# 2013 Mosquito Action Plan and Surveillance Protocols (Protocols)

## Fire Island National Seashore's Mosquito Surveillance and Management Program

Prepared by Kaetlyn Kerr, Biological Technician
Jordan Raphael, Park Biologist

Reviewed By _____ Date 6/11/13
(Chief of Resources Management)

Approved By _____ Date 6/11/2013
(Superintendent)

## Table of Contents

Executive Summary....3
Introduction....4
History and Biology of Mosquitoes and Disease on Fire Island....5
Mosquito Surveillance....7
- Larval Mosquito Monitoring....7
- Adult Mosquito Monitoring....8
- Viral Testing....9
- Dead Birds....9

Pre-Season Preparations....9
Levels....11
- Education....11
- Surveillance....11

Level 1- Active Surveillance and Education....12
Level 2- Detection and Public Notification....12
- Criteria for move to Level 2....13
- Management Actions....13

Level 3- Disease Risk....14
- Criteria for move to Level 3....14
- Management Actions....14

Post-Season Wrap-Up....15

Figure 1- 3....17
References....18
Appendix A....19
Appendix B....23
Appendix C....26
Appendix D....27
Appendix E....30
Appendix F....33

## EXECUTIVE SUMMARY

The Fire Island National Seashore (FIIS) Mosquito Surveillance and Management Program has been established to monitor the emergence of mosquito-borne diseases and their associated human health risks for visitors, residents and staff of FIIS. This program ensures that FIIS is properly monitoring and managing human health risks in accordance with National Park Service (NPS) policy (See chapter 4.4.5.1 in Management Polices 2006). Surveillance efforts focus on Eastern equine encephalitis virus (EEEV) and West Nile virus (WNV). The FIIS Mosquito Surveillance and Management Program overall goals are to protect the public and staff of FIIS from mosquito-borne diseases while maintaining protection of the natural resources that is mandated by the park's enabling legislation. Minimal applications of pesticides are desired in order to protect the fragile ecosystems of Fire Island and this is done, while protecting human health, by monitoring mosquito and animal populations for disease. This document outlines preventative measures for lowering disease risk through management actions in response to data collected through this program. These conditions vary from year to year, and cannot be predicted; therefore a consultation process with other agencies will be used to determine whether interventions within the park are warranted on a case by case basis. Interventions can include increasing education efforts, closing portions of the park to the public, applications of pesticides, or other options discussed below. The final decision on all management interventions within FIIS, including the William Floyd Estate (WFE), will be made by the park superintendent in accordance with NPS Management Policies. In addition, other documents, like the Mosquito Program Readiness Fact Sheet, updated annually to keep FIIS staff aware of risks to mosquito-borne diseases, what the Mosquito Surveillance and Management Program entails, and what staff can do to protect themselves. Due to the reduction of base funding and the effects of sequestration, the FIIS mosquito program will be altered for the 2013 season. FIIS Natural Resource Management staff has set priority areas for mosquito trapping and deployment times based on scientific research and recommendations from scientists at the United States Geological Survey (USGS) and Suffolk County Vector Control (SCVC). The Mosquito Action Plan and Surveillance Protocols (Protocols) below describes FIIS's mosquito program under full deployment as it has been implemented in previous years. Appendix A describes the 2013 changes to locations and deployment times. All mosquito management in response to disease risks in 2013 will be conducted by the Protocols below.

## INTRODUCTION

Since 1998, FIIS has produced two annual documents, the Mosquito Action Plan (MAP) and the Mosquito Surveillance Protocols (Protocols). These documents were to provide guidelines to FIIS staff in how to manage FIIS's mosquito program. The MAP and Protocols were developed to reduce human health risk from mosquito-borne diseases while adhering to the NPS legal mandate to protect the natural resources of the Park. In 2013 these two documents were merged to create one cohesive and complete document, the Mosquito Action Plan and Surveillance Protocols (Protocols) making it easier for FIIS staff and others to understand what the FIIS Mosquito Surveillance and Management Program is and how it is carried out. In addition, these documents (the old MAP, Protocols, and the new Protocols) have served as an adaptive management tool where each year the documents are updated appropriately for the upcoming mosquito trapping season. For 2013, the mosquito program was altered to reflect the new deployment times and locations for mosquito traps due to the reduction of base funding (Appendix A). FIIS's goal is to implement the mosquito program in its entirety so the Protocols below encompass all of the monitoring sites as in past years and the management strategies FIIS uses to respond to human health risks. The changes to the program for 2013 can be found in greater detail in Appendix A.

Fire Island is a 32-mile long barrier island approximately 1-5 miles south of Long Island. Fire Island National Seashore (FIIS) is located on the eastern 26 miles of Fire Island. Additionally, FIIS includes the 613 acre William Floyd Estate (WFE) in the community of Mastic Beach, New York on Long Island. The park's boundary around Fire Island extends 1,000 feet into the Atlantic Ocean and 4,000 feet into the Great South Bay and encompasses the islands adjacent to the bay shoreline. All of Fire Island is located in Suffolk County, NY and there are four municipal governments that operate on Fire Island: Islip and Brookhaven Towns and the Villages of Saltaire and Ocean Beach. There are approximately 4,100 developed properties dispersed among 17 communities, including the two villages, within the boundaries of the park. Approximately 300 residents live year-round on Fire Island. During the summer season, the population of Fire Island swells to approximately 30,000 with a total number of 2 to 3 million visitors arriving each year.

FIIS has the responsibility to protect and preserve the park's natural and cultural resources and to assist in the protection of visitor and employee health and safety. FIIS, as well as the National Park Service (NPS), consider mosquitoes a natural component of tidal wetlands and other ecosystems but also recognize that mosquitoes may pose a risk to human and/or wildlife health. NPS policy directs park staff to create management criteria that minimize impacts to park resources from actions (in this case, mosquito management) taken within designated boundaries of National Park units. The park needs to monitor the emergence of mosquito-borne diseases and their associated human health risks for visitors, residents and staff in accordance with National Park Service policy. These criteria must be consistent with NPS policy regarding what, when, and how these actions can be performed.

Public concern for mosquito-borne diseases, including Eastern Equine Encephalitis virus (EEEV) and West Nile virus (WNV), from mosquitoes on Fire Island prompted FIIS

mosquito research in the 1980s and the development of the Mosquito Surveillance and Management Program in the 1990s. Research and management plans regarding mosquitoes are necessary to accomplish both protecting human health and the natural resources of FIIS. To further limit the possibility of human health risks and to ensure a quick and rational response should a mosquito-borne disease be found in, or near the park, FIIS has developed levels of management guidelines that are appropriate for different levels of disease risk. This document is intended to guide park staff and managers in the proper response to WNV and EEEV occurrences within FIIS boundaries. These guidelines can also be used to address other emerging infectious diseases. Surveillance monitoring methods and levels of action in response to disease is discussed below.

The use of pesticides within a National Park Service area is required to be in accordance with Servicewide policies as found in NPS-77 (Natural Resources Management Guidelines). An Integrated Pest Management (IPM) Plan for Fire Island National Seashore was prepared in late November 2006 to provide basic low-risk pest management guidelines to help protect park resources and to protect the health and safety of people.

All pesticides used within Fire Island National Seashore must be applied by or under the direct supervision of a State of New York certified pesticide applicator. All pesticides used in the park by residents, contractors, special use permittees, agricultural issues, or non-NPS personnel must conform to NPS policies and guidelines, and be approved before use. The goal is to use low-risk pesticides, if necessary, that will accomplish desired objectives.

Under a letter of authorization from the National Park Service (NPS), Suffolk County Department of Public Works, Division of Vector Control (SCVC) conducts spraying for adult and/or larval mosquitoes in several of the towns and villages within the boundaries of FIIS. Individual residents may request that their property be excluded from nonemergency treatments.

This document is intended to guide park staff and managers in the proper response to WNV and Eastern equine encephalitis virus (EEEV) occurrences within FIIS boundaries. These guidelines can also be used to address other emerging infectious diseases. Listed below are the actions that will be taken by the park and the different levels of response to human health risks from disease.

In previous years, FIIS has used a yearly updated Mosquito Action Plan (MAP) and Mosquito Surveillance and Management Protocol (Protocols) as guidance for implementing FIIS's mosquito program and carrying out management decisions. This document has combined the old MAP and Protocols for easier implementation.

## HISTORY AND BIOLOGY OF MOSQUITOES AND DISEASE ON FIRE ISLAND

Approximately 40 mosquito species have been documented in Suffolk County, Long Island (Guirgis, 1984). Approximately 25 of these species have been recorded throughout

FIIS with *Aedes sollicitans* (=*Ochlerotatus sollicitans*), *Ae. vexans*, *Culex pipiens*, *Cx. restuans,* and *Cx. salinarius* being the most common. Of these species, the FIIS Mosquito Surveillance and Management Program focuses on mosquitoes of the genus *Culex*, which are known to have a higher estimated transmission rate (ETR) for WNV than other mosquitoes found in FIIS. In our area, the primary epidemic or bridge vector that is responsible for transmission of WNV to people is *Cx. pipiens* and *Cx. salinarius,* with *Ae. sollicitans* and *Ae. vexans* possibly also being WNV bridge vectors in the northeastern U.S.

The preferred habitats of *Culex* are areas that contain standing freshwater with high organic content (Crans, 2004). This could be natural areas such as woodland pools or artificial containers like barrels, discarded tires and wells (Means, 1987). The breeding of *Culex* is continuous throughout the summer months. Breeding of *Cx. pipiens* peaks in July and early August (Means, 1987); while *Cx. restuans* peaks is in June and early July (Andreadis et al., 2004). These two species are both primarily bird feeders (ornithophagic) that are known to only occasionally bite mammals. *Cx. salinarius* breeds in a wide range of habitats, but is exceptionally abundant in freshwater marshes in Suffolk County (Means, 1987). In contrast to *Cx. pipiens* and *Cx. restuans*, however, *Cx. salinarius* also lays eggs in brackish water and has a broader host range, including mammalian species.

*Ae. sollicitans*, commonly known as the eastern saltmarsh or striped saltmarsh mosquito, are also abundant in the saltmarshes of Suffolk County (Means, 1979). They are multivoltine breeders (Crans, 2004), with adults emerging by mid-May to produce successful generations into late September and even October (Means, 1979). Eggs are normally deposited on bare moist soil in saltmarsh depressions which are regularly flooded, particularly by lunar tides, producing broods at approximately two week intervals. Storm tides and heavy rains can also trigger additional broods (Crans, 2004). The natural landscape found within FIIS, especially in the Otis Pike Fire Island High Dune Wilderness (Wilderness) in the eastern portion of Fire Island, supports healthy populations of *Ae. sollicitans.* However, research has found that the Great South Bay acts as a migration barrier for mosquitoes and only a small percentage (< 1% - 6% in differing emergences) of *Ae. sollicitans* produced in the Wilderness migrate across to the neighboring communities of Mastic Beach and Shirley (Ginsberg, 1986). Moreover, of those that do migrate across the bay, it was suggested that they are primarily newly-emerged mosquitoes (Ginsberg and Rohlf, 1985) and are thus not likely to transport arboviruses across to Long Island. This is based on the understanding that WNV has not been suggested to be transferred transovarially among local mosquito species.

It should be noted that public health concern is growing due to the rapidly spreading introduced Asian Tiger mosquito, *Aedes albopictus,* and the established populations of *Ae. albopictus* close by in New Jersey (Farajollahi and Nelder, 2009) and now throughout Long Island and Fire Island (SCVC per. comm and FIIS mosquito surveillance 2012). This insect has been shown to be a vector of Dengue Fever, EEEV, and capable of transmission of WNV (Tiawsirisup et al., 2005). As such, FIIS staff will be closely monitoring mosquito traps for the presence and spread of *A. albopictus*. In addition, FIIS will be monitoring for *A. japonicus* as well due to its similar morphological characteristics, often mistaken for *A. albopictus*. However, it is important to note that

both *Ae. albopictus* and *Ae. japonicus* are day-biters, and so they are not well sampled using light traps but they can be sampled as larvae in containers.

WNV has been detected in at least 326 native and exotic bird species in the U.S. since 1999 (CDC, 2009). Although birds infected with WNV can die or become ill, most infected birds survive and act as reservoir hosts that continue to circulate the virus in the environment. On Fire Island, WNV is maintained in an enzootic cycle by several *Culex* species, with many bird species acting as reservoir hosts. In addition to mosquito population concerns, FIIS is concerned with finding dead birds, specifically crows (*Corvidae* spp), hawks (family *Accipitridae*), and blue jays (*Cyanocitta cristata*), and has developed Dead Bird Protocols (Appendix B) to safely collect and transport dead birds for WNV testing.

## MOSQUITO SURVEILLANCE

The FIIS Mosquito Surveillance and Management Program overall goals are to protect the public and staff of FIIS from mosquito-borne diseases while maintaining protection of the natural resources that is mandated by the park's enabling legislation. Minimal applications of pesticides are desired in order to protect the fragile ecosystems of Fire Island and this is done, while protecting human health, by monitoring mosquito and animal populations for disease. When mosquito-borne diseases are identified, management options may be implemented to lower disease prevalence. The decision to apply mosquito management interventions will depend on the intensity and persistence of viral activity, proximity of viral activity to mosquito emergence sites within FIIS, time of year, mosquito population levels, etc. These conditions vary from year to year and cannot be predicted; therefore a consultation process with other agencies will be used to determine whether interventions within the park are warranted on a case by case basis. This consultation may include the National Park Service (NPS), Suffolk County Vector Control (SCVC), United States Geologic Survey (USGS) scientists, Centers for Disease Control and Prevention (CDC), New York State (NYS), and other local agencies as needed. In order to verify the presence or absence of disease in mosquito populations and/or dead birds and therefore human health risks, FIIS staff monitors disease prevalence by monitoring larval populations, testing mosquito populations for disease and by passive surveillance for dead birds with the assistance of SCVC.

### *Larval Mosquito Monitoring*

Mosquito larvae will be monitored using a pint dipper by SCVC or FIIS staff on Fire Island. Sampling sites will be selected by reference to Ginsberg & Rohlf (1985) and/or by consultation with mosquito biologists and SCVC officials. At least 5 dips will be taken at each site, the larvae counted, and representative specimens returned to the lab to confirm identifications when needed (Ginsberg & Rohlf, 1985). When appropriate, such as in saltmarshes, at least 25 dips will be taken when habitat is appropriate when determined by SCVC or FIIS biologists. Larvae can be sampled as needed based on consultation with SCVC and mosquito experts.

### *Adult Mosquito Monitoring*

Most years, mosquito surveillance begins with a total of eighteen traps at seven locations (10 light traps and 8 gravid traps) (Figure 3). Most traps will be placed in pairs, with one $CO_2$-baited light trap paired with one gravid trap at each trap site. Individual trap placement will depend on local habitat (the gravid trap will generally not be directly adjacent to the paired light trap). The 2013 sites are different than those used in 2012 (see Appendix A) and have been identified as valuable sites for monitoring disease. Exact locations of each trap were selected based on various factors such as vegetative indicators, proximity to residential communities, the degree of staff and visitor use, visibility of trap (to avoid vandalism), mosquito productivity, canopy cover (for light traps) and either the presence of standing water or indications of water table surfacing (for gravid traps). Discussed below are the locations that would be used during full implementation of FIIS's mosquito and surveillance program (not for 2013).

On Fire Island a total of fourteen traps are placed from west to east. The traps are located as follows:

- One gravid/light trap pair will be placed near wetlands at the eastern end of the Lighthouse tract;
- One gravid/light trap pair located in the Village of Saltaire;
- One gravid/light trap pair will be placed in the Sunken Forest along the board walk and one single light trap will be place behind the concession stand at Sailor's Haven Marina;
- One gravid/light trap pair will be placed in the Carrington Tract just west of Fire Island Pines;
- One gravid trap and one light trap will be placed near the Watch Hill/Davis Park border along with a single light trap located near the park employee housing at Watch Hill; and
- One gravid/light trap pair will be placed behind the primary dune just west of the Wilderness Visitor's Center at Smith Point.

At the WFE, a total of four traps are set: one gravid/ light trap pair will be placed in woodland habitat near the salt marsh/woods border; and one light trap and one gravid trap will be placed near the freshwater wetland and drainage area near the main entrance.

With the exception of the traps located in the Village of Saltaire, all mosquito traps are located on FIIS federal property and all the mosquito traps are located within the boundaries of the park.

This initial distribution of traps park-wide may be modified based on surveillance results. For example, if there are positive results in birds or mosquitoes in an area, additional traps can be added to that area to get more complete information about the local epizootiology of the virus.

Traps are normally set once each week, June – September (traps at different sites may be placed on different nights to facilitate timely setting and collecting of traps), See Appendix A for 2013 trapping locations and dates.

### *Viral Testing*

Mosquitoes captured in the surveillance traps will be sorted to species and placed in pools using appropriate techniques. A pool will consist of 10-60 mosquitoes of a single species from a single trap (pool size is recommended by testing lab). Samples will first be delivered by FIIS staff to SCVC offices in Yahpank, NY where identifications are verified and then sent with other Suffolk County samples to Albany for arbovirus testing. Pools of *Culex* (especially *Cx. pipiens* and *Cx. salinarius*) will be sent for viral testing by cell culture, PCR (Polymerase Chain Reaction), or other techniques utilized by the New York State Department of Health Wadsworth Center in Albany. Pools of additional species can be sent for testing at the discretion of FIIS staff in coordination with SCVC.

### *Dead Birds*

FIIS staff will be passively monitoring for dead birds throughout the summer. Reports of bird mortality will be investigated by resource management staff, and candidates for possible viral infection will be collected and submitted for testing using FIIS's Dead Bird Protocols (Appendix B) developed by the park in accordance with guidelines from SCVC, NPS Wildlife Health Team, the U.S. Fish and Wildlife Service, and the CDC.

## PRE-SEASON PREPARATIONS

Before June, the park receives low to moderate visitation and mosquito activity is dormant to low. The primary goal of this pre-season time is to prepare for the upcoming summer months. Pre-season should be accomplished before mosquito trapping begins.

Things to be accomplished pre-season:

1. All Mosquito Cache Boxes will be checked to ensure that personal protective equipment (PPE) is maintained or replaced from the previous year. Those employees that are incidental responders in the field will have access to Tyvek tick suits, head nets, gloves and insect repellant at each ranger station in the park (William Floyd Estate (WFE), Wilderness Visitor Center, Watch Hill, Sailor's Haven, Fire Island Lighthouse). These items are stored in locked, weather-resistant caches at each station. Caches will be checked and restocked as necessary. See Appendix C for equipment cache information.

2. All dead bird transport coolers will be checked to ensure that the equipment and protocols are maintained and current. Each ranger station in the park has a cooler with PPE and other items needed to collect and transport dead birds in accordance with FIIS Dead Bird Protocols (Appendix B) and state and federal guidelines.

3. Park employees will be informed of the FIIS Mosquito Surveillance Management Program and educated about disease prevention including use of proper PPE (Appendix D). The education program in the park will target all-employee meetings as well as smaller "tail-gate" sessions for each division throughout the season. Employees should know how mosquito-borne diseases in the area can be transmitted, how to prevent breeding areas from forming around the workplace or at home, and how to protect

themselves. All employees should also be taught to recognize the signs and symptoms of WNV (Appendix E).

4. All park areas will be checked to identify any potential artificial freshwater mosquito breeding areas. Work orders should be generated to clean up these areas. This should include evaluating park vehicle access roads (Burma Road, road to facilities, etc.). Those areas that have significant rutting that retain standing water longer then 2-3 days may need to be graded or filled. Sanitation actions should continue until October, when mosquito breeding activity ceases (Appendix D and E).

5. Educational/outreach documents (mosquito brochure, interpretive programs), and other brochures and handouts will be prepared and finalized. Education should consist of brochures, interpretive programs, press releases or other means to inform the public.

6. Documents related to the FIIS Mosquito Surveillance and Monitoring Program (i.e., Protocols, Mosquito Program Readiness Fact Sheet, Dead Bird Protocols, etc.) will be updated annually and approved by the Park Superintendent and Chief of Resource Management. Updates may include altered or new trapping locations and protocols.

7. FIIS maintains a Mosquito Management Committee (MMC) of staff that may assist in mosquito management decisions, especially during a Level 3 Incident Command System situation. Each pre-season, the committee must be given updated documents and verify their continued membership of the MMC. The 2013 MMC includes:

> Jim Dunphy – Facility Manager; Lena Koschmann – Chief Ranger; Paula Valentine – Public Affairs Officer, Kathy Krause – Chief of Interpretation; Elizabeth Rogers – Science Communications Park Ranger; Roger Huguenin – Chief of Administration; Jordan Raphael – Park Biologist; Michael Bilecki – Chief of Natural Resource Management; and Kaetlyn Kerr – Biological Technician.

8. Arrangements will have been made with SCVC and Suffolk County Department of Health Services or other agencies for transport and testing of mosquitoes, dead birds, etc. Shipment schedule for samples sent from Suffolk to the New York State Department of Health Wadsworth Center in Albany testing facility will dictate when specimens should be sent to Suffolk County by FIIS staff. This is important for working out the weekly trapping schedule in order to minimize the turnover period from collection to receiving test results.

9. All trapping equipment, parts and batteries, will be checked for functionality to be repaired or purchased. All PPE, sorting/identification materials and all other supplies need to be inventoried before the start of the season and restocked if necessary.

10. Pesticide application permits will be created and signed to allow proper parties to apply pesticides on a case by case basis when needed. This will allow for quick response time to disease risks if they should arise.

## LEVELS

In the FIIS Mosquito Surveillance and Management Program, three levels of vector disease risk actions are utilized: Level 1- Surveillance and Education; Level 2 – Detection and Notifications; and Level 3 – Disease Risk. Based on monitoring data, guidelines are presented for conditions that would trigger a move to the next level of surveillance and management. Each level triggered potentially involves greater management action in response to an increased disease risk. These levels were created to help managers appropriately respond to an increase in disease risk in a standardized and effective way.

The three levels are discussed below with Level 1 conditions being of lower disease risk and Level 3 being the highest disease risk. Each level builds upon management strategies in the previous level.

### *Education*

Educating residents, visitors, and staff on FIIS is important in reducing human health disease risks associated with mosquito-borne illnesses. Education efforts at FIIS consist of park brochures, interpretive programs, and other products to inform the public about mosquitoes, their roles in natural systems, potential disease transmission, and FIIS's Mosquito Surveillance and Management Program. An emphasis on PPE, like using DEET or natural mosquito repellants, wearing protective clothing (pants and long sleeves), and being active outdoors when mosquitoes are less active are presented in education efforts. In addition, how the public can reduce artificial breeding locations for mosquitoes and the symptoms of WNV and EEEV are incorporated into education efforts, as well. Park brochures, handouts, and other sources of information should be distributed to all the visitor centers and, where appropriate and workable, in Fire Island communities. Employees should be sufficiently knowledgeable to provide residents and visitors with accurate information (or know where they can get it). However, it is critical that all employees realize that the park superintendent or his/her designee is the only one speaking to the media to represent the park. Educations efforts are integral to FIIS's Mosquito Surveillance Management Program and will be used during all three levels of mosquito surveillance and management. Efforts may increase as with the progression of management levels, however, it is important to identify education as a common and important aspect to the program for all levels. More information on FIIS's mosquito program and education can be found at the sites below:

- http://www.nps.gov/fiis/parkmgmt/mosquito-management.htm
- http://www.nps.gov/fiis/planyourvisit/avoid-mosquitoes.htm

### *Surveillance*

In order to verify the presence or absence of disease in mosquito populations and/or dead birds and therefore human health risks, FIIS staff monitors mosquito populations and disease prevalence by monitoring larval populations, and testing adult mosquito populations and dead birds for disease with the assistance of SCVC. This disease surveillance is the backbone of FIIS's Mosquito Surveillance and Management Program

because the data collected from the surveillance indicates the level of management appropriate throughout the summer. Efforts of surveillance may increase as with the progression of management levels, however, it is important to identify surveillance as a common and important aspect to the program for all levels.

Mosquitoes are normally collected once a week from identified trapping locations listed previously throughout Fire Island and the William Floyd Estate. The mosquitoes collected will be sorted by species and common vectors for WNV and EEEV will be separated to be sent to SCVC for testing. Deadlines for delivery of mosquitoes to SCVC will be coordinated with that agency.

Passive surveillance of dead birds is also common to all levels of disease surveillance. The protocol for handling dead birds will be distributed and promoted to all staff. FIIS employees should understand what to do if they or a member of the public find a dead bird (Appendix B). Species of dead birds that are known to be susceptible to WNV will be sent for arbovirus testing through SCVC. These bird species can be found in Appendix B.

Management actions are not required or definitive responses to each level's criteria. These are suggested management actions and are used in an arsenal of options as part of adaptive management. In order to determine which management option is best, the consultation process involving outside agencies has been created. Each occurrence of disease varies in location, time of year, risk to humans, and other aspects that warrants case by case management decisions. FIIS's superintendent has the ultimate decision for management actions under each level with appropriate interventions in accordance with NPS Management Policies.

## LEVEL 1 – ACTIVE SURVEILLANCE AND EDUCATION

Monitoring mosquito and bird populations for pathogens and education efforts are the basis for FIIS's Mosquito Surveillance and Management Program for all levels. For Level 1, surveillance and education efforts are the main components.

Level 1 begins in June when park visitation and mosquito activity increases. The park will begin trapping mosquitoes and preparing pools of mosquitoes to be tested in June (when possible) after consulting with SCVC to verify when to begin trapping and what day is identified for weekly drop-offs of specimens. Natural Resource Management and Interpretation staff will work together to provide education efforts on mosquitoes and disease to the public and FIIS staff.

## LEVEL 2 – DETECTION AND PUBLIC NOTIFICATION

This stage occurs when routine mosquito monitoring indicates a potential emergence of adult mosquitoes within the boundaries of the park, and/or if WNV is detected in the park or within two miles of or if Eastern equine encephalitis virus (EEEV) has been detected in FIIS or within five miles of FIIS. Visitation is probably high and mosquito activity high to very high. FIIS will notify Suffolk County of a potential emergence. If disease is

detected in or near the park, visitors will be notified, informed of the realistic potential for contracting disease and advised to take proper precautions.

***Criteria for move to Level 2***

Below are the criteria necessary for FIIS staff to elevate from a Level 1 to Level 2 management scenario based on disease surveillance.

1. A positive detection of WNV in a pool of mosquitoes from a FIIS trap or a dead bird or a mammal from Fire Island or the WFE.

2. A positive detection from a mosquito, bird, or mammal of WNV within 2 miles of Fire Island or the WFE.

3. A positive detection of EEEV in a pool of mosquitoes from a FIIS trap or a dead bird or a mammal from Fire Island or the WFE.

4. A positive detection from a mosquito, bird, or mammal of EEEV within 5 miles of Fire Island or the WFE.

***Management Actions***

FIIS will work with SCVC closely to receive the results from the surveillance program. Consultation may be initiated between FIIS and SCVC, NYS Health Department, CDC, DOI, and/or experts from universities or other institutions to guide the park superintendent with appropriate interventions in accordance with NPS Management Policies.

1. Visitors and residents of FIIS will be notified of the potential risk for mosquito-borne diseases with increased mosquito populations and of any positive occurrences of WNV or EEEV have been found in the area. These notifications are part of the education efforts by FIIS staff and may include fliers, press releases, website updates, more frequent interpretive talks, community outreach and active distribution of brochures or handouts. Press releases should be generated (see Appendix F). Social media (Twitter and/or Facebook, etc.) pages will be updated.

   Press release website http://www.nps.gov/fiis/parknews/newsreleases.htm

   Follow latest FIIS updates on Twitter and Facebook:
   - http://twitter.com/FireIslandNPS
   - http://www.facebook.com/FireIslandNPS

2. FIIS staff will be reminded of the resources available to them (mosquito cache boxes) and of the current disease risk situation.

3. Increased surveillance by increasing the amount of mosquito traps may take place in and (if applicable) adjacent to the site(s) where disease was detected to increase sensitivity of disease surveillance.

4. In the event that disease is detected, arrangements for larvicide use may be finalized if warranted. FIIS staff will work closely with SCVC and other involved parties to assure that, should the need arise; application of pesticides is done within the guidelines approved by NPS, SCVC, CDC, Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (NYSDEC).

## LEVEL 3 – DISEASE RISK

### *Criteria for move to Level 3*

Below are the criteria necessary for FIIS staff to elevate from a Level 2 to Level 3 management scenario based on disease surveillance.

1. Multiple positive detections of WNV from pools of mosquitoes from a FIIS trap or from dead birds or mammals from the same trapping location or close by.

2. Multiple positive detections from a mosquito, bird, or mammal of WNV within 2 miles of Fire Island or the WFE from the same location or close by.

3. Multiple positive detections of EEEV in pools of mosquitoes from a FIIS trap or a dead bird or a mammal from Fire Island or the WFE at the same location or close by.

4. Multiple positive detections from a mosquito, bird, or mammal of EEEV within 5 miles of Fire Island or the WFE from the same location or close by.

### *Management Actions*

FIIS will work with SCVC closely to receive the results from the surveillance program. Consultation may be initiated between FIIS and SCVC, NYS Health Department, CDC, DOI, and/or experts from universities or other institutions to guide the park superintendent with appropriate interventions in accordance with NPS Management Policies. The approach taken for mosquito management will depend on the nature of the disease risk, as projected from the surveillance data. EEEV activity must be detected by cell culture followed by virus characterization, or by other suitably rigorous techniques approved by FIIS staff, before mosquito management is initiated in the park. Detection methods for WNV will be based on CDC recommendations and approved by FIIS staff.

1. Visitors and residents of FIIS will be notified of the potential risk for mosquito-borne diseases with increased mosquito populations and if multiple positive occurrences of WNV or EEEV have been found in the area. These notifications are part of the education efforts by FIIS staff and may include fliers, press releases, website updates, more frequent interpretive talks, community outreach

and active distribution of brochures or handouts. Press releases should be generated (see Appendix F). Social media (tweeter and/or Facebook, etc.) pages will be updated.

Press release website http://www.nps.gov/fiis/parknews/newsreleases.htm

Follow latest FIIS updates on Twitter and Facebook:

- http://twitter.com/FireIslandNPS
- http://www.facebook.com/pages/Fire-Island-National-Seashore/145302202157881

2. FIIS staff will be reminded of the resources available to them (mosquito cache boxes) and of the current disease risk situation.

3. Increased surveillance by increasing the amount of mosquito traps may take place in and (if applicable) adjacent to the site(s) where disease was detected to increase sensitivity of disease surveillance.

4. FIIS staff will work closely with SCVC and other involved parties to assure that, should the need arise; application of pesticides (both larvacides or adulticides) is done within the guidelines approved by NPS, SCVC, CDC, Environmental Protection Agency (EPA) and New York State Department of Environmental Conservation (NYSDEC).

5. FIIS may close areas of the park where disease is reoccurring to protect visitors and staff.

6. In extreme cases, a management response could be in accordance to the Suffolk County Unified Command (SCUC) structure and NPS Incident Command System (ICS). The IC team should consist of members of the MMC as defined above. FIIS headquarters will be the Command Center, with supply, public relations and administrative functions. The Superintendent/Incident Commander will close areas of FIIS as needed or appropriate. This may impact large areas of the park such as a marina or the WFE, or just specific trails. There will be a daily radio brief to FIIS staff as part of the incident command process. Public information efforts should be coordinated with the CDC and SCVC to prevent duplication of work and assure that information is consistent. A debriefing period should be held in accordance with the NPS ICS.

## POST- SEASON WRAP-UP

The end of the mosquito trapping season is generally at the end of September. However, if there is viral activity in the area, FIIS staff may consult with SCVC to coincide with the ending of Suffolk County's trapping season which may extend into October. The post-season time is used to evaluate the past season, report results and clean and store all equipment.

1. A final report will be written, detailing the results of the season's mosquito surveillance and management activities, along with any recommendations for the following year.

2. Monitoring equipment will be cleaned and put into safe storage, ready the following year's use.

FIIS mosquito surveillance program documents were created with the consultation of Howard S. Ginsberg, Ph.D. from the USGS Patuxent Wildlife Research Center. Dr. Ginsberg has assisted on multiple levels, including locating appropriate sites for mosquito traps throughout FIIS and training staff on equipment and identification of mosquito species. The park will contact Dr. Ginsberg for consultation on any future alterations to FIIS mosquito monitoring program and for any other assistance in regards to mosquitoes and arboviral diseases.

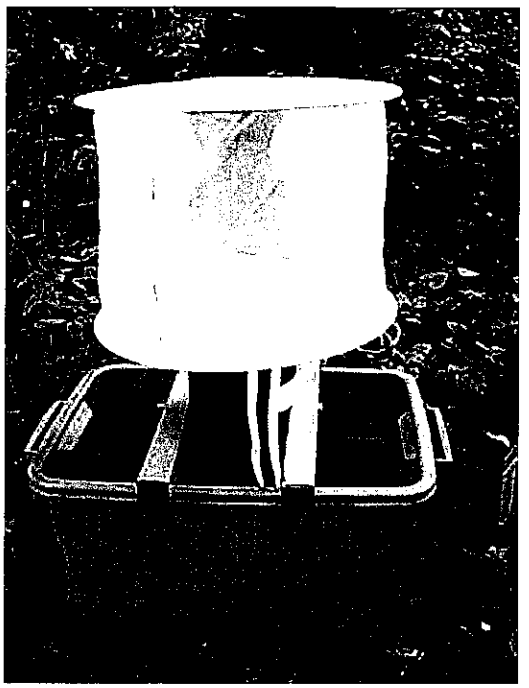

**Figure 1. Gravid trap with collection net and battery.**

**Figure 2. Light trap with collection container.**

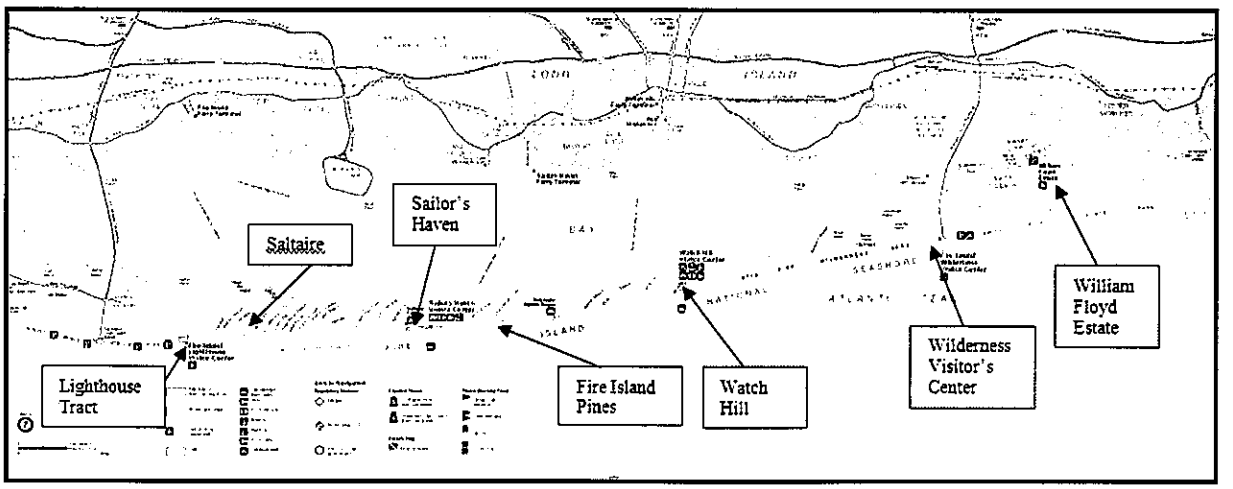


**Figure 3. Map of FIIS mosquito surveillance locations, 2013.**

## REFERENCES


Andreadis TG, Anderson JF, Vossbrinck CR, Main AJ Epidemiology of West Nile virus in Connecticut: a five-year analysis of mosquito data 1999–2003. Vector Borne Zoonotic Dis. 2004;4:360–78. doi: 10.1089/vbz.2004.4.360

Centers for Disease Control and Prevention (CDC), National Center for Emerging and 528 Zoonotic Infectious Diseases (NCEZID), Division of Vector-Borne Diseases (DVBD). 2009. 529 www.CDC.gov.

Crans, W.J. 2004. A classification system for mosquito life cycles: life cycle types for mosquitoes of the northeastern United States. Journal of Vector Ecology, June 2004: 1-10.

Farajollahi, A., and M. P. Nelder. 2009. Changes in *Aedes albopictus* (Diptera: Culicidae) populations in New Jersey and implications for arbovirus transmission. J. Med. Entomol. 46(5): 1220-1224.

Ginsberg H.S., & Rohlf. J. F. 1985. Distribution and Dispersal of Mosquitoes, Fire Island National Seashore. Final Report, Contract No. CX1600-3-0041. Dept. of Ecology and Evolution. State University of New York, Stony Brook, N.Y.

Ginsberg, H.S. 1986. Dispersal patterns of *Aedes sollicitans* (Diptera: Culicidae) at the east end of Fire Island National Seashore, New York, USA. *Journal of Medical Entomology* 23: 146-155.

Guirgis, S.S. 1984. A new record of *Culiseta annulata* with notes on mosquito species in Suffolk County, Long Island, New York. Mosquito News 44: 246.

Lussier, C. M. H. S. Ginsberg, R. A. LeBrun. July 2006. Distribution of Mosquitoes in National Park Units of the Northeastern United States. Technical Report NPS/NER/NRTR-- 2006/050. National Park Service. Boston, MA.

Means, R.G. 1979. Mosquitoes of New York part I: the genus *Aedes* Meigen with identification keys to genera of Culicidae. The University of the State of New York, Albany, NY.

Means, R.G. 1987. Mosquitoes of New York part II: genera of Culicidae other than *Aedes* occurring in New York. The University of the State of New York, Albany, NY.

Tiawsirisup S, Platt K, Evans R, Rowley W (2005) A comparison of West Nile virus transmission by Ochlerotatus trivittatus (COQ.), Culex pipiens (L.), and Aedes albopictus (Skuse). Vector Borne Zoonotic Dis 5:40–47

## APPENDIX A

## FIRE ISLAND NATIONAL SEASHORE MOSQUITO TRAPPING SCHEDULE AND LOCATIONS CHANGES FOR 2013

Summary
Due to the reduction of base funding, Fire Island National Seashore (FIIS) Natural Resource Management staff has set priority areas for mosquito trapping and deployment times for the 2013 summer season. The 2013 deployment schedule will run from August to October and the priority locations will include Watch Hill, Sailor's Haven/ Sunken Forest, and the Fire Island Pines. As the season progresses changes may occur to increase or decrease traps and/or locations. Positive detections of West Nile Virus (WNV) from mosquito traps will be handled by protocols set forth in FIIS's Mosquito Surveillance Protocols.

2013 Season
Budget and time constraints at the park are not the only factors that justify the reduction in mosquito monitoring and surveillance. Suffolk County Vector Control (SCVC) has also requested FIIS to decrease trapping times and locations to accommodate their limitations for the 2013 season. With guidance from Dr. Scott Campbell at SCVC and Dr. Howard Ginsberg at the United States Geologic Survey (USGS), FIIS has crafted this season's trapping schedule based on locations and times of year WNV has been detected on Fire Island and the William Floyd Estate (WFE).

Trapping Schedule
Over the years, mosquito trapping at FIIS has started in the first week of June and ended in the beginning of October. The sampling season typically ends in the first week in October due to colder weather and a decrease in human disease risk (visitation to the park declines during that time). October trapping has occurred in prior seasons due to positive detections of WNV toward the end of September and only at targeted locations.

Thirteen years of data have been compiled to show when WNV was isolated from trapped mosquitoes for all years combined (Figure 1). From all positive pools, 60% occurred in September, 26% in August, 7% in early October, and 7% in late July. Based on this information the park has decided that the 2013 trapping season will begin in the first week of August and end by the first week in October. However, if SCVC is recording high numbers of positive WNV pools earlier in the season, FIIS may start trapping mosquitoes in the end of July (if advised to do so by SCVC). Trapping may also extend into October if pools are positive for WNV at the end of September based on consultation with SCVC and USGS.

Locations
Over the years FIIS has increased trapping locations and shifted sites as necessary. Since 2008, FIIS has trapped mosquitoes at seven locations: Lighthouse tract/ Kismet, Village of Saltaire, Sailor's Haven/Sunken Forest, Fire Island Pines, Watch Hill, Wilderness Visitor Center, and William Floyd Estate. For 2013, FIIS needs to decrease the amount of locations and traps managed by the park. The sites that have produced the highest number of positive pools of WNV over the 13 years of trapping with consideration of visitation and logistics will be used in the mosquito surveillance program for 2013 (Figure 2).
Recommended Locations

- **Watch Hill Res and Watch Hill West locations**: these locations have produced the highest number of positive pools of WNV from FIIS's mosquito surveillance program (14 pools in 13 years) (Figure 2). In addition, Watch Hill has high visitation throughout

the summer season and park staff and concessionaires live at Watch Hill housing during the summer. The high human populations visiting and living at Watch Hill, the incidence of WNV, and the habitat for WNV vectors warrants the continued surveillance of mosquitoes for the 2013 season. In addition, Watch Hill has high accessibility for staff via boat or ferry and employee housing provides for easy deployment and collection of traps.

- **Sailor's Haven/ Sunken Forest**: this area has high visitation throughout the summer and has had positive pools of WNV (2 pools in 13 years) (Figure 2). Although it is not one of the locations with the highest incidence of WNV, it is an important natural resource at FIIS that draws in public visitation. The Sunken Forest has many fresh water sources and tree holes that provide suitable habitat for WNV vectors, specifically *Culex pipiens* and *Cx. restuans*. It is FIIS's responsibility to provide mosquito surveillance at Sailor's Haven/ Sunken Forest for monitoring human health risks. This location is easily accessible by boat, ferry, or by ATV from Watch Hill.
- **Fire Island Pines/ Carrington Tract**: this location has had some incidence of WNV on Fire Island in the past (3 pools in 13 years) (Figure 2). The fresh water swamp habitat that is found in this area supports the WNV vectors *Cx. pipiens* and *Cx. restuans*. The incidence of WNV, habitat, and close proximity to two important Fire Island communities (Fire Island Pines and Cherry Grove) warrants mosquito surveillance at this site. Traditionally, Watch Hill, Sunken Forest/Sailor's Haven, and the Fire Island Pine traps were set and collected on the same days, making for easy logistics.

Possible Location Additions (depending on ArboVirus detections)

- **Saltaire**: The ability for FIIS to maintain traps at Saltaire will be determined later in the season based on FIIS employee availability for two nights of trapping during the week. One night of trapping is required for Watch Hill and other mid- island traps that are accessed by boat/ ATV and one night for additional traps that are accessed by driving. Logistically Saltaire is not an easy site to access and is time consuming. However, FIIS can provide trapping equipment and may be able to provide mosquito identifications for those traps. Adding Saltaire traps to a schedule of every other week may work for FIIS employees, as well. Again, this will not be determined until the mosquito trapping season begins.
- **William Floyd Estate**: The William Floyd Estate (WFE) has had relatively high incidence of WNV in the lower acreage at the WFE W trap (4 pools over 13 years) and low incidence of disease at the WFE Entrance trap (1 pool over 13 years) (Figure 2). The WFE W trap is close to marshes and in an area not frequented by the public. Due to the low visitation in that area, larger distance from the community of Mastic Beach, and logistics, WFE W trap will not be deployed for 2013. In addition, the WFE Entrance trap will not be deployed due of the low incidence of disease in the past and because SCVC maintains a mosquito trap in close proximity to the WFE Entrance in Mastic Beach. However, if SCVC finds high incidence of WNV in the Mastic Beach trap, FIIS will deploy the WFE Entrance trap if necessary after consultation with SCVC.

Locations for No Deployment

- **Lighthouse Tract/ Kismet**: this trapping location has had relatively low incidence of disease (2 pools out of 13 years) (Figure 2) and is logistically difficult to access, again requiring a second night of trapping during the week.
- **Wilderness Visitor Center (WVC)**: this location has provided low incidence of disease (1 pool over 13 years) (Figure 2). The wilderness area near the WVC has been overwashed by Hurricane Sandy and has destroyed the area FIIS's mosquito traps were once placed. FIIS staff would have to find a new location farther back from the visitor center increasing the difficulties of logistics. This site will require the second night of trapping in a week. SCVC does maintain a New Jersey mosquito trap at the WVC that provides them with species composition of that area. This may be used to inform FIIS of *Culex* outbreaks and any need to deploy traps at WVC as the season progresses.

Ideally, FIIS would maintain the mosquito surveillance program in its entirety as it has in recent years. With the current and anticipated sequestration reductions, FIIS must be prepared to revise the mosquito surveillance program for upcoming years as it has done for 2013. As the 2013 season progresses, FIIS will evaluate trapping needs and either decrease or increase the amount of mosquito traps based on arboviral activity. This type of adaptive management will help FIIS in producing the most efficient and efficacious mosquito surveillance program under budget constraints for 2013 and in the future.

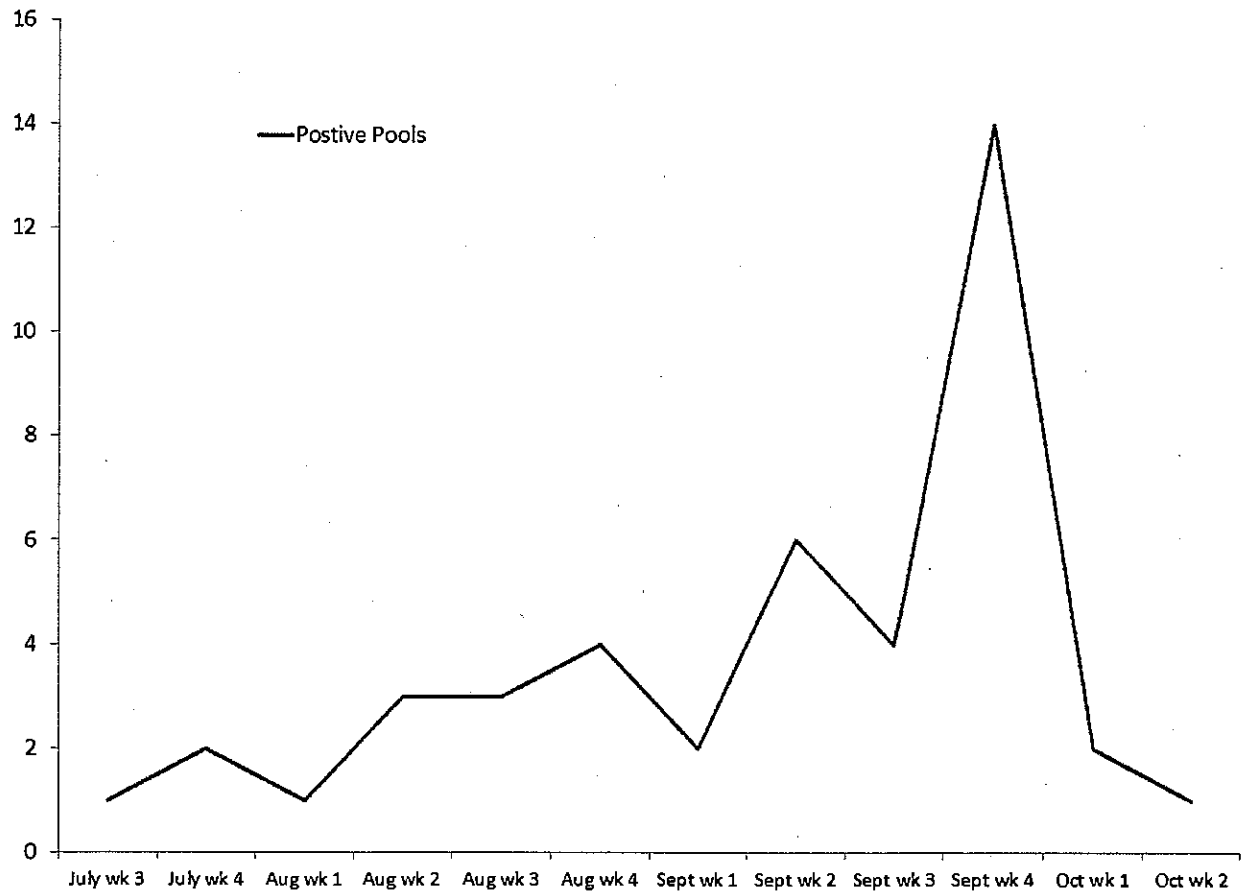


Figure 1. All positive pools of WNV isolated over 13 years and separated by week from July through October when they occurred.

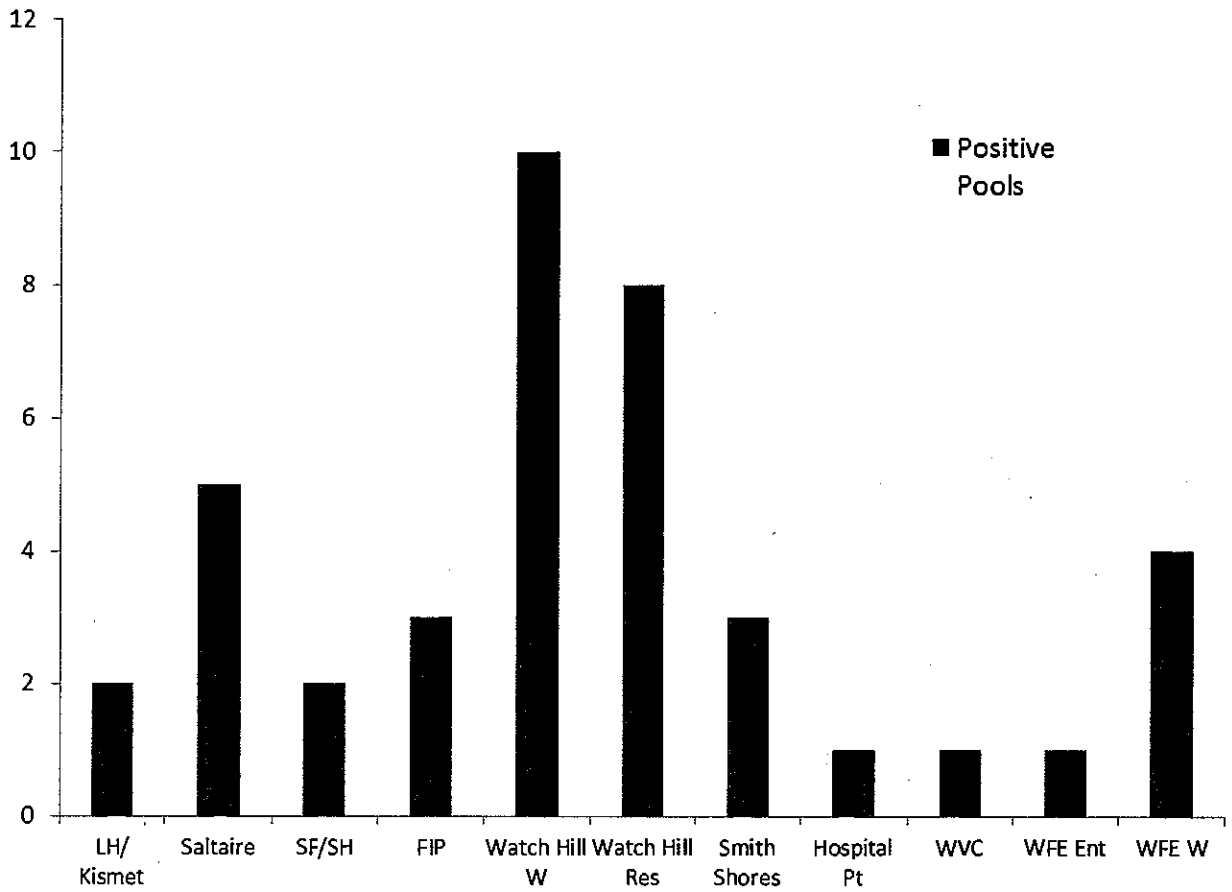


Figure 2. Total number of positive pools isolated from each location. Locations have varied over the years and some locations represented above are no longer used mainly for logistical reasons (Smith Shores and Hospital Pt).

## APPENDIX B

## 2013 PROTOCOL FOR COLLECTING DEAD BIRDS ON FIRE ISLAND NATIONAL SEASHORE FOR WEST NILE VIRUS SURVEILLANCE

**The Start Date for Dead Bird collection and the Dead Bird hotline is on May 25, 2013**

The National Park Service (NPS), Fire Island National Seashore (FIIS) will work with the New York State Department of Environmental Conservation (DEC), Suffolk County Health Department and Suffolk County Vector Control (SCVC) to collect and transport bird carcasses. This will be done in accordance with guidelines developed by the U.S. Fish and Wildlife Service, the Center for Disease Control (CDC), New York State and the Suffolk County Health Department.

Suffolk County is solely interested in corvids and raptors and therefore there may be other dead birds the Park may want tested for disease. Under this circumstance, the Park will send dead birds (other than corvids and raptors) to the NPS Wildlife Health Team that provides testing of dead wildlife. In addition, if the Park has dead birds tested through the County, those results will be shared with the NPS Wildlife Health Team.

**FIIS managers and their staff should familiarize themselves with this protocol in order to stay protected when collecting dead birds. Additional training by park biologists and a JHA is available for staff.**

For viral testing, the DEC definition of an acceptable bird carcass for collection and transportation is:

- The bird is a **crow**, a **raven**, a **blue jay** or a **raptor** (osprey, eagle, hawk, vulture, or falcon).
- The collector believes it **died within the past 18-24 hours** (the carcass is fresh, not bloated, infested or decayed).
- The collector believes **it did not die of routine natural causes or due to an accident**.

**EVERY EFFORT SHOULD BE MADE TO COLLECT AND TRANSPORT CARCASSES TO THE PATCHOGUE MAINTENANCE FACILITY (PMF) WITHIN A FEW HOURS SO THAT THE 24-HOUR PERIOD IS NOT PASSED.**

---

List of dead-bird drop off locations on Fire Island National Seashore:

Lighthouse Annex (checkpoint)
Sailors Haven
Watch Hill
Wilderness Visitor Center (Smith Point)
William Floyd Estate

Rules for reporting, handling and transporting dead birds:

1. When a dead bird is found by a visitor, resident, or park staff, a trained NPS employee should be contacted to safely collect the specimen. Park biologists should be contacted when other trained individuals are unavailable. Park biologists should also be made aware of all dead bird collections in order to coordinate with SCVC.

2. Safety first and foremost – **DO NOT TOUCH THE CARCASS WITH YOUR BARE HANDS!**

2. Collecting equipment will be found in the dead bird collection-and-transport coolers located at all ranger stations or visitor centers (Lighthouse Annex, Sailors Haven, Watch Hill, Smith Point –Wilderness Visitor Center, and William Floyd Estate). In the coolers will be large plastic bags, rubber gloves and specimen tags. THE TAGS ARE TO BE COMPLETED BY THE CARCASS COLLECTOR.

3. Collectors shall wear rubber gloves (found in cooler).

7. The carcass is collected by inverting a plastic bag (found in cooler), grasping the bird, and then pulling the bird into the bag.

8. The bag with the bird is sealed, and then placed inside another plastic bag with a tag containing the following information:
   - Where the bird was found
   - Date and time the bird was found
   - Collector's name
   - Name and number of person who found the bird
   - Best estimate of what species it is (e.g. *Cyanocitta cristata*) and the common name (e.g. Blue Jay).

9. Place the bagged carcass in the dead bird transportation cooler with two or three blue ice packs (found in ranger/visitor station freezer). **DO NOT FREEZE THE BIRD.**

10. Remove the rubber gloves by turning one inside out, holding it with the other glove then turning that one inside out also. PLACE THE GLOVES IN THE COOLER. If possible, immediately wash hands with soap and water or use alcohol-based hand sanitizer.

11. Close the cooler securely and transport to the PMF as quickly as possible. At PMF B there will be a large light gray dry ice cooler in the mosquito lab. The cooler will be marked "DEAD BIRDS IN HERE- DO NOT STORE FOOD OR DRINK" and is situated on the refrigerator in the back of the lab. Place two or three blue ice packs, found in the freezer compartment of this refrigerator, into this cooler until dry ice can be obtained. Place the bird in the cooler and close securely. The bird will be transported to SCVC with the next shipment of mosquitoes. The park has arranged with SCVC to keep dead birds on dry ice until delivered (dry ice will preserve the integrity of the virus, if any is present, but regular freezing will not).

12. Return the dead bird cooler to the ranger station/visitor center it came from and replace plastic bags and gloves with new ones. Make sure the blue ice packs go back into the freezer at the ranger station/visitor center.

13. Once a specimen is collected, park staff must call the Suffolk County dead bird hotline immediately to report it: (631) 853-8405, 9:00 AM to 4:30PM. Information on the person who found the bird, the bird collector, the bird species, location, date and time of collection needs to be given to SCVC.

## APPENDIX C

## CHECK LIST FOR MOSQUITO CACHES BOXES

Each ranger station at Fire Island National Seashore has Level Three Personal Protective Equipment (PPE) stored in a clearly labeled black box. Each station also has a cooler for transporting dead birds. Boxes and coolers should be kept in an area with other protective equipment. They should be inspected periodically by Rangers and Biological Technician when possible. Caches are available at:

- Lighthouse- RM shed (small white shed off to the west of boardwalk leading to the bay)
- Sailors Haven Ranger Station/Shop-storage closet in the visitor center
- Watch Hill Ranger Station/Maintenance Shop- RM storage room/office
- Wilderness Visitor Center- crawl space underneath the visitor center
- William Floyd Estate- Fire shed
- Patchogue Maintenance Facility (PMF B)- RM storage room

The following is the list of items in a cache:

- Hoop style head nets
- Net style bug jackets
- Leather gloves
- Tyvek paper suits
- Repellant:
  - With DEET
  - DEET free
  - Permethrin
- "After Bite" pens
- Copy of the FIIS Mosquito Action Plan and Surveillance Protocols

**Dead Bird Coolers:**

- Large plastic bags
- Rubber gloves
- Bird carcass identification tags
- Blue plastic ice packs (to be placed in site area freezer)

Additional PPE equipment is stored at PMF B in the Resource Management storage room, second floor.

If an employee needs PPE, they should contact their supervisor and request the equipment. The cache boxes are for emergency situations and not for regular daily usage.

## APPENDIX D

# MOSQUITO PROGRAM READINESS FACT SHEET FOR FIRE ISLAND NATIONAL SEASHORE EMPLOYEES

### Program Summary

The Fire Island National Seashore (FIIS) Mosquito Surveillance and Monitoring Program has been established to monitor the emergence of mosquito-borne diseases and their associated human health risks for visitors, residents and staff of FIIS in accordance with National Park Service (NPS) policy. Surveillance efforts focus on Eastern equine encephalitis virus (EEEV) and West Nile virus (WNV). Minimal applications of pesticides are desired in order to protect the fragile ecosystems of Fire Island and this is done, while protecting human health, by monitoring mosquito and animal populations for disease from June through September annually. When mosquito-borne diseases are identified, management options may be implemented to lower disease prevalence. Interventions may include increasing education efforts; closing portions of the park to the public, applications of pesticides, or a variety of other options. The final decision on all management interventions within FIIS, including the William Floyd Estate (WFE), will be made by the park superintendent in accordance with NPS Management Policies.

### What you need to know:

FIIS has a mosquito monitoring program that tests for the presence of WNV and EEEV.

Mosquitoes are collected every week from June-September from traps located throughout Fire Island and the WFE.

FIIS also collects dead birds that are found on park property to be tested for diseases, as well. Please refer to the Dead Bird Protocols for more detailed information and what you can do.

### What is my responsibility as a FIIS employee?

Help FIIS decrease man-made breeding areas for mosquitoes on park property. FIIS wants to maintain a sanitation program to remove or reduce artificial larval habitat for the WNV vector, *Culex* species. Such habitat is characterized by the presence of stagnant fresh water with high organic content. Fresh water that is present and undisturbed for 4 days or more and that contains organic matter (decaying vegetation; animal droppings; garbage of any kind; pollution or runoff from gardens, or other sources) is prime habitat for *Culex* species. The following are suggestions for where to look for *Culex* larval habitat and mechanical remedies to reduce the attractiveness of these areas to mosquitoes.

<u>Underground Septic Tanks</u>

Mosquitoes can enter through covers that do not fit properly, through cracks in the ground, or through vent pipes, and produce offspring in large numbers. Covers should be altered so that they fit adequately, cracks should be filled, and all vents should be covered with screening, preferably aluminum, to prevent the entry of females ready to lay eggs.

Crawl Spaces under Buildings

Garbage bags, tin cans or other open containers may collect water. Refuse may attract vermin whose droppings will make the area even more enticing to *Culex*. Trash or garbage of any kind should be removed.

Garbage Dumps

Areas should be examined for the presence of standing fresh water (in cans or can covers, trash bags, old buckets, under or beside storage sheds). Containers should be overturned or adequately covered and puddles filled in.

Gas Tanks

Area should be examined for the presence of refuse, standing fresh water or containers able to collect standing water. Refuse should be removed, puddles filled, and containers covered or overturned.

Clogged Ditches or Drains

Remove source of clog and check routinely.

Garbage Cans, Recycle Bins and Other Containers

Holes should be punched in the bottoms (not the sides) of plastic garbage or recycling bins to prevent them from holding water. All areas with significant human impact should be examined for forgotten or discarded containers (flower pots, tin cans, buckets, etc.) that may fill with fresh water and provide breeding habitat. Containers should be discarded, covered or overturned.

Tire ruts on roads

Tire ruts can prove to be significant breeding ground for freshwater mosquitoes. The ruts should be filled and the road graded to improve drainage.

Note: If potential breeding sites are found that are not easy to remedy by the means outlined above, the location and a brief description of the area should be given to your supervisor and the park biologist or biological technician.

**What can I do to stay protected?**

Personal Protective Equipment (PPE) should be provided by your supervisor so you can protect yourself from biting mosquitoes. PPE includes:

- Tyvek suits, bug jackets, head nets,
- Permethrin, DEET or non-DEET insect repellent,
- Gloves and boots.

Also, it is suggested to avoid being outside around dawn and dusk as these are times of day that mosquitoes are very active. If you need to be outside during that time, wear long sleeves and pants, and use proper PPE. In high disease risk emergencies, cache boxes with PPE can be found at visitor centers and other park facilities (William Floyd Estate, Wilderness Visitor Center, Watch Hill, Sailor's Haven, and Fire Island Lighthouse). These cache boxes are for disease emergencies only and PPE for normal work conditions should be distributed by your supervisors.

**More Information**

If you have more questions related to FIIS's Mosquito Surveillance and Monitoring Program, please contact your supervisor or NRM staff to obtain the 2013 Mosquito Action Plan and Surveillance Protocols (Protocols). Please contact park biologists with any questions and concerns related to mosquitoes and mosquito-borne diseases and visit FIIS's websites:

- http://www.nps.gov/fiis/parkmgmt/mosquito-management.htm
- http://www.nps.gov/fiis/planyourvisit/avoid-mosquitoes.htm

## APPENDIX E

# QUESTIONS AND ANSWERS ON WNV/ENCEPHALITIS FOR EMPLOYEES AND VISITORS OF FIRE ISLAND NATIONAL SEASHORE

**What is West Nile Encephalitis?**
"Encephalitis" means an inflammation of the brain and can be caused by bacteria and viruses, including viruses transmitted by mosquitoes. West Nile Encephalitis is an infection of the brain caused by West Nile Virus (WNV), a virus native to Africa, West Asia, and the Middle East. WNV is also less commonly found in southern Europe. It was found in the Western Hemisphere for the first time in 1999. It is closely related to St. Louis Encephalitis virus, also found in the United States.

**How big a threat is WNV to the health and safety of National Park Service (NPS) employees and visitors?**
Since its introduction into the Western Hemisphere, WNV has proven to be most serious in the elderly and people who are already weakened by other ailments. From 2001 to 2011, there have been a total of 68 human cases of WNV in Suffolk County, NY. In 2011, there were 44 human cases of WNV and subsequently, 2 deaths in New York State (not in Suffolk County). Of these human cases, 4 were located in Suffolk County. The peak in occurrence in human cases for New York State was in the latter half of August 2011, commonly when WNV is most prevalent (CDC, 2012). In the United States, WNV is transmitted by infected mosquitoes, primarily members of the *Culex* and *Aedes* genus of which, several species occur on Fire Island (CDC, June 2010). From FIIS mosquito and surveillance monitoring since 1998, there have been 15 positive WNV occurrences in mosquitoes or dead birds on Fire Island and two positive occurrences at the William Floyd Estate. People most likely to develop serious symptoms are the elderly and those who have a compromised immune system, such as people diagnosed with AIDS. By using insect repellents when engaged in outside activities, the risk of contracting WNV can be greatly lowered. For maximum protection, a repellent containing 33% DEET is recommended. Follow the label directions carefully, especially when using DEET on children, for whom a lower % of DEET is recommended.

**What is the basic transmission cycle for the WNV?**
Mosquitoes become infected when they feed on birds infected with the virus. After an incubation period (roughly 10 days), infected mosquitoes can transmit WNV to humans and/or other animals. Disease symptoms do not develop in everyone who is bitten by an infected mosquito. Elderly and other people who are fighting an illness are more likely to develop symptoms and possibly encephalitis.

**How long has WNV been in the United States?**

It is not known how long the virus has been in the U.S., but the CDC scientists first detected it in the eastern U.S. during the summer of 1999 in Queens, NY.

**How do people get WNV?**
Transmission comes through the bite of a mosquito (primarily the *Culex spp.,* or possibly *Aedes sollicitans*) that is infected with the WNV. The virus is located in the mosquito's salivary glands. It is not commonly transmitted by casual contact between people, but in a small number of cases it has been transmitted by blood transfusions, organ transplants, breastfeeding and even during pregnancy from mother to baby.

**What are the symptoms of WNV?**
Most people who are infected with WNV have no symptoms. Some experience flu-like symptoms, including fever, headaches, and body aches, and skin rash and swollen lymph glands are also common symptoms. In fewer cases, the infection may be more severe and an infected person may also experience neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, and/or paralysis. Severe infection may lead to permanent neurological damage or death in the most extreme cases.

**What is the treatment for WNV?**
There is no specific treatment for WNV. Mild cases usually clear up with no treatment. In more severe cases, intensive supportive therapy is indicated including hospitalization, IV fluids and nutrition, and good nursing care. If you develop symptoms of severe WNV illness, such as unusually severe headaches or confusion, seek medical attention immediately.

**Is there a vaccine against WNV?**
Though there are vaccines for the WNV for horses and other pets, there is no vaccine for human use at this time.

**Can a person get WNV directly from birds that might have the virus?**
There is evidence that a person with a cut can get West Nile Encephalitis from handling live or dead birds that test positive for the virus. To be safe, always use gloves or double plastic bags to handle or remove dead birds.

**Is a woman's pregnancy at risk if she gets West Nile encephalitis?**
There is evidence that an infection caused by the WNV can be transmitted to the non-born child of a pregnant woman. The CDC recommends that pregnant women avoid being bitten (stay away from mosquitoes and ask your doctor about the use of repellent).

**Why doesn't Fire Island National Seashore (FIIS) spray for mosquitoes?**
FIIS is by law required to protect the native wildlife, plants and other natural resources within its boundaries from environmental contamination. Modern insecticides, while safer for humans than their older counterparts, are often very toxic to fish and other forms of marine life.

Since 1999, FIIS, in cooperation with Suffolk County, and in consultation with New York State and the CDC, has conducted a mosquito surveillance program each summer to monitor mosquitoes on park lands for the presence of diseases that present a threat to

humans, such as Eastern Equine Encephalitis Virus (EEEV) and WNV. The program was designed by a leading entomologist from the University of Rhode Island.

Each week, mosquitoes are sent to Albany to be tested for disease. If mosquito-borne disease is found in the park, or within a few miles of park boundaries, the NPS will consult with Suffolk County, the CDC, and New York State and with academic experts to decide whether or not to spray park lands to reduce the number of adult mosquitoes. Other control methods such as larviciding may also be implemented.

**What role does the CDC play in NPS mosquito management efforts?**
The CDC and other federal, state and local agencies will assist the NPS to determine the severity of the public health threat from mosquito-borne disease in FIIS, and to choose the appropriate course of action to protect the health of staff, residents and visitors. CDC does not announce a "public health threat"; they simply provide technical assistance to the park in the decision-making process.

**What can park visitors or park employees do to prevent becoming infected with the WNV?**
No control method will eliminate *all* mosquitoes. For the individual, the very best form of protection is personal protection. Avoid areas with mosquitoes, but if you must be outside, wear protective clothing and use repellent.

- Long-sleeved shirts, long pants, a hat, and gloves can provide increased protection from mosquitoes. For extra protection, clothing can also be treated with an insecticide such as permethrin.
- The use of an insect repellent on exposed skin will reduce your chances of being bitten by mosquitoes. A repellent with 20% to 30% DEET (N,N-diethyl-meta-toluamide) as the active ingredient works the best.
- The combination of permethrin-treated clothing and a DEET-based repellent on exposed skin will provide for maximum personal protection.
- The use of a head net and mesh jacket can also provide added protection and needed ventilation on warm days.

**Where can I get more information on WNV and other mosquito borne diseases?**
Check on the web at HYPERLINK http://www.cdc.gov/ncidod/dvbid/westnile/index.htm or call your local public health office.

## APPENDIX F

# DRAFT PRESS RELEASE

**Date_____**

### West Nile Virus Found on Fire Island

Fire Island National Seashore Superintendent K. Christopher Soller announced today that West Nile Virus (WNV)-infected mosquitoes/birds have been found on Fire Island. The bird was found by _____ at _____. The mosquitoes were from a trap set by_____ (Suffolk County/the park as part of its weekly monitoring program). Testing was done by _____ (currently the New York State Department of Health Wadsworth Center in Albany).

The National Park Service will be working closely with the Centers for Disease Control and Prevention (CDC), the New York State Department of Environmental Conservation (DEC), Suffolk County Vector Control, and local Fire Island and Long Island municipalities to determine the best course of action to protect residents, visitors and employees of the Seashore. Actions to protect the public may include control methods such as larviciding or spraying. The public will be notified 24 hours in advance of any spray event.

The park is also conducting continued surveillance to monitor the severity and extent of WNV in the Seashore.

Residents, visitors and staff are advised to avoid mosquito-infested areas. If contact with mosquitoes is unavoidable, it is advisable to wear protective clothing and use an effective insect repellent, such as one containing at least 30% DEET. People most at risk of becoming ill from WNV are those over 50 years of age or whose health is impaired. Such people are advised to stay away from areas with mosquitoes.

For general information on WNV, please contact your local health department. Information can also be obtained from the CDC, New York State or Suffolk County WNV web sites, or one of the park visitor centers. If you have information or questions for the park, please contact our headquarters at (631) 687-4750.