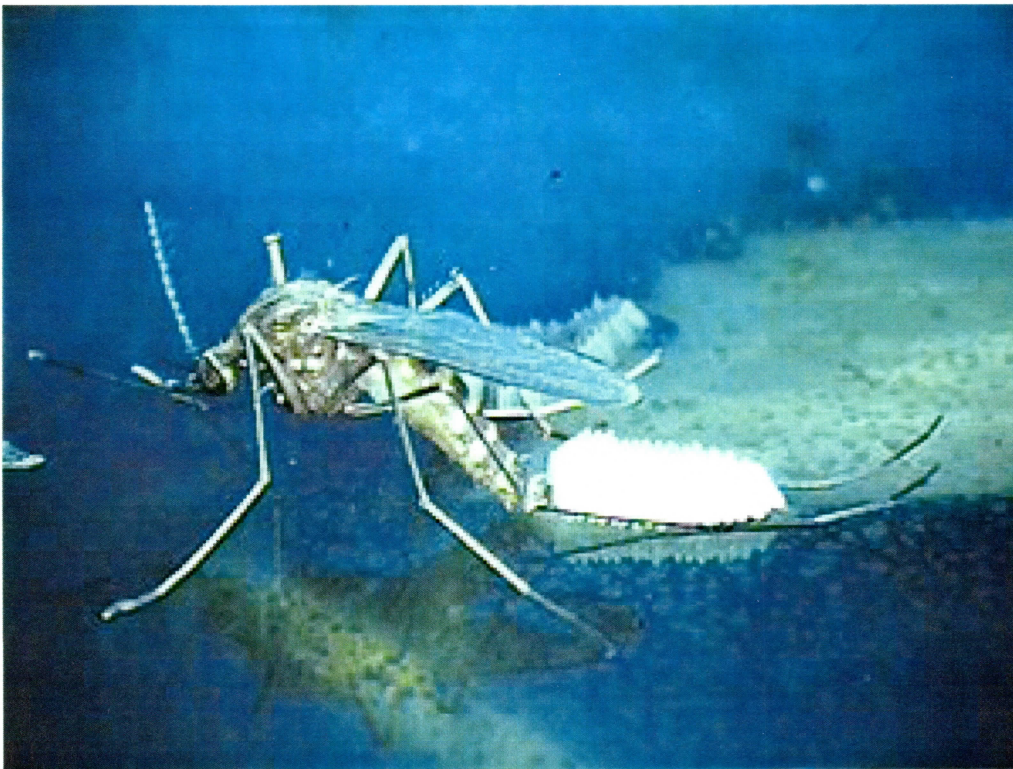


Mosquito and West Nile Virus Monitoring Program

Rocky Mountain Arsenal NWR



Culex mosquito laying eggs

2004

INTRODUCTION

Background

West Nile Virus (WNV) first appeared in North America in 1999. Transmitted by mosquitoes, this potentially deadly disease has taken its toll on humans and animals alike. Symptoms for people range from flu-like to encephalitis, with the majority of fatalities occurring within the elderly. For animals, symptoms vary depending on species. Domestic dogs and cats that test positive for WNV tend to be asymptomatic, whereas one in three horses die once infected. Avian species, specifically corvids and raptors appear to be the most susceptible. During 2003, red-tail hawk deaths across the U.S. reached into the tens of thousands, while dead magpies and ravens were routinely turned into health centers for testing. Typical modes of transmission include either a mosquito-bird-mosquito cycle, or an infected mosquito spreading the disease to a dead end host such as a human or a horse, in which case the disease is no longer contagious.

For Colorado, WNV infections in humans, horses and other animals was first reported in 2002, with 14 human cases, 380 WNV-positive horses, and 138 WNV-positive wild birds – all reported from areas east of the continental divide. WNV infections reported in Colorado increased dramatically in 2003 with 2,947 human cases (including 63 deaths), 604 WNV-positive horses, and 766 WNV-positive wild birds – reported from all across the state. RMA NWR (Refuge) is located in Adams County Colorado where the 2003 reported cases included 232 humans (6 deaths), 22 horses, and 23 wild birds. The Refuge also is situated within 60 miles or less of the Colorado counties that reported the highest numbers of infected humans, horses, and wild birds for 2003 compared to other areas of the state. Human cases of WNV in Colorado represented nearly 25 percent of all human cases reported in the United States for 2003 and more than 30 percent of all WNV-related deaths.

In 2003, the Fish and Wildlife Service (Service) began the implementation of a mosquito monitoring program at RMA focused specifically on WNV. Past monitoring efforts focused on mosquitoes as a nuisance rather than a vector for disease. The current program was designed to estimate population numbers as well as identify and tally *Culex tarsalis*, the species of mosquito known to transmit WNV in Colorado. Monitoring areas were selected on the basis of potential breeding habitat, as well as areas that receive mosquito nuisance complaints. Still in the initial stages, this program may undergo modifications and incorporate new strategies each season as needed.

In 2004, in cooperation with USGS in Fort Collins, a monitoring study was established to assess the level of occurrence and potential effects of WNV on wild raptor populations at RMA using the American kestrel (*Falco sparverius*) as a surrogate sentinel species. The American kestrel was chosen because of their large relatively accessible populations, willingness to nest in boxes, and exhibiting WNV like symptoms in previous years. In addition, Kestrels are currently part of RMA's raptor monitoring program therefore, their use as a surrogate species will help to improve the interpretation of potential WNV impacts on other diurnal raptors. Annual inception and the level of WNV occurrence will be monitored as well as kestrel survival and reproduction parameters between infected and non-infected individuals within the population. The results of this

study will provide insights as to how WNV may be impacting Kestrels as well as other populations of raptors in the wild. Results for this study are still pending.

In addition to trapping, plan strategies may include mowing areas of high vegetation next to standing water as a way of eliminating mosquito resting areas when a direct threat to public safety exists. Plains killifish (*Fundulus zebrinus*) may also be introduced as larval control into lakes and wetlands as a native alternative to gambusia (mosquito fish). Also, Army may continue to treat non-Service lands and areas of standing water with *Bacillus thuringiensis israelensis* (Bti), while dead corvids such as magpies will be submitted to Tri-County Health Center for testing. In the event Tri-County is no longer accepting samples, specimens will be sent to the National Wildlife Health Center (USGS) in Madison Wisconsin or submissions discontinued. Complete contact information is listed in Appendix A.

Public awareness

Rocky Mountain Arsenal is bordered on the south by Montebello, on the west, north, northwest, and northeast by residential and commercial areas of Commerce City, and on the southeast by housing/commercial developments in the city and county of Denver. Therefore the Service has a responsibility to keep the public informed on issues concerning public safety and perception. Questions concerning West Nile Virus and RMA can be handled directly by Tri-County Health Department or by updated notices on the RMA website.

Regulatory and policy compliance

All surveillance was done in accordance with USFWS policy as outlined in the mosquito draft policy, specifically sections 2.7 and 2.9, paragraphs A and B regarding monitoring on refuges and human health factors. In addition, mosquito management specifically related to habitat modifications such as mowing areas of high vegetation will only take place when a serious threat to public safety has been identified by local health officials, and such recommendations are pursuant with draft policy section 2.8 paragraph A and refuge habitat management strategies. Monitoring and surveillance activities can be categorically excluded from NEPA under existing Department of the Interior (DOI) procedures for data collection and inventory (516 DM 2, Appendix 1.6; and 516 DM 6, Appendix 1.4 B(1), see 516 DM 2. Also, wintering and nesting bald eagles (*Haliaeetus leucocephalus*), listed under the Endangered Species Act will not be affected by the monitoring undertaken in this plan.

METHODS

Trapping

Mosquito survey kits from Clarke Mosquito Control Products Incorporated were used for trapping. Traps were placed approximately 4 to 6 feet above the ground, hanging from a tree limb or other available fixture. Kit components included, thermos for dry ice, motor combined with lamp, fan, net and 6V battery.

Trap locations included one trap on the north side of Lake Mary to sample the Visitor Center area, one trap near north bog and First Creek, one trap near building 111, one trap along west perimeter and a trap near Parkfield wetland. Trapping times and dates (listed below) varied slightly depending upon weather conditions. Typically traps were set at 2 pm on the first day and collected at 9 am on the second day of trapping. In the event trapping was delayed due to weather conditions such as thunderstorms or high winds, trapping resumed the following day. Dry ice required for trapping was purchased the day the traps were set from Air Gas, Inc.

Mosquito larval monitoring continued to be handled by Merrick, a private contractor at RMA. Protocols consist of larval dip counts and the use of *Bti* on standing water and lakes. Trapping dates are listed below.

July 6th - 7th, 20th - 21st
August 3rd - 4th, 17th - 18th
September 7th - 8th, 21st - 22nd

Sample processing

Mosquitoes were killed in the traps by freezing at -20° C prior to being tallied and identified using a dissecting microscope and mosquito ID criteria in the prep room of building 120. For each trap, total numbers of overall species as well as totals and percent of *Culex tarsalis* were recorded. In addition, all *C. tarsalis* were tested every two weeks for W. Nile by Colorado Dept. of Public Health via Tri-County. Mosquitoes which could not be processed immediately were stored in jars at -20° C until a later date.

Data management and record keeping

Site locations were recorded by section, description and GPS coordinates. Dates and times of trapping were recorded in a field notebook, whereas final numbers for species, percents and test results were tallied in an excel spreadsheet. Mosquito trap numbers were forwarded to Tri-County Health Department for surveillance purposes and consultation on appropriate control measures. Data recording sheet listed in Appendix B.

RESULTS AND DISCUSSION

The low number of mosquitoes trapped (989) combined with negative test results for all samples submitted, led to Tri-County Health Department recommendation that RMA NWR suspend trapping and testing mosquitoes until further notice of potential health concerns. In addition, the 2004 Draft FWS Mosquito Policy advises mosquitoes not be controlled on Service lands. Therefore RMA NWR will discontinue trapping and/or controlling mosquitoes until further notification from Tri-County Health or new Service Policy. This includes discontinuing the use of *Bti* on Refuge property for larval control and submitting dead corvids for testing. This does not prevent Army or subcontractors from controlling mosquitoes on non-Service RMA lands. Complete data sets and test results are listed in individual tables in Appendix C.

APPENDIX A: CONTACTS

RMA point of contact: Judson Spicer

Agency: USFWS

Office: B121, room 133

Phone: 303-289-0572 (ext. 5572)

Secondary points of contact: Lorenz Sollmann and Tom Jackson

Agency: USFWS

Office: B121 and B111 respectively

Phone: 303-289-0927 (ext. 5927) or 303-289-0538 (ext. 5538)

County health department contact: Monte Deatrich

Agency: Tri-County Health Department

Office: 4201 East 72nd, Suite D, Commerce City

Phone: 303-288-6816

APPENDIX B: DATA RECORDING SHEET

Date	Obs.	Trap #	Trap Location	Time Set	Time Removed	Temp (°F)	Wind Speed	Precip?	Comments

APPENDIX C: TABLES

Table 1. Mosquito Trap Locations RMA NWR, 2004

Trap #	Area Name	Section #	UTM Easting	UTM Northing	Lat/Long N	Lat/Long W
1	Building 111	35	512273	4408460	39°49.675'	104°51.429'
2	West Perimeter	27	509998	4410882	39°50.987'	104°53.022'
3	Lake Mary	2	511769	4407541	39°49.179'	104°51.783'
4	Parkfield	7	516170	4405222	39°47.921'	104°48.702'
5	North Perimeter	24	513988	4413162	39°52.216'	104°50.220'

Table 2. West Nile Virus and Mosquito Monitoring: RMA NWR, 2004

Date Trap Set	Trap #	Sec. #	Trap Area	UTM Easting	UTM Northing	Temp (F)	Wind
7/28/2004	1	35	Building 111 West	512273	4408460	78	2
7/28/2004	2	27	Perimeter	509998	4410882	78	2
7/28/2004	3	2	Lake Mary	511769	4407541	78	2
7/28/2004	4	7	Parkfield North	516170	4405222	78	2
7/28/2004	5	24	Perimeter	513988	4413162	78	2
8/3/2004	1	35	Building 111 West	512273	4408460	86	4
8/3/2004	2	27	Perimeter	509998	4410882	86	0
8/3/2004	3	2	Lake Mary	511769	4407541	86	2
8/3/2004	4	7	Parkfield North	516170	4405222	86	0
8/3/2004	5	24	Perimeter	513988	4413162	86	0

Time Set	Time Removed	Duration	Total # Mosq.	# <i>C. tarsalis</i>	# <i>C. pipiens</i>	# Other	Test Results
1420	1100	14 hrs	9	8	0	1	Negative
1540	1030	14 hrs	28	23	0	5	Negative
1440	935	14 hrs	42	26	6	10	Negative
1445	1002	14 hrs	71	36	24	11	Negative
1555	1050	14 hrs	95	83	1	10	Negative
1450	945	14 hrs	147	67	13	67	Negative
1545	1000	14 hrs	188	34	2	152	Negative
1507	1045	14 hrs	116	38	28	50	Negative
1523	1100	14 hrs	82	29	14	39	Negative
1559	1145	14 hrs	211	98	50	63	Negative