CLACKAMAS COUNTY BOARD OF COUNTY COMMISSIONERS
Policy Session Worksheet

Presentation Date:	Approximate Start Time:	Approximate Length:
16 February 2016	1:30 pm	30 minutes

Presentation Title: Annual Work Plan for Clackamas County Vector Control District

Department: Vector Control (Special District)

Presenters: George Peck (District Director), Joshua Jacobson (District Biologist)

Other Invitees: Dan Green (District Board President), Lowell Hannah (Board Treasurer), Gordon Young (Board Secretary), John Borden (Board Vice President), and Mike Bondi (Board member).

WHAT ACTION ARE YOU REQUESTING FROM THE BOARD?
Approval of the 2016-2017 Annual Work Program and the 2015 Annual Report.

EXECUTIVE SUMMARY (why and why now): The Clackamas County Vector Control District, pursuant to ORS 452.120, is required to furnish by 1 February of each year a proposed Annual Work Program which shall include an estimate of funds required for the next year, a description of the work contemplated, and the methods to be employed by the district. The Board, after consultation with the District officers, shall approve the Annual Work Program of the district. Further, the District shall furnish to the Board by 1 February of each year an Annual Report covering moneys expended, methods employed, and work accomplished during the past fiscal year.

FINANCIAL IMPLICATIONS (current year and ongoing): The District passed a five year local option levy of 0.025 per thousand in 2014. Thus, 2015 was year one of five years of the District's local option levy, securing stable funding until 2019.

STRATEGIC PLAN ALIGNMENT: Not applicable.

LEGAL/POLICY REQUIREMENTS: Not applicable.

PUBLIC/GOVERNMENTAL PARTICIPATION: Not applicable.

OPTIONS: Not applicable.

RECOMMENDATION: The Board of the Clackamas County Vector Control District is recommending the approval of the 2016-2017 Annual Work Program and the 2015 Annual Report. Robust vector control programs are crucial to public health protection. Emerging vector borne diseases and invasive mosquitoes are ever present threats to Oregon.

ATTACHMENTS: Cover letter, Power Point Presentation on Emerging Vector Borne Diseases, 2016-2017 Annual Work Plan, and 2015 Annual Report.

SUBMITTED BY:
Division Director/Head Approval _____
Department Director/Head Approval George W. Peck George W. Peck, Director CCVCD
County Administrator Approval _____

For information on this issue or copies of attachments, please contact George Peck @ 503-655-8394

CLACKAMAS COUNTY

VECTOR CONTROL DISTRICT

STAFF REPORT

February 16, 2016
Clackamas County
Board of Commissioners
2051 Kaen Road
Oregon City, OR 97045

Members of the Board:

IN THE MATTER OF ACCEPTING THE 2015 ANNUAL REPORT

AND THE 2016-2017 ANNUAL WORK PROGRAM

FOR CLACKAMAS COUNTY VECTOR CONTROL DISTRICT

The Clackamas County Vector Control District, pursuant to ORS 452.120, is required to furnish by 1 February of each year a proposed annual work program which shall include an estimate of funds required for the next year, a description of the work contemplated, and the methods to be employed by the district. The Board, after consultation with the District officers, shall approve the annual work program of the district. Further, the District shall furnish to the Board by 1 February of each year an annual report covering moneys expended, methods employed and work accomplished during the past fiscal year.

To comply with these requirements, the District will meet with the Clackamas County Board of Commissioners in policy session on 16 February, 2016 at 1:30 p.m.

RECOMMENDATION

The Board of the Clackamas County Vector Control District is recommending the approval of the 2016-2017 Annual Work Program and the 2015 Annual Report.

Sincerely,

George W. Peck

George W. Peck, PhD
Director

Clackamas County Vector Control Work Plan and Arbovirus Update

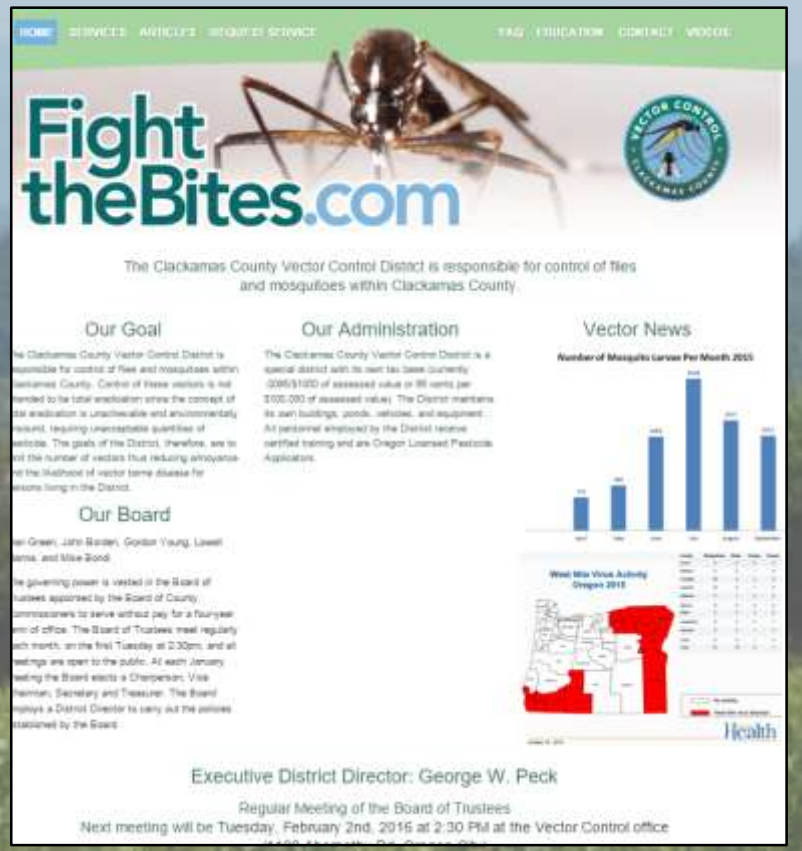
with

Special Issue Updates: Invasive mosquitoes and Zika virus

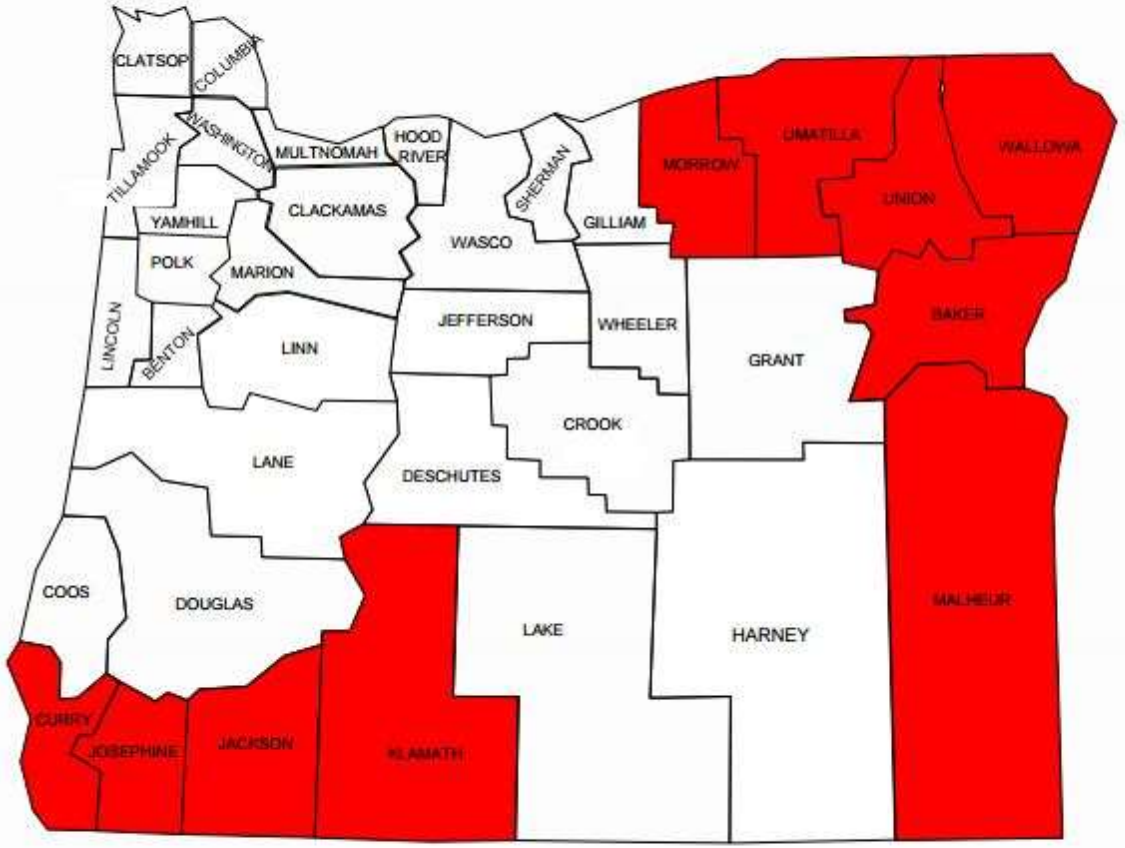
George W. Peck, PhD

Clackamas County Vector Control District

16 February 2016



West Nile Virus Activity
Oregon 2015



County	Mosquitoes	Birds	Horses	Human
Union	3	0	2	0
Malheur	4	0	1	0
Umatilla	26	0	0	0
Jackson	15	5	1	0
Wallowa	0	1	0	0
Morrow	8	0	0	0
Baker	4	0	0	0
Josephine	0	4	0	1
Klamath	0	0	1	0
Curry	0	0	1	0
Total	57	10	6	1

No activity

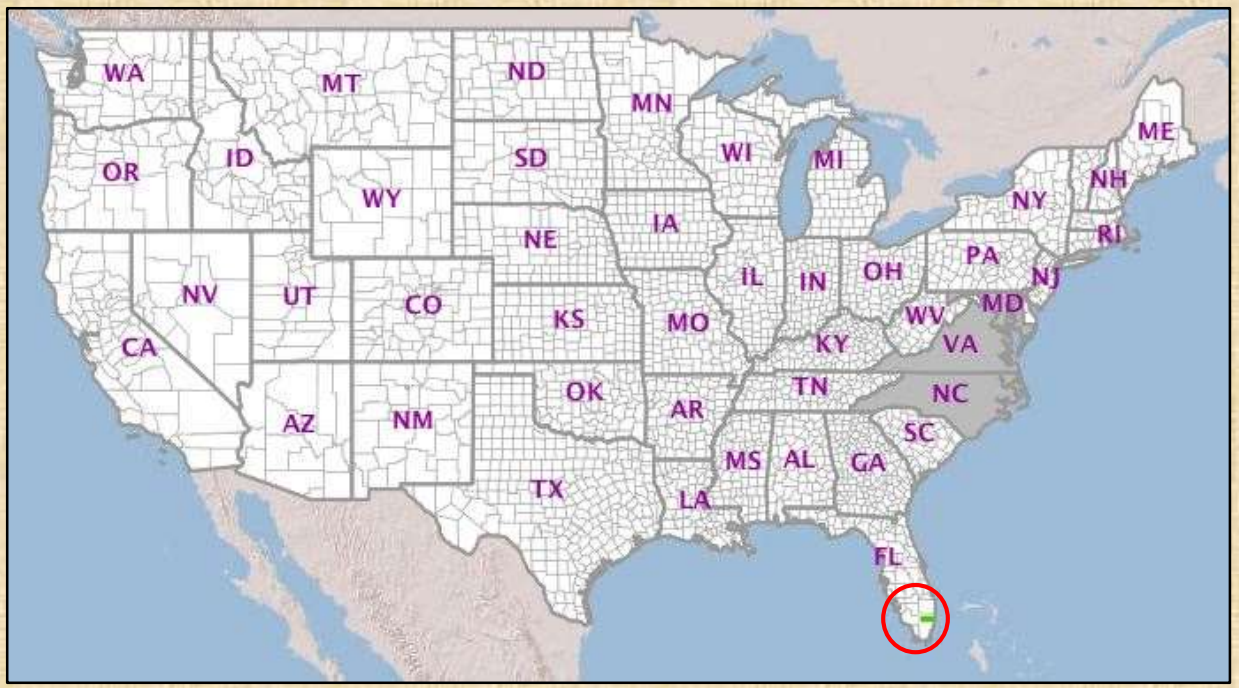
West Nile virus detected

Oregon Health Authority

October 10, 2015

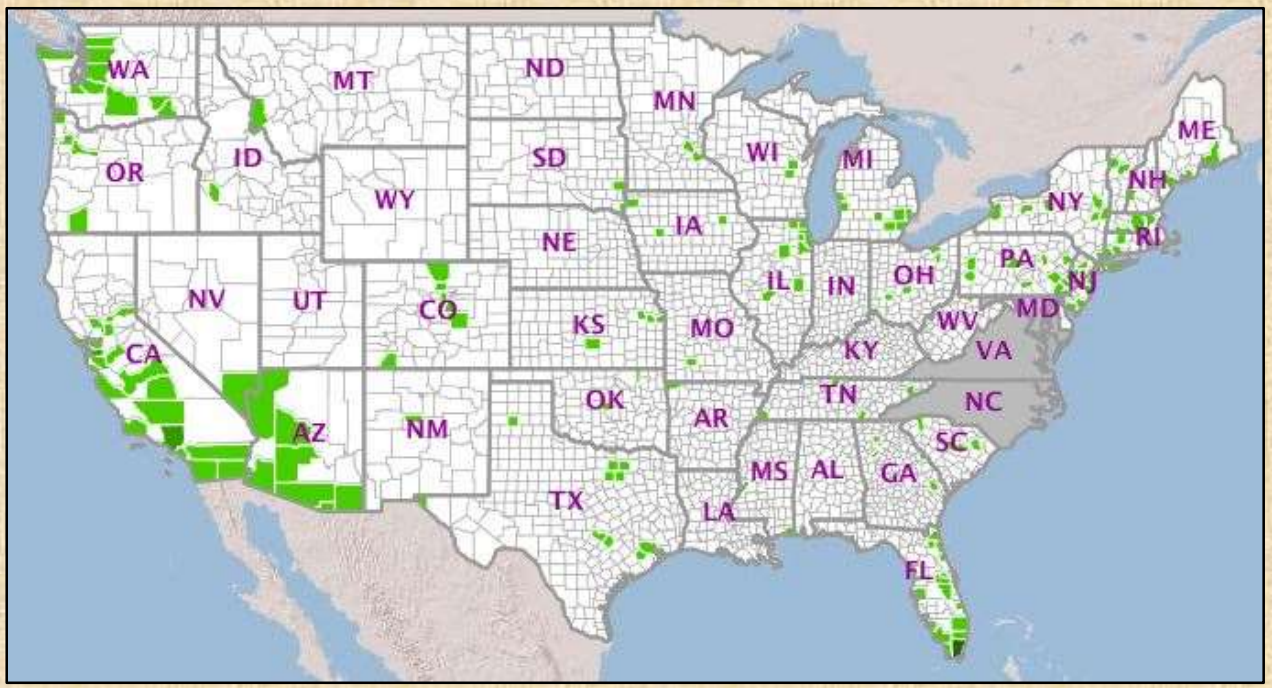
Dengue cases in 2015

Locally transmitted



211 cases reported in Miami-Dade County

Imported

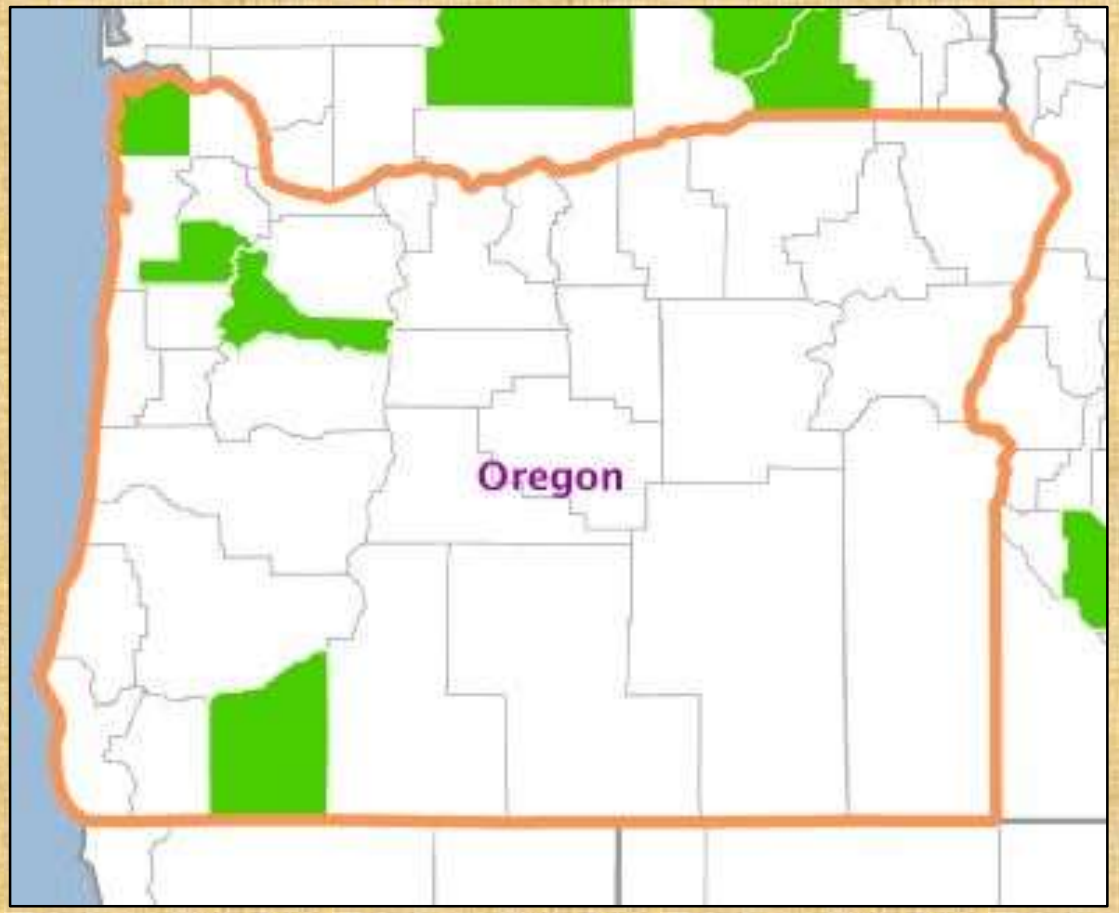


540 cases reported nation-wide

Dengue cases in 2015

Locally transmitted

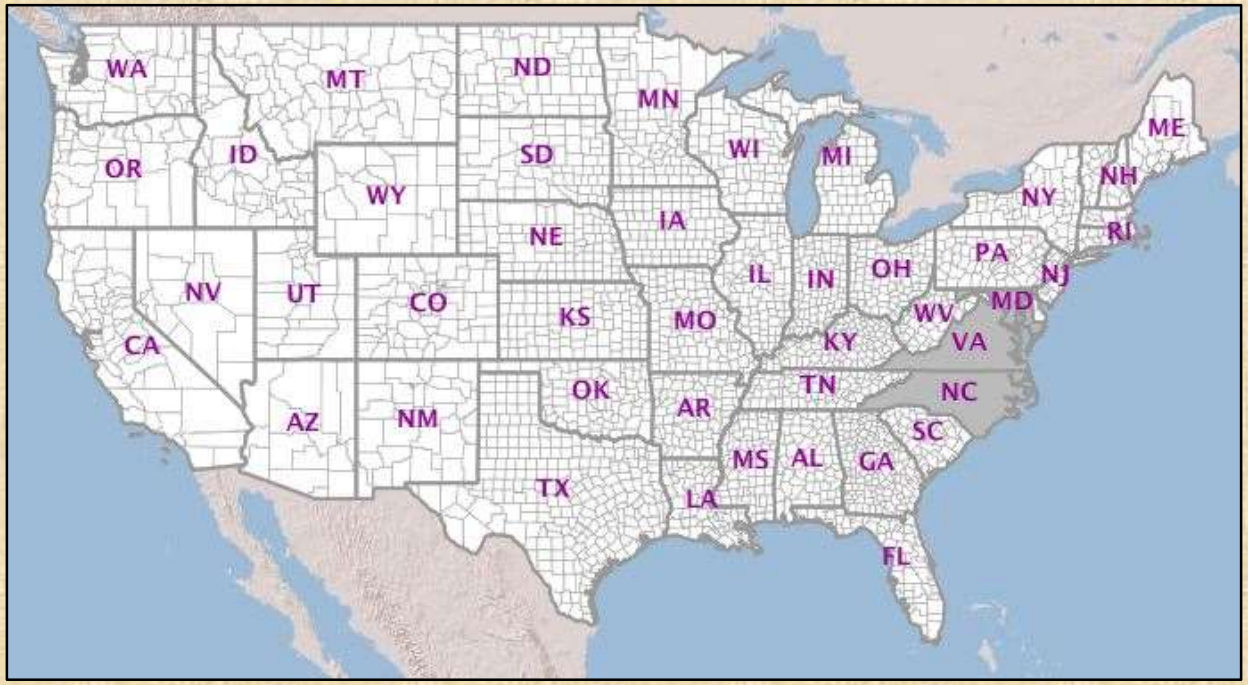
Imported



4 cases reported

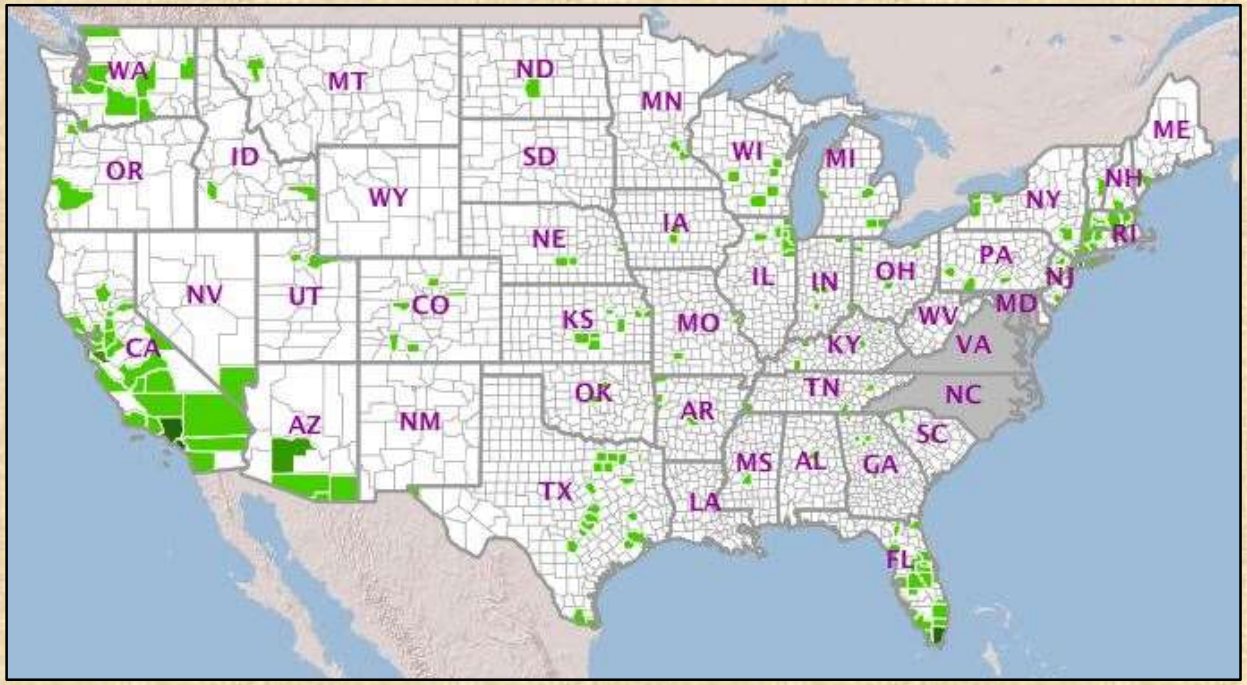
Chikungunya cases in 2015

Locally transmitted



202 cases reported ?

Imported



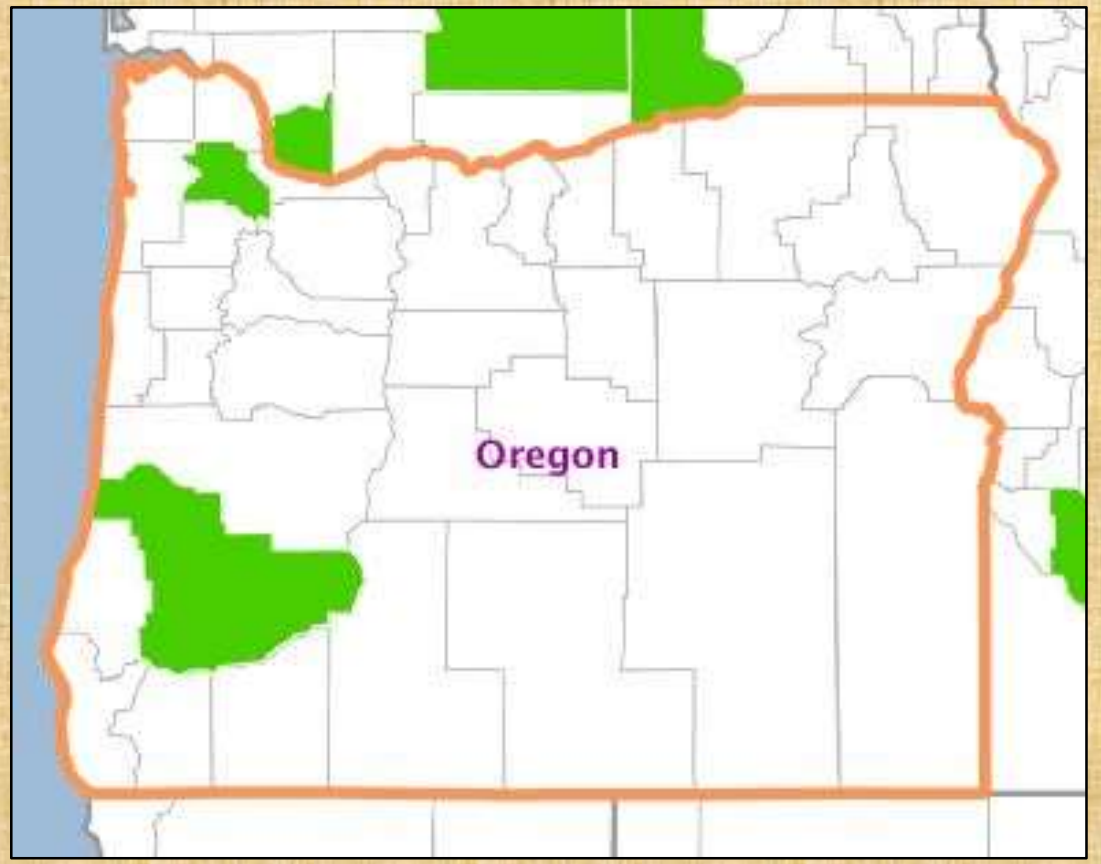
673 cases reported

Source: http://diseasemaps.usgs.gov/mapviewer/

Chikungunya cases in 2015

Locally transmitted

Imported



3 cases reported

Source: http://diseasemaps.usgs.gov/mapviewer/

Aedes mosquito biology

- Container breeders
- Suited for urban life
- Attracted to humans at all hours
- Major vector of pathogenic viruses to humans
- *Aedes* eggs can survive long periods without water

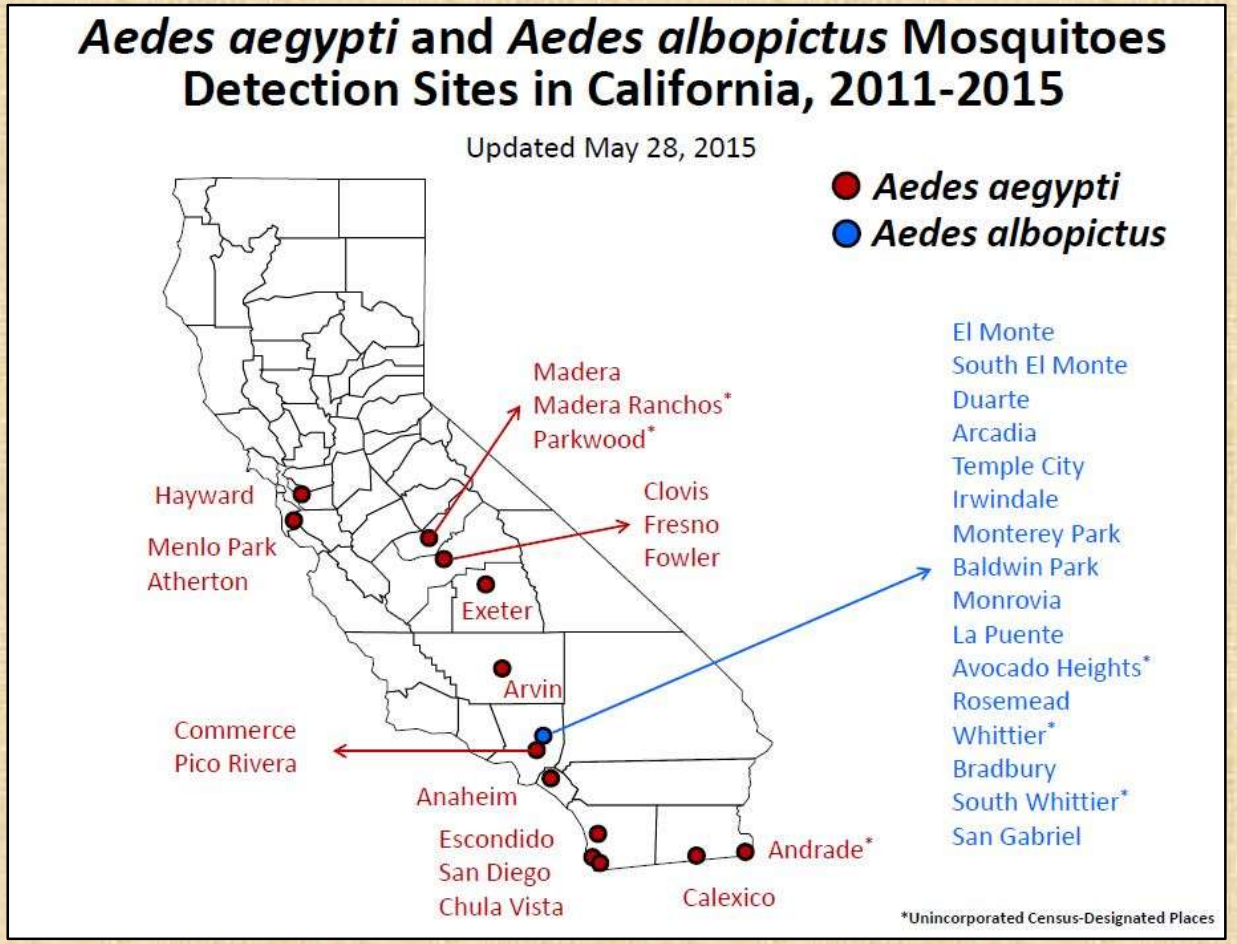
Mosquito Invasions

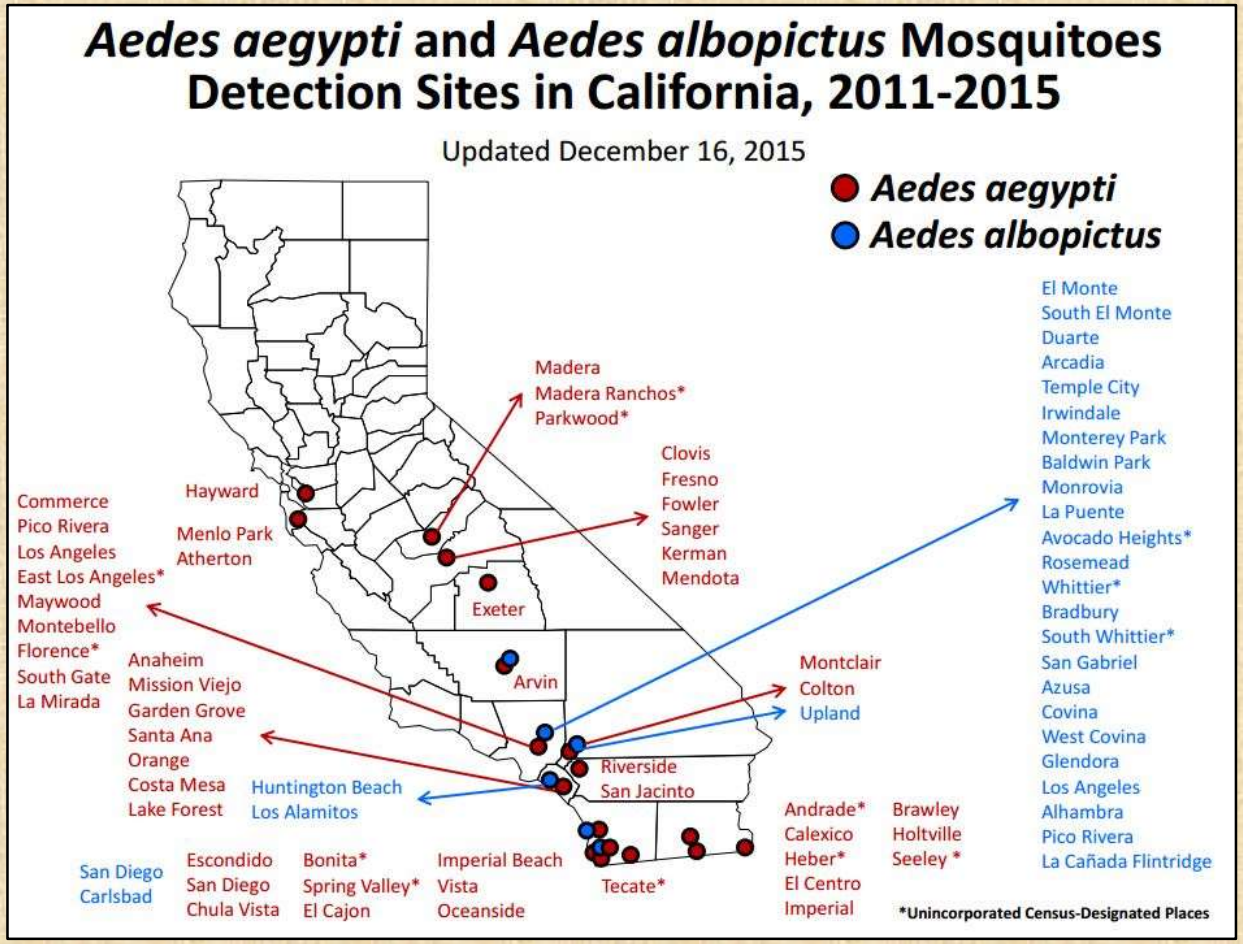
- Climate change
  - Warmer springs, summers, and falls
  - Mosquito range expansion
- Increased trade and travel means possibility of mosquito introduction
  - Humans infected during foreign travel can bring disease to Oregon
- *Aedes aegypti*
  - Established along California-Mexico border
  - Detected in Fresno, Madera, and San Mateo counties in 2013 and 2014
  - Detected in Kern, Tulare, Los Angeles, and San Diego counties in 2014
- *Aedes albopictus*
  - Detected in El Monte in 2011, and has spread to 12 more cities
- *Aedes japonicus*
  - 2006 detections in Kelso, WA and Portland, ORE
  - Irish SR, Pierce CS 2008 Upate on the distribution of *Oclerotatus japonicus* in Oregon and Washington. J Amer Mosq Control Assoc. 24:110-111

Diseases *Aedes* mosquitoes bring

- Dengue Fever
- Chikungunya Fever
- Yellow Fever
- Rift Valley Fever
- Japanese Encephalitis
- Venezuelan Encephalitis
- Zika virus

6 month spread of *Aedes* in California May to December, 2015

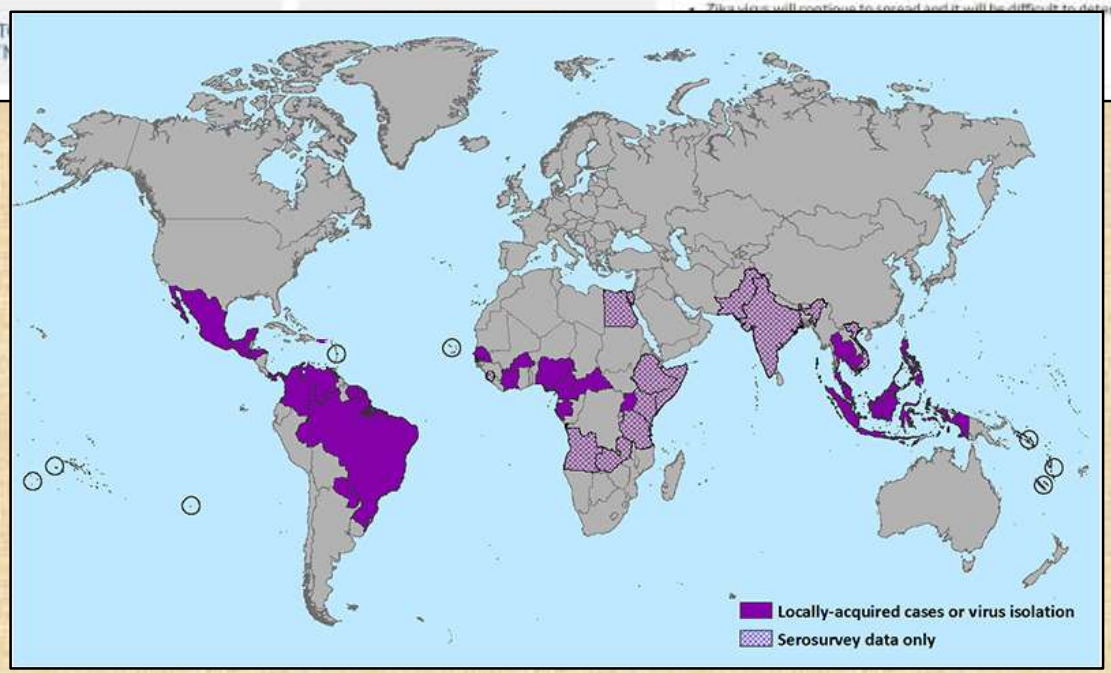




Source: http://www.cdph.ca.gov/HealthInfo/discond/Documents/AedesDistributionMap5-28-15.pdf

Zika virus

- Found in Africa in 1947
- Began global circulation in 2007
- Reached Brazil in April 2015
- 100 + cases in US
  - Local transmission / STD
- 3 + cases in Oregon



Clinical Presentation of Dengue and CHIK

DENGUE

- Mild, nonspecific febrile illness
- Acute onset of high fever 3 to 14 days after bite
- Severe headache, pain behind eyes, muscle and joint pain, rash
- In rare cases severe bleeding (hememoragic fever)
- Treatment is supportive only (no vaccine available)

CHIK

- Acute fever with severe joint pain 3 to 7 days after bite
- Other symptoms include headache, muscle pain, fatigue, and rash
- Treatment is supportive (no vaccine)

Source: CDPH *Aedes* page at
http://www.cdph.ca.gov/HEALTHINFO/DISCOND/Pages/Aedes-albopictus-and-Aedes-aegypti-Mosquitoes.aspx

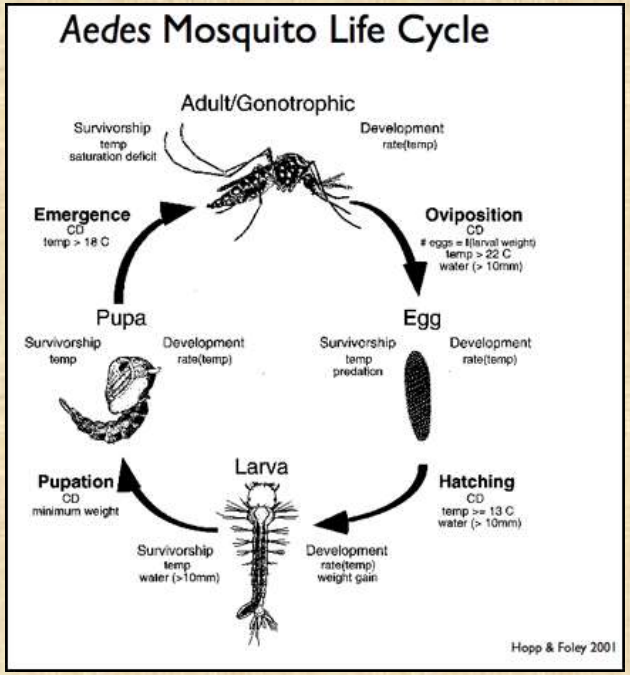
Clinical Presentation of Zika

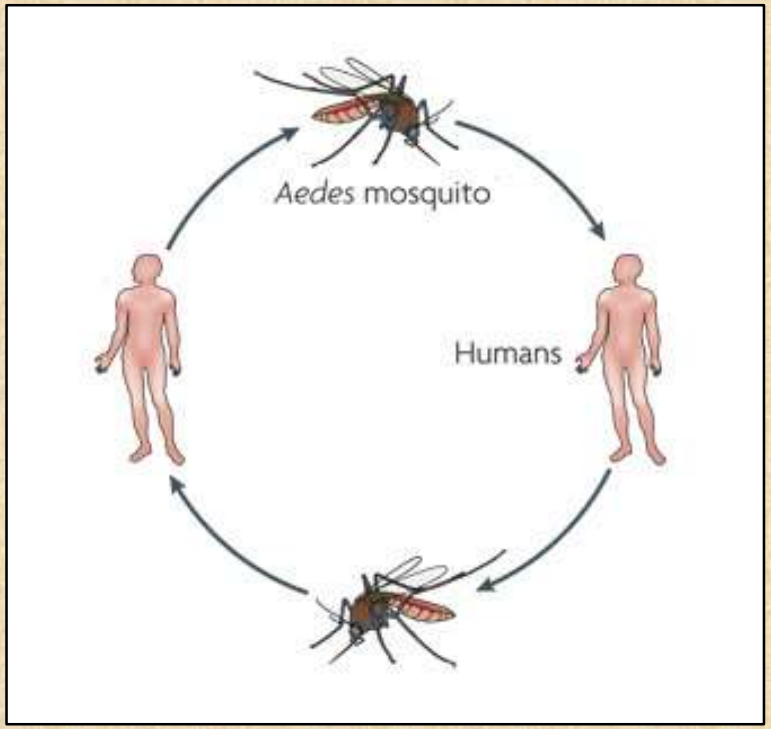
- Asymptomatic in 4 out of 5 infections
- Symptoms include fever, rash, joint pain, or conjunctivitis
- Headache and muscle pain also reported
- Mild illness
- Symptoms last several days to a week
- Treatment is supportive only
- No vaccine available
- Strong effects on first term pregnancy

Source: CDC Zika virus page www.cdc.gov/zika/
and http://www.npr.org/

Epidemiology of Dengue, CHIK and Zika

- No animal reservoir (unlike WNV)
- Transmitted from person to person by bite of infected *Aedes* mosquito
- "Urban disease"

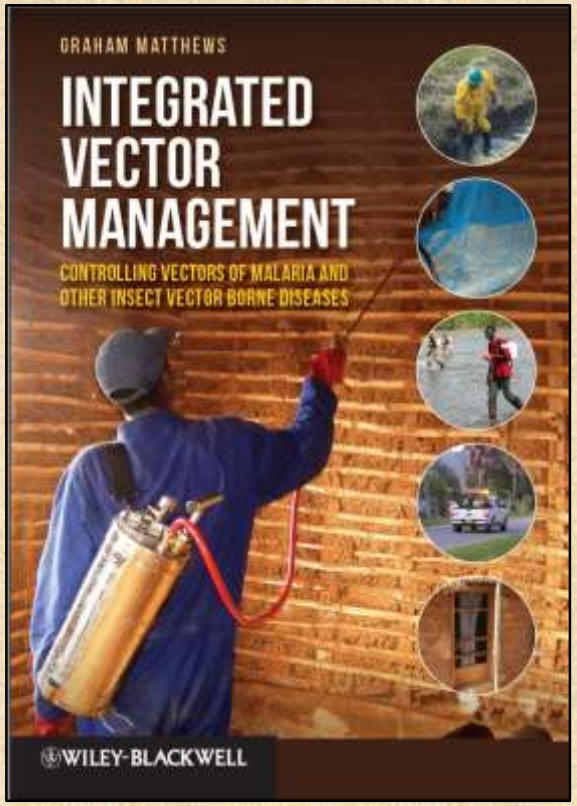




Source: CDPH *Aedes* page at
http://www.cdph.ca.gov/HEALTHINFO/DISCOND/Pages/Aedes-albopictus-and-Aedes-aegypti-Mosquitoes.aspx

Integrated Pest Management (IPM)

- Based on science
- Planned Management Tactics and Control Strategies
- Reduce the Abundance of Target Pests in a Timely Manner
- IPM Methods
  - Public Relations and Education
  - Mosquito and Vector Surveillance
  - Bio-rational Control (Biological and Physical)
  - Chemical Control (larvacides and adulticides)
  - Genetic technologies (gene drive)



Public Relations and Education for invading *Aedes* mosquitoes (IPM)

- Primary Objectives: Educate and Inform the public about *Aedes* mosquitoes and the diseases they can transmit
- Encourage District Residents to Practice **The Seven D's**
  - **DRAIN** – any standing water that may produce mosquitoes (pools)
  - **DAWN** and **DUSK** – are times to avoid being outdoors when mosquitoes are active
  - **DRESS** – appropriately with long sleeves and long pants when outside
  - **DEFEND** – by using mosquito repellents such as DEET
  - **DOOR** – check to see if door and window screens are in good working condition
  - **DISTRICT** – Call the District for any mosquito or vector problem

SACRAMENTO-YOLO MOSQUITO & VECTOR CONTROL DISTRICT

Adapted from http://www.fightthebite.net/download/brochures/Integrated_Pest_Management.pdf

Aedes traps

- Dry ice-baited trap
- Light Trap
- Gravid traps (Standard, CDC, GAT)
- BioGents Sentinel
- Ovi-trap

BG standard and prototypes. Photo: Joe DiClaro

Standard Gravid Trap
wchd.org

Ovitrap flikr.com

CDC-AGO trap designed by Roberto Barrera
(CDC Dengue Branch, Puerto Rico)

Gravid *Aedes* Trap
Photo: S. Ritchie

Novel vectors of Zika

- *Culex pipiens*
- Common house mosquito
- Abundant in Clackamas Co.
- Tests being conducted
- Oswaldo Cruz Foundation
- Results in three weeks (1/29)
  - Update before talk

- http://www.telegraph.co.uk/
- http://news.sky.com/story/1631065/zika-virus-may-have-spread-to-common-mosquito

Brazilian experts investigate if 'common mosquito' is transmitting zika virus

Brazil would face an even greater struggle against zika If the common "culex" mosquito is passing on the virus

221 1 3 225 Email

A common 'culex' mosquito Photo: Alamy

By Priscilla Moraes, Rio de Janeiro

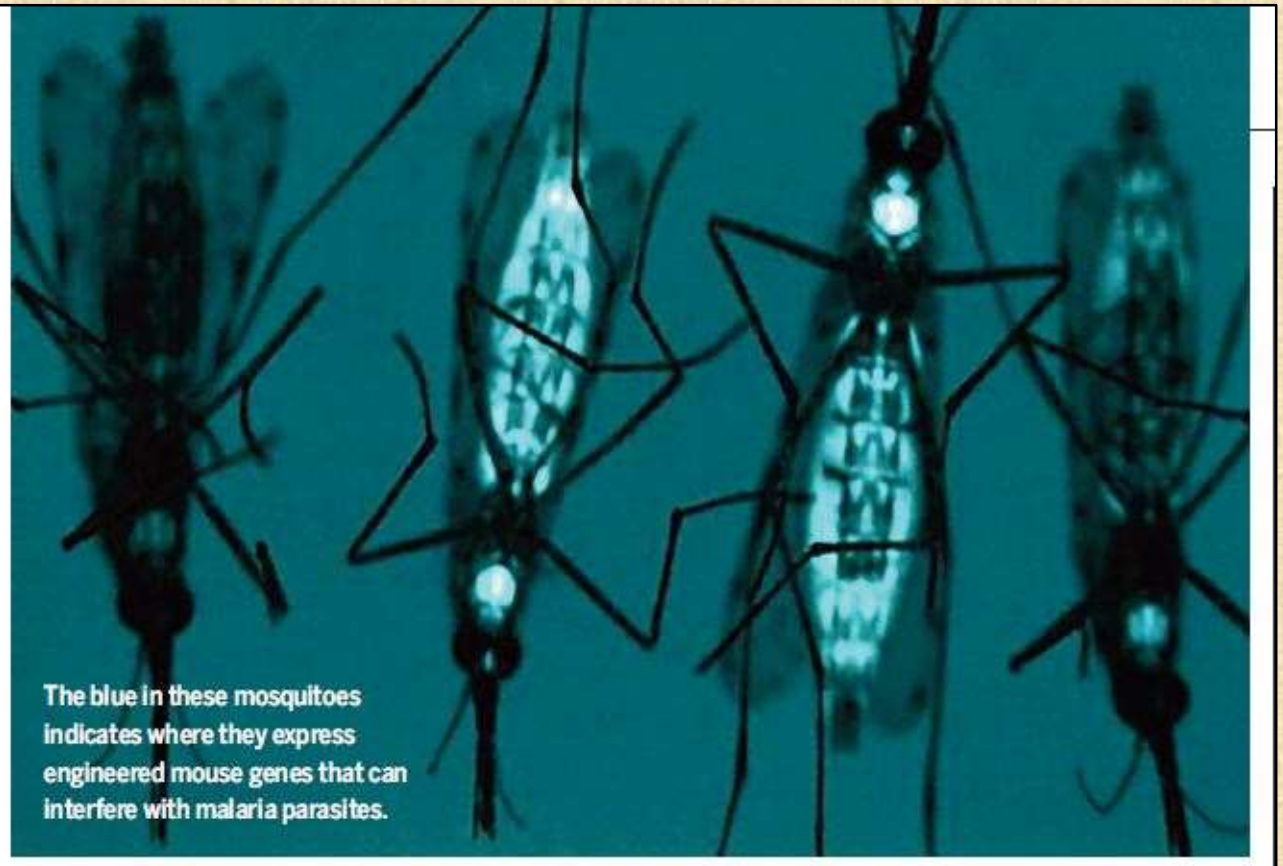
5:13PM GMT 27 Jan 2016

Brazil could be facing a greater fight against the zika virus than previously feared as researchers investigate whether the common mosquito is

Using gene drive to protect the public health

Science
27 Nov 2015

- Gene drive demonstrated in fruit fly (UCSD)
- Malaria-killing gene
- Anopheles stephensi lab colony (UCI)
- Future?



The blue in these mosquitoes indicates where they express engineered mouse genes that can interfere with malaria parasites.

SCIENCE AND SOCIETY

Gene drive turns mosquitoes into malaria fighters

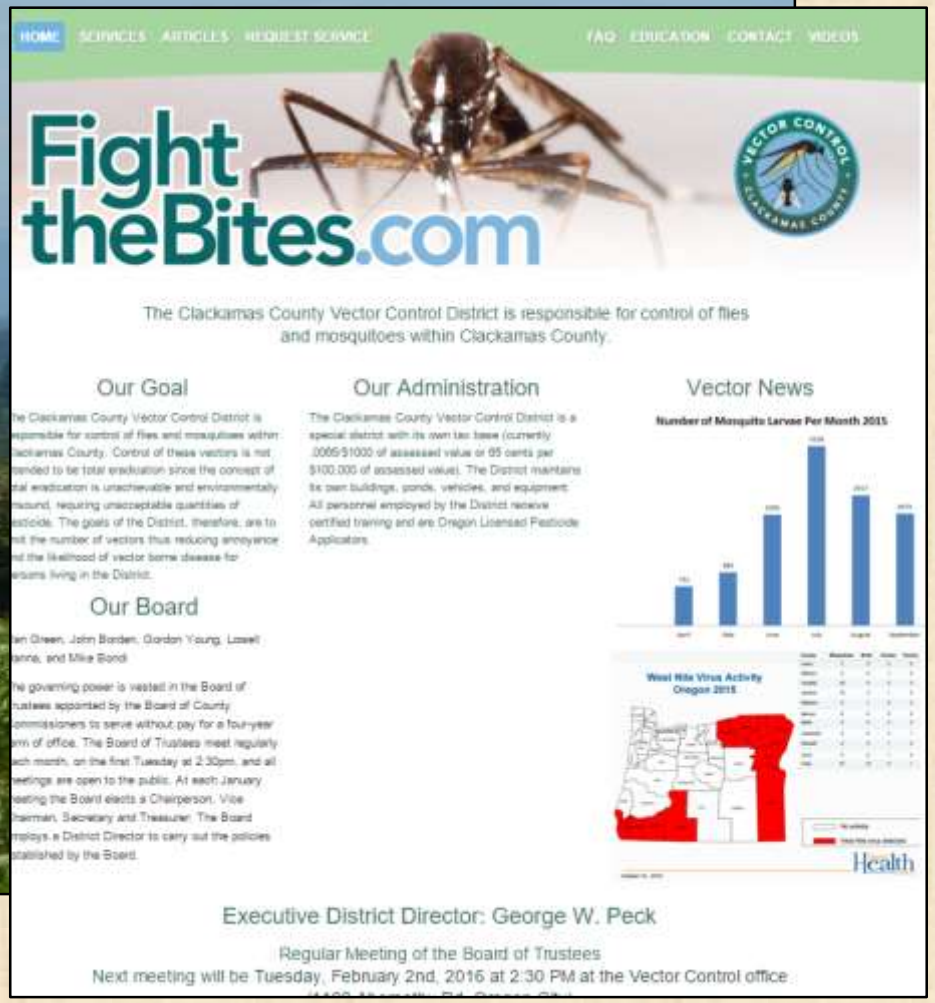
Antiparasite genes made to spread among lab insects

By **Elizabeth Pennisi**

and wipe out populations of entire species.

Clackamas County Vector Control District
"Serving the public by protecting them from vector borne diseases"

Thank you!



Annual Work Plan

Fiscal Year 2016 - 2017

Clackamas County Vector Control District
1102 Abernethy Road, Oregon City, Oregon 97045
(503) 655-8394
www.clackamas.us/vector

CLACKAMAS COUNTY VECTOR CONTROL DISTRICT

ANNUAL WORK PLAN 2016-2017

Prepared by:

District Staff

in collaboration with

Clackamas County Vector Control Board of Trustees

Submitted to:

Clackamas County Board of Commissioners

Contents

1. Executive Summary

The purpose of this **Annual Work Plan**[1] is to provide the Clackamas County Board of Commissioners a plan covering the proposed work to be accomplished by the **Clackamas County Vector Control District** in 2016. This is an annual requirement covered in Oregon Revised Statute 452. The Annual Work Plan also provides guidelines for District staff and the District Board of Trustees. It also provides information to stakeholders regarding decisions and responses the District will utilize in the prevention and control of **West Nile Virus** or other mosquito-borne disease that may threaten Clackamas County in the future.

The District (all of Clackamas County) had no reported humans cases of autochthonous or allochthonous West Nile Virus in 2015. The District began inspections in early March and continued do inspections throughout the county until mid-October. District's active partnerships with public and private stakeholders including: local county and city officials and staff, state and federal agencies, environmental groups, agricultural interests, community groups and Clackamas County residents is of the utmost importance . The District will keep in close communications with the appropriate Oregon Health Authority Officer. The District monitors equine illnesses or deaths related to cases of suspected West Nile Virus through communication with local veterinarians and the State Department of Agriculture. If cases are reported, the District then traps from within one-half mile to two miles of the affected area. These collaborating agencies and individuals will be identified as part of the **West Nile Virus Information Exchange**. Through this Information Exchange, the District provided accurate and useful information to these stakeholders and encouraged them to participate in the management of mosquitoes and mosquito-borne diseases that threaten Clackamas County.

The District has applied **Integrated Mosquito Management** principles in its program. A detailed definition of Integrated Mosquito Management is provided in Appendix 1. These principles will be the basis of all decisions and responses used by the District. The Integrated Mosquito Management program will include: public education, community outreach, surveillance, and control activities that use the least toxic and most environmentally friendly methods available.

The District will continue to increase public education, community outreach, mosquito surveillance and mosquito control.

This plan, while giving stakeholders an overview of the District's program guidelines, will serve as an educational tool to provide readers with background information on the District's programs and more knowledge of mosquito management methods.

The District has held meetings with Water Environment Services, Soil and Water Conservation District, and other agencies to locate current and future mosquito breeding sites in the county to better control possible future West Nile Virus breeding sites.

[1] All bold references are defined in the Glossary Section located on page 14. Acronyms and abbreviations are noted at their first occurrence (in parentheses) and will then be used throughout the Annual Work Plan.

2. Background and Introduction

The Clackamas County Vector Control District was established in 1964 by voter referendum to provide residents limited mosquito and fly control services. The funding generated by the original tax base was adequate to meet minimal service requirements prior to the arrival of West Nile Virus in Oregon. In November 2004, the Clackamas County voters approved a five-year option levy for vector control operations, and in 2009 and 2014 voters renewed this levy for an additional five years. This increased funding allowed the District to better prepare for, and minimize the impact of West Nile Virus in Clackamas County. The enhanced program will be implemented as part of the Annual Work Plan, which is submitted yearly to the Clackamas County Board of Commissioners for review and approval as required by Oregon Revised Statute 452.

West Nile Virus was first detected in the United States in New York City in 1999. This virus, a mosquito transmitted disease, had never before been detected in the Western Hemisphere. Since 1999, West Nile Virus has rapidly spread throughout the continental United States. Oregon first experienced the disease in early August 2004 when dead birds and equines were found positive with the disease. Approximately three weeks later the first human case was diagnosed. West Nile Virus was detected in Clackamas County in August 2007 with 3 birds testing positive for the virus.

It is anticipated that West Nile Virus will be found in Oregon again in 2016, although the likelihood of the disease being detected in Clackamas County is low. The District's Local Option Levy funds are being utilized to implement an upgraded program. The 2016 - 2017 proposed budget for the District is given in *Appendix 2*. Budget narrative and specific details can be obtained from the District.

This Annual Work Plan consists of two parts: the first addresses the current program; the second, a West Nile Response Plan. It is expected, through continual community involvement, that the Annual Work Plan will be a fluid, ever-changing document —its primary goal being to reduce the threat of West Nile Virus and other mosquito-borne diseases to Clackamas County residents, while using the least toxic and most environmentally friendly methods available.

3. Program Overview

3-1. District Objectives

The overall objectives of the District are as follows:

- Map and survey breeding locations strategically throughout the County. Collect and identify vector species and base control measures on type and numbers of vectors present.
- Utilize Integrated Mosquito Management strategies to select the best and most appropriate control measures that will cause the least harm to the environment and provide the maximum safeguard for District employees and the public.
- Provide public education, outreach and technical assistance to assist in the reduction of nuisance and vector mosquitoes.
- Submit Annual Work Plans to the Board of County Commissioners for approval before implementation.
- Collaborate and share information with local stakeholders, agencies and the public.

3-2. Training

All permanent staff will be given the necessary training to meet state certification requirements. Appropriate staff members will attend local, regional and national mosquito association meetings to learn new technological advances. Specialized training in mosquito identification and surveillance, public education and community outreach, equipment maintenance and use, and other training will be provided as needs are identified. All staff will contact homeowners before any treatment is to be done.

3-3. Equipment and Supply Requirements

When West Nile Virus is detected in Clackamas County it will be necessary to focus on area control rather than individual homeowners, as it has been in the past. **Ultra Low Volume** spray equipment and the associated vehicles will be used for ground spraying of Vector Control Zones.

3-4. Public Education

A professional, well-organized public education program will be an essential part of all District prevention and control programs. District staff and West Nile Virus Information Exchange members have been, and will continue to be, participants in this program. These include: District website, media relations, school and community education, development of printed and electronic educational material and staff training on public education. The District continued a new education program on its website for teachers both public and private . The Communication Plan is a key document and used as guidance for District work.

3-5. Surveillance

No vector control program can be effective without surveillance. It may be as simple as taking service requests by telephone from the public in response to nuisance mosquitoes or as complex as using sophisticated trapping and mapping systems that provide finite data on mosquitoes, weather and mosquito-borne diseases.

Presently, the District does adult and immature mosquito surveillance and has data available from present and past mosquito collections. This data has been transferred to a new database. Beginning in 2006 all data collected was identified by Vector Control Zones. This has allowed information to be exchanged between programs such as surveillance, control activities, source reduction, etc. More detail on types of surveillance performed will be given in the West Nile Virus Response Plan.

3-6. Nuisance Mosquito and Fly Control

This Annual work plan focuses primarily on the development and implementation of the District's plan for reducing the potential for West Nile Virus in the county. The District will continue its responsibility to respond to citizen calls related to nuisance mosquitoes and flies. However, when West Nile Virus is detected in the county, priority will be given to area disease prevention rather than nuisance mosquito and fly abatement at individual residences. The general guidelines that will be used for nuisance mosquito and fly prevention and control are given below.

3-7. Nuisance Mosquito and Fly Prevention and Control Guidelines

Status 1: No Nuisance Mosquitoes or Flies Present

- Environmental conditions not conducive to mosquito or fly development.

Action None

Status 2: Nuisance Mosquitoes or Flies Present

- Environmental conditions conducive to mosquito or fly development.

Action

- Homeowner contacts the District with a request for service. Explanation of service and requirements of homeowner provided by District staff.
- Types of service provided to homeowners related to nuisance mosquito and fly prevention and control include: public education, both printed and verbal, inspection of property for surveillance or control purposes, and if necessary, control of nuisance species will be done using the most environmentally friendly methods available.

Mosquito Fish – *Gambusia affinis*
The District uses mosquito fish as a biological control agent for mosquito larvae. The District recognizes the use of mosquito fish for its promotional value to help educate homeowners on best management practices to reduce nuisance mosquito populations. The District will make mosquito fish available to homeowners on a site-specific basis. The District keeps GPS locations of all Gambusia distributed.

4. West Nile Virus Response Plan

This West Nile Virus Response Plan provides the Clackamas County Vector Control District staff with specific and general guidelines for the prevention and control of West Nile Virus in Clackamas County. Additionally, the plan provides the Clackamas County Board of Commissioners and all stakeholders with educational information about West Nile Virus and the methods to be used by the District to reduce the potential for transmission of the disease in humans and domestic animals.

The decision to use various risk levels for West Nile Virus prevention and control in Clackamas County will be made using the best knowledge and practices available considering that the management of mosquitoes and mosquito-borne diseases is very complex and not fully understood. Therefore, the District Director and staff may be required to modify the responses given in these guidelines if the health of residents is threatened. However, no changes will be made without approval of the Clackamas County Vector Control District Board of Trustees and communication with West Nile Virus Information Exchange members.

The response to various risk levels associated with West Nile Virus are provided after the adult mosquito control section. The risk level sections will provide staff and stakeholders the recommended action to be taken at different levels of risk for West Nile Virus. When the use of insecticides is required, all application methods and materials used will be in compliance with federal, state and local regulations.

4-1. Public Education / Community Outreach

In addition, there needs to be close communication and coordination between Clackamas County Public and Government Relations and Clackamas County Vector Control District for disseminating information about West Nile Virus and its prevention and control to the public and media. The media will play a critical role in getting information to the public and the information provided to the media should be accurate, timely and brief. Information on West Nile Virus that involves more than one agency will be closely coordinated with local and state officials.

All brochures, fact sheets and other printed material produced and provided by the District will be of professional quality and reviewed. Any printed materials developed all or in part by another agency should recognize that agency. The Communication Plan is a key document and used as guidance for District work.

4-2. Surveillance

4-2.1 Immature Mosquito Surveillance

Immature mosquito surveillance can provide early warning to forecast size of future adult mosquito populations and estimates of control effectiveness. The data collected from immature mosquito habitats must be carefully recorded and maintained. The sites that are found positive for *Cx. pipiens* and *Cx. tarsalis*, the most important vectors of West Nile Virus for Clackamas County, will be identified by GPS. Control measures as given in Risk Levels 2-4 will be implemented at these sites. (page13)

Presently, Clackamas County Vector Control District has a database for inputting immature mosquito collections data. This data will be retained. The information is utilized in the prevention and control process.

4-2.2 Adult Mosquito Surveillance

Adult mosquito density is a key factor contributing to the risk of West Nile Virus. Monitoring adult mosquito populations provides essential information on population size, infectivity rate and effectiveness of larval and adult control efforts.

Two methods may be used by the District to sample adult mosquito populations. One is the **EVS trap**, the other a **gravid trap**. The EVS trap is very effective in collecting *Cx. tarsalis*, the latter *Cx. pipiens.* These species are considered the most likely to transmit West Nile Virus to humans in Oregon.

Each Vector Control Zone in the county will have predetermined locations for placement of these traps. The EVS trap can be used in both urban and rural areas; the gravid trap, primarily in urban areas to target *Cx. pipiens.* This trapping regime will provide valuable information that may allow prediction of high-risk areas for West Nile Virus transmission to humans. The District keeps all locations on GPS.

The mosquitoes collected in traps will be returned to the Clackamas County Vector Control District laboratory, identified and tested for West Nile Virus using the **RAMP** test. Results from these tests will be a key factor in determining the areas requiring adult control measures. Information will be sent to stakeholders in a Weekly Biologist Report.

4-2.3 Dead Bird Surveillance

In addition to testing adult mosquitoes for West Nile Virus, the disease can be detected in dead birds, particularly corvids (crows, jays, magpies). Clackamas County Vector Control District will be responsible for the collection of samples and testing of dead birds. This is necessary in planning surveillance and control strategies. The District again was able to test dead birds using the RAMP test in the 2013-2014 season. This information was included in the Weekly Biologist Report sent weekly to stakeholders.

4-2.4 Human Surveillance for West Nile Virus

All information in Oregon regarding human infections of West Nile Virus is maintained by the Oregon Department of Human Services. This agency works closely with Clackamas County Community Health and the District in the prevention and control of West Nile Virus. Contact information is provided in *Appendix 3.*

4-2.5 Domestic Animal Surveillance for West Nile Virus

Domestic animals, particularly equines, can be seriously affected by West Nile Virus. Surveillance and laboratory detection of West Nile Virus in animals is conducted by the Oregon Department of Agriculture. Contact information is provided in *Appendix 3*.

4-3. Control Activities

The Clackamas County Vector Control District will use best management practices for the control of immature and adult mosquitoes. These practices promote the least toxic approach likely to be effective in controlling immature and adult mosquito populations. A phased response utilizing surveillance results — the initial step in a best management practices program — will emphasize public education, community outreach and source reduction. Larviciding will be limited to those areas where the mosquito species meet the industry standards for treating. The use of larvicides and adulticides will be limited to the conditions set in Risk Levels 2 through 4 (see page 13).

4-3.1 Larvae/Pupae Control

This control program will reduce development of larvae and pupae through water management activities and the selective use of larvicides. The materials to be used are given in *Appendix 4* along with pertinent information on the use of each product. Additionally, the District will collaborate with local, state, federal and private agencies to identify, and where feasible, prioritize those water sources that are known to, or have the ability to, create significant mosquito breeding problems. Reasonable efforts will be made to reduce mosquito development in the zones.

4-3.2 Adult Mosquito Control

Adult mosquito control will be used in Clackamas County if a West Nile Virus outbreak meets the action criteria in Risk Levels 3 and 4. When adulticiding is required, the products will usually be applied using truck-mounted **Ultra Low Volume** (ULV) sprayers, Backpacks, or Barrier Sprayers. If a major outbreak of West Nile Virus should occur in Clackamas County, consideration would be given to aerial application. Application of chemicals would be done by a qualified contractor using **EPA** and state approved insecticides. The District currently has a signed contract with Clarke Mosquito Control should this become necessary.

Additionally, aerial spraying of adult mosquitoes for WNV will not be done without the recommendation of the District Director, approval by the Board of Trustees carried out by its West Nile Virus Agent, and coordination with the West Nile Virus Information Exchange. If application of adulticides becomes necessary, advance notice will be given through the media, the District website, other outlets and associated formats as appropriate.

5. Risk Level Descriptions

Risk Levels Summary

Level 1

- No West Nile Virus activity in the state or six-county metropolitan area.
- Environmental conditions not conducive to support West Nile Virus activity.

Level 2

- No West Nile Virus activity detected in Clackamas County or within two miles of the county line.
- Environmental conditions suitable for mosquito development.

Level 3

- West Nile Virus detected in mosquito species or dead birds in Clackamas County or within two miles of the county line.
- No human or equine cases of West Nile Virus diagnosed in Clackamas County or within two miles of the county line.
- Environmental conditions ideal for mosquito development.

Level 4

- West Nile Virus detected in mosquito species in multiple vector zones of Clackamas County or in multiple locations of any one vector zone in Clackamas County.
- One or more human or equine cases of West Nile Virus diagnosed in one or more vector zones in Clackamas County.
- Environmental conditions ideal for mosquito development.

5-1 West Nile Virus Risk Level 1

Status

- No West Nile Virus activity in State or six-county Metro area.
- Environmental conditions not conducive to support West Nile Virus activity.

Actions

- Monitor environmental conditions to include: precipitation, temperature and humidity.
- Perform routine administrative and maintenance activities.
- Update Annual Plans.
- Attend training classes and mosquito control association meetings as appropriate.
- Consolidate and interpret previous year's data for Annual Reports.
- Prepare presentations for schools, community groups and others as requested.
- Continue a mapping system that has standardized locations for all vector control activities, to include: surveillance, public education and control measures.
- Recruit stakeholder individuals and groups for volunteer activities during West Nile Virus season.
- Identify individuals, groups or locations considered higher risk for West Nile Virus.
- Coordinate with **Water Environment Services** and other public agencies in Clackamas County responsible for surface water management to map all catch basins, retention/detention systems and other storm water infrastructure. Collaborate and coordinate with these agencies to develop a plan to classify all these water-holding areas by West Nile Virus risk level.
- Identify at least one location in each Vector Control Zone to place an Encephalitis viral surveillance (EVS) trap or a gravid trap.
- Complete District purchases from qualified distributors of pesticide products to be used by the District in 2015.
- Renew contingency aerial contract for controlling adult mosquitoes in an emergency situation.

Summary Risk Level 1
The actions taken in Risk Level 1 are considered off-season activities but are very important in developing and maintaining a good West Nile Virus prevention and control program. As historical data are collected, these actions will evolve and provide the District information critical to the maintenance and improvement of the program.

5-2 West Nile Virus Risk Level 2

Status

- No West Nile virus activity detected in Clackamas County or within two (2) miles of the county line.
- Environmental conditions suitable for mosquito development.

Actions

Public Information and Agency Coordination

- Increase public education through community outreach. Provide media general information on West Nile Virus and follow media's response to public.
- Coordinate source reduction activities, such as container removal and site modification with public agencies and stakeholders.

Surveillance and Control

- Maintain close coordination with county and state health officials responsible for West Nile Virus monitoring of dead birds and human infections. Notify these agencies when immature mosquito activity is found. Provide these agencies with locations, species and numbers of the immature mosquitoes.

- Initiate trapping of adult mosquitoes using EVS and / or gravid traps. These traps will be set throughout the county to monitor West Nile Virus activity in mosquito populations. Adjust the numbers of traps and locations throughout the season to provide maximum coverage for detection of West Nile Virus.

- Identify and map mosquito-breeding sites not presently in the District's database.
- Implement immature mosquito control measures. Criteria for control are given below.
- No adult control measures are recommended at West Nile Virus Risk Level 2.

Control Criteria

- Locate mosquito breeding site – predators either present or absent.
- Verify one or more larvae or pupae present per dip – count based on average from ten (10) dips.
- Identify mosquitoes and record data.
- Recommend treatment – larvicide with State and Federal approved materials.
- Monitor site weekly until no positive collections are produced.

Summary Risk Level 2

The action taken in West Nile Virus Risk Level 2 is directed at the surveillance and control of immature mosquitoes (larval/pupal stages). The purpose of these actions is to reduce vector mosquito populations, particularly *Culex pipiens* and *Culex tarsalis* to a level where adult mosquito populations are too low to allow West Nile Virus transmission.

Information on larvicides to be used by the District is provided in *Appendix 4*. All insecticides used are approved by ODHS and the Oregon Department of Fish and Wildlife (ODFW) through a yearly **Pesticide Use Plan** (PUP).

5-3 West Nile Virus Risk Level 3

Status

- Environmental conditions ideal for mosquito development.
- West Nile Virus detected in *Cx. pipiens, Cx. tarsalis* or other mosquito species, dead birds in Clackamas County or within two miles of the county line.

Actions

Public Information and Agency Coordination

- Increase public information through community outreach. Media provided specific information on West Nile Virus including general locations (Vector Control Zones) of positive mosquito samples.
- Coordinate with Clackamas County and state health officials regarding the release of information concerning the locations where positive dead birds have been found.
- Initiate daily contact with local and state officials regarding potential human or equine cases.
- Provide all new information on West Nile Virus positive mosquitoes to all public and private agencies that participate in the West Nile Virus Information Exchange.
- Notify the media and all West Nile Virus Information Exchange participants, in accordance with the District Communication Plan, when and where Vector Control Zones will be treated for adult mosquito control. Affected properties will be notified according to the District's Communication Plan. This information will also be posted on the District website.

Surveillance and Control

- Increase immature mosquito surveillance in Vector Control Zones where West Nile Virus has been detected. Monitor these sites two times per week and adjacent zones once a week.
- Treat sites with immature populations using the same criteria as given in **Risk Level 2.**
- Initiate ground and/or aerial adult control measures in zones as described below.

Control Criteria

- Immature Mosquito Control – Use same criteria as in Risk Level 2.
- Adult Mosquito Control—West Nile Virus detected in one mosquito sample in one Vector Control Zone. Adulticides applied using ground ULV application in that zone with EPA and state approved materials.
- Multiple positive samples from any surveillance method detected in one Vector Control Zone location. Adulticides applied in necessary areas within the Vector Control Zone and selected adjacent Vector Control Zones as necessary, using ground ULV application with EPA and state approved materials.
- Multiple positive samples detected in two or more Vector Control Zone locations and adjacent Vector Control Zones. Adulticides applied to in necessary areas within the positive zones and select adjacent Vector Control Zones as necessary.
- In unusual situations where the threat to humans warrants thorough control, and ground control may not be adequate, aerial applications of adulticides will be considered.

Summary Risk Level 3

The action taken in **Risk Level 3** is done to reduce the potential for increased West Nile Virus activity in adult mosquito populations, thereby reducing the threat to humans and domestic animals. No Aerial treatment for adult mosquitoes will be done without the recommendation of the Director, approval of the District Board of Trustees and communication with appropriate local and state officials and West Nile Virus Information Exchange participants.

Information on adulticides and larvicides to be used by Clackamas County Vector Control District is given in *Appendix 4*. Furthermore, all insecticides used are approved by the ODHS and ODFW through a yearly Pesticide Use Plan.

5-4 West Nile Virus Risk Level 4

Status

- Environmental conditions ideal for mosquito development.
- West Nile Virus detected in *Cx. pipiens, Cx. tarsalis* or other mosquito species in multiple Vector Control Zones in Clackamas County.
- West Nile Virus detected in mosquito species in multiple locations in any one Vector Control Zone.
- One or more human or equine cases diagnosed in one or more Vector Control Zones.

Actions

Public Information and Agency Coordination

- Initiate all activities that would be done under Level 3, plus the following:
- Provide daily public information to all West Nile Virus Information Exchange participants on status of West Nile Virus outbreak.
- Consider the following actions in collaboration with local and state health officials:

  1) Recommend the restriction/cancellation of outdoor evening activities and closing of recreational areas.

  2) Recommend direct notification to health care facilities, nursing homes and other locations with high health risks.
- Notify the media, all West Nile Virus Information Exchange participants, and the maximum number of affected property holders when and where Vector Control Zones will be treated for adult mosquito control, in accordance with the District Communication Plan. This information will also be posted on the Clackamas County Vector Control District website.

Surveillance and Control

- Initiate the immature mosquito surveillance activities detailed in Risk Level 2.
- Increase ground adult mosquito control operations using the criteria given below.
- Consider the use of aerial application for the control of adult mosquitoes in high-risk areas using the criteria given below.

Control Criteria

- Immature Mosquito Control—Use same criteria as in Risk Level 2.
- Two or more positive mosquito samples in one Vector Control Zone, or any one human case. Increase ground adult control to include all Vector Control Zones meeting these criteria where necessary.
- When human health appears threatened and aerial spraying offers the best method to ameliorate the threat, the Board of Trustees will authorize the District to apply adulticides using planes or helicopters. Applications will use EPA and state approved adulticides and will be applied during night time where human contact with the spray will be minimized.)

Summary Risk Level 4

The action taken in **Risk Level 4** will be based on a severe outbreak of West Nile Virus. All decisions made at this level will be made by the District Director and Board of Trustees in collaboration with local and state health officials and West Nile Virus Information Exchange participants.

Information on adulticides and larvicides to be used by the District is given in *Appendix 4*. Furthermore, all insecticides used are approved by the ODHS and ODFW through a yearly Pesticide Use Plan.

6. Glossary/Acronyms

Adulticide	Insecticides used to kill adult mosquitoes. All must be approved by EPA and state
AWP	Annual Work Plan
Breeding Site	An aquatic habitat where immature mosquitoes hatch and develop into adults
CCCH	Clackamas County Community Health
CCVCD	The 'District' - Clackamas County Vector Control District
Community Outreach	Information – verbal, written or other – provided to all residents in the community
EPA	Environmental Protection Agency
Equine	Horse
EVS Trap	Encephalitis viral surveillance trap
High-Risk Areas	Areas in Clackamas County where human health appears threatened due to positive test results for West Nile Virus
Immature Mosquitoes	The larval and pupal forms of mosquitoes. All are found in aquatic habitats
Insecticide Label	Information sheet required by EPA for all insecticides. Mosquito control agencies must have copies of each, for all insecticides used by that agency
Integrated Mosquito Management	The best management practices used by mosquito control agencies that include: surveillance, public education, community outreach, source reduction, and the use of insecticides in the most environmentally friendly ways possible
Larvae	The aquatic, immature stages of a mosquito that undergoes four molts then changes into the pupal stage
Larvicide	Insecticides used to kill immature mosquitoes. All must be approved by EPA and state
MSDS	Material Safety Data Sheet
Nuisance Mosquitoes	Mosquitoes that bite but are not considered important vectors to humans

ODA	Oregon Department of Agriculture
ODFW	Oregon Department of Fish and Wildlife
ODHS	Oregon Department of Health Services
PUP	Pesticide Use Permit. A yearly report required of all Oregon mosquito control programs and sent to ODFW and ODHS
Pupae	The aquatic, immature form of a mosquito prior to emerging as an adult
RAMP	Rapid Analyte Measurement Platform, a test used to detect WNV in mosquitoes and dead birds
ULV	Ultra Low Volume. The term used to describe insecticide spray units that break up spray particles into micron size units, typically 15-25 microns. Insecticide labels state micron size allowable for that particular material.
VCZ	Vector Control Zone. Specific areas in Clackamas County used as geographical markers by CCVCD to plan all operational programs
Vector	An organism, usually an insect or other arthropod, capable of carrying and transmitting a disease agent from one host to another
WNV	West Nile Virus
WNVIE	West Nile Virus Information Exchange. A group of public or private agencies, community organizations and individual stakeholders in Clackamas County that was formed in 2006 to collaborate and exchange information on WNV

7. References

The following references were used in conjunction with the development of the Clackamas County Vector Control District's 2013-14Annual Work Plan and West Nile Virus Response Plan

- Association of State and Territorial Health Officials (ASTHO), Public Health Confronts the Mosquito, Developing Sustainable State and Local Mosquito Control Programs.

- California Department of Health Services; Mosquito and Vector Control Association of California; University of California, *California Mosquito-borne Virus Surveillance and Response Plan.*

- Center for Disease Prevention and Control, Epidemic/Epizootic West Nile Virus in the United States: Guidelines for prevention and control.

- The City of New York, Department of Health, Comprehensive Mosquito Surveillance and Control Plan.

- Clackamas County Vector Control District, Work Plan 2008-2009 and various records, regulations, and documents.

- Deschutes County Health Department, West Nile Virus, *Executive Report and Comprehensive Plan for 2005.*

- Multnomah County Health Department, 2004 Mosquito Season West Nile Virus Response Plan.

- New York State Department of Health, *West Nile Virus Response Plan.*

- Northwest Mosquito and Vector Control Association, *Integrated Mosquito Management,* 2007 website information.

- Oregon Department of Human Services, Hazard Plan: 5.1, Non-Communicable Diseases, West Nile Virus.

- Sacramento-Yolo Mosquito and Vector Control District, Mosquito and Mosquito-borne Disease Management Plan.

- Washington County Vector Control, Information on West Nile Virus in Oregon and Pesticide Use Plan.

- Water Environmental Services, Clackamas County, Various reports, regulations, and general background information on storm water management in Clackamas County.

Appendix 1

Integrated Mosquito Management

The Clackamas County Vector Control District, through its association with the Northwest Mosquito and Vector Control Association, supports management of vector populations when and where necessary by means of an integrated program designed to benefit or to have minimal adverse effects on people, domestic animals, wildlife and the environment. This integrated pest management policy recognizes that vector populations cannot always be eliminated, but often must be suppressed to tolerable levels for the well-being of humans, domestic animals and wildlife, and that selection of scientifically sound suppression methods must be based upon consideration of what is ecologically and economically in the long-term interest of humankind.

The following principles are to be followed:

1. Vector control measures should only be undertaken when there is adequate justification based upon surveillance data.

2. The combination of methods for vector control should be chosen after careful consideration of the efficacy, health effects, ecological effects and cost versus benefits of the various options; including public education, legal action, natural and biological control, elimination of the breeding sources, and pesticide applications.

3. Vector breeding sources, whether natural or created by human activity, should be altered in such a manner as to cause the least undesirable impact on the environment.

4. Pesticides and application methods should be used in the most efficient and least hazardous manner in accordance with all applicable laws, regulations and available scientific data. The registered label requirements for pesticide use should be followed. When choices are available among effective pesticides, those offering the least hazard to non-target organisms should be used. Pesticides should be chosen and used in a manner that will minimize the development of resistance in vector populations.

5. Personnel involved in the Vector Control program should be properly trained and supervised, certified in accordance with relevant laws and regulations, and should keep current with improvements in management techniques through continuing education and/or training programs.

Appendix 2

Proposed Budget Fiscal Year 2015- 2016

PERSONNEL SERVICES	**$1,140,176.00**
Director	
Administrative Assistant	
Field Supervisor	
Entomologist/Biologist	
Assistant Biologist	
Seasonal Employees	
Retirement	
Social Security & Unemployment	
State Compensation (SAIF)	
Health Insurance	
Tri Met Tax	
MATERIALS AND SERVICES	**$297,000.00**
Insecticides	
Vehicle & Equipment Maintenance	
General Supplies	
Office Supplies	
Insurance & Bonds	
Utilities	
CONTRACTUAL SERVICES	**$590,700.00**
Protective Clothing	
Audit & Filing	
Legal & Licensing	
Building Maintenance & Grounds	
West Nile Virus Prevention	
Public Education & Awareness	
OTHER	**$37,400.00**
Publishing & Literature	
Association Dues	
Travel & Conferences	
CAPITAL OUTLAY	**$594,000.00**
Building Repairs	
Control Equipment	
Vehicle	
RESERVE FUND (Land & Buildings)	**$550,000.00**
OPERATING CONTINGENCIES	**$150,000.00**
UNAPPROPRIATED FUND	**$68,595.00**
Total Budget Requirements	**$3,387,871.00**

2/ The District follows Oregon budget law. The actual budget for 2015-16 will be approved by the District's Budget Committee in March, 2015

Appendix 3

Key Agencies / Clackamas County West Nile Virus Task Force

1. Key Agencies

This list identifies key agencies with West Nile Virus responsibilities and interests in Clackamas County and Oregon. The websites of these agencies can provide further information regarding their role and functions involving West Nile Virus.

- Clackamas County Vector Control District, (503) 655-8394, **www.vectorclackamas.com**
- Clackamas County Community Health, (503) 655-8350. **www.co.clackamas.or.us/ph/westnile**
- Clackamas County Dept. of Public and Government Relations, (503) 742-5911, **www.co.clackamas.or.us/pgr**
- Clackamas County Water Environment Services, (503) 353-4597, **www.co.clackamas.or.us/wes**
- State of Oregon, Public Health Department, Disease Prevention, (503) 731-4024, **www.ohd.hr.state.or.us/acd/wnile/index.cfm**
- Oregon Department of Agriculture, Don Hansen, (503) 986-4680, **http://egov.oregon.gov/ODA/AHID**
- OSU Extension Service – Clackamas County, (503) 655-8631 **www.oregonstate.edu/clackamas**
- Oregon Department of Fish and Wildlife, Habitat Division, (503) 947-6092 **www.dfw.state.or.us/lands**
- County Health Officer – Gary Oxman (tri-county) 503-988-3674 **www.co.multnomah.or.us/health/**

Appendix 4

Larvicides and Adulticides

Larvicides/Pupacides

These insecticides are applied directly to the water or to habitats that routinely flood to kill immature mosquitoes. The larvicides and pupacides given below will be used by the District. Complete product information, including details for use, labels and material safety data sheets is available at the listed websites.

- **Altosid** (methoprene) – *Manufactured by: Wellmark International/Zoecon Professional Product*. An insect growth regulator (IGR) containing the active ingredient methoprene. Larvae exposed to this product develop normally to the pupal stage where they die. www.altosid.com

- ***Bti*** (*Bacillus thuringiensis var. israelinsis*) - *Manufactured by: Summit Chemical*. A mosquito and blackfly larvicide containing the active ingredient Bacillus thuringiensis, var. israelensis. A sustained release formulation offering activity against mosquito larvae for thirty days or more. The floating quality of the briquet provides for release of the active ingredient at the water's surface where it affects surface feeding larvae, and as it sinks slowly through the water column, the active ingredient also becomes available to those larvae feeding in this area as well. www.clarkemosquito.com

- **Vectolex - *Bs*** (*Bacillus sphaericus*) - www.clarkemosquito.com *Bacillus sphaericus* is a rod-shaped, strictly aerobic, Gram positive bacterium which is used as an insecticide against larval mosquitoes. The benefit of using *B. sphaericus* as a mosquito larvicide versus other commercially available pesticides is that it is virtually non-toxic to pets, birds, fish, other worms and insects, humans, and the environment. Because it can form spores, it can persist in a mosquito habitat for months because it is recycled through mosquito life cycles.

- **Agnique MMF** (monomolecular surface film) - Manufactured *by Cognis Corporation.* Agnique MMF is a larvicide and pupacide with an alternative mode of action. It is ideally suited for mosquito control programs and environmentally sensitive situations. www.adapcoinc.com

Adulticides

These insecticides are applied into the air to kill flying mosquitoes. Three classes of insecticides may be used by the District as adulticides. These are pyrethroids and natural Pyrethrins, various pyrethroids such as permethrin (Permanone), Anvil (sumithrin), as well as a variety of natural pyrethrins. Complete product information including detail for use, labels and material safety data sheets is available at the websites listed below. Perimeter sprays are included as these are commonly used by request on the scale of single family residences.

- **Anvil** 2+ 2(permethrin, natural pyrethrin) - Anvil® is particularly effective against most known vector species, including organophosphate-resistant species. The active ingredient in Anvil is sumithrin, a synthetic pyrethroid formulation that replicates the mosquito fighting properties of pyrethrum, an extract of the chrysanthemum flower. Sumithrin is synergized with piperonyl butoxide (PBO) providing a fast knockdown of adult mosquitoes. www.clarkemosquito.co

- **ULD BP-100** (natural pyrethrin) Mosquito fighting properties of pyrethrum, an extract of the chrysanthemum flower.

- **Flit** The active ingredient in Flit is emulsifiable permethrin, designed to create an invisible mosquito barrier around the perimeter of the area. Flit is appropriate for residential and recreational areas, especially those surrounded with dense vegetation. It can be applied to all evergreens, shrubbery, trees, flowers and ornamental grasses to effectively reduce mosquito populations that are harbored in shady areas during the day.

- **Mavrik** (perimeter spray formulation). Active ingredient is Tau-fluvalinate, a synthetic pyrethroid. Industry-standard perimeter spray for mosquito control. High toxicity to mosquitoes means small amounts of the active ingredient are used, thus minimizing risk of spillage, run-off, and other types of environmental leakage. Applied directly to plants around homes on request, efficacious for two weeks barring rain.

- **Eco-Exempt** (natural plant oil extract formulation). Environmentally friendly product (exempt from EPA registration as an insecticide) for use as a barrier spray on plants around homes by request. Highly effective against adult mosquitoes that find harborage on plant surfaces. Excellent alternative for County residents that want mosquito control but also want to have minimal impact on non-target species and the general ecosystem.

All larvicides and adulticides used by the District will be EPA approved materials. Additionally, the insecticides will be approved by ODHS and ODFW through the PUP. This is a required yearly report for all mosquito control programs in Oregon.

2015 Annual Report

Clackamas County Vector Control District
1102 Abernethy Road, Oregon City, Oregon 97045
(503) 655-8394
www.clackamas.us/vector

CLACKAMAS COUNTY VECTOR CONTROL DISTRICT

1102 ABERNETHY ROAD

OREGON CITY, OREGON 97045

FORTY-EIGHTH ANNUAL REPORT

FOR THE YEAR 2015

COMPILED BY

George Peck
District Director

Richard Imholt
Field Manager

Theresa Micallef
Administrative Assistant

Josh Jacobson
Biologist

Table of Contents

Executive Summary

Dear Clackamas County Citizens,

It is my pleasure to present to you the 2015 Clackamas County Vector Control Annual Report. We hope you find this document enlightening and informative.

In 2015, the Clackamas County Vector Control District saw no human cases of West Nile virus. The District again provided mosquito and fly control. Rodent control information for the citizens of Clackamas County was also provided. There were 457 requests for mosquito and fly control assistance and a total of 2,424 mosquito treatments and 13 fly treatments made throughout the county. The District processed 11,593 larval mosquito samples and 2,630 adult mosquito sample in 2015. The District received 2 dead bird calls.

The District again focused on larval mosquito surveillance and larval mosquito insecticide treatments. Adult mosquito surveillance was regularly conducted, and adult barrier sprays were applied as requested. The District put much effort into maintaining the electronic database program for mapping and recording treatments. Software issues were addressed with the surveillance vendor, while hardware and networking issues were addressed with Clackamas County Internet Technology personnel.

The use of *Gambusia affinis*, the mosquito fish, for biological control of mosquito larvae remains an important part of the mosquito control program. 2,559 individual fish were released into newly located breeding areas and to re-supply locations where fish populations were depleted.

The pest information service was provided by the Vector Control District throughout the control season. The District received 97 requests for information on a wide variety of pest species this year. Printed information or consultation was provided in each of these cases. Informational programs on mosquito, fly and rodent control were provided for schools, service clubs and any other interested group within the District .

The District passed a FIVE YEAR LOCAL OPTION LEVY of 0.025 per thousand in 2014, and the 2015 seasonal personnel will be asked to work in 2016. Thus, 2015 was year one of five years of the District's local option levy, securing stable funding. We will continue to work closely with other organizations within the county to ensure that the public receives the proper treatment and protection from West Nile virus. The District published its calendar again this year and distributed it at the Clackamas County Fair, along with informative pamphlets, stickers, refrigerator magnets, and other items related to vector control.

Sincerely, George Peck, PhD
Director, Clackamas County Vector Control District

Forward

The forty-ninth Clackamas County Vector Control District Annual Report is prepared for the purpose of informing the public of objectives and operations conducted by the Vector District. The Clackamas County Vector Control District is responsible for control of flies and mosquitoes within Clackamas County. Control of these vectors is not intended to be total eradication since the concept of total eradication is unachievable and environmentally unsound, requiring unacceptable quantities of insecticide. The goals of the Vector Control District are therefore to limit the number of vectors, thus reducing annoyance and the likelihood of vector borne diseases, such as West Nile virus, for persons living in the District. Objectives of this program are to reduce public health vectors below levels considered detrimental to public health and the enjoyment of outdoor activities. Chemical control measures are used to control vectors where biological control is not applicable. Prevention of vector related problems are stressed in the program. Continued efforts are made to achieve the Vector District program objectives through economical and scientifically sound control programs.

Board of Trustees

District operations are supervised by a five member board appointed to four year terms by the County Commissioners. Vector Control Board meetings are held the first Tuesday of each month at 2:30 p.m. in the Vector Control District office.

Member	Term Expires
John Borden, Vice Chairman	November 16, 2018
Lowell Hanna, Treasurer	November 16, 2016
Gordon Young, Secretary	November 16, 2017
Michael Bondi	November 16, 2016
Daniel Green, Chairman	November 24, 2019

Board members do not receive over $50 per month or a portion thereof as compensation for services performed as a member of the governing body.

District Staff

George Peck – District Director
Full Time

Richard Imholt – Field Manager
Full Time

George Cashdollar – Biologist
Permanent as needed

Josh Jacobson – Biologist
Full Time

Theresa Micallef – Administrative Assistant
Full Time

6 Seasonal Employees

All personnel employed by Clackamas County Vector Control receive certified training. All employees are Licensed Public Pesticide Operators. Many seasonal employees plan on returning to the Vector Control District for the 2015-2016 mosquito season. The District's efficiency is increased when retaining already knowledgeable employees from year to year.

Clackamas County Vector Control District Objectives

1. Survey and map mosquito habitats throughout Clackamas County. Reduce vector[1] production through public education, biological control and chemical measures.

2. Collect and identify mosquito species. Base control measures on mosquito species (vector or nuisance) and numbers of mosquitoes present in a given habitat.

3. Select pesticides causing little environmental damage and provide maximum safeguards for employees and the general public.

4. Use insecticide application methods that conform to all state and federal regulations.

5. Submit annual control plans to cooperating agencies for approval before implementation.

6. Provide information to other agencies and the general public on various insect problems.

7. Conduct the above activities as economically as possible.

In order to meet these objectives, Clackamas County Vector Control utilizes Integrated Pest Management (IPM). Historically, IPM is an ecosystem-based strategy that focuses on long-term suppression of vector populations and thus prevention of the diseases they transmit through a combination of techniques such as biological control, habitat manipulation, modification of cultural/behavioral practices, and public education. Insecticides are used only after monitoring indicates they are needed, and they are applied according to established guidelines. Furthermore, treatments are made with the goal of removing only the target vector(s). Control materials are selected and applied in a manner that minimizes risks to human health, beneficial and non-target organisms, and the environment.

(Source: http://www.ipm.ucdavis.edu/GENERAL/ipmdefinition.html)

[1] Vector is defined here as any mosquito or fly capable of transmitting a pathogen that causes disease in humans or animals.

Affiliated Professional Organizations

The Clackamas County Vector Control District collaborates with the following professional organizations:

AMERICAN MOSQUITO CONTROL ASSOCIATION

NORTHWEST MOSQUITO AND VECTOR CONTROL ASSOCIATION

OREGON VECTOR CONTROL ASSOCIATION

SPECIAL DISTRICTS ASSOCIATION OF OREGON

Integrated Pest Management

The Northwest Mosquito and Vector Control Association supports management of vector populations when and where necessary by means of an integrated program designed to benefit or to have minimal adverse effects on people, domestic animals, wildlife and the environment. The integrated pest management policy recognizes that vector populations cannot always be eliminated, but often must be suppressed to tolerable levels for the well-being of humans, domestic animals and wildlife, and that the selection of scientifically sound suppression methods must be based upon consideration of what is ecologically and economically beneficial in the long term interest of humankind.

The following principles are to be followed[2]:

- Vector control measures should only be undertaken when there is adequate justification based upon surveillance data.

- The combination of methods of vector control should be chosen after careful consideration of the efficacy, health benefits, ecological effects and cost versus benefits of the various options; including public education, legal action, natural and biological control, elimination of larval mosquito sources, and insecticide applications.

- Larval mosquito habitats producing vectors, whether natural or created by human activity, should be altered in such a manner as to reduce their capacity to produce mosquitoes, while causing the least impact on the environment.

- Insecticides and application methods should be used in the most efficient and least hazardous manner in accordance with all applicable laws, regulations and available scientific data. The registered label requirements for insecticide use should be followed. When choices are available among effective insecticides, those offering the least hazard to non-target organisms should be used. Insecticides should be chosen and used in a manner that will minimize the development of resistance to a given insecticide in vector populations.

- Personnel involved in the vector control program are properly trained and supervised, certified in accordance with relevant laws and regulations, and are required to keep current with improvements in management techniques through continuing education and/or training programs.

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[2] All methods and materials used by the District are based on these principals outlined by the Northwest Mosquito and Vector Control Association and the American Mosquito Control Association.

General District Surveillance and Control Statistics, Insecticide Treatment Summary, Adult mosquito surveillance summary, and Larval mosquito surveillance summary

The overall service statistics for the District are displayed in Table 1. The active ingredients, trade names, and amounts of mosquito larvicides and mosquito adulticides used during control operations of the District are summarized in Table 2.

Biological control through distribution of *Gambusia affinis*, the mosquito fish, was promoted as the preferred means of mosquito control conducted by the District. Bio-rational insecticides, such as bacterial agents (*Bti* and *Bs*; Table 2), we utilized in situations were long lasting larval control was needed (swales, retention/detention ponds, storm drains, etc.).

When chemical control became necessary per evaluations of service requests for adult mosquito control, the most environmentally sensitive insecticides were recommended, and were applied using ground application equipment (back pack sprayers).

Table 3 shows the number of each adult mosquito species collected and identified. Table 4 shows the number of each larval mosquito species collected and identified. Figures 1 through 5 depict surveillance statistics for the 2015 and earlier seasons.

Table 1. Control and Surveillance 2015 Statistics.

Service type	Service description	Statistic
Distribution of mosquitofish (*Gambusia affinis*)	Individual fish	2,559
Mosquito and fly control	Service calls fielded	457
Miscellaneous calls	Advice over the phone	97
Mosquito control operations	Total treatments (including multiple at same site)	2,325
	Acres treated (adult control)	108.8
	Acres treated (larval control)	67.3
Larval mosquito surveillance	Total larvae collected for identification	11,593
Adult mosquito surveillance	Total adults collected for identification	2,630
Arbovirus surveillance	Dead bird collections	2

Table 2. Summary of 2015 Insecticide Treatments.

Insecticide type	Active Ingredient	Trade Name	EPA Reg. No.	Amount of formulation used
Larvacide				
	Long chain oxy-hydrocarbons	Agnique MMF (liquid)	53263-28	58.00 oz (0.45 gal)
	Long chain oxy-hydrocarbons	Agnique MMF (granules)	53263-30	2.30 lbs.
	Bacillus thuringiensis var. israelensis (*Bti*)	AquaBac (granules)	62637-3	82.63 lbs.
	Bti	Summitt *Bti* briquettes	6218-47	1,339
	Bacillus sphaericus (*Bs*)	Spheratax WSP (50 g packets)	84268-2	0
	Bs	Vectolex FG granules (aka CG)	73049-20	1.00 lbs.
	Bs	Vectolex WSP (Pouch)	73049-20	0
	Bti and *Bs*	Vectomax WSP	73049-429	0
	Methoprene	Altosid Briquets (30 Day)	2724-375	1,343
	Methoprene	Altosid XR Briquets (extended residual)	2724-421	0
	Methoprene	Altosid WSP (Pouch)	2724-448	0
	Bti and *Bs*	4 Star 45 day Briquettes	83362-3	1,156
	Bti and *Bs*	4 Star 90 day Briquettes	88362-3	403
	Bti and *Bs*	4 Star 180 day Briquettes	88362-3	0
Adulticide				
	Pyrethrins	ULD BP-100	499-514	0.00 oz. (0.00 gal)
	Pyrethrins	Pyrocide 100	1021-1424	20.48 oz. (0.16 gal)
	Permethrin	Flit 10 EC	8329-67	0.00 oz. (0.00 gal)
	Plant oils	EcoExempt	N/A	48.00 oz. (0.38 gal)
	Deltamethrin	Suspend SC	432-763	0.00 oz. (0.00 gal)
	Tau-fluvalinate	Mavrik Aquaflow	2724-478	57.28 oz. (0.45 gal)

Table 3. Adult mosquito surveillance: 2015 CO_2 EVS trap species composition.

Genus	species	Number collected	% of total collection
Aedes		87	3.31
	cinereus	0	0.00
	sierrensis	0	0.00
	sticticus	11	0.42
	vexans	63	2.40
	washinoi	13	0.49
	Ae. species	0	0.00
Anopheles		121	4.60
	freeborni	0	0.00
	punctipennis	121	5.93
	An. species	0	0.00
Culex		1,429	54.33
	boharti	0	0
	pipiens	1,181	44.90
	stigmatosoma	52	1.98
	tarsalis	191	7.26
	territans	5	0.19
	Cx. species	0	0.00
Culiseta		951	36.16
	incidens	949	36.08
	inornata	1	0.04
	particeps	1	0.04
Coquillettia	*peterbans*	7	0.27
Total	collected	2,630	100.00

Table 4. Larval mosquito surveillance: 2015 larval dipper sample species composition.

Genus	species	Number Collected	% of total collection
Aedes		59	0.51
	cinereus	0	0.00
	japonicus	6	0.05
	sierrensis	1	0.01
	sticitus	38	0.33
	vexans	9	0.08
	washinoi	3	0.03
	Ae. species	8	0.07
Anopheles		45	0.39
	freeborni	0	0.00
	punctipennis	41	0.35
	An. species	4	0.03
Culex		6,131	52.89
	boharti	48	0.41
	pipiens	5,774	49.81
	stigmatosoma	17	0.15
	tarsalis	146	1.26
	territans	105	0.91
	Cx species	41	0.35
Culiseta		4,864	41.96
	incidens	4,840	41.75
	inornata	2	0.02
	particeps	0	0.00
	Cs. species	22	0.19
Unidentified species		448	3.86
Total		11,593	100.00

Figure 1. Most abundant adult mosquito species by zone in 2015.

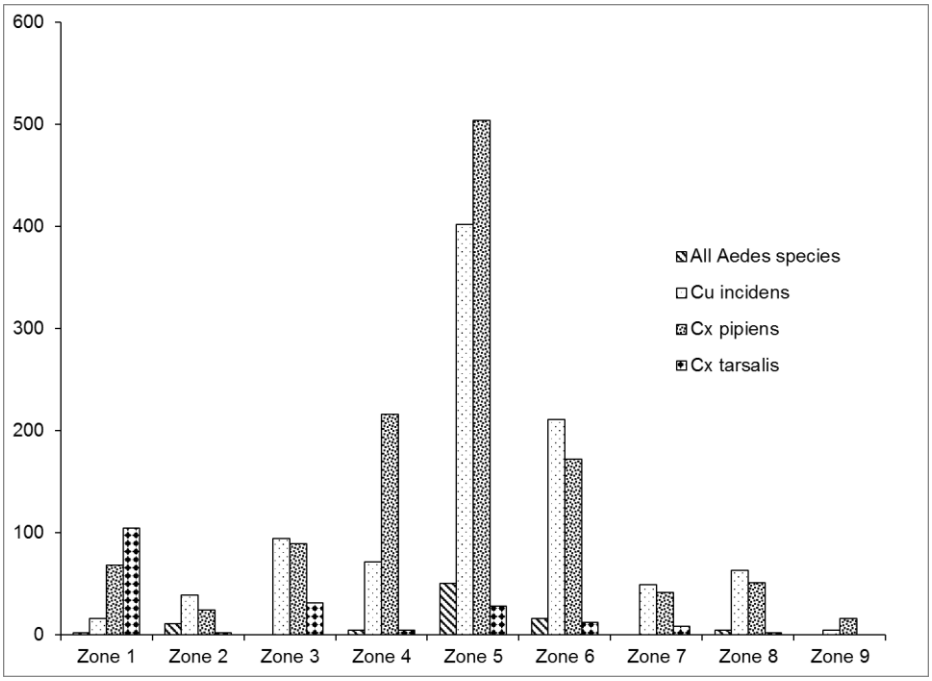


Figure 2. Most abundant adult mosquitoes collected: 2005 to 2015.

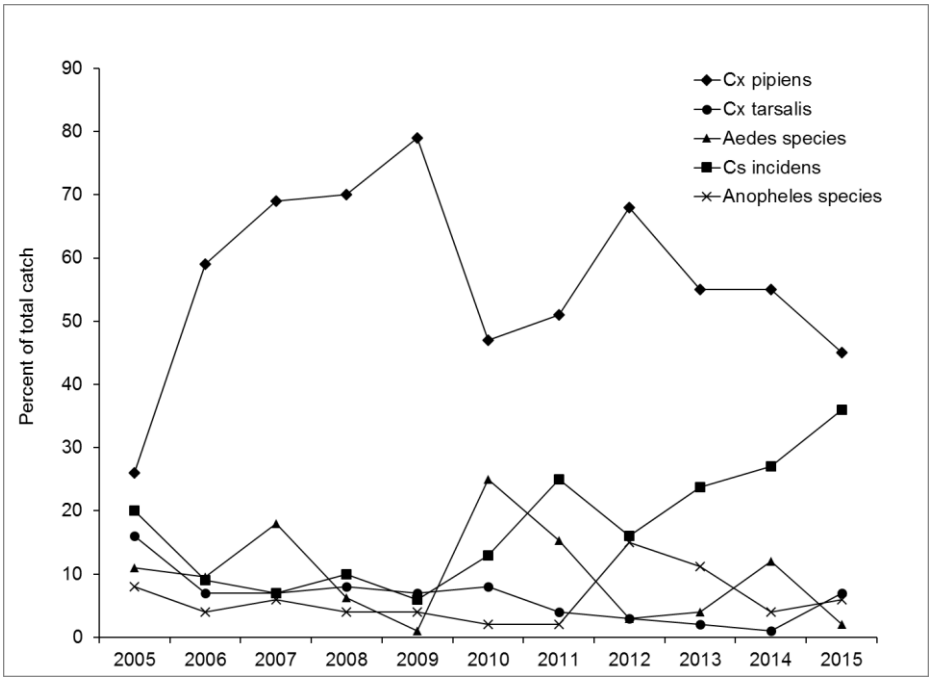


Figure 3. Total number of adult dry ice traps set by year: 2005 – 2015. Due to new policies adopted in 2015, 161 (29%) of trap sets were pre-spray evaluations of county resident adulticide barrier spray requests.

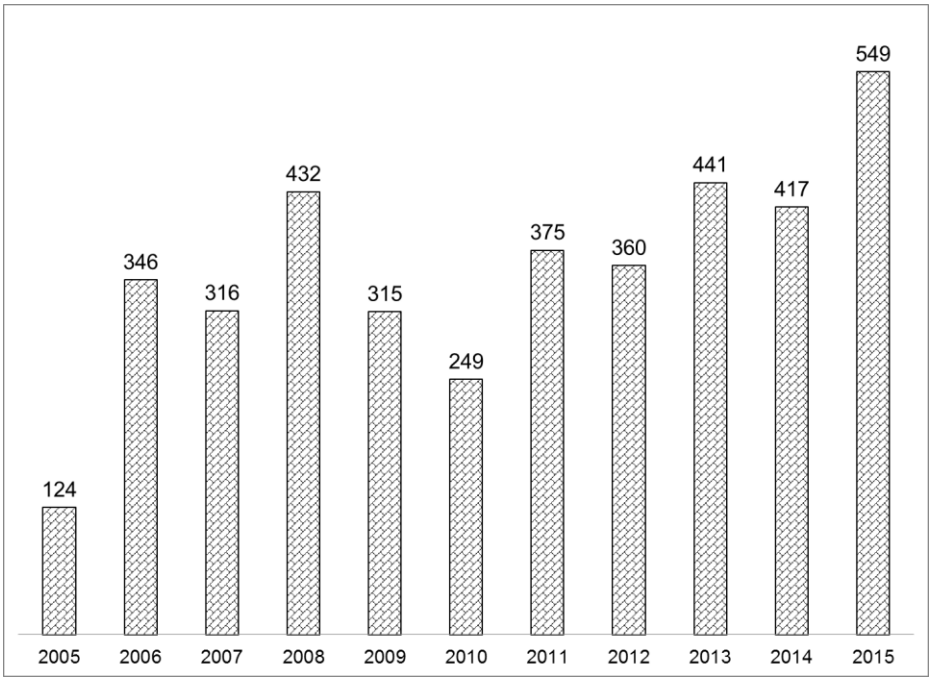


Figure 4. 2015 larval mosquito collection by zone.

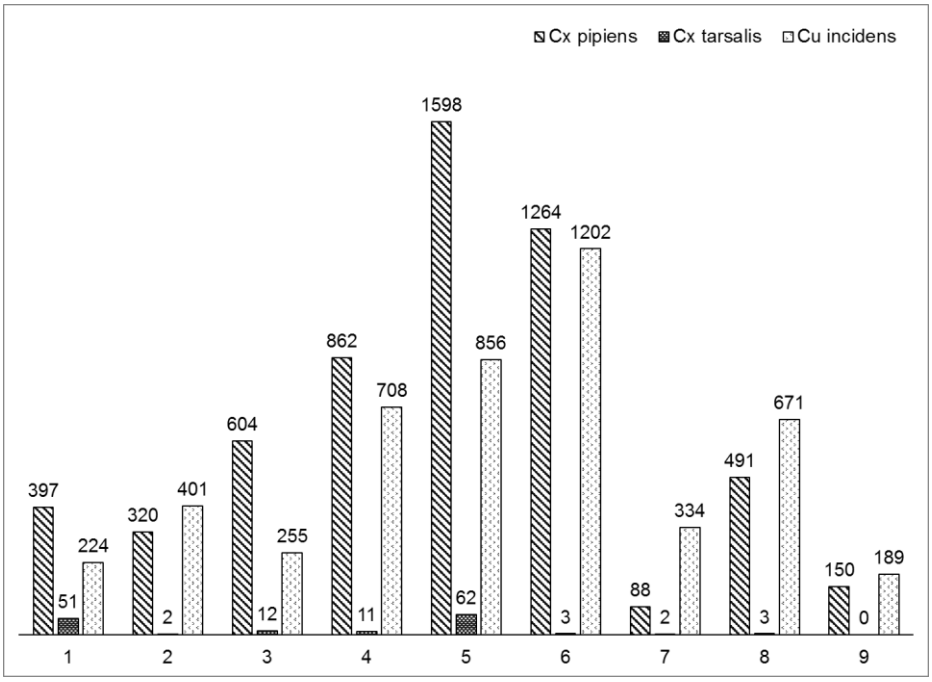
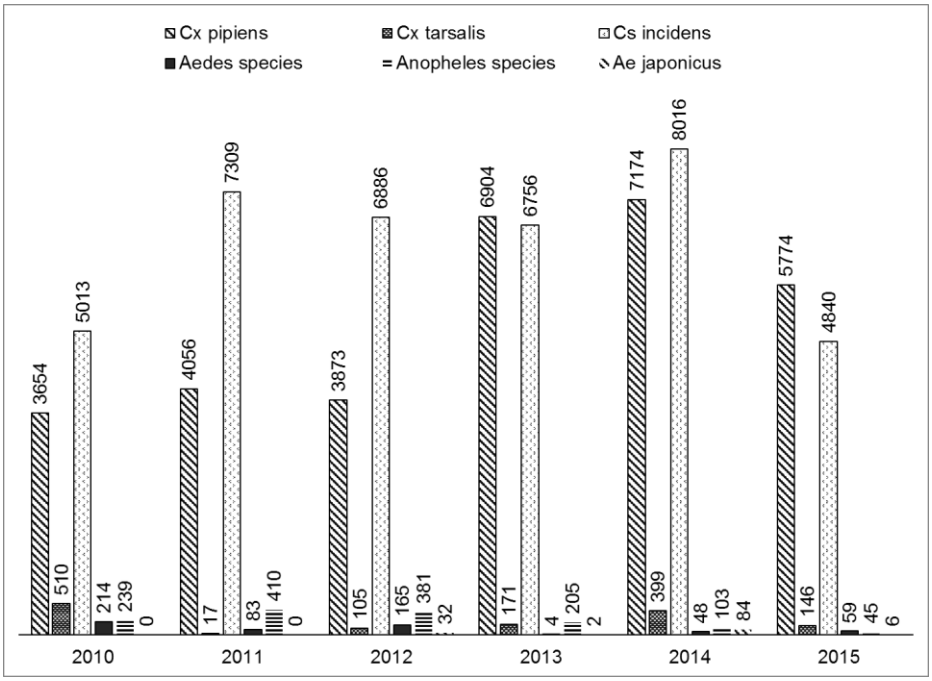


Figure 5. Larval mosquito collections by year: 2010 – 2015.



Miscellaneous service requests, Public Outreach, Continuing Education and District Maps

The Vector Control District receives numerous requests for information on miscellaneous pests found in the District. The species and number of inquiries about each received in 2015 are listed in Table 5. Public outreach in 2015 included special events (Table 6) and ongoing efforts (Table 7). District personnel were involved in various continuing education events during 2015 (Table 8). Continuing education units were awarded at selected events and assure continued certification of individual pesticide application licenses in Oregon. Figures 6 and 7 are included as general reference to the reader.

Table 5. Miscellaneous service calls (97 total)

Pest	# of Calls	Pest	# of Calls
Ant	0	Indian Meal Moth	0
Aphid	0	Mole	2
Bat	4	Mouse	2
Beaver	0	Nutria	2
Bed Bugs	0	Opossum	4
Bee	10	Raccoon	11
Box Elder Bug	0	Rat	20
Carpenter Ant	0	Silverfish	0
Cockroach	0	Skunk	5
Coyote	1	Spider	2
Crane Fly	0	Squirrel	0
Flea	0	Termite	1
Gnat	0	Tick	1
Gopher	1	Vole	2
Hornet	1	Other	28

Table 6. Public Outreach Events for 2015

Event	Location	Date	Participants
Master Gardener's Spring Garden Fair	CC Fairgrounds, Canby	2-3 May	Betsy, Theresa, Josh, Steven
"Wild Things Day" at Lewelling Elementary School	Seth Lewelling Elementary, Milwaukie	15 May	George C. and Josh
Clackamas County Fair	CC Fairgrounds, Canby	18-23 August	Entire CCVCD staff

Table 7. Ongoing Public Outreach

Effort	Scope	Elements	Timeline
CC Vector Control District Web Site	World-wide	Public information, District Educational Documents for Teachers, Mosquito Control Videos, News	Continuous
CC Vector Control District Face Book Page	World-wide	Updates, news, other items relevant to vector control and the Citizens of CC	Continuous
CC Vector Control District Calendar	Clackamas County	Mosquito control tips in calendar	2015
Turtle Dove Clemens PR Firm	Clackamas County	A range of efforts*	2015

***** Banners, Television, Pandora, Google AdWords, YouTube, Comcast Pre-Roll, Digital Community Newspapers, Remarketing, Bill-Boards, Social Media posts, School Mailings, CCTV TV, email blasts, Garden Centers, Festivals.

Table 8. Continuing Education and Training

Event	Location	Date	Participants
OSU—Urban Pest Management	CCC, Oregon City Campus	2/4	Josh, Theresa, Rich, and Gary
CCC Local Budget Law Training	CCC Oregon City Campus	3/3	Josh
OMVCA Spring Conference	Conference Call	4/8	Betsy, Rich
NWMVCA Spring Workshop	Richland, WA	4/15-16	Rich
Columbia County Drainage Truck Rodeo, St. Helens	Columbia County Drainage	4/30	Rich, Steven, Loren, Brent, Tiffany
SDAO – Board and Managers Training	Astoria, OR	9/2	George P.
Society of Vector Ecology (SOVE)	Albuquerque, NM	9/27-10/1	Rich
NWMVCA Annual Meeting	Osoyoos, BC, Canada	10/7-9	George P., Theresa, Josh
SDAO – Risk Management Workshop	Seaside, OR	10/15	George P.
OMVCA Meeting and Recertification Workshop	Newport, Oregon	11/4-5	Betsy, Rich, George P. and Josh

Miscellaneous Figures

Figure 6. Vector Control Zone Map. Clackamas County is divided into 10 vector control zones. Technicians are assigned a zone of responsibility during the control season (March through September).

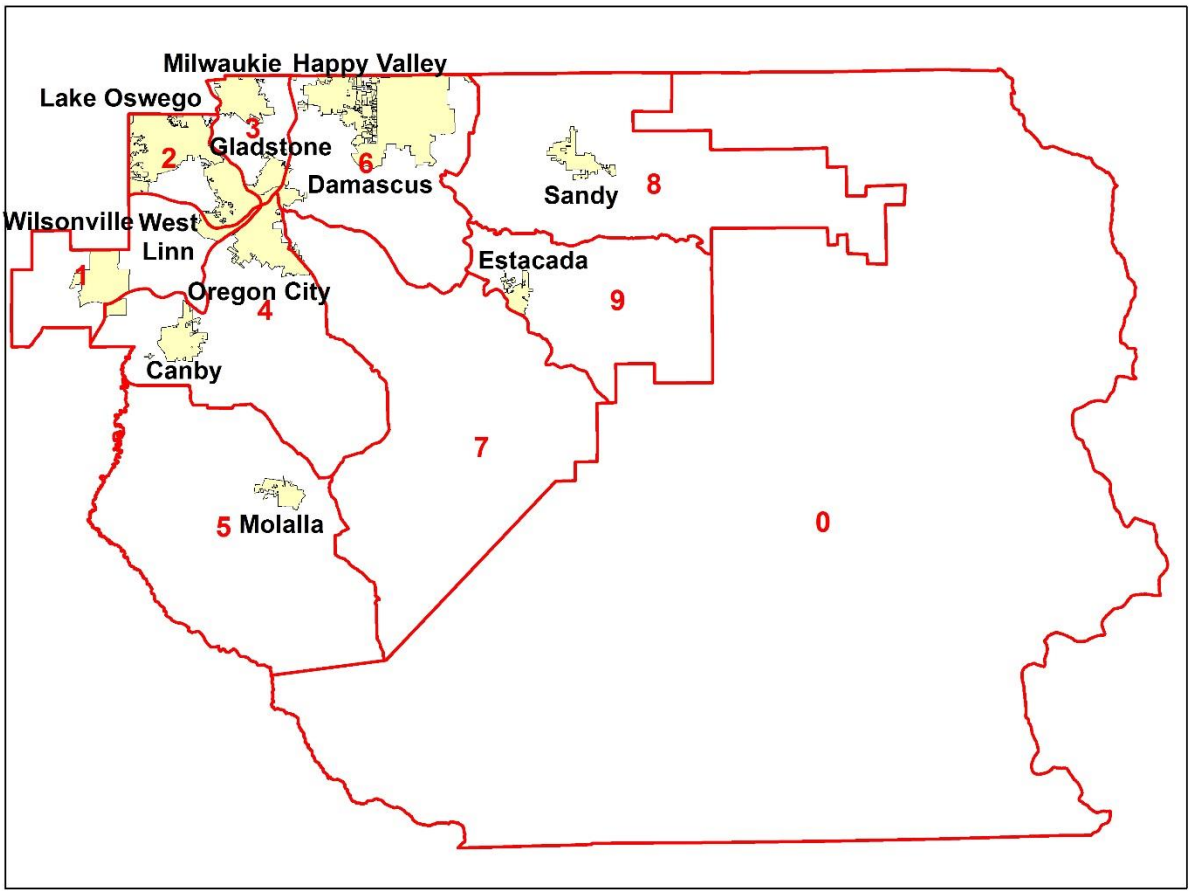


Figure 7. Vector Control Treatment Map. Bold outline is the boundary of Clackamas County. Dark solid circles are sites receiving treatments during 2015.