State of Connecticut

West Nile Virus Surveillance and Response Plan, 2012

Introduction

The West Nile Virus (WNV) Surveillance and Response Plan originally was developed in 2000 by the Mosquito Management Program (MMP), an interagency state working group led by the Department of Energy and Environmental Protection (DEEP). The Department of Public Health (DPH), the Connecticut Agricultural Experiment Station (CAES), the Department of Agriculture (DoAg), the University of Connecticut Department of Pathobiology and Veterinary Science (UConn), and the Connecticut Association of Directors of Health participated in the planning process. The Plan is used as a guide for the state's mosquito-borne disease prevention activities.

Mosquito Management Program

In 1997, Public Act 97-289, "An Act Concerning Mosquito Control and Aerial Application of Pesticides," (CGS Sec 22a-45b) created the MMP to monitor mosquito breeding populations for the prevalence of infectious agents that can cause disease in humans and to determine when measures to abate a threat are necessary. The original focus of the program was to monitor the threat of Eastern equine encephalitis (EEE) virus. The Act authorizes the necessary measures to abate any pest-borne threat, including prevention and remedial measures, and allows for the application of broad spectrum chemical pesticides to address an imminent peril to the public health, safety, or welfare posed by pests, including mosquitoes that carry the EEE virus. The Mosquito Management Program is based on an integrated pest management (IPM) approach, which includes a combination of surveillance, education, source reduction, larval and adult mosquito control and personal protection measures.

Surveillance Activities

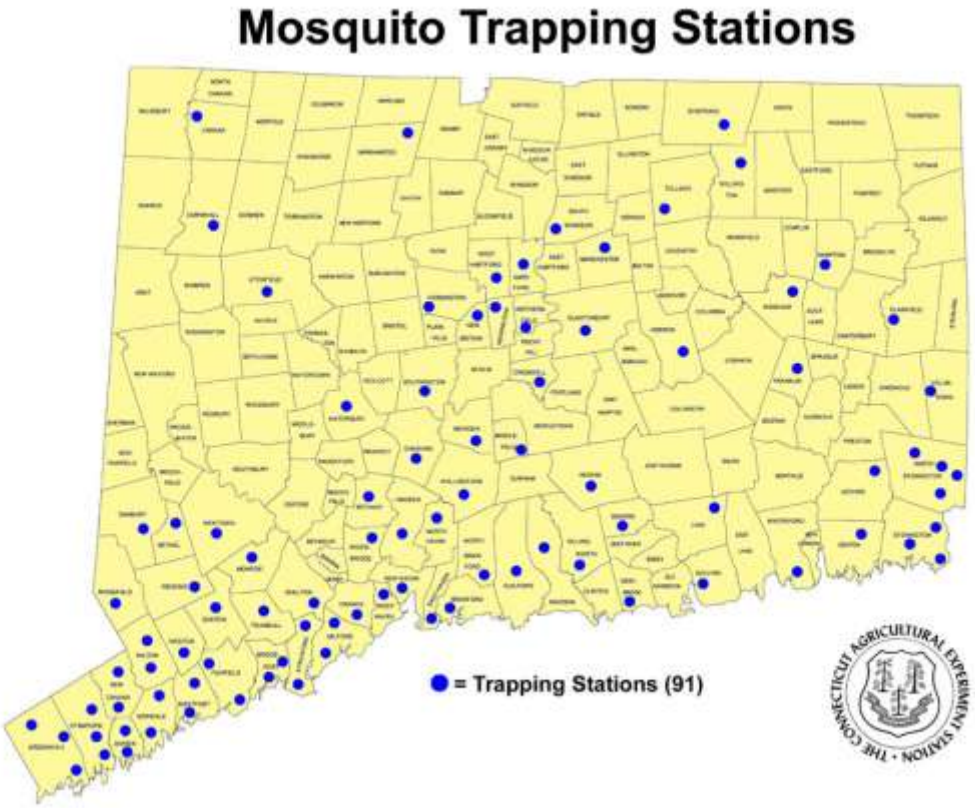
Public health surveillance is the ongoing and systematic collection, analysis, and interpretation of health data in the process of describing and monitoring a health event. This information is used for planning, implementing, and evaluating public health interventions and programs. Surveillance activities are at the core of the Plan and currently include surveillance for EEE as well as WNV in mosquitoes, domestic animals and poultry, and humans.

Mosquito Surveillance

Surveillance for WNV in mosquitoes is integral to the public health response to WNV in Connecticut. The CAES maintains a network of 91 fixed mosquito-trapping stations located in 72 municipalities throughout the state providing information that includes mosquito species composition and abundance in the community, seasonal and spatial distribution of mosquito vectors, and WNV infection rates in mosquitoes. One-third of the sites are located in southern Fairfield and New Haven counties where the highest levels of WNV activity in mosquitoes and humans have been detected in previous years (see Figs. 1a and b).

Traps are set and attended by CAES staff every 10 days at each site on a regular rotation from June through October. Two trap types are used at all trapping stations – a CO_2-baited CDC Light Trap, designed to trap host-seeking adult female mosquitoes (all species), and a Gravid Mosquito Trap with hay

infusion, designed to trap previously blood-fed adult female mosquitoes (principally *Culex* and container-breeding *Ochlerotatus* species). Mosquitoes are transported alive to the laboratory each morning where they are identified to species. Mosquitoes are grouped (pooled) according to species, collecting site, and date and frozen at –80°C. A maximum of 50 female mosquitoes are included in each pool. Aliquots of each mosquito pool are inoculated into Vero cell cultures for detection of WNV and other mosquito-borne arboviruses of public health importance. Virus isolates from mosquito pools are tested for WNV, Eastern equine encephalitis (EEE), Jamestown Canyon (JC), Cache Valley (CV), Trivittatus (TVT), Highlands J (HJ), LaCrosse (LAC), and Potosi (POT) viruses. Isolated viruses are identified by Real Time (TaqMan) PCR or standard RT-PCR using virus-specific primers, plaque reduction neutralization (PRNT) and/or an enzyme-linked immunosorbent assay (ELISA) with specific reference antibodies. All of the virus isolation work is conducted in a certified Bio-Safety Level 3 laboratory at the CAES. Weekly test results are reported to the CDC electronically via ArboNet and to the DPH for dissemination to other state agencies, local health departments, the media, and neighboring states.



Domestic Animal Surveillance

The DoAg investigates potential cases involving domestic animals, poultry and pet birds with suspicious neurologic disease reported to the State Veterinarian and/or presented for necropsy and testing to the Connecticut Veterinary Medical Diagnostic Laboratory at UConn. Horses are emphasized since they are most frequently affected. Horses presenting with the following clinical signs during the mosquito season raise suspicion: apprehension, head shaking, inability to stand, depression, flaccid paralysis of lower lip, single or multiple limb paralysis, listlessness, loss of coordination, weakness of hind limbs, or acute death. This surveillance (approximately 50,000 horses in the state) provides another means to detect the

presence of WNV and assess the risk of WNV infection to the human population, especially in more rural areas where mosquito trapping is not conducted. A WNV vaccine for horses is now available.

Human Surveillance

The surveillance for disease in humans caused by WNV is coordinated by the DPH. Testing of serum and cerebrospinal fluid specimens for WNV antibodies and antibodies to other arboviruses (e.g. EEE, California encephalitis group, St. Louis encephalitis, Jamestown Canyon) is available at the DPH Laboratory and has been offered at no charge. Emphasis is on patients who require hospitalization for neurologic illness. Testing is available year round but is of particular importance for Connecticut residents who have not traveled during June through October indicating locally acquired infection. Physicians wishing to test persons suspected of having WNV infection on the basis of mild illness, such as fever or headache, and recent mosquito bites are encouraged to submit specimens to hospital or commercial laboratories since they are unlikely due to WNV infection and not necessary for prognostication. Reporting of positive test results from laboratories to DPH is required (see Fig. 2).

Should spraying of pesticides be conducted to reduce adult mosquito populations in response to WNV or EEE virus, the DPH also conducts surveillance for possible health effects of pesticide exposure. Physicians are encouraged to report to the DPH Environmental and Occupational Health Assessment Program possible pesticide-related health effects. The DPH compiles and summarizes this information and reports significant findings to the local health departments and other agencies as appropriate. This system is based on National Institute for Occupational Safety and Health classification of acute pesticide-related illness. The DPH assists local health departments monitor calls from the general public regarding health complaints and reports unusual clustering of complaints in terms of location or time to the DEEP Division of Pesticides for investigation of possible misapplication of pesticide.

Wild Bird Surveillance

West Nile virus has been detected in dead birds of over 300 species. Infected mosquitoes carrying virus particles in their salivary glands infect susceptible bird species. Bird species capable of sustaining a sufficiently high level of virus circulating in the bloodstream for several days then serve as a source of infection for additional mosquitoes.

Although most birds infected with WNV do not develop serious illness some species, particularly crows and jays, can develop fatal infections. During the first several years of WNV in Connecticut reports of dead crows served as a useful sentinel for the presence of WNV and to describe seasonal variation.

From 2000 to 2003, 92% of the human WNV infections acquired in Connecticut were preceded by a dead crow sighting in their town and 87% by a bird with laboratory confirmed WNV infection. However during 2004 and 2005, the numbers of dead crow reports and submissions for testing decreased sharply resulting in reduced utility of this system for WNV monitoring purposes.

Since 2006, mosquito surveillance has been more reliable than avian surveillance in describing the level of statewide WNV activity. Dead birds are no longer being tested for WNV. Available resources are currently devoted to maintaining the statewide mosquito trapping and testing program conducted June through October.

Dead birds can be placed in a double plastic bag and placed out with the trash or brought to a municipal landfill. They can also be disposed of on-site by burying. As for all dead animals, avoid handling with birds with bare hands.

Mosquito Management Activities

Pre-emptive mosquito control is the most effective way to prevent transmission of WNV and other mosquito-borne viruses. The most effective and economical way to control mosquitoes is by larval source reduction through local abatement programs that monitor mosquito populations and initiate control before disease transmission occurs. In addition, larval control allows for the use of target-specific agents in definable areas, which is an environmental benefit over other methods. Depending on the time of year, these programs also can be used in an emergency response for mosquito control if disease is detected in humans or domestic animals.

To prevent standing water, federal, state and local governments need to maintain existing drainage structures on their properties such as sumps, recharge basins, sewage or wastewater treatment facilities, street catch basins, upland streams, ponds, and pools. The DEEP Wetlands Habitat and Mosquito Management Program directly conducts mosquito control activities on state-owned property in coastal marsh areas and on contiguous land. The DEEP also works with municipal officials statewide to identify mosquito-breeding habitat (e.g. tidal and inland wetlands, catch basins) and develop appropriate control strategies based on Integrated Pest Management strategies to eliminate larval mosquito breeding sites.

Municipalities are responsible for coordination of mosquito control activities on municipal and private lands in their jurisdictions, working with state agencies on behalf of residents, and enforcement of abatement requirements of mosquito breeding areas if necessary. Mosquito breeding on residential and commercial properties can be reduced significantly by reducing the amount of standing water available for mosquito breeding. Regulations relevant to mosquito control and the powers of local directors of health are addressed in the Public Health Code.

To further reduce the risk of mosquito-borne virus infections, individuals are urged to take personal protective measures to avoid mosquito bites when outdoors and mosquitoes are biting through the use of repellents and proper clothing (e.g., light-colored, loose-fitting pants and shirts, head nets). Homeowners are advised to assure that window and door screens are in good repair.

Insecticides

Larvicides can be used to control mosquitoes in the aquatic stage before they become biting adults. This type of control using insecticides generally is the most effective at controlling mosquitoes and has the least effect on non-target species and the environment. Ideally, use of larvicides is started early in the mosquito season repeated as necessary. The use of larvicides may require a permit from the DEEP, and the product must be registered for use in Connecticut. Depending upon the type of product used, or for commercial applications, the applicator must be licensed by the DEEP Pesticide Division to apply mosquito pesticides.

Adulticides can be used to kill adult mosquitoes when a quick reduction of mosquitoes is needed. Currently available adulticides may be applied by hand-held, backpack or truck-mounted Ultra Low Volume (ULV) foggers, or by fixed-wing or rotary aircraft. These materials have advantages and disadvantages that will influence which material is most appropriate for a given situation, and all must be applied according to regulations and label directions. Weather and logistical conditions are important factors influencing the ability to effectively control adult mosquito populations and include the following:

- Ground-level adulticiding is done when mosquitoes are most active (between dusk and dawn).
- Aerial application is done between dusk and dawn, under favorable weather conditions and at the discretion of the DEEP and its aerial contractor.
- Wind speed is less than 10-12 mph.

- Wind direction and temperature inversions favor drift onto the target area.
- Air temperature is above 50 degrees F.
- Adulticide application is not made during rainfall.
- When making a ground-level application, the distribution and network of roads and access areas in the treatment zone are considered, as this affects the level of coverage.

Communication and Public Awareness Activities

Public education about mosquito-borne diseases, particularly modes of transmitting and means of preventing or reducing risk for exposure, is a critical component of a prevention and control program. Communication and public awareness activities are designed to provide pertinent information during the mosquito season to state agencies, municipal officials, health care providers, the public, and the media including:

- Disease prevention recommendations including personal protective measures and homeowner source reduction.
- The use of larvicides, adulticides and other control methods.
- The virus, clinical manifestations, and its diagnosis.
- Mosquito Management Program information.
- Recommendations in response to the identification of WNV or other mosquito-borne viruses in Connecticut.

Outreach to Municipal Officials and the Public

- The DEEP makes available brochures, flyers, and fact sheets on WNV infection, larvicides, pesticides, personal protective measures for people, and mosquito control methods targeted at homeowners. This information and surveillance results are available in electronic format on the state Mosquito Management Program website (www.ct.gov/mosquito). The website includes links to the DPH, CAES, and DoAg.
- Surveillance findings are disseminated by press release to media statewide as needed. Each agency has designated staff to respond to media inquiries for up to date information.
- The DPH includes a WNV update as needed at its semi-annual meetings with directors of health.
- The DPH Infectious Diseases Section newsletter, the *Connecticut Epidemiologist*, is available to hospitals, laboratories, local health departments, and physicians statewide; the newsletter periodically includes summaries of prior seasons.
- Conference calls with local health directors occur as needed and are organized by the DPH Local Health Administration, and include members of the State Mosquito Management Team. Conference calls with state experts are a forum to discuss current state and national information and actions.

When WNV Activity is Identified

- Local health directors in the towns where WNV is identified in mosquitoes, domestic animals, or people are notified directly by the DPH. Notification is done by phone when the first infected mosquitoes, a human or domestic animal is identified in a town.
- Information available on human cases of WNV infection is posted as they become available on the DPH and web site. Upon identification of the first human case of WNV, the MMP will issue a statewide press release announcing the finding. In specific cases, where the human identification does not indicate an increase in a threat to public health, the MMP may decide not to issue a statewide press release. Examples of such cases include, but are not limited to, identification of WNV in a Connecticut resident when the infection is believed to have occurred out of state or identification of WNV in a Connecticut resident late in the season when mosquitoes are not as active and WNV is not believed to be a significant threat.

- In coordination with officials in the towns affected, the MMP will issue a statewide press release when needed to warn Connecticut residents that WNV activity is increasing in intensity or geographic distribution and an elevated risk of human infections may occur.
- Throughout the season the DPH, on behalf of the MMP, will issue press releases as needed to announce findings of regional or statewide importance.
- The MMP conducts discussions with municipal officials in the towns affected and provides guidance for of public health actions if necessary. These may include dissemination of public information and mosquito control measures.
- If findings suggest a possible role for spraying to kill adult mosquitoes to mitigate a heightened risk of sustained transmission to people, the DEEP organizes and coordinates a conference call with the appropriate state and local officials. The purpose of this call is to develop a plan based on all available surveillance information and community sentiment.
- The state assists municipalities with key support information needed to respond to common questions from the general public.
- In the event adulticide use is recommended the state works with the municipality to:
  - Notify residents of the targeted area at least 24 hours before application.
  - Place posters and signs at key town locations as needed.
  - Address local resident's questions and concerns.
  - Coordinate application with local police.
  - Monitor health complaints.

Interagency Communication

- During the mosquito season state mosquito management team members are in contact regularly and multiple times each week by telephone and e-mail.
- Conference calls with the team occur as needed and are coordinated by the DEEP.
- The DEEP and DPH work together to disseminate information regarding WNV among the Mosquito Management Program agencies including surveillance results as they are available.
- Press releases are drafted by the DPH and distributed for review to DEEP and CAES, and, in the event of animal cases, to the DoAg.

Public Health Action Levels

If WNV is confirmed in Connecticut, the DPH, in consultation with other state and local agencies, evaluate the potential threat to human health. Following evaluation of the data obtained from public health surveillance activities and depending on the nature of the threat, either the Commissioner of the DPH or the Commissioner of the DEEP, after consulting with the Commissioner of DPH, will recommend implementation of control measures.

Recommendations reflect a graded response that is in proportion to the threat of WNV infections in people. Numerous factors contribute to the level of increased risk making each situation unique. The goal is to prevent a sustained outbreak of human infections. Sporadic cases are likely to occur each season that WNV is circulating in mosquitoes since the principal mosquito species responsible for transmission is found in high numbers in residential areas.

Factors

The following factors are important considerations in formulating an appropriate response to the identification of WNV:

- Mosquito populations and relative species abundance.
- Proportion of mosquitoes infected and number of pools previously identified.

- Local surveillance data in previous season.
- Time of the season.
- Weather conditions.
- Geographic extent.
- Nature and proximity of potential mosquito habitat.
- Proximity and nature of human residential areas.
- Number and location of infected horses.
- Number and residence of human patients with WNV related illness.
- Community concern and acceptance of mosquito control activities.
- Extent of previous larval mosquito control activities.
- Likely effectiveness of local application of larval or adult insecticides.

Activities

The following activities may be part of the response:

- Evaluation of the findings by the entire Mosquito Management Program team.
- Consultation with local directors of health and other municipal officials.
- Advice to community groups regarding outdoor activities.
- Dissemination of information on prevention and control methods locally or statewide.
- Emphasize the importance of *Culex* mosquito breeding site reduction on residential properties.
- Urge adoption of personal protective measures among high risk residents in affected areas.
- Expansion of mosquito trapping and human surveillance locally and beyond town lines.
- Identification of locations in the affected area where larviciding would be effective.
- Disseminate information on adulticide applications.
- Assessment of the need, practicality, frequency, extent and method necessary to control mosquitoes.
- Application of adulticide by the state with approval and at the request of municipal officials for assistance in the towns affected.

Public Health Emergency

The Commissioner of DPH may proclaim a Public Health Emergency, pursuant to CGS Section 22a-66l, when WNV is confirmed in a town or contiguous towns in Connecticut. The following additional actions would be taken if a Public Health Emergency is proclaimed:

- In accordance with the provisions of CGS Section 28-9, the Governor evaluates the need for declaring a civil preparedness emergency.
- The application of adulticides by the state under these circumstances does not require the approval of the municipal officials in the towns affected.
- After consultation with the Commissioner of DPH, the Commissioner of DEEP has the responsibility and authority to act unilaterally if the application of chemical pesticides from the air or ground is necessary to control mosquito vectors of human disease pursuant to CGS section 22a-54(e). Concurrent with this determination, officials from the Mosquito Management Program will meet with local officials in the affected communities to inform them of the situation and to discuss the logistics of spraying.

Important State Phone Numbers and Websites

Mosquito Management Program Website **http://www.ct.gov/mosquito**

Department of Energy and Environmental Protection **http://www.ct.gov/deep**

- Communications Division **(860) 424-4100**

- State mosquito control policy and programs, media inquiries

- Wetlands Habitat and Mosquito Management Program **(860) 642-7630**
  - Technical questions regarding mosquitoes, mosquito control measures
- Pesticide Management Program **(860) 424-3369**
  - Technical questions regarding safe pesticide use and chemical make-up. Also, persons who wish to be specifically notified prior to a pesticide application or those who are chemically sensitive to pesticides should contact the Pesticide Pre-Notification Registry at this number

Department of Public Health **http://www.ct.gov/dph**

- Epidemiology and Emerging Infections Program **(860) 509-7994**
  - WNV infections in people, laboratory testing of human specimens
- Environmental and Occupational Assessment Program **(860) 509-7740**
  - Effects of pesticides on people
- Virology Laboratory **(860) 509-8553**
  - Technical questions regarding testing of human specimens from physicians, hospitals, laboratories

Connecticut Agricultural Experiment Station **http://www.ct.gov/caes**

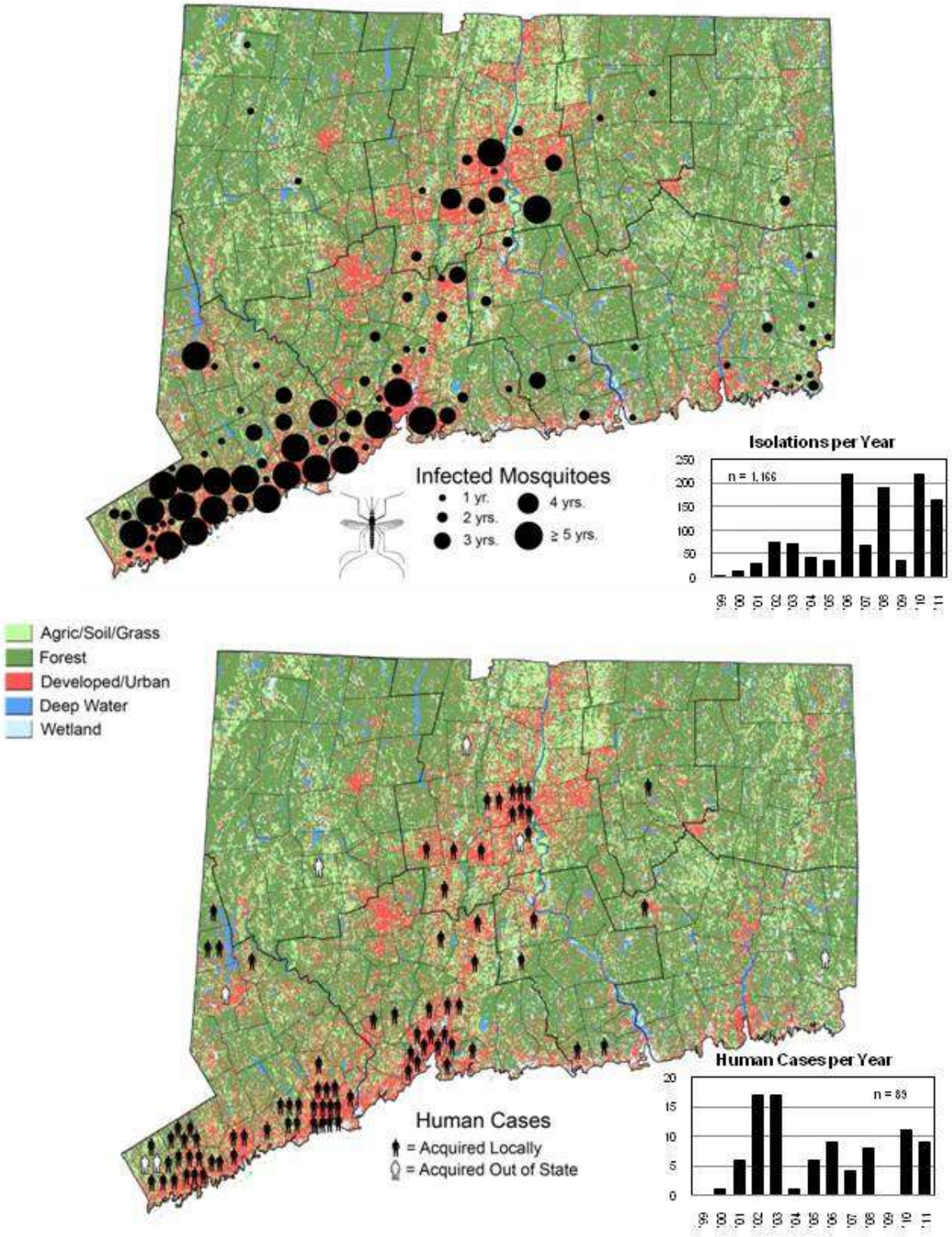
- Main Number **(203) 974-8510**
  - Technical questions from local health departments regarding mosquito trapping and testing

University of Connecticut **http://www.patho.uconn.edu**

Department of Pathobiology and Veterinary Science **(860) 486-4000**
- Testing and necropsy of animals

Department of Agriculture **http://www.ct.gov/doag**

- Office of the State Veterinarian **(860) 713-2505**
  - WNV infections in domestic animals, including livestock, poultry, and pet



Figures 1a and b. Land use maps of Connecticut showing the distribution and prevalence of mosquitoes found infected with West Nile virus and human cases from 1999 to 2011.

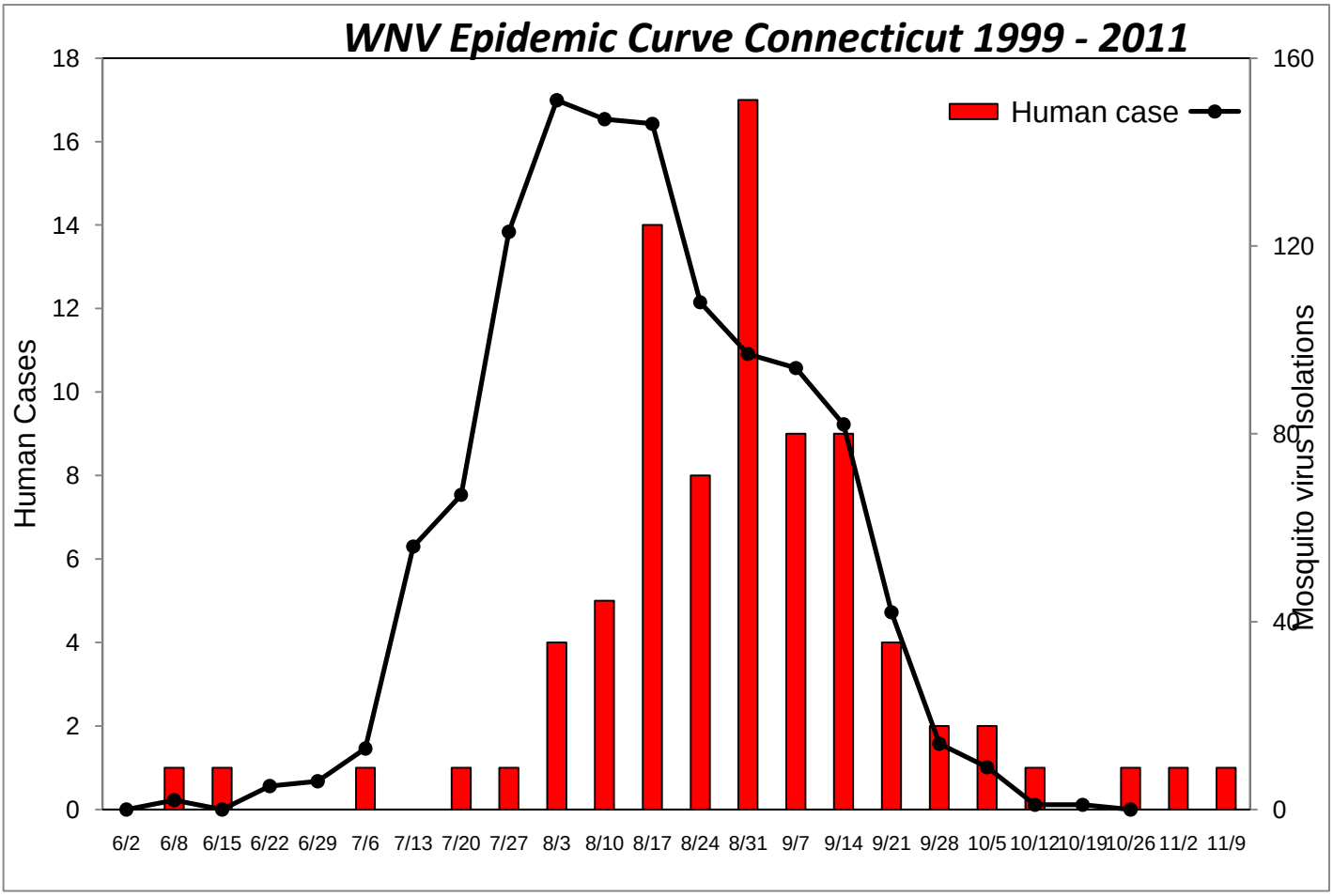


Figure 2. West Nile virus epidemic curve showing the cumulative number of virus-infected mosquitoes collected in surveillance traps and subsequent human cases in Connecticut from 1999 to 2008.