

To request translation or disability-related accommodations, please contact us at **bcc@clackamas.us | 503-655-8581**.

Si quiere solicitar servicios de traducción o adaptaciones para la discapacidad, contáctenos en/al **bcc@clackamas.us | 503-655-8581**.

Чтобы запросить перевод или приспособления, связанные с инвалидностью, пожалуйста, свяжитесь с нами по: **bcc@clackamas.us | 503-655-8581**.

Щоб попросити переклад або спеціальні послуги для осіб з особливими потребами, зверніться до нас, скориставшись такими контактними даними: **bcc@clackamas.us | 503-655-8581**.

如需翻译服务或残障相关的协助，请与我们联系：**bcc@clackamas.us | 503-655-8581**。

Để yêu cầu dịch vụ dịch thuật hoặc điều chỉnh liên quan đến tình trạng khuyết tật, vui lòng liên hệ với chúng tôi qua **bcc@clackamas.us | 503-655-8581**.



Clackamas County
www.clackamas.us

CLACKAMAS COUNTY BOARD OF COUNTY COMMISSIONERS

Policy Session Worksheet

Presentation Date: March 31, 2026 **Approx. Start Time:** 1:30pm **Approx. Length:** 30 Minutes

Presentation Title: Vector Control District Annual Report & 2026 Work Program

Department: Clackamas County Vector Control District (CCVCD)

Presenters: Amber Wimsatt (Interim Executive Director, CCVCD)

WHAT ACTION ARE YOU REQUESTING FROM THE BOARD?

Accept the District's 2025 Annual Report and the 2026 Annual Work Program.

EXECUTIVE SUMMARY:

Under the authority of ORS 452.120, the Clackamas County Vector Control District shall provide to the Board of County Commissioners with a proposed Annual Work Program to include an estimate of funds required for the upcoming year, a description of the work contemplated, and the methods to be employed to control vectors of public importance. The Annual Work Program provides guidelines for District Staff and the District Board of Trustees, and information to stakeholders regarding decisions and responses the District will utilize in the prevention and control of West Nile Virus (WNV) or other mosquito-borne and fly-borne disease that may threaten the citizens of Clackamas County.

2025 Highlights

- Actual budget expenditures \$1,333,650
- Three full time employees and up to 8 seasonal employees
- 499 citizen requests for assistance
- 5,765 mosquito treatments (larval and adult)
- 40,261 larval mosquito samples
- 20,172 adult mosquito samples
- 1,017 *Gambusia* fish distributed
- 70 pools of mosquitoes tested for diseases (1,754 individual mosquitoes)

2026 Work Plan

- Proposed budget \$6,287,584
- Conduct surveillance for mosquito-borne viruses
- Provide educational opportunities for community members
- Provide mosquito control treatments
- Second annual tire drive source reduction program

FINANCIAL IMPLICATIONS (current year and ongoing):

The District passed a five year local option levy of 0.025 per thousand in 2024. Thus, fiscal year 2026-27 is year two of five years, securing stable funding until 2029. Collections are estimated at \$1,695,122

Is this item in your current budget? YES NO

What is the cost? \$6,287,584

What is the funding source? Local option levy

STRATEGIC PLAN ALIGNMENT:

- How does this item align with your Department’s Strategic Business Plan goals?
Not Applicable.
- How does this item align with the County’s Performance Clackamas goals?
Not Applicable.

LEGAL/POLICY REQUIREMENTS:

The Clackamas County Vector Control District, pursuant to ORS 452.120, is required to furnish by 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 completed, and the methods to be employed by the district.

These documents were ready in February, but it was requested to move the meeting out to have the proposed budget included so that the board could see that portion as well since staff had to update budget materials that took longer than anticipated.

Further, the District shall furnish to the Board by February of each year an Annual Report covering expenditures, methods employed, and work accomplished during the past fiscal year.

PUBLIC/GOVERNMENTAL PARTICIPATION:

Not Applicable.

OPTIONS:

Option #1: Accept the 2025 Annual Report and the 2026 Annual Work Plan as submitted.

Option #2: Require revisions to the 2025 Annual Report and/or the 2026 Annual Work Plan. Program.

Option #3: Do not accept the 2025 Annual Report and the 2026 Annual Work Plan at this time.

RECOMMENDATION:

Option #1: Accept the 2025 Annual Report and the 2026 Annual Work Plan as submitted.

ATTACHMENTS:

Attachment #1: Board Presentation Slides

Attachment #2: 2025 Annual Report

Attachment #3: 2026 Annual Work Program

SUBMITTED BY:

Division Director/Head Approval _____

Department Director/Head Approval _____

County Administrator Approval _____

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

CLACKAMAS COUNTY VECTOR CONTROL DISTRICT

Mosquito and Fly Control in Clackamas County

-Overview

- CCVCD Introduction
- West Nile Virus Update
- Invasive Species Update
- Plans for 2026
- Closing Remarks
- Vote

-Introductions

Interim Executive Director Amber Wimsatt as Presenter

Board of Trustees:

Dan Green – Chairman
Waylon Martin – Vice Chair
Lowell Hannah - Treasurer
James Rhodes - Secretary
Everett Wild – Board Member

INTRODUCTION

- **Vision Statement**

- To progress towards a future free of vector-borne disease using all the scientific and educational tools available.

- **Mission Statement**

- The control of public health vectors within Clackamas County using an environmentally responsible approach that aims to limit the number of mosquitoes and flies, reducing annoyance and vector-borne disease.

- **Core Values**

- Service, Professionalism, Integrity, Respect, Individual Accountability and Trust.



ORS 452

Receives revenue through two types of taxes

Permanent levy of \$0.0065 per \$1,000 of assessed property value

Local option levy of \$0.025 per \$1,000 of assessed property value

Local option levy to expire in 2030

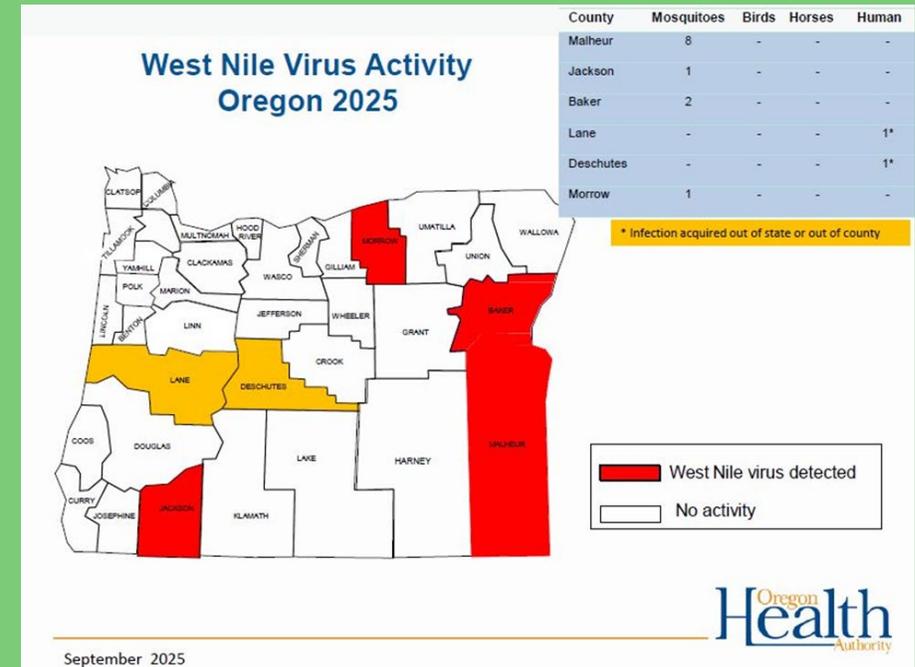
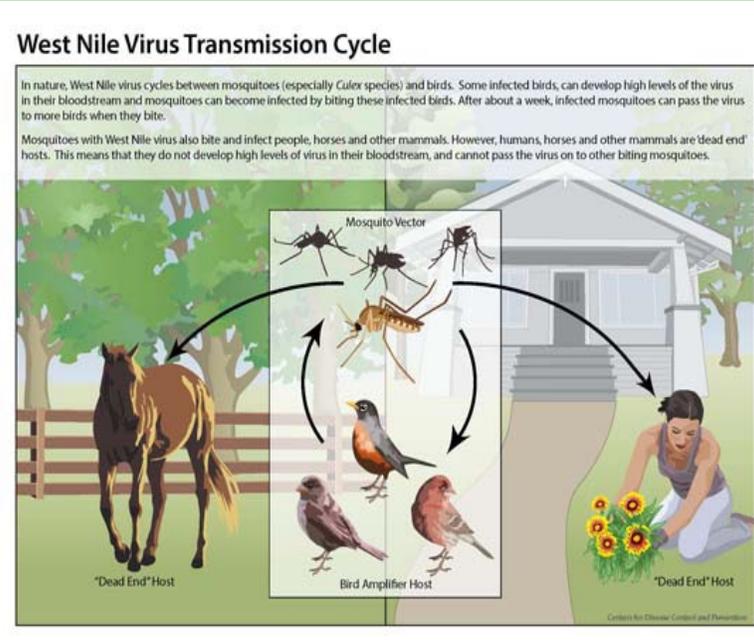
CCVCD 2025 HIGHLIGHTS

- 2025
 - Actual budget expenditures \$1,333,650
 - Four full time positions and up to ten seasonal employees
 - 13 Active Vehicles in our fleet, one equipped for spraying
 - 499 Citizen requests for assistance
 - 5,765 Mosquito treatments (larval and adult)
 - 40,261 Larval mosquito samples
 - 20,172 Adult mosquito samples
 - 1,017 *Gambusia* fish distributed
 - 70 pools of mosquitoes were tested for diseases (1,754 individual mosquitoes included)
 - 378 Tires collected from residents



WEST NILE VIRUS

- Culex species are most common mosquito vector in OR
- Mosquito to Bird Amplification Cycle
- Humans & Horses are “Dead End” Hosts
- Disease incidents vary with temperature & humidity.



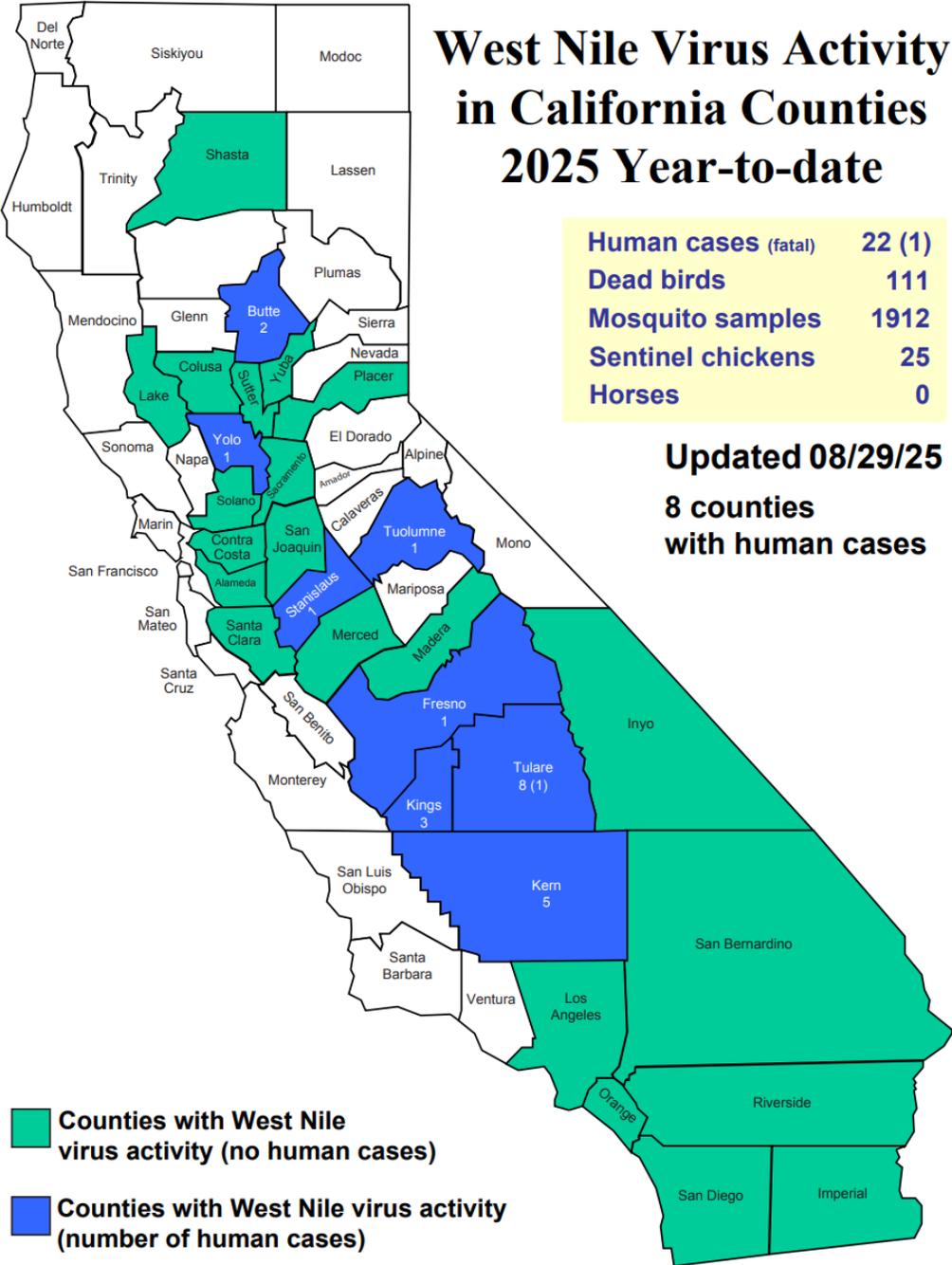
September 2025



West Nile Virus Activity in California Counties 2025 Year-to-date

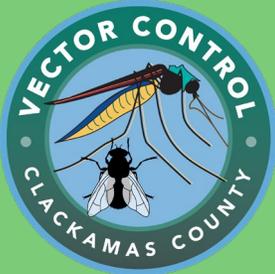
| | |
|---------------------|--------|
| Human cases (fatal) | 22 (1) |
| Dead birds | 111 |
| Mosquito samples | 1912 |
| Sentinel chickens | 25 |
| Horses | 0 |

Updated 08/29/25
8 counties
with human cases

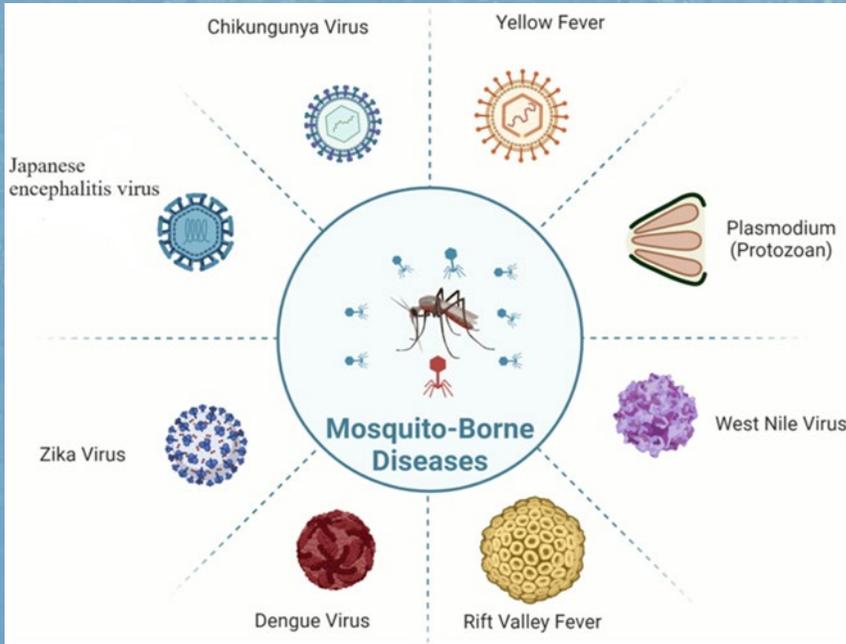


Green Counties with West Nile virus activity (no human cases)

Blue Counties with West Nile virus activity (number of human cases)



INVASIVE SPECIES & DISEASES THEY CARRY



ALL ABOUT AEADES

- ◆ *Aedes* mosquitoes are an invasive species that have made their way into many counties in California.
- ◆ *Aedes aegypti* and *Aedes albopictus* are urban mosquitoes that feed primarily on humans.
- ◆ They are aggressive day-biters found both indoors and outdoors.
- ◆ They especially like to feed on ankles, wrists, and elbows.
- ◆ Both species lay eggs in small sources of water, as small as a bottle cap.
- ◆ Eggs can survive on the surfaces of containers for a long time. They hatch when the container fills with water.



1/8-1/4 inch

Actual size of mosquito

Contact your local vector control agency if you detect unusual numbers of mosquitoes or you are being bitten during the day.

WHY IS THIS IMPORTANT?

- ◆ *Aedes aegypti* and *Aedes albopictus* are a major annoyance and a public health threat.
- ◆ These mosquitoes can spread diseases including Zika, dengue, and chikungunya.

INVASIVE MOSQUITOES



Aedes aegypti



Aedes albopictus



California Department of Public Health
 Infectious Diseases Branch
 Vector-Borne Disease Section
 (916) 552-9730
www.cdph.ca.gov
 September 2016

25 Plants That Repel MOSQUITOES



PREVENT

Eliminate breeding sites

- ◆ Every week, dump and scrub containers that hold standing water
- ◆ Keep rain gutters free of debris
- ◆ Keep decorative fountains operational or drain the water
- ◆ Change water in animal watering dishes often
- ◆ Make sure yard drain pipes are not clogged and collecting water

PROTECT

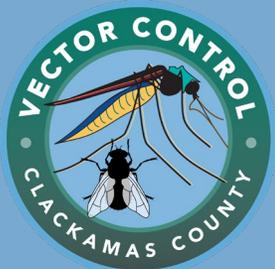
- ◆ **Cover up:** Wear long sleeves and pants when outdoors
- ◆ **Screens:** Make sure doors and windows have screens that fit tightly and do not have holes
- ◆ **Use insect repellent:** Apply repellent with active ingredients DEET, picaridin, IR3535 or oil of lemon eucalyptus to exposed skin and/or clothing (as directed on the product label)



ELIMINATE MOSQUITO BREEDING SITES AROUND YOUR HOME!

- ◆ Discarded cans/bottles
- ◆ Garden tools
- ◆ Tree holes
- ◆ Flower pots
- ◆ Old tires
- ◆ Toys
- ◆ Buckets
- ◆ Rain drums/barrels
- ◆ Pet dishes

Anything that holds water!



2026 OPPORTUNITIES

- **Source Reduction Program:**
Second Annual Tire Drive to take place in September 2026.



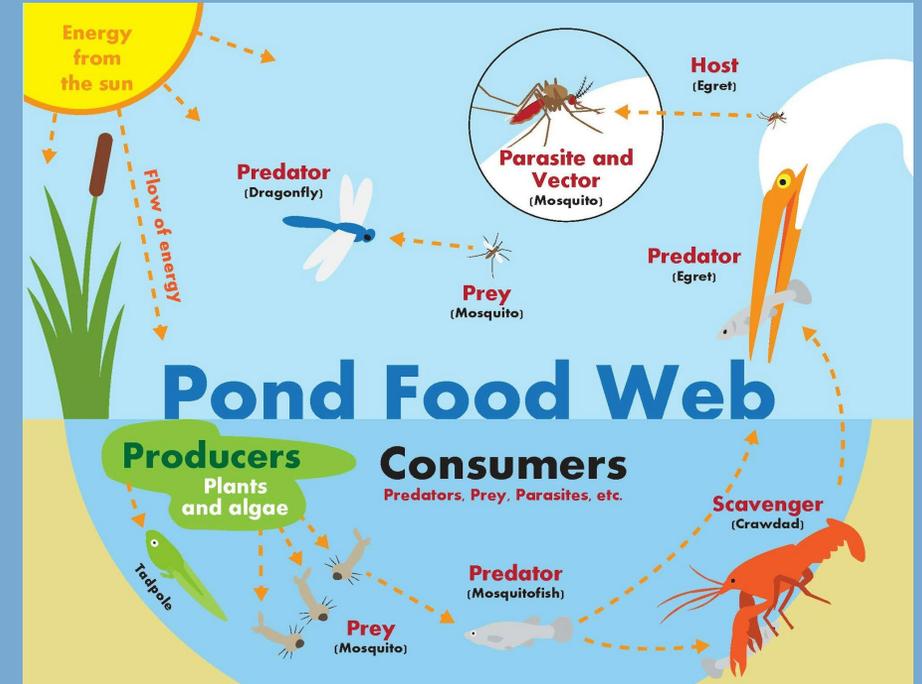
- **American Mosquito Control Association**
They are holding their annual meeting in Portland, Oregon March 23rd-27th, 2026 at the Oregon Convention Center.



MITIGATION NOT EXTRIPATION

Why Mosquitoes Matter?

- Pollinators
- Biodiversity
- Nutrient cyclers
- Part of the food web
- Not all species transmit diseases
- Only females bite and not all species bite humans



Thank You

Fightthebites.com
503-655-8394





2025 Annual Report

Clackamas County Vector Control District
320 Warner Milne Road, Oregon City, Oregon 97045
(503) 655-8394
www.fightthebites.com

CLACKAMAS COUNTY VECTOR CONTROL DISTRICT

320 WARNER MILNE ROAD

OREGON CITY, OREGON 97045

ANNUAL REPORT

FOR THE YEAR 2025

COMPILED BY

Amber Wimsatt
Interim Executive Director

Clare Babcock
Seasonal Assistant Biologist

Theresa Micallef
Office Manager

Maggie Atchley
Field Manager

| Table of Contents | Page number |
|--|--------------------|
| Cover | i |
| Author list | ii |
| Table of contents | iii |
| Executive Summary | 1-2 |
| West Nile Virus Summary graphic | 3 |
| Board of Trustees and District Staff | 4 |
| Charter Statements | 5 |
| Tables, Figures and Maps | 6-17 |
| Source Reduction, Biological Control, Vector Surveillance & Virus Prevalence, Integrated Mosquito Management, Important Acknowledgements | 18-20 |
| Affiliated Professional Organizations | 21-23 |

EXECUTIVE SUMMARY

Dear Clackamas County Residents,

It is my pleasure to present to you the 2025 Clackamas County Vector Control District Annual Report. We hope you find this document enlightening and informative.

Under ORS 452, the Clackamas County Vector Control District receives revenue through two types of taxes on property: a permanent levy of \$0.0065 per \$1,000 of assessed property value and a local option levy of \$0.025 per \$1,000 of assessed property value. The local option levy was re-approved in 2024 and will expire in 2029.

In 2025 the District has re-evaluated many of its programs to implement modern approaches and to strive to have accurate scientific data to drive all control measures throughout the county. Striving to not only provide the best management of nuisance and vector-competent mosquito species but to do it in a way that is environmentally responsible. This document highlights some of those changes. Switching gears to improve efforts of adult sampling was a major part of those efforts with more traps, more trap locations, and more employees trapping we were able to sample much more of the county and surveyed later into the season. In addition, the District also implemented testing for pesticide resistance, thresholds for which barrier sprays would be approved, new source reductions programs, and started a student volunteer program.

The District charter mandates a focus on mosquito and fly control within the county, and in 2025, the District focused on two general areas of mosquito management: 1) larval mosquito surveillance and larval mosquito insecticide treatments, and 2) adult mosquito surveillance and adult mosquito control. The District answered **499 resident requests** for mosquito control assistance, and a total of **5,765 mosquito treatments** were conducted county-wide. Our mosquito surveillance program processed **40,261 larval mosquito samples** and **20,172 adult mosquito samples**. The District had **no dead bird collections**. The District continues to maintain a paper database and an electronic database for mosquito source mapping and mosquito source treatments. A total of **70 pools of mosquitoes (1,754 individual mosquitoes** were included in those pools) and were tested at the OSU Oregon Veterinary Diagnostic Laboratory for West Nile Virus, Eastern Equine Encephalitis, and St. Louis Encephalitis Virus (SLE).

The District promotes biologically-based suppression of mosquito and fly populations where feasible and practical. The use of *Gambusia affinis*, the ‘mosquitofish’, for biological

control of mosquito larvae remains an important part of the mosquito control program. There were **1,017 individual fish** distributed into appropriate aquatic environments in 2025.

Mosquito and fly disease-vector information was provided by the District throughout the control season to interested residents. The District received **125 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 and fly control were provided for schools, service clubs and other interested groups within the County.

The year (2025) was the first year (1 of 5) for the District's local option levy. The residents of the Clackamas County voted in favor of continuing to fund Clackamas County Vector Control District. The district will therefore have funding through 2029. We worked to have a closer relationship with Clackamas County Public Health and the Infectious Disease Department along with other relevant areas of management within Clackamas County whom we plan to further those collaborative efforts to keep residents of the county safe from vector-borne diseases.

Sincerely,

Amber M. Wimsatt

Interim Executive Director, Clackamas County Vector Control District

FIGURE 1: Oregon County map of West Nile Virus activity in 2025.

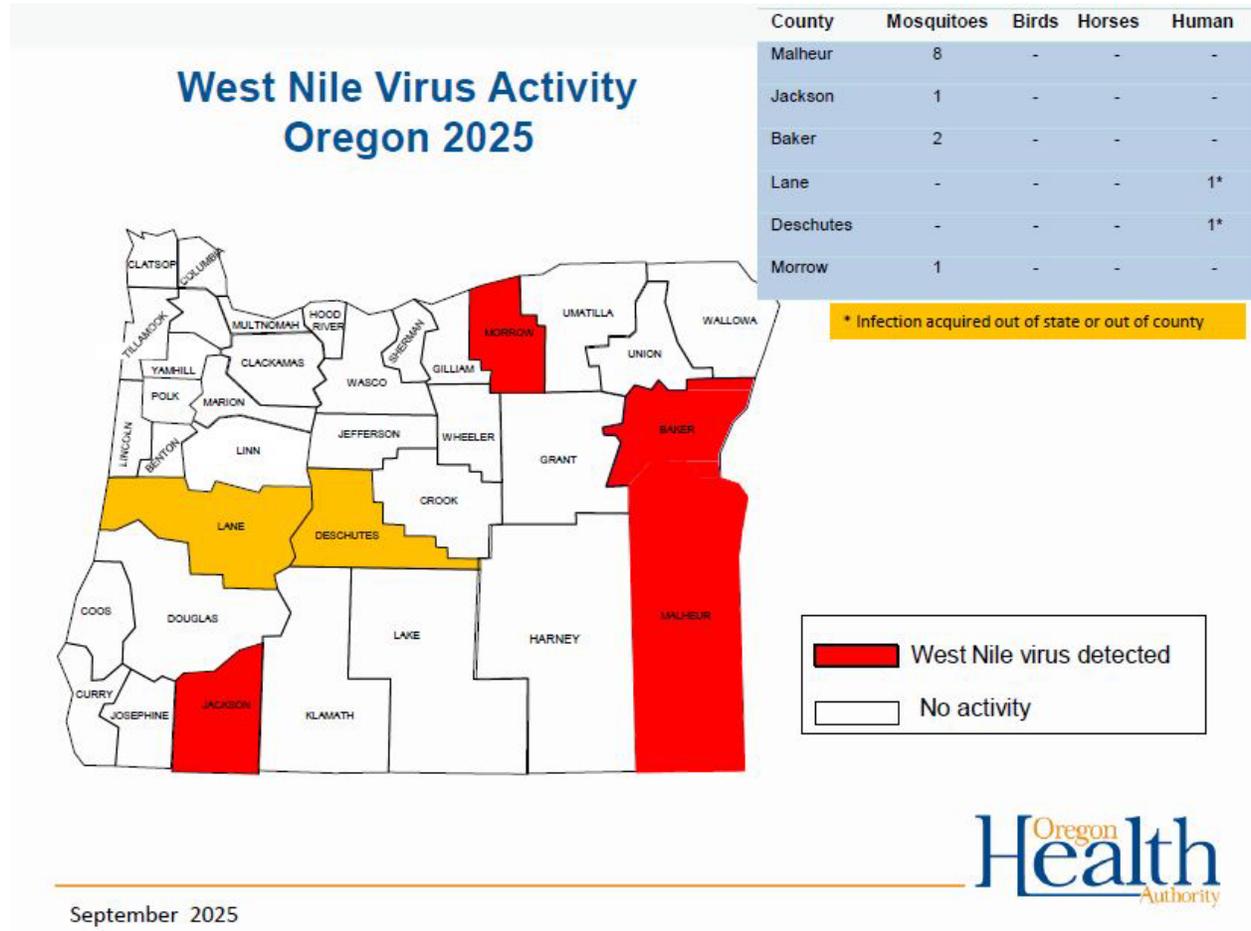


TABLE 1: BOARD OF TRUSTEES

District operations are supervised by a five-member board appointed to four-year terms by the County Commissioners. Vector Control Board meetings are held on the second Tuesday of each month at 4:30 p.m. in the Vector Control District office. Board members receive up to \$50 per day as compensation for services performed as a member of the governing body per ORS 198.190.

| Member | Term Expiration Date |
|-------------------------------|-----------------------------|
| Waylon Martin, Board Chairman | November 16, 2028 |
| Dan Green, Secretary | November 16, 2027 |
| Lowell Hanna, Treasurer | November 16, 2028 |
| James Rhodes, Member | August 12, 2029 |
| Everett Wild, Member | August 12, 2029 |

TABLE 2: DISTRICT STAFF

| Employee | Title |
|------------------------|-----------------------------------|
| Amber Wimsatt | Interim Executive Director |
| Theresa Micallef | Office Manager |
| Maggie Atchley | Field Manager |
| Seasonal Employees (8) | Assistant Biologist & Technicians |

All personnel employed by the District that distribute larvicide and/or adulticide receive pesticide usage and safety training and are Licensed Public Pesticide Applicators by the Oregon Department of Agriculture.

*Note: December 1st, 2025, we hired a fourth full time permanent staff member. Clare Babcock is joining the District Staff as the Biologist.

CHARTER STATEMENTS

Vision Statement

Clackamas County Vector Control District's vision is to progress towards a future free of vector borne disease using modern scientific, technical and educational tools.

Mission Statement

The District's mission is to control public health vectors within Clackamas County using an integrated management approach aiming to limit the number of mosquitoes and flies, reducing annoyance and vector-borne disease.

Core Values

Clackamas County Vector Control District employees work towards the goal of protecting the public from vector-borne diseases. In that spirit, we pledge to hold ourselves to a higher standard of accountability and transparency in our data collection, our programs and their benefit to the residents of Clackamas County, and to be good stewards of taxpayer funds.

Legislative Guidance

Under the authority of ORS 452.120, Clackamas County Vector Control District shall provide the two following documents to the Clackamas County Commissioners in the first quarter of each calendar year: 1) a proposed Annual Work Program to include an estimate of funds required for the next year, a description of the work contemplated, and the methods to be employed by CCVCD; 2) an Annual Report covering monies expended, methods employed, and work accomplished during the past fiscal year. This report is to serve as satisfying the requirement of the Annual Report portion of the documentation requested.

TABLE 3: Control and Surveillance 2025 Statistics. The overall service statistics for the District are displayed below.

| Service type | Service description | Statistic |
|--|--|-----------|
| Distribution of mosquitofish (<i>Gambusia affinis</i>) | Individual fish | 1,017 |
| Mosquito and fly control | Service calls fielded | 499 |
| Miscellaneous calls | Advice over the phone | 125 |
| Mosquito control operations | Total treatments (including multiple at same site) | 5,765 |
| Larval mosquito surveillance | Total larvae collected for identification | 40,261 |
| Adult mosquito surveillance | Total adults collected for identification | 20,172 |
| Arbovirus surveillance | Dead bird collections | 0 |

TABLE 4: Summary of 2025 Insecticide Treatments. The active ingredients, trade names, and amounts of mosquito larvicides and mosquito adulticides used during control operations of the District are summarized below.

| Insecticide type | Active Ingredient | Trade Name | EPA Reg. No. | Amount of formulation used |
|------------------|---|-------------------------------|--------------|----------------------------|
| Larvacide | | | | |
| | Long chain oxy-hydrocarbons | Agnique MMF (liquid) | 53263-28 | 3.1 oz. |
| | Long chain oxy-hydrocarbons | Agnique MMF (granules) | 53263-30 | 0.0 lbs. |
| | <i>Bacillus thuringiensis var. israelensis</i> (<i>Bti</i>) | AquaBac (granules) | 62637-3 | 0.0 lbs. |
| | <i>Bti</i> bacteria | Summitt <i>Bti</i> briquettes | 6218-47 | 321 units |
| | Methoprene | Altosid Briquets (30 Day) | 2724-375 | 368 units |
| | <i>Bti</i> and <i>Bs</i> bacteria | 4 Star 45 day Briquettes | 83362-3 | 0 units |

| | | | |
|-----------------------------------|--------------------------|-----------|-------------|
| <i>Bti</i> and <i>Bs</i> bacteria | 4 Star 90 day Briquettes | 88362-3 | 0 units |
| <i>Bti</i> and <i>Bs</i> bacteria | VectoMax WSP (packets) | 73049-429 | 5,020 units |
| Methoprene | Altosid XR Briquette | 2724-421 | 193 units |
| <hr/> | | | |
| Adulticide | | | |
| <hr/> | | | |
| Pyrethrins | Pyroicide 100 | 1021-1424 | 0.0 oz. |
| Plant oils | Essentria Pro | N/A | 576.0 oz. |
| Tau-fluvalinate | Mavrik Aquaflow | 2724-478 | 20.48 oz. |
| <hr/> | | | |

TABLE 5: Adult mosquito surveillance: 2025 CO₂ encephalitis virus surveillance trap species composition. The table below shows the number of each adult mosquito species collected and identified from traps baited with carbon dioxide and set out overnight.

| Genus | Species | Mosquitoes collected | % of total collection |
|------------------|---------------------|----------------------|-----------------------|
| <i>Aedes</i> | | 2300 | 11.40 |
| | <i>japonicus</i> | 10 | |
| | <i>sierrensis</i> | 103 | |
| | <i>vexans</i> | 647 | |
| | <i>washinoi</i> | 1308 | |
| | <i>aegypti</i> | 0 | |
| | <i>albopictus</i> | 0 | |
| | <i>Ae. species</i> | 232 | |
| <i>Anopheles</i> | | 917 | 4.55 |
| | <i>freeborni</i> | 25 | |
| | <i>punctipennis</i> | 889 | |
| | <i>An. species</i> | 3 | |
| <i>Culex</i> | | 4243 | 21.03 |
| | <i>pipiens</i> | 3593 | |
| | <i>tarsalis</i> | 603 | |
| | <i>Cx. species</i> | 12 | |
| <i>Culiseta</i> | | 11288 | 55.96 |

| | | | |
|-------|-----------------------|--------|--------|
| | <i>incidens</i> | 11147 | |
| | <i>inornata</i> | 123 | |
| | <i>particeps</i> | 18 | |
| | <i>impatiens</i> | 0 | |
| | <i>Cs. species</i> | 0 | |
| | <i>Coquillettidia</i> | 128 | 0.63 |
| | <i>Perturbans</i> | 128 | |
| Male/ | Unidentified | 1296 | 6.42 |
| Total | Collected | 20,172 | 100.00 |

TABLE 6: Larval mosquito surveillance: 2025 larval dipper sample species composition.
 The table below shows the number of larval mosquito species collected and identified from ‘dipper’ samples.

| Genus | Species | Larvae collected | % of total collection |
|------------------|---------------------|------------------|-----------------------|
| <i>Aedes</i> | | 142 | 0.35 |
| | <i>albopictus</i> | 0 | |
| | <i>aegypti</i> | 0 | |
| | <i>japonicus</i> | 54 | |
| | <i>sierrensis</i> | 20 | |
| | <i>vexans</i> | 25 | |
| | <i>washinoi</i> | 37 | |
| | <i>Ae. Species</i> | 6 | |
| <i>Anopheles</i> | | 55 | 0.14 |
| | <i>freeborni</i> | 2 | |
| | <i>punctipennis</i> | 53 | |
| | <i>franciscanus</i> | 0 | |
| | <i>An. species</i> | 0 | |
| <i>Culex</i> | | 22946 | 56.99 |
| | <i>pipiens</i> | 22577 | |
| | <i>tarsalis</i> | 163 | |
| | <i>Cx. species</i> | 206 | |

| | | |
|----------------------|-------|--------|
| <i>Culiseta</i> | 14459 | 35.91 |
| <i>impatiens</i> | 0 | |
| <i>incidens</i> | 14453 | |
| <i>inornata</i> | 6 | |
| <i>particeps</i> | 0 | |
| <i>Cs. species</i> | 0 | |
| <hr/> | | |
| Unidentified species | 2659 | 6.60 |
| Total | 40261 | 100.00 |

FIGURE 2: Vector Control Zone Map. Clackamas County is divided into 10 vector control zones. Technicians are assigned a zone(s) of responsibility during the control season (March through September). In 2025, sampling took place April through the first part of October. Zone 0 is mostly federal lands not requiring regular mosquito control.

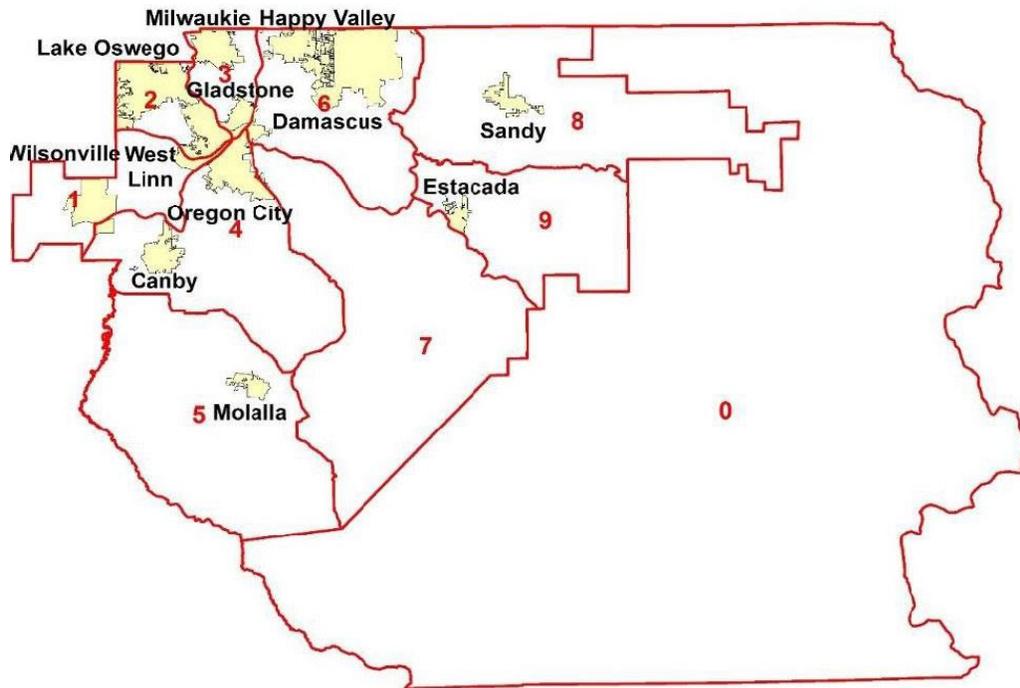


FIGURE 3: Vector Control Treatment Map. Blue and green circles are approximate sites that typically receive treatment. Treatments focused on developed urban/suburban/rural areas.

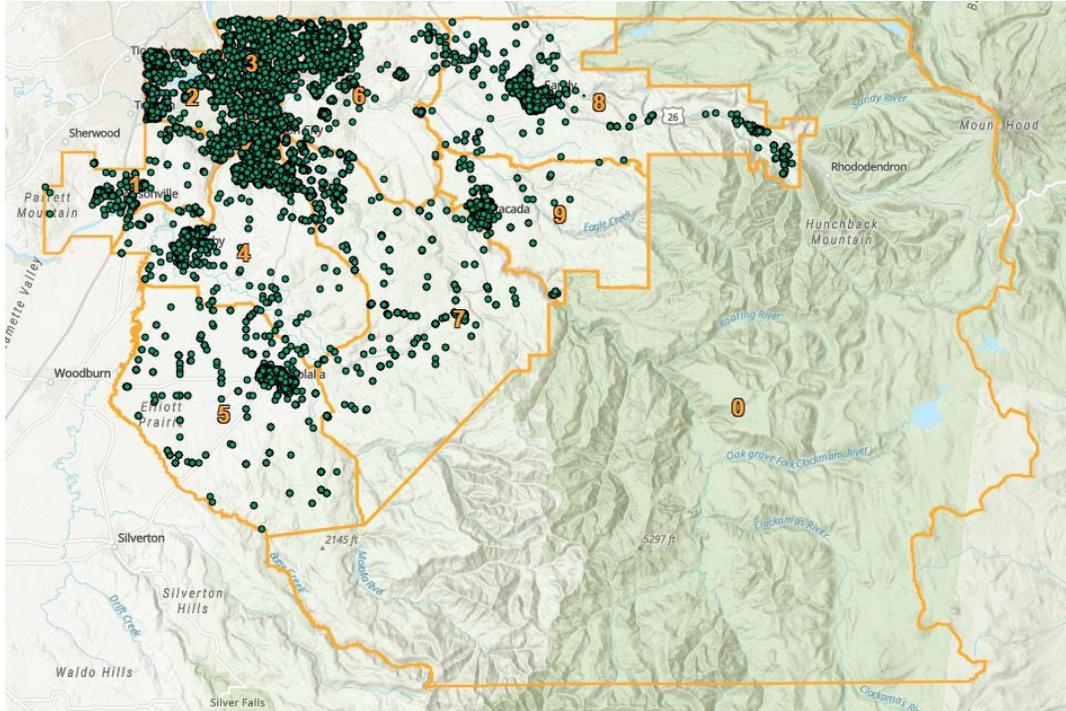


FIGURE 4: Most abundant adult mosquito species by zone in 2025. Adult mosquito abundance per zone. *Culiseta incidens* dominant species in all zones. *Aedes vexans* counts in Zone 4 inflated due to MT-13499.

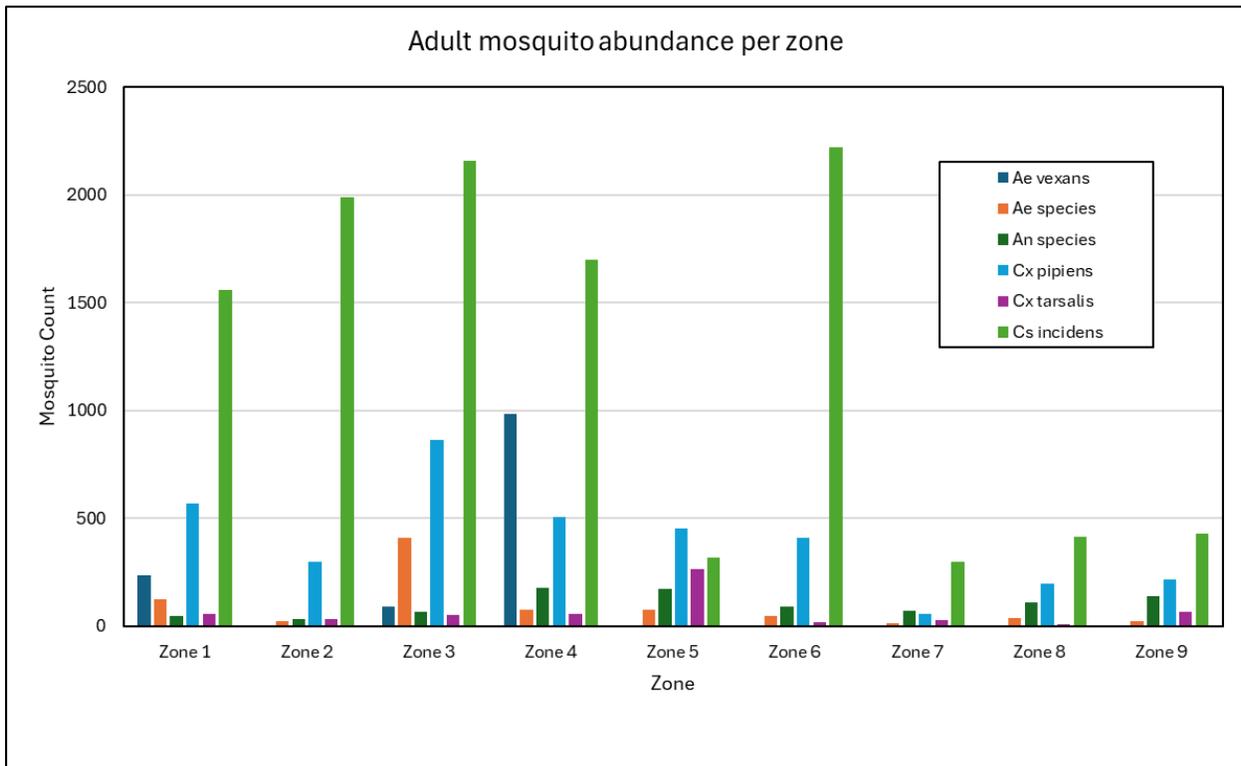


FIGURE 5: Most abundant adult mosquitoes collected over entire District (2015 to 2025). Historical adult mosquito species distribution. *Culiseta incidens* and *Culex pipiens* populations continue to fluctuate. Changes in proportion for each species could be due to sampling efforts, temperature variations, or source reduction/creation.

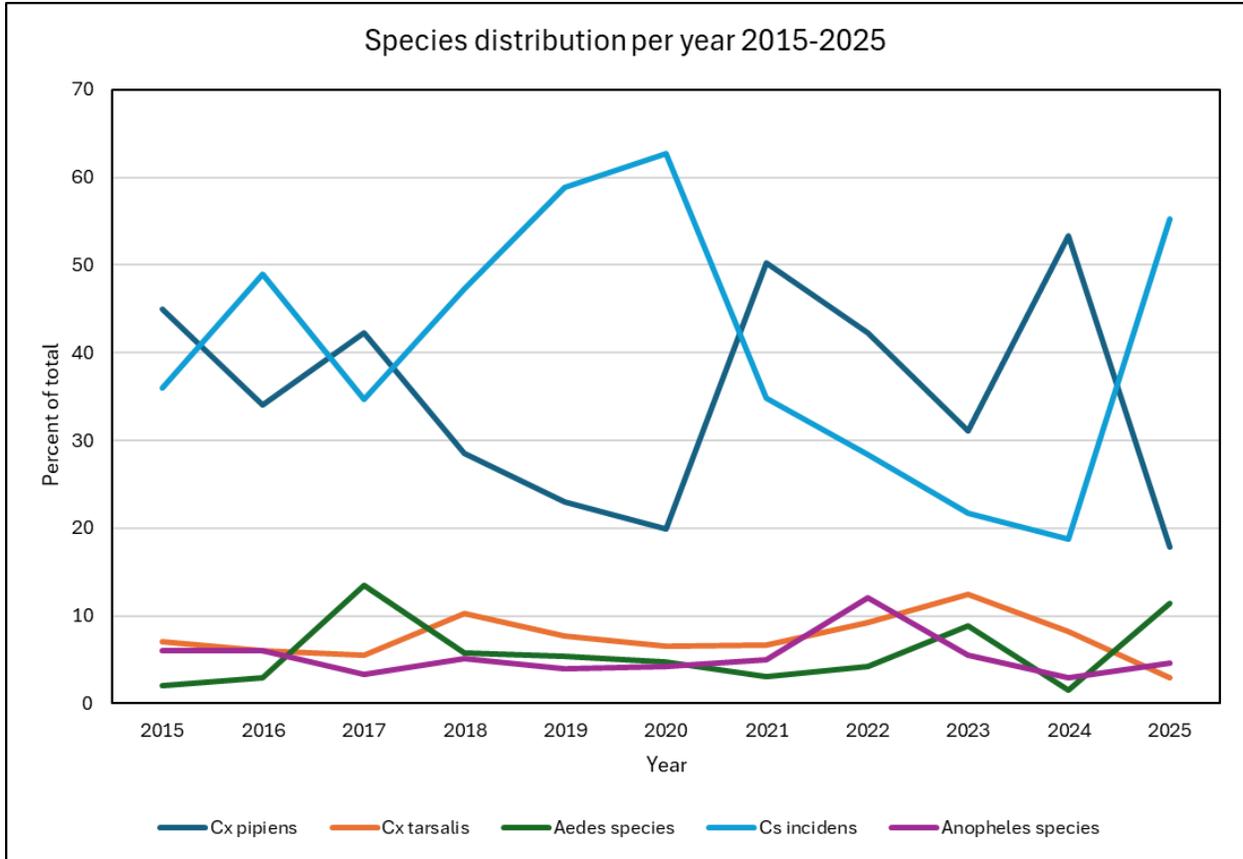


FIGURE 6: Total number of adult dry ice traps set by year (2006 – 2025). Number of traps set during 2025 mosquito season increased due to the number of traps available to set, more people assisting with trapping effort and changes in trapping locations and methods. BG-Pro traps were used in a few configurations with both carbon dioxide (dry ice) bait and lures.

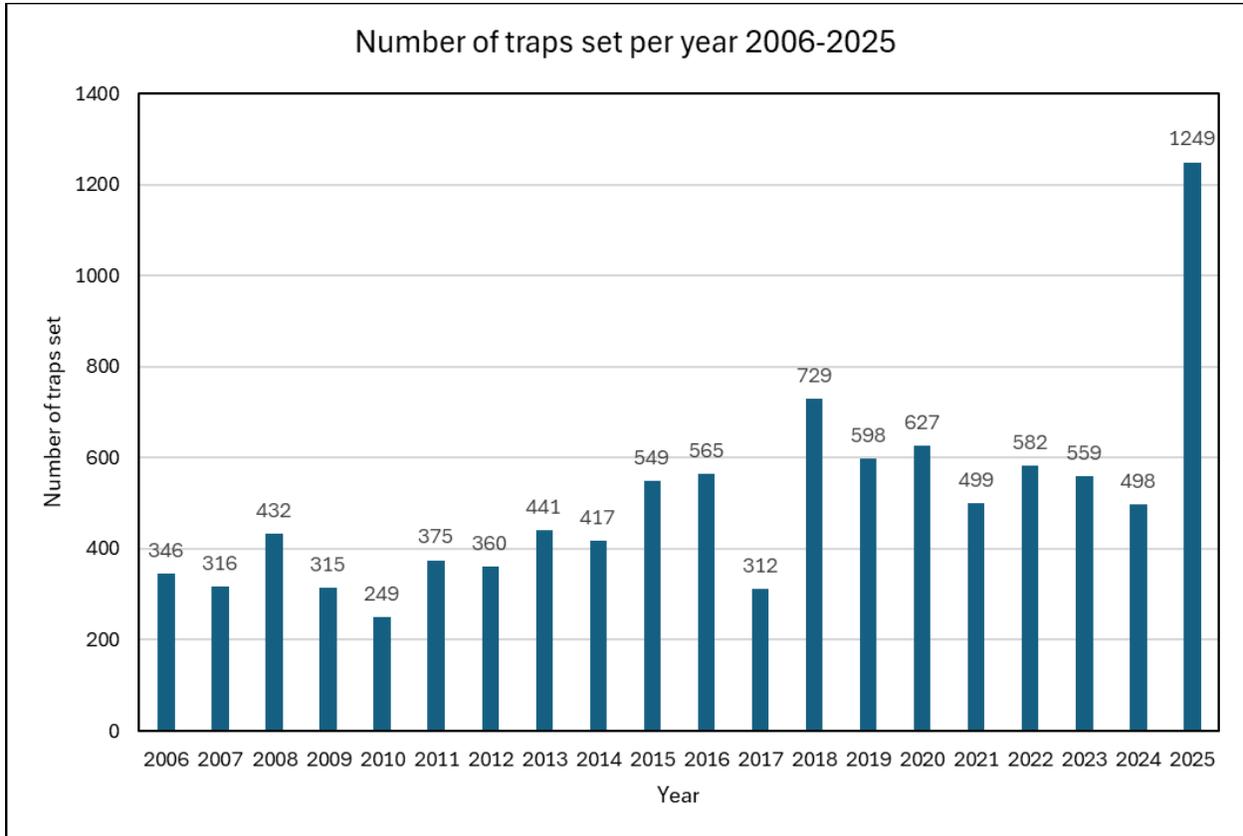


FIGURE 7: Larval mosquito collection by zone for 2025.

Mosquito larva abundance per zone. *Culex pipiens* population dominates in each zone except for Zone 5, 7, 9, and 0.

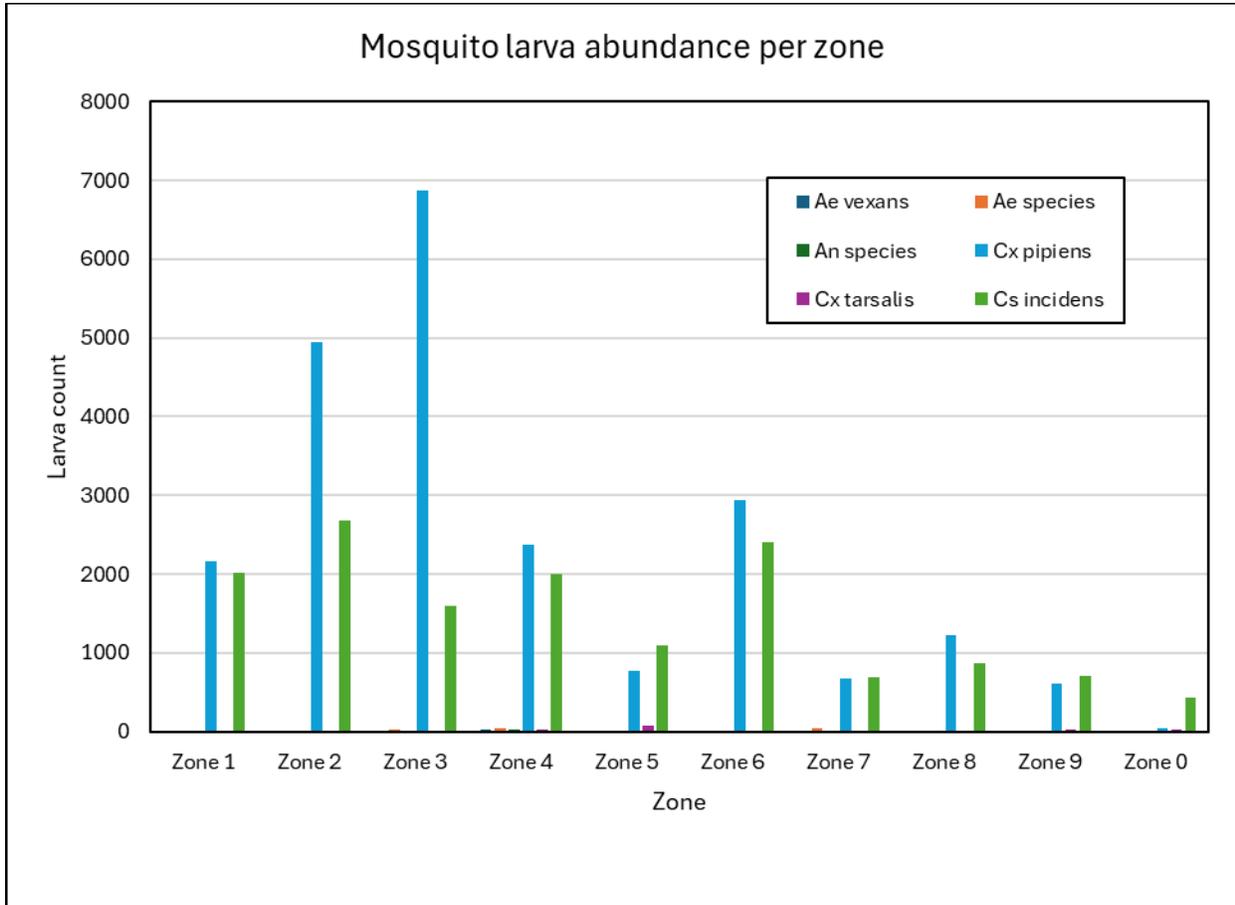


FIGURE 8: Larval mosquito collections by year (2015 – 2025). *Note graph does not include 2014 despite graph title.

Historical mosquito larva distribution. Increase in *Culex pipiens* and *Culiseta incidens* collection due to increased sampling efforts.

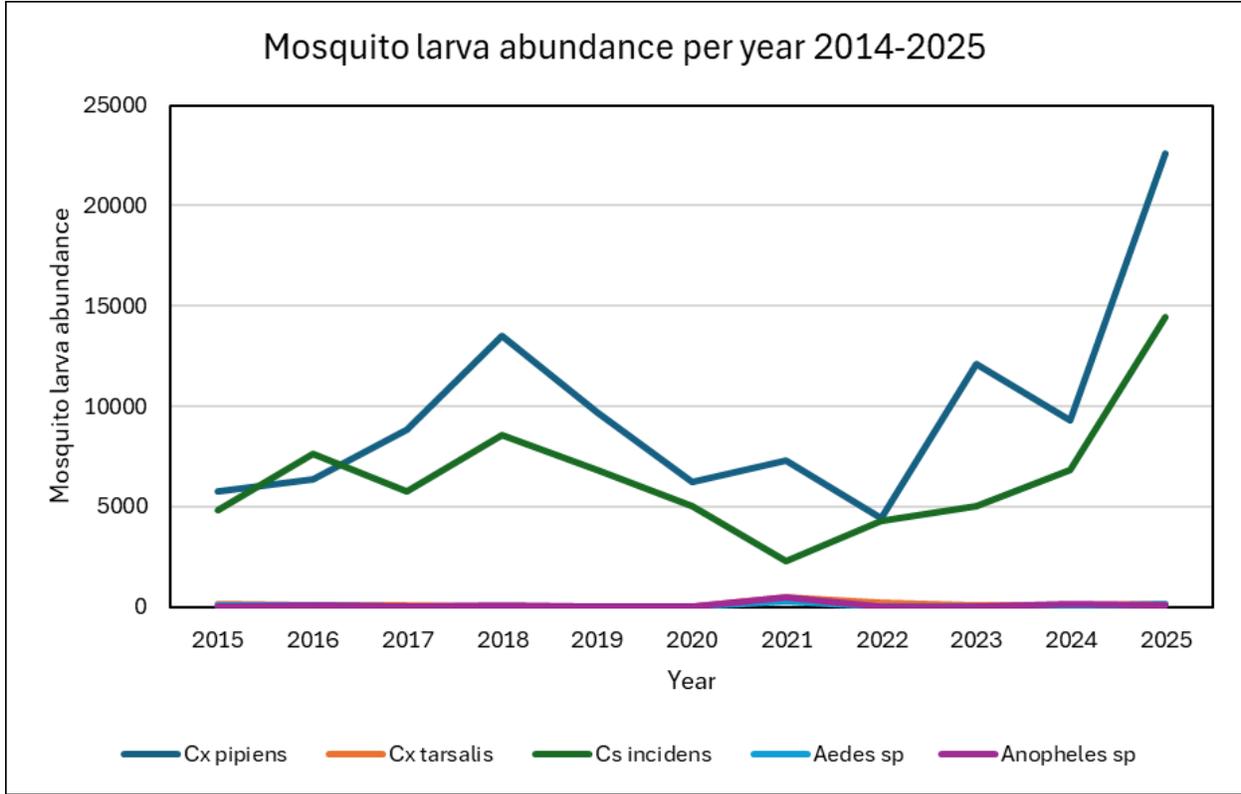


TABLE 7: Miscellaneous service calls (125 total). The Vector Control District receives numerous requests for information on miscellaneous pest problems. The species and number of inquiries about each received in 2025 are listed below.

| Pest | # of Calls | Pest | # of Calls |
|---------------|-------------------|------------------|-------------------|
| Ant | 0 | Indian Meal Moth | 0 |
| Aphid | 0 | Mole | 0 |
| Bat | 5 | Mouse | 1 |
| Beaver | 0 | Nutria | 0 |
| Bed Bugs | 0 | Opossum | 1 |
| Bee | 9 | Raccoon | 3 |
| Box Elder Bug | 0 | Rat | 33 |
| Carpenter Ant | 0 | Silverfish | 0 |
| Cockroach | 0 | Skunk | 8 |
| Coyote | 4 | Spider | 3 |
| Crane Fly | 0 | Squirrel | 3 |
| Flea | 0 | Stink bug | 0 |
| Gnat | 1 | Tick | 0 |
| Gopher | 0 | Vole | 0 |
| Hornet | 2 | Other | 52 |
| | | | Total # 125 |

TABLE 8: Public Education Events and Ongoing Public Outreach in 2025.

The district is always happy to give presentations to local entities on vector ecology and mosquito/fly control. This list includes efforts that continue throughout the calendar year.

| 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 Facebook Page, Instagram | World-wide | Updates, news, other items relevant to vector control and the Citizens of CC | Continuous |
| CC Vector Control District Calendar | Web/Office | Mosquito control tips in calendar | 2025 |
| PAC/WEST Communication Public Outreach Program | Clackamas County | A range of efforts* | 2025 |
| Workshops | Clackamas County | Rick Reynolds Public Education | 2025 (multiple dates) |
| Clackamas County Fair | Clackamas County | Informational Booth | August 2025 |
| Tree School | Clackamas County | Informational Booth | March 2025 |
| Clackamas County Master Gardeners Spring Garden Fair | Canby, OR | Informational Booth | May 2025 |
| Tire Recycling Event | Clackamas County | A range of efforts* | September 2025 |
| NWREC Small Farm School | Clackamas County | Informational Booth | September 2025 |
| | | | |

* The District Public Outreach Program through PAC/WEST includes telephone surveys, digital and social media messaging, direct mailers, local newspaper advertisements, scheduling public speaking engagements, production of tote bags and calendars, curation of our Facebook page, and an educational program that includes lesson plans, posters and pamphlets, and technical advice to teachers.

TABLE 9: Continuing Education and Training in 2025.

Professional development is a key aspect of staff training, and the CCVCD board of trustees supports this through budgeted travel expenditures and support for various educational opportunities.

| Event | Location | Date | Participants |
|---|---|--------------|---|
| OMVCA Bi-Monthly Conference Calls | Virtual | 2025 | Amber, Theresa, Clare |
| Clarke, Calibration Workshop | Columbia Drainage Vector Control District | April 2025 | Amber, Maggie, Dan S., Clare |
| Mosquito-borne Disease Emergency Response Network Meetings | Clackamas County | 2025 | Amber, Theresa, Clare Clackamas County Infectious Disease Public Health team members & PAC/WEST Resources team members |
| ABC Liaison Training Meeting | Virtual | October 2025 | Theresa |
| SDAO Academy Regional Trainings | Various | 2025 | Amber, Theresa |
| Biology of Vector-borne Diseases Course | Idaho | June 2025 | Amber |
| AMCA Best Practices for Mosquito Management During a Public Health Emergency Virtual Training Program | Virtual | August 2025 | Amber |

SOURCE REDUCTION EFFORTS 2025

Clackamas County Vector Control District implemented a new pilot source reduction program during mosquito season 2025. This was our first time having a tire drive so that citizens of the county could bring in old tires to local participating Les Schwab tire locations throughout Clackamas County. The program was targeted towards the end of summer clean-up to reduce sources before the next mosquito breeding season. It ran from September 1st to September 30th, 2025. This first year Oregon City, Canby, Happy Valley, and Estacada stores participated in the event, and we would like to potentially partner with more stores in the future including Molalla and Sandy. Thanks to the citizens dropping off tires we were able to remove 378 tires from yards in the county that could potentially be breeding ground next season. This program is also in efforts to limit breeding grounds that invasive species prefer and thrive in.

BIOLOGICAL CONTROL EFFORTS 2025

Biological control through distribution of *Gambusia affinis*, the mosquitofish, was provided for citizen requests to ornamental ponds and livestock troughs that are not fed nor drained into natural waterways. *Gambusia affinis* is non-native in the Pacific Northwest and therefore cannot be introduced into any natural aquatic habitats that connect with the larger Willamette watershed. There are sever consequences to releasing or transporting these fish to other bodies of water in Oregon including potential legal measures including criminal violations, fines, and legal responsibility to pay for restoration efforts **ORS 498.222**. Citizens are advised of this during the distribution process and all CCVCD employees are coached on these matters before delivering fish to the residents' homes.

Bio-rational insecticides, such as bacterial agents (*Bti* and *Bs*; Table 2), we utilized in situations where long lasting larval control was needed (swales, retention/detention ponds, storm drains, etc.).

VECTOR SURVEILLANCE & VIRUS PREVELANCE

Invasive mosquitoes (*Aedes aegypti*, *Aedes albopictus*, and other *Aedes spp.*) continue to expand their ranges throughout the western United States bringing with them the risk of pathogens that can cause diseases that we do not presently see as locally acquired in Clackamas County, OR. As of November 2025, *Aedes aegypti* had not been detected in Clackamas County, however as of July 2024 *Aedes aegypti* has been found in Jackson County, OR and was documented again in August of 2025. Monitoring invasive *Aedes spp.* in general is important as they can be competent vectors for pathogens that cause chikungunya, dengue, and zika. In 2025 Clackamas County Vector Control District implemented the use of new BG-Pro traps that can be set to monitor these invasive species in a configuration known as a Sentinel style trap. These traps are lower to the ground where these cryptid ankle-biting species are located.

INSECTICIDE RESISTANCE TESTING LARVAL AND ADULT (BIOASSAYS)

Clackamas County Vector Control District implemented insecticide resistance testing during the 2025 mosquito season facilitated by our Seasonal Assistant Biologist Clare Babcock. We would also like to thank Clark County Mosquito Control for their assistance with sharing their larval bioassay methods and offering support and answering questions during the process. We also sourced supplies from the Center for Disease Control (CDC) for the adult bottle bioassays to test our products used in barrier sprays for adult mosquito control. This season we discovered what challenges we may face and concluded that these studies indicate that mosquito populations in Clackamas County are susceptible to Vectomax and *L. sphaericus* but are developing or are resistant to tau-fluvalinate and pyrethrum. However, due to sampling and time constraints many errors likely arose during the experiment that affected the data. This is not an uncommon phenomenon when running new tests and developing a standard procedure. Although errors occurred, this data should not be overlooked. Follow up testing must occur to confirm resistance. These preliminary results highlight why these tests need to be done annually and why we will be hiring a full-time permanent biologist to our team before the 2026 mosquito season. Keeping mosquito populations susceptible is important since we only have so many classes of pesticides in our tool belt. The overuse of pesticide can become a major problem and that is why we are taking precautions to limit the overuse when mosquito thresholds are not met.

IMPORTANT ACKNOWLEDGEMENTS

A huge thank you to all the staff this season. This year there was a major transition for the district and its employees. I, Amber Wimsatt, came on as Interim Executive Director right at the start of gearing up for the 2025 mosquito season. Theresa Micallef, Office Manager, and Maggie Atchley, Field Manager, helped with the hiring process and we were able to welcome an amazing crew on this season. Clare Babcock returned as our Seasonal Assistant Biologist for her fourth season and was instrumental in revamping the entire surveillance program and training people to set traps to increase trapping efforts, trained other employees on mosquito larval and adult identification, and performed bioassays. Shaun Johnson for his help in the lab not only with trapping but with the enumeration and identification of mosquitoes. Dan Smith for his efforts in trapping remote zones and vetting new trap locations. Alex Allsup and Gavin Mayfield help with the adult surveillance programs with setting traps, doing barrier sprays, and the surveillance and control of larval mosquitoes. Aidan Willis, JC McPherson, and NC Cooke for all their help with larval surveillance and control and for also aiding with adult barrier sprays. Without the help of dedicated seasonal and full-time staff we would not have been able to collect as much data, implement new programs, and have a successful mosquito season like we did. All these efforts aid in the goal of monitoring and mitigating potential health risks to the residents of Clackamas County against mosquito-borne diseases and large nuisance populations of mosquitoes.

INTEGRATED MOSQUITO MANAGEMENT

The Northwest Mosquito and Vector Control Association support management of vector populations when and where necessary by means of an integrated mosquito management (IMM) designed to benefit or to have minimal adverse effects on people, domestic animals, wildlife and the environment. The integrated mosquito management policy recognizes that vector populations cannot be eliminated but may 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 responsible and economically beneficial in the long-term interest of humankind.

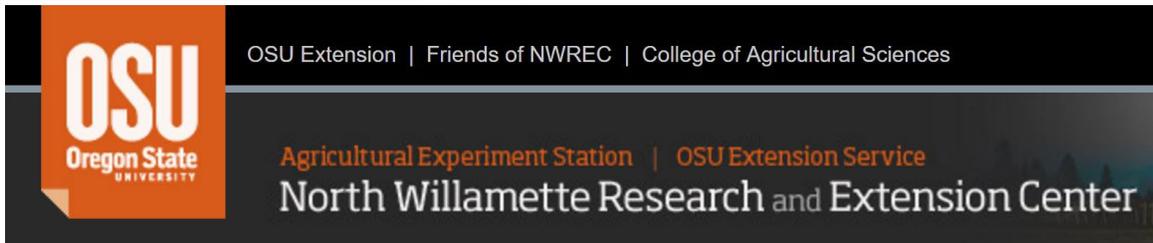
The following IMM principles are to be followed¹:

- 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, natural and biological control, elimination of larval mosquito sources, and insecticide applications.
- Larval mosquito habitats producing vectors that are either 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 as possible.
- 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 should be 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.

¹ All methods and materials used by the District are based on these principals supported by the Northwest Mosquito and Vector Control Association and the American Mosquito Control Association. <http://www.nwmvca.org/about.php>

COLLABORATING ORGANIZATIONS

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





Home About AMCA Mosquito Info Meetings/Events Legislation Publications Memberst

Welcome to the American Mosquito Control Association

AMCA® is a nonprofit organization that is dedicated to providing **leadership, information** and **education** leading to the enhancement of public health and quality of life through the suppression of mosquitoes.



Department of Environmental Quality



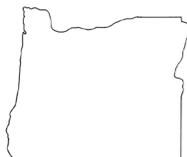
Oregon Department of Agriculture



Advancing global health since 1903



NORTHWEST MOSQUITO and VECTOR CONTROL ASSOCIATION



OREGON VECTOR CONTROL ASSOCIATION



S O V E

Society For Vector Ecology

est. 1968

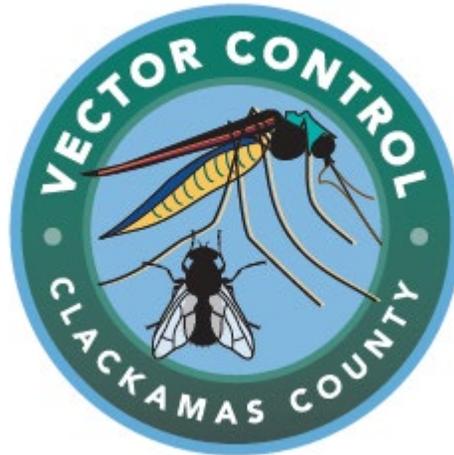


Entomological Society of America
Sharing Insect Science Globally

PAC/WEST20th
Anniversary



**Public
Health**



Annual Work Program

Fiscal Year 2026 - 2027

**Clackamas County Vector Control District
320 Warner Milne Road, Oregon City, Oregon 97045
(503) 655-8394
www.fightthebites.com**

**Prepared by: Interim Executive Director Amber Wimsatt
In collaboration with Clackamas County Vector Control Board of Trustees:
Waylon Martin, Daniel Green, Lowell Hannah, James Rhodes, and Everett Wild
Submitted to the Clackamas County Commissioners**

Table of Contents

| Topic | Page |
|--|--------------|
| Executive Summary | 3-4 |
| Background, Introduction, Vision, Mission, District Structure | 5-7 |
| Mosquito-borne Virus Surveillance and Response Plan | 8-25 |
| Staff Training and Public Outreach Program | 26-27 |
| Glossary and Acronyms | 28-30 |
| References | 30 |
| Appendix 1: Proposed Budget for FY26-27 | 31 |
| Appendix 2: Integrated Mosquito Management | 32-33 |
| Appendix 3: Key Agencies for Response Plan | 33-34 |
| Appendix 4: Larvicides and Adulticides | 34 |

Executive Summary

It is our pleasure to provide the Clackamas County Board of Commissioners with this Annual Work Program covering the proposed work to be accomplished by the Clackamas County Vector Control District (CCVCD) during the mosquito season of 2026. This Annual Work Plan also outlines the District's response plan when an outbreak of mosquito-borne disease is eminent. Under the authority of ORS 452.120, the District shall provide the Commissioners with a proposed Annual Work Program to include an estimate of funds required for the upcoming year, a description of the work contemplated, and the methods to be employed to control vectors of public importance. The Annual Work Program provides guidelines for District Staff and the District Board of Trustees, and information to stakeholders regarding decisions and responses the District will utilize in the prevention and control of West Nile Virus (WNV) or other mosquito-borne and fly-borne diseases that may threaten the residents of Clackamas County.

The District will conduct surveillance for mosquito-borne viruses in various ways during the 2026 season. The larval mosquito surveillance will involve taking samples of water from all known mosquito habitats via a dipper cup, checking the water for the presence of mosquito larvae, and taking these larval samples back to the district's laboratory for identification to the species level where possible. Adult mosquito surveillance will involve deploying various types of mosquito traps within the County. Our primary trap is a carbon dioxide-baited trap (CO₂ traps), capable of attracting many species of mosquitoes. Captured adult mosquitoes are taken back to the district's laboratory for identification and will be prepped and sent off to the OSU Oregon Veterinary Diagnostic Laboratory to be tested for West Nile Virus, Eastern Equine Encephalitis, and St. Louis Encephalitis Virus (SLE).

The District will begin inspections of larval and adult mosquito habitats in late March or early April and will increase inspection intensity as temperatures increase. Inspections will continue until temperatures and day length signal the end of mosquito production in the County in late September or early 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 are of the utmost importance. During peak mosquito season, the District participates in weekly conference calls with the Oregon Health Authority (OHA) and the Oregon Mosquito and Vector Control Association (OMVCA). The District monitors West Nile Virus reports throughout Oregon, including human and livestock cases. This regular monitoring of disease statistics provides the District with up-to-date information on mosquito-borne diseases that threaten Clackamas County. A Mosquito-Borne Virus Surveillance and Response Plan is provided here as guidance in the event of a disease outbreak.

The District uses Integrated Mosquito Management (IMM) principles in its program. 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, cultural controls such as source reduction programs, surveillance, and control activities that use the least toxic and most environmentally responsible methods available.

Respectfully,

Amber M. Wimsatt

Interim Executive Director, Clackamas County Vector Control District

Background and Introduction

The Clackamas County Vector Control District (CCVCD) was established in 1964 by voter referendum to provide County residents with 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 (WNV) in Oregon. With the arrival of WNV in November 2004, the Clackamas County voters approved a five-year option levy for enhanced vector control operations in 2009, 2014, 2019 and again in 2024. This increased funding allows the District to prepare for and minimize the impact of West Nile Virus and other emerging mosquito-borne diseases in Clackamas County. This enhanced vector control program has been implemented since 2004 and will be implemented again in 2026. This Annual Work Plan is submitted yearly to the Clackamas County Board of Commissioners for review and approval as required by ORS 452.120.

The Clackamas County Vector Control District is organized and operates under the authority of ORS 452, generating revenue through two types of taxes on property: a permanent levy of \$0.0065 per \$1,000 of assessed property value and a local option levy of \$0.025 per \$1,000 of assessed property value. The local option levy was re-approved in 2024 and will expire in 2029. The 2025 actual District expenditures were \$1,333,650. The FY26-27 proposed budget for the District is given in *Appendix 1*.

This Annual Work Program consists of two parts: the first addresses the current program; the second, a Mosquito-Borne Virus Surveillance and Response Plan. It is expected, through continual community involvement, that the Annual Work Program 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 using Integrated Mosquito Management, thus using the least toxic and most environmentally responsible methods available.

Program Overview

The guiding vision of the Clackamas County Vector Control District is “to progress towards a future free of vector-borne disease using all the scientific, technical and educational tools available”. The general mission of the Clackamas County Vector Control District is “the control of public health vectors within Clackamas County using an environmentally responsible approach that aims to limit the number of mosquitoes and flies, reducing annoyance and vector-borne disease”. Clackamas County Vector Control District employees come to work each day with the goal of protecting the public from vector-borne diseases. We aim to be accountable and transparent in our actions to provide control methods that are evidence-based and backed by scientific data.

Under the authority of ORS 452.120, Clackamas County Vector Control District shall provide these two documents to the Clackamas County Commissioners in the first quarter of each calendar year: 1) a proposed Annual Work Program to include an estimate of funds required for the next year, a description of the work contemplated, and the methods to be employed by Clackamas County Vector Control District; 2) an Annual Report covering monies expended, methods employed, and work accomplished during the past fiscal year.

District Objectives

The overall objectives of the District align with the mission: The control of public health vectors within Clackamas County using an environmentally friendly approach that aims to limit the number of mosquitoes and flies, reducing annoyance and vector-borne disease. The goal of total eradication of all mosquitoes and flies within Clackamas County is not obtainable nor ideal since they are an important part of the ecosystem. Instead, we support the use of environmentally responsible approaches to vector population suppression, such as an integrated mosquito management approach. We keep the public health of Clackamas County residents at the forefront of our efforts.

District Structure

The District has three main programmatic units: office, laboratory, and field. Office personnel focus on administrative tasks, including budget formulation and bookkeeping, accounting, human resource functions, logistical planning and support and

overall supervision of district operations. Laboratory personnel focus on areas of scientific expertise, including entomological identification of insects collected, analysis of insects for pathogens of human disease, designing and executing mosquito and fly surveillance operations, and other fundamental and applied scientific tasks. Field personnel conduct mosquito surveillance by discovering, documenting, investigating and sampling mosquito and fly production areas. They are also responsible for applying mosquito and fly suppressing chemicals in a safe and legal manner. They are also ambassadors and ecologists, advising citizens on best practices for reducing the risk of mosquito-borne disease and physical practices that aim to reduce the suitability of aquatic habitats for mosquito breeding. All three programmatic units work synergistically to accomplish the District's mission.

In addition to West Nile Virus, Oregon is vulnerable to introduction of other highly virulent mosquito-borne viruses of public and veterinary health concern, such as Japanese encephalitis, dengue, Zika, chikungunya, yellow fever, Rift Valley fever, and Venezuelan equine encephalitis viruses. If an existing or introduced virus is detected, it is critical that local and state agencies are prepared to respond in a concerted effort to protect people and animals from infection and disease. The plan below describes an enhanced surveillance and response program for mosquito-borne viruses in Clackamas County and is applicable to all of Oregon and adjacent western states. Its contents are drawn from previous Clackamas County Vector Control District Annual Work Programs and from response guidelines published by the California Department of Public Health (CDPH), the Mosquito and Vector Control Association of California (MVCAC), and the University of California at Davis (UCD)¹.

CLACKAMAS COUNTY VECTOR CONTROL DISTRICT MOSQUITO-BORNE VIRUS SURVEILLANCE AND RESPONSE PLAN

Objectives

The Clackamas County Vector Control District Mosquito-borne Virus Surveillance and Response Plan was developed to meet several objectives. Specifically, the Plan:

- Provides guidelines and information on the surveillance and control of mosquito-borne viruses in Clackamas County, including West Nile Virus and other mosquito-borne pathogens that may emerge.
- Incorporates surveillance data into risk assessment models.
- Prompts surveillance and control activities associated with virus transmission risk level.
- Provides Clackamas County Vector Control District, local and state agencies with a decision support system; and
- Outlines the roles and responsibilities of Clackamas County Vector Control District, local and state agencies involved with mosquito-borne virus surveillance and response.

This document provides Clackamas County Vector Control District guidelines but can be modified to meet regional and state-wide conditions.

Background and Introduction

Clackamas County Vector Control District was established in 1964. Although the directive has remained the same to protect residents of Clackamas County from mosquitoes and flies and potential vector-borne diseases, they may transmit the methods are ever changing and need constant re-evaluation of programs within the integrated mosquito management program (IMM). Collaboration among state and regional mosquito and vector control agencies and local public health officials is essential to understand the risks of vector-borne diseases in Clackamas County. Surveillance and response guidelines for Clackamas County Vector Control District have been published annually as a component of the Annual Work Program per ORS 452.120. Moving forward the district will make an active effort to be transparent when programs change or are discontinued

which is why there are some noticeable changes to this year's Annual Work Program in 2026.

West Nile Virus was first detected in the United States in New York City in 1999. This virus, a mosquito transmitted disease, had never 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 first detected in Clackamas County in August 2007, with 3 birds testing positive for the virus, however, all other cases detected since have been travel related in both 2014 and 2018. It is anticipated that West Nile Virus will be found in Oregon again in 2026, although the likelihood of the disease being detected in Clackamas County is low, with most disease incidence occurring in the eastern and southern parts of the state².

Clackamas County Vector Control District Surveillance Program emphasizes monitoring and providing early warning for temporal and spatial activity of West Nile Virus and other emerging mosquito-borne pathogens that may cause disease. West Nile Virus is maintained in wild bird-mosquito cycles that do not depend upon infections of humans or domestic animals to persist. Surveillance and control activities focus on this maintenance cycle, which involves primarily *Culex* mosquitoes, such as the common house mosquito, *Culex pipiens*, and birds such as crows, jays, house finches and house sparrows.

Immature stages (called larvae and pupae) of *Culex* mosquitoes can be found throughout Clackamas County in a wide variety of aquatic sources, ranging from clean to highly polluted waters. Most such water is associated with rainwater detention, retention ponds, swales, storm water sumps, and other urban wastewater. Species such as *Culex pipiens*, *Culex tarsalis*, and *Culex stigmatosoma*, play an important role in the transmission cycles of West Nile Virus and other viruses in urban and suburban areas. Additional mosquitoes such as *Aedes vexans* and *Culex erythrothorax* also could be important bridge (i.e. bird to mammal) vectors in transmission. Lastly, *Aedes albopictus* and *Ae. Aegypti* mosquitoes, important vectors of Zika, dengue and chikungunya viruses in other parts of the world, have been detected in several locations in California. In 2024

Jackson County, Oregon first found *Aedes Aegypti* populations in the city of Talent and again in 2025 in the city of Ashland. This highlights the importance of monitoring for invasive mosquito species as ranges expand and climate shifts in the region.

Mosquito control is a practical method of protecting the human population from mosquito-borne diseases. There are no specific treatments or cures for many diseases transmitted by mosquitoes. Pregnant, elderly, adolescents, and immuno-compromised individuals are at the highest risk of complications of mosquito-borne diseases. West Nile Virus also kills a wide variety of native and non-native birds. Vaccine for West Nile Virus is available to protect horses that are vulnerable to severe neurological disease caused by these viruses. Mosquito-borne disease prevention strategies must be based on a well-planned integrated mosquito management (IMM) program that uses surveillance methods to detect problem areas, focus control, and evaluate operational efficacy. The primary components of an Integrated Mosquito Management program include education, cultural controls, source reduction, surveillance, and mosquito control.

Education

Citizens play an important role in reducing the number of adult mosquitoes by eliminating standing water that may support the development of immature mosquitoes. For instance, home and business owners can help by properly disposing of discarded tires, cans, or buckets; emptying plastic or unused swimming pools; and unclogging blocked rain gutters around buildings. Farmers and ranchers can be instructed to use irrigation practices that do not allow water to stand for extended periods, and wetland managers or duck club owners can work with mosquito control agencies to determine optimal flooding schedules. Educating residents to curtail outdoor activities during peak mosquito biting times, using insect repellents, and wearing long-sleeved clothing will help reduce exposure to mosquitoes. Public health officials need to be alerted if a mosquito-borne disease related case is detected, especially if the public health risk is high.

Surveillance

Surveillance includes monitoring, visualization, and analysis of data on climatic factors, immature and adult mosquito abundance. In addition, virus activity measured by testing mosquitoes and dead birds for evidence of infection. In 2025 we began sending specific species of mosquitoes to the OSU Oregon Veterinary Diagnostic Laboratory for

disease testing that had not been done since 2021, which was the only other year they were sent there for testing of West Nile Virus (WNV), Eastern Equine Encephalitis (EEE), and St. Louis Encephalitis Virus (SLE).

For zoonotic viruses such as West Nile virus, surveillance of the mosquitoes and vertebrate hosts (e.g., birds) that transmit the virus is particularly important for early warning of human disease risk. Surveillance must focus not only on mosquito-borne diseases known to exist in Oregon but be sufficiently broad to detect newly introduced arboviruses (arthropod-borne viruses). This is especially important since the recent detection of the globally important arboviral vectors, *Aedes aegypti* in Oregon in 2024 and 2025.

Climate Variation

Oregon's predictable variation in climate allows forecasting mosquito abundance and arbovirus activity by region. In eastern Oregon, most precipitation falls during winter as rain at lower elevations or as snow at higher elevations. Spring and summer temperatures then influence the rate of snow melt and runoff, mosquito population growth, the frequency of blood feeding, the rate of virus development in the mosquito, and therefore the intensity of virus transmission. In general, West Nile Virus outbreaks occurred in eastern and southern Oregon when wet winters are followed by warm summers, and outbreaks have been linked to warm, dry conditions that lead to large populations of *Culex* species of mosquitoes. Within the Willamette valley, cold wet winters are followed by temperate, wet springs that work to suppress the West Nile Virus enzootic cycle. Although climate variation may forecast conditions conducive to virus amplification, a critical sequence of events is required for amplification to reach outbreak levels. In the interest of a complete forecasting appraisal, it should be mentioned that as climate warms the two important competent vectors, *Aedes* species, will almost continue to expand their range and establish local populations in Oregon annually.

Mosquito Abundance

Mosquito abundance can be estimated through collection of immature or adult mosquitoes. The immature stages (larvae and pupae) can be collected from water sources where mosquitoes lay their eggs. A long-handled ladle ("dipper") is used to collect water

samples and the number of immature mosquitoes per "dip" can lead to an estimate of population density in each habitat. At Clackamas County Vector Control District, technicians search for new sources and inspect known habitats for mosquitoes on a 7 to 14-day cycle. These data are used to direct control operations. Maintaining careful records of immature mosquito occurrence and abundance, developmental stages treated, source sizes, and control effectiveness can be useful for estimating the expected size of future adult populations.

Adult mosquito abundance is a key factor contributing to the risk of virus transmission. Monitoring the abundance of adult mosquito populations provides important information on the size of the vector population as it responds to changing climatic factors and to control efforts. Adult sampling at Clackamas County Vector Control District uses a variety of traps based on the location, habitat, and the targeted species of mosquito. Being fluid and adjusting sampling sites in coordination with resident complaints helps to understand the county wide distribution of mosquito populations. The advantages and disadvantages of these sampling methods, and guidelines for the design, operation, and processing of the traps have been discussed in *Guidelines for Integrated Mosquito Surveillance*¹.

Mosquito Infections

Virus activity can be monitored by testing adult mosquitoes for virus infection. Because *Culex tarsalis* is the primary rural vector of West Nile Virus, and *Culex pipiens* is the primary urban vector of West Nile Virus, *Aedes vexans* are also tested. Female mosquitoes are trapped, usually using carbon dioxide-baited or gravid traps, identified to species, and counted. Then they are divided into groups (pools) of ≤ 50 females each for testing and sent to the OSU VDL⁴. The current surveillance system at Clackamas County Vector Control District is designed to detect infection with West Nile Virus. Mosquito testing typically begins early in the season and, with adequate trapping and testing effort, provides early warning of virus activity. Testing adult mosquitoes for infection is also one of the best methods to detect newly introduced or emerging mosquito-borne diseases.

Avian Infections

West Nile Virus frequently causes death in North American birds, especially those in the family Corvidae (e.g. crows, ravens, magpies, jays). Dead bird surveillance was

initiated by Clackamas County Vector Control District in 2005 to provide early detection of West Nile Virus. Dead bird surveillance has been shown to be one of the earliest and most cost-effective indicators of West Nile Virus activity where susceptible bird species are abundant and many Oregon vector control agencies promote this program. Dead birds that meet criteria for species and condition are collected by Clackamas County Vector Control District for West Nile Virus testing. Typically, an oral sample is collected by swabbing the oropharyngeal cavity of the bird and pressing the swab onto an RNA preservation card that preserves nucleic acids. The cards are analyzed for West Nile Virus RNA testing by RT-PCR. Dead bird swabs can be shipped to Oregon Veterinary Diagnostic Laboratory (OVDL) for West Nile Virus testing³. The communication and testing algorithm for the dead bird surveillance program is detailed at the Oregon Health Authority website³.

Equine Infections

Currently, equine disease due to West Nile Virus, Western Equine Encephalitis Virus (WEEV) is no longer a sensitive indicator of epizootic activity (unusually high incidence of infections in animals other than humans) in Oregon because of the widespread vaccination or natural immunization of equids (horses, donkeys, and mules). Nevertheless, confirmed cases in horses can indicate that Western Equine Encephalitis Virus or West Nile Virus has amplified to levels where tangential transmission has occurred and risk to humans is elevated in that region of the state. Numerous infectious and non-infectious causes, including other mosquito-borne viruses, can contribute to encephalitis and neurologic signs in horses. Testing of equine specimens for these possible etiologies is available through the Oregon Veterinary Diagnostic Laboratory (OVDL). Complete information on specimen collection and submission is available on the Oregon Veterinary Diagnostic Laboratory (OVDL) website at:

<http://vetmed.oregonstate.edu/diagnostic/available-tests>.

Human Infections

Local mosquito control agencies need information from the rapid detection and reporting of confirmed human cases to plan and implement emergency control activities to prevent additional infections. However, human cases of arboviral infection are an insensitive surveillance indicator of virus activity because most people who become

infected develop no or mild symptoms. For those individuals who do become ill, it may take up to two weeks for symptoms to appear, followed by additional time until the case is recognized and reported. Overall, the total number of cases of West Nile Virus have remained relatively low in Oregon. No human cases of St. Louis Encephalitis Virus or Western Equine Encephalitis Virus have been reported in Oregon in recent years, agreeing with negative enzootic surveillance findings. Development of this section is just beginning with relevant agencies. However, Clackamas County Vector Control District does periodically contact Oregon Health Authority for human case updates² as well as the Clackamas County Public Health Division regarding West Nile Virus human case prevalence.

Mosquito Control

Problems detected by surveillance are mitigated through source reduction and larval and adult mosquito control. Mosquito control is the only public health method of protecting people from mosquito-borne diseases. Mosquito control in Oregon is conducted by approximately 20 local agencies, including mosquito and vector control districts, county environmental and health departments, and county agriculture departments. Agencies applying pesticides directly to a water of the United States, or where deposition may enter a water of the United States, must obtain a National Pollutant Discharge Elimination System (NPDES) Permit for Biological and Residual Pesticide Discharges to Waters of the United States from Vector Control Applications (Vector Control Permit). Agencies must comply with provisions of the permit.

<http://www.oregon.gov/deq/wq/wqpermits/Pages/Pesticide.aspx> Compounds currently approved for larval and adult mosquito control in Oregon are listed in *Appendix 4*.

The Clackamas County Vector Control District uses an Integrated Mosquito Management (IMM) approach to control mosquito vector populations. Integrated mosquito management programs incorporate multiple modalities to accomplish their ultimate goals. For the District, the modalities include cultural control, physical control, biological control and chemical control. Cultural control includes an informed public that takes precautions to protect themselves and their neighbors from mosquito-borne disease. Specific cultural control actions would include dumping rainwater-filled pots, keeping drainage channels open, repairing window screens, wearing mosquito repellent, and

sharing information that empowers others to protect themselves. Physical control includes careful planning of watershed drainage systems, maintenance of storm water retention ponds and swales, proper design of artificial ponds and wetlands, and creating positive collaborative relationships with governmental agencies and private property owners that have jurisdiction and responsibility for any of these physical systems. Biological control includes using mosquito-eating fish (*Gambusia affinis*) to control larval mosquito populations in a select class of water containment systems, including animal watering troughs, private ornamental ponds, and similar aquatic habitats. Water containment systems receiving mosquito fish cannot drain into the greater Willamette watershed. Chemical control includes the use of bacterial toxins and growth hormone mimics that target larval mosquitoes directly in their aquatic environments. It also includes the use of a broad range of relatively benign insecticides to control adult mosquitoes. Bacterial toxins are dispersed as small blocks or pellets directly into the aquatic habitat where they dissolve and are ingested by larval mosquitoes, causing disruption of the digestive membrane and a subsequent lethal leakage effect within the larval gut. The growth hormone products are also dispersed as solid blocks or pellets that dissolve slowly in the aquatic environment, releasing a juvenile hormone that effectively prevents the larvae from developing into adult mosquitoes. Another useful larval suppressant is a monomolecular surface film, sprayed in small amounts onto larval habitats that are extremely enriched in organic debris (dairy milking ponds, septic tanks, etc.). These films essentially asphyxiate all aquatic organisms that breathe through the water surface and can have unintended non-target effects. Thus, surface films are only occasionally used in very specific larval habitats. Adult mosquito control is achieved using relatively benign insecticides that include pyrethroids, a class of insecticides that degrade rapidly in the environment and can be applied in residential settings as a barrier spray. Other adult insecticides with similar rapid degradation properties are also used, including environmentally friendly blends of essential plant extracts, e.g., mint oil blends.

Response Levels

The Clackamas County Vector Control District Mosquito-borne Virus Surveillance and Response Plan was developed to provide a semi-quantitative measure of

virus transmission risk to humans that could be used by staff and other local mosquito control agencies to plan and modulate control activities. Independent models are presented for Western Equine Encephalitis Virus, St. Louis Encephalitis Virus and West Nile Virus to accommodate the different ecological dynamics of these viruses⁵. Models for other mosquito-borne diseases perpetuated by invasive mosquito species are being developed but are not presented here. St. Louis Encephalitis Virus and West Nile Virus are closely related, require similar environmental conditions, and employ the same *Culex* vectors. Seven surveillance factors are measured and analyzed to determine the level of risk for human involvement and thereby gauge the appropriate response level:

1. Environmental or climatic conditions (snowpack, rainfall, temperature, season)
2. Adult *Culex* vector abundance
3. Virus infection rate in *Culex* mosquito vectors
4. Sentinel chicken seroconversions
5. Fatal infections in birds (West Nile Virus only)
6. Infections in humans
7. Proximity of detected virus activity to urban or suburban regions (Western Equine Encephalitis Virus only)

Each factor included is scored on an ordinal scale from 1 (lowest risk) to 5 (highest risk). The mean score calculated from these factors corresponds to a response level as follows: normal season (1.0 to 2.5), emergency planning (2.6 to 4.0), and epidemic (4.1 to 5.0).

Table 1 provides

a worksheet to assist in determining the appropriate rating for each of the risk factors for each of the three viruses. Surveillance data can be managed and risk level calculated in time and space using computer models such as the Surveillance Gateway in California¹.

Risk calculations should be applied within a defined area, typically encompassing a local mosquito and vector control district. Use of smaller spatial units (e.g., city boundaries) is ideal due to spatial variation in virus activity. Due to spatial variation in the distributions of humans and the dominant vector species, *Cx. tarsalis* and the *Cx. pipiens* complex, separate calculation of risk for urban and rural areas is encouraged where applicable.

For surveillance factor 2 (vector abundance), abundance is expressed as a percentage of normal by comparing the current level for an area to the average over the previous 5 years for the same area and two-week period. The mosquito virus infection rate should be calculated using the most recent data (prior two week period) and expressed as the minimum infection rate (MIR) per 1,000 female mosquitoes tested. Calculations may also use maximum likelihood estimates that account for varying numbers of specimens in pools and the possibility that more than one mosquito could be infected in each positive pool when infection rates are high. For West Nile Virus and St. Louis Encephalitis Virus, risk may be estimated separately for *Cx. tarsalis* and the *Cx. pipiens* complex, respectively, because these species generally have different habitat requirements and therefore spatial distributions (e.g., rural vs. urban).

Each of the three viruses differs in its response to ecological conditions. Western Equine Encephalitis Virus activity typically is greatest during El Niño conditions of wet winters, excessive run-off and flooding, cool springs, and increased *Culex tarsalis* abundance. In contrast, St. Louis Encephalitis Virus and perhaps West Nile Virus activity appears to be greatest during La Niña conditions of drought and hot summer temperatures, because both St. Louis Encephalitis Virus and West Nile Virus transmission risk increases when temperatures are above normal. Abundance and infection of the *Culex pipiens* complex are included in both St. Louis Encephalitis Virus and West Nile Virus estimates of risk because these mosquito species are important vectors, particularly in suburban/urban environments. The occurrence of dead bird infections is included as a risk factor in the West Nile Virus calculations. For surveillance factors 4-6 (chickens, birds, humans), the specific region is defined as the area within the agency's boundary and the broad region includes the area within 150 miles (~241 km) of the agency's boundary.

Proximity of virus activity to human population centers is considered an important risk factor for all three viruses of public health concern. In the risk assessment model in Table 1 this was accommodated in two different ways. Western Equine Encephalitis Virus transmitted by *Culex tarsalis* typically amplifies first in rural areas and may eventually spread into small and then larger communities. A risk score was included to account for where virus activity was detected. West Nile Virus and St. Louis Encephalitis

Virus may be amplified concurrently or sequentially in rural and urban cycles. The rural cycle is similar to Western Equine Encephalitis Virus and is transmitted primarily by *Cx. tarsalis*, whereas the urban cycle is transmitted primarily by members of the *Culex pipiens* complex. If the spatial distributions of key *Culex* species differ within an area (e.g., rural vs. urban), it may be advantageous to assess risk separately by species for abundance and infection rates in *Cx. tarsalis* and the *Cx. pipiens* complex. This would result in two estimates of overall risk for the areas dominated by each species.

Each of these surveillance factors can differ in impact and significance according to time of year and geographic region. Climate is used prospectively to forecast risk during the coming season. Climatic factors provide the earliest indication of the potential for increased mosquito abundance and virus transmission and constitute the only risk factor actually measured from the start of the calendar year through mid-spring when enzootic surveillance commences in most areas. Other factors that may inform control efforts as the season progresses are typically in chronological order: mosquito abundance, infections in non-humans (e.g., dead birds for West Nile Virus, mosquitoes, sentinel chickens), and infections in humans. Enzootic indicators measure virus amplification within the *Culex*-bird cycle and provide nowcasts of risk, whereas human infections document tangential transmission and are the outcome measure of forecasts and nowcasts. Response to the calculated risk level should consider the time of year; e.g., epidemic conditions in October would warrant a less aggressive response compared to epidemic conditions in July because cooler weather in late fall will contribute to declining risk of arbovirus transmission.

The ratings listed in Table 1 are benchmarks only and may be modified as appropriate to the conditions in each specific region or biome of the state. Calculation and mapping of risk have been enabled by tools for local agency use included in the CalSurv Gateway. Roles and responsibilities of key agencies involved in carrying out the surveillance and response plan are outlined in “Key Agency Responsibilities.”

Table 1. Mosquito-borne Virus Risk Assessment.

| West Nile Virus Surveillance Factor Assessment | Assessment Value | Benchmark | Assigned Value |
|--|------------------|--|----------------|
| Environmental Conditions High-risk environmental conditions include above-normal temperatures with or without above-normal rainfall, runoff, or snowpack. | 1 | Avg daily temperature during prior 2 weeks ≤ 56 °F | |
| | 2 | Avg daily temperature during prior 2 weeks 57 – 65 °F | |
| | 3 | Avg daily temperature during prior 2 weeks 66 – 72 °F | |
| | 4 | Avg daily temperature during prior 2 weeks 73 – 79 °F | |
| | 5 | Avg daily temperature during prior 2 weeks > 79 °F | |
| Adult <i>Cx.pipiens</i> relative abundance Determined by trapping adults, enumerating them by species, and comparing numbers to those previously documented for an area for the prior 2-week period. | 1 | Vector abundance well below average ($\leq 50\%$) | |
| | 2 | Vector abundance below average (51 - 90%) | |
| | 3 | Vector abundance average (91 - 150%) | |
| | 4 | Vector abundance above average (151 - 300%) | |
| | 5 | Vector abundance well above average ($> 300\%$) | |
| Virus infection rate in <i>Cx. pipiens</i> Mosquitoes Tested in pools of 50. Test results expressed as minimum infection rate per 1,000 female mosquitoes tested (MIR) for the prior 2-week period. | 1 | MIR = 0 | |
| | 2 | MIR = 0.1 - 1.0 | |
| | 3 | MIR = 1.1 - 2.0 | |
| | 4 | MIR = 2.1 - 5.0 | |
| | 5 | MIR > 5.0 | |
| Sentinel chicken seroconversion Number of chickens in a flock that develop antibodies to West Nile Virus during the prior 2-week period. If more than one flock is present in a region, number of flocks with seropositive chickens is an additional consideration. Typically 10 chickens per flock. | 1 | No seroconversions in broad region | |
| | 2 | One or more seroconversions in broad region | |
| | 3 | One or two seroconversions in a single flock in specific region | |
| | 4 | More than two seroconversions in a single flock or two flocks with one or two seroconversions in specific region | |
| | 5 | More than two seroconversions per flock in multiple flocks in specific region | |
| Dead bird infection Number of birds that have tested positive (recent infections only) for West Nile Virus during the prior 3-month period. This longer time period reduces the impact of zip code closures during periods of increased West Nile Virus transmission. | 1 | No positive dead birds in broad region | |
| | 2 | One or more positive dead birds in broad region | |
| | 3 | One positive dead bird in specific region | |
| | 4 | Two to five positive dead birds in specific region | |
| | 5 | More than five positive dead birds in specific region | |
| Human cases Do not include this factor in calculations if no cases are detected in region. | 3 | One or more human infections in broad region | |
| | 4 | One human infection in specific region | |
| | 5 | More than one human infection in specific region | |

| | | | |
|--|--|--|---------|
| Response Level / Average Rating | | | TOTAL |
| Normal Season (1.0 to 2.5) | | | |
| Emergency Planning (2.6 to 4.0) | | | |
| Epidemic (4.1 to 5.0) | | | AVERAGE |
| | | | |

General suggestions for applying the risk assessment model at the county, city, or local level

- Use a consistent time period for environmental conditions, adult mosquito abundance, mosquito infection rates, and human cases. If you use a period that differs from the prior two-week period defined in the risk assessment, such as the prior month, use the same period for all other relevant measures. Note that sentinel chicken seroconversions may need special treatment to accommodate bleeding schedules and dead bird data need to accommodate zip code closures. For sentinel seroconversions, use data from the most recent collection.
- If you have multiple trap types in your surveillance program, determine the vector abundance anomaly (Table 1) for each trap type and species and use the most sensitive trap type’s value in the risk assessment, with trap sensitivity being defined as the most attractive to the species of interest in each location.
- When determining the vector abundance anomaly, there should be at least two and preferably five years of prior data to provide a comparative baseline for the trap type. Ideally, the prior years should use the same or very similar trap locations. If mosquito breeding occurs continuously, as it might with increasing temperatures due to climate change, analysis of data from previous years should use the same or very similar trap locations and immediately precede the time being evaluated.

Characterization of Conditions and Responses for Clackamas County Vector Control District and other agencies (*Note: this section will be evaluated in the future as well as CCVCD continues to use scientifically relevant and updated methods.)

Level 1: Normal Season

Risk rating: 1.0 to 2.5

CONDITIONS

- Cool to moderate seasonal temperatures (< 65°F)
- *Culex* mosquito abundance at or below five-year average (key indicator vector adults)
- No virus infection detected in mosquitoes
- No seroconversions in sentinel chickens
- No recently infected West Nile Virus -positive dead birds
- No human cases

RESPONSE

- Conduct routine public education (eliminate standing water around homes, use personal protection measures)
- Conduct routine mosquito and virus surveillance activities
- Comply with National Pollutant Discharge Eliminations System (NPDES) permit if applying pesticides to waters of the United States
- Conduct routine mosquito control with emphasis on larval control
- Inventory pesticides and equipment
- Evaluate pesticide resistance in vector species
- Ensure adequate emergency funding
- Release routine press notices
- Send routine notifications to physicians and veterinarians
- Establish and maintain routine communication with local office of emergency services personnel; obtain Standardized Emergency Management System (SEMS) training

Level 2: Emergency Planning

Risk rating: 2.6 to 4.0

CONDITIONS

- Temperature above average (66–79°F)
- Adult *Culex* mosquito abundance greater than 5-year average (150% to 300% above normal)
- One or more virus infections detected in *Culex* mosquitoes (MIR < 5 per 1,000 tested)
- One or more seroconversions in single flock or one to two seroconversions in multiple flocks in specific region
- One to five recently infected West Nile Virus -positive dead birds in specific region
- One human case in broad or specific region
- Western Equine Encephalitis Virus detected in small towns or suburban area

RESPONSE

- Review epidemic response plan
- Enhance public education (include messages on the signs and symptoms of encephalitis; seek medical care if needed; inform public about pesticide applications if appropriate)
- Enhance information to public health providers
- Conduct epidemiological investigations of cases of equine or human disease
- Increase surveillance and control of mosquito larvae
- Increase adult mosquito surveillance
- Increase number of mosquito pools tested for virus
- Conduct or increase localized chemical control of adult mosquitoes as appropriate
- Contact commercial applicators in anticipation of large scale adulticiding
- Review candidate pesticides for availability and susceptibility of vector mosquito species

- Ensure notification of key agencies of presence of viral activity, including the local office of emergency services

Level 3: Epidemic Conditions

Risk rating: 4.1 to 5.0

CONDITIONS

- Temperature well above average ($> 79^{\circ}\text{F}$)
- Adult vector population extremely high ($> 300\%$ above normal)
- Virus infections detected in multiple pools of *Culex tarsalis* or *Cx. pipiens* mosquitoes (MIR > 5 per 1,000 tested)
- More than two seroconversions per flock in multiple flocks in specific region
- More than five recently infected West Nile Virus -positive dead birds and multiple reports of dead birds in specific region
- More than one human case in specific region
- Western Equine Encephalitis Virus detection in urban or suburban areas

RESPONSE

- Conduct full-scale media campaign
- Alert physicians and veterinarians to expect cases
- Conduct active human case detection
- Conduct epidemiological investigations of cases of equine or human disease
- Continue enhanced larval surveillance and control of immature mosquitoes
- Broaden geographic coverage of adult mosquito surveillance
- Accelerate adult mosquito control as appropriate by ground and/or air
- Coordinate the response with the local Office of Emergency Services or if activated, the Emergency Operation Center (EOC)
- Initiate mosquito surveillance and control in geographic regions without an organized vector control program

- Determine whether declaration of a local emergency should be considered by the County Commissioners (or Local Health Officer)
- Determine whether declaration of a “State of Emergency” should be considered by the Oregon Governor at the request of designated county or city officials
- Ensure state funds and resources are available to assist local agencies at their request
- Determine whether to activate a Standardized Emergency Management System (SEMS) plan at the local or state level
- Continue mosquito education and control programs until mosquito abundance and enzootic virus activity is substantially reduced and no additional human cases are detected

Key Agency Responsibilities

Clackamas County Vector Control District and other local Mosquito and Vector Control Agencies

- Acquire and interpret local climate and weather data.
- Monitor abundance of immature and adult mosquitoes.
- Collect and submit mosquito pools for virus detection at OSU Oregon Veterinary Diagnostic Laboratory.
- Pick-up and sample dead birds by oral swabs using RNA preservation cards for West Nile Virus testing at OSU Oregon Veterinary Diagnostic Laboratory.
- Update the Clackamas County Vector Control District database and any other relevant databases such as VectorSurv.
- Conduct routine control of immature mosquitoes.
- Comply with National Pollution Discharge Elimination System permit if applying pesticides to waters of the United States.
- Conduct control of adult mosquitoes when needed.
- Educate public on mosquito avoidance and reduction of mosquito breeding sites.
- Coordinate with local Office of Emergency Services personnel.
- Communicate regularly with neighboring agencies.

Mosquito and Vector Control Association of Oregon

- Receive, track, and disburse payment for mosquito surveillance expenses.
- Coordinate surveillance and response activities among member agencies.
- Serve as spokesperson for member agencies.
- Establish liaisons with press and government officials.

Oregon Health Authority Vector Borne Disease Section

- Collate adult mosquito abundance data submitted by local agencies; provide summary of data to local agencies.
- Maintain a West Nile Virus information and dead bird reporting system:
<https://public.health.oregon.gov/DiseasesConditions/DiseasesAZ/WestNileVirus/Pages/wnvprevent.aspx> .
- Coordinate submission of specimens for virus testing.
- Provide supplies for sentinel chicken diagnostic specimens.
- Test sentinel chicken sera for viral antibodies.
- Test human specimens for viruses.
- Distribute a weekly bulletin summarizing surveillance test results.
- Report weekly surveillance results to the Centers for Disease Control and Prevention ArboNET surveillance system.
- Immediately notify local vector control agency and public health officials when evidence of virus activity is found.
- Conduct epidemiological investigations of cases of human disease.
- Coordinate and participate in a regional emergency response in conjunction with Oregon Emergency Management Agency.
- Conduct surveillance for human cases.
- Provide oversight to local jurisdictions without defined vector-borne disease control program.
- Maintain inventory of antigens, antisera, and RNA assays to detect exotic viruses.
- Provide confirmation of tests done by local agencies.

End of Mosquito-Borne Virus Surveillance and Response Plan

Training and Professional Development

All Clackamas County Vector Control District permanent and seasonal staff must pass an Oregon Department of Agriculture Public Pesticide Applicator Licensing test, including excellence in general pesticide safety and pesticide laws, and a section specific to the safe delivery of public health pesticides. To keep their license current, all staff must accumulate yearly quotas of continuing educational units. These units are awarded by attendance at relevant meetings and virtual or in person accredited continuing education credits approved by the Oregon Department of Agriculture (ODA). Permanent staff are encouraged to attend regional and national meetings focused on the biology and control of vector-borne diseases, including any technological breakthroughs, and the District offers financial support for these activities. Specialized training in mosquito identification and surveillance, public education and community outreach, equipment maintenance and use, and other training will be provided to staff as needs are identified. Clackamas County Vector Control District supports advanced professional development with college tuition assistance as budgetary constraints allow.

Public Education

A professional, well-organized public education program is an essential part of all District vector-borne disease prevention and vector control programs. The District is contracted with a local public relations firm. This partnership has allowed the District and its mission to reach a large audience of stakeholders throughout Clackamas County and beyond. Deliverables include electronic media, social media informational updates, District Calendars, other give-away items, and a website (www.fightthebites.com).

Public education is crucial to prevent mosquito-borne disease transmission. When residents understand mosquito habitats and behaviors, they are empowered to make decisions that protect their families and neighbors from vector-borne diseases such as West Nile Virus and other emerging mosquito-borne diseases. The Clackamas County

Vector Control District website gives simple, actionable advice that residents can use to stop the breeding of mosquitoes in their immediate environments.

With invasive mosquito species that possibly carry different vector-borne diseases public education will be of even greater importance which is why CCVCD is actively updating our information we disseminate to the residents of Clackamas County. While some native mosquitoes prefer large open wetlands; the invasive mosquitoes that may transmit other mosquito-borne diseases can breed in very small containers of water, a common occurrence in many yards. Please see the 2025 Annual Report for educational program details.

Glossary/Acronyms

| | |
|---------------------------------------|--|
| Adulticide | Insecticides used to kill adult mosquitoes. All must be approved by EPA and state |
| Arboviral | Having to do with arthropods that transmit viruses affecting humans and other animals |
| 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 |
| epizootic | Relating to or denoting a disease that is temporarily prevalent and widespread in an animal population. |
| 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 |
| PCR | Polymerase chain reaction: a technique used in molecular biology to amplify a single copy or a few copies of a segment of DNA across several orders of magnitude, generating thousands to millions of copies of a particular DNA sequence. |
| 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 (RAMP), a test used to detect WNV in mosquitoes and dead birds. The RAMP system is an immunoassay test for West Nile virus (WNV) detection. RAMP uses WNV-specific antibodies, conjugated to fluorescent latex particles, to determine the status of a sample. For details see https://www.ncbi.nlm.nih.gov/pubmed/22855771 |
| RT-PCR | Real time polymerase chain reaction: RT-PCR is used to clone expressed genes by reverse transcribing the RNA of interest into its DNA complement using reverse transcriptase. Subsequently, the newly synthesized cDNA is amplified using traditional PCR. |

| | |
|-----------------|---|
| 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 |
| Zoonosis | Zoonosis are infectious diseases of animals (usually vertebrates) that can naturally be transmitted to humans. Includes Ebola, salmonella, Zika, WNV, Dengue, Lyme Disease and many others. |

References cited

1. California Department of Public Health, Vector Borne Disease Section
<https://www.cdph.ca.gov/programs/vbds/Pages/default.aspx>
2. Oregon Health Authority West Nile Archive
<https://public.health.oregon.gov/DiseasesConditions/DiseasesAZ/WestNileVirus/Pages/survey.aspx>
3. Oregon Health Authority WNV reporting page
<https://public.health.oregon.gov/DiseasesConditions/DiseasesAZ/WestNileVirus/Pages/clinicians.aspx>
4. Oregon State University Veterinary Diagnostic Laboratory
<http://vetmed.oregonstate.edu/diagnostic>
5. Barker, C. M., W. K. Reisen, and V. L. Kramer. 2003. California State Mosquito-borne Virus Surveillance and Response Plan: A retrospective evaluation using conditional simulations. Am. J. Trop. Med. Hyg. 68: 508-518.

Appendix 1

Proposed Budget for Fiscal Year 2026-2027

GENERAL FUND

PERSONNEL SERVICES (8 FTE) \$1,043,500

Retirement (PERS & Deferred Comp)
Social Security, Medicare & Unemployment
State Compensation (SAIF)
Health Insurance
Tri Met Tax
Wages & Salaries (8 FTE)

MATERIALS AND SERVICES \$995,000

Materials & Services
Contractual Services
Publishing, Dues, & Travel
Elections
Applied Research
Professional Development

CAPITAL OUTLAY \$150,000

Buildings & Land
Office & Lab Equipment
Vehicles & Vehicle Equipment
New Facility Renovation

OPERATING CONTINGENCIES \$150,000

UNAPPROPRIATED FUND \$2,188,500

Total Requirements General Fund \$6,287,584

RESERVE FUND (Land/Buildings)

Total Requirements Reserve Fund \$6,222,751

Capital Outlay New Facility Renovation
Reserve for Future Expenditure (RFE)

Note: The District follows Oregon budget law. The actual budget for FY26-27 will be adopted by the District's Board in June, 2026.

Appendix 2

Integrated Mosquito Management

The Clackamas County Vector Control District uses an Integrated Mosquito Management (IMM) approach to control mosquito vector populations. Integrated pest management programs incorporate multiple modalities to accomplish their ultimate goals. For the District, the modalities include cultural control, physical control, biological control and chemical control. Cultural control includes an informed public that takes precautions to protect themselves and their neighbors from mosquito borne disease. Specific cultural control actions would include dumping rainwater-filled pots, keeping drainage channels open, repairing window screens, wearing mosquito repellent, and sharing information that empowers others to protect themselves. Physical control includes careful planning of watershed drainage systems, maintenance of storm water retention ponds and swales, proper design of artificial ponds and wetlands, and creating positive collaborative relationships with governmental agencies and private property owners that have jurisdiction and responsibility for any of these physical systems. Biological control includes using mosquito-eating fish to control larval mosquito populations in a select class of water containment systems, including animal watering troughs, private ornamental ponds, and similar aquatic habitats. Water containment systems receiving mosquito fish cannot drain into the greater Willamette watershed. Chemical control includes the use of bacterial toxins and growth hormone mimics that target larval mosquitoes directly in their aquatic environments. It also includes the use of a broad range of relatively benign insecticides to control adult mosquitoes. Bacterial toxins are dispersed as small blocks or pellets directly into the aquatic habitat where they dissolve and are ingested by larval mosquitoes, causing disruption of the digestive membrane and a subsequent lethal leakage effect within the larval gut. The growth hormone products are also dispersed as solid blocks or pellets that dissolve slowly in the aquatic environment, releasing a juvenile hormone that effectively prevents the larvae from developing into adult mosquitoes. Another useful larval suppressant is a monomolecular surface film, sprayed in small amounts onto larval habitats that are extremely enriched in organic debris (dairy milking ponds, septic tanks, etc.). These films essentially asphyxiate all aquatic organisms that breath through the water surface and can have unintended non-target effects. Thus, surface films are only occasionally used in very specific larval habitats. Adult mosquito control is achieved using relatively benign insecticides that include pyrethroids, a class of insecticides that degrade rapidly in the environment and can be applied in residential settings as a barrier spray. Other adult insecticides with similar rapid degradation properties are also used, including environmentally friendly blends of essential plant extracts, e.g., mint oil blends.

Integrated Mosquito Management methods suggest an approach to each instance of mosquito control that follows a series of steps. The first step (after mosquitoes have been positively detected at a given site) is to ask if cultural controls can be implemented to solve the problem of excessive abundance of mosquitoes. If cultural controls are not possible then physical controls are suggested, sometimes simultaneously. If stakeholders need immediate action (with cultural and/or physical controls to follow), then biological and/or chemical control actions may be indicated.

The following principles are to be followed when:

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 3

Key Agencies / Clackamas County Vector District

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.fightthebites.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/wmile/index.cfm
- Oregon Department of Agriculture, (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

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. Larvicides will be used by the District. Complete product information, including details for use, labels and material safety data sheets, are available on vendor websites or can be obtained directly from CCVCD. Also see Pesticide Use Plan for annual updates on pesticides used.

Adulticides

These insecticides are applied into the air to kill flying mosquitoes when there is an imminent risk to public health. Perimeter sprays are included as these are commonly used by request of residents on private property if they meet thresholds set by CCVCD for the number of vector and nuisance species. Complete product information, including details for use, labels and material safety data sheets, are available on vendor websites or can be obtained directly from CCVCD. Also see Pesticide Use Plan for annual updates on pesticides used.

**Note: All larvicides and adulticides used by the District will be Environmental Protection Agency 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.*