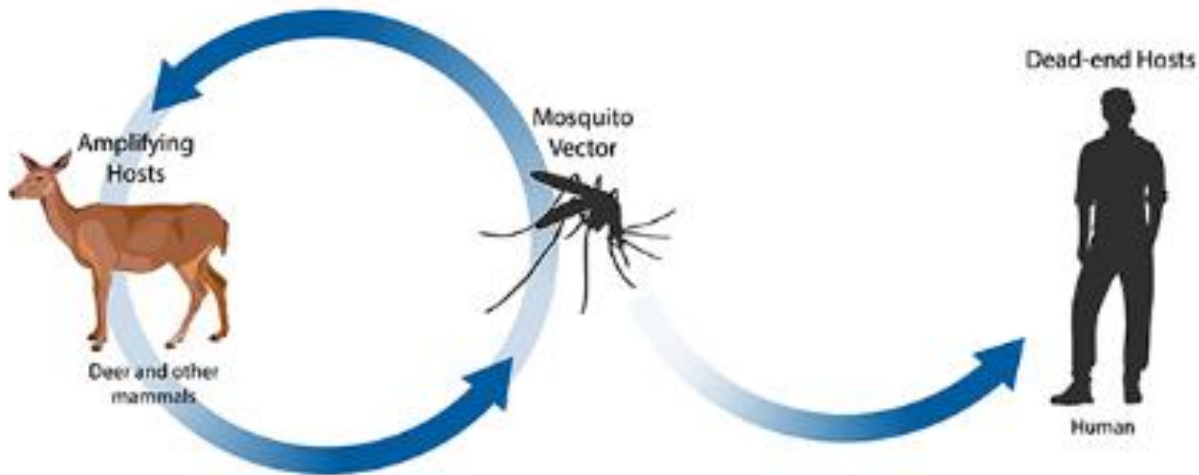
- First reported detection in Luzerne County was on 8/12/2002 in a mosquito collection in West Wyoming Boro.
- First Luzerne County human report of WNV was in 2003.



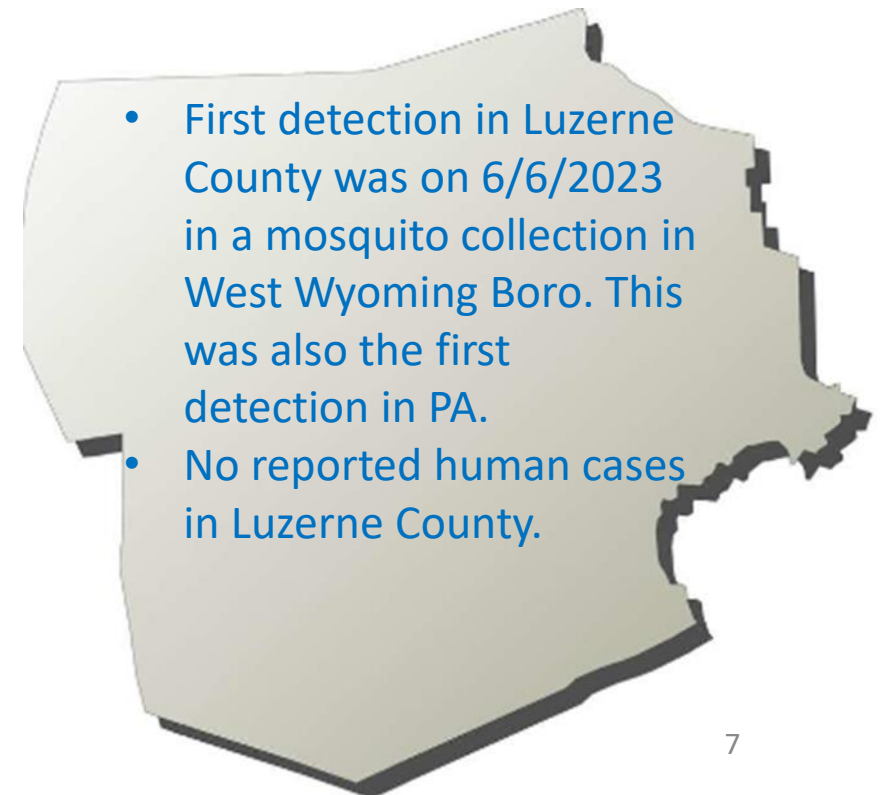
Jamestown Canyon Virus (JCV)



- Transmitted through the bite of an infected mosquito. Mosquitoes become infected when they feed on deer and other animals that have the virus in their blood
- No human vaccine
- People >50 years of age or people with weakened immune systems are at a greater risk.
- First detected in Jamestown Canyon, Colorado in 1961.
- First PA human report of disease was in 2013 in Northampton County.
- PA began surveillance for JCV in 2022.



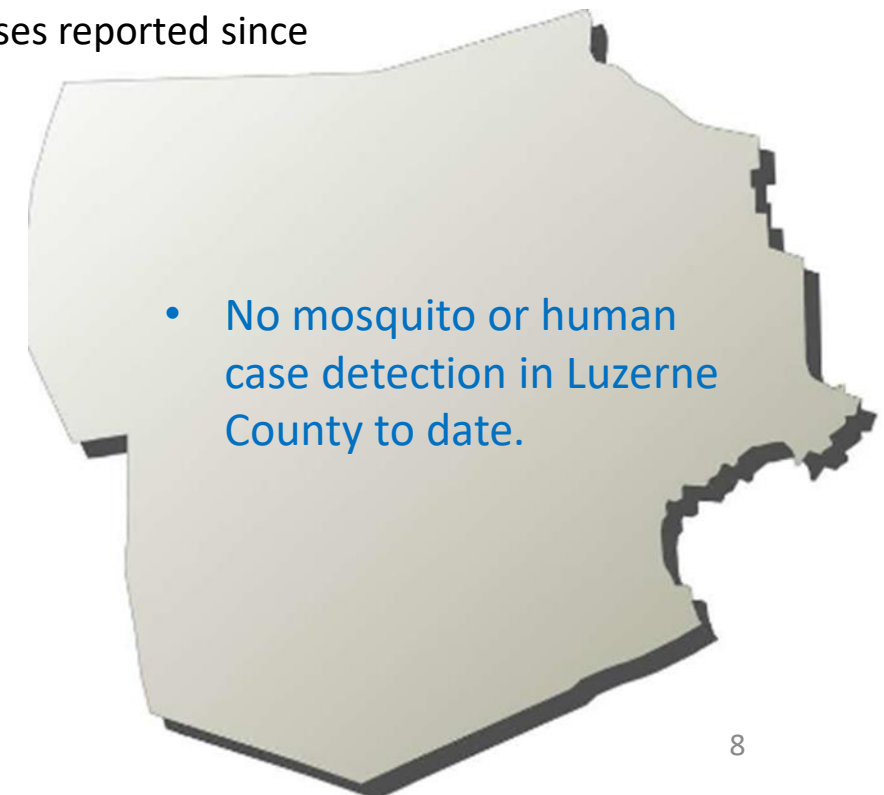
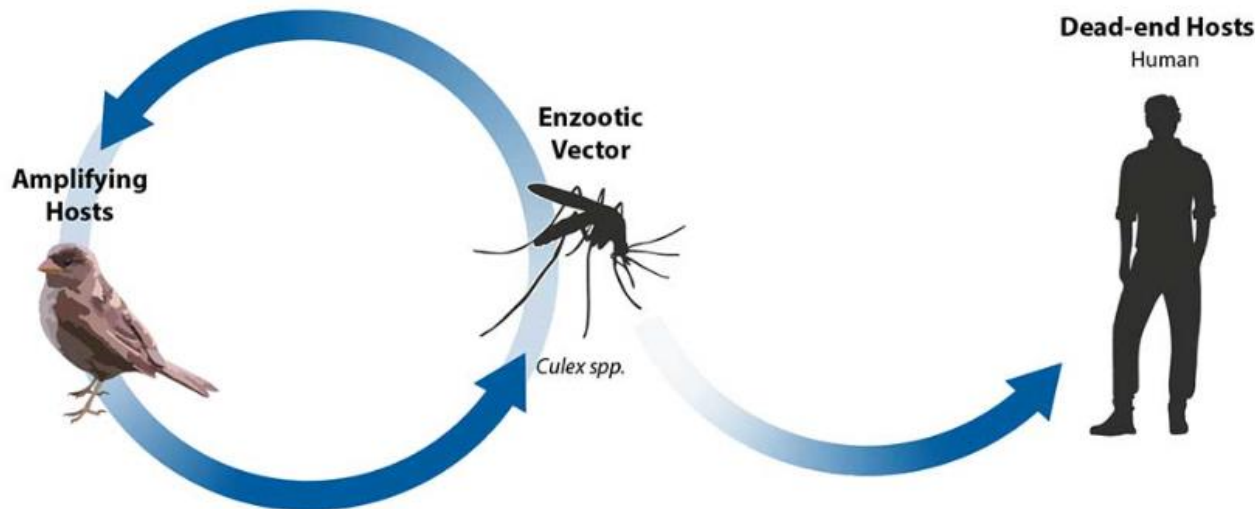
- First detection in Luzerne County was on 6/6/2023 in a mosquito collection in West Wyoming Boro. This was also the first detection in PA.
- No reported human cases in Luzerne County.



St. Louis Encephalitis (SLE)



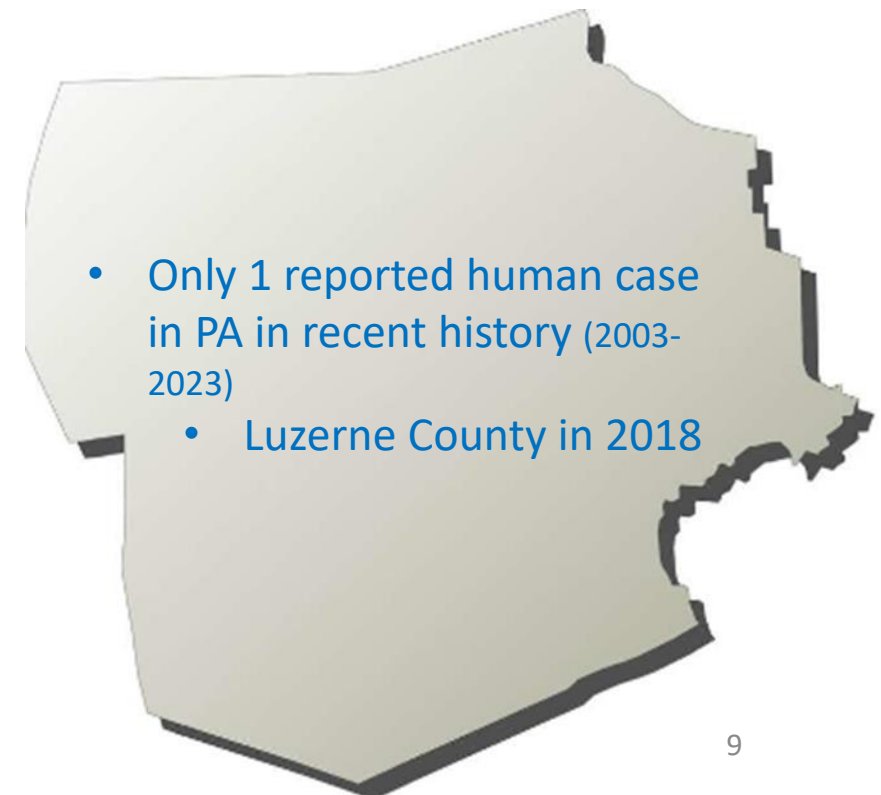
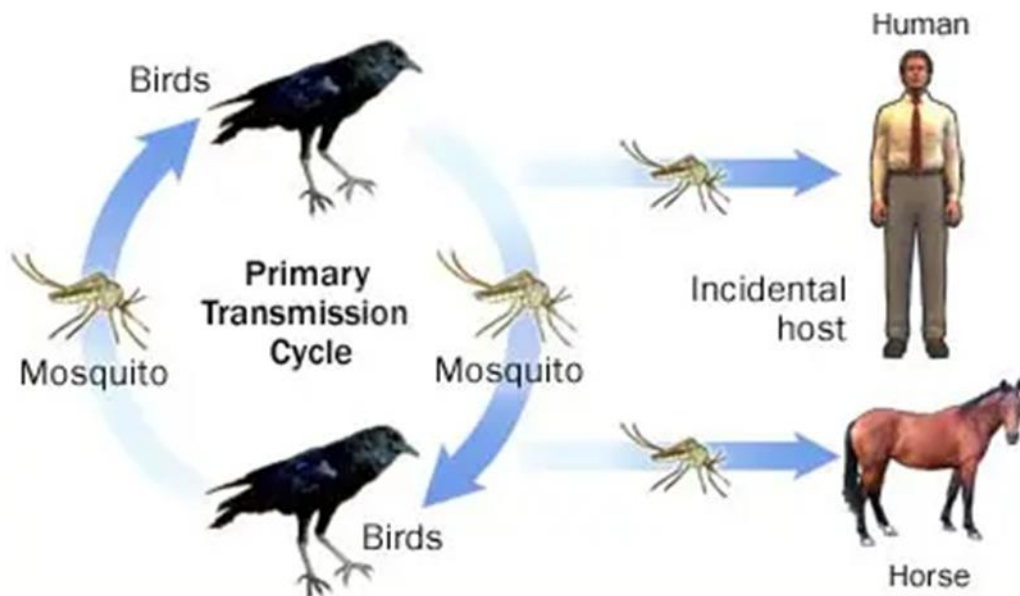
- Transmitted through the bite of an infected mosquito. Similar to WNV
- No human vaccine
- The mortality rate from SLE ranges from 5 to 30%, with higher rates among older adults (≥ 65 years)
- The virus was first recognized in 1933 when an epidemic in St. Louis, Missouri resulted in over 1,000 cases of encephalitis. Several epidemics have occurred sporadically throughout the U.S. since then, with the majority of cases occurring in eastern and central states
- First PA human report of disease was in 2003 in Monroe County. Only 4 human cases reported since then.



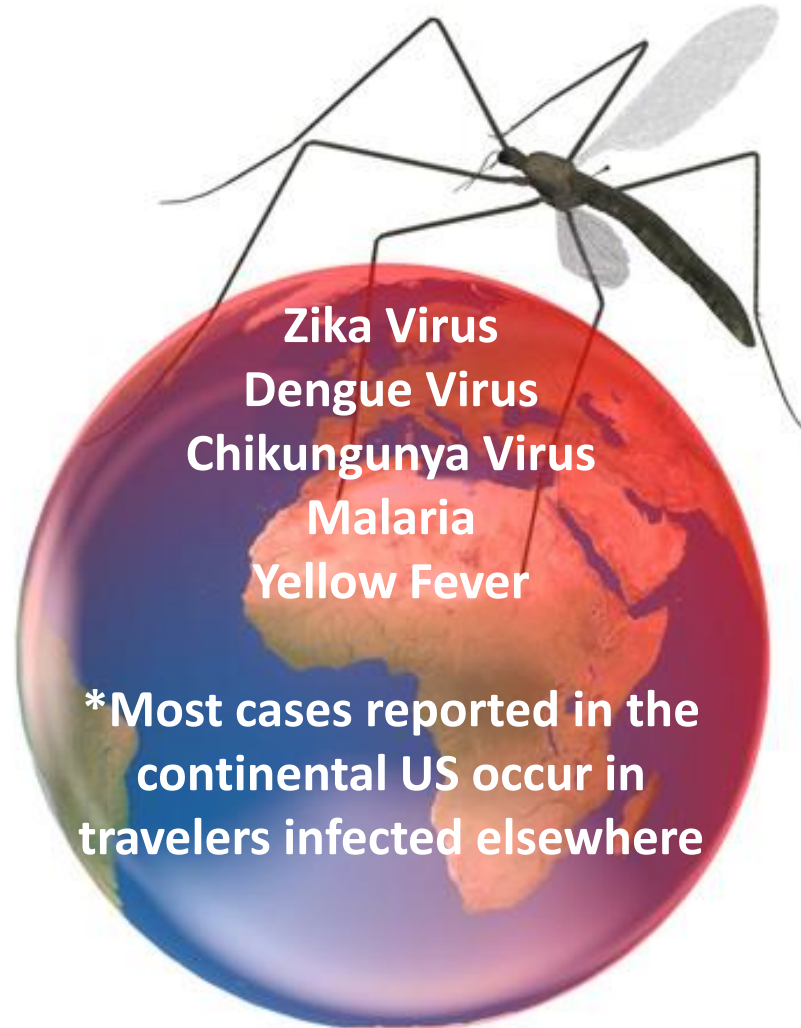
Eastern Equine Encephalitis (EEE)



- Transmitted through the bite of an infected mosquito. Not prevalent, but a serious arbovirus
 - 35% mortality rate in humans
 - 35% of survivors are afflicted with partial paralysis or brain damage
 - Symptoms similar to WNV encephalitis
- No human vaccine. Vaccine available for horses
- Human EEE cases occur relatively infrequently, largely because the primary transmission cycle takes place in and around acidic hardwood swampy areas where human populations tend to be limited.
- PA human EEE cases reported in 1968, 1979, and 2018.



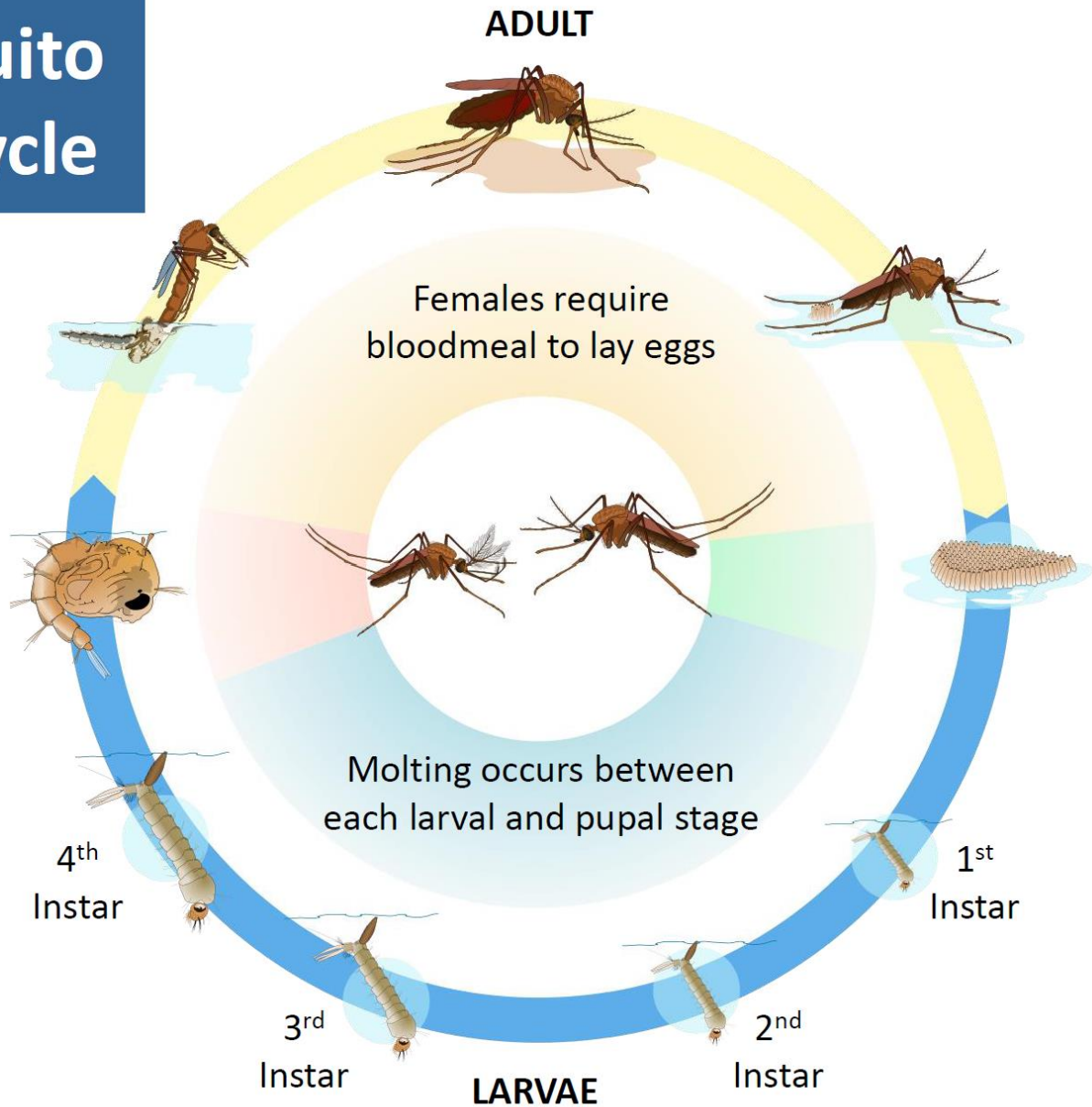
Other Important Mosquito-borne Diseases



Zika Virus
Dengue Virus
Chikungunya Virus
Malaria
Yellow Fever

*Most cases reported in the
continental US occur in
travelers infected elsewhere

Mosquito Life Cycle



Eggs laid directly on water surface
OR
in depressions or above water line to become inundated during a later rain event.

Some species have eggs that can lie dormant (not submersed in water) for many years.

Mosquitos can proceed from egg to adult in less than 1 week.

62 Mosquito Species in PA



Main vectors of WNV transmission

Culex restuans

Culex pipiens

Mainly container
breeding species

Potential vectors of JCV

Aedes japonicus

Aedes albopictus

Aedes vexans

Aedes trivittatus

Aedes sticticus

Mainly floodwater / woodland
pool breeding species

Anopheles punctipennis

Psorophora ferox



Integrated Mosquito Management (IMM)



Education/Outreach efforts

 Educate the public on prevention, source reduction techniques, personal protection

 Work with local municipalities to eliminate mosquito breeding habitat. **NOTE: LCD MDC staff has no regulatory authority to enforce mosquito habitat reduction/elimination.**

Mechanical Controls


 Prevention - Eliminate standing water before mosquitos lay eggs

 Source Reduction - Eliminate standing water after mosquitos lay eggs

Larval control

 Using appropriate methods for the habitat (ie. biological pesticides)

Adult control

 Using pesticides applied from backpacks, trucks or aircrafts when established thresholds have been exceeded

****Mosquito Surveillance required prior to pesticide control****

MDC Surveillance



LARVAE SURVEILLANCE	ADULT SURVEILLANCE	
DIPS	GRAVID TRAPS	BG SENTINEL TRAPS
<ul style="list-style-type: none">• Integral part of IMM• Find and control mosquito larvae before they emerge as adults• Identify new breeding habitats• Monitor mosquito population densities, species, growth stage, etc	<ul style="list-style-type: none">• Best choice for collecting <i>Culex restuans</i> and <i>pipiens</i> (WNV vectors)• Collects most WNV positive specimens• Used odor and stagnant water to attract females to lay eggs• Great collector of mosquitos that have already taken blood meal	<ul style="list-style-type: none">• Ideal for collection of nuisance and floodwater species.• Collects vectors of JCV.• Bait with BG Lure (human scented lure) and dry ice (CO2)



Larval Dip



Gravid Trap



BG Sentinel 2 Trap

MDC Control



LARVAL CONTROL

- Mechanical controls – eliminate standing water sources
- Larvicides
 - *Bacillus thuringiensis israelensis (Bti)*
 - Bacterial toxin
 - Ingested
 - *Lysinibacillus sphaericus (Ls)* (formerly *Bs*)
 - Bacterial toxin
 - Ingested
 - Methoprene
 - Insect growth regulator
 - Does not kill larvae
 - Causes non-viable adults
 - Spinosad
 - Isolated from soil bacteria
 - Ingested & contact toxin
 - Surface films
 - Refined mineral oils / Monomolecular films
 - Reduces surface tension of water
 - Kills pupae & late instar larvae exclusively

ADULT CONTROL

- Adulticides
 - Pyrethroids
 - Permethrin, bifenthrin, sumethrin, prallethrin
 - AquaDuet and Flit EC used most recently in Luzerne County
 - Application equipment
 - Backpack sprayers
 - Truck-mounted ultra-low volume (ULV) sprayer
 - Thermal Fogger
- Impacts to non-target species must be considered

2023 Season Summary

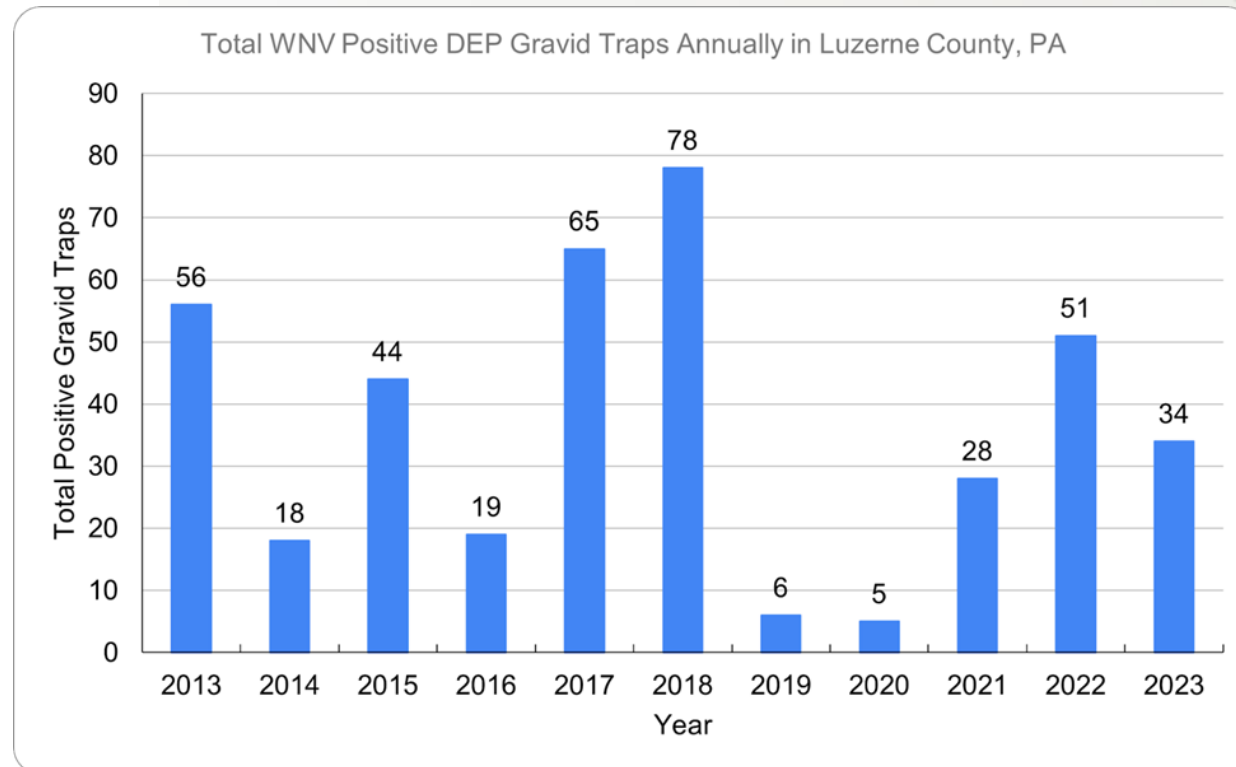


- ✈ **72,799** adult mosquitos were collected by LCD staff
- ✈ **628** gravid traps were set by LCD staff.
- ✈ **126** BG-Sentinel traps were set by LCD staff
 - **Luzerne County holds the top 4 highest mosquito trap counts in PA**, with the highest being 8,913 mosquitos collected in a BG trap set in Wyoming Borough
- ✈ **423** mosquito larval samples were logged by LCD staff.
- ✈ Mosquito surveillance included **187** sites throughout Luzerne County.
- ✈ **64** mosquito complaints were received and investigated by LCD staff.

2023 Season Summary

WEST NILE VIRUS (WNV)

- 🦟 **35** mosquito traps collected by LCD staff tested positive for WNV.
- 🦟 **53** positive mosquito pools identified by DEP lab
- 🦟 **0** WNV human cases in Luzerne County.
- 🦟 **20** WNV human cases in PA, **4** resulting in death.



*omitted above are gravid traps set by the PA Game Commission and an outlier WNV positive BG in 2023

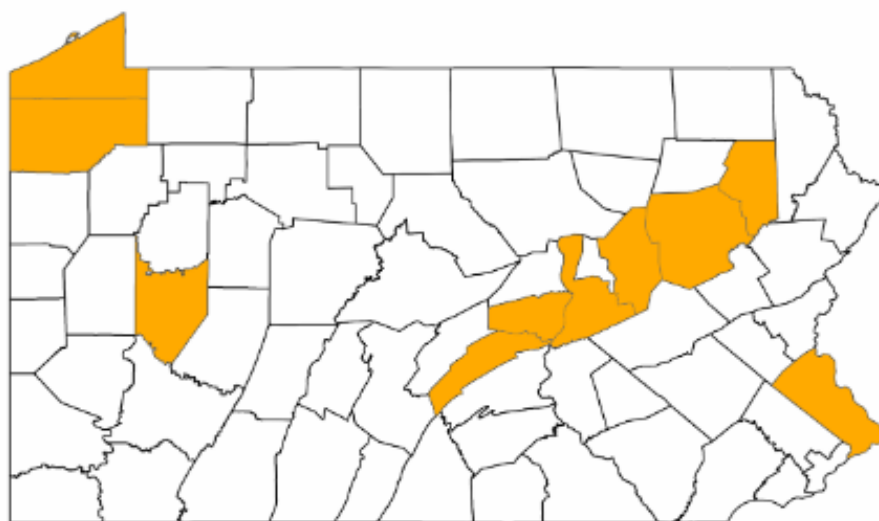


2023 Season Summary





JAMESTOWN CANYON VIRUS (JCV)

- DEP Vector Management started testing for JCV in PA in 2022
- 1st JCV positive sample in PA was found in a BG trap collected by LCD staff on June 6, 2023 in West Wyoming Borough.**
- 6 mosquito traps collected by LCD staff tested positive for JCV
 - 18 positive mosquito pools identified by DEP lab**




Legend

-  Jamestown Canyon Virus Present
-  Jamestown Canyon Virus Not Present

2023 Season Summary



MOSQUITO PESTICIDE CONTROL OPERATIONS







 **192** mosquito control operations performed by LCD staff.

- **11** truck-mounted ULV sprays
- **15** backpack barrier sprays
- **166** larval control applications






Larval Habitat: Artificial Containers

Habitat Notes

-  Tires
-  Buckets
-  Tarps
-  Gutters
-  Neglected swimming pools
-  Backyard Clutter

How can municipalities help?


Source reduction

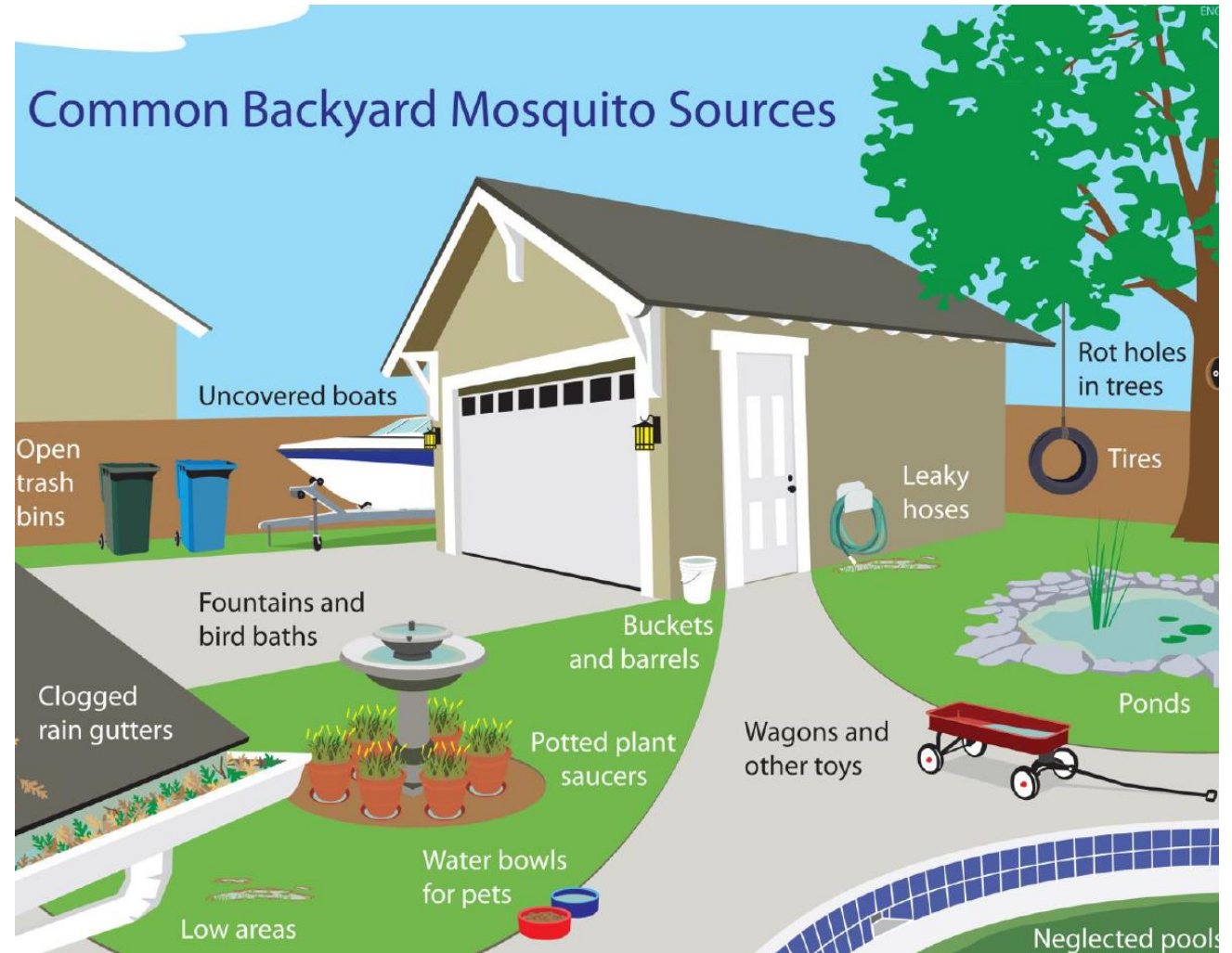
-  Emptying containers
-  Solving drainage issues
-  Reducing standing water

Standing/Stagnant Water Ordinance

Organize tire/scrap collection event






Biological Larvicides

-  BTI (mosquito dunks, mosquito bits, etc)










Larval Habitat: Sewage Treatment Plants

Habitat Notes

-  Highly organic (food)
-  Smelly (attractant)
-  Chlorine contact tanks (**Note: chlorine does not kill larvae!**)
-  Offline tanks
-  Surrounding standing water

How can municipalities, municipal authorities, or STP operators help?

-  Eliminate standing water or keep it moving.
-  Flush or aerate offline tanks weekly.
 -  Flush corners of chlorine contact tanks – mosquitos thrive there
-  Maintain regular dumpster & trash collections.
-  Cover or dispose of tires & artificial containers.
-  Find, seal, & flush hidden crypts & obsolete pipes.
-  Use biological or chemical larvicides when draining, flushing, aerating isn't possible.



Eliminate MOSQUITOES at your FACILITY

1. OFFLINE BASINS
2. SCUM PIPES & SKIMMERS
3. SLUDGE BEDS & REED BEDS
4. CATCH BASINS
5. CHLORINE CONTACT TANKS
6. DUMPSTERS, TIRES, ARTIFICIAL CONTAINERS, ETC...

MOSQUITOES NEED STANDING WATER TO SURVIVE...

- MOSQUITO LARVAE, LIKE THOSE BELOW, CAN BECOME ADULTS IN ONLY **5-7 DAYS!!!**
- ORGANIC, PONDING WATER ON REED BEDS & SLUDGE BEDS IS IDEAL MOSQUITO HABITAT!

ELIMINATE STANDING WATER, OR KEEP IT MOVING!

DUMP THE SCUM PIPES & SKIMMERS FREQUENTLY!

FLUSH THE CORNERS OF CHLORINE CONTACT TANKS WEEKLY!

MOSQUITOES WILL BREED IN MOST ARTIFICIAL CONTAINERS THAT HOLD WATER...

- MAINTAIN REGULAR DUMPSTER & TRASH COLLECTIONS.
- COVER OR DISPOSE OF TIRES & ARTIFICIAL CONTAINERS.
- CLEAN GUTTERS ANNUALLY.





AVOID THROWING GRASS CLIPPINGS IN CATCH BASINS.

MOSQUITOES SEEK OUT ORGANIC WATER!

FLUSH OR AERATE TANKS WEEKLY!



Larval Habitat: Stormwater Infrastructure

Habitat Notes

-  Inlets/outlets
-  Drainage ditches
-  Tire ruts
-  Rock pool areas

How can municipalities/municipal authorities help?

Routine maintenance

-  Maintain plant densities to support mosquito predator movement and promote water movement.
-  Prevent structure clogging by removing sediment and debris.

Ensure all new Dry Detention Basins / Infiltration basins are designed to completely drain in 72 hours. **Remember, mosquitos can proceed from egg to adult in less than 1 week.**

Ensure structure grades are designed to promote water flow and reduce standing water.

For infiltration-based SMW systems, inspect SCMs to ensure drawdown is occurring. Remove sediment and debris from infiltration areas to promote drainage through underlying soil.

When possible, Wet Ponds and Constructed Wetlands should be maintained with a water depth of 2.5 feet or more to promote aquatic predators of mosquito larvae (frogs, fish, etc) Aeration systems/Fountains can minimize zones where mosquitos can proliferate.

For subsurface stormwater detention systems, cover basins/vaults with tight sealing permeable material that prevents mosquitoes from laying eggs.


Biological/chemical larvicides may be applied if needed.

-  Contact the County MDC Coordinator for more info.







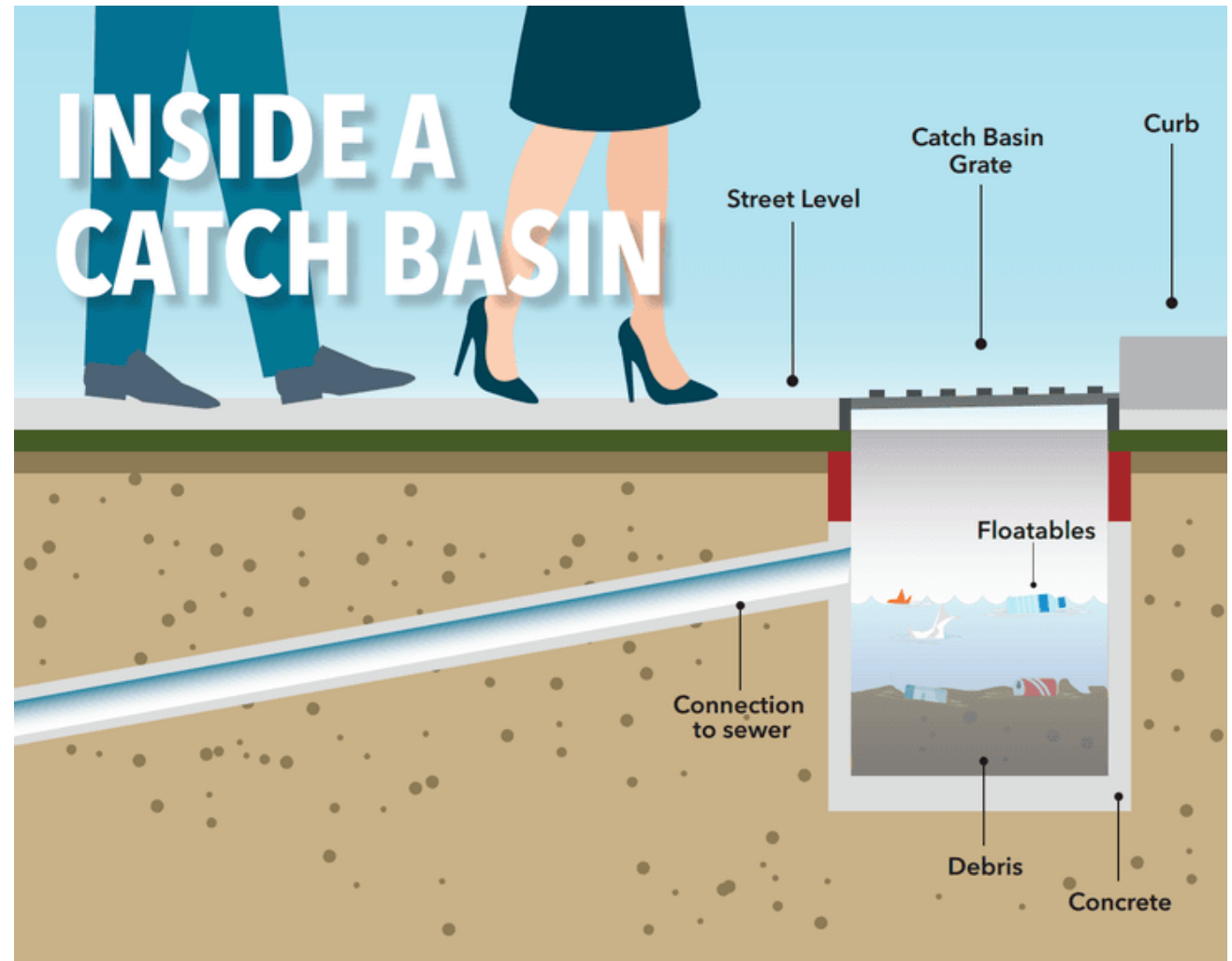
Larval Habitat: Catch Basins

Habitat Notes

-  Standing water in catch basin sumps.




How can municipalities help?

-  Keep catch basins free of debris and organic matter.
-  Where possible, new catch basins should be designed without sumps.
-  Provide catch basin/inlet mapping to Luzerne County MDC Program staff to support mosquito surveillance efforts.
-  Coordinate with Luzerne MDC Program Coordinator if larvicide control is needed.






Larval Habitat: Vernal/ Woodland/ Floodwater pools

Habitat Notes

-  Usually wet in the spring, then dries during the summer
-  Luzerne County's largest source of nuisance mosquitos
-  Found in floodplain areas along Susquehanna River and tributaries.

How can municipalities help?

-  Contact LCD MDC staff if resident complaints are received near these areas.
-  Send LCD MDC staff the location of known floodwater/woodland standing water sites – we have a good sense of most problem areas, but there are areas that have not yet been surveyed.
-  Do not fill in vernal/woodland pools without coordination with LCD/DEP staff – they may be regulated.



Can municipalities legally apply pesticides?it depends

§ 128.41. Requirements for certification.

(a) A person is deemed to be a commercial or public applicator and required to be certified if one or more of the following criteria are met:

(1) A person who applies or supervises the application of a pesticide on an easement or on the property or premises of another (other than his employer). This includes the use of a pesticide exempted from Federal registration under § 128.91 (relating to EPA approval required).

(2) A person who applies or supervises the use of a restricted use pesticide on property owned by him or his employer when not applied for the purpose of producing an agricultural product.

(3) A person who applies or supervises the application of a pesticide to the following locations or who is involved in the following types of application:

(i) Fumigation—Includes a person who uses fumigants except a person who meets the definition of a private applicator.

(ii) Golf courses—Includes a person who uses pesticides in the establishment and maintenance of a golf course.

(iii) Public and private parks—Includes a person who uses a pesticide in a recreational or campground area of a public or private park.

(iv) Educational and research institutions—Includes a person employed by a public or private educational and research facility that uses pesticides in its educational or research programs.

(v) Playgrounds and athletic fields—Includes a person who applies a pesticide to a public playground or an athletic field.

(vi) Apartment dwellings—Includes an owner of an apartment building or an employee of an owner who applies a pesticide other than a disinfectant to an apartment structure of four or more units. Commercial certification is not required if the owner or employee resides in the apartment structure and applies general use pesticides to the unit in which he resides.

(vii) Schools—Includes a person who uses a pesticide on school property, except for the use of disinfectants and sanitizers within the school building.

(viii) Swimming pools—Includes a person who uses a pesticide in the care and maintenance of swimming pools or water recreation facilities associated with a public or private park, excluding lakes, ponds, rivers or streams.



RESTRICTED USE PESTICIDE

Due to High Acute Toxicity to Humans.

For retail sale and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

To summarize: A municipality is not required to be a certified commercial or public applicator when applying a non-restricted use pesticide to their municipal-owned property (excluding locations listed in § 128.41(a)(3))

Summary of how municipalities can help.

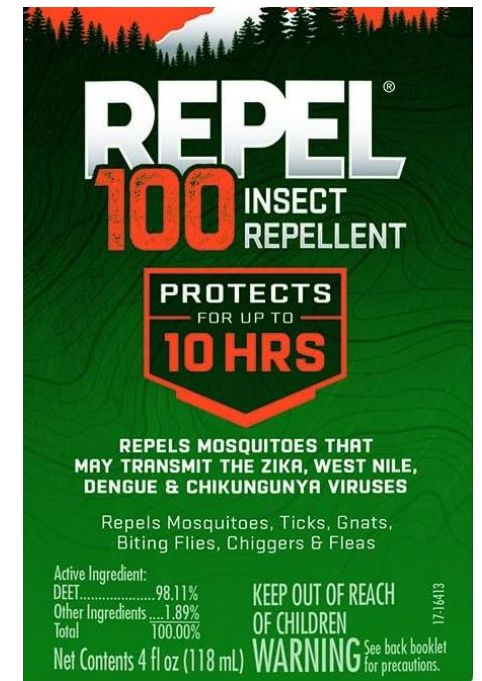


- 🦟 Reduce sources of standing water on properties and educate residents to do the same.
- 🦟 Design/maintain stormwater facilities to either completely dewater in 72 hours (dry detention/infiltration basin) OR maintain deep pools (wet ponds). Support mosquito predatory species
- 🦟 Consider hosting tire collection events.
- 🦟 Monitor STPs for mosquito larvae. Aerate, flush, cover, dump!
- 🦟 Provide potential mosquito breeding site info (tire piles, neglected swimming pools, catch basin mapping, hidden vernal pools, stormwater basins, etc) to county MDC Coordinator.
- 🦟 Consider implementing a stagnant/standing water ordinance. Leverage code enforcement officials to help regulate standing water sources on private property.
- 🦟 Apply biological larvicides where allowed. Follow the label!

Protection from Mosquito Bites



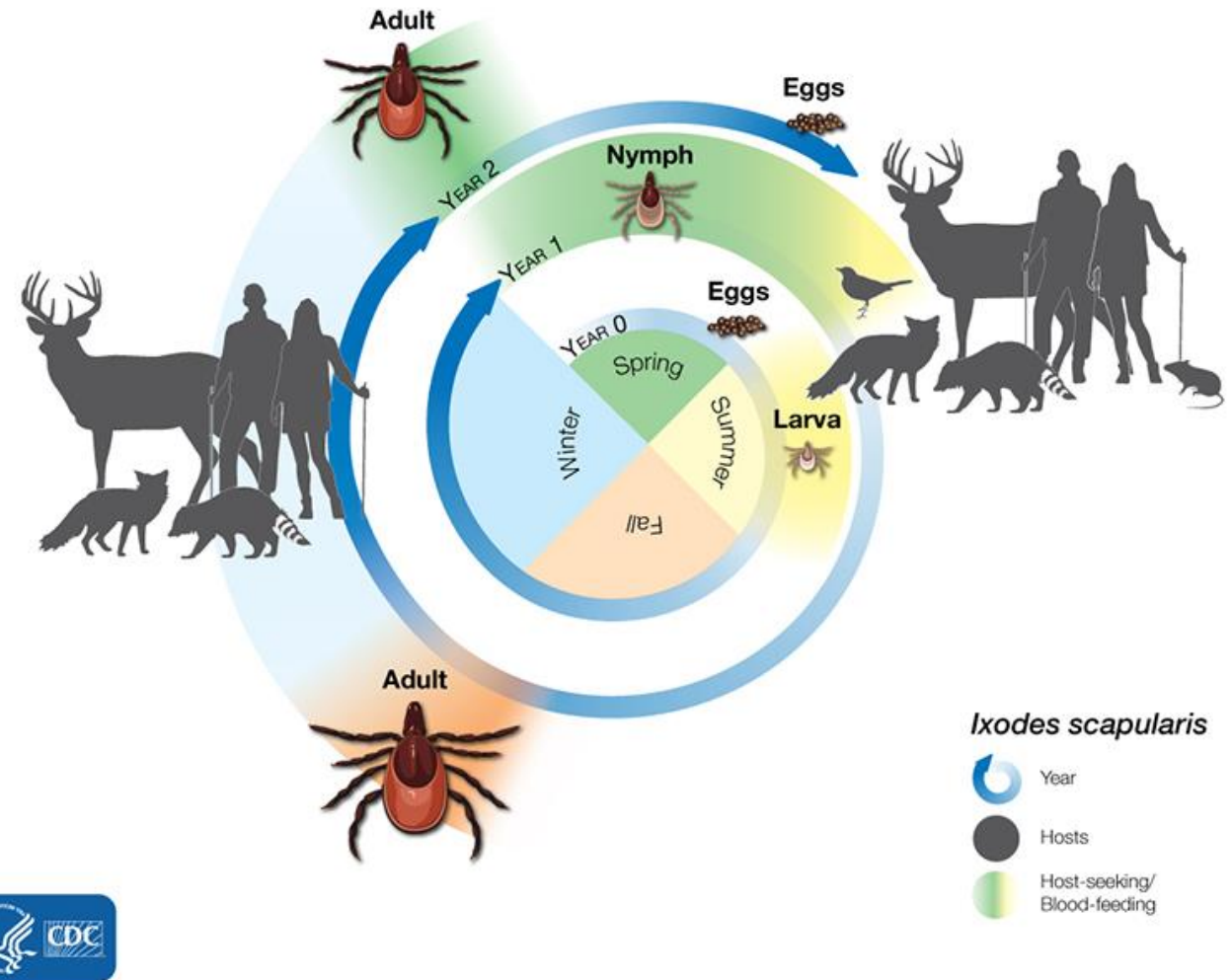
- Use screens on windows to prevent mosquitos from entering your home.
- Limit time outdoors during dusk and dawn. Mosquitos are most active at these times.
- Use mosquito repellent (DEET, picaridin, oil of lemon eucalyptus).
- Wear long sleeves and pants. Wear thicker fabrics and looser fitting cloths.
- Use small fans when outside. Mosquitos are weak flyers.



Tick Surveillance

TICK SURVEILLANCE (as of 12/1/23)

- Total Blacklegged (Deer) Tick (*Ixodes scapularis*) nymphs collected by LCD: **23**
- Total Blacklegged Tick adults collected by LCD & DEP: **127**
- Total Blacklegged Tick specimens tested for Lyme: **38**
- Total Blacklegged Ticks testing positive for Lyme: **18**
- Percent of tested Blacklegged Tick specimens testing positive for Lyme: **47.37%**



Questions?



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