FINAL

MUNICIPAL SERVICE REVIEWS AND SPHERE OF INFLUENCE PLANS
FOR
THE MOSQUITO ABATEMENT DISTRICTS WITHIN BUTTE COUNTY:

BUTTE COUNTY MOSQUITO AND VECTOR CONTROL DISTRICT
DURHAM MOSQUITO ABATEMENT DISTRICT
OROVILLE MOSQUITO ABATEMENT DISTRICT

PREPARED BY:
THE BUTTE LOCAL AGENCY FORMATION COMMISSION
ADOPTED DECEMBER 7, 2017

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MUNICIPAL SERVICE REVIEWS AND SPHERE OF INFLUENCE PLANS FOR MOSQUITO ABATEMENT DISTRICTS IN BUTTE COUNTY

LAFCO

Established in 1963, Local Agency Formation Commissions (LAFCo) are responsible for administering California Government Code Section 56000 *et. seq.*, which is known as the Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000 (CKH). CKH charges LAFCOs with encouraging the orderly formation and development of all local governmental agencies in their respective counties in a manner that preserves agricultural and open-space lands, promotes the efficient extension of municipal services, and prevents urban sprawl. Principle duties include regulating boundary changes through annexations or detachments, approving or disapproving city incorporations; and forming, consolidating, or dissolving special districts. There is a LAFCo located in each of the 58 counties in California.

Spheres of Influence

Under the CKH Act, LAFCos are required to "develop and determine the sphere of influence of each local governmental agency within the county and enact policies designed to promote logical and orderly development of areas within the sphere" (Section 56425, CKH). A Sphere of Influence (SOI) is generally considered a 20-year, long-range planning tool, and is defined by Government Code Section 56425 as ". . . a plan for the probable physical boundary and service area of a local agency. . .." The sphere indicates the logical area in which the jurisdiction anticipates services will be needed and can be provided. According to the CHK Act, LAFCos are required to, as necessary, review and update SOIs every five years.

A Sphere of Influence is a long-range planning tool that analyzes the physical boundary of a local agency or jurisdiction, and the present and probable need for services within that area. As such, it does not give property inside the sphere boundary any more development rights than already exist as land use authority in these areas remains entirely at the discretion of the County of Butte. Realistically, an agency's SOI is solely reactive to the land use decisions already adopted by the agencies with land use authority. Ultimately, an SOI study assists LAFCo in making decisions about a change in a jurisdiction's future service area boundary.

Butte LAFCo policies allow for different categories of spheres of influence including:

- *"**Growth**"* spheres that are larger than an agency's jurisdictional boundaries and anticipates a need to expand services to new territory;
- *"**Coterminous**"* spheres which mirror the agency's jurisdictional boundaries and indicates no additional service expansions are needed or an inability to expand services; and
- "***Zero***" spheres, which indicate the agency cannot or does not provide any services and should be considered for a merger or dissolved altogether.

- A "***minus***" sphere when it has determined that some territory within the agency's jurisdictional boundaries is not in need of all or some of the agency's services, or when the agency has not feasible plans to provide efficient and adequate service to the territory in question.
- A "***limited* or *service specific***" sphere designation for territory outside the agency's jurisdiction that may require some-but not all-of the services that the agency is authorized to provide.

Establishing the appropriate sphere category can be challenging as individual circumstances can vary between agencies. City spheres, which may convey future land use entitlements, are more scrutinized for growth impacts than a mosquito abatement district. Although a helpful tool for future planning, a sphere of influence determination does not convey any specific entitlements to landowners nor require an agency to guarantee services should priorities change.

Pursuant to Butte LAFCo's Operations Manual Policies and Procedures, the Sphere of Influence Plans for all government agencies within LAFCo's jurisdiction shall contain the following:

1. A map defining the probable 20-year boundary of its service area and coordinated with the Municipal Service Review.
2. Maps and explanatory text delineating the present land uses in the area, including, without limitation, improved and unimproved parcels; actual commercial, industrial, and residential uses; agricultural and open space lands; and the proposed future land uses in the area.
3. The present and probable need for public facilities and services in the sphere area. The discussion should include consideration of the need for all types of major facilities, not just those provided by the agency.
4. The present capacity of public facilities and adequacy of public services which the agency provides or is authorized to provide.
5. Identification of any relevant social or economic communities of interest in the area.
6. Existing population and projected population at build-out of the near- and long-term spheres of the agency.
7. A Municipal Service Review.

Municipal Service Reviews

The Cortese-Knox-Hertzberg Act requires that a Municipal Service Review (MSR) be conducted prior to, or in conjunction with, the adoption or update of an SOI plan. A MSR is a comprehensive analysis of service provision by each of the special districts, cities, and the unincorporated county service areas within the legislative authority of the LAFCo. It essentially evaluates the capability of a jurisdiction to serve its existing residents and future development in its SOI. The legislative authority for conducting MSRs is provided in Section 56430 of the CKH Act, which states ". . . in order to prepare and to update Spheres of Influence in accordance with Section 56425, LAFCos are required to conduct a MSR of the municipal services provided in the County..."

Pursuant to Section 56430, in order to update a SOI, the associated MSR must have written determinations that address the following factors:

1. Growth and population projections for the affected area.
2. The location and characteristics of any disadvantaged unincorporated communities within or contiguous to the sphere of influence.
3. Present and planned capacity of public facilities, adequacy of public services, and infrastructure needs or deficiencies including needs or deficiencies related to sewers, municipal and industrial water, and structural fire protection in any disadvantaged, unincorporated communities within or contiguous to the sphere of influence.
4. Financial ability of agencies to provide services.
5. Status of, and opportunities for, shared facilities.
6. Accountability for community service needs, including governmental structure and operational efficiencies.
7. Any other matter related to effective or efficient service delivery, as required by commission policy.

These determinations must be determined by the Commission before, or concurrently with, the sphere review and update for the mosquito abatement districts in Butte County.

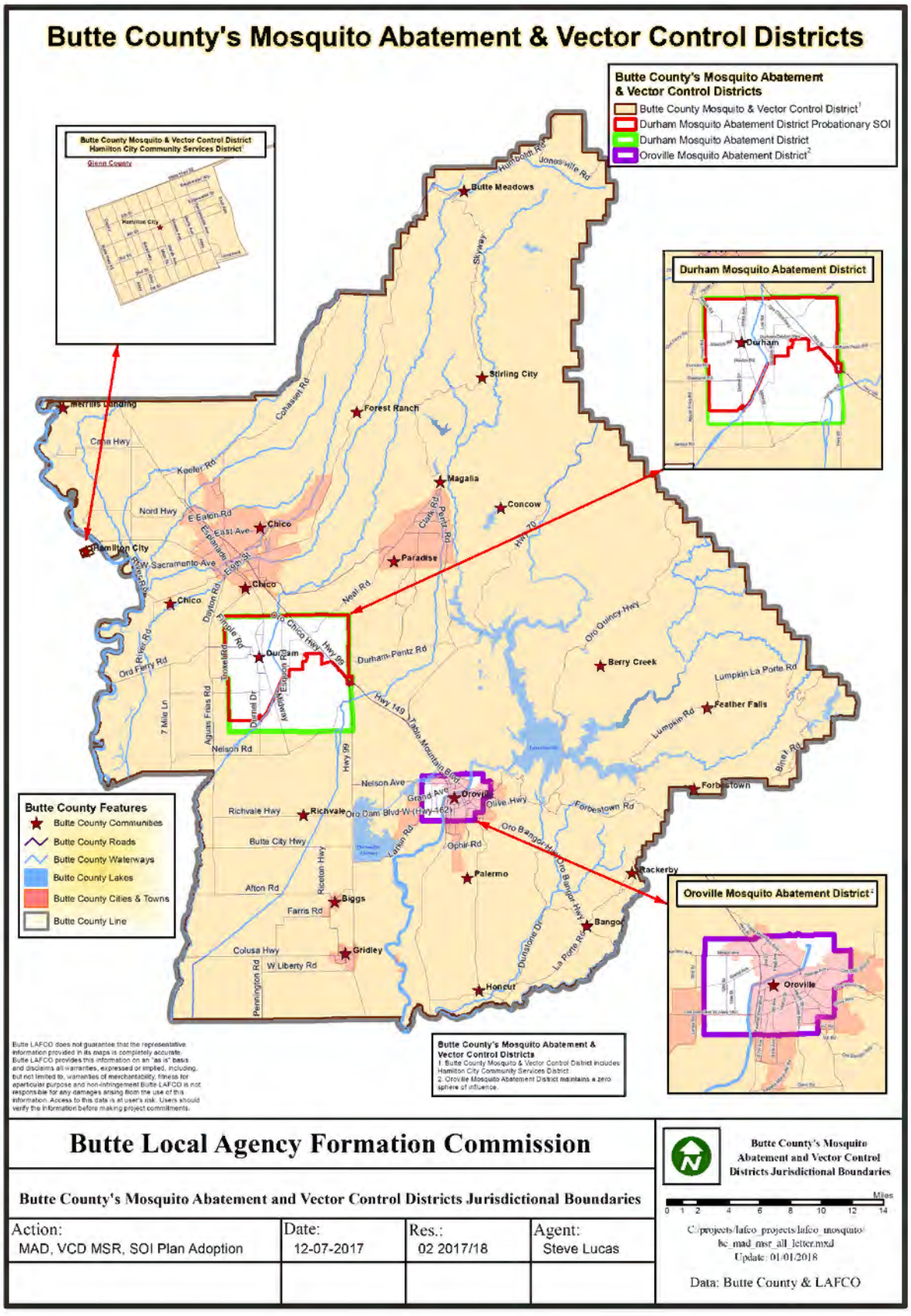
MOSQUITO ABATEMENT DISTRICTS IN BUTTE COUNTY

There are three mosquito abatement districts in Butte County:

- The Butte County Mosquito and Vector Control District (BCMVCD), formed in 1948.
- The Durham Mosquito Abatement District (DMAD), formed in 1918.
- The Oroville Mosquito Abatement District (OMAD), formed in 1916.

The Durham Mosquito Abatement District encompasses the unincorporated community of Durham and the immediate surrounding area, while the Oroville Mosquito Abatement District encompasses a large portion of the City of Oroville and the immediate surrounding area, including the unincorporated community of Thermalito. The Butte County Mosquito and Vector Control District encompasses all of Butte County, excluding the parcels within the Durham and Oroville Mosquito Abatement Districts. The Butte County Mosquito and Vector Control District also includes the unincorporated community of Hamilton City in Glenn County.

The Butte County Mosquito and Vector Control is a large, full service mosquito and vector control district with numerous full-time and seasonal employees, and has a wide range of equipment, including three airplanes used for aerial spraying operations. BCMVCD has annual revenues in excess of $3.5 million and expenditures in excess of $4.3 million.


Butte County's Mosquito Abatement & Vector Control Districts
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Butte County's Mosquito Abatement & Vector Control Districts
1. Butte County Mosquito & Vector Control District includes Hamilton City Community Services District.
2. Oroville Mosquito Abatement District maintains a zero sphere of influence.
Butte LAFCO does not guarantee that the representative information provided in its maps is completely accurate. Butte LAFCO provides this information on an "as is" basis and disclaims all warranties, expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose and non-infringement. Butte LAFCO is not responsible for any damages arising from the use of this information. Access to this data is at user's risk. Users should verify the information before making project commitments.
Butte Local Agency Formation Commission
Butte County's Mosquito Abatement and Vector Control Districts Jurisdictional Boundaries
Action: MAD, VCD MSR, SOI Plan Adoption
Date: 12-07-2017
Res.: 02 2017/18
Agent: Steve Lucas
Butte County's Mosquito Abatement and Vector Control Districts Jurisdictional Boundaries
Miles
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Update: 01/01/2018
Data: Butte County & LAFCO

The Durham and Oroville Mosquito Abatement Districts provide similar, but much more limited services, primarily fogging operations for adult mosquitoes. Each District has one full-time employee (the District Manager) and several part-time and seasonal employees. DMAD has annual average revenues of approximately $141,200 and annual average expenditures of $133,500, while OMAD has annual average revenues of approximately $181,362 and annual average expenditures of $148,500. Given the very large disparity in revenue and resources between the BCMVCD and the other two smaller districts, it is extremely difficult to make meaningful comparisons of service capabilities that does not revolve around finances. **The Durham and Oroville Mosquito Abatement Districts were given "Zero" Sphere of Influences by the Commission in 2005.**

A full description of each district and the services they provide can be found in Sections 2, 3, and 4 of this document.

Sphere of Influence Plan Update Process

Butte LAFCo is now in the process of updating each SOI Plan for each of the three mosquito abatement districts in Butte County. A municipal service review was adopted by LAFCo for all three of the mosquito abatement districts in Butte County in 2004. The MSR contained numerous determinations regarding the three districts, most notably *"…reorganizing the three districts into one county-wide district would provide numerous advantages and with little to no disadvantages. There may be a slight limit of 'personalized' service in the Durham and Oroville areas, but that disadvantage is greatly outweighed by the advantages of a county-wide district with a large number of employees, regularly scheduled office hours, education and training programs, and aerial capability."* This statement remains as true today as it was in 2004.

As a result of the determinations contained in the 2004 MSR, the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District were given a "Zero" Sphere of Influence (SOI) boundary by the Commission in 2005. At the same time, the Commission expanded the SOI of the Butte County Mosquito and Vector Control District (BCMVCD) to encompass the Durham Mosquito Abatement District's and the Oroville Mosquito Abatement District's jurisdictional boundaries. Pursuant to Commission policies, a zero sphere of influence can be applied when a "districts functions are either non-existent, inadequate, no longer needed, or ***should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved."*** The Commission may initiate dissolution of an agency when it deems such appropriate. It is for this reason that the BCMVCD SOI boundary overlaps the DMAD and the OMAD as the potential exists for the BCMVCD to serve these island areas in the event an agency reorganization is pursued.

There are numerous factors to consider in reviewing a SOI Plan, including current and anticipated land uses, facilities, and services, as well as any relevant communities of interest. Updates generally involve a comprehensive review of the entire SOI Plan, including boundary and SOI maps and the District's MSR. In reviewing an agency's sphere, the Commission is required to consider and prepare written statements

addressing five factors enumerated under California Government Code Section 56425(e). These factors are identified below.

1. The present and planned land uses in the area, including agricultural and open-space lands.
2. The present and probable need for public facilities and services in the area.
3. The present capacity of public facilities and adequacy of public services that the agency provides or is authorized to provide.
4. The existence of any social or economic communities of interest in the area if the commission determines that they are relevant to the agency.
5. For an update of a sphere of influence of a city or special district that provides public facilities or services related to sewers, municipal and industrial water, or structural fire protection, that occurs pursuant to subdivision (g) on or after July 1, 2012, the present and probable need for those public facilities and services of any disadvantaged unincorporated communities within the existing sphere of influence.

Mosquito and Vector Control District Laws

All mosquito and vector control districts within the State of California operate under the authority of the State of California, which is codified in the Health and Safety Code, Section 2000, *et seq,* and which is known as the Mosquito Abatement and Vector Control District Law. Prior to 2003, mosquito abatement districts operated under the requirements of the Mosquito Abatement District Law, which became law in 1939. In 2003, Senate Bill 1588 enacted the new Mosquito Abatement and Vector Control District Law. SB 1588 was the first thorough revision of the districts' principal act in decades. A 20-member Working Group carefully drafted the new Law to spell out the districts' policies, powers, procedures, and oversight duties.

The Mosquito Abatement and Vector Control District Law allows a district to exercise the following powers:

- Conduct surveillance programs, prevent, abate, and control vectors and vector-borne diseases.
- Request inspection warrants and enter property "where there is no reasonable expectation of privacy."
- Participate in land use planning and environmental quality processes.
- Abate public nuisances and recover the districts' costs with liens.
- Impose a $1,000 a day civil penalty for failing to abate a public nuisance.
- Pay the boards of trustees' expenses and benefits but not regular stipends.
- Raise revenues with special taxes, benefit assessments, and fees.
- Borrow funds, like other local governments, for cash-flow purposes.
- Manage their own finances, similar to some other special districts.

The Mosquito Abatement and Vector Control District Law also:

- Provides that forming a new district requires adherence to the Cortese-Knox-Hertzberg Act but does not require voter approval.

- Allows county boards of supervisors and city councils to appoint the members of the districts' boards of trustees.
- Allows the Director of the State Department of Health Services to resolve disputes between districts and other public agencies.
- Retains an exception from public nuisance abatement for flies from agricultural operations that use accepted standards and practices.
- Exempts property that has not been artificially altered from its natural condition from the districts' power to abate public nuisances.
- Clarifies the districts' annual budget procedures, increasing the controls over budget reserves, including public health emergencies.
- Allows special benefit assessments to finance vector control projects and programs, consistent with Proposition 218.
- Allows officials to create zones within a district to provide different levels of service with different revenue sources.
- Contains cross-references to other major statutes that apply to mosquito abatement districts as well as to other local governments.
- Requires officers and employees to be bonded if they manage a district's funds.
- Requires stricter accounting for budgetary reserves.
- Repeats the requirement for the districts to conduct regular audits and file annual reports with the State Controller.

California Health and Safety Code §2022(a) states that each person appointed by a board of supervisors to be a member of a board of trustees shall be a voter in that county and a resident of that portion of the county that is within the district. Section 2022(b) states that each person appointed by a city council to be a member of a board of trustees shall be a voter in that city and a resident of that portion of the city that is within the district (this is an issue for OMAD as discussed in Section 4). California Health & Safety Code §2022(d) states that it is the intent of the Legislature that persons appointed to boards of trustees have experience, training, and education in fields that will assist in the governance of the districts. Finally, §2022(e) states that all trustees shall exercise their independent judgment on behalf of the interests of the residents, property owners, and the public as a whole in furthering the purposes and intent of this chapter. The trustees shall represent the interests of the public as a whole and not solely the interests of the board of supervisors or the city council that appointed them. A mosquito abatement district trustee serves for a fixed term of office, and not merely at the pleasure or discretion of the appointing authority.[1]

Brief History of California Mosquito Abatement Districts[2]

Although the state laws on mosquito abatement districts date from 1915, the state's first efforts to control mosquitoes occurred against salt marsh mosquitoes in San Rafael in 1904 under the direction of Professor C.W. Woodworth of the University of California, Berkeley. According to a history of these efforts, "hordes of mosquitoes were causing great annoyance and lowering real estate values." In February 1905, the Burlingame Improvement Club provided $2,000 to the UC Agricultural Experiment Station for ditches

[1]State of California, Office of the Attorney General, Opinion No. 09-502.
[2]California Senate Local Government Committee. Science, Service, and Statutes: A Legislative History of Senate Bill 1588 and the "Mosquito Abatement & Vector Control District Law." September 2003.

and dikes that drained tidal salt marshes along San Francisco Bay. Using techniques developed along the Panama Canal, UC personnel applied oil and "Panama Larvicide" to kill immature mosquitoes.

Reactions to disease. Thousands of cases of malaria in California resulted in 112 deaths in 1909. In 1910, specific areas of the state had malaria death rates that were significantly higher than the national rate. While the national death rate was 4.8 per 100,000, in the Shasta-Tehama-Butte area the rate was 46.3 per 100,000.

First efforts. A 1908 malaria outbreak in the Central Valley prompted the Southern Pacific Railway to sponsor a mosquito control education program by UC professor William B. Herms. Anti-malaria programs followed in 1910 in Penryn, **Oroville**, and Bakersfield and in Los Molinos in 1911. The California Mosquito Control Association credited the Penryn effort as "the first organized anti-malaria campaign in the United States."

First bill. In 1913, Governor Hiram W. Johnson pocket-vetoed a bill that would have allowed communities to create "mosquito control districts" and make appointments to mosquito control boards. Later, Assembly Bill 1463, authored by Assemblyman John H. Guill, Jr. (D-Oroville), passed the Assembly in April 1913 but apparently ran into trouble in the Senate Committee on Public Health and Quarantine, which recommended against the bill. Although Guill's measure passed the Senate in May 1913, Governor Johnson declined to sign the bill and it did not become law. In those days, when a governor pocket-vetoed a bill, he did not have to issue a veto message that explained his reasons. A governor's inaction simply killed a bill.

First law. Legislative success occurred in 1915 when Governor Johnson signed Assembly Bill 1565 that allowed communities to set up "mosquito abatement districts." The author of AB 1565 was the Assembly Committee on Public Health and Quarantine, chaired by Assemblyman George Beck (D-Livermore). Signed into law as Chapter 584 of the Statutes of 1915, the measure spelled out the steps needed to form a mosquito abatement district and provided for county boards of supervisors and city councils to appoint five-member boards of trustees to govern the districts.

First districts. The first three districts formed in 1915-16 were the Marin Mosquito Abatement District, the Three Cities Mosquito Abatement District (San Mateo County), and the Kern Mosquito Abatement District. The Pulgas Mosquito Abatement District (San Mateo County) and the **Oroville Mosquito Abatement District** followed the next year.

Statutory revisions. In 1929, the Legislature overhauled the original 1915 statute by passing Assembly Bill 568, authored by Assemblyman Frank L. Coombs (R-Napa). Born in Napa in 1853, Coombs was an attorney with a distinguished public career which included two stints as Speaker of the Assembly (1891 and 1897), U.S. ambassador to Japan, State Librarian, U.S. Attorney for Northern California, and Member of Congress. Coombs returned to the Assembly in the 1920s. Governor C.C. Young signed AB 568 into law as Chapter 804 of the Statutes of 1929.

The California Mosquito Control Association formed in 1930 through the efforts of UC Berkeley Professor Herms and with Harold F. Gray, the manager of the Alameda County Mosquito Abatement District. Now called the Mosquito and Vector Control Association of California, the professional association continues to represent the districts and other local programs.

Codification. The bewildering complexity of California's state laws led to a decades-long effort that systematically organized the statutes into topical codes. In 1939, legislators created the Health and Safety Code, combining hundreds of earlier laws. Senate Bill 657 was authored by Senator Frank W. Mixler (R&D-Tulare) and Senator John D. Foley (D-Santa Clara). Because of SB 657, the state laws governing the mosquito abatement districts became Chapter 5 (commencing with Section 2200) of Division 3 of the new Health and Safety Code.

By 1945, there were 25 local mosquito control agencies in California, most of them mosquito abatement districts. However, after World War II there was a "meteoric growth in the number of new districts and the expansion of existing districts," according to Charles Myers. Myers attributed this growth and expansion to three factors:

- Fear of mosquito borne diseases returning with servicemen
- The availability and initial effectiveness of DDT
- State financial aid to local efforts, including the mosquito abatement districts.

The districts remained popular and effective even though the insecticides changed and the state stopped its subventions. By 1977-78, there were 53 mosquito abatement districts. In 1999-00, the State Controller counted 46 mosquito abatement and vector control districts.

SB 1588 (Mosquito Abatement and Vector Control District Law.) On September 5, 2002, Governor Gray Davis signed SB 1588. The next day the Governor's office issued a press release that declared:

> *This law gives mosquito abatement and vector control districts the tools they need to stand as guardians of epidemics, public health emergencies, and economic disasters. California needs this additional protection to help prevent the spread of diseases carried by mosquitoes.*

On September 6, 2002, Secretary of State Bill Jones chaptered the Committee's bill as Chapter 395 of the Statutes of 2002. The newly enacted Mosquito Abatement and Vector Control District Law became effective on January 1, 2003.

GENERAL INFORMATION ABOUT MOSQUITOES[3]

Mosquitoes are insects belonging to the order Diptera, the True Flies. Like all True Flies, they have two wings, but unlike other flies, mosquito wings have scales. Female mosquitoes' mouthparts form a long skin piercing-sucking proboscis. Males differ from

[3] Most of the information in this section was obtained from the American Mosquito Control Association's web page (http://www.mosquito.org/mosquito-info).

females by having feathery antennae and mouthparts not suitable for piercing skin. A mosquito's principal food is nectar or similar sugar source, however, females do require blood protein in order to lay eggs.

There are over 3,000 different species of mosquitoes throughout the world; currently 176 species are recognized in the United States. A new species, *Anopheles grabhamii*, was reported from the Florida Keys in 2001 (Darsie et al. 2002). Each mosquito species has a Latin scientific name, such as *Anopheles quadrimaculatus*. *Anopheles* is the "generic" name of a group of closely related mosquitoes and *quadrimaculatus* is the "species" name that represents a group of individuals that are similar in structure and physiology and capable of interbreeding. These names are used in a descriptive manner so that the name tells something about each particular mosquito, for example, *Anopheles* - Greek meaning hurtful or prejudicial and *quadrimaculatus* - Latin meaning four spots (4 dark spots on the wings). Some species have what are called "common names" as well as scientific names, such as *Ochlerotatus taeniorhynchus*, the "black salt marsh mosquito."

Scientific investigators (taxonomists) are constantly looking for new mosquitoes, as well as reviewing previously identified specimens for new information or identifying characteristics. Better microscopic equipment developed in the last 20 years has improved the taxonomist's ability to determine differences between species. Recently such a review by Dr. John Reinert (2000) led to a change in the name of many mosquitoes belonging to the genus *Aedes*. Using improved methods and over 30 years' experience he elevated a subgenus of *Aedes* (*Ochlerotatus*) to the status of genus. This will necessitate the renaming of many mosquitoes previously named Aedes to the genus Ochlerotatus and the rewriting of many taxonomic keys important to public health entomologists working in mosquito control.

The Name "Mosquito"

The Spanish called the mosquitoes "musketas," and the native Hispanic Americans called them "zancudos." "Mosquito" is a Spanish or Portuguese word meaning "little fly" while "zancudos," a Spanish word, means "long-legged." The use of the word "mosquito" is apparently of North American origin and dates back to about 1583. In Europe, mosquitoes were called "gnats" by the English, "Les moucherons" or "Les cousins" by French writers, while the Germans used the name "Stechmucken" or "Schnacke." In Scandinavian countries mosquitoes were called by a variety of names including "myg" and "myyga" and the Greeks called them "konopus." In 300 B.C., Aristotle referred to mosquitoes as "empis" in his "Historia Animalium" where he documented their life cycle and metamorphic abilities. Modern writers used the name Culex and it is retained today as the name of a mosquito genus. What is the correct plural form of the word mosquito? In Spanish it would be "mosquitos," but in English "mosquitoes" (with the "e") is correct.

Mosquitoes can be an annoying, serious problem in man's domain. They interfere with work and spoil hours of leisure time. Their attacks on farm animals can cause loss of weight and decreased milk production. Some mosquitoes are capable of transmitting diseases such as malaria, yellow fever, dengue, filariasis and encephalitis [St. Louis

encephalitis (SLE), Western Equine encephalitis (WEE), LaCrosse encephalitis (LAC), Japanese encephalitis (JE), Eastern Equine encephalitis (EEE) and West Nile virus (WNV)] to humans and animals.

Some species of mosquitoes ***fly over twenty miles***, while others fly no further than they must to find a human or animal host to bite. Only female mosquitoes bite; the female needs proteins in blood for egg development, although both males and females feed on plant nectar as a source of carbohydrates. Some species lay several hundred eggs at a time in rafts on water, while other species will lay their eggs singly on the water. Generally, females lay eggs in all types of freshwater and certain species prefer somewhat polluted water such as sewage, street drainage, septic tanks, cesspools, and industrial waste. Some species do not lay their eggs in water however, all mosquito larvae require water to develop. When eggs are laid directly in water they float in clusters called rafts and hatch into larvae in one to four days. Larvae, or "wigglers", feed on small organic particles and microorganisms in the water, however they must always return to the surface to breath.

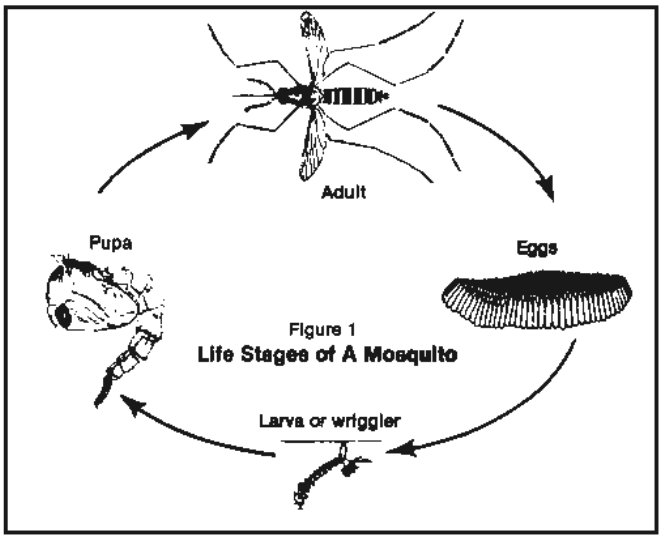


Figure 1
Life Stages of A Mosquito

At the end of the larval stage in approximately four to six days, the wigglers will molt in to the aquatic pupa called "tumbler". At this stage, the pupa will not feed and will only move if disturbed. The tumbler will transform into an adult in about two days at which time the new adult splits the pupal skin and emerges at the surface. Transformation from egg to adult, under optimum conditions, ***generally takes a week***. However, mosquito development times will vary dependant on temperatures and nutrients of the water in which they develop.

Mosquito Biology

Many mosquitoes, such as *Culex quinquefasciatus*, lay their eggs on the surface of fresh or stagnant water. The water may be in tin cans, barrels, horse troughs, ornamental ponds, swimming pools, puddles, creeks, ditches, catch basins or marshy areas. Mosquitoes prefer water sheltered from the wind by grass and weeds.

Culex mosquitoes usually lay their eggs at night over a period of time sticking them together to form a raft of from 100 to 300 eggs. A raft of eggs looks like a speck of soot floating on the water and is about 1/4 inch long and 1/8 inch wide. A female mosquito ***may lay a raft of eggs every third night during its life span***.

Anopheles and many other mosquitoes lay their eggs singly on the water surface. *Aedes* and *Ochlerotatus* mosquitoes lay their eggs singly, usually on damp soil. *Aedes* and *Ochlerotatus* eggs are more resistant to drying out (some require complete drying

out before the eggs will hatch) and hatch only when flooded with water (salt water high tides, irrigated pastures, treeholes flooded by rains, flooded stream bottoms). *Anopheles, Culex* and *Mansonia* eggs are susceptible to drying out during extended droughts. Tiny mosquito larvae (1st instar) emerge from the eggs within 24 - 48 hours almost in unison.

Mosquito Larva

Mosquito larvae, commonly called "wigglers," live in water from 4 to 14 days depending on water temperature. Larvae of almost all species must come to the surface at frequent intervals to obtain oxygen through a breathing tube called a siphon. Larvae of *Coquillettidia* and *Mansonia* possess modified siphons that allow them to pierce the stems of emergent vegetation in water and draw their oxygen from the plant in this process. Larvae are constantly feeding since maturation requires a huge amount of energy and food. They hang with their heads down and the brushes by their mouths filtering anything small enough to be eaten toward their mouths to nourish the growing larvae. They feed on algae, plankton, fungi and bacteria and other microorganisms. They breathe at the water surface with the breathing tube up breaking the water surface tension. The larvae of a few mosquito species are cannibalistic, feeding on larvae of other mosquitoes: *Toxorhynchites* and some *Psorophora*, the largest mosquitoes known, are predators of other mosquito larvae sharing their habitat. Their larvae are much larger than other mosquito larvae.

MOSQUITO LARVAE

During growth, the larva molts (sheds its skin) four times. The stages between molts are called instars. At the 4th instar, the usual larva reaches a length of almost 1/2 inch and toward the end of this instar ceases feeding. When the 4th instar larva molts, it becomes a pupa.

Mosquito Pupa

Mosquito pupae, commonly called "tumblers," live in water from 1 to 4 days, depending upon species and temperature. The pupa is lighter than water and therefore floats at the surface. It takes oxygen through two breathing tubes called "trumpets." The pupa does not eat, but it is not an inactive stage. When disturbed, it dives in a jerking, tumbling motion toward protection and then floats back to the surface.

MOSQUITO PUPAE

The metamorphosis of the mosquito into an adult is completed within the pupal case. The pupal case thus serves as a factory wherein the mosquito makes an adult out of a larva. The adult mosquito splits the pupal case and emerges to the surface of the water where it rests until its body dries and hardens.

Mosquito Adult

Only female mosquitoes require a blood meal and bite animals - warm or cold blooded - and birds. Stimuli that influence biting (blood feeding) include a combination of carbon dioxide, temperature, moisture, smell, color and movement. Male mosquitoes do not bite, but feed on the nectar of flowers or other suitable sugar source. Acquiring a blood meal (protein) is essential for egg production, but mostly both male and female mosquitoes are nectar feeders for their nutrition. Female *Toxorhynchites* actually can't obtain a bloodmeal and are restricted to a nectar diet. Of those female mosquitoes capable of blood feeding, human blood meals are seldom first or second choices. Horses, cattle, smaller mammals and/or birds are preferred.

Aedes and *Ochlerotatus* mosquitoes are painful and persistent biters. They search for a blood meal early in the morning, at dusk (crepuscular feeders) and into the evening. Some are diurnal (daytime biters) especially on cloudy days and in shaded areas. They usually do not enter dwellings, and they prefer to bite mammals like humans. *Aedes* and *Ochlerotatus* mosquitoes are strong fliers and are known to fly many miles from their larval developments sites.

Culex mosquitoes are painful and persistent biters also, but prefer to attack at dusk and after dark. They readily enter dwellings for blood meals. Domestic and wild birds usually are preferred over man, cows, and horses. *Culex nigripalpus* is known to transmit St. Louis encephalitis to man in Florida. *Culex* mosquitoes are generally weak fliers and do not move far from home, although they have been known to fly up to two miles, *Culex* usually live only a few weeks during the warm summer months. Those females that emerge in late summer search for sheltered areas where they "hibernate" until spring. Warm weather brings them out again in search of water on which to lay their eggs.

Culiseta mosquitoes are moderately aggressive biters, attacking in the evening hours or in the shade during the day. *Psorophora, Coquillettidia* and *Mansonia* mosquitoes are becoming more pestiferous as an ever-expanding human population invades their natural habitats. Anopheles mosquitoes are persistent biters and are the only mosquitoes which transmit malaria to man.

MOSQUITO-BORNE DISEASES

Mosquitoes cause more human suffering than any other organism -- over one million people worldwide die from mosquito-borne diseases every year. Not only can mosquitoes carry diseases that afflict humans, they also transmit several diseases and parasites that dogs and horses are very susceptible to. These include dog heartworm, West Nile virus (WNV) and Eastern equine encephalitis (EEE). In addition, mosquito bites can cause severe skin irritation through an allergic reaction to the mosquito's saliva - this is what causes the red bump and itching. Mosquito vectored diseases include protozoan diseases, i.e., malaria, filarial diseases such as dog heartworm, and viruses such as dengue, encephalitis and yellow fever. CDC Travelers' Health provides information on travel to destinations where human-borne diseases might be a problem.

Malaria

Malaria is an ancient disease. In all likelihood originating in Africa, it has been described by the Chinese as far back as 2700BC and the Sumerians from 1700 BC. The malaria parasite (plasmodium) is transmitted by female Anopheles mosquitoes. The term malaria is attributed to Horace Walpole in a letter from Italy in 1740 and is derived from the Italian 'mal-aria" or "bad air" because it was thought to come on the wind from swamps and rivers. Scientists conducted much research on the disease during the 1880s and early 1900s. Approximately 40% of the world's population is susceptible to malaria, mostly in the tropical and sub-tropical areas of the world. It was by and large eradicated in the temperate area of the world during the 20th century with the advent of DDT and other organochlorine and organophosphate mosquito control insecticides. An elevated standard of living, including the use of air conditioners and window screens, along with public health interventions have largely remanded malaria transmission to tropical areas. Nonetheless, it can still be found in northern Europe.

More than one million deaths and 300 - 500 million cases are still reported annually in the world. It is reported that malaria kills one child every 40 seconds. In the United States malaria affected colonization along the eastern shore and wasn't effectively controlled until the 1940s when mosquito control organization instituted Anopheles control programs. A resurgence occurred during the 1960s and early 70s in the United States due to returning military personnel from Vietnam. Minor outbreaks of locally-acquired malaria occur sporadically in the United States, but have been quickly controlled by aggressive mosquito control measures. The influx of illegal immigrants in addition to returning tourists may provide for infrequent outbreaks in the future.

Antimalarial drugs have been available for more than 50 years and recently scientists in Britain and the United States have cracked the code of the malaria parasite genome, a step that may help boost the campaign against the disease. In the meantime, active case detection

Chikungunya

Chikungunya virus is a pathogen transmitted by mosquitoes, and has established itself in the Caribbean (approximately 350,000 suspected cases in the Western Hemisphere since December 2013). It has now resulted in two cases of locally-transmitted Chikungunya virus in Florida in July of 2014. As of July 22, 2014, 497 travel-related cases have been found in 35 states, Puerto Rico and the U.S. Virgin Islands. The occurrence of locally-transmitted cases causes public health officials fear to its spread and establishment in states bordering the Caribbean. The name “Chikungunya” is attributed to the Kimakonde (a Mozambique dialect) word meaning “that which bends up”, which describes the primary symptom – excruciating joint pain. Although rarely fatal, the symptoms are debilitating and may persist for several weeks. There is no vaccine and primary treatment is limited to pain medication.

The mosquito species that transmit this disease are the Asian Tiger Mosquito (*Aedes albopictus*) and the Yellow Fever Mosquito (*Aedes aegypti*). Genetically, it appears that viral strain currently spreading throughout the Americas is more easily transmitted by *Ae. aegypti*. Both species lay their eggs in containers such as cans, discarded tires

and other items that hold water close to human habitation, but *Ae. aegypti* is more geographically confined to the southeastern United States. Traditional mosquito methods of truck-mounted and aerial sprays are ineffective in controlling these mosquitoes. Removal of water-bearing containers and sanitation are key preventive strategies.

Dog Heartworm (*Dirofilaria immitis*)

Dog heartworm (Dirofilaria immitis) can be a life-threatening disease for canines. The disease is caused by a roundworm. Dogs and sometimes other animals such as cats, foxes and raccoons are infected with the worm through the bite of a mosquito carrying the larvae of the worm.

It is dependent on both the mammal and the mosquito to fulfill its life cycle. The young worms (called microfilaria) circulate in the blood stream of the dog. These worms must infect a mosquito in order to complete their lifecycle. Mosquitoes become infected when they blood feed on the sick dog. Once inside the mosquito the microfilaria leave the gut of the mosquito and live in the body of the insect, where they develop for 2-3 weeks. After transforming twice in one mosquito the third stage infective larvae move to the mosquito's mouthparts, where they will be able to infect an animal. When the mosquito blood feeds, the infective larvae are deposited on the surface of the victim's skin. The larvae enter the skin through the wound caused by the mosquito bite. The worms burrow into the skin where they remain for 3-4 months. If the worms have infected an unsuitable host such as a human, the worms usually die. The disease in dogs and cats cannot be eliminated but it can be controlled or prevented with pills and/or injections. Some risk is present when treating dogs infected with heartworms but death is rare; still prevention is best. Of course, good residual mosquito control practices reduce the threat of mosquito transmission. Until the late sixties, the disease was restricted to southern and eastern coastal regions of the United States. Now, however, cases have been reported in all 50 states and in several provinces of Canada.

Arthropod-borne viruses (arboviruses) are the most diverse, numerous and serious diseases transmitted to susceptible vertebrate hosts by mosquitoes and other blood-feeding arthropods. Arboviral encephalitides are primarily zoonotic, being maintained in complex life cycles involving a nonhuman primary vertebrate host and a primary arthropod vector. These cycles usually remain undetected until humans encroach on a natural focus, or the virus escapes this focus via a secondary vector or vertebrate host as the result of some ecologic change. Humans and domestic animals can develop clinical illness but usually are "dead-end" hosts because they do not produce significant viremia, and do not contribute to the transmission cycle. There are several virus agents of encephalitis in the United States: West Nile virus (WN), eastern equine encephalitis (EEE), western equine encephalitis (WEE), St. Louis encephalitis (SLE), La Crosse (LAC) encephalitis, dengue and yellow fever all of which are transmitted by mosquitoes. Another virus, Powassan, is a minor cause of encephalitis in the northern United States, and is transmitted by ticks. A new Powassan-like virus has recently been isolated from deer ticks. Encephalitis is global, in Asia, for example, about 50,000 cases of Japanese encephalitis (JE) are reported annually.

Dengue

Dengue is a serious arboviral disease of the Americas, Asia and Africa. Although it has a low mortality, dengue has very uncomfortable symptoms and has become more serious, both in frequency and mortality, in recent years. *Aedes aegypti* and *Ae. albopictus* are the vectors of dengue. These mosquitoes prefer to lay their eggs in containers close to human habitations and are not well-controlled by standard spraying techniques. The spread of dengue throughout the world can be directly attributed to the proliferation and adaptation of these mosquitoes. Over the last 16 years dengue has become more common, for example; in south Texas 55 cases were reported in 1999 causing one death. More recently, Hawaii recorded 85 cases of dengue during 2001 and the Florida Keys reported over 20 cases in 2010. In 2004 Venezuela has reported more than 11,600 cases classic dengue fever and over 700 cases of DHF. Indonesia dengue outbreak has caused over 600 deaths and more than 54,000 cases. In 1999, Laredo and Nuevo Laredo had an outbreak of almost a 100 cases.

In 2010, Puerto Rico experienced its largest outbreak, with 21,000 cases reported. In 2009, Florida reported the first cases of local dengue transmission in 75 years, within Old Town, Key West. A serosurvey of residents suggested an infection rate of 5%, indicating serious risk of transmission. Despite thorough control efforts carried out by the county and state in early 2010, by the end of 2010, Florida had reported an additional 65 locally acquired dengue cases. All the cases were in Key West, except two cases in two more northerly counties.

Yellow fever

Yellow fever, which has a 400-year history, at present occurs only in tropical areas of Africa and the Americas. It has both an urban and jungle cycle. It is a rare illness of travelers anymore because most countries have regulations and requirements for yellow fever vaccination that must be met prior to entering the country. Every year about 200,000 cases occur with 30,000 deaths in 33 countries. It does not occur in Asia. Over the past decade, it has become more prevalent. In 2002 one fatal yellow fever death occurred in the United States in an unvaccinated traveler returning from a fishing trip to the Amazon. In May 2003, 178 cases and 27 deaths caused by yellow fever were reported in southern Sudan. In the Americas 226 cases of jungle yellow fever have been reported with 99 deaths (ProMed 12-22-03).

Eastern Equine Encephalitis (EEE)

Eastern Equine Encephalitis (EEE) is spread to horses and humans by infected mosquitoes. It is among the most serious of a group of mosquito-borne arboviruses that can affect the central nervous system and cause severe complications and even death. EEE is found in freshwater hardwood swampland in the Atlantic and Gulf Coast states in the eastern part of North America, Central and South America, and the Caribbean. It has a complex life cycle involving birds and a specific type of mosquitoes including several *Culex* species and *Culiseta melanura*. These mosquitoes feed on infected birds and become carriers of the disease and then feed on humans, horses and other mammals. EEE cannot be transmitted from humans or other mammals because the viremia presented in the disease is not sufficient to further transmission. Thus, humans and other animals are known as "dead-end hosts." Symptoms may range

from none at all to a mild flu-like illness with fever, headache, and sore throat. More serious infections of the central nervous system lead to a sudden fever and severe headache followed quickly by seizures and coma. About half of these patients die from the disease. Of those who survive, many suffer permanent brain damage and require lifetime institutional care. There is no specific treatment. A vaccine is available for horses, but not humans.

St. Louis Encephalitis (SLE)

St. Louis Encephalitis (SLE) is transmitted from birds to man and other mammals by infected mosquitoes (mainly some Culex species). SLE is found throughout the United States, but most often along the Gulf of Mexico, especially Florida. Major SLE epidemics occurred in Florida in 1959, 1961, 1962, 1977, and 1990. The elderly and very young are more susceptible than those between 20 and 50. During the period 1964-1998 [35 years] a total of 4478 confirmed cases of SLE were recorded in the United States Symptoms are similar to those seen in EEE and like EEE, there is no vaccine. Mississippi's first case of St. Louis Encephalitis since 1994 was confirmed in June 2003. Previously the last outbreak of SLE in Mississippi was in 1975 with over 300 reported cases. It was the first confirmed mosquito-borne virus in the United States in 2003. It turned up in October 2003 in California Riverside County in sentinel chickens. The last [SLE] human case in California occurred in 1997. In Louisiana in 2003 there was a fatal St Louis Encephalitis case previously listed as a West Nile caused death. In early September 2017, for the first time since 1969, the Butte County Mosquito and Vector Control District identified and confirmed the presence of St. Louis Encephalitis virus in a mosquito pool collected from the Honcut area.

LaCrosse Encephalitis (LAC)

LaCrosse encephalitis (LAC) is much less widespread than EEE or SLE, but approximately 90 cases occur per year occurs in all 13 states east of the Mississippi, particularly in the Appalachian region. It was reported first in 1963 in LaCrosse, Wisconsin and the vector is thought to be a specific type of woodland mosquito (*Aedes triseriatus*) called the tree-hole mosquito, with small mammals the usual warm-blooded host. Infrequent fatalities occur in children younger than 16. It is not transmissible from human to human. There is no vaccine for LaCrosse encephalitis.

Western Equine Encephalitis (WEE)

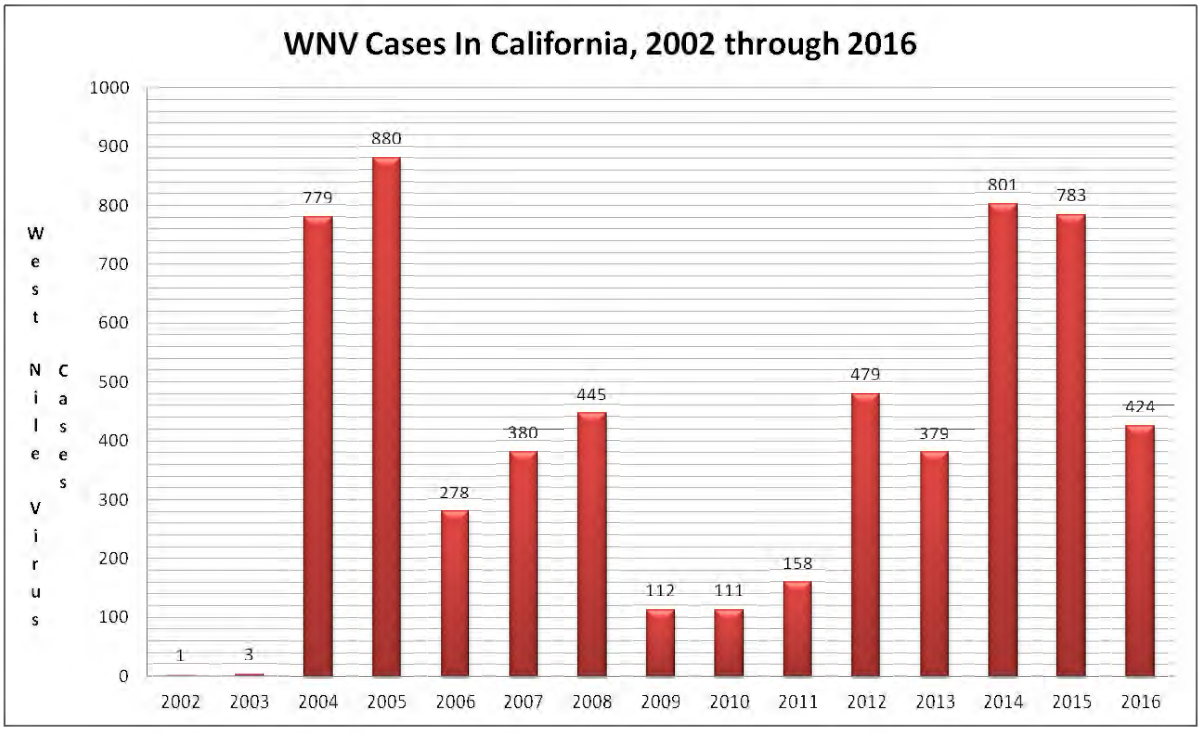
Western Equine Encephalitis (WEE) was first recognized in 1930 in a horse in California. It is found west of the Mississippi including parts of Canada and Mexico. The primary vector is *Culex tarsalis* and birds are the most important vertebrate hosts with small mammals playing a minor role. Unlike LAC it is nonspecific in humans and since 1964 fewer than 1000 cases have been reported. As with EEE, a vaccine is available for horses against WEE but not for humans.

West Nile Virus (WNV)

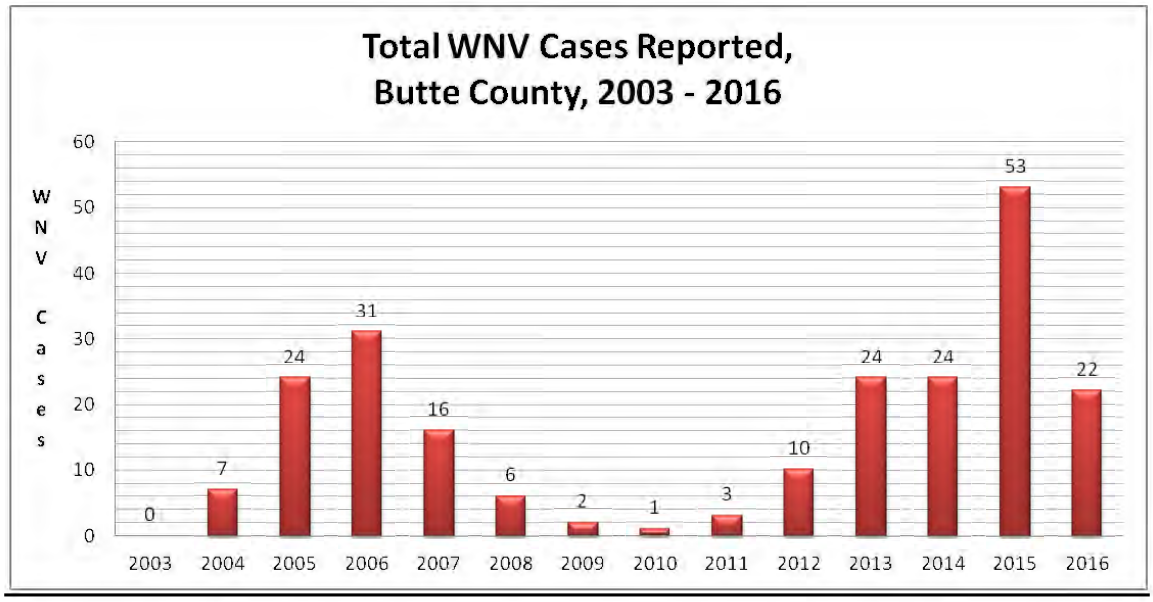
West Nile virus (WNV) emerged from its origins in 1937 in Africa (Uganda) into Europe, the Middle East, west and central Asia and associated islands. It is a Flavivirus (family Flaviviridae) with more than 70 identified viruses. Serologically, it is a Japanese encephalitis virus antigenic complex similar to St. Louis, Japanese and Murray Valley

encephalitis viruses. Similar to other encephalitises, it is cycled between birds and mosquitoes and transmitted to mammals (including horses) and man by infected mosquitoes. WNV might be described in one of four illnesses: West Nile Fever might be the least severe, characterized by fever, headache, tiredness and aches or a rash, sort of like the "flu". This might last a few days or several weeks. At least 63% of patients report symptoms lasting over 30 days, with the median being 60 days. The other types are grouped as "neuroinvasive disease" which affects the nervous system; West Nile encephalitis which affects the brain, and West Nile meningitis (meningoencephalitis) which is an inflammation of the brain and membrane around it. (CDC)West Nile virus first appeared in North America in 1999 in New York with 62 confirmed cases and 7 human deaths. In the United States (2004) over 43 species of mosquitoes have tested positive for WNV transmission, and the Culex pipiens group seems the most common species associated with infecting people and horses. Currently, 65 mosquito and 300 bird species have tested positive in the United States for this virus.

From 1999 through 2015, there have been 43,937 cases of WNV from throughout the United Stated reported to CDC, with 1,911 deaths reported. As seen in the charts below, there were 6,013 cases of West Nile virus reported in California for 2002 through 2016, with 246 deaths[4]. Butte County had 223 reported cases of West Nile virus from 2002 through 2016.



[4] https://www.cdc.gov/westnile/index.html. 2016 data is preliminary.



Zika Virus

Zika virus has emerged from its origins in central Africa and has rapidly spread to the South Pacific and western hemisphere. A Flavivirus related to West Nile, Yellow Fever, St Louis and the equine encephalitides, Zika was first discovered in macaque monkeys in 1947 in the Zika Forest region of Uganda. Since its discovery in 2014 off the coast of South America, Zika cases have been found in 35 countries in the Americas.

As of 28 April, 2016, there have been 426 reported cases of Zika virus due to travel to endemic areas. However, local transmission within the continental United States has, as yet, not been reported. In US Territories in the Caribbean, a total of 599 cases have been reported, with 596 being locally acquired, primarily in Puerto Rico and the US Virgin Islands.

Although in rare cases Zika can be spread through sexual contact with an infected person, it is usually transmitted through the bite of an infected Aedes agypti or Aedes albopictus mosquito. The illness is usually quite mild, with fever, rash, conjunctivitis and joint pain lasting a few days to several weeks or months. Often patients are not sick enough to seek medical treatment so a great many cases are not reported. It is thought that one attack confers immunity. However, cases of microcephaly, a congenital defect of cranium and brain size resulting in profound neurological defects in newborns usually resulting in death have been positively identified as being caused by Zika infection. An autoimmune condition called Guillain-Barré syndrome, causing damage to nerve cells resulting in muscle weakness and, on occasion, paralysis and death has been linked to Zika infection.

The mosquito vectors of Zika virus are peridomestic, preferring to lay their eggs above the waterline of containers, treeholes, creases in tarpaulins and other vessels that may contain water. Aedes aegypti, in particular, will lay eggs in a series of containers after feeding. Both Aedes agypti and Aedes albopictus will feed day or night when a

potential host comes within their limited flight ranges. Aedes agypti has more of a tendency to enter and stay within houses if conditions are proper. This species is exceedingly skittish, often leaving its host prior to taking a full blood meal when the host moves. Both mosquitoes also seem to prefer feeding on the host's lower extremities.

Traditional outdoor ULV sprays are ineffective against Aedes agypti, it being difficult to obtain contact with the spray droplets in flight due to its cryptic habits. Some success with ULV sprays has been obtained against Aedes albopictus in urban areas, while suburban areas remain difficult to control. The primary means of controlling both species is to eliminate their oviposition (egg-laying) habitats by removing water bearing containers or emptying them and scrubbing the insides to remove eggs deposited above the waterline. Personal protective measures such as application of EPA-registered repellents and wearing of long-sleeved shirts and long pants are also effective measures.

When traveling to areas endemic for Zika in the Caribbean, it is also recommended to stay in hotels with air conditioning and window and door screens to keep mosquitoes outside. If available, it is advised to sleep under mosquito bed nets.

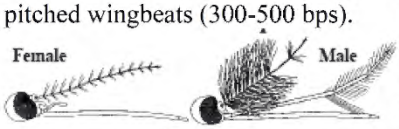
The following graphic from the Prairie Research Institute (http://www.prairie.illinois.edu) provides some interesting information about mosquitoes.

Mosquito Facts

Why do mosquitoes drink blood?
Only female mosquitoes take blood. They use the protein and iron found in blood to make their eggs. Females feed on nectar and water, just like males do.

How much blood does a female mosquito "drink" per bite?
Female mosquitoes "drink" about 3 millionths of a liter, or 3 milligrams, of blood.

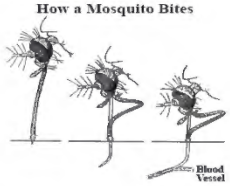
How do you tell male from female mosquitoes?
The easiest way is to look at the antennae. Male mosquitoes have very feathery antennae. They help sense female mosquitoes high-pitched wingbeats (300-500 bps).



Female mosquitoes have very plain antennae sparsely covered in small hairs.

Why do mosquito bites itch?
Mosquito saliva contains several enzymes and proteins that affect the body's clotting ability. Most people are allergic to these enzymes. The itch and bump is our allergic response to them.

How a Mosquito Bites



How do mosquitoes find prey?
Mosquitoes use a range of signals to find their hosts, including movement, odor, carbon dioxide, and body heat.

Do all mosquitoes suck human blood?
Only a small number of mosquitoes feed primarily on humans. Mosquitoes usually feed on birds, a wide range of mammals, and even amphibians and reptiles. Mosquitoes in the genus *Toxorhynchites* (toxo-rin-kite-ees) do not feed on blood at all. Females use nectar to make their eggs.

How far can mosquitoes fly?
Most mosquitoes stay within 1-2 miles of their larval (breeding) habitat, but some can fly 20 miles away!

What is the mosquito life cycle?
First, eggs hatch into larvae. They live in the water and feed on algae and bacteria. After the larvae are fully developed, they metamorphose into pupae. Pupae do not eat at all. Larvae and pupae live in the water, but they breathe air. Next, adult mosquitoes emerge, or "hatch," from the pupae and rest on the surface of the water before flying away.

Emergence of an Adult Mosquito

How long do mosquitoes live?
In nature, female mosquitoes can live for a few weeks and males usually live for about a week. Life span depends on temperature, humidity and time of year.

How much does a mosquito weigh?
About 2 to 2.5 milligrams for medium size mosquitoes.

What do mosquitoes do in winter?
Some species of mosquitoes can survive the winter. The mosquitoes can sense when the days are getting shorter and enter diapause. Diapause is a hibernation-like state that allows them to live off fat stores. Adult mosquitoes find warm places to stay, like sewer drains, so they do not freeze. Females do not take blood or reproduce during this time. Mosquitoes in diapause can live for several months!

How many mosquito species are there?
There are about 2,700 species worldwide, about 175 species in North America, and about 60 species in Illinois.

Can mosquitoes carry HIV or hepatitis?
No. Mosquitoes carry viruses and pathogens in their salivary glands. In HIV and hepatitis, the virus does not replicate in the salivary glands, so it cannot be injected into the next host.

How many people die from mosquito-borne diseases per year?
Worldwide estimates range from 1-2 million people per year. The most common disease is malaria. A single malarial mosquito can infect more than 100 people.

How common is West Nile Virus?
West Nile virus is found in over 60 mosquito species and over 200 vertebrates. The virus usually cycles between *Culex* (cue-lex) mosquito species and common urban birds like American robins, northern cardinals, and house sparrows.

MOSQUITO ABATEMENT PROCESS

Integrated Pest Management

Mosquito and vector control is based on scientifically planned management tactics and control strategies that reduce the abundance of target pests in a timely manner. This method is commonly referred to as "integrated pest management" (IPM). This comprehensive program incorporates five basic methods:

- public information and education,
- mosquito and vector surveillance,
- biological control,
- physical control, and
- chemical control (larvicides and adulticides).

Public Information and Education

Advertising and outreach programs educate and inform the public about mosquito control and prevention methods through the use of media, participation in community events, a comprehensive school program and presentations to various organizations.

Mosquito and Vector Surveillance

Surveillance consists of closely monitoring mosquito activity, climate change, and virus activity by testing mosquitoes, sentinel chickens and wild birds for the presence of a virus or parasite. This research and surveillance information helps guide all control efforts.

Biological Control

Biological control is the use of living organisms to control a particular pest. This organism will attack the harmful pest, resulting in a reduction of its population levels. Biological control elements are natural predators, parasites or pathogens that can be used to achieve desired reductions in pest population levels. The primary biological control used against mosquitoes is the mosquitofish, *Gambusia affinis*. Mosquitofish are ideal control agents for several reasons. They feed primarily at the water's surface, where larvae can be found. They can tolerate a significant range in water temperature and water quality. They are also easy to handle, transport, stock, and monitor. The use of mosquitofish is a long-term control strategy that works well in artificial water bodies such as ornamental ponds, animal watering troughs, water gardens, fountains, and unmaintained swimming pools.

Mosquito pathogens include an assortment of viruses and bacteria. Examples of bacteria pathogenic to mosquitoes are *Bacillus sphaericus* (Bs), *Bacillus thuringiensis israelensis* (Bti), and *Saccharopolyspora spinosa* (spinosid). These materials are also referred to as biorational products. Bs and Bti, produce proteins that are toxic to most mosquito larvae, while spinosid produces compounds known as spinosysns, which effectively control all larval mosquitoes.

Physical Control

Physical control (also known as source reduction, environmental manipulation, or permanent control) to reduce mosquito breeding sites is a very effective method of mosquito control. Physical control is usually the most effective of the mosquito control techniques available and is accomplished by eliminating mosquito breeding sites or modifying these sites to favor natural predation or to be unfavorable to mosquitoes. Source reduction can virtually eliminate the need for pesticide use in the affected habitat. Source reduction is appropriately touted for its effectiveness and economic benefits. A few examples of physical control include: promoting effective drainage, controlling vegetation, and appropriate timing of irrigation.

Microbial and Chemical Control

Microbial and chemical control is the prudent use of chemical compounds (insecticides) that reduce mosquito populations. Chemical products are used when biological control methods have been incapable of maintaining mosquito numbers below a tolerable level. Chemical control is the judicious application of specific chemical compounds (insecticides) that reduce adult and immature mosquitoes. It is applied when bio-rational methods are unable to maintain mosquito numbers below a level that is considered tolerable or when emergency control measures are needed to rapidly disrupt or terminate the transmission of disease to humans. Adulticides are chemicals that specifically reduce adult mosquitoes. Larvicides target mosquito larvae and pupae.

The UC Davis Western Integrated Pest Center recently published a very informative report on the importance of an integrated pest management program in preventing the spread of West Nile Virus in California. This report - *Management of Mosquitoes: A Case Study of West Nile Virus in California* (October 2017) - documents the many integrated pest management tools used by three mosquito abatement districts in California and how recent changes in decision-tools, mapping and surveillance, area-wide management, and outreach, have further reduced the exposure of humans and the environment to mosquitoes and the products used to control them. This report is attached as Attachment D to this MSR/SOI Plan.

BUTTE COUNTY MOSQUITO ABATEMENT DISTRICTS GOVERNMENTAL STRUCTURE - REORGANIZATION

There are three mosquito abatement districts within Butte County; one very large, well-funded district (BCMVCD) that surrounds the other two much smaller districts (OMAD and DMAD). This MSR/SOI plan is an opportunity to carefully evaluate and compare each district and consider any governance restructuring scenarios that may result in improved efficiencies and public health outcomes. Scenarios include,

- The smaller districts (OMAD, DMAD) remain intact but contract all services through the BCMVCD, thus acting a funding mechanism;
- The three districts could be consolidated into one county-wide mosquito abatement district; and
- Another approach that would result in just one county-wide abatement district would be the dissolution of the two smaller districts – DMAD and OMAD - and the annexation of those district's territory to the BCMVCD. It should be noted that

BCMVCD's existing sphere of influence already encompasses the boundaries of DMAD and OMAD.

Potential positive impacts of a consolidation of the three districts may include a uniform county-wide mosquito abatement and vector control program, reduced administrative and operating costs, improved reserves, and greater public visibility, which could create an improved image of program accountability. A consolidation of the three districts would result in improved overall mosquito abatement and vector control services to the residents of the two smaller districts (DMAD and OMAD), who would have access to greater resources and more programs. This approach is supported by the 2016-2017 Butte County Grand Jury Report and the May 31, 2017, letter from the Butte County Department of Public Health as discussed below.

A consolidation may also have negative impacts such as increased operational complexities, particularly in light of the difference in services and philosophy between each agency. The opportunity to consolidate the district may be affected by limited funding, inability to expand into new areas based on existing funding levels, and/or political issues, especially regarding the loss of local control. Additionally, a consolidation of the three districts would require majority approval by the registered voters of all three districts, but such approval is not assured. Such governance reorganizations are not always readily accepted among affected constituents who may feel current services are adequate and who have type of brand loyalty to their current local agency and board of directors and perhaps more importantly, local agency personnel. Additionally, the costs to prepare a consolidation study and to hold an election could be cost prohibitive and funding would need to be secured before going forward with the consolidation process. The BCMVCD Manager has indicated that BCMVCD could provide mosquito and vector control services to these areas, and which could be accomplished without the need for the current employees, assets, and facilities of both the OMAD and DMAD. With the resources, assets, and staff that BCMVCD has to offer, the BCMVCD Manager strongly believes that the protection of the public's health would increase within these two districts dramatically.

The 2004 Municipal Service Review adopted by the Commission determined that *"…reorganizing the three districts into one county-wide district would provide numerous advantages and with little to no disadvantages. There may be a slight limit of 'personalized' service in the Durham and Oroville areas, but that disadvantage is greatly outweighed by the advantages of a county-wide district with a large number of employees, regularly scheduled office hours, education and training programs, and aerial capability*."

Subsequent to adoption of the 2004 MSR, the Commission adopted Resolution No. 17 2004/05 that gave the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District a "Zero" Sphere of Influence. Pursuant to Butte LAFCo Policy 3.1.11, the Zero SOI designation indicates that one or more of the public service functions of the agency are either non-existent, inadequate, no longer needed, or should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved and that the

Commission may initiate dissolution of an agency when it deems such appropriate. Resolution 17 2004/05 gave the Butte County Mosquito and Vector Control District an expanded sphere of influence, which took in the SOI of Durham Mosquito Abatement District and the Oroville Mosquito Abatement District. BCMVCD's SOI now encompasses all of Butte County and the Hamilton City area of Glenn County.

Numerous Butte County Grand Jury reports, including the most recent Grand Jury report, have included a review of one or more of the three mosquito abatement districts in the county. The following was extracted from the various Grand Jury reports regarding consolidation of the mosquito abatement districts in Butte County.

- **1971 Grand Jury Report** - *"...it is believed to be in the best interest of the entire County to eventually have all mosquito abatement controlled from one central plant, the Butte County Mosquito Abatement District*."

- **1972 Grand Jury Report** - "*The Grand Jury recommends consolidation of mosquito abatement districts into one Butte County Mosquito Abatement District.*"

- **1973-74 Grand Jury Report** - "*Previous grand juries have recommended consolidation of the three Mosquito Abatement Districts within Butte County. Research in the past years as to cost, efficiency, and tax rates show that consolidation is favorable and this Grand Jury concurs*."

- **1979-80 Grand Jury Report** - "*Observation. Until such time as the Oroville and Durham Mosquito Abatement Districts, either through their respective Boards of Directors or the people within their service areas actively seek inclusion in the larger Butte County Mosquito Abatement District, no further consideration should be given the matter. The question of merger is basically a local government decision*."

- **1980-81 Grand Jury Report** - "*Finding: Prior Grand Juries have recommended a merger of the Oroville Mosquito Abatement District with the Butte County Mosquito Abatement District. Recommendation: The committee found the Oroville Mosquito Abatement District to be very professionally managed with a professional dedicated employee. Cost containment was evident in all areas therefore no need or practical benefit can be seen for a merger at this time*."

- **2007-08 Grand Jury Report** - "*This Grand Jury has chosen not to make a recommendation on whether the three districts should consolidate, but to try and make the voters aware of all options. In the event of future ballot measures for additional special parcel tax assessments, voters should be aware of the consolidation alternative.*"

- **2009-10 Grand Jury Report** – "*OMAD should continue to function as an independent mosquito abatement district and should not be consolidated with another mosquito abatement district.*"

- **2016-17 Grand Jury Report** – "*Recommendation R1. The Grand Jury recommends that pending the results of the 2017 MSR, LAFCo initiate the process of consolidating OMAD and DMAD under BCMVCD.*"

The 2016-17 Grand Jury report also stated:

"Having three districts performing the same function in the same county brings redundancies. Each district has a board, is required to be compliant with all applicable labor and pesticide regulations, requires an annual audit, regular board meetings, budgets and bookkeepers. This encumbers each of the districts with a minimum level of costs, and the budgets of OMAD and DMAD are such that after covering the costs of these operational requirements, there is little funding left for actual control. Effectiveness would be greatly improved by consolidating the three districts under one set of policies and one management team.

In the past, when Grand Juries have recommended consolidation, or LAFCo released their MSR in 2004 recommending the districts be consolidated, no consolidation action was taken. The Grand Jury believes this is because there was no leadership to put the recommended changes into effect. The groups that benefit most from a consolidation are the residents within the OMAD and DMAD districts, however, they may not be aware of the potential improvements and thus not motivated to petition for policy change. Under California state LAFCo policies, a petition for consolidation may be initiated by LAFCo itself. The Grand Jury recommends Butte LAFCo take this course of action pending the results of the 2017 MSR."

A reorganization of the three mosquito abatement districts into one county-wide district should be closely examined by LAFCo to determine if a reorganization would actually result in improved, more efficient, and more cost-effective comprehensive mosquito abatement and vector control services to the Durham and Oroville areas, and would result in improved public health benefits to the residents of the county as a whole. Mosquito abatement services in the Durham and Oroville areas consist **primarily of the control of adult mosquitoes through fogging operations**. The services provided by the Butte County Mosquito and Vector Control District are significantly more comprehensive, more effective at all aspects and stages of vector control, and more efficient than the services provided by the Durham and Oroville Mosquito Abatement Districts given the total integration of all five aspects of mosquito control discussed above.

The public health benefits of having only one county-wide mosquito abatement district cannot be understated as supported by comments received from the Butte County Public Health Department (DPH), Community Health and Sciences Office, in their comment letter of May 31, 2017 (Attachment A to this MSR). The DPH is very concerned about the ongoing presence of West Nile virus cases in the County and in their letter, DPH notes that Butte County consistently ranks among the state's counties with the highest West Nile virus case rates (number of cases by population).

The DPH believes that a close working relationship with local vector control agencies is critical to their efforts to detect, monitor and prevent WNV disease, further stating that

"*Having one agency to work with would likely improve efficiencies and provide a more consistent approach"* to addressing the WNV concerns.

While reorganization options are being analyzed, the DMAD and OMAD Board of Trustees could contract with the Butte County Mosquito and Vector Control District to provide mosquito abatement services within DMAD and OMAD's jurisdictional boundaries. In this scenario, DMAD and OMAD would transfer most of the revenues they receive to BCMVCD, which in turn would use those funds to provide mosquito abatement and vector control services to the DMAD and OMAD service area. BCMVCD may be reluctant to agree to this plan and this scenario may result in the elimination of DMAD's and OMAD's District Manager position since there may be no duties for this person to perform. In this scenario, DMAD and OMAD would continue to exist and the DMAD and OMAD Board of Trustees would occasionally meet to handle administrative affairs, such as approving the District's annual budget.

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Section 1.0 - Introduction Final Mosquito Abatement Districts MSRs/SOI Plans

The following table summarizes each of the mosquito abatement districts reviewed in this Municipal Service Review and includes the following information.

Summary of Mosquito Abatement Districts in Butte County

District Name	Services Provided*	No. of Parcels	Area Served (sq. miles)	Estimated Population	Available Fund Balance (as of 6-30-16)	FY 2015-16 Revenue	FY 2015-16 Expenditures	Parcel Assessment	Per Capita Expenditures (FY 2015-16)
Butte County Mosquito and Vector Control District	• Surveillance • Ground fogging • Aerial spraying • Public education • Control of wasps, fleas, and other insects • Laboratory • Mosquitofish breeding and distribution	84,665	1,677	192,700	$1,628,329	$3,802,331	$3,372,849	Zone 1 – $9.27 per single family dwelling equivalent. Zone 2 - $2.56 per single family dwelling equivalent.	$17.50
Durham Mosquito Abatement District	• Surveillance • Ground fogging • Public education • Mosquitofish distribution	1,973	60	4,200	$121,275	$141,579	$127,177	$25 per parcel ≥ 100 ac $25 per parcel ≤ 100 ac plus $0.5 per ac	$30.00
Oroville Mosquito Abatement District	• Surveillance • Ground fogging • Public education • Mosquitofish distribution	8,128	12.7	25,000	$89,318	$195,180	$161,205**	$12.76 per single family dwelling equivalent	$6.50

*It is important to indicate that while each agency may provide some level of service by category, that not all service levels are provided equally between each agency. For example: While DMAD and OMAD both provide a basic level of public education, it is clear that absent a website or specific budget allocation, these agencies cannot reach the large audience that BCMVCD does through its comprehensive website and attendance at public events.

**OMAD's expenditures for FY 2015-16 of $161,205 reflect the expenditures minus one time capital outlay of $70,920.

Section 1.0 - Introduction Final Mosquito Abatement Districts MSRs/SOI Plans

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Summary Observations and Recommendations

This MSR provides a thorough review of the three mosquito abatement districts in Butte County and makes individual determinations and recommendations based on the analysis of the data.

The overall process of reviewing the mosquito abatement districts has led to several comprehensive recommendations that go beyond the individual district. These recommendations below speak to the broader management and operations of the mosquito abatement districts within the County and what issues warrant additional review by LAFCo.

1. At present, there is very little evidence of consistent professional contact between the three agencies and no clear, unified approach to countywide mosquito and vector control services. Such a lack of integration in attacking a mobile pest with ranges up to 20 miles that do not respect political boundaries is an opportunity lost and only serves to complicate public health outcomes. It is paramount that all three districts view mosquito and vector control as a countywide public health concern, a concern that does not respect boundaries and one that cannot be waged independently. **RECOMMENDATION**: At the very minimum, the three mosquito abatement districts should fully cooperate with each other, and share facilities, equipment, personnel, and costs, to ensure that mosquito abatement services are provided effectively, equally and efficiently to all residents of Butte County. This level of cooperation/coordination should begin immediately with regularly scheduled coordination meetings between the District managers.

2. The Durham and Oroville Mosquito Abatement Districts do provide ~~adequate~~ basic adult mosquito abatement services primarily focused on a philosophy of regular and consistent fogging of populated areas during mosquito season. They however, do not provide comprehensive mosquito abatement and vector control services to the residents of their district based on their lack of a fully vetted integrated vector management plan (IVMP) and lack of greater resources, such as aerial spraying. The lack of such integrated vector management program could create public health issues as expressed by the Butte County Department of Public Health. **RECOMMENDATION**: Both DMAD and OMAD should immediately develop an IVMP that addresses ALL aspects of vector control as established by the Mosquito and Vector Control Association of California. Additionally, both DMAD and OMAD should immediately reach out to the Butte County Department of Public Health for any helpful public health guidance available and fully participate in any DPH mosquito and vector control coordination efforts.

3. The Butte County Mosquito and Vector Control District provides professional, comprehensive and complete mosquito abatement and vector control services to the residents of their district. Given their geographic position surrounding the other two districts and effectiveness in managing all aspects of an IVMP, thus reducing breeding sources and migrating adult mosquitoes, the BCMVCD is by default, already providing a level of mosquito control services to the other two districts. The BCMVCD District Manager has indicated that the district can provide the same services to the residents of the Durham and Oroville Mosquito Abatement Districts. **RECOMMENDATION**: OMAD and DMAD should aggressively consider exploring ALL options to improve services to their constituents including discussing with BCMVCD options for shared services.

4. Numerous Butte County Grand Juries, including the most recent (Fiscal Year 2016-2017), have determined that the three mosquito abatement districts in Butte County should be consolidated into one countywide district. This conclusion also appears to be supported by the Butte County Department of Public Health and the City of Oroville City Council (as further discussed in the OMAD Chapter). **RECOMMENDATION**: The three mosquito abatement districts in Butte County should be reorganized in some manner so that there is only a single, countywide mosquito abatement and vector control district.

FINAL

MUNICIPAL SERVICE REVIEW AND SPHERE OF INFLUENCE PLAN

FOR

THE BUTTE COUNTY MOSQUITO AND VECTOR CONTROL DISTRICT

Prepared by:
Butte Local Agency Formation Commission
ADOPTED DECEMBER 7, 2017

DISTRICT DATA SHEET

BUTTE COUNTY MOSQUITO AND VECTOR CONTROL ABATEMENT DISTRICT

Contact: Matthew Ball, District Manager
Address: 5117 Larkin Road, Oroville, CA 95965
Phone: (530) 533-6038 or (530) 342-7350
Webpage: www.bcmvcd.com

GOVERNING BOARD

Butte County Mosquito and Vector Control District Board of Trustees (see pg. 2-4)

Normal Board Meeting Date: Second Wednesday of each month at 6:30 pm

Board Meeting Location: Alternates between the District headquarters in Oroville at 5117 Larkin Road and the District's Chico substation at 444 Otterson Drive in Chico

FORMATION INFORMATION

The Butte County Mosquito and Vector Control District was formed in June 1948.

PURPOSE

1. Enabling Legislation: GC §2000 et. seq.
2. Authorized Services:
   - Mosquito Abatement
   - Vector Control
3. Provided Services:
   - Mosquito Abatement
   - Vector Control
   - Public Education
   - Mosquitofish

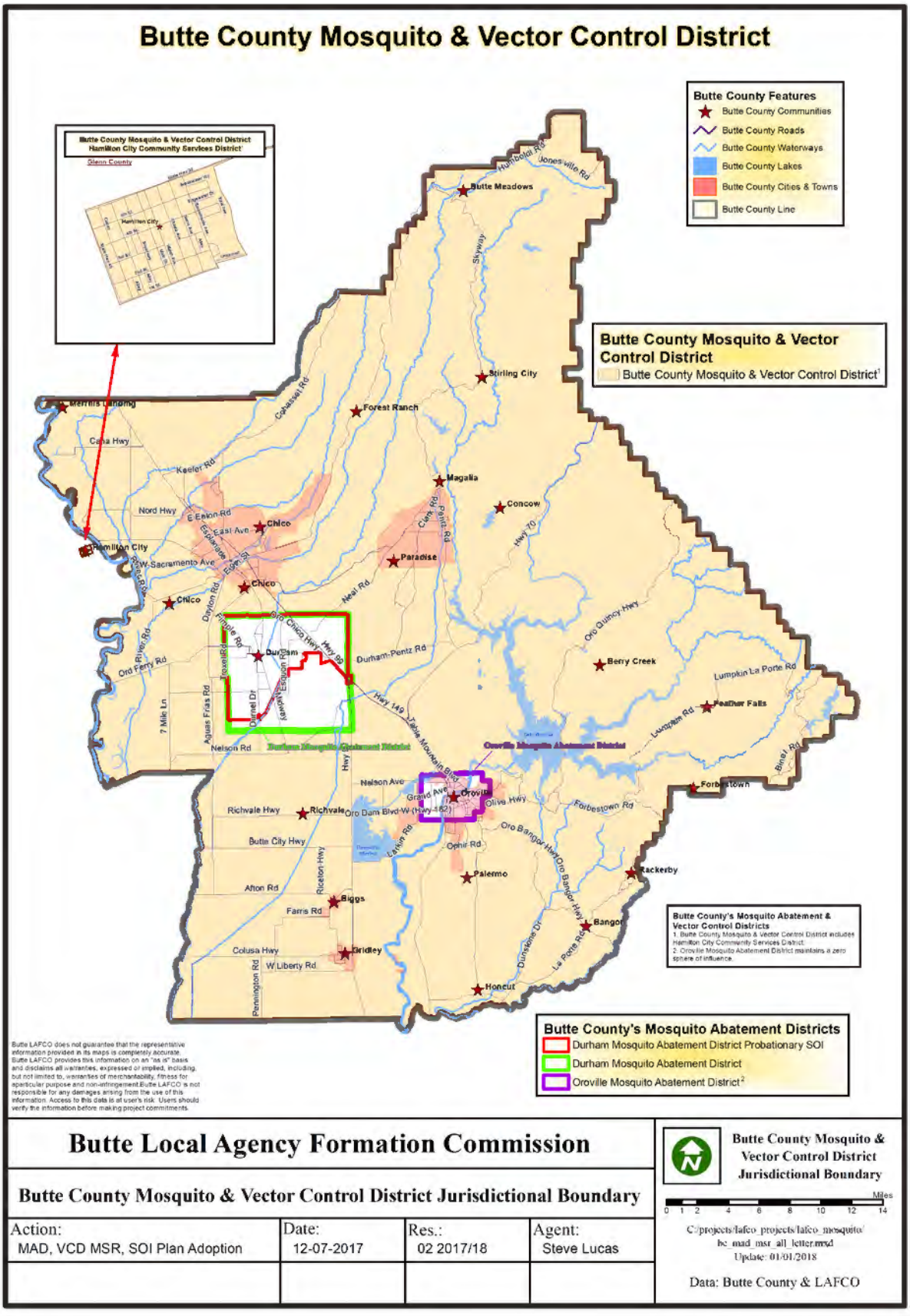
AREA SERVED

1. Supervisorial District: 1, 2, 3, 4, & 5
2. No. of Parcels: 84,665
3. District Size: 1,677 square miles
4. Estimated Population: 192,700
5. Location: All of Butte County excluding the greater Durham and Oroville areas. The District also includes the unincorporated community of Hamilton City in Glenn County.
6. Sphere of Influence: All of Butte County and the Hamilton City area of Glenn County. The District's SOI encompasses the boundaries of the Durham and Oroville Mosquito Abatement Districts.

FINANCIAL INFORMATION

Fiscal Year 2015-16
Revenues: $3,802,331
Expenditures: $3,372,849
Unassigned Fund Balance beginning of FY 2016-17: $2,532,973

Revenue Sources:
- Property taxes
- Annual per parcel assessments
- Service fees
- RDA pass through funds
- Interest


Butte County Mosquito & Vector Control District
Butte County Features
Butte County Communities
Butte County Roads
Butte County Waterways
Butte County Lakes
Butte County Cities & Towns
Butte County Line
Butte County Mosquito & Vector Control District
Butte County Mosquito & Vector Control District
Butte County Mosquito & Vector Control District Hamilton City Community Services District
Glenn County
Hamilton City
Butte Meadows
Stirling City
Forest Ranch
Magalia
Concow
Paradise
Chico
Durham
Berry Creek
Feather Falls
Oroville
Forbestown
Richvale
Palermo
Biggs
Gridley
Honcut
Rackerby
Bangor
Durham Mosquito Abatement District
Oroville Mosquito Abatement District
Butte County's Mosquito Abatement & Vector Control Districts
1. Butte County Mosquito & Vector Control District includes Hamilton City Community Services District.
2. Oroville Mosquito Abatement District maintains a zero sphere of influence.
Butte County's Mosquito Abatement Districts
Durham Mosquito Abatement District Probationary SOI
Durham Mosquito Abatement District
Oroville Mosquito Abatement District
Butte LAFCO does not guarantee that the representative information provided in its maps is completely accurate. Butte LAFCO provides this information on an "as is" basis and disclaims all warranties, expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose and non-infringement.Butte LAFCO is not responsible for any damages arising from the use of this information. Access to this data is at user's risk. Users should verify the information before making project commitments.
Butte Local Agency Formation Commission
Butte County Mosquito & Vector Control District Jurisdictional Boundary
Action: MAD, VCD MSR, SOI Plan Adoption
Date: 12-07-2017
Res.: 02 2017/18
Agent: Steve Lucas
Butte County Mosquito & Vector Control District Jurisdictional Boundary
Miles
0 1 2 4 6 8 10 12 14
C:/projects/lafco_projects/lafco_mosquito/bc_mad_msr_all_letter.mxd
Update: 01/01/2018
Data: Butte County & LAFCO

DISTRICT SUMMARY

The Butte County Mosquito and Vector Control District (BCMVCD) was established in 1948 to serve all of Butte County excepting those areas that were already located within the Durham and Oroville Mosquito Abatement Districts. In 1994, "Vector Control" was added to the District name to reflect the additional disease surveillance and information now provided. The legal authority to provide service is Health and Safety Code 2000 et seq. The mission of the Butte County Mosquito and Vector Control District is primarily to suppress mosquito-transmitted disease and to reduce the annoyance levels of mosquitoes and diseases associated with ticks, fleas, and other vectors through environmentally compatible control practices and public education.

The Butte County Mosquito and Vector Control District has an eleven-member Board of Trustees. Five Trustees represent the county at large, one from each of the incorporated cities, and one member representing Hamilton City. The five Trustees representing the county at large are appointed by the Butte County Board of Supervisors, the members representing the cities are appointed by the respective city council, and the Hamilton City member is appointed by the Glenn County Board of Supervisors. Per the California Health and Safety Code, Section 2024(a) "except as provided in Section 2023, the term of office for a member of the board of trustees shall be for a term of two or four years, at the discretion of the appointing authority. Terms of office commence at noon on the first Monday in January."

California Health and Safety Code §2022(a) states that each person appointed by a board of supervisors to be a member of a board of trustees shall be a voter in that county and a resident within the district. Section 2022(b) states that each person appointed by a city council to be a member of a board of trustees shall be a voter in that city and a resident of that portion of the city that is within the district. California Health and Safety Code §2022(d) states that it is the intent of the Legislature that persons appointed to boards of trustees have experience, training, and education in fields that will assist in the governance of the districts. Finally, §2022(e) states that all trustees shall exercise their independent judgment on behalf of the interests of the residents, property owners, and the public as a whole in furthering the purposes and intent of this chapter. The trustees shall represent the interests of the public as a whole and not solely the interests of the board of supervisors or the city council that appointed them. A mosquito abatement district trustee serves for a fixed term of office, and not merely at the pleasure or discretion of the appointing authority.[1]

The current BCMVCD Board of Trustees are:

Position	Trustee Name	Area Represented	Length	Start	End
President	Dr. Albert Beck	County at Large	4-Year	2014	2017
Vice President	Dr. Larry Kirk	City of Chico	4-Year	2014	2017
Secretary	A. Tom Anderson	Hamilton City	4-Year	2014	2017
Asst Secretary	James Bo Sheppard	City of Biggs	4-Year	2015	2018

[1]State of California, Office of the Attorney General, Opinion No. 09-502.

Trustee	Carl Starkey	County at Large	4-Year	2017	2020
Trustee	Dr. Suzanne Hanson	County at Large	4-Year	2015	2018
Trustee	Jack Bequette	County at Large	4-Year	2017	2020
Trustee	Dr. Thomas Vickery	County at Large	4-Year	2016	2019
Trustee	Bruce Johnson	City of Gridley	4-Year	2016	2019
Trustee	Gordon Andoe	City of Oroville	4-Year	2014	2017
Trustee	Melissa Schuster	Town of Paradise	4-Year	2017	2020

The BCMVCD Board of Trustee meetings are held the second Wednesday of each month at 6:30 p.m., with the meeting location alternating between the BCMVCD District Office in Oroville and the BCMVCD Chico substation.

The District's service area encompasses 1,676 square miles, consisting of approximately 84,665 parcels. In 1986, the unincorporated community of Hamilton City located in eastern Glenn County was annexed to BCMVCD. The Hamilton City portion of the District encompasses approximately 304 acres and consists of 665 parcels. The estimated population of the District is approximately 192,700.

The District's Sphere of Influence (SOI), as last amended by the Commission in 2005, totals approximately 1,073,178 acres (1,677 square miles) and consists of all of Butte County and the unincorporated community of Hamilton City located in Glenn County. The District's SOI encompasses the jurisdictional boundaries of the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District, both of which have "Zero" spheres of influence resulting from the 2004 MSR. Pursuant to Commission policies, a zero sphere of influence can be applied when a "districts functions are either non-existent, inadequate, no longer needed, or ***should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved."*** The Commission may initiate dissolution of an agency when it deems such appropriate. It is for this reason that the BCMVCD SOI boundary overlaps the DMAD and the OMAD as the potential exists for the BCMVCD to serve these island areas in the event an agency reorganization is pursued.

BCMVCD SERVICES

The Butte County Mosquito and Vector Control District is an independent special district (self-governing, not part of any county or city) that controls and monitors mosquitoes, and other harmful pests such as ticks and yellow jackets. The District protects the usefulness, desirability and livability of property and the inhabitants of property within its jurisdictional area through the abatement of vertebrate and invertebrate vectors. In addition, the District regularly tests for diseases carried by mosquitoes and ticks, and educates property owners and the occupants of property in the District about how to protect themselves from diseases transmitted by these and other organisms.

The District services include:

- Mosquito and vector surveillance and control,
- Mosquito-borne and vector-borne disease surveillance and control,

- Yellow jacket and wasp control,
- Insect and arachnid identification,
- Best management practices consultation,
- Biological control (mosquitofish), and
- Public education and outreach, intergovernmental coordination.

All services are provided year round. However, some of the services relating to mosquitoes and yellow jackets are much more in demand during mosquito season (usually April through October) while tick services are usually October through April.

The District is aware that adjusting land management practices can reduce mosquito populations thereby reducing mosquito control costs, reducing the amount of pesticide used in mosquito control applications, helping to protect the public's health, and contributing to the District's Integrated Vector Management (IVM) approach to mosquito and vector control.

Integrated Vector Management (IVM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices to effectively manage vectors. The District's IVM program uses current, comprehensive information on the life cycles of pests and their interaction with the environment. This information is used to manage pest nuisance and public health threats by the most economical means, and with the least possible hazard to people, property, and the environment. The District's IVM includes:

- Vector surveillance;
- Source reduction and/or elimination;
- Best management practices;
- Public education;
- Biological and chemical controls; and
- Monitoring.

Key Practices

There are four different types of mosquito control methods practiced by the District.

- **Physical control** is an environmental manipulation including, but not limited to, the removal of standing water that results in the reduction or elimination of mosquito development sites.
- **Cultural control** is designed to change the behavior of the county's residents so that their actions prevent the development of mosquitoes through public education and outreach and by establishing best management practices on known mosquito-breeding sources.
- **Biological control** uses biological agents to reduce larval mosquito populations.
- **Chemical control** is the use of federal and state registered public health pesticides to control mosquito populations. Two types of public health pesticides are utilized, adulticides which kill adult mosquitoes, and larvicides which are designed to kill immature aquatic stage mosquitoes (larvae) or inhibit development to adult emergence. All chemical applications that may enter waters of the State shall be performed in accordance with the requirements of

the Statewide General NPDES Permit for Discharge of Aquatic Pesticides for Vector Control (Water Quality Order 2016-0039 DWG).

Each method of control is designed to eliminate or minimize mosquito-breeding sites, reduce mosquito populations, and to reduce transmission of vector-borne disease.

The District is continually striving to enhance its efforts to effectively control mosquitoes by physical, cultural, and biological mosquito control thus lessening the dependency for chemical control, which is in stark contrast to agencies who utilize adulticides as the primary control method. The District's IVM program accomplishes this.

Surveillance

Mosquito and vector surveillance and control is an essential service of the District. Other than the District, no other agency provides this service to the residents within the District's service area. Following the District's IVM program, the District conducts routine surveillance of all potential mosquito-breeding sources. Such sources include, but are not limited to, unmaintained swimming pools, storm drains, catch basins, retention/detention ponds, dairy lagoons, pastures, row crops, orchard crops, rice, managed wetlands, and much more. The District controls mosquito larvae by the utilization of U.S. EPA and Cal EPA approved public health pesticides and/or the use of *Gambusia affinis* (mosquitofish). The District conducts adult mosquito surveillance by utilizing New Jersey light traps, gravid traps, carbon dioxide baited traps, ovi traps, B&G traps, and landing count rates. This surveillance data is used to coordinate effective applications of adult mosquito public health pesticides. The District will spray for adult mosquitoes utilizing U.S. EPA and Cal EPA approved public health pesticides in urban areas, residential areas, foothill areas, mountain areas, agricultural areas, and wetland areas. In addition to mosquitoes, the District also monitors tick populations throughout the service area. The District utilizes the tick flagging method to determine adult tick population abundance counts. The District has and continues to be able to assist the CDC, California Department of Public Health, and other agencies with any surveillance and/or control of other vectors not listed.

The District also provides mosquito-borne and vector-borne disease surveillance. The District monitors for mosquito-borne disease by several methods. The District works in cooperation with the California Department of Public Health by assisting with the dead bird program. The District collects and submits dead bird specimens for testing of West Nile virus. The District maintains 8 chicken coops strategically placed throughout the county. Seven of the 8 coops are used for sentinel chickens while the 8th coop is used for replacement chickens. Biweekly, District laboratory staff takes sera samples from all 42 sentinel chickens and sends the samples for testing of mosquito-borne disease. The District's laboratory staff deploys and sets at minimum 32 carbon dioxide baited traps throughout the service area each week to capture live mosquitoes. These mosquitoes are counted, identified, and pooled in same specie groups and sent for mosquito-borne disease testing. The District's 23 gravid traps can and are used for this as well. The District also works cooperatively with the Butte County Public Health Department and meets monthly to review mosquito-borne disease in humans and horses during mosquito season (usually May-October).

In addition to mosquito-borne disease surveillance, the Districts also provides surveillance of other vector-borne diseases. The District routinely collects and conducts tick surveillance from public high use areas. Areas such as Loafer Creek, Lime Saddle, Lake Wyandotte, and Bidwell Park are examples where the District conducts routine surveillance. The ticks collected during these surveillance operations are identified, pooled in same specie groups, and sent for testing. The District has and continues to be available to assist and coordinate with other state and federal agencies for surveillance of other vector-borne diseases. The District has in the past provided surveillance for plague, hantavirus, Newcastle disease, and others.

The yellow jacket and wasp control program is another service the District provides. The District removes above and below ground nests of yellow jackets and wasp, controls large population outbreaks of yellow jackets and/or wasps, deploys lure traps, and conducts routine surveillance of yellow jacket populations in public high use areas.

Vector Identification

The District provides insect and arachnid identification for everyone that supplies a sample. Not only will the District provide accurate identification, the District will assist the individual with information on where the specimen came from, where its habitat is, provide consultation on how to exclude or control the specimen, and provide the basic biology of the specimen. The District has and continues to assist local private pest control companies with identification and provides information for the proper abatement of the specimen. The District has worked with universities to provide expert identification for research projects, curation of specimens for museums, and provided samples.

Best Management Practices

Another service the District provides is Best Management Practices to reduce mosquitoes (BMP). The District has created and provides BMPs to local, state, and federal agencies, businesses, homeowners, and land managers. The District is consulted routinely for new development, new construction, redevelopment, and land management practices. The District always provides, when applicable, design options, provides comments, and assists with BMPs.

Biological Controls

The District provides mosquitofish free of charge. The District's mosquitofish program is extensive and is on the cutting edge. The District has six ponds for rearing and holding of mosquitofish as well as a fisheries department. The mosquitofish ponds rear fish during the warmer months of the year (May-October). The District annually plants and provides well over 500 pounds of fish each year. The District's fisheries department has four filtered and heated tanks that provides fish year round, which is especially important when the District's fishponds are not actively rearing or when populations of fry are present in the ponds. The District's fisheries department is producing over 10,000 fry per month. The combination of the District's ponds and tanks allows the District to provide mosquitofish to residents year round. The District also seasonally puts public fish tanks out each May and leaves them in operation until the end of October. These public tanks are put at feed stores, nurseries, and hardware stores throughout the county. These tanks are maintained by District personnel weekly and are stocked with

fish twice a week. This allows the public to pick up free mosquitofish more conveniently. It also reduces the need for District staff to deliver fish to each resident that requests fish. The District staff also will deliver and stock fish for residents that can't make it to a public tank or that has a water source requiring larger numbers of mosquitofish.

Public Education

The District has a large extensive education and outreach program. This District believes that one of the most effective ways to reduce mosquito and vector populations and mosquito-borne and vector-borne disease is through education. Mosquito-borne and vector-borne disease is 100% preventable, the residents of the District's service area just need the knowledge of how to prevent such diseases.

The District advertises extensively during the warmer months of the year (May through October). The District advertises through local newspapers, billboards, radio, and mobile devices. The District routinely publishes and distributes advisories and press releases. The District maintains and updates its website with current and factual information. The District distributes and provides brochures, door hangers, fly swatters, and mosquito repellents. The District has a K-8 school program where staff will teach the students about mosquitoes and ticks. The District routinely gives presentations to civic groups, homeowner associations, museums, nature centers, and other events. The District routinely staffs a booth at local fairs and events. The District provides homeless shelters and evacuation centers repellent wipes during times of need.

The District coordinates with the United States Centers for Disease Control, the American Mosquito Control Association, the Mosquito and Vector Association of California, the California Department of Public Health, the Butte County Public Health Department, the Butte County Agriculture Department, California Fish and Wildlife, and the United States Fish and Wildlife Services. The District has and will continue to participate in various events, activities, and services.

The District has been awarded the California Special District Association's District Transparency of Excellence Award twice. The first time for the 2014 and 2015 calendar years and a second time for 2016 through 2018. This award is in recognition of the District's completion of all transparency program requirements designed to promote transparency in the District's operations and governance to the public and other stakeholders. The District has four employees that have won the American Mosquito Control Association's (AMCA) Boyd-Ariaz Grass Roots Award. This award is given to non-supervisory staff for excellence in mosquito and vector surveillance and control. The District has been a sustaining member of the AMCA for over 30 years. In addition to sustaining membership, the District is a partner to the EPA's Pesticide Environmental Stewardship Program (PESP) since 1997. The goal of this program is to reduce any risk associated with using pesticides. Partners are recognized by the EPA for their work in this area.

MUNICIPAL SERVICE REVIEW FACTORS FOR THE BUTTE COUNTY MOSQUITO AND VECTOR CONTROL DISTRICT

Pursuant to California Government Code §56430, in order to update a Sphere of Influence (SOI) for a city or special district, the associated MSR must include written determinations that address various factors regarding the ability of the subject agency to provide services. The following provides an analysis of the seven categories or components required by §56430 for the Municipal Service Review for the Butte County Mosquito and Vector Control District:

MSR FACTOR NO. 1: GROWTH AND POPULATION PROJECTIONS FOR THE AFFECTED AREA.

BCMVCD's jurisdictional boundaries consist of all of Butte County, excluding the greater Durham and Oroville areas, which are currently served by the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District. Incorporated areas within the District include the incorporated cities of Biggs, Chico, Gridley, the Town of Paradise, and portions of the City of Oroville. Larger unincorporated communities within the District include Cohasset, Forest Ranch, Richvale, Honcut, Bangor, Palermo, East Oroville/Kelly Ridge, Berry Creek, Concow, Magalia/Paradise Pines, and Stirling City.

The urban areas within the district consist of residential, commercial, industrial, and public uses. Agricultural uses, primarily rice and orchards, and rural residential uses are found in the in the valley area of the District. Livestock grazing and rural residential uses are found in the foothill areas of the District. Timber harvesting is the primarily land use in the mountainous portion of the District. There is significant potential for new development within the existing urban areas of the District, including the cities of Biggs, Chico, and Gridley. Development within the rural portions of the District is limited due to large parcel size requirements and the lack of public sewer infrastructure.

The unincorporated community of Hamilton City in the County of Glenn is also within the jurisdictional boundaries of the BCMVCD. Land uses within Hamilton City are primarily residential, along with a few commercial and public uses. Most of parcels within Hamilton City are developed and very little area is available for new development.

Population growth within the District varies by location. The following table provides population data for Butte County for the years 2010 to 2017:[2]

[2] State of California, Department of Finance, *E-4 Population Estimates for Cities, Counties, and the State, 2011-2017, with 2010 Census Benchmark*. Sacramento, California, May 2017.

	4/1/10	1/1/11	1/1/12	1/1/13	1/1/14	1/1/15	1/1/16	1/1/17	2010-2017 Growth Rate	Compound Annual Growth Rate 2010-2016
Biggs	1,707	1,711	1,703	1,713	1,708	1,767	1,899	1,905	11.6%	1.6%
Chico	86,187	86,819	88,068	89,283	90,217	91,306	92,117	93,383	8.4%*	1.2%
Gridley	6,584	6,585	6,519	6,648	6,655	6,654	6,663	6,704	1.8%	0.26%
Oroville	15,546	15,532	15,524	15,989	15,994	16,139	17,999	18,037	16.0%*	2.25%
Paradise	26,218	26,215	25,915	25,759	25,769	25,739	25,755	25,841	-1.4%	-0.21%
Unincorporated	83,758	83,966	83,335	82,949	82,958	82,862	80,270	80,534	-3.8%*	-0.6%
Incorporated	136,242	136,862	137,729	139,392	140,343	141,605	144,433	145,870	7.0%*	1%
County Total	220,000	220,828	221,064	222,341	223,301	224,467	224,703	226,404	2.9%	0.4%

*The increases, or decreases, in these populations were due in large part to annexations of developed unincorporated parcels to the cities.

The growth rate of Butte County as a whole for 2010 to 2017 was 2.9 percent, which is a compound annual growth rate of approximately 0.4 percent. The population growth rate during this period was lower than previous years due to the slowdown in the economy and in the housing market that began in 2008.

In March 2017, the State of California Department of Finance released updated population growth projections for all of the counties within the state[3]. The population projection for Butte County shows that by 2060 the county may have a population of 292,892. The 2060 projected population is approximately 30.5 percent above the county's current population, which represents an approximate compound annual growth rate of 1.03 percent.

California Department of Finance Population Projections for Butte County 2020-2060

Estimates		Projections								
2010	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**2055**	**2060**
220,157	224,363	230,709	238,546	247,339	256,042	263,642	270,612	277,512	285,290	292,892

The growth rate projected by the State of California for Butte County, which is approximately 1.03 percent, appears to be the most accurate growth rate estimate based upon historic growth rates.

The incorporated areas within the District experienced very different population growth rates over the last six years, with several cities experiencing population loss. The City of Biggs had a growth rate of 11.6 percent from 2010 to 2017, which is a compound annual growth rate of approximately 1.6 percent. All of this population growth is due to actual population increases, primarily the result of new low-income housing developments within the City. The City of Biggs has adequate capacity and area to handle new growth, especially considering the City's Sphere of Influence was significantly increased in 2015 to accommodate future growth.

[3] State of California, Department of Finance, *P-2: County Population Projections (2010-2060)*. Sacramento, California, March 8, 2017.

The City of Chico had a growth rate of 8.4 percent from 2010 to 2017, which is a compound annual growth rate of approximately 1.2 percent. A large portion of this population growth is due to the annexation of developed, populated parcels to the City. Population growth in the City of Chico is expected to grow as the City has recently experienced new housing starts and several new large residential subdivisions are planned within the area. In 2020, the City of Chico will experience a large population increase due to the already-approved annexation of the Chapman and Mulberry neighborhoods to the City, which will add approximately 1,350 people to the City.

The City of Gridley had a growth rate of 1.8 percent from 2010 to 2017, which is a compound annual growth rate of approximately 0.26 percent. Due to the downturn in the housing market in 2008, very little new development has occurred within the City of Gridley in the 2010-2017 timeframe. The City of Gridley has adequate capacity and area to handle new growth and it is anticipated that population growth in the city will occur as the housing market improves.

The Town of Paradise had a negative growth rate of -1.4 percent from 2010 to 2017, which is a compound annual growth rate of approximately -0.2 percent. Very little new development has occurred within the Town of Paradise in recent years. The Town of Paradise has limited area available for new growth, and the lack of a public sewer system to serve the town will continue to act as an impediment to new development. It is anticipated that population growth in the town will slightly increase as the housing market improves.

The 2000 U.S. Census data shows that Hamilton City had a population of 1,903, while the 2010 U.S. Census shows this community had a population of 1,759, a decrease of approximately 7.5 percent (144 people). The U.S. Census Bureau shows that the estimated population for Hamilton City in 2015 was 1,917, although this estimate may be on the high side.[4] The growth rate in the unincorporated area of Glenn County from 2010 to 2016 is approximately 0.8 percent, which is an annual growth rate of approximately 0.13 percent.[5] Applying this growth rate to 2010 population count for Hamilton City results in an estimated population of 1,773, which may be a more accurate estimate than the Census Bureau's estimate.

It is estimated that the Butte County Mosquito and Vector Control District has a total population of approximately 192,600 people. Future population growth within the District will be concentrated within the incorporated portions of the district, primarily in the City of Chico.

As population increases, and growth occurs within Butte County, service demands will increase. Urban areas provide breeding habitats for mosquitoes (stagnant water), and treatment becomes more difficult and costly, as treatment needs occur more on individual private properties. Expansion of services is facilitated by increases in

[4] Source: U.S. Census Bureau, 2011-2015 American Community Survey 5-Year Estimates
[5] State of California, Department of Finance, *E-1 Population Estimates for Cities, Counties and the State with Annual Percent Change — January 1, 2015 and 2016.* Sacramento, California, May 2016.

revenues due to increases in property tax income and the collection of assessment fees from new development.

MSR DETERMINATION 1-1: POPULATION	
	The District has a current population of approximately 192,600 people.

MSR DETERMINATION 1-2: POPULATION GROWTH	
	The population of the District as a whole is expected to grow at a rate of approximately 1 percent annually.

MSR DETERMINATION 1-3: POPULATION GROWTH	
	Future population growth within the District is expected to occur primarily within the incorporated portions of the district, with most of that growth anticipated to occur within the City of Chico urban area.

MSR DETERMINATION 1-4: POPULATION GROWTH AND NEW SERVICE DEMANDS	
	As population increases, and growth occurs within the BCMVCD, service demands will increase. Expansion of services by BCMCVCD is facilitated by increases in revenues due to increases in property tax revenue and assessment fees from new development.

MSR FACTOR NO. 2: THE LOCATION AND CHARACTERISTICS OF ANY DISADVANTAGED UNINCORPORATED COMMUNITIES WITHIN OR CONTIGUOUS TO THE SPHERE OF INFLUENCE.

Disadvantaged unincorporated communities (DUCs) are defined by statute as inhabited territory (meaning 12 or more registered voters), or as determined by commission policy, that constitutes all or a portion of a community with an annual median household income (MHI) that is less than 80 percent of the statewide annual MHI (Water Code Section 79505.5). The statewide MHI data is obtained from the US Census American Community Survey (ACS) 5-Year Data: 2010 - 2014. California's MHI for this period was $61,489, and 80 percent of that is $49,191.

A number of disadvantaged unincorporated communities are found within the boundaries of the BCMVCD, including Palermo, Kelly Ridge, Honcut, Nord, Paradise Pines, the Chapman/Mulberry neighborhoods in the Chico area, and Hamilton City. Some of the disadvantaged unincorporated communities within the District, such as the Chapman/Mulberry neighborhoods and Kelly Ridge, are provided with high levels of

urban services, such as public sanitary sewer and domestic water service. The District's Sphere of Influence also includes the unincorporated communities of Durham and Thermalito and the City of Oroville.

The BCMVCD provides mosquito and vector control services to all of the parcels within the District's boundaries, including those identified as being within a disadvantaged unincorporated community. The existence of disadvantaged unincorporated communities within the District does not affect the District's ability to provide services, nor do the District's services affect the status of these communities as "disadvantaged".

MSR DETERMINATION 3-1: DISADVANTAGED UNINCORPORATED COMMUNITIES	
	Numerous areas within the Butte County Mosquito and Vector Control District have been identified as being disadvantaged unincorporated communities (DUC). The existence of disadvantaged unincorporated communities within the District does not affect the District's ability to provide services, nor do the District's services affect the status of these communities as "disadvantaged".

MSR FACTOR NO. 3: ***PRESENT AND PLANNED CAPACITY OF PUBLIC FACILITIES, ADEQUACY OF PUBLIC SERVICES, AND INFRASTRUCTURE NEEDS OR DEFICIENCIES INCLUDING NEEDS OR DEFICIENCIES RELATED TO SEWERS, MUNICIPAL AND INDUSTRIAL WATER, AND STRUCTURAL FIRE PROTECTION IN ANY DISADVANTAGED, UNINCORPORATED COMMUNITIES WITHIN OR CONTIGUOUS TO THE SPHERE OF INFLUENCE.***

PUBLIC FACILITIES

Oroville Area

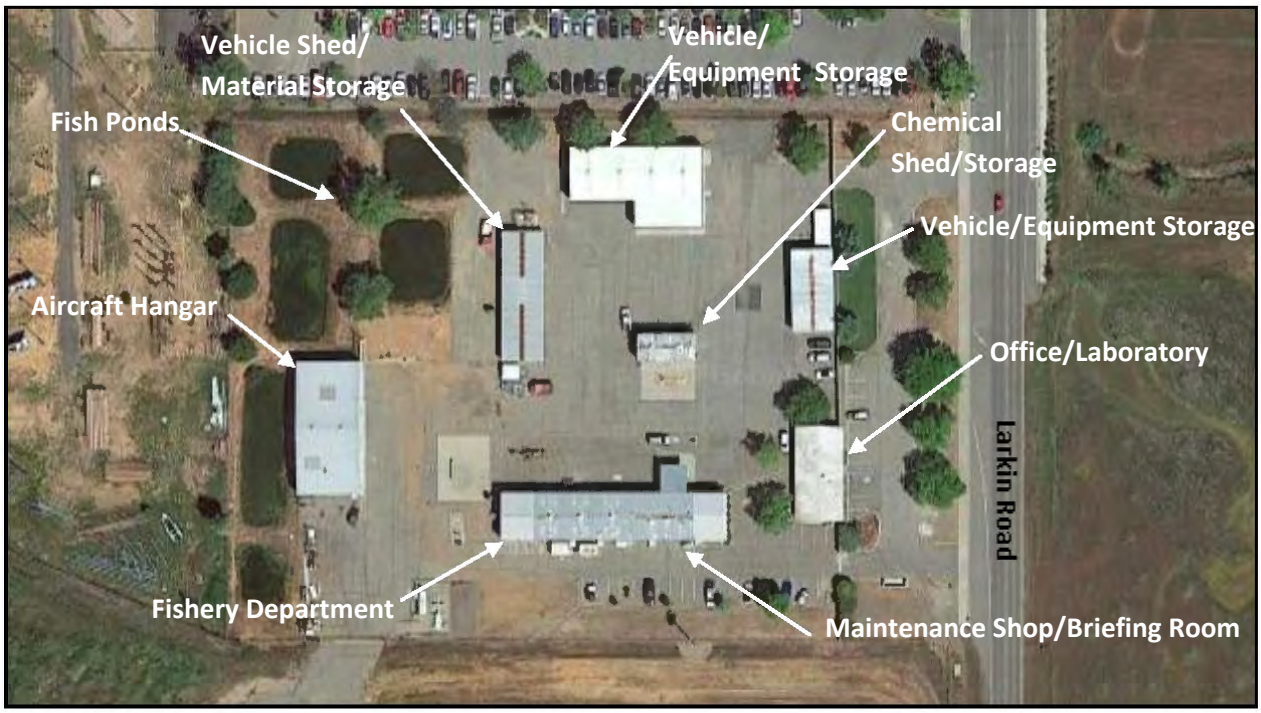
The District's headquarters and main facilities are located at 5117 Larkin Road, at the Oroville Municipal Airport. While the District owns all of the existing structures at this location, the 5-acre parcel (land only) is owned by the City of Oroville and leased to the District. The lease term and payment provisions of the original lease agreement were amended on February 17, 2015, as follows:

1. The term of the lease shall be for a period of thirty (30) years, commencing February 17, 2015, and ending February 17, 2045.
2. The District shall pay $350 per month rent to the City.

The District approached the City of Oroville about purchasing the 5-acre parcel. However, per the City of Oroville, the Federal Aviation Administration (FAA) will not allow the property surrounding the airport to be sold at this time. Instead of purchasing the parcel, the District secured the 30-year lease. The District now has $1.3 million reserved to demolish and replace the administration/lab building.

The Oroville facility includes administrative offices, laboratory, a mosquitofish propagation facility, mosquitofish ponds, equipment repair shop, equipment, vehicle,

and material storage buildings, aircraft hangar, and underground fuel tanks. The administrative office and several of the shop structures date from the 1960s, while most of the other structures were constructed from the 1990s to the present.



According to the District, the existing administrative and laboratory building at the Oroville facility is undersized, outdated, and needs repairs. Plans for the upcoming (2017-18) fiscal year include a new administration building and laboratory and two portable sheds for the safe storage of supplies and equipment. The new administration building would include a large meeting room for the District Board of Trustees.

Chico Area

The District has another facility located at 444 Otterson Drive in southwest Chico. This facility, referred to as the "Chico Substation" is located on a 2.2-acre parcel owned by the District. Previously, BCMVCD rented a smaller facility in Chico. The Chico Substation facility, which was completed in 2011, is a 10,000 square foot contains a large meeting room, office space, shop, garage, chemical storage room, and laboratory facility. The landscaping and drainage on the parcel are designed for the prevention of mosquito breeding, and for use as a demonstration model for public education.

The Chico Redevelopment Agency provided funding to reimburse the District for the costs of acquiring the property and the construction of the Chico Substation. The total cost of the Chico Substation project was $2,214,003. The funding proceeds were identified as a loan on the title company settlement statement and the loan was evidenced by a secured deed of trust in favor of the Chico Redevelopment Agency, now known as the City of Chico Successor Agency to the Chico Redevelopment Agency. Under the terms of the Public Facilities Reimbursement Agreement between

the District and the former Chico Redevelopment Agency, the District must utilize the facility for a period of 25 years (beginning on September 14, 2007), and at the end of the period, the City of Chico Successor Agency to the Chico Redevelopment Agency will execute a Deed of Reconveyance to remove the lien on the property. At that time, all land and structures will be owned by the District.

DISTRICT EQUIPMENT

The District has an extensive inventory of various types of equipment, which would take several pages to list in detail. The following is a list of the more significant pieces of equipment that the District owns and operates:

- Pickup trucks (33)
- Quad runners (3)
- Triton amphibious vehicles (2)
- Gas-powered ULV foggers (16)
- Electric-powered ULV foggers (6)
- Commercial grade electric power sprayers (2 25 gallon and 1 50 gallon)
- Truck mounted electric power sprayers (34)
- Nurse/hopper truck (used to fill aircraft with liquid, granule, and pellet insecticides and refuel the aircraft at the District and off airport landing strips)
- Flatbed truck
- Dump truck
- 10 yard hydraulic dump trailer
- Utility trailers (6)
- Electric powered "Zap" pickup
- Forklifts (3) (1 propane powered at the Chico Substation, 1 propane powered at Oroville, and 1 gas powered at Oroville)
- Backhoe
- 14 foot aluminum boat
- Mosquitofish tanks (4 fisheries department tanks with heating, filtration, and aeration)
- Mosquitofish tanks (8 tanks at the District facilities and 10 public pick up tanks throughout the service area)
- Underground tank monitoring system
- Enhanced vapor recovery gas tank monitoring system
- Aircraft (3)
- Spare engines for aircraft (2)
- Night vision goggles
- Office equipment, including computers, network server, photocopiers, projector
- Ice machine (2)
- Sub-zero chest freezer (used to store insects and viruses)
- Office telephone system
- Photocopiers (2)
- Two-way radio system (all trucks, aircraft and base unit)

BCMVCD Video Microscope

- GIS/Mapping software and equipment
- Epifluorescence microscope
- Video microscope and monitor
- Low temperature chill table (2)
- Pressure washer (2)
- Air compressor (2)
- Rotary post lift
- Welders (4)

The District owns other smaller equipment for service and maintenance, as well as analysis equipment for the biological lab contained at the District's Oroville facility offices. The District maintains a full listing of all equipment and facilities.

The model years of the pickup trucks owed by the District range from 2000 to 2017. Each year the District purchases two to four new vehicles to keep the fleet functioning at a high level. Maintenance of the trucks is performed by District personnel. In February 2017, the District purchased a 2017 Toyota Tacoma and two Ford F150's. In Fiscal Year 2017-18, the District plans to purchase three new vehicles.

The gas-powered and electric ULV foggers are mounted in the beds of the trucks and are operated remotely via cable by the drivers.

BCMVCD Trucks

BCMVCD ULV Foggers and Power Sprayers

Each year the District purchases 1 to 4 new foggers to ensure spraying operations are functioning at a high level. In Fiscal Year 2017-18, the District plans to purchase four new foggers. Maintenance of the sprayers is performed in-house by the District shop, which also maintains and repairs other District equipment, such as electric and gas ultra low volume (ULV) foggers, chain saws, weed eaters, lawn mowers, and other mechanical items. The District shop is also responsible for repairing and installing improvements to the District facilities and grounds when and where necessary. Often the shop will repair the District's security system, lighting fixtures, plumbing fixtures, and other items as needed.

DISTRICT AIRCRAFT

The District owns three fixed-wing, single-engine aircraft that are used for the eradication of mosquito larvae found in large water sources such as rice fields, wetlands and pastures, and for the control of large areas with high populations of adult mosquitoes. Each plane is fitted to handle a particular formulation of material for use in specific areas. With the current aerial set-up, the planes are able to spray larvicides extremely close to urbanized areas. Aerial ULV applications require an FAA setback of 1,000 feet from urbanized areas. One aircraft can apply adulticide material to 3,750 acres in a 45-minute period. The three aircraft the District owns are:

- 1963 Grumman G-164A with a Pratt &Whitney R-985 series reciprocating engine (450 horsepower), FCC Registration No. N606Y
- 1964 Grumman G-164 with a Pratt &Whitney R-985 series reciprocating engine (450 horsepower), FCC Registration No. N714Y
- 1978 Grumman G-164B Ag Cat with a Pratt & Whitney PT6A-15AG turboprop engine.

The District employs one full time pilot (Chief Pilot) and seasonal pilots as needed. During down time, the three planes receive repairs and technological improvements such as new instruments and instrument panels, installation of new technology (altimeter, Satloc, Ag-Nav), repainting, replacing engine parts, and routine annual maintenance. The Chief Pilot is also responsible for maintenance and technical improvements to the District's loader truck (nurse truck) and for renting a passenger plane and providing aerial surveillance flights over seasonally flooded wetlands and duck clubs for the District's Mosquito and Vector Control Specialists. Additionally, the Chief Pilot is also responsible for training the District's seasonal Loader Truck Operator.

BCMVCD GRUMMAN G-164B AG CAT

On average, the District's aircraft make applications to over 150,000 acres each year. The following table shows the amount of acres the District treated using aerial spraying in 2016.

BCMVCD AIRCRAFT SPRAYING IN 2016

Total Acres Rice Larvicided	64,355.449
Managed Wetlands Larvicided	8,097.490
Total Acres ULV* (Adulticided)	137,901.090
Total Aerial Acres Treated	**210,354.030**

*Ultra-Low Volume

All of the District's aircraft had their engines recently replaced with rebuilt engines and the District has already allocated funds in its reserve to provide for adequate funding for the next engine replacements. All three aircraft are currently being upgraded with MapVision 2.0 data management system and SatLoc G4 global positioning system units. The Satloc G4 units are the most accurate aircraft GPS systems available to pesticide applying aircraft on the market. These new GPS units will allow the District to execute extremely accurate pesticide treatments, have the ability to minimize any potential drift, and will allow flight maps to be uploaded to the aircraft via wireless connection.

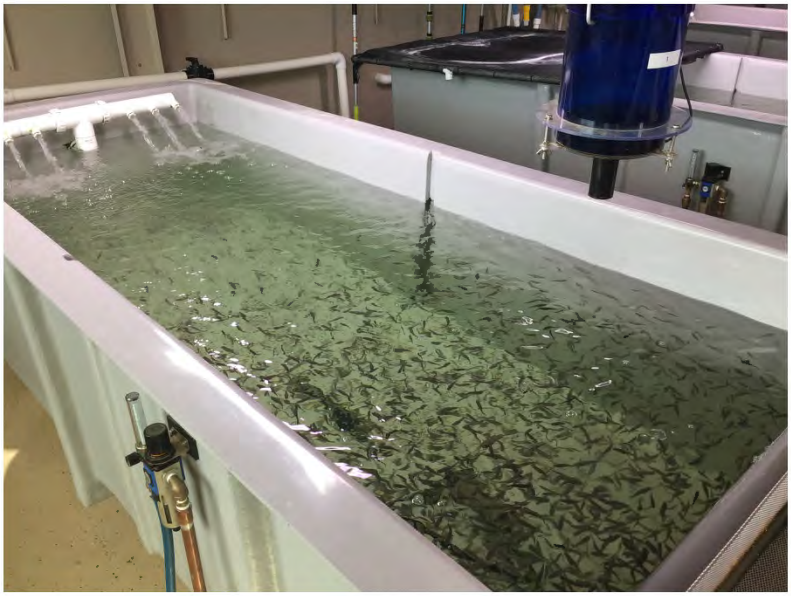
The District recently purchased MapVision 2.0, which is a geospatial web-based data management system. Workflow associated with each District department is automated, streamlined and results in cross department enterprise data sharing and data integrity. Management, finance/billing, employee time tracking, operations, treatment applications, field technician activities, laboratory processes, maintenance, vehicles, equipment, and reporting are a few of the core features MapVision offers. MapVision offers the most advanced options for management, finance, laboratory, maintenance and field operations. Examples include: inter-agency/commercial invoicing, employee time card tracking/payroll, bar code management system for inventory control and real time synchronization with state reporting databases such as CalSurv Gateway (synchronization with other state agency databases is available). Three unique components available in MapVision include:

- The Heightened Surveillance feature designed to monitor for invasive species and newly emerging pathogens in mosquitoes, ticks and wildlife.
- The Team Concentric Parcel Inspection Program based off the heightened surveillance feature.
- The Resistance Management module.

The MapVision data management system dynamically bridges all vector control departments in real time, resulting in the most efficient, effective, and resourceful geospatial data management solution available. All District computers will have MapVision loaded, and field bound laptops will have MapVision Mobile installed. This will be a comprehensive data collection system that will record accurate pesticide treatments, generate required regulated reports, and the District's mapping system. All of these systems will allow the District to operate more efficiently and effectively. The entire system is tailor made and customized to the District.

BCMVCD FISHERIES DEPARTMENT

The District recently converted an unused steam rack facility into a fisheries department for the propagation of mosquitofish. Within the fisheries department, the District has installed four tanks from Gambusia Solutions Inc. that are self-contained with their own filters, heaters, and water supplies. These tanks will allow the district to provide residents with year-round mosquitofish and will allow the District to produce "clean" mosquitofish should California Fish and Wildlife ever require them. The District has six large outdoor ponds where mosquitofish are kept and reared. The District provides mosquitofish to the public at no charge and there are numerous locations throughout the District where the public can obtain the mosquitofish.



MOSQUITOFISH TANK WITH MOSQUITOFISH

BCMVCD FISHERIES DEPARTMENT

Facilities Summary

According to the District Manager and confirmed by supporting documentation, the existing District infrastructure is sufficient to accommodate both present demand and anticipated future demands. Equipment and facilities of the District appear sufficient to provide necessary services. All infrastructure and equipment, including vehicles, aircraft, sprayers, and facilities are owned by the District. All equipment is well maintained and

replaced as necessary. There are no outstanding issues related to the needs and deficiencies of infrastructure with the District.

ADEQUACY OF PUBLIC SERVICES

According to the District Manager, service needs are established based on a number of factors including, but not limited to:

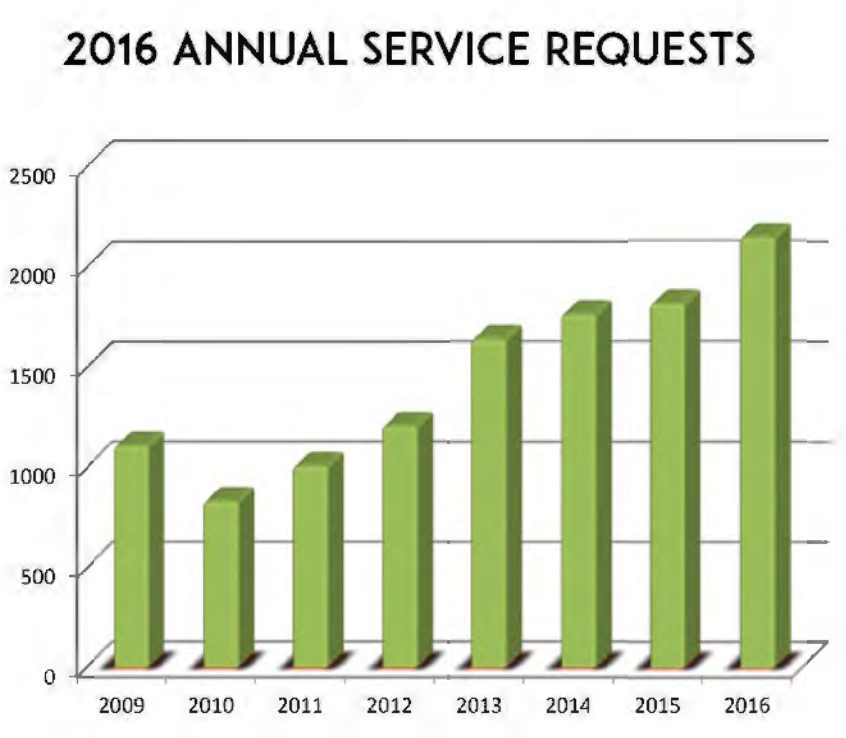
- Public requests and/or demands for service;
- Existing mosquito and vector populations;
- Mosquito-borne and vector-borne disease identification, and
- Available financial resources.

The standards and thresholds the District uses to determine service needs is based on District policies, the District's Integrated Vector Management (IVM) Program, and the demands the residents place upon the District. Within its financial ability and availability, the District responds to mosquito and vector populations and disease based on scientific data gathered by the District's surveillance programs. This is the fundamental core of a proper IVM program. In addition, the District strives to respond to service requests as fast as possible. The District also follows the California Department of Public Health's California Mosquito-Borne Virus Surveillance and Response Plan.

SERVICE REQUESTS

A major factor influencing service demand is the presence of vectors (in particular mosquitoes) and vector-borne disease agents within the District and neighboring areas. BCMVCD monitors for vector-borne viruses known to exist within the County. The demand for surveillance and control efforts increases as a result of vector-borne virus detection within the State of California and neighboring counties.

The District responds to service requests within its boundaries. As shown on the graph to the right, the number of service requests the District receives has increased from a little more than 1,000 requests in 2009 to over 2,140 requests in 2016.



Any property owner, business, or resident in the District may contact the District to request vector control related service or inspection and a District field technician

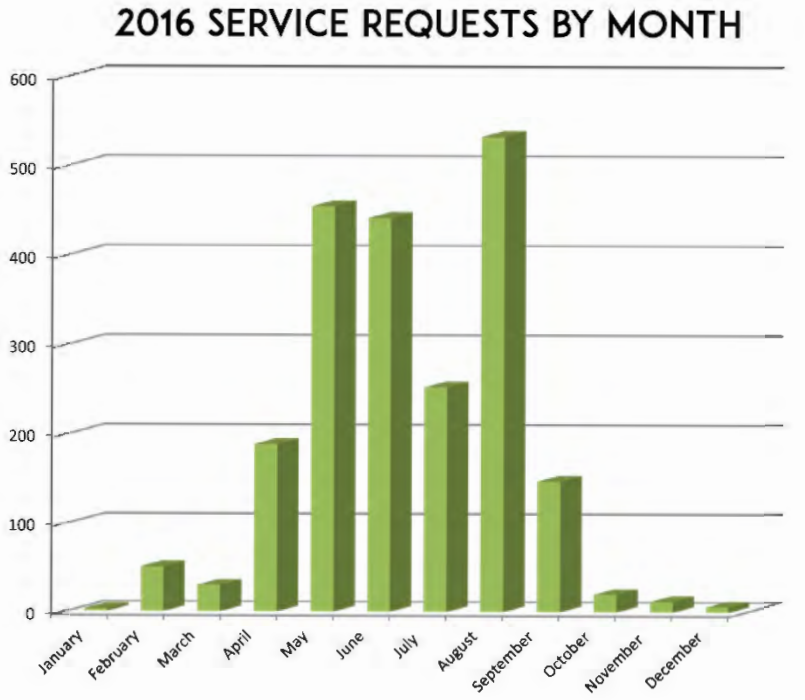
will respond promptly to the particular property to evaluate the property and situation and to perform appropriate surveillance and control services. The District responds to all service requests in a timely manner, regardless of location, within its boundaries and at times within the boundaries of allied districts.

As shown in the following table, in 2016, the District received 2,142 requests for services. The Lake Madrone area had the most services requests (376), followed closely by the Paradise area (351), the Chico area (308), the Oroville area (275), and the Biggs/East Biggs area (251).

2016 BCMVCD SERVICE REQUESTS

Area	Number of Service Requests	Percentages
Lake Madrone	376	17.6%
Paradise	351	16.4%
Chico	308	14.4%
Oroville	275	12.8%
Biggs/E. Biggs	251	11.7%
Magalia	200	9.3%
Gridley/East	113	5.3%
Berry Creek	112	5.2%
Richvale	35	1.6%
Stirling City	27	1.3%
Palermo	17	0.8%
Forest Ranch	17	0.8%
Cohasset	13	0.6%
Dayton	10	0.5%
Bangor	7	0.3%
Brush Creek	6	0.3%
Forbestown	7	0.3%
Hamilton City	4	0.2%
Clipper Mills	4	0.2%
Honcut	2	0.1%
Nelson	3	0.1%
Yankee Hill	3	0.1%
Durham	1	0.0%
Totals	**2,142**	**100%**

As shown on the following graph the vast majority of these service requests are received during the mosquito season, which is usually April through September.



It should be noted that the District runs a vigorous preventative program, which controls larval mosquitoes before they emerge. With this program, the residents of the District will see much fewer biting adult mosquitoes and fewer cases of vector borne diseases. Consequently, service requests alone are not a good indicator of the level of demand for the District's services. The preventative work that BCMVCD performs helps keep the number of service calls related to mosquito biting activity low and prevents cases of disease.

The District tracks the time it takes for its staff to perform various duties directly related to mosquito abatement and vector control services. The following table shows the types of services performed and the number of hours District staff spent performing those services in 2016.

Service Performed	**Hours**
Ground Larvicide Treatments	1,006.85
Fish Plants	244.40
Aerial Larvicide	317.67
Ground Adulticide	4,420.64
Residual Sprays	210.07
Aerial Adulticide	13.20
Inspections	4,389.00
Total Hours	**10,601.83**

In an average year, the District performs thousands of individual applications of pesticides throughout the District to control mosquitoes, at both the larvae stage and the adult stage. To reduce the number of mosquito larvae, in 2016, the District performed 2,863 individual applications of various types of larvicides. These applications used a total of 5,379 gallons of liquid larvicides and 87,396 pounds of solid larvicides, which treated 72,796 acres of area. Also in 2016, the District performed 3,194 individual applications of various types of adulticides. These applications used a total of 2,417 gallons of adulticides, which treated approximately 405,486 acres of area.

MSR DETERMINATION 3-1: ADEQUACY OF PUBLIC SERVICES AND FACILITIES	
	BCMVCD has sufficient infrastructure, personnel and resources to provide efficient and effective mosquito abatement and vector control services within the boundaries of the District, both at present and into the future.

MSR DETERMINATION 3-2: ADEQUACY OF PUBLIC SERVICES AND FACILITIES	
	BCMVCD provides a comprehensive vector and disease control function that relies on an Integrated Vector Management program utilizing a full range of tools including public education, surveillance, biological controls, and chemical controls.

MSR DETERMINATION 3-3: ADEQUACY OF PUBLIC SERVICES AND FACILITIES	
	Other than the need for a new administration building and laboratory at the District's Oroville facility, the District has no unmet infrastructure needs or deficiencies.

MSR DETERMINATION 3-4: ADEQUACY OF PUBLIC SERVICES AND FACILITIES	
	BCMVCD has a large inventory of vehicles and equipment, all of which are well maintained and replaced as necessary.

MSR DETERMINATION 3-5: ADEQUACY OF PUBLIC SERVICES AND FACILITIES	
	In Fiscal Year 2017-18, the District intends to build a new administrative building and laboratory at the District's Oroville facility to replace the existing structure, which is undersized, outdated, and in need of major repairs. The new administrative building and laboratory will be much larger than the existing structure.

MSR DETERMINATION 3-6: ADEQUACY OF PUBLIC SERVICES AND FACILITIES	
	The District has recently acquired a new geospatial web-based data management system, which will allow the District to operate more efficiently and efficiently. The District has also recently acquired highly accurate GPS units for their aircraft that will allow the District to perform extremely accurate pesticide treatments and minimize any potential pesticide drift.

MSR DETERMINATION 3-7: ADEQUACY OF PUBLIC SERVICES AND FACILITIES	
	In 2016, the District performed 6,057 individual applications of larvicides and adulticides, which treated 478,282 acres of area. This large number of applications, and the large area treated, demonstrates that the District is diligently performing the services it is empowered to provide.

MSR FACTOR NO. 4: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES.

This section analyzes the financial structure and viability of the District. Included in this analysis is the consideration of revenue sources, amount of revenue, stability of revenues, and expenditures.

Each year the District's District Manager and Office Manager prepare and submit an operating budget to the Board of Trustees for the General Fund no later than June of each year. The adopted budget becomes operative on July 1 of each year. The Board of Trustees must approve all supplemental appropriations to the budget and transfers between major accounts.

The District's funds are deposited with, and maintained by, the Butte County Treasurer and Tax Collectors Department, but the County has no control over how the District's funds are utilized. The funds that the District deposits with the County Treasurer are placed in the County's Investment Trust Fund, which accounts for the assets of legally separate entities that deposit cash with the County Treasurer in an investment pool, which commingles resources in the investment portfolio for the benefit of all participants. The District receives dividends from the Investment Trust Fund. Because the County Treasurer and Tax Collectors Department maintains the District's funds, the District's annual budget is included as a part of the County's overall annual budget.

The District's latest adopted budget for each year is placed on the District's website, along with past budgets. The current and past annual financial reports for the District are also placed on the District's website.

The District has adopted a formal investment policy as required by Section 53600, et al. seq., of the California Government Code. Investments are made in the following areas:

- Butte County Treasurer investment pool
- Vector Control Joint-Powers Agency (VCJPA)
- Local Agency Investment Fund (LAIF)

Substantially all of the District's cash is invested in interest bearing cash accounts.

Revenues

The District receives revenue from a number of different sources. The primary sources of revenue for BCMVCD derive from:

- **Ad-valorem Property Taxes**. Ad-valorem[6] property tax is a one percent general levy of the assessed market value of a property. This one percent is distributed among many agencies in the county. For cities and the county, this tax is usually deposited into their general funds, which can be used for any service. For special districts, this tax is also deposited into the district's general funds to be used for the district's sole purpose. The level of revenue from property taxes can be considered relatively consistent, as the taxes usually remain at the same level from year to year. However, property tax revenue can decrease due to decreasing property values, which is what occurred beginning in 2008 due to the downturn in the economy and housing market. Due to the downturn in the economy, properties were reassessed to a lower amount, which in effect reduced property tax revenue flowing to cities and special districts. Revenue from property taxes has been increasing over the last few years as properties are reassessed, but remain below pre-2008 levels. New development on a property raises the property value of that parcel, with a corresponding increase in property tax revenues.

  In Fiscal Year 2015-16, approximately 54 percent ($2,073,678) of BCMVCD's revenues were received from the District's share of the 1 percent ad valorem property tax. The District receives revenue from property taxes at a rate of .00013179 multiplied by the assessed value of a parcel.

  The Butte County Tax Collector's Office bills and collects the District's share of property taxes and assessments. The Butte County Treasurer's Office remits current and delinquent property tax collections to the District throughout the year.

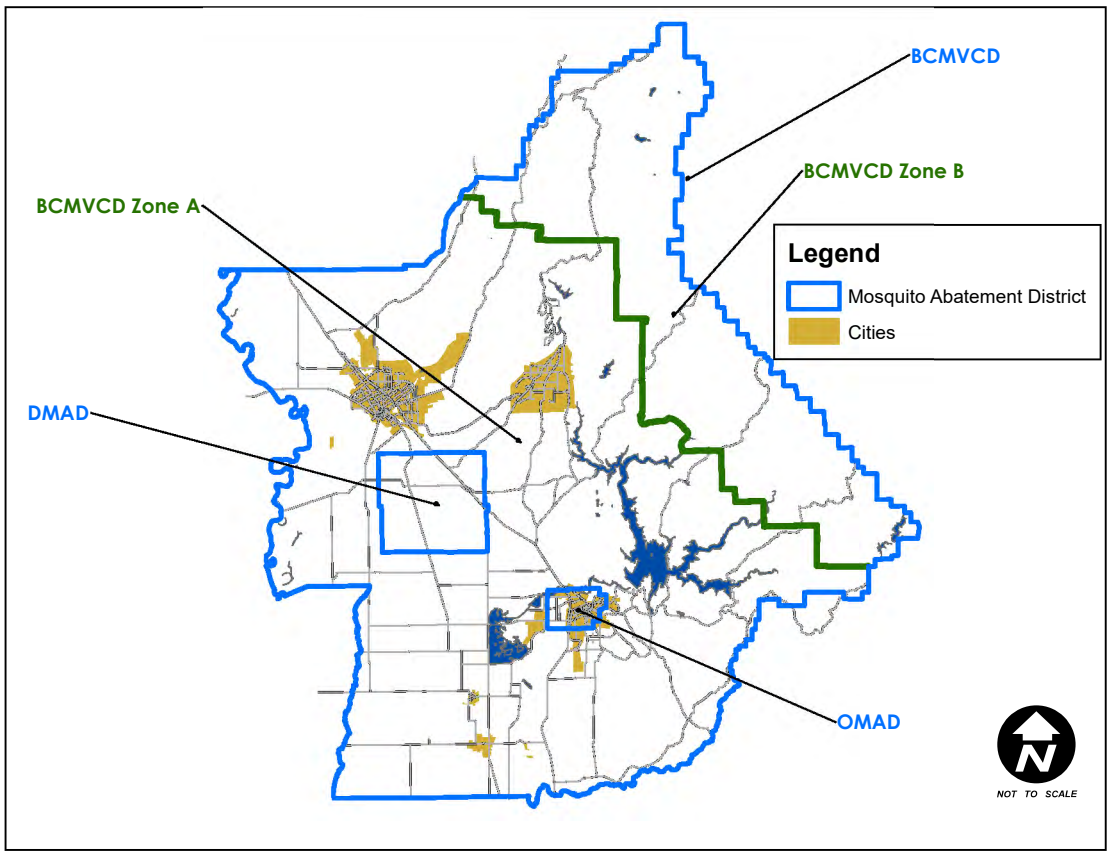
- **Assessment Fees**. In Fiscal Year 2015-16, approximately 19.5 percent ($741,270) of BCMVCD's revenues were received from special benefit parcel assessments.

  On July 9, 2014, the District Board of Trustees adopted Resolution No. 14-07 ratifying property owner voter approval of an annual per parcel assessment for enhanced mosquito and vector control services. Single-family homes of one acre or less as assessed $9.68 plus eight cents for each additional acre. Owners of vacant parcels are assessed $2.42 per parcel. Apartment complexes are assessed $3.78 per apartment up to 20, and 97 cents after that. Farmers are assessed eight cents per acre and undeveloped rangeland are assessed 2 cents an acre. Commercial property and mobile homes are assessed $4.85 per quarter acre and $4.85 for each

[6] Latin for "according to value"

additional acre over five. The assessment charge for other land uses is based on benefit derived to that use. The parcels within the Hamilton City portion of the District have an annual per parcel assessment of $4.00.

As provided for by California Health and Safety Code §2090, the District created two assessment zones of benefit – Zone A and Zone B (see the below map). The Zone B area is located in the far eastern portion of the county and consists mostly of large, undeveloped parcels that are predominately utilized for timber harvesting, although Zone B does include the unincorporated mountain community of Butte Meadows. Parcels within Zone A are assessed as noted above, while the parcels within Zone B are assessed $2.42. The District recognizes that the parcels within Zone B require a lesser degree of mosquito and vector control services and the reduced assessment charge in Zone B reflects this.



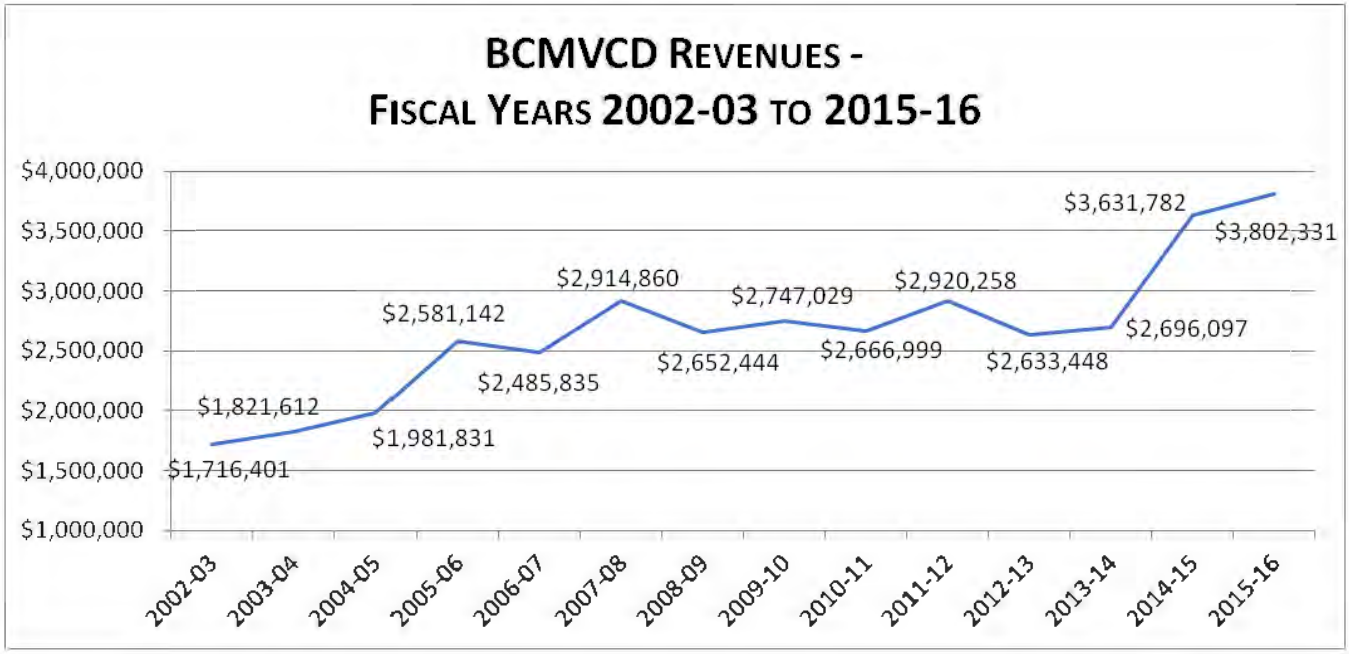
BCMVCD PARCEL ASSESSMENT ZONES

Each year the District has an Engineer's Report prepared that describes the mosquito and vector control services to be funded by the assessment, establishes the estimated costs for those services, determines the special benefits and general benefits received by property from the services and apportions the assessments to lots and parcels within the District based on the estimated special benefit each parcel receives from the services funded by the benefit assessment.

- **Redevelopment Agency (RDA)/RDA Residual Pass Through Funds**. The District at one time received revenue through the Chico Redevelopment Agency but in 2012, the State dissolved all redevelopment agencies. The District continues to receive RDA residual pass through funds from the City of Chico as Successor Agency to the Chico Redevelopment Agency, which is the successor agency to the Chico RDA. In Fiscal Year 2015-16, approximately 17 percent ($652,729) of BCMVCD's revenues were received from RDA residual pass through funds. It should be noted that the revenue from the RDA residual pass through funds received by the District in FY 2015-16 was significantly greater than that received in the three prior fiscal years, when $351,004, $361,199, and $383,754 was received.

- **Service Fees.** In Fiscal Year 2015-16, approximately 5.7 percent ($217,422) of BCMVCD's revenues were received from direct charges for services. While the District is a non-enterprise district, District policy allows the District to charge for control of significant landowner caused mosquito sources defined by District policy as being three or more acres in size and producing three or more larvae per dip.

Revenues for the District have remained relatively steady over the last ten years, with some minor fluctuations. Revenue for the District in Fiscal Year 2015-16 was $3,802,331, and revenue for the current fiscal year (2016-17) is projected to be $3,596,700. District revenues rose dramatically after the District's special benefit assessment was approved in 2005. Prior to the approval of the assessment, annual District revenues were usually less than $2,000,000. The following chart shows the District's revenues for Fiscal Years 2003-04 to 2015-16.



EXPENDITURES

Expenditures for BCMVCD generally consist of salaries and employee benefits, services and supplies (costs for pesticides, fuel, insurance, maintenance) and fixed (capital)

assets expenditure (purchase of new vehicles or equipment). In Fiscal Year 2015-16, salaries and employee benefits ($1,989,108) accounted for 59% of the District's expenditures, services and supplies ($1,217,699) accounted for 36.1% of the District's expenditures, and expenditures for fixed assets ($166,042) accounted for 4.9% of the District's expenditures.

Total operating and capital expenditures for the District for Fiscal Year 2015-16 was $3,451,522. A breakdown of the District's actual, itemized expenditures for Fiscal Years 2013-14, 2014-15, and 2015-16 are shown on the following table.

BCMVCD ADOPTED BUDGET EXPENDITURES FOR FISCAL YEARS 2013-14 TO 2015-16

	2013-14	2014-15	2015-16
SALARIES & BENEFITS			
Salaries	1,198,500	1,215,000	1,300,700
Workers Compensation	50,000	50,000	60,000
FICA & U I	103,500	105,000	112,200
Health Insurance	309,000	365,000	285,500
Health Ins		24,200	20,500
PERS	224,000	217,000	303,000
Total	**$1,885,000**	**$1,976,200**	**$2,081,900**
SERVICES & SUPPLIES			
Gas & Oil	90,000	120,000	100,000
Repairs & Parts-	10,000	20,000	20,000
Repairs & Parts	25,000	30,000	30,000
Office Supplies	13,000	15,000	15,000
Education & Publicity	20,000	40,000	30,000
Insecticides	303,500	553,000	553,000
Expendable Equipment	10,000	50,000	50,000
Communications	15,000	20,000	20,000
Travel	10,000	15,000	15,000
Utilities	20,000	25,000	25,000
Rent	4,000	5,000	5,000
Special Services	80,000	100,000	80,000
Trustee Allowance	13,200	13,200	13,200
General Insurance	70,000	85,000	75,000
Employee Trng & Dues	8,000	10,000	10,000
District Fees and	30,000	30,000	30,000
Miscellaneous	10,000	20,000	12,000
Research Supplies	20,000	50,000	40,000
Alternate Technology	1,000	5,000	1,000
Special Discretionary	10,000	25,000	10,000
Gambusia	2,000	5,000	5,000
Total	**$764,700**	**$1,236,200**	**$1,139,200**

Bldg & Improvements	1,000	50,000	50,000
Vehicles	1,000	90,000	95,000
Spray Equipment	1,000	30,000	25,000
Aircraft	5,000	10,000	-5,000
Office Equipment	1,000	2,000	-1,000
Laboratory Equipment	1,000	2,000	-1,000
Shop Equipment	1,000	2,000	-1,000
Education & Publicity	1,000	2,000	-3,000
Miscellaneous	1,000	2,000	5,000
Communications	10,000	5,000	-1,000
Total	**$23,000**	**$195,000**	**$187,000**
Total Expenditures	**$2,672,700**	**$3,407,400**	**$3,400,100**

BCMVCD Annual Budgets

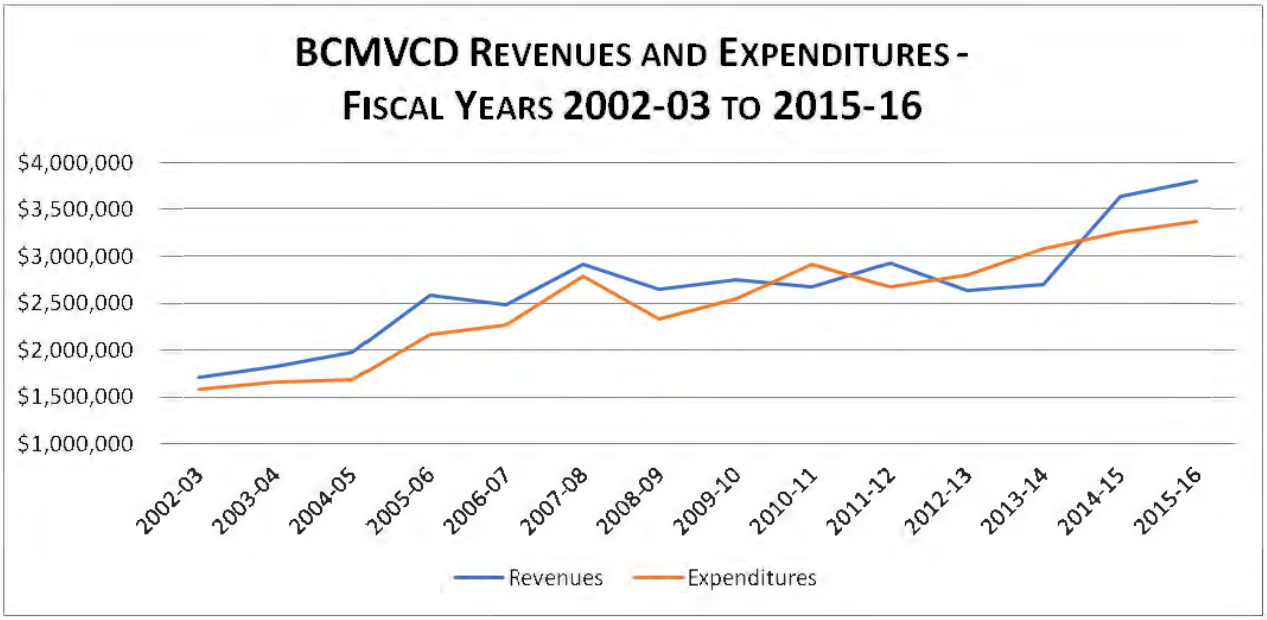
As previously noted, the District prepares a budget for the upcoming fiscal year which shows anticipated revenue and anticipated expenditures. The District's budgets for Fiscal Years 2012-13 to 2016-17 are shown in the below table. The budgets for FY 2012-13 to 2015-16 are actual budgets, while the FY 2016-17 budget shows the budget as adopted and amended by the District Board of Trustees.

BUTTE COUNTY MOSQUITO AND VECTOR CONTROL DISTRICT BUDGETS – FY 2012-13 to FY 2016-17

Detail by Revenue Category and Expenditure Object	2012-13 Actuals	2013-14 Actuals	2014-15 Actuals	2015-16 Actuals	2016-17 Amended By District Board
REVENUES					
Current Secured Property Tax	1,804,783	1,926,518	2,035,744	1,915,906	1,968,941
Current Supplemental Property Tax	7,402	13,584	22,807	23,245	14,214
Current Unsecured Property Tax	113,016	122,041	120,667	129,951	130,573
Prior Unsecured Property Tax	3,587	3,985	2,831	4,576	2,747
Miscellaneous Taxes	4,846	4,442	4,633	5,442	4,315
Interest and Rents	31,921	15,997	18,105	22,153	21,743
Fair Market Value Adj - Unrealized Gain (Loss)	(38,287)	14,712	396	19,845	-
Homeowners Property Tax Relief	38,055	37,811	37,404	36,785	36,784
Property TX-RDA Residual (Pass Through Property Taxes)	-	-	-	215,323	93,559
R.D.A. - City of Chico	351,004	361,199	383,754	435,307	378,749
Charges For Current Services	270,779	177,306	984,161	217,422	150,000
Other County Benefit Assessment				741,270	766,505
Miscellaneous Revenue	4,950	-	13,135	26,145	20,000
Reimbursement of Prior Year Expense	-	1,681	-	-	
Interest and Rents - Hamilton City Service Area Fund	(103)	98	76	86	-
Charges For Current Services - Hamilton City Area	2,931	2,588	8,465	8,803	8,570
Interest and Rents / Unrealized Gain/Loss	(71)	27		72	-
TOTAL REVENUES	**$2,594,813**	**$2,710,836**	**$3,632,178**	**$3,802,331**	**$3,596,700**
EXPENDITURES/APPROPRIATIONS					
Salaries and Employee Benefits - County	1,941,232	1,771,373	1,799,086	1,984,009	2,137,800
Salaries and Employee Benefits - Hamilton City	5,642	4,759	4,835	5,099	5,000
Sub-Total	1,946,874	1,776,132	1,803,921	1,989,108	2,142,800
Services and Supplies - Butte County	813,319	928,412	1,183,602	1,214,907	1,235,700
Services and Supplies - Hamilton City	1,151	1,499	3,128	2,792	3,432
Sub-Total	814,471	929,911	1,186,730	1,217,699	1,239,132
Fixed (Capital) Assets	43,301	369,796	264,424	166,042	530,000*
Appropriation for Contingencies-Butte County	-	-	-	-	895,875
Appropriation for Contingencies-Hamilton City	-	-	-	-	2,108
Sub-Total	-	-	-	-	897,983
TOTAL EXPENDITURES / APPROPRIATIONS	**$2,804,646**	**$3,075,839**	**$3,255,075**	**$3,372,849**	**$4,809,915**
NET COSTS / USE OF FUND BALANCE	**($209,833)**	**($365,003)**	**$377,103**	**$429,482**	**($1,213,215)**

*This appropriation was initially $210,000 but was increased by $320,000 to $530,000 by the District Board of Trustees in October 2016. The additional funds were obtained from the District's Capital Outlay Reserve and were utilized to purchase new mapping software and equipment.

The annual expenditures of a special district should generally equal, or, ideally, be less than the revenue a district receives in any given fiscal year. The following graph shows the total revenues and expenditures for Fiscal Years 2002-03 through 2015-16



The budgets for Fiscal Years 2012-13 and 2013-14 show that expenditures exceeded revenues for each of these fiscal years. According to the District, in Fiscal Year 2012-13, District expenditures exceeded revenues due to a much earlier and longer mosquito season due to drought and above average temperatures, a massive increase in West Nile virus activity, unexpected maintenance and repairs to aircraft, and a large decrease in revenues due to declining property values due to the economic slump. Expenditures exceeding revenues in Fiscal Year 2013-14 was again due to an unforeseen early and long lasting mosquito season due to drought, a massive increase in West Nile virus activity, the replacement of the District's turbo AgCat aircraft engine (+$350,000), and another large decrease in revenues due to declining property values. The District's appropriation for contingencies was utilized to cover the unanticipated expenses in these two fiscal years. Due to the unanticipated expenses in these fiscal years, the District laid off two full-time permanent employees in July 2013 and has not filled several other open positions.

The District's budgets contain an appropriation for contingencies. For Fiscal Year 2016-17, the District appropriated $897,983 for this purpose. The amount appropriated for contingencies is substantial and would appear to be able to fund almost any unforeseen events.

As of June 30, 2016, the District's General Fund reported a fund balance of $3,388,721. Of that amount, $523,807 has been assigned to cover the costs of compensated absences for District personnel and $331,941 is not available for future spending because it has already been designated for chemical and supplies inventory and for prepaid expenses. The amount of $2,532,973 constitutes unassigned fund balance that is available for future District operations. A detailed schedule of fund balances and their funding composition as of June 30, 2016, is as follows:

	2016
Fund balances:	
Non-spendable:	
Materials and supplies inventory	310,103
Prepaid expenses	21,838
Total non-spendable	$331,941
Assigned:	
Compensated absences	523,807
Total assigned	523,807
Unassigned	$2,532,973
Total	$3,388,721

The District also has an emergency allocated reserve known as Vector-Borne Disease Emergency. This reserve allocation is pursuant to GASB 54 requirements. The District has $205,000 ($200,000 in Butte and $5,000 in Hamilton City) in this emergency fund to address any vector-borne disease emergency.

Net Pension Liability (CalPERS)

As of the fiscal year ended June 30, 2016, the District reported $2,390,965 in net pension liabilities for its proportionate shares of the net pension liability of the District's pension plan. The net pension liability is defined as the unfunded liability for the pension benefits promised to current employees, retirees, and their beneficiaries. The District's net pension liability for the pension plan is measured as the proportionate share of the net pension liability. The net pension liability of the Plan is measured as of June 30, 2015 (the measurement date), and the total pension liability for the Plan used to calculate the net pension liability was determined by an actuarial valuation as of June 30, 2014 (the valuation date), rolled forward to June 30, 2015, using standard update procedures. The District's proportion of the net pension liability was based on a projection of the District's long-term share of contributions to the pension plan relative to the projected contributions of all participating employers, actuarially determined.

Annual Financial Audit

Every year the District retains the services of a certified public accountant to prepare the District's annual financial audit. An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the District's financial statements. The District's financial statements include all transactions for which the District is financially accountable. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

The District's Annual Financial Report for Fiscal Year 2015-16 determined that the District's basic financial statements have been prepared in conformity with accounting principles generally accepted in the United States of America (GAAP). The Governmental Accounting Standards Board (GASB) is the accepted standard-setting body for establishing governmental accounting and financial reporting principles. The Financial Report did not identify any deficiencies in the District's internal financing controls, material weaknesses, or significant deficiencies in the District's financial reporting.

MSR DETERMINATION 4-1: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES - REVENUE	
	The primary sources of revenue for the District include property taxes, parcel assessments, service fees, and RDA residual pass through funds. Revenue amounts have remained relatively steady in the last four years with no significant changes expected.

MSR DETERMINATION 4-2: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES - EXPENDITURES	
	Normal expenditures for the District include salaries, insecticides, pension and health insurance contributions, gas and oil, and purchases of new vehicles. The District's expenditures are clearly described, do not appear to be excessive and are necessary to provide superior services to the residents of the District.

MSR DETERMINATION 4-3: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – BUDGET IMBALANCE	
	The District appears to be financially stable, with sufficient funding for services provided. However, several times in the last few years expenditures by the District have exceeded revenues, which was the result of earlier and longer mosquito seasons, a massive increase in West Nile virus activity, unexpected maintenance and repairs to the District's aircraft, and a large decrease in revenues due to declining property values due to the economic slump. The District had adequate fund balance to cover the revenue shortfall. The District should continue to monitor its fund balance and contingency funds in order to meet new and emerging public health threats.

MSR DETERMINATION 4-4: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FUND BALANCE	
	As of June 30, 2016, the District's General Fund had a fund balance of $3,388,721, $2,532,973 of which is unassigned and is available for future District operations. This is a very large fund balance that could be used for unforeseen expenditures. The District maintains $205,000 in an emergency fund to address vector-borne disease emergencies.

MSR DETERMINATION 4-5: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FINANCIAL AUDIT	
	The BCMVCD complies with the State Law regarding audits and has an annual audit/financial report prepared by an outside accounting firm.

MSR FACTOR NO. 5: STATUS OF, AND OPPORTUNITIES FOR, SHARED FACILITIES.

There are three mosquito abatement districts within Butte County – the Butte County Mosquito and Vector Control District (BCMVCD), the Durham Mosquito Abatement District (DMAD), and the Oroville Mosquito Abatement District (OMAD), each of which has its own budgets, board, staff, equipment, materials, and facilities. DMAD and OMAD are completely surrounded by the boundaries of the BCMVCD. Given that there are three mosquito abatement districts within Butte County, there are many opportunities for these districts to share facilities, equipment, personnel, and costs.

All three districts, on a short-term basis, may be able to offer their services (staff, equipment, and expertise) to help control mosquitoes outside of Butte County in the event of a public health emergency, such as if an outbreak of West Nile disease cases occurred. As an example, the BCMVCD may (and has) provide aerial spraying services to an area outside of its jurisdiction if another district or county needed urgent assistance to control mosquitoes.

Sharing facilities, equipment, and personnel between the three districts could result in significant cost savings. Unfortunately, there is very little in the way of shared facilities occurring between the three districts. The BCMVCD has shared costs with Sutter-Yuba Mosquito and Vector Control District and other districts to purchase bulk pesticides, repellents, mosquitofish food, and research. These shared bulk purchases results in lower material and shipping costs and in higher staff efficiencies. BCMVCD offers joint training sessions with the other two districts, and has offered spray equipment characterization and calibration for the other two districts.

BCMVCD owns and operates three airplanes for aerial spraying. The use of aerial spraying is a valuable resource for the District and provides an opportunity for shared resources with DMAD, since this district contains large areas of rice fields and contains the Rancho Esquon wildlife area, which consists of 900+ acres of managed wetland habitat that provide significant mosquito breeding habitat. The Durham Mosquito Abatement District does not have any aircraft, and, on the occasion that aerial spraying is necessary, could contract with BCMVCD for such services. BCMVCD has offered this service to DMAD at a reduced cost. It should be noted that BCMVD, without charge to DMAD, already performs aerial spraying of the 900-arce Rancho Esquon wetlands area in order to reduce mosquito populations within BCMVCD's service area. BCMVCD abates the mosquitoes created by Rancho Esquon to suppress the extraordinary high populations of mosquitoes that managed wetlands produce. Surveillance data has shown that prior to the District treating these fields at Rancho Esquon, the populations would migrate north into south Chico affecting the BCMVCD tax payers. The District has a cooperative MOU with the owner of Rancho Esquon.

Rancho Esquon reimburses the District for the larviciding control costs. Therefore, there are no BCMVCD tax dollars expended within the Durham MAD service area.

The three mosquito abatement districts within Butte County should immediately begin discussions towards increasing shared resources between the districts that would result in better operational efficiencies and at lower costs for the districts. The failure of the districts to effectively engage in such discussions and achieve meaningful results may cause the Commission or another local agency to initiate a formal consolidation of the three districts.

MSR DETERMINATION 5-1: STATUS OF, AND OPPORTUNITIES FOR, SHARED FACILITIES	
	There are many opportunities for the sharing of resources (facilities, equipment, training and staff) between the three mosquito abatement districts within Butte County, but very little sharing of resources occurs. All three districts should engage in immediate and meaningful discussions to increase shared resources between the districts. The failure of the districts to effectively engage in such discussions and achieve meaningful results may cause the Commission or another local agency to initiate a formal consolidation of the three districts.

MSR FACTOR NO. 6: ACCOUNTABILITY FOR COMMUNITY SERVICE NEEDS, INCLUDING GOVERNMENTAL STRUCTURE AND OPERATIONAL EFFICIENCIES.

BCMVCD BOARD OF TRUSTEES

The BCMVCD is governed by an 11-member Board of Trustees. The current Board of Trustees is highly qualified and balanced. Four Trustees hold doctorates, including a veterinarian, a medical entomologist, a chemist, and a medical doctor. The Board of Trustees are appointed pursuant to California Health and Safety Code, Sections 2022 to 2025, with a term of office of two or four years. Five Trustees represent Butte County and are chosen by the Butte County Board of Supervisors; one Trustee represents Glenn County and is chosen by the Glenn County Board of Supervisors; and five Trustees, one each from each incorporated city in Butte County who are chosen by each city council.

The Board of Trustees is responsible for setting policy and general administrative procedures for the District, establishes and regulates fees, and selection of the District Manager, who serves at the will of the Board. The policies and procedures set by the Board of Trustees are administered by the District Manager.

Regular meetings of the Butte County Mosquito and Vector Control District Board of Trustees are on the 2nd Wednesday of each month, starting at 6:30 PM. Meeting locations alternate monthly between the Oroville Headquarters and Chico Substation.

Trustees who attend one or more meetings a month are eligible to receive a set amount per month and for expenses incurred in attending business meetings of the Board. Currently the amount is $100 per month (approved 2/8/06). Payment is made within five days following a Board of Trustees meeting.

BCMVCD BOARD OF TRUSTEES MEETING ROOM

The agendas for the Board of Trustees meeting are posted on the window next to the front door of the Oroville Headquarters, in a bulletin display board at the Chico Substation, and are posted to the District's website (www.bcmvcd.com). The posting of the agendas are in a visible spot easily observed during open and closed office hours. Copies of the agendas are also sent to the media. All agenda postings and mailing are done at least six-days prior to the meeting.

The District Board of Trustees recently considered approving switching the Board meeting packets from paper to electronic format and the District is currently in the process of purchasing tablet computers for this purpose. Switching to the electronic meeting packets will reduce staff time in preparing the Board meeting packets and will reduce costs as no paper or photocopying will be required.

The room at the District's Oroville facility where the Board of Trustees meets is small and may not be conducive to effective meetings, especially if more than a few members of the public are attending a meeting. The District has plans to build a new administration building in Fiscal Year 2017-18, which would include a larger room where the Board of Trustees would meet. The room at the District's Chico facility where the Board of Trustees meets is large, modern, and conducive to effective meetings. On occasion, for anticipated large Board meeting attendance for things such as an EIR public hearing, Benefit Assessment public hearings, and others, the Board of Trustees will hold the meeting (if it happens to be a Oroville month) in the Oroville Headquarters' Briefing Room, which has a much larger size.

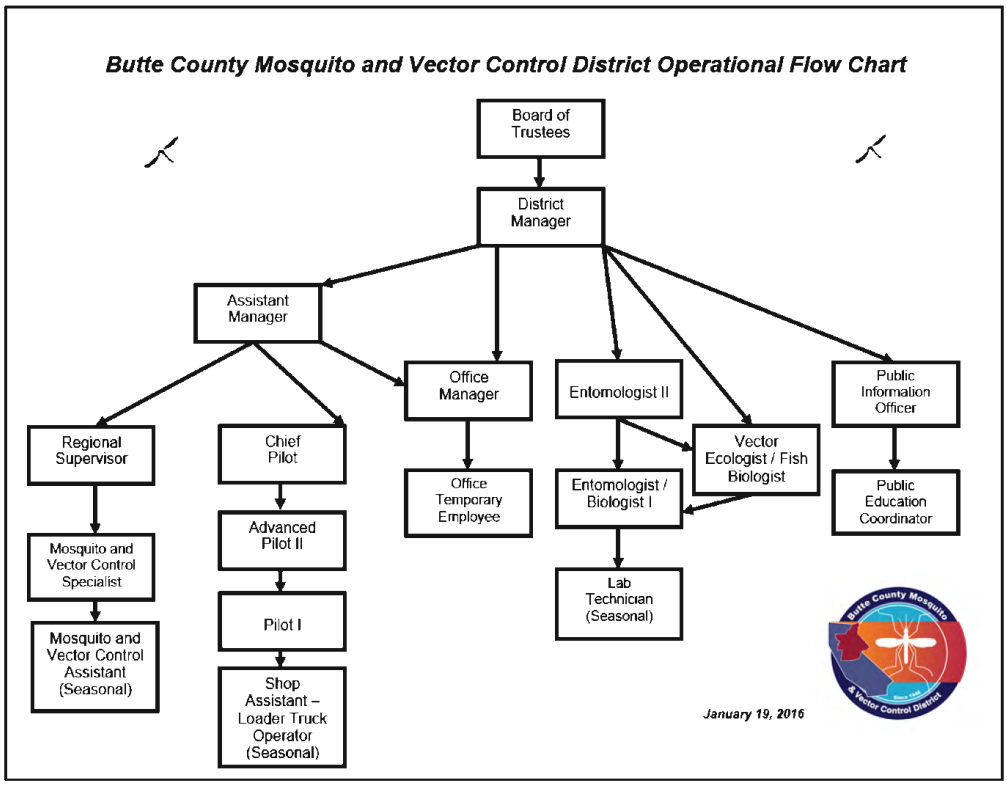
BCMVCD STAFFING

While public sector management standards vary depending on the size and scope of the organization, there are minimum standards. Well-managed organizations evaluate employees annually, track employee and agency productivity, periodically review agency performance, prepare a budget before the beginning of the fiscal year,

conduct periodic financial audits to safeguard the public trust, maintain relatively current financial records, conduct advanced planning for future service needs, and plan and budget for capital needs.

The BCMVCD is managed by the District Manager, who is appointed by the BCMVCD Board of Trustees and serves at the will of the Board. The current District Manager has been in this position since April 9, 2008. The District Manager acts in a very professional manner and is dedicated to ensuring that the District provides comprehensive and high-quality mosquito abatement and vector control services to the residents living within the District's boundaries.

As shown on the following table and figure, the District currently has sixteen full-time employees and hires about thirteen seasonal employees for the mosquito season (usually May through October).



BCMVCD Employee Positions	No. of Employees
District Manager	1
Assistant Manager	1
Office Manager	1
Chief Pilot	1
Entomologist II	1
Vector Ecologist / Fish Biologist	1
Regional Supervisor	2
Mosquito and Vector Control Operator	8
Mosquito and Vector Control Assistant Seasonal	10
Shop Assistant Seasonal	2
Lab Assistant Seasonal	1
Total Positions/Employees	29

The staff of the BCMVCD work a 40 hour a week job from 6:00 a.m. until 4:30 p.m. During this time the staff could be doing a various activities, but for the most part, all the activities are centered on surveillance and control of immature mosquitoes or virus.

The BCMVCD has a total of 9 Mosquito and Vector Control Specialists and 9 Mosquito and Vector Control Assistants that perform larval surveillance, larval control, best management practices to reduce mosquitoes, physical control, source reduction, create aircraft application maps, and conduct public education and outreach.

BCMVCD has a total of 3 staff members (2 full-time permanent / 1 seasonal) that work in the District's lab. Their 40 hour week consists of maintaining traps, servicing traps, larval inspections, identification, tabulating mosquito populations, testing mosquito-borne disease, resistance studies, pesticide efficacy studies, and public education and outreach.

BCMVCD has a pilot and a loader truck operator that perform aircraft and loader truck maintenance, load the aircraft, and make larval applications to large acreage sources.

BCMVCD has three Regional Supervisors positions that perform paperwork, supervise field employees, conduct larval inspections, larval control, best management practices, source reduction, and public education and outreach. Only two of the Regional Supervisors are currently filled.

BCMVCD has three administrative staff that performs the day to day management/administrative tasks to run the District, answer phones, take service requests, balance and create the budgets, orders, etc. etc.

During the forty hour a week time, all staff look for ways to monitor mosquito populations, control and/or lower mosquito populations, perform virus surveillance, and teach the public ways to prevent mosquitoes and mosquito bites which would be best described and summarized as preventative work. Fogging is done as an extra or overtime task. The preventive work that the District provides/conducts greatly lowers

the overall adult mosquito population that plagues the residents of Butte County. Without preventive mosquito control, tens of thousands or hundreds of thousands more acres would need to be fogged. Millions, if not billions more adult mosquitoes would be on the wing flying into the communities of Butte County. Preventive mosquito control is the most effective and efficient way to control mosquitoes.

Customer service is the number one priority for the District's administrative staff. The District employs one full time Office Manager. The tasks of the administrative personnel involve serving the residents of Butte County and Hamilton City, as well as the employees of the District. Accounting, budgeting, responding to telephone inquiries, maintaining public records, coordinating policies, and reporting to the Board of Trustees are just a few of the many duties the Administration Department performs.

Fifteen of the 16 full-time permanent employees have obtained mosquito and vector control licenses (Categories A, B, C, and D) through the California Department of Public Health and three of the 16 employees have additional licenses through the California Department of Pesticide Regulation. These licenses require continuing educational training and recertification every two years. The District's Chief Pilot has a commercial pilot's license through the Federal Aviation Administration.

All of BCMVCD's field personnel have assigned zones and also team up to share efforts when needed or to serve as a substitute when the primary assigned person is not available. Thus, the workload on each person is kept more balanced. Zone assignments occasionally change, and many of the District's personnel have worked in different zones, giving them a broader knowledge of the whole District. Such a zone assignment structure would also lend itself to serving the areas of the OMAD and DMAD should the BCMVCD be responsible for services in the future. In addition to zone assignments, many District personnel have specialized skills for serving the whole District. These skills include operation of specialized treatment equipment, making public presentations, repairing equipment, maintaining equipment, general construction, landscaping, welding, working on data systems, doing needed research, and maintaining disease monitoring chicken flocks. The District prides itself on being self-sufficient and conducts most repairs, maintenance, and improvements in house with its multi skilled staff.

The management structure of BCMVCD is relatively simple and is well suited to the type of operations undertaken by the District. No other alternative structures or reorganizations of staff have been discussed that would result in more efficient operations, and the existing structure is considered appropriate. The District management is very knowledgeable in rules and regulations effecting mosquito abatement operations and provides continual training for staff at all levels. Local and state requirements appear to be rigorously followed.

The ratio of managers to workers is appropriate; BCMVCD is not top heavy in managers. The District has various policies and procedures related to personnel, provision of services, customer relations, operations and maintenance, relationships with other agencies, and the like. The District's Policy Manual can be found on the District's website.

All qualified permanent and probationary employees are eligible to participate in the District's Miscellaneous Employee Pension Plan, cost-sharing multiple employer defined benefit pension plans administered by the California Public Employees' Retirement system (CalPERS). CalPERS derives its income from investments, from member contributions, and from employer contributions. Currently, District employees contribute 3% percent of their salary towards their CalPERS retirement and will contribute 4% or half of the employees' contribution rate by the beginning of 2018 (current MOU with employees). District employees hired before December 31, 2012, are eligible for the District's 2.5% at 55 Risk Pool Retirement Plan. All employees hired after January 1, 2013, are eligible for the District's CalPERS 2.0% at 62 Retirement Plan. The employees of the District can contribute to a deferred compensation 457 plan, however, the District does not contribute any funds to any employee in this plan.

BCMVCD WEBSITE

The BCMVCD has a very comprehensive and thorough website (www.bcmvcd.com) that is easy to navigate and contains a vast array of information. The District's website provides detailed information on the District, including the names and terms of the District's Board of Trustees, key staff contact information, and provides very detailed information on the services the District provides. The District's webpage includes such documents as:

- Board of Trustees' meeting agendas and minutes
- Board of Trustees' ethics training certificates
- Board of Trustees' current term length and expiration date
- Budgets and financial audits
- Local government compensation reports
- Policy Manual
- Best Management Practices Manual
- Public Notices, Press Releases, and News Articles
- Current Municipal Service Review
- District Annual Report and Quarterly Newsletters
- Mosquitoes and vectors of the District's service area
- CDPH Dead Bird Program
- District's fogging notification system

The minutes of the Board of Trustees' meetings posted on the District's webpage are detailed and clearly show the action taken by the Board. A review of the agendas for the District's Board of Trustees meeting placed on the District's webpage show that the agendas do not contain links to the applicable staff report, memorandum, or background document(s) for the agenda items. Although not required to do so, linking an agenda item to the pertinent document(s) would provide for better public understanding of the agenda item and provide for better transparency.

DISTRICT TRANSPARENCY

In addition to the District's extensive public education and outreach efforts, the District is active in promoting transparency to the community and media. The District's Board meeting dates, times, and locations are printed in the local newspapers. Agendas are mailed to every media outlet within the service area usually six days prior to each Board

meeting. Agendas to Board meeting are posted to the District's website usually six days prior to each Board meeting. Minutes are posted to the District's website following a Board meeting where the minutes were approved. The District makes at minimum, four copies of the entire Board packet and places them at members of the public seating before each Board meeting. The District posts Board meeting agendas visible to the public at both the Oroville and Chico facilities usually six days prior to each Board meeting. The District publishes, posts to the website, and distributes quarterly newsletters. The District publishes, posts to the website, and distributes an annual report. The District's 2016 Annual Report is attached to this MSR as Attachment B. The District posts to the website at least three years of fiscal budgets, at least three years of fiscal audits, at least three years of the State Controller's Report, all press releases, Board of Trustees meeting agendas for the past year, and minutes for the past year. The District also posts to the website any news and information of the District, such as the District's Environmental Impact Report, most recent Grand Jury report, most recent Municipal Services Review, public notices, and ethics training certificates.

Every year the District prepares an annual report, which is an outstanding document and which provides the public with exhaustive information on the District. The annual report provides in-depth information on District services and operations, public health information, and information on District finances. The annual report that the District prepares should be the standard by which other special districts follow for providing information on their district to the public. The BCMVCD 2016 Annual Report is attached to this MSR to provide additional information on the District.

Public Notices: Fogging

The District utilizes an email notification system to notify the public of upcoming mosquito fogging operations. The email notification system was created to meet public concerns and expectations, to enhance media coverage, and to help inform other agencies that need to know when and where the District is mosquito fogging. The email notifications are usually sent out at least 30 hours before a fogging operation takes place. The email notifications include maps of the areas to be fogged, links to the labels and material safety data sheets of the public health pesticides used, the dates and times of the fogging operations, and a link to the District website. The public can sign up for email notifications on the District website. The District also makes phone calls to notify residents and agencies that do not use email or have access to a computer.

Transparency Certificate of Excellence

For the last four years, the Butte County Mosquito and Vector Control District received the Transparency Certificate of Excellence by the Special District Leadership Foundation (SDLF) in recognition of the District's outstanding efforts to promote transparency and good governance.

In order to receive the award, a special district must demonstrate the completion of eight essential governance transparency requirements, including conducting ethics training for all board members, properly conducting open and public meetings, and filing financial transactions and compensation reports to the State Controller in a timely manner. The Butte County Mosquito and Vector Control District also fulfilled fifteen

website requirements, including providing readily available information to the public, such as board agendas, past minutes, current district budgets, and the most recent financial audit. Finally, the District must have demonstrated outreach to its constituents that engages the public in its governance, through regular district newsletters and community engagement projects.

OPERATIONAL EFFICIENCIES

The District utilizes a variety of cost avoidance and facilities sharing measures in its operations. The District is a member of the Vector Control Joint Powers Agency (VCJPA). The VCJPA is a public entity formed by a joint powers agreement in accordance with the California Government Code. The purpose of this JPA is to provide insurance coverage to the District's real and personal property and liability coverage.

The District replaced almost all interior and exterior lighting with LEDs, which will reduce utility costs. The District has been in a position to purchase three to four new vehicles each year for the past three years, which increases fuel mileage and decreases breakdowns. The District purchased wifi hardware so that field technicians can email airplane maps to the District Headquarters, which are then forwarded to air operations. This cuts down the time and expenses as field technicians use to drive maps back to the District Headquarters. Technicians now can stay in the field longer, which results in greater surveillance and treatment opportunities.

Cost Reductions

The District also switched to longer acting public health pesticides that are used in man-made mosquito-breeding sources (such as storm drains), providing a residual of 180 days as opposed to 30 days with older applications. The District will be able to reduce the costs of salaries and benefits of one seasonal employee this season as a result. The District created a private property mosquito-breeding source surveillance, abatement, warrant, and abatement order procedures program to minimize legal costs for filing surveillance and abatement warrants as well as to minimize potential trespassing civil culpability by proper identification of properties protected under the 4th Amendment as well as advanced training to District personnel.

The new administration building that the District plans to construct at the District's Oroville facility will have energy saving components such as skylights, concrete floors, superinsulation, and other such improvements to lower energy costs. The District would like to install solar panels at some point at both the Oroville and Chico Substation facilities to significantly reduce or zero out the costs of energy. The Board of Trustees will be considering solar proposals at the June 14, 2017, regular meeting of the Board of Trustees for the Oroville facility.

The District is a member of the Mosquito and Vector Control Association of California. This organization is comprised of 63 public agencies and provides its members with a number of valuable services, including cost avoidance opportunities relating to training services and publication materials. Other notable services offered by this organization include serving as a legislative advocate for statewide vector control and abatement issues and facilitating the exchange of service information between member agencies.

Reimbursements by private sources allow the District to recover costs for providing higher levels of service to properties with persistent mosquito problems. The District usually receives $150,000 to $300,000 in reimbursements each year for these spraying operations.

FUTURE CHALLENGES AND ISSUES TO OPERATIONAL EFFICIENCIES

A relatively new regulatory requirement that has impacted the District's budget is the requirement for a National Pollutant Discharge Elimination System Permit (NPDES), which, according to the District Manager, is a burdensome and duplicative regulation and requires a large amount of staff time. Districts for decades were already regulated by the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). This regulation has negatively impacted the District for five years now going on the 6th. In addition, regulations that affect the re-permitting of California Public Health Pesticides costs continue to grow which in turn increases the costs of the public health pesticides that the District purchases. Continuing regulation changes to existing programs such as Injury Illness Prevention Programs (example new Heat Illness Prevention Program) and Certified Unified Program Agencies (CUPA) continue to shift District resources and allocations to keep up with these new regulations.

The District Manager is an active member of the Mosquito and Vector Control Association's (MVCAC) Legislative Committee and as such he constantly sees new regulations aimed at reducing the use of public health pesticides, the way in which public health pesticides are applied, and other regulations that will impair mosquito and vector control districts (MVCDs) abilities to protect the public's health. According to the District Manager, the MVCAC lobbying for the most part is usually fairly successful at opposing such bills. For example, SB 1246 would have required MVCDs to notify numerous people and entities at least 4 to 7 days prior to the application of aerial adulticides of neighborhoods. Following a proper Integrated Vector Management Program requires MVCDs to make applications based on sound science and surveillance (real time data). Mosquitoes are mobile and virus spreads quickly. Having a need to treat an adult population of mosquitoes potentially carrying a virus like West Nile virus or Zika and then having to wait 4 to 7 days may result in more human transmissions, larger populations of mosquitoes, a more widespread geographical area of mosquitoes, and increased larval counts. The MVCAC was successful at getting this bill killed. Each year new bills are introduced and this year AB 718 has been introduced that will allow wetland managers/owners to flood managed wetland fields without fear of being charged for mosquito control. Districts such as BCMVCD would be financially devastated if a bill like this were to pass. As part of the District's aggressive larvicide program, the District charges abatement costs to the property owner/land manager for reimbursement should the property be 3 acres in size or larger and produce 3 or more larvae per dip. The District usually receives $150,000 to $300,000 in reimbursements each year for treating the larger parcels and the loss of this revenue source may affect the ability of the District to continue to provide the same level of services that the District now provides to these larger parcels.

According to the District Manager, financial challenges are always on the horizon. The reduction of property taxes due to Proposition 13 is still felt today by the District. The economic downturn beginning in 2008 and the resulting decline in property values is still

affecting the finances of the District. According to the District Manager, the District has had to learn to do more with less and should the economy slump again, the District will again face the potential of having to make do with the resulting limited resources available.

Another issue that may affect operational efficiencies is climate change. In the past five years, warmer climate mosquitoes have migrated north from the equator and have established themselves in California. These species are unlike any species mosquito abatement districts in California has faced. They are cryptic and prefer to breed in water sources that are much smaller than normal. Each invasive species that has been introduced in California has established populations and eradication efforts failed. These mosquitoes prefer to bite during the day when adult mosquito control products do not work and/or cannot be used. Until their arrival, California had no risk of yellow fever, dengue fever, Zika virus, and others. Now the state has vectors of such diseases present from Hayward to San Diego. Various mosquito-borne diseases have emerged since the climate has warmed. Viruses such as Zika, chikungunya, and mayaro are just a few. As new mosquitoes and new disease enters the United States, California, and Butte County, MVCDs are going to continue to face ongoing challenges on how to best protect the public's health. There will only be a greater need for the services the District provides in the upcoming year, which in all likelihood will require additional District staffing, equipment, and pesticides, all at substantial additional cost to the District.

Mosquito and vector control districts, including BCMVCD, are continually facing less effective public health pesticides due to mosquito and vector populations increasing tolerance and/or resistance. This issue has been dramatically increasing over the past five to ten years. Regulations, public pressure, and the continuance of phasing out of carbamates and organophosphates have left the pesticide world with very few pesticide families. In regards to mosquito control, there are only natural pyrethrins and synthetic pyrethriods with a few organophosphates left available to combat adult mosquito populations. The same active ingredients used for adult mosquito control are the same active ingredients found in private pest control pesticides, agricultural pesticides, and home use pesticides. This only exacerbates and accelerates the problem. In addition, due to various regulations (e.g. NPDES permit, Clean Water Act, etc.) pesticide re-registration is more costly causing the prices of pesticides to dramatically increase and/or for some pesticide manufacturers to discontinue registration of some pesticides. California stipulations and regulations are even more problematic and costly than that of the federal ones. Less pesticides are available in California than other parts of the country. Mosquito and vector control districts are pressuring chemical companies to invent/create new pesticides. However, this is costly and the mosquito and vector control industry is not as lucrative as agriculture and private pest control world.

According to the District Manager, each year providing services in the mosquito and vector control world is a challenge. For the past five years, West Nile virus has escalated to the point that during the height of the drought record numbers of West Nile virus was present. The District recorded record numbers of human infections, neuroinvasive infection, and mosquito pools. Each year there is no real guess as to how

many mosquitoes and/or vectors will be present for their respective season. The District is always vigilant to remain proactive, to be looking for these things, and to be best prepared to respond when something is seen.

Governmental Structure - Reorganization

There are three mosquito abatement districts within Butte County; one very large, well-funded district (BCMVCD) that surrounds the other two much smaller districts (OMAD and DMAD). This MSR/SOI plan is an opportunity to carefully evaluate and compare each district and consider any governance restructuring scenarios that may result in improved efficiencies and public health outcomes. Scenarios include,

1. The smaller districts (OMAD, DMAD) remain intact but contract all services through the BCMVCD thus acting a funding mechanism;
2. The three districts could be consolidated into one county-wide mosquito abatement district; and
3. Another approach that would result in just one county-wide abatement district would be the dissolution of the two smaller districts – DMAD and OMAD - and the annexation of those district's territory to the BCMVCD. It should be noted that BCMVCD's existing sphere of influence already encompasses the boundaries of DMAD and OMAD.

Potential positive impacts of a consolidation of the three districts may include a uniform county-wide mosquito abatement and vector control program, reduced administrative and operating costs, improved reserves, improved public health outcomes and greater public visibility, which could create an improved image of program accountability. A consolidation of the three districts may result in improved mosquito abatement and vector controls services to the residents of the two smaller districts (DMAD and OMAD) who would have access to greater resources and more programs.

A consolidation may also have negative impacts such as increased operational complexities, particularly in light of the difference in service levels and philosophy between each agency. The opportunity to consolidate the districts may be affected by limited funding, inability to expand into new areas based on existing funding levels, and/or political issues, especially regarding the loss of local control. Additionally, a consolidation of the three districts would require majority approval by the registered voters of all three districts, but such approval is not assured. Such governance reorganizations are not always readily accepted among affected constituents who may feel current services are adequate and who have a type of brand loyalty to their current local agency and board of directors and perhaps more importantly, local agency personnel. Additionally, the costs to prepare a consolidation study and to hold an election would be cost prohibitive and funding would need to be secured before going forward with the consolidation process. The BCMVCD Manager has indicated that BCMVCD could provide mosquito and vector control services to these areas, and which could be accomplished without the need for the current employees, assets, and facilities of both the OMAD and DMAD. With the resources, assets, and staff that BCMVCD has to offer, the BCMVCD Manager strongly believes that the protection of the public's health would increase within these two districts dramatically.

The 2004 Municipal Service Review adopted by the Commission determined that "...reorganizing the three districts into one county-wide district would provide numerous advantages and with little to no disadvantages. There may be a slight limit of 'personalized' service in the Durham and Oroville areas, but that disadvantage is greatly outweighed by the advantages of a county-side district with a large number of employees, regularly scheduled office hours, education and training programs, and aerial capability."

Subsequent to adoption of the 2004 MSR, the Commission adopted Resolution No. 17 2004/05 that gave the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District a "Zero" Sphere of Influence. Pursuant to Butte LAFCo Policy 3.1.11, the Zero SOI designation indicates that one or more of the public service functions of the agency are either non-existent, inadequate, no longer needed, or should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved and that the Commission may initiate dissolution of an agency when it deems such appropriate. Resolution 17 2004/05 gave the Butte County Mosquito and Vector Control District an expanded sphere of influence, which took in the SOI of Durham Mosquito Abatement District and the Oroville Mosquito Abatement District. BCMVCD's SOI now encompasses all of Butte County and the Hamilton City area of Glenn County.

Numerous Butte County Grand Jury reports have included a review of one or more of the three mosquito abatement districts in the county. The following was extracted from the various Grand Jury reports regarding consolidation of the mosquito abatement districts in Butte County.

- **1971 Grand Jury Report** - "...it is believed to be in the best interest of the entire County to eventually have all mosquito abatement controlled from one central plant, the Butte County Mosquito Abatement District."

- **1972 Grand Jury Report** - "The Grand Jury recommends consolidation of mosquito abatement districts into one Butte County Mosquito Abatement District."

- **1973-74 Grand Jury Report** - "Previous grand juries have recommended consolidation of the three Mosquito Abatement Districts within Butte County. Research in the past years as to cost, efficiency, and tax rates show that consolidation is favorable and this Grand Jury concurs."

- **1979-80 Grand Jury Report** - "Observation. Until such time as the Oroville and Durham Mosquito Abatement Districts, either through their respective Boards of Directors or the people within their service areas actively seek inclusion in the larger Butte County Mosquito Abatement District, no further consideration should be given the matter. The question of merger is basically a local government decision."

- **1980-81 Grand Jury Report** - "Finding: Prior Grand Juries have recommended a merger of the Oroville Mosquito Abatement District with the Butte County

Mosquito Abatement District. Recommendation: The committee found the Oroville Mosquito Abatement District very professionally managed with a professional dedicated employee. Cost containment was evident in all areas therefore no need or practical benefit can be seen for a merger at this time."

- **2007-08 Grand Jury Report** - "This Grand Jury has chosen not to make a recommendation on whether the three districts should consolidate, but to try and make the voters aware of all options. In the event of future ballot measures for additional special parcel tax assessments, voters should be aware of the consolidation alternative.

- **2009-10 Grand Jury Report** – "OMAD should continue to function as an independent mosquito abatement district and should not be consolidated with another mosquito abatement district."

- **2016-17 Grand Jury Report** – "*Recommendation R1. The Grand Jury recommends that pending the results of the 2017 MSR, LAFCo initiate the process of consolidating OMAD and DMAD under BCMVCD.*"

  The 2016-17 Grand Jury report also stated:

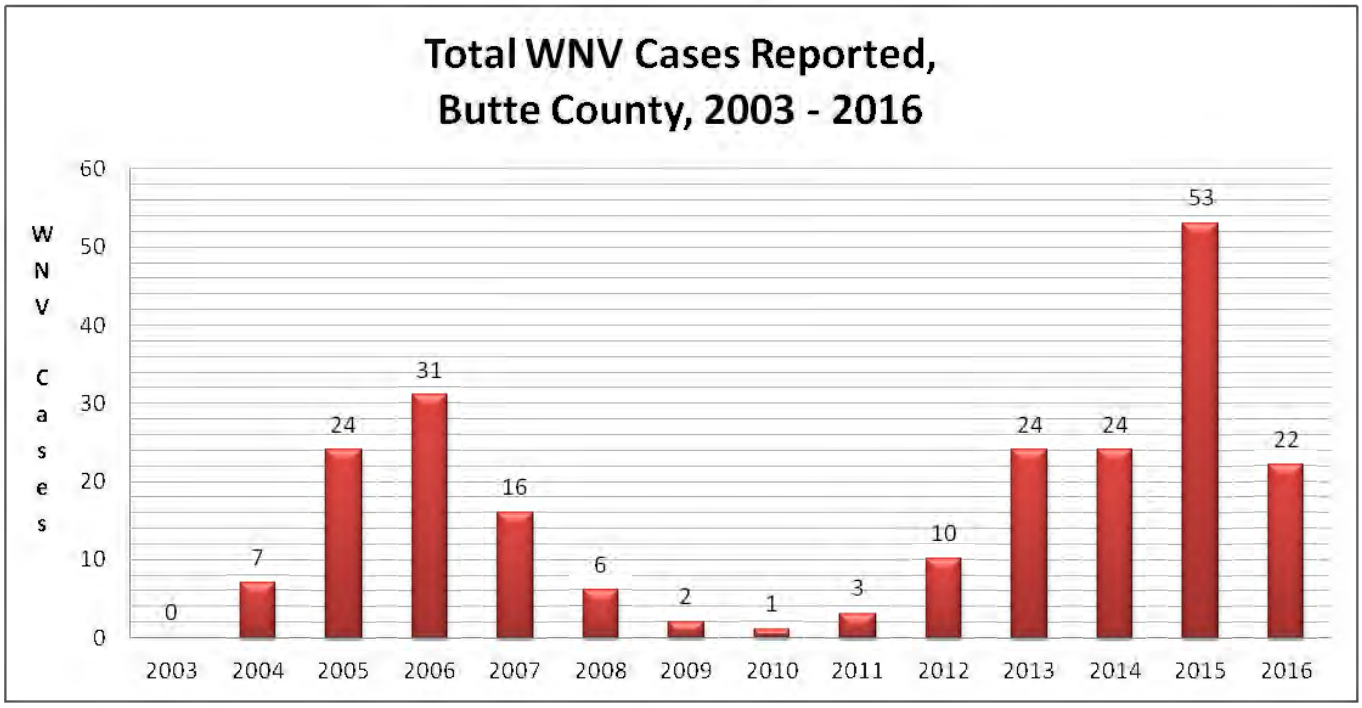
  "Having three districts performing the same function in the same county brings redundancies. Each district has a board, is required to be compliant with all applicable labor and pesticide regulations, requires an annual audit, regular board meetings, budgets and bookkeepers. This encumbers each of the districts with a minimum level of costs, and the budgets of OMAD and DMAD are such that after covering the costs of these operational requirements, there is little funding left for actual control. Effectiveness would be greatly improved by consolidating the three districts under one set of policies and one management team.

  In the past, when Grand Juries have recommended consolidation, or LAFCo released their MSR in 2004 recommending the districts be consolidated, no consolidation action was taken. The Grand Jury believes this is because there was no leadership to put the recommended changes into effect. The groups that benefit most from a consolidation are the residents within the OMAD and DMAD districts, however, they may not be aware of the potential improvements and thus not motivated to petition for policy change. Under California state LAFCo policies, a petition for consolidation may be initiated by LAFCo itself. The Grand Jury recommends Butte LAFCo take this course of action pending the results of the 2017 MSR."

A reorganization of the three mosquito abatement districts into one county-wide district should be closely examined by LAFCo to determine if a reorganization would actually result in improved, more efficient, and more cost-effective mosquito abatement and vector control services within the areas currently served by the Durham and Oroville Mosquito Abatement Districts and would result in improved public health benefits to the residents of the county as a whole. Such examination would require that a

consolidation study be prepared, which would look at this MSR and expand the discussion to show how services would be provided if consolidation occurred and how the affairs of the dissolved districts would be concluded and passed onto the successor district (BCMVCD). Such study would be very expensive to prepare and a source of funding would need to be found to pay to have the study prepared by a qualified consultant.

The public health benefits of having only one county-wide mosquito abatement district cannot be understated as supported by comments received from the Butte County Public Health Department (DPH), Community Health and Sciences Office, in their comment letter of May 31, 2017 (Attachment A to this MSR). The DPH is very concerned about the ongoing presence of West Nile Virus cases in the County and in their letter, DPH notes that Butte County consistently ranks among the state's counties with the highest West Nile virus case rates (number of cases by population). As shown on the following chart, the number of West Nile virus cases has fluctuated significantly over the years, but Butte County has seen a larger number of cases in the last four years. As of June 26, 2017, Butte County has had no reported human cases of West Nile virus.[7]



The DPH believes that a close working relationship with local vector control agencies is critical to their efforts to detect, monitor and prevent WNV disease, further stating that *"Having one agency to work with would likely improve efficiencies and provide a more consistent approach"* to addressing the WNV concerns.

[7] California West Nile Virus Website - http://westnile.ca.gov/

MSR DETERMINATION 6-1: GOVERNMENTAL STRUCTURE	
	BCMVCD is governed by an eleven-member Board of Trustees appointed by the Butte County Board of Supervisors and by City Councils. BCMVCD holds regular meetings that are open and accessible to the public. BCMVCD maintains accountability and compliance in its governance, and public meetings appear to be held in compliance with Brown Act requirements.

MSR DETERMINATION 6-2: GOVERNMENTAL STRUCTURE	
	BCMVCD is governed by a responsive, educated, and dedicated board and staff. These characteristics enhance accountability and cultivate positive working relationships with members of the public and other local agencies.

MSR DETERMINATION 6-3: TRANSPARENCY - WEBSITE	
	The Butte County Mosquito and Vector Control District's website contains a wealth of information about the District and the services it provides. The website is very comprehensive and is easy to navigate. The District should be commended for creating and maintaining such an outstanding website. *The District may want to consider adding a link to the agenda items on the District's Board of Trustee meeting agenda, which will display or download any background documents, such as a staff report, that are applicable to that particular agenda item. Doing so would provide the public with access to all the documents that the Board of Trustees would see.* *The District may also want to consider showing the date of the next District Board of Trustees meeting on the District's homepage and adding a link to the agenda for that meeting when the agenda is posted. Doing so will provide better transparency and allow the public to easily find the date of the meeting.*

MSR DETERMINATION 6-4: TRANSPARENCY	
	The Butte County Mosquito and Vector Control District operates in a very open and transparent manner. The District has an extensive public education and outreach program and the District's website contains numerous documents and information regarding District operations and public health. The District prepares an annual report, which provides the public with exhaustive information on the District. The District utilizes an email notification system to notify the public of upcoming mosquito fogging operations. For the last four years, the Butte County Mosquito and Vector Control District received the Transparency Certificate of Excellence by the Special District Leadership Foundation (SDLF) in recognition of the District's outstanding efforts to promote transparency and good governance.

MSR DETERMINATION 6-5: OPERATIONAL EFFICIENCIES	
	The Butte County Mosquito and Vector Control District operates with a full-time staff of sixteen employees and hires about thirteen seasonal employees. The overall management structure of BCMVCD is sufficient to account for necessary services and to maintain operations in an efficient and effective manner. BCMVCD is adequately staffed at this time.

MSR DETERMINATION 6-6: FUTURE CHALLENGES TO OPERATIONAL EFFICIENCIES	
	The District faces numerous challenges to continue to provide effective mosquito abatement and vector control services to the residents of the District. New regulations, climate change, and resistance to existing pesticides are some of the more significant challenges the District faces, which will have a significant effect on the level of services the District currently provides. Due to these issues, there will be a greater need for the services the District provides in the coming years, which will require additional District staffing, equipment, and pesticides, all at substantial additional cost to the District.

MSR DETERMINATION 6-7: REORGANIZATION	
	The 2004 Municipal Service Review for Mosquito Abatement Districts in Butte County, numerous Butte County Grand Jury reports, including the most recent Grand Jury report (Fiscal Year 2016-17) released on May 19, 2017, and the May 30, 2017, letter from the Butte County Public Health Department all suggest or acknowledge the value reorganizing the three mosquito abatement districts into one county-wide district would provide numerous advantages and with little to no disadvantages.

MSR DETERMINATION 6-8: REORGANIZATION	
	Commission Resolution No. 17 2004/05 gave the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District "Zero" Sphere of Influences. At the same time, the Commission expanded the Sphere of Influence for the Butte County Mosquito and Vector Control District to encompass the boundaries of the Durham and Oroville Mosquito Abatement Districts. The Zero SOI designation indicates that one or more of the public service functions of the agency are either non-existent, inadequate, no longer needed, or should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved and that the Commission may initiate dissolution of an agency when it deems such appropriate.

MSR DETERMINATION 6-9: REORGANIZATION	
	Potential positive impacts of a reorganization of the three mosquito abatement districts may include a uniform county-wide mosquito abatement and vector control program, reduced administrative and operating costs, improved reserves, greater public visibility, and improved public health benefits.

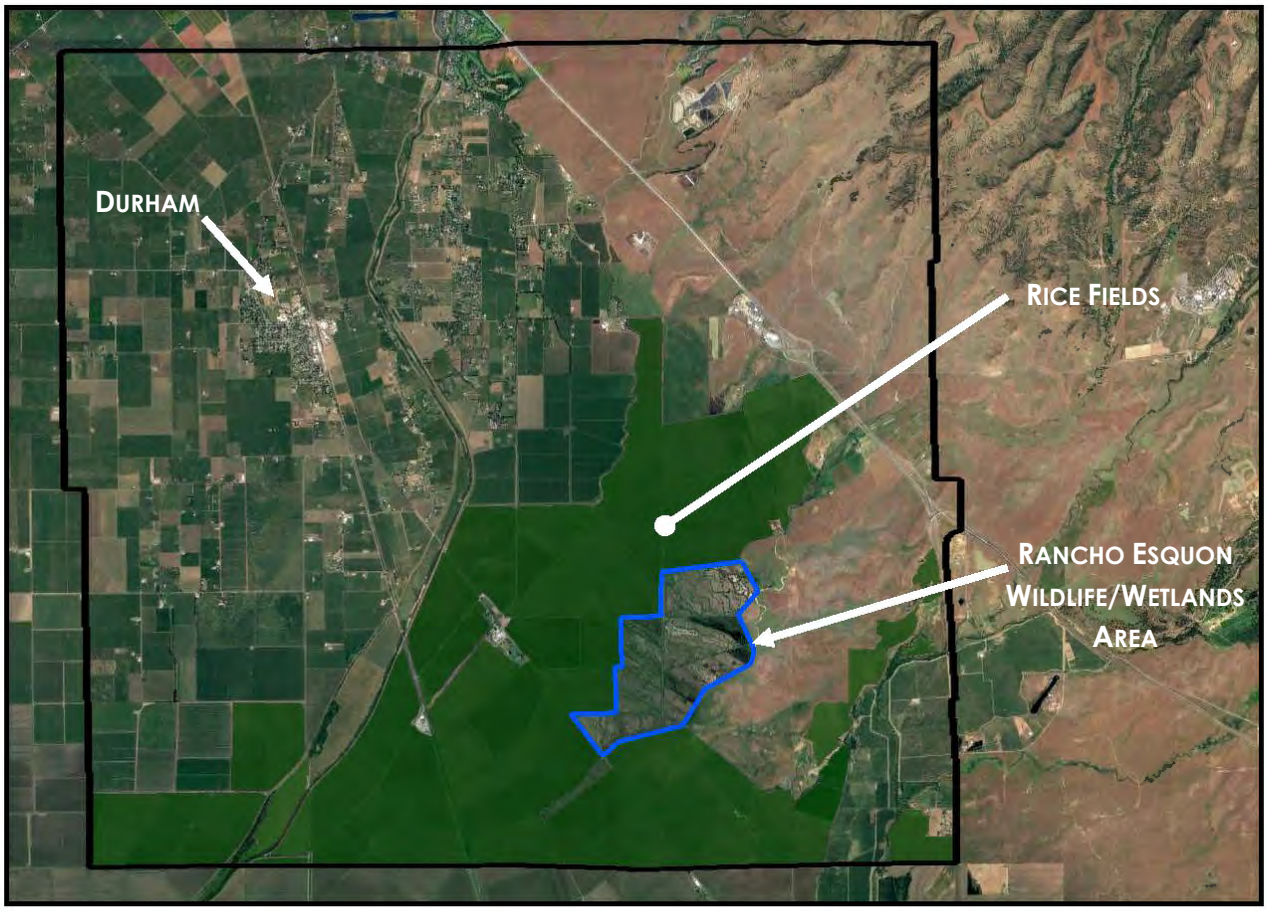
MSR FACTOR NO. 7: ANY OTHER MATTER RELATED TO EFFECTIVE OR EFFICIENT SERVICE DELIVERY, AS REQUIRED BY COMMISSION POLICY.

POTENTIAL BOUNDARY CHANGES

The Rancho Esquon wildlife area, which consists of 900+ acres of managed wetland habitat, is within the jurisdictional boundaries of the Durham Mosquito Abatement District. The map on the next page shows the location of the wildlife area. According to the District Manager of the Butte County Mosquito and Vector Control District (BCMVCD), the Rancho Esquon wildlife area has extraordinary high populations of mosquitoes that migrate to areas within the service area of BCMVCD. BCMVCD mosquito surveillance data showed that the mosquito populations originating from the wildlife area would migrate north into the south Chico area, affecting the residents of BCMVCD. Also in this area are numerous rice fields, which are significant breeding habitat for mosquitoes. DMAD does not have the necessary revenue, equipment, and staff needed to provide effective mosquito abatement services to the wildlife area and to the numerous nearby rice fields.

The Butte County Mosquito and Vector Control District provides mosquito abatement services to the Rancho Esquon wetlands area, believing that it is in the best interest of the people residing within BCMVCD to reduce the numbers of mosquitoes originating from the wildlife area. BCMVCD has a cooperative memorandum of understanding with the owner of the Rancho Esquon Ranch, where the wildlife area is located. Rancho Esquon reimburses BCMVCD for the larviciding control costs and no BCMVCD tax dollars are expended within the DMAD service area. The Durham Mosquito

Abatement District does not provide any funding to BCMVCD for providing mosquito abatement services to the wetlands area. It should be noted that BCMVCD does not provide mosquito abatement services to any of the rice fields located near the wetlands area. The following map shows the location of the Rancho Esquon wildlife/wetland area and the location of the rice fields within DMAD's boundaries.

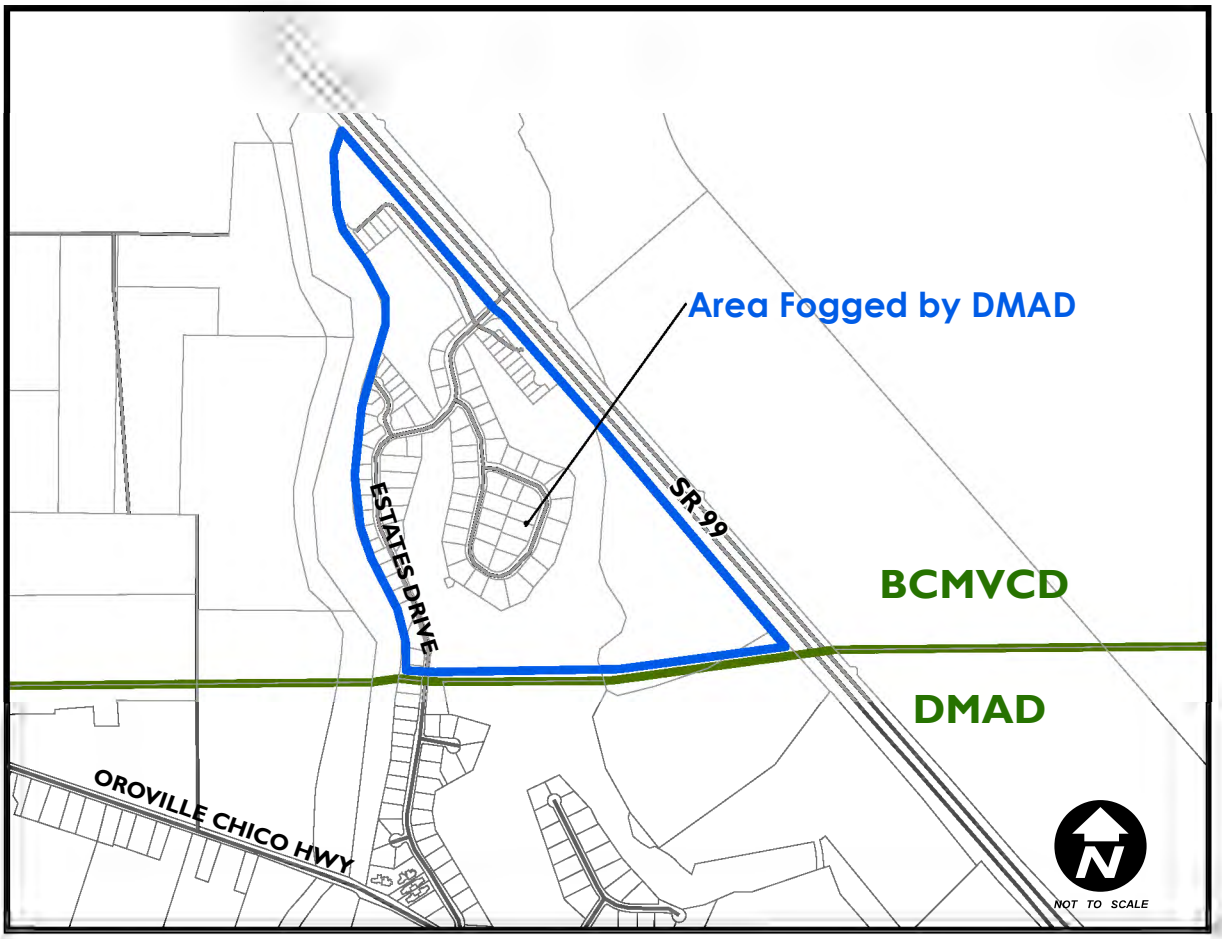


RANCHO ESQUON WETLANDS AREA WITHIN DMAD BEING TREATED BY BCMVCD

Similarity, the DMAD provides mosquito abatement services within a small portion of BCMVCD's service area in the Butte Creek Estates Subdivision on Estates Drive, south of Chico. The Butte Creek Estates Subdivision is bisected by the two districts, with roughly the south half of the subdivision, consisting of approximately 60 residential parcels, within DMAD and the north half of the subdivision, consisting of approximately 90 residential parcels, within BCMVCD.

This situation began with DMAD fogging the BCMVCD portion of the subdivision without notifying BCMVCD. DMAD started fogging all of Estates Drive because residents were complaining when the DMAD fogging operation would stop half way down this roadway. This situation could have resulted in excessive and unnecessary fogging operations (some pesticide labels do not allow treatment more than once in a 24-hour, 48-hour, 72-hour, etc. period) or spraying properties that had requested "No Sprays" through BCMVCD.

To ensure compliance with pesticide label requirements and with the National Pollutant Discharge Elimination System (NPDES) regulations, BCMVCD agreed to allow DMAD to continue to fog the Estates Drive area without charge to BCMVCD. BCMVCD still continues to provide residents with other mosquito and vector control services, such as larval inspections, larvicides applications storm drain treatment, mosquitofish delivery and planting, virus surveillance, adult mosquito surveillance, and residual treatments. The BCMVCD would like DMAD to stop all fogging operations within BCMVCD's portion of the Butte Creek Estates Subdivision.



AREA WITHIN BCMVCD BEING FOGGED BY DMAD

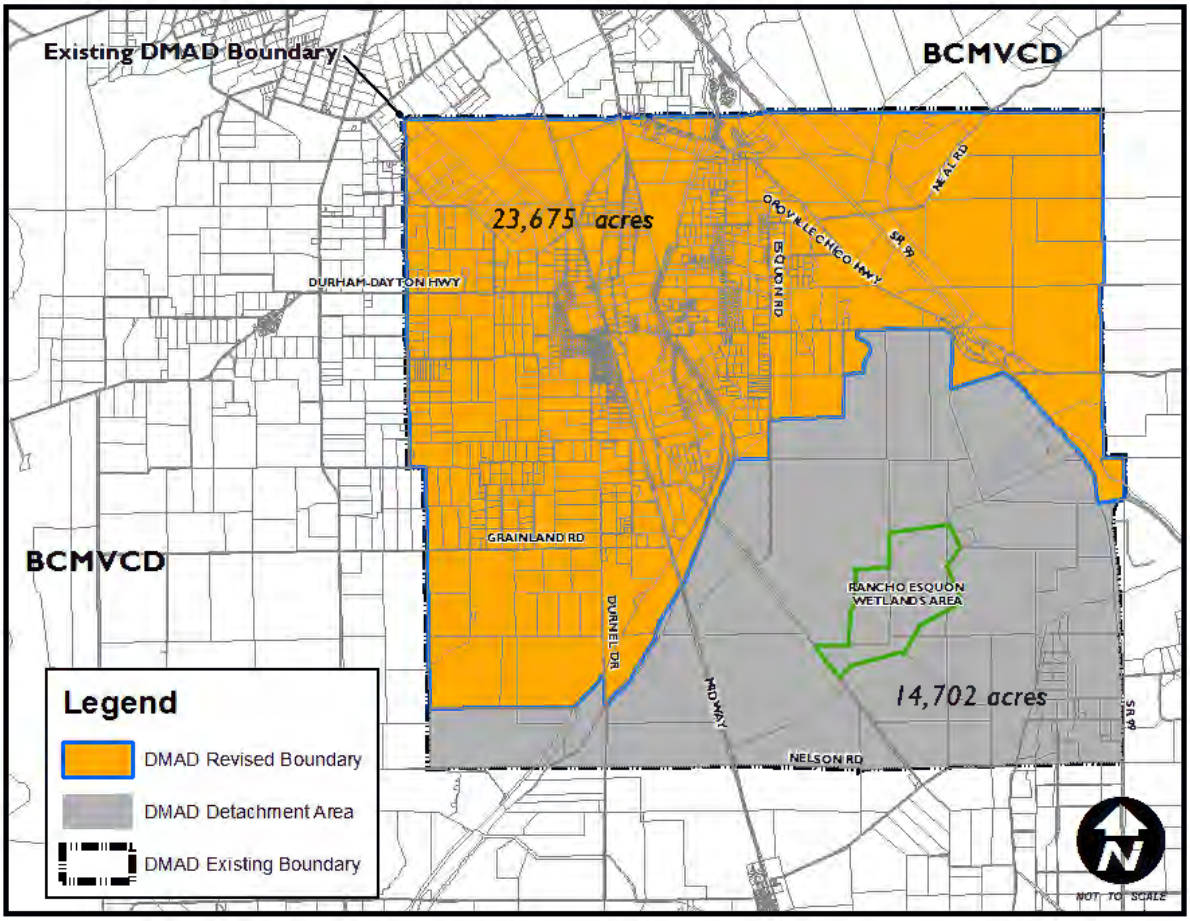
The BCMVCD and DMAD may want to consider changes to their jurisdictional boundaries so that the boundaries reflect the agency actually providing mosquito abatement services to the areas in questions. The portion of Butte Creek Estates Subdivision within BCMVCD could be detached from BCMVCD and annexed to DMAD, which would result in all of the subdivision being within the boundaries of a single mosquito abatement district. It should be noted that DMAD has a "Zero" Sphere of

Influence and that BCMVCD's Sphere of Influence encompasses the jurisdictional boundaries of DMAD. Annexation of the subject area to DMAD may require that DMAD be given a traditional "Growth" sphere of influence boundary or that the Commission make specific findings with regards to the Zero SOI boundary to allow the subject area to be annexed to DMAD. This scenario would solve a localized boundary concern, but is not consistent with the overall analysis that suggests BCMVCD provides comprehensive services that are superior to the smaller districts. The BCMVCD Board of Trustees does not agree with detaching their portion of the Butte Creek Estates Subdivision and annexing that area to DMAD. Annexing the DMAD portion of the Butte Creek Estates Subdivision to BCMVCD is feasible and would provide the residents of that area with comprehensive mosquito abatement services. However, annexing the DMAD portion of Butte Creek Estates Subdivision to BCMVCD would result in DMAD losing approximately $8,720 in tax revenue.

Discussions have taken place between BCMVCD, DMAD, and LAFCo regarding the detachment of the rice fields from DMAD and the subsequent annexation of that area to BCMVCD. Both districts are in general agreement with detaching the rice fields from DMAD and annexing that area to BCMVCD. The BCMVCD Board of Trustees recently gave approval to the district manager to file an annexation application for the rice fields and approved of the district manager to participate in any future community meetings regarding annexation of the rice fields.

The rice field detachment/annexation area would be approximately 14,702 acres in size, consisting of approximately 87 parcels. The Rancho Esquon wetlands area, which is already being treated by BCMVCD, is within the potential detachment/annexation area. With the detachment, DMAD's service area would decrease from its current size of approximately 38,372 acres to approximately 23,675 acres (a 39% reduction). Annexing the rice field area to BCMVCD would result in DMAD losing approximately $14,900 in tax revenue. BCMVCD has stated that providing effective mosquito abatement services to the rice field area will cost the District approximately $350,000 or more annually.

The following map shows the potential rice field detachment/annexation area.



POTENTIAL DMAD DETACHMENT/BCMVCD ANNEXATION AREA

MSR DETERMINATION 7-1: BOUNDARY CHANGES - RANCHERO ESQUON WILDLIFE/WETLANDS AREA	
	BCMVCD currently provides mosquito abatement services to the Ranchero Esquon wildlife/wetlands area, which is within the boundaries of the Durham Mosquito Abatement District. The wildlife/wetlands area should be detached from DMAD and annexed to BCMVCD.

MSR DETERMINATION 7-2: BOUNDARY CHANGES – RICE FIELDS	
	Due to lack of adequate funding, DMAD does not provide mosquito abatement services to the numerous rice fields within their jurisdictional ***boundaries*** *and in all likelihood will never have the ability to provide services to the rice fields. The rice fields should be detached from DMAD and annexed to BCMVCD, which has the funding, staffing, and equipment needed to service the rice fields.*

MSR DETERMINATION 7-3: DUAL SERVICE PROVISIONS WITHIN THE BUTTE CREEK ESTATES SUBDIVISION	
	The Durham Mosquito Abatement District currently fogs for adult mosquitoes in a portion of the Butte Creek Estates Subdivision that is within the boundaries of the Butte County Mosquito and Vector Control District. DMAD should stop all fogging operations within the BCMVCD portion of the Butte Creek Estates Subdivision as this area is outside of DMAD's boundaries and because BCMVCD provides other mosquito abatement services to this area and clearly has the ability to provide fogging services. *DMAD and BCMVCD should work together to resolve the issue of the dual service provisions within the Butte Creek Estates Subdivision.*

SPHERE OF INFLUENCE PLAN REVIEW FACTORS FOR THE BUTTE COUNTY MOSQUITO AND VECTOR CONTROL DISTRICT

There are numerous factors to consider in reviewing a SOI Plan, including current and anticipated land uses, facilities, and services, as well as any relevant communities of interest. Updates generally involve a comprehensive review of the entire SOI Plan, including boundary and SOI maps and the District's MSR. In reviewing an agency's sphere, the Commission is required to consider and prepare written statements addressing five factors enumerated under California Government Code Section 56425(e), as listed below.

1. The present and planned land uses in the area, including agricultural and open space lands;
2. The present and probable need for public facilities and services in the area;
3. The present capacity of public facilities and adequacy of public services which the agency provides, or is authorized to provide; and
4. The existence of any social or economic communities of interest in the area if the commission determines that they are relevant to the agency.
5. For an update of an SOI of a city or special district that provides public facilities or services related to sewers, municipal and industrial water, or structural fire protection, the present and probable need for those public facilities and services of any disadvantaged unincorporated communities within the existing sphere of influence.

SOI FACTOR NO. 1: THE PRESENT AND PLANNED LAND USES IN THE AREA, INCLUDING AGRICULTURAL AND OPEN-SPACE LANDS.

BCMVCD's jurisdictional boundaries consist of all of Butte County, excluding the greater Durham and Oroville areas. Incorporated areas within the District include the incorporated cities of Biggs, Chico, Gridley, and the Town of Paradise. Larger

unincorporated communities within the District include Cohasset, Forest Ranch, Richvale, Honcut, Bangor, Palermo, East Oroville/Kelly Ridge, Berry Creek, Concow, Magalia/Paradise Pines, and Stirling City.

The urban areas within the District consist of residential, commercial, industrial, and public uses. Agricultural uses, primarily rice and orchards, and rural residential uses are found in the valley area of the District. Livestock grazing and rural residential uses are found in the foothill areas of the District. Timber harvesting is the primarily land use in the mountainous portion of the District. There is significant potential for new development within the existing urban areas of the District, including the cities of Biggs, Chico, and Gridley. Development within the rural portions of the District is limited due to large parcel size requirements and the lack of public sewer infrastructure.

The unincorporated community of Hamilton City in the County of Glenn is also within the jurisdictional boundaries of the BCMVCD. Land uses within Hamilton City are primarily residential, along with a few commercial and public uses. Most of the parcels within Hamilton City are developed and very little area is available for new development.

SOI DETERMINATION 1-1: PRESENT AND PLANNED LAND USES	
	Land uses within the boundaries of the Butte County Mosquito and Vector Control District include residential, commercial, industrial, public, and agricultural uses. Future growth within the boundaries of the District is expected to occur primarily within the existing urban areas of the District. The provision of mosquito abatement and vector control services has no impact on existing or future land uses within the District.

SOI FACTOR NO. 2: THE PRESENT AND PROBABLE NEED FOR PUBLIC FACILITIES AND SERVICES IN THE AREA.

The Butte County Mosquito and Vector Control District provides vital and necessary mosquito and vector control services to a very large portion of Butte County. The District's services prevent large populations of mosquito larvae from becoming biting adults and the District's services eradicate large populations of adult mosquitoes. The District also provides important education on mosquitoes and mosquito-borne diseases to the public. The public health benefits that the District provides to all of the residents of Butte County cannot be overstated now that new mosquito species carrying new diseases are migrating into California and Butte County.

SOI DETERMINATION 2-1: THE PRESENT AND PROBABLE NEED FOR PUBLIC FACILITIES AND SERVICES IN THE AREA	
	BCMVCD provides vital and necessary mosquito abatement and vector control services to a very large portion of Butte County. The District's services are crucial to the prevention of significant mosquito populations and the prevention of mosquito-borne diseases.

SOI FACTOR NO. 3: THE PRESENT CAPACITY OF PUBLIC FACILITIES AND ADEQUACY OF PUBLIC SERVICES THAT THE AGENCY PROVIDES OR IS AUTHORIZED TO PROVIDE.

As presented in MSR Factor No. 3 (Present and planned capacity of public facilities, adequacy of public services, and infrastructure needs or deficiencies) the Butte County Mosquito and Vector Control District has adequate facilities, equipment, staff, and funding to provide a very high level of mosquito abatement and vector control services within the district.

SOI DETERMINATION 3-1: PRESENT CAPACITY OF PUBLIC FACILITIES AND ADEQUACY OF PUBLIC SERVICES	
	The Butte County Mosquito and Vector Control District has adequate facilities, equipment, staff, and funding to provide a very high level of mosquito abatement and vector control services to the residents of the District.

SOI DETERMINATION 3-2: PRESENT CAPACITY OF PUBLIC FACILITIES AND ADEQUACY OF PUBLIC SERVICES	
	In 2016, the District performed 6,057 individual applications of larvicides and adulticides, which treated 478,282 acres of area. This large number of applications, and the large area treated, demonstrates that the District is diligently performing mosquito abatement and vector control services.

SOI FACTOR NO. 4: THE EXISTENCE OF ANY SOCIAL OR ECONOMIC COMMUNITIES OF INTEREST IN THE AREA IF THE COMMISSION DETERMINES THAT THEY ARE RELEVANT TO THE AGENCY.

There are four cities and numerous unincorporated communities within the boundaries of the Butte County Mosquito and Vector Control District. The incorporated cities within the District include Biggs, Chico, Gridley, and the Town of Paradise. Additionally, portions of the City of Oroville are located within the boundaries of BCMVCD. The larger unincorporated communities within the District include Palermo, Kelly Ridge, Berry Creek, Bangor, Feather Falls, Concow, Paradise Pines, Magalia, Stirling City, Forest Ranch, Cohasset, Durham, Dayton, Nord, and Richvale. The District's Sphere of Influence also includes the unincorporated communities of Durham and Thermalito, and the City of Oroville.

SOI DETERMINATION 4-1: EXISTENCE OF ANY SOCIAL OR ECONOMIC COMMUNITIES OF INTEREST IN THE AREA	
	The Cities of Biggs, Chico, Gridley, the Town of Paradise, a portion of the City of Oroville, and numerous unincorporated communities are within the jurisdictional boundaries of the Butte County Mosquito and Vector Control District. The District provides mosquito abatement and vector control services to all of the communities located within the District. The District's Sphere of Influence also includes the unincorporated communities of Durham and Thermalito, and the City of Oroville.

SOI FACTOR NO. 5: ***FOR AN UPDATE OF A SPHERE OF INFLUENCE OF A CITY OR SPECIAL DISTRICT THAT PROVIDES PUBLIC FACILITIES OR SERVICES RELATED TO SEWERS, MUNICIPAL AND INDUSTRIAL WATER, OR STRUCTURAL FIRE PROTECTION, THAT OCCURS PURSUANT TO SUBDIVISION (G) ON OR AFTER JULY 1, 2012, THE PRESENT AND PROBABLE NEED FOR THOSE PUBLIC FACILITIES AND SERVICES OF ANY DISADVANTAGED UNINCORPORATED COMMUNITIES WITHIN THE EXISTING SPHERE OF INFLUENCE.***

The Butte County Mosquito and Vector Control District does not provide public facilities or services related to sewers, municipal and industrial water, or structural fire protection.

SOI DETERMINATION 5-1: DISADVANTAGED UNINCORPORATED COMMUNITIES	
	The Butte County Mosquito and Vector Control District does not provide public facilities or services related to sewers, municipal and industrial water, or structural fire protection.

Sphere of Influence Findings and Recommendations

Based on the MSR and SOI determinations as listed above, the Commission:

1. Finds that the services being provided by the Butte County Mosquito and Vector Control District are adequate and are being provided in an effective and efficient manner.
2. Finds that no changes to the Sphere of Influence boundary for the Butte County Mosquito and Vector Control District are necessary.
3. Affirms the existing Sphere of Influence boundary for the Butte County Mosquito and Vector Control District as shown on the Sphere of Influence map on page 2-2.
4. Finds that the 2004 Mosquito and Vector Control District Municipal Service Review determined that the three mosquito abatement districts in Butte County should be consolidated.
5. Finds that in 2005, the Commission gave a "Zero" Sphere of Influence boundaries to the Durham and Oroville Mosquito Abatement Districts and amended the

Butte County Mosquito and Vector Control District's Sphere of Influence boundary to include the area within the Durham and Oroville Mosquito Abatement Districts jurisdictional boundaries.

6. Finds that the 2016-17 Butte County Grand Jury determined that the Butte County Mosquito and Vector Control District, the Durham Mosquito Abatement District, and the Oroville Mosquito Abatement District should be consolidated into one district.
7. Finds that the rice fields and the Rancho Esquon wetland area located within the boundaries of the Durham Mosquito Abatement District should be detached from DMAD and annexed to the Butte County Mosquito and Vector Control District, which has the ability to provide effective mosquito abatement services to these areas.

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FINAL

MUNICIPAL SERVICE REVIEW AND SPHERE OF INFLUENCE PLAN

FOR THE

DURHAM MOSQUITO ABATEMENT DISTRICT

Prepared by:
Butte Local Agency Formation Commission
ADOPTED DECEMBER 7, 2017

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DISTRICT DATA SHEET

DURHAM MOSQUITO ABATEMENT DISTRICT

Contact: Aaron Amator, District Manager
Address: 9202 Midway, Durham, CA 95938.
Mailing Address: PO Box 386, Durham, CA 95938
Phone: (530) 345-2875
Webpage: None

GOVERNING BOARD

Durham Mosquito Abatement District Board of Trustees

Normal Board Meeting Date: Second Wednesday of each month at 7:30 p.m.

Board Meeting Location: Durham Memorial Hall, 9319 Midway, Durham

FORMATION INFORMATION

The Durham Mosquito Abatement District was formed in 1918.

PURPOSE

1. Enabling Legislation: H&S§2000 et. seq.
2. Authorized Services:
   - Mosquito Abatement
3. Provided Services:
   - Mosquito Abatement
   - Mosquitofish Distribution
   - Public Education

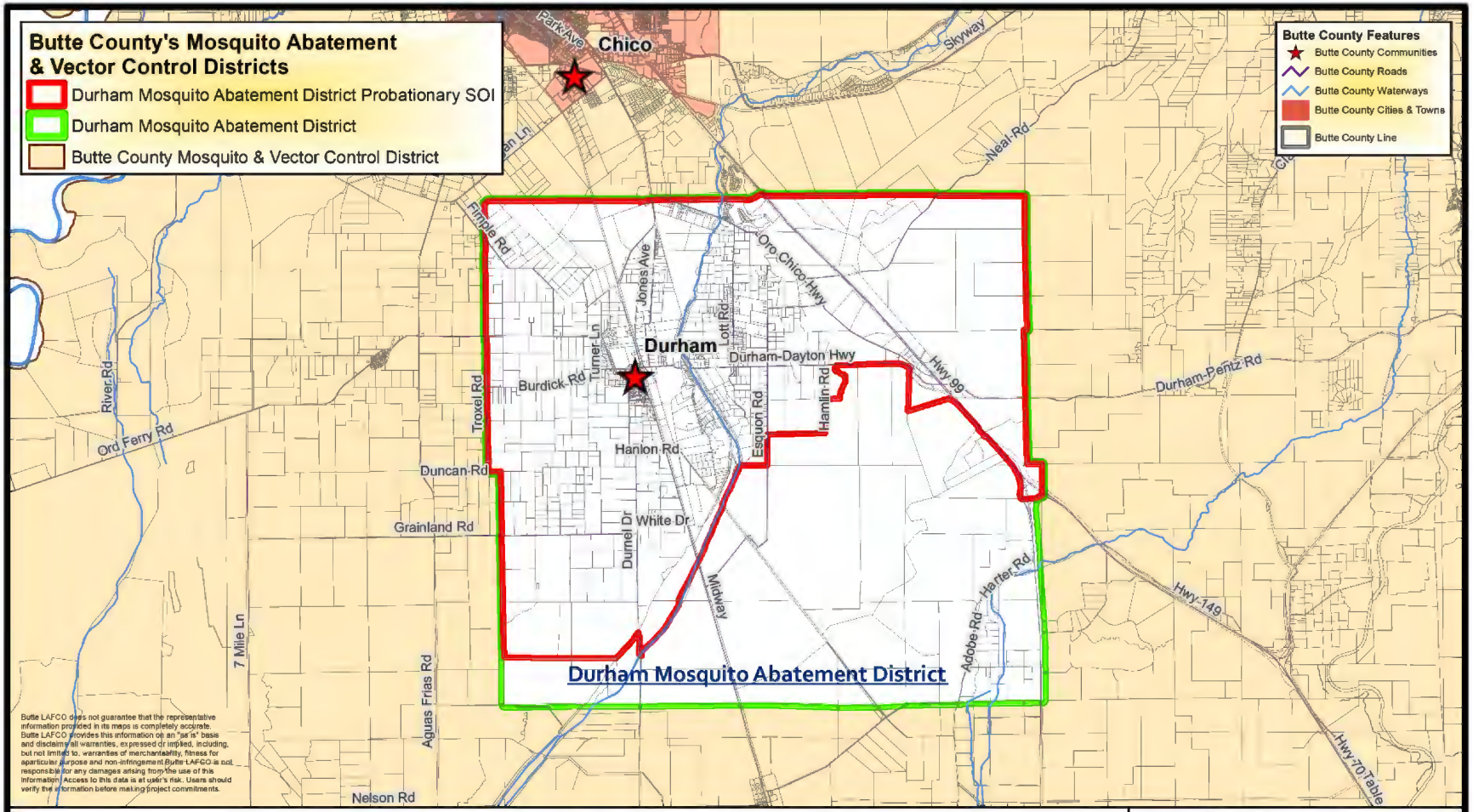
AREA SERVED

1. Supervisorial District: 4 & 5
2. No. of Parcels: 1,973
3. District Size: 60 square miles
4. Estimated Population: 4,200
5. Location: Unincorporated community of Durham and the surrounding area.
6. Sphere of Influence: None. DMAD has a "Zero" Sphere of Influence as assigned by the Commission in 2005.

FINANCIAL INFORMATION

Fiscal Year 2015-16
Revenues: $141,579
Expenditures: $127,177
Unassigned Fund Balance as of 6-30-16: $121,275

Revenue Sources:
- Property taxes
- Annual per parcel assessments
- Interest



BUTTE LOCAL AGENCY FORMATION COMMISSION

Durham Mosquito Abatement District Jurisdictional Boundaries

Action:	Date:	Res.:	Agent:
MAD, VCD MSR, SOI Plan Adoption	12-07-2017	02 2017/18	Steve Lucas

Durham Mosquito Abatement District Jurisdictional Boundaries

0 0.5 1 2 3 4 Miles

C:/Projects/lafco_projects/lafco_mosquito/bc_mad_msr_durham_landscape.mxd
Updated: 01/01/2018
Data: Butte County, LAFCO

DISTRICT SUMMARY

The Durham Mosquito Abatement District (DMAD) was established in 1918 to serve the unincorporated community of Durham and the surrounding area. The District was established to combat malaria in the area; between 1915 and 1918, Durham lost 13% of its population due to malaria and the mortality rate was 100% for children under the age of eight at that time. The District's service area encompasses approximately 38,372 acres (60 square miles) and consists of approximately 1,973 parcels. The District has an estimated population of 4,200.

Pursuant to Article 3 (Sections 2020 - 2030) of the Health and Safety Code, the Durham Mosquito Abatement District has a five-member Board of Trustees who reside within the District boundaries and shall meet at least once every three months. Trustees are appointed by the Board of Supervisors to serve for a term of office of two to four years at the discretion of the appointing authority (California Health & Safety Code §2024).

California Health and Safety Code §2022(a) states that each person appointed by a board of supervisors to be a member of a board of trustees shall be a voter in that county and a resident of that portion of the county that is within the district. Section 2022(b) states that each person appointed by a city council to be a member of a board of trustees shall be a voter in that city and a resident of that portion of the city that is within the district. California Health & Safety Code §2022(d) states that it is the intent of the Legislature that persons appointed to boards of trustees have experience, training, and education in fields that will assist in the governance of the districts. Finally, §2022(e) states that all trustees shall exercise their independent judgment on behalf of the interests of the residents, property owners, and the public as a whole in furthering the purposes and intent of this chapter. The trustees shall represent the interests of the public as a whole and not solely the interests of the board of supervisors or the city council that appointed them. A mosquito abatement district trustee serves for a fixed term of office, and not merely at the pleasure or discretion of the appointing authority.[1]

The current DMAD Board of Trustees are:

Position	Trustee Name	Term Ends
Trustee/President	Dr. John Azevedo	2019
Trustee/Secretary	Lance Smith	2019
Trustee	Sandra Atteberry	2017
Trustee	Dave Jessen	2019
Trustee	William Dempsey	2017

The Durham Mosquito Abatement District Board of Trustees holds it meetings on the second Wednesday of each month at 7:30 p.m. and are subject to the Brown Act. The Board meetings are held at the Durham Memorial Hall located at 9319 Midway, Durham.

[1]State of California, Office of the Attorney General, Opinion No. 09-502.

The services provided by the District were last reviewed in the Mosquito Abatement Services Municipal Service Review adopted by Butte LAFCo in 2004. The MSR contained numerous determinations regarding OMAD's operations, most notably *"…reorganizing the three districts into one county-wide district would provide numerous advantages and with little to no disadvantages. There may be a slight limit of 'personalized' service in the Durham and Oroville areas, but that disadvantage is greatly outweighed by the advantages of a county-wide district with a large number of employees, regularly scheduled office hours, education and training programs, and aerial capability."*

As a result of the determinations contained in the 2004 MSR, the District was given a "Zero" Sphere of Influence (SOI) boundary by the Commission in 2005. At the same time, the Commission expanded the SOI of the Butte County Mosquito and Vector Control District (BCMVCD) to encompass the Durham Mosquito Abatement District's and the Oroville Mosquito Abatement District's jurisdictional boundaries. Pursuant to Commission policies, a zero sphere of influence can be applied when a "districts functions are either non-existent, inadequate, no longer needed, or ***should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved."*** The Commission may initiate dissolution of an agency when it deems such appropriate. It is for this reason that the BCMVCD SOI boundary overlaps the DMAD and the OMAD as the potential exists for the BCMVCD to serve these island areas in the event an agency reorganization is pursued.

DMAD SERVICES

The Durham Mosquito Abatement District is an independent special district (not part of any county or city) that monitors and controls mosquitoes. The District protects the usefulness, desirability and livability of property and the inhabitants of property within its jurisdictional area through the abatement of mosquitoes. Based on the Notice of Intent and Pesticide Application Plan submitted to the State Water Resources Control Board, the District's primary services utilize the Best Management Practices for Mosquito Control in California (2010), which includes:

- Larvicide applications (control products applied directly to breeding sources).
- Adulticide applications (control products applied using ULV foggers. Ultra low volume (ULV) spraying is the process of putting very small amounts of liquid (typically 4 ounces per acre or less) into the air as a fine mist of droplets. These droplets can float on air currents for up to 1 hour and quickly kill mosquitoes that come into contact with them. ULV adulticides are applied when mosquitoes are most active – typically sunset and early evening).
- The District provides mosquitofish free of charge. The mosquitofish can be picked up at the District office and are also distributed at several locations.
- Surveillance: The District uses light traps to track mosquito populations during the mosquito season (generally May through October). It should be noted that the District only deploys two light traps, which are placed on the edge of the rice fields within the District. The District does not sort the trapped mosquitoes by species nor does the District test the trapped mosquitoes for viruses. The District

does not collect and submit dead bird specimens to the State for testing of West Nile virus, although the District has done so in the past.
- District Manager provides public information talks to local groups and schools to keep the public informed.
- The District provides localized and personal mosquito abatement services for special events, plus continuous control for schools and parks.
- The District provides year round service.

These practices are not however, fully described in a District adopted, and publicly available, Integrated Vector Management Plan (IVMP). Nor is there a District policy to prepare or maintain such an IVMP or alternative written comprehensive vector management plan or strategy.

MUNICIPAL SERVICE REVIEW FACTORS FOR THE DURHAM MOSQUITO ABATEMENT DISTRICT

Pursuant to California Government Code §56430, in order to update a Sphere of Influence (SOI) for a city or special district, the associated MSR must include written determinations that address various factors regarding the ability of the subject agency to provide services. The following provides an analysis of the seven categories or components required by §56430 for the Municipal Service Review for the Durham Mosquito Abatement District:

MSR FACTOR NO. 1: GROWTH AND POPULATION PROJECTIONS FOR THE AFFECTED AREA.

DMAD's jurisdictional boundaries consist of the unincorporated community of Durham and the surrounding area. It is estimated that the Durham Mosquito Abatement District has a population of approximately 4,200 people. Land uses within the District include single-family residential uses, commercial uses, industrial uses, and public uses. Outside of the immediate Durham area, the predominant land use is agricultural, consisting of rice fields, orchards, row crops, irrigated pastures, and seasonal livestock grazing. A portion of the Butte Creek Estates Subdivision on Estates Drive is located within the District and consists of approximately 60 residential units and a golf course. Also found within the District is a 70-acre industrial subdivision located at the intersection of SR 99 and Durham Dayton Highway.

Approximately 1,195 acres within the District consist of urban uses on smaller parcels, most of which are located within the community of Durham. Agriculture is the largest land use within the District, consisting of approximately 34,500 acres. Orchard crops (12,200 acres) are the largest agricultural use, followed by rice (9,000 acres), and grazing (6,650 acres).

There is very little potential for new development within the boundaries of the District. A large portion of the community of Durham is zoned for medium and medium-high density residential uses. However, the lack of a public sanitary sewer system in the Durham area precludes the creation of small parcels or the construction of additional dwellings on existing developed parcels. The area of the District outside of the community of Durham is mostly zoned for agricultural uses on parcels with a minimum

parcel size of 20 to 40 acres. One potential development within the District is located on a 40-acre parcel located on the east side of Durham, which is proposed to be developed with 40 1-acre single-family residential parcels.

The following table provides population data for the unincorporated area of Butte County, and for Butte County as a whole, for the years 2010 to 2016:[2]

	4/1/10	1/1/11	1/1/12	1/1/13	1/1/14	1/1/15	1/1/16	2010-2016 Growth Rate	Compound Annual Growth Rate 2010-2016
Unincorporated	83,758	83,966	83,270	82,622	82,563	82,371	80,262	-4.2%	-0.7%
County Total	220,000	220,828	221,064	222,250	223,120	224,121	224,601	2.1%	.35%

The above table shows that the population of the unincorporated area of Butte County has decreased by approximately 4.2 percent since 2010. Most, if not all, of this population decrease can be attributed to the annexations of a large number of developed parcels to the cities within the county, primarily to the City of Chico.

The growth rate of Butte County as a whole for 2010 to 2016 was 2.1 percent, which is a compound annual growth rate of approximately 0.35 percent. The population growth rate during this period was lower than previous years due to the slowdown in the economy and in the housing market that began in 2008.

In March 2017, the State of California Department of Finance released updated population growth projections for all of the counties within the state[3]. The population projection for Butte County shows that by 2060 the county may have a population of 292,892. The 2060 projected population is approximately 30.5 percent above the county's current population, which represents an approximate compound annual growth rate of 1.03 percent.

CALIFORNIA DEPARTMENT OF FINANCE POPULATION PROJECTIONS FOR BUTTE COUNTY 2020-2060

Estimates		Projections								
2010	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**2055**	**2060**
220,157	224,363	230,709	238,546	247,339	256,042	263,642	270,612	277,512	285,290	292,892

The population of the Durham Mosquito Abatement District is expected to grow at a rate of approximately 1 percent a year, with most of that grown occurring within the incorporated community of Durham. The following table shows estimated population projections for the Durham Mosquito Abatement District.

[2] State of California, Department of Finance, *E-4 Population Estimates for Cities, Counties, and the State, 2011-2016, with 2010 Census Benchmark*. Sacramento, California, May 2016.
[3] State of California, Department of Finance, *P-2: County Population Projections (2010-2060)*. Sacramento, California, March 8, 2017.

POPULATION PROJECTIONS FOR DURHAM MOSQUITO ABATEMENT DISTRICT - 2017-2030

2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
4,200	4,242	4,284	4,327	4,371	4,414	4,458	4,503	4,548	4,593	4,639	4,686	4,733	4,780

Population growth within the Durham area could be significantly greater than 1 percent annually if a sanitary sewer system is constructed to serve the area. However, there are no known plans for a sanitary sewer system to be constructed in the Durham area.

As population increases, and growth occurs within the District, service demands will increase. Urban areas provide breeding habitats for mosquitoes (stagnant water), and treatment becomes more difficult and costly, as treatment needs occur more on individual private properties. Expansion of services is facilitated by increases in revenues due to increases in property tax income and the collection of assessment fees from new development.

MSR DETERMINATION 1-1: POPULATION	
	The District has a current population of approximately 4,200 people.

MSR DETERMINATION 1-2: POPULATION GROWTH	
	The population of the Durham Mosquito Abatement District as a whole is expected to grow at a rate of approximately 1 percent annually. Future population growth within the District is expected to occur primarily within the unincorporated community of Durham.

MSR DETERMINATION 1-3: POPULATION GROWTH AND NEW SERVICE DEMANDS	
	As population increases, and growth occurs within the DMAD, service demands will increase. Expansion of services by DMAD is facilitated by increases in revenues due to increases in property tax revenue and individual parcel assessment fees from new development.

MSR FACTOR NO. 2: THE LOCATION AND CHARACTERISTICS OF ANY DISADVANTAGED UNINCORPORATED COMMUNITIES WITHIN OR CONTIGUOUS TO THE SPHERE OF INFLUENCE.

Disadvantaged unincorporated communities (DUCs) are defined by statute as inhabited territory (meaning 12 or more registered voters), or as determined by commission policy, that constitutes all or a portion of a community with an annual median household income (MHI) that is less than 80 percent of the statewide annual MHI (Water Code Section 79505.5). The statewide MHI data is obtained from the US

Census American Community Survey (ACS) 5-Year Data: 2010 - 2014. California's MHI for this period was $61,489, and 80 percent of that is $49,191.

Median household income data is available at the U.S. Census block group mapping level. Based upon the MHI data for the U.S. Census block groups within the boundaries of the District, there are no areas within the District that are identified as being disadvantaged unincorporated communities.

MSR DETERMINATION 3-1: DISADVANTAGED UNINCORPORATED COMMUNITIES	
	No areas within the Durham Mosquito Abatement District are identified as being a disadvantaged unincorporated community (DUC).

MSR FACTOR NO. 3: ***PRESENT AND PLANNED CAPACITY OF PUBLIC FACILITIES, ADEQUACY OF PUBLIC SERVICES, AND INFRASTRUCTURE NEEDS OR DEFICIENCIES INCLUDING NEEDS OR DEFICIENCIES RELATED TO SEWERS, MUNICIPAL AND INDUSTRIAL WATER, AND STRUCTURAL FIRE PROTECTION IN ANY DISADVANTAGED, UNINCORPORATED COMMUNITIES WITHIN OR CONTIGUOUS TO THE SPHERE OF INFLUENCE.***

FACILITIES

The District's office/maintenance shop is located at 9202 Midway, Durham, on a 0.17-acre parcel. Until recently, the District leased the parcel from the County of Butte for $1 per year, but the County recently transferred ownership of the parcel to the District. In 1977, the District improved the parcel with a 30' x 60' (1,800 sq. ft.) steel building that provides space for an office, vehicle/equipment storage, and repair equipment. Insecticides and other sensitive materials are stored in a large, locked, shipping container located outdoors adjacent to the building. The District's building does not contain adequate space for the District's Board of Trustees to meet in, but the building was never intended for that use.

DURHAM MOSQUITO ABATEMENT BUILDING

The District has no plans to make any significant improvements to their building. The District is currently receiving quotes to resurface the District parking lot, which is still usable but deteriorating.

The District's office is *generally* open Monday through Friday, 7 a.m. to 4 p.m. However, the office may be closed at times during these hours because the District Manager and the District's part-time administrative assistant/bookkeeper/secretary may be out of the office or in the field providing services. During the mosquito season (generally May through September), the District office is generally open from 7 a.m. to 2 p.m., and then reopens a half hour before sunset for three hours to conduct evening fogging operations. Residents of the District can leave a voice mail if no one is in the office to answer the phone. The District Manager returns calls as soon as possible. The District Manager has a mobile phone, provided by the District, to receive and make calls while away from the District office.

DISTRICT EQUIPMENT

The District has various types of equipment that is utilized to perform mosquito abatement services. Equipment includes office equipment, three pickup trucks, four ultra low volume truck-mounted foggers (one of which is new), and various tools such as hand-held foggers, backpack sprayers, and hand-held sprayers. The District also has several large fish tanks to hold mosquitofish.

The District's ultra low volume foggers are utilized for three to five years and then replaced. The foggers are cycled asynchronously so that the District always has at least two foggers that are no greater than two years old. Maintenance of the foggers is performed by District staff. The foggers, which are mounted in the beds of the District's trucks, are gas-powered and are operated remotely via cable by the drivers.

DMAD ULTRA LOW VOLUME FOGGER

The District's trucks are all Chevrolet 1500 models. Two of the trucks have regular cabs and were made in 2005, while the third truck has an extended cab and was manufactured in 2007. According to the District, all three trucks have very low miles on them.

DMAD TRUCK WITH FOGGING UNIT

The District replaces their trucks as necessary and has budgeted for the purchase of a new truck within the next two years. The district performs all minor maintenance services on trucks. Vehicles requiring major repairs are taken to a certified vehicle repair business. Until several years ago the District would perform oil changes on the trucks, but now has oil changes performed by a private business, finding that it was less expensive and time consuming to do it this way.

There are approximately 9,900 acres of rice fields and wetlands within the District, but the District does not have the necessary operating revenue, equipment, or personnel to provide targeted, effective mosquito abatement services to these areas. The equipment that would be needed to provide mosquito abatement service to the rice fields can include quad runners, boats, amphibious vehicles, and, most importantly, aircraft, which would allow for very efficient and effective application of control agents.

ADEQUACY OF PUBLIC SERVICES

As previously noted, DMAD provides the following services:

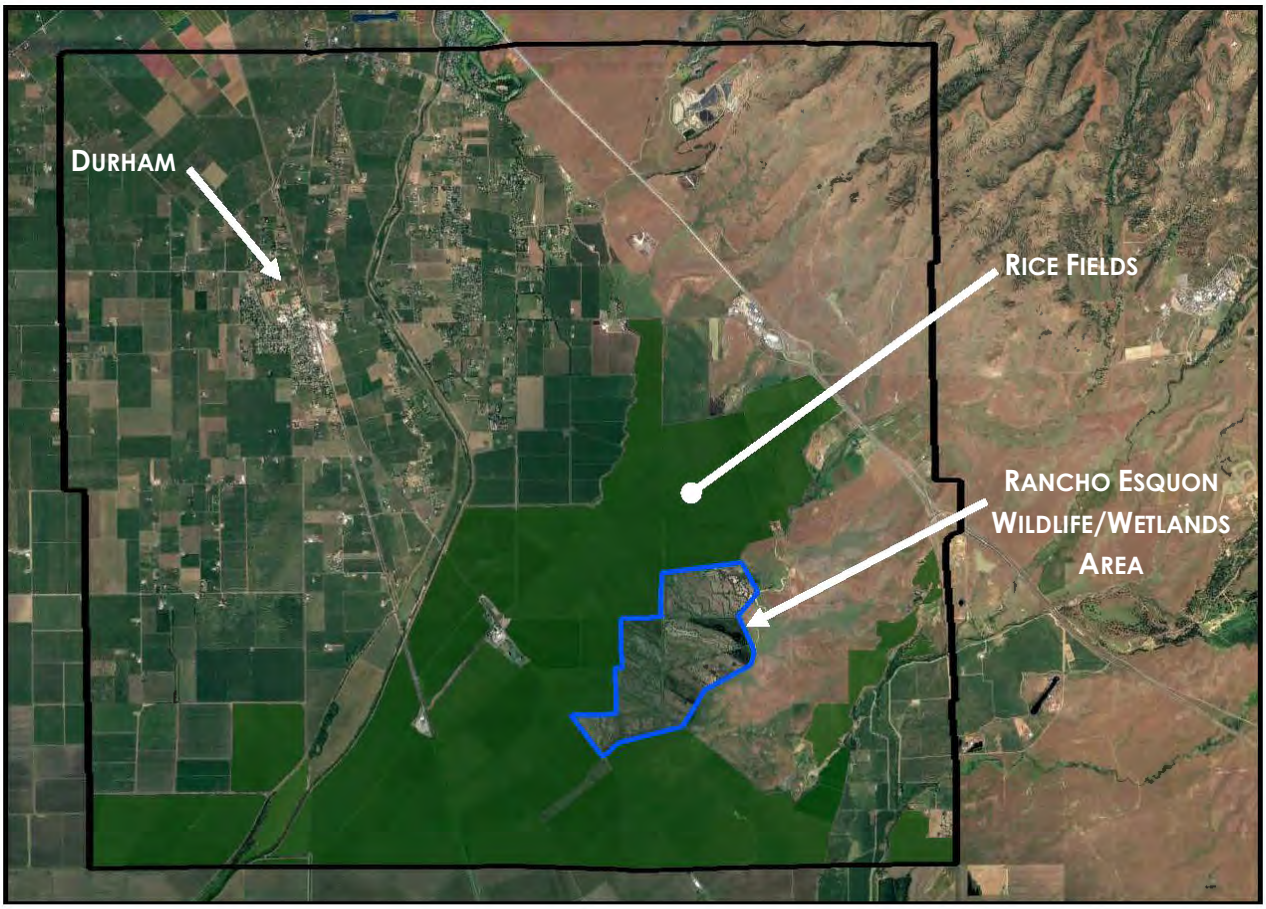
- Larvacide applications (control products applied directly to breeding sources to kill mosquito larvae).
- Adulticide applications (control products applied using ultra low volume foggers to kill adult mosquitoes).
- The District provides mosquitofish free of charge. The mosquitofish can be picked up at the District office and are distributed at several locations.
- Surveillance: The District uses two light traps to track mosquito populations during the mosquito season (generally May through October). The two light traps are placed on the edge of the rice fields within the District. The District does not sort the trapped mosquitoes by species nor tests the trapped mosquitoes for viruses.

The District does not collect or submit dead bird specimens to the State for testing of West Nile virus, although the District has done so in the past.
- The District Manager provides public information talks to local groups and schools to keep the public informed.
- The District provides localized and personal mosquito abatement services for special events, plus continuous control for schools and parks.
- The District provides year round service.

DMAD's District Manager has indicated that one of the benefits of a smaller local district to District residents is the personalized service provided on an as needed basis.

Given the District's very limited funding, its primary mosquito abatement strategy is aimed at eradicating adult mosquitoes in residential and business areas within the District where humans may congregate or live because the District has determined that it is impractical to eradicate mosquitoes from the whole of the District boundaries.[4] This impracticality arises from the fact that mosquitoes can breed in one area and can travel up to 20 miles in their life span. This is the case with the majority of mosquitoes in the Durham area in that they are bred predominantly in areas where substantial irrigation water is applied and stands on the land surface (such as rice fields and wetlands). The mosquitoes originating from the rice fields and wetlands in the south and southeast portions of the District migrate outwards to other parts of the District where humans congregate and to areas outside of the District. The following map shows the location of the rice fields and the Rancho Esquon wildlife/wetlands area located within the District.

[4] Engineer's Report Regarding Durham Mosquito Abatement District for Potential Proposition 218 Benefit Assessment, 2003.



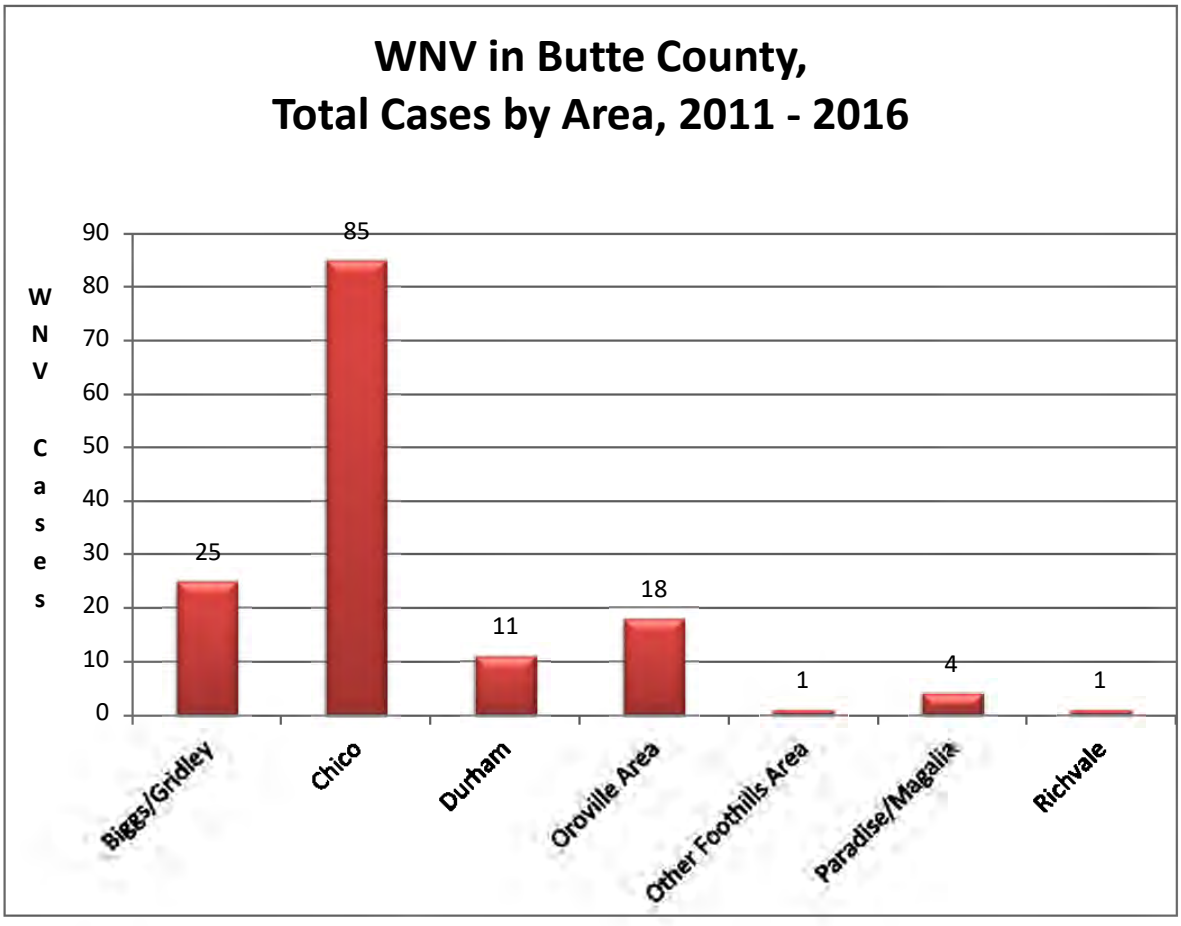
RICE FIELDS AND WETLANDS LOCATED WITHIN DMAD JURISDICTIONAL BOUNDARIES

The strategy of the District is to use its chemicals, fogging and labor force to try to create barriers to the migration of adult mosquitoes from these flooded agricultural and wetland areas to the residential portions of the District. The strategy is not to eradicate the breeding of mosquitoes in all areas adjacent to residences, but instead to set up regional barriers to interrupt the migration pattern from the large-scale agricultural and wetland operations to the southeast to the residential and business areas to the north and west.

The second prong of the District's effort and expenditure of limited resources is to focus upon particular residential areas in which landowners are noting substantial mosquito populations/activity. A particular home may not receive fogging or chemical activity in a given year, but that may be a result of the benefit of the expenditure in creating a migration barrier from other areas. The District tries to spray each street in the more heavily populated portions of the District three times a week between March and August, weather permitting.

The District's primary strategy of preventing large populations of adult mosquitoes from reaching the more populated areas of the District, and not treating the numerous rice fields and the wetlands in the District, is logical given the District's limited operating budget. However, this approach to mosquito control is analogous to aggressively

treating the symptoms of a disease rather than addressing the root cause. In other words, it is accepted that the district cannot treat vast areas of mosquito breeding grounds or larvae, so they focus on reducing adult mosquitoes where they are most problematic - where people live. This focus on adult eradication appears to be in conflict with the strategies reported in the Pesticide Application Plan submitted to the State Water Resources Control Board, which states "Adult mosquito control is a last resort option..." This strategy appears to be adequately addressing mosquito populations in the more populated areas of the District given that there have been no identified outbreaks of mosquito-borne diseases within the District and the residents of the District, based on a lack of complaints, appear to be satisfied with the level of services the District currently provides. Although there does not appear to be significant public health issues related to mosquito-borne diseases in the District, the Butte County Public Health Department reports that 11 cases (by residence) of West Nile virus has been identified within the Durham area over the past six years (it should be noted that the infection may not have occurred at the place of residence or occurred within DMAD's jurisdictional boundaries). The below chart, provided by the Public Health Department, represents West Nile virus cases (by residence) over the past six years for communities and cities within Butte County.[5]



[5] Butte County Public Health Department, Community Health and Sciences Office, letter, dated May 31, 2017.

The District's primary strategy of preventing large populations of adult mosquitoes from reaching the more populated areas of the District could result in significant nuisance and public health issues if mosquito populations from the rice fields and wetlands exceed the District's ability to prevent large numbers of adult mosquitoes from migrating to the populated areas of the District or to areas outside of the District's boundaries.

There are approximately 9,000 acres of rice fields within the District. Rice culture, as well as other irrigated agricultural situations, can provide a suitable environment for mosquito breeding. In cases where these agricultural lands interface with urbanized or public areas, mosquitoes can be a public nuisance, and certain mosquito species can create health problems for humans and livestock.[6]

Mosquito control in rice fields is often carried out primarily by mosquito abatement or vector control personnel who are authorized to visit rice fields and treat for mosquito infestations. Mosquito abatement or vector control districts combine a variety of methods to manage mosquitoes in rice fields including insecticide application and stocking fields with the mosquito-eating fish, *Gambusia affinis.* Some mosquito control agencies use the bacteria *Bacillus thuringiensis israelensis* (Bti) and *B. sphaericus* (Bs), which are effective in killing mosquito larvae, yet have low toxicity to other organisms. Agencies also use ultra-low volume pesticide fogs to control flying adult mosquitoes in rice-growing areas (usually pyrethroidsor malathion). These fogs do not kill the fish, insects, and some of the other invertebrates in the water.

The Durham Mosquito Abatement District does not have the necessary equipment, staff, or revenue to provide mosquito abatement services to the rice fields. Not providing ongoing mosquito abatement services to the rice fields could result in extremely large mosquito populations that migrate to other areas of the District, such as the highly populated community of Durham, and to areas outside of DMAD's boundaries. The rice fields within DMAD's boundaries represent a very significant potential public health issue that is not currently being abated by the District.

SERVICE REQUESTS

A major factor influencing service demand is the presence of vectors (in particular mosquitoes) and vector-borne disease agents within the District and neighboring areas. The District actively responds to service requests within its boundaries. Any property owner, business, or resident in the District may contact the District to request mosquito abatement service and District staff will respond promptly to the particular property to evaluate the property and situation and to perform appropriate control services. The District responds to all service requests in a timely manner, regardless of location, within its boundaries.

Although the primary goal of the District is to prevent adult mosquitoes from reaching the more populated areas of the District, it should be noted that the District does have

[6] *UC IPM Pest Management Guidelines: Rice.* UC ANR Publication 3465 (http://ipm.ucanr.edu/PMG/r682000411.html#REFERENCE). The University of California Statewide IPM Program (UC IPM)

a preventative program that controls larval mosquitoes before they emerge. With this program, the residents of the District will see fewer biting adult mosquitoes and fewer cases of vector borne diseases. Consequently, service requests alone are not a good indicator of the level of demand for the District's services. The preventative work that DMAD performs helps keep the number of service calls related to mosquito biting activity low and prevents cases of disease.

MSR DETERMINATION 3-1: ADEQUACY OF PUBLIC SERVICES	
	DMAD's primary mosquito abatement strategy is to prevent large numbers of mosquitoes from reaching the more populated areas of the District, mostly by fogging operations to kill adult mosquitoes at the interface with agricultural uses and in the populated areas of the District.

MSR DETERMINATION 3-2: ADEQUACY OF PUBLIC SERVICES	
	While DMAD aggressively pursues adult mosquito eradication through consistent fogging, it does not have a comprehensive vector control strategy that is based on an adopted Integrated Vector Management Plan (IVMP). The District should immediately develop, adopt, and make publicly available an IVMP that clearly details its vector control strategy that includes a reasonable and effective plan to address currently unmet needs in the vast agricultural areas where mosquito breeding grounds surround populated areas of the District. The integrated vector management plan should, at a minimum, include the following elements: *1. Outreach and education;* *2. Mosquito surveillance;* *3. Treatment thresholds;* *4. Biological and microbial control;* *5. Physical and cultural control; and* *6. Chemical control.* *The DMAD District Manager has recently indicated that the District will adopt and implement an integrated pest management program. It is vitally important to public accountability that the District maintain adequate records/documentation that demonstrates how each of the IVMP factors have been implemented and evaluated for effectiveness.*

MSR DETERMINATION 3-3: ADEQUACY OF PUBLIC SERVICES	
	DMAD has sufficient facilities and resources to provide basic, but not comprehensive, mosquito abatement services only to the more populated areas of the District, such as the unincorporated community of Durham and the Butte Creek Estates Subdivision.

MSR DETERMINATION 3-4: ADEQUACY OF PUBLIC SERVICES - INFRASTRUCTURE NEEDS OR DEFICIENCIES	
	DMAD does not have the equipment, staff, or funding to provide mosquito abatement services to the numerous rice fields and the wetlands found in the south and southeast portions of the District. *The District should consider whether it can realistically increase services to these agricultural and open space areas to reduce breeding grounds or whether these areas should be detached from DMAD and annexed into the BCMVCD, which has the resources, primarily aerial application resources, to better address significant mosquito populations in these areas.*

MSR DETERMINATION 3-5: ADEQUACY OF PUBLIC SERVICES - INFRASTRUCTURE NEEDS OR DEFICIENCIES	
	The District has no unmet infrastructure needs or deficiencies concerning the provision of basic, but not comprehensive mosquito abatement services to the more populated areas of the District. However, the District does not have adequate operating revenues, equipment, or staff to provide mosquito abatement services to the numerous rice fields and the wetlands found within the boundaries of the District. The lack of mosquito abatement operations on the rice fields represents a significant public health issue that needs to be abated.

MSR DETERMINATION 3-6: ADEQUACY OF PUBLIC SERVICES - EQUIPMENT	
	District equipment appears to be adequately maintained and is replaced as necessary to ensure uninterrupted mosquito abatement operations.

MSR FACTOR NO. 4: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES.

This section analyzes the financial structure and fiscal viability of the District. Included in this analysis is the consideration of revenue sources, amount of revenue, stability of revenues, and expenditure sources.

Each year the District's District Manager prepares and submits an operating budget to the Board of Trustees for the upcoming fiscal year. The Board of Trustees reviews and approves of the budget prior to the beginning of each fiscal year.

As required by California Health and Safety Code §2027(c), the District's funds are deposited with and maintained by the Butte County Treasurer and Tax Collectors Department. The funds that the District deposits with the County Treasurer are placed in the County's Investment Trust Fund, which accounts for the assets of legally separate entities that deposit cash with the County Treasurer in an investment pool, which commingles resources in the investment portfolio for the benefit of all participants. The

District receives dividends from the Investment Trust Fund. Because the County Treasurer and Tax Collectors Department maintains the District's funds, the District's annual budget is included as a part of the County's overall annual budget.

Revenues

The District receives revenue from two main sources:

- **Ad-valorem Property Taxes**

  In Fiscal Year 2015-16, approximately 63 percent ($89,006) of DMAD's revenues were received from the District's share of the ad valorem property tax. Ad-valorem[7] property tax is a one percent general levy of the assessed market value of a property. This one percent is distributed among many agencies in the county. For cities and the county, this tax is usually deposited into their general funds, which can be used for any service. For special districts, this tax is also deposited into the district's general funds to be used for the district's sole purpose.

  The level of revenue from property taxes can be considered relatively consistent, as the taxes usually remain at the same level from year to year. However, property tax revenue can decrease due to decreasing property values, which is what occurred beginning in 2008 because of the downturn in the economy and housing market. Due to the downturn in the economy, properties were reassessed to a lower value, which reduced property tax revenue flowing to cities and special districts. Revenue from property taxes has been increasing over the last few years as properties are reassessed to a higher value, but remain below pre-2008 levels. New development on a property raises the property value of that parcel, with a corresponding increase in property tax revenues.

  The Butte County Tax Collector's Office bills and collects the District's share of property taxes and assessments. The Butte County Treasurer's Office remits current and delinquent property tax collections to the District throughout the year.

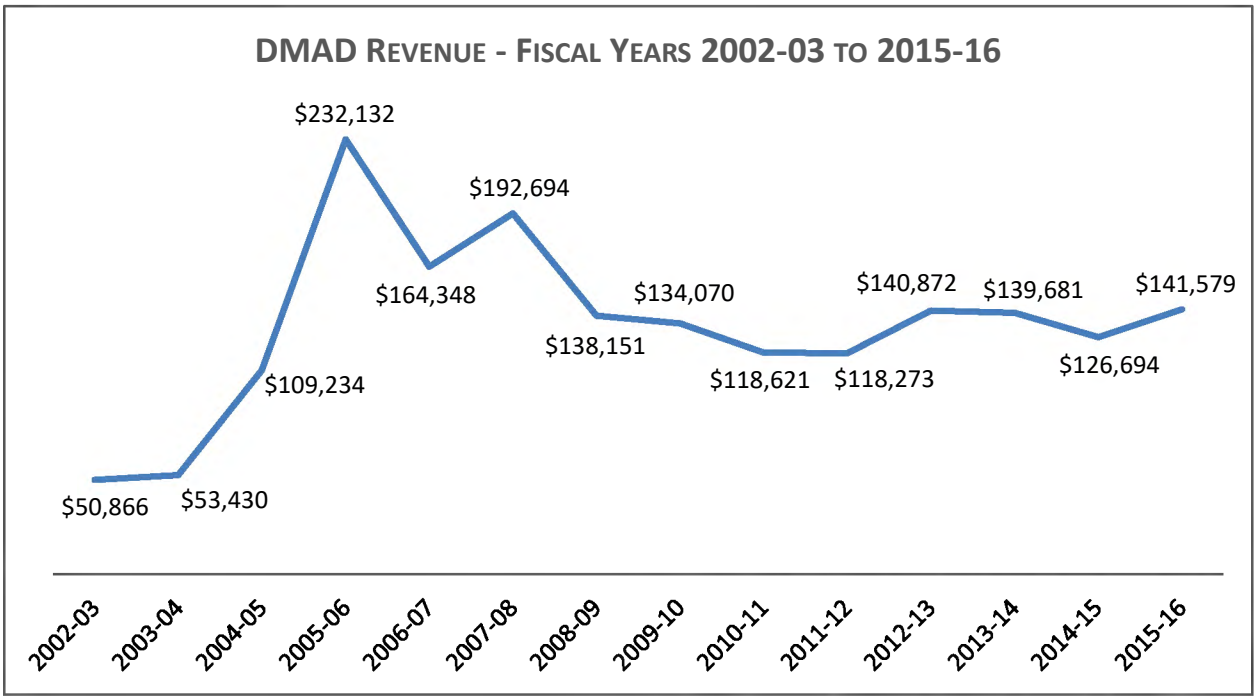
- **Assessment Fees**

  In Fiscal Year 2015-16, approximately 34 percent ($48,011) of DMAD's revenues were received from special benefit parcel assessments. The maxim assessment fee is $25 per parcel for parcels up to 100 acres in size and the maximum assessment for parcels greater than 100 acre in size is $25 per parcel plus $.50 per acre. The actual amount of the collected annual assessment varies upon the size of the District's available fund balance and anticipated expenditures. The assessment was approved on June 17, 2004, by the registered voters within the District and passed by 69.2 percent.

Revenues for the District have remained relatively steady over the last five years, with some minor fluctuations. Revenue for the District in Fiscal Year 2015-16 was $141,579, and revenue for the current fiscal year (2016-17) is estimated to be $135,150. District revenues rose dramatically after the District's special benefit assessment was approved in 2004. Prior to the approval of the assessment, annual District revenues were usually

[7] Latin for "according to value"

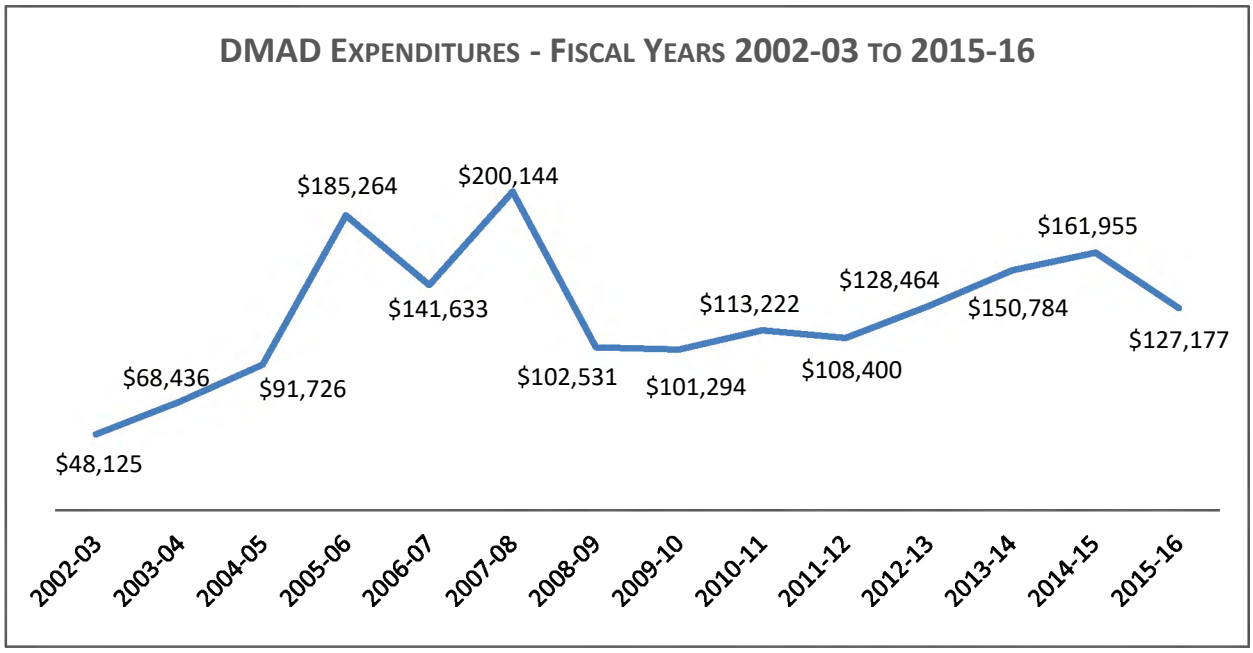
less than $55,000. The following chart shows the District's revenues for Fiscal Years 2003-04 to 2015-16.



EXPENDITURES

Total operating and capital expenditures for the District for Fiscal Year 2015-16 was $127,177. Expenditures for BCMVCD generally consist of salaries and employee benefits, services and supplies (costs for pesticides, fuel, insurance, maintenance) and fixed (capital) assets expenditure (purchase of new vehicles or equipment). In Fiscal Year 2015-16, salaries and employee benefits ($83,292) accounted for 65.5% of the District's expenditures and services and supplies ($43,885) accounted for 34.5% of the District's expenditures. In Fiscal Year 2015-16, there were no expenditures for fixed assets.

District expenditures vary from year to year, reflecting the amount of revenue received and any high-cost purchases, such as a vehicle or fogging equipment. Since Fiscal Year 2002-03, in which expenditures were $48,125, District expenditures gradually increased, reaching a high of $200,144 in Fiscal Year 2008-09. As shown on the following graph, District revenues rose dramatically after the District's special benefit assessment was approved in 2004.



DMAD ANNUAL BUDGETS

A special district's budget is a financial plan that details the district's projected revenues and expenditures for a defined period of time, usually one fiscal year (July 1 to June 30.) Special districts typically have operating budgets, which is a plan of current (annual) spending and the means to pay for it (taxes, fees, etc.). As previously noted the District prepares a budget for each fiscal year that shows anticipated revenue and anticipated expenditures (appropriations).

The District's budgets for Fiscal Years 2012-13 to 2016-17 are shown in the below table. The budgets for FY 2012-13 to 2015-16 show the actual revenue and expenditure figures, while the FY 2016-17 budget shows the budget as adopted by the District Board of Trustees and only reflects anticipated revenues and appropriations (anticipated expenditures).

DURHAM MOSQUITO ABATEMENT DISTRICT

Detail by Revenue Category and Expenditure Object	2012-13 Actuals	2013-14 Actuals	2014-15 Actuals	2015-16 Actuals	2016-17 Adopted By District Board
REVENUES*					
Current Secured Property Tax	90,348	76,059	78,607	83,696	81,000
Current Supplemental Property Tax	283	486	752	779	450
Current Unsecured Property Tax	4,558	4,067	4,042	4,378	4,500
Prior Unsecured Property Tax	113	161	94	153	100
Interest	2,097	1,596	1,650	1,441	1,600
Fair Market Value Adj - Unrealized Gain (Loss)	(3,029)	1,226	115	1,115	-
Homeowners Property Tax Relief	1,535	1,260	1,253	1,239	1,500
Charges For Current Services	39,476	39,551	39,530	48,011	44,000
Miscellaneous Revenue	-	-	-	-	2,000
Reimbursement of Prior Year Expense	2,462	16,501	765	767	-
TOTAL REVENUES	**$137,843**	**$140,907**	**$126,808**	**$141,579**	**$135,150**
EXPENDITURES/APPROPRIATIONS*					
Salaries and Employee Benefits	82,786	102,127	94,908	83,292	100,000
Services and Supplies	45,678	48,656	67,047	43,885	60,000
Fixed Assets	-	-	-	-	20,000
Appropriation for Contingencies	-	-	-	-	-
TOTAL EXPENDITURES / APPROPRIATIONS	**$128,464**	**$150,783**	**$161,955**	**$127,177**	**$180,000**
NET COSTS / USE OF FUND BALANCE	**$9,379**	**($9,877)**	**($35,147)**	**$14,402**	**($44,850)**

The budgets for Fiscal Years 2013-14 and 2014-15 show that expenditures exceeded revenues for each of these fiscal years. According to the District, in Fiscal Year 2013-14, District expenditures exceeded revenues due to the unanticipated purchase of an $11,000 fogging unit. Expenditures exceeding revenues in Fiscal Year 2014-15 was due to unanticipated expenses associated with the preparation of several years of financial audits (Fiscal Years 2009-10 through 2013-14) and consulting fees for accounting services.

The adopted budget for Fiscal Year 2016-17 shows that expenditures are projected to exceed revenue by $44,850. According to the District, the full amounts of the appropriations shown in the adopted budget are not expected to be fully utilized, which will probably not result in a budget deficit. The District stated that appropriations are usually budgeted higher than what are actually expected to be expended, stating that it is very difficult to obtain additional funds from the County if it is not included in the District's adopted budget.

FUND BALANCES

DMAD maintains a fund balance, and as of June 30, 2016, the District had $121,275 in available (unappropriated) fund balance. The following table shows the District's available fund balance from Fiscal Years 2008-09 through 2015-16.

DURHAM MOSQUITO ABATEMENT DISTRICT UNAPPROPRIATED FUND BALANCES	
Fiscal Year 2015-16	$121,275
Fiscal Year 2014-15	$56,872
Fiscal Year 2013-14	$92,019
Fiscal Year 2012-13	$131,896
Fiscal Year 2011-12	$142,517
Fiscal Year 2010-11	$159,571
Fiscal Year 2009-10	$179,571
Fiscal Year 2008-09	$146,144

For public agencies, unappropriated fund balances are not just money in a bank; they are fundamental resources for ensuring reliable core services and community security.[8] Public agencies designate money toward savings in order to balance their budget, respond to emergencies, keep rates affordable, maintain current infrastructure and plan for future public works projects. The following are the benefits of a public agency maintaining an adequate level of unappropriated fund balance:

- Balancing Budgets – Over the course of the fiscal year, fund balances help balance the ebb and flow of revenues verse expenditures.
- Emergency Preparation – In the event of a disaster, communities can't afford not to have savings readily available to quickly repair critical local infrastructure and bring core services back online.
- Affordable Rates – With appropriate savings, special districts are able to use resources wisely and smooth out the highs and the lows of volatile economic conditions, rather than spend their entire surplus and then seek new revenue or jeopardize services.
- Infrastructure Maintenance – Reserves mean the pipes are fixed, roofs are patched, and worn equipment is replaced without going back to the taxpayers or ratepayers to pay for routine upkeep.
- Planning for the Future – A long-term, thoughtful approach to public infrastructure requires the foresight to plan for, and discipline to save for, future needs.

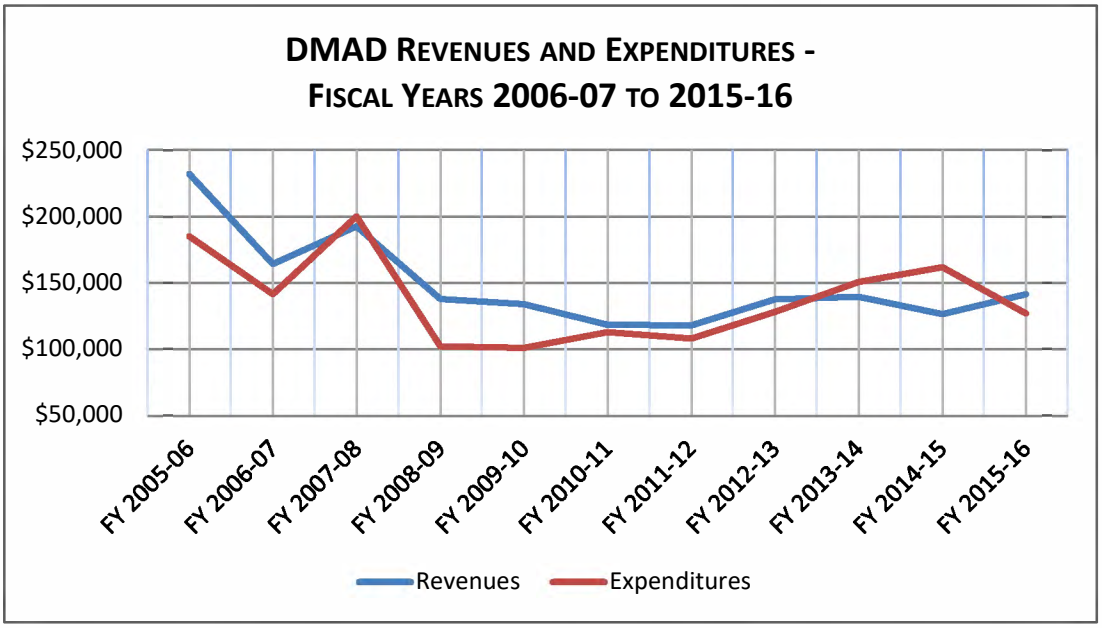
The District's unappropriated fund balance has varied slightly over the years in response to unanticipated expenses and reduced revenues. According to the District Manager, the District tries to maintain a fund balance that is large enough to fund District operations for a one-year period.

BUDGET DEFICITS

As shown in the following table and graph, DMAD experienced budget deficits (where expenditures exceeded revenues) in three of the last ten fiscal years. The following table and chart show the revenue and expenditures for these fiscal years and the revenue/expenditure variances.

[8] *Special District Reserve Guidelines - A Guide to Developing a Prudent Reserve*. Second edition. California Special Districts Association. 2013.

Fiscal Year	Revenues	Expenditures	Variance Favorable (Unfavorable)
2005-06	$232,132	$185,264	$46,868
2006-07	$164,348	$141,633	$22,715
2007-08	$192,694	$200,144	($7,450)
2008-09	$138,151	$102,531	$35,620
2009-10	$134,070	$101,294	$32,776
2010-11	$118,621	$113,222	$5,399
2011-12	$118,273	$108,400	$9,873
2012-13	$137,843	$128,464	$9,379
2013-14	$140,907	$150,783	($11,103)
2014-15	$126,808	$161,955	($35,147)
2015-16	$141,579	$127,177	$14,402



Budgets are meant to balance revenues and expenditures, so that a public agency is able to provide needed services with the resources available. However, the reality is that budgets will rarely work out precisely as planned, leading to operating deficits (when expenditures exceed revenues) or operating surpluses (when revenues exceed expenditures.) As long as these deficits or surpluses are minor or intermittent, they do not constitute a material problem for a local government and should not be cause for concern. It is when there is a persistent pattern of larger surpluses or deficits that there should be concern about the budgeting practices of the agency.[9]

[9] *Citizens' Guild to Local Budgets*, Office of the New York State Comptroller-Division of Local Government and School Accountability. 2010.

An agency experiencing a budget deficit can use fund balance or other reserves, if available, to balance their budget. However, using the fund balance is a one-time course of action that cannot fix a structural imbalance. A district experiencing continuous budget deficits may be having financial difficulties that need to be identified and corrected. If budget deficits cannot be corrected, a district may have to reduce service levels if new sources of funding cannot be obtained.

The District's budget deficit of $11,103 in Fiscal Year 2013-14 was due to the unanticipated purchase of a sprayer unit, while the budget deficit of $35,261 in Fiscal Year 2014-15 was due to unanticipated expenditures for the preparation of several years of financial audits and for consulting fees for accounting services. These budget deficits do not appear to be an indication that the District is having any systemic financial difficulties.

NET PENSION LIABILITY (CALPERS)

The DMAD District Manager is the only District employee with a CalPERS pension plan. CalPERS retirement benefits are funded through contributions paid by contracting employers, member contributions, and earnings from CalPERS investments. Employer contribution requirements are determined by periodic actuarial valuations under state law. Actuarial valuations are based on the benefit formulas the agency provides and the employee groups covered. The benefit formula for OMAD is 2.0% at age 60.

As of the fiscal year ended June 30, 2015, the District had $20,396 in net pension liabilities for its proportionate shares of the net pension liability of the District's pension plan. The net pension liability is defined as the unfunded liability for the pension benefits promised to current employees, retirees, and their beneficiaries. As of June 30, 2015, the District's pension plan had an accrued liability of $104,149, which is the value of benefit earned for past service.

For Fiscal Year 2016-17 the District's normal cost (NC) rate for the District Manager's pension plan is 7.612% of the District's Manager annual salary.[10] For FY 2016-17, the District's estimated employer normal cost is $4,043. For the current fiscal year, the District's estimated unfunded accrued liability (UAL) annual payment is $1,765.[11] The total annual cost to the District for the District Manager's pension plan for FY 2016-17 is estimated to be $5,808 ($4,043 employer normal cost plus $1,765 unfunded accrued liability cost). The following table shows the District's current, past fiscal year, and the next fiscal year's unfunded accrued liability annual payment and the normal cost rate.

Employer Plan	NC Rate FY 2017-18	UAL 2017-18	NC Rate FY 2016-17	UAL 2016-17	NC Rate FY 2015-16	UAL FY 2015-16
Miscellaneous	7.653%	$2,002	7.612%	$1,765	7.163%	$1,600

[10] Normal Cost (NC) Rate represents the annual cost of service accrual for the upcoming fiscal year for active CalPERS employees. Normal cost is shown as a percentage of payroll and is paid as part of the payroll reporting process.

[11] Annual payment on the Unfunded Accrued Liability (UAL) is the amortized dollar amount needed to fund past service credit earned (or accrued) for members who are currently receiving benefits, active members, and for members entitled to deferred benefits, as of the valuation date. The UAL is billed monthly.

The following table shows projected CalPERS employer contributions for DMAD up to Fiscal Year 2022-23.

	Required Contribution	Projected Future Employer Contributions				
Fiscal Year	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**
Normal Cost %	7.653%	7.7%	7.7%	7.7%	7.7%	7.7%
UAL $	$2,002	$2,349	$2,715	$2,969	$3,237	$3,443

The District's CalPERS cost will gradually increase and by Fiscal Year 2022-23 the District's annual CalPERS costs will be almost $1,500 greater than the District's current cost. It should be noted that at its December 21, 2016 meeting, the CalPERS Board of Administration approved lowering the CalPERS discount rate assumption, which is the long-term rate of return, from 7.50 percent to 7.00 percent over the next three years. Lowering the discount rate means plans will see increases in both the normal costs (the cost of pension benefits accruing in one year for active members) and the accrued liabilities. These increases will result in higher required employer contributions, although the increased amount is not known at this time.

ANNUAL FINANCIAL AUDIT/FINANCIAL REPORTS

California Health and Safety Code §§2079(a) and (b) require that board of trustees of a mosquito abatement district to provide for regular audits of the district's accounts and records pursuant to Section 26909 of the Government Code, and that the board of trustees shall provide for the annual financial reports to be filed with the State Controller. State Law requires that every public agency retrain the services of a certified public accountant to prepare that agency's annual financial audit. An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in an agency's financial statements. Financial statements include all transactions for which a public agency is financially accountable. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

DMAD did not have financial audits/financial reports prepared for five consecutive fiscal years - Fiscal Years 2009-10 through 2013-14 – in a timely manner. Once the District was aware the fiscal reports were tardy, the District had a comprehensive financial audit/financial report prepared for those fiscal years in July 2015. The financial audit/financial report for Fiscal Year 2014-15 was also tardy, and a comprehensive financial audit/report for Fiscal Years 2014-15 and 2015-16 was completed in April 2017.

The District's financial statements include all transactions for which the District is financially accountable. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

The District's Annual Financial Report for Fiscal Years 2009-10 through 2013-14 found one material deficiency and three significant deficiencies in the District's internal control of financial reporting. A deficiency in internal control exists when the design or operation of a control does not allow management or employees, in the normal course of performing their assigned functions, to prevent, or detect and correct misstatements on a timely basis. A material weakness is a deficiency, or a combination of deficiencies, in internal control such that there is a reasonable possibility that a material misstatement of the entity's financial statements will not be prevented, or detected and corrected on a timely basis. A significant deficiency is a deficiency, or a combination of deficiencies, in internal control that is less severe than material weakness, yet important enough to merit attention by those charged with governance. As identified in the District's comprehensive financial report for Fiscal Years 2009-10 through 2013-14, the weaknesses found in the District's internal control of their finances were:

- **Significant Deficiency 2014-01**
  Internal Control- Cash Disbursements

  Condition
  Board minutes, check registers, and invoices or other supporting documentation for cash disbursements could not be located for July 2009.

  Criteria
  Signed and approved copies of board minutes and check registers along with supporting documentation for all cash disbursements should be properly maintained.

  Effect
  We were unable to test approval and validity of cash disbursements for July 2009 and were unable to review Board of Director actions taken in July 2009.

  Recommendation
  We recommend that the District implement procedures to insure that all supporting documentation is maintained for disbursements and that all actions of the Board of Directors are properly documented.

  Management's Response
  Management will adopt procedures during the fiscal year ending June 30, 2016, to implement the recommendation.

Current Status[12]
Fully implemented

❖ **Significant Deficiency 2014-02**
Internal Control- Payroll (Timecards)

Condition
Timecards are not being signed by employee and supervisor. Several timecards could not be located.

Criteria
Internal control procedures should provide reasonable assurance that wages paid are approved prior to processing the corresponding payroll transactions. Timecards should be maintained for all hourly employees and the timecards should be signed by the employee and supervisor.

Effect
Without strengthening internal controls over payroll disbursements, wages may be improperly paid to District employees.

Recommendation
In order to strengthen internal controls over payroll, we recommend that employees be required to sign timecards and submit to their supervisor for approval.

Management's Response
Management will adopt procedures during the fiscal year ending June 30, 2016, to implement the recommendation.

Current Status
See current year finding at 2016-001

❖ **Significant Deficiency 2014-03**
Internal Control- Payroll (Personnel Files)

Condition
Personnel files do not include documentation of approved pay rates and benefits.

Criteria
Personnel files should contain documentation of approved pay rates upon employee hire date and any subsequently approved pay adjustments. Personnel files should also include documentation of approved benefit plan changes.

Effect
Without strengthening internal controls over payroll, wages and benefits may be improperly paid to District employees.

[12] The "Current Status" statement was obtained from the Durham Mosquito Abatement District's Financial Statements and Supplementary Information with Independent Auditors' Reports, Years Ended June 30, 2015 and 2016.

Recommendation
In order to strengthen internal controls over payroll, we recommend that personnel files be updated to include documentation of current pay rates and benefits for all employees. Approval of subsequent pay adjustments and benefit plan changes should be maintained in personnel files.

Management's Response
Management will adopt procedures during the fiscal year ending June 30, 2016, to implement the recommendation.

Current Status
See current year finding at 2016-002

❖ **Material Weakness 2014-04**
Internal Control- Payroll (Reporting)

Condition
The District's policies and procedures do not provide for adequate management oversight and review of the District's payroll reporting process. Payroll taxes for the 2012 and 2013 calendar years were not remitted to the IRS until November of 2014. Form W-2 Wage and Tax Statements for the 2010 to 2013 calendar years were not filed until January of 2015.

Criteria
The District's policies and procedures should provide for the timely withholding and filing of all payroll taxes and related payroll tax forms and the timely filing of W-2 forms. These procedures should include management oversight and review.

Effect
Failure to remit required amounts to the government in a timely manner resulted in the District incurring penalties in the amount of $8,673.

Recommendation
We recommend that policies and procedures be implemented to provide for management oversight and review of the District's payroll reporting process thereby reducing the risk of fraud or error in this area.

Management's Response
Management will adopt procedures during the fiscal year ending June 30, 2016, to implement the recommendation.

Current Status
Fully implemented

The District's comprehensive Annual Financial Report for Fiscal Years 2014-15 and 2015-16 found two significant deficiencies in the District's internal control of financial reporting, both of which were previously identified in the District's comprehensive financial report for Fiscal Years 2009-10 through 2013-14. The weaknesses found in the District's internal control of their finances for Fiscal Years 2014-15 and 2015-16 were:

❖ **Significant Deficiency**
2016-001: Internal Control – Payroll (Timecards)

Condition
Timecards are not consistently being signed by supervisor. Several timecards could not be located for testing. We found four instances in the fiscal year ending June 30, 2015, where the supervisor did not sign the timecard or timecards could not be located. We found one instance in the fiscal year ending June 30, 2016, where the supervisor did not sign the timecard.

Criteria
Internal control procedures should provide reasonable assurance that wages paid are approved prior to processing the corresponding payroll transactions. Timecards should be maintained for all hourly employees and the timecards should be signed by the employee and supervisor.

Effect
Without strengthening internal controls over payroll disbursements, wages may be improperly paid to District employees.

Recommendation
In order to strengthen internal controls over payroll, we recommend that employees be required to sign timecards and submit to their supervisor for approval.

Management's Response
Management will adopt procedures during the fiscal year ending June 30, 2017, to implement the recommendation.

❖ **Significant Deficiency**
2016-002: Internal Control – Payroll (Personnel Files)

Condition
Personnel files do not include documentation of approved pay rates and benefits.

Criteria
Personnel files should contain documentation of approved pay rates upon employee hire date and any subsequently approved pay adjustments. Personnel files should also include documentation of approved benefit plan changes.

Effect
Without strengthening internal controls over payroll, wages and benefits may be improperly paid to District employees.

Recommendation
In order to strengthen internal controls over payroll, we recommend that personnel files be updated to include documentation of current pay rates and benefits for all employees. Approval of subsequent pay adjustments and benefit plan changes should be maintained in personnel files.

Management's Response
Management will adopt procedures during the fiscal year ending June 30, 2017, to implement the recommendation.

The District's failure to have the financial audits preformed in a timely manner was in non-compliance with State Law (California Health and Safety Code §2079(a) and (b)) and with generally accepted accounting principles. The lack of timely completion of the District's financial audits/reports could have resulted in the loss of District funds through fraud or through accounting errors. The comprehensive financial reports identified several deficiencies that could have resulted in the loss of large sums of the District money over time. Had these deficiencies been identified sooner any possible losses would have been minimized. The District should place extreme importance on ensuring that all future financial audits are prepared for each fiscal year in a timely manner consistent with State Law.

The Financial Report for Fiscal Years 2014-15 and 2015-16 addressed the current status (condition) of the four deficiencies noted in the comprehensive Financial Report for Fiscal Years 2009-10 through 2013-14. Significant Deficiency 2014-01 (Cash Disbursements) and Material Deficiency 2014-04 (Payroll-Reporting) were determined to have been implemented. However, Significant Deficiency 2014-02 (Payroll Timecards) and Significant Deficiency 2014-03 (Payroll-Personnel Files) had not been implemented. To ensure that the District complies with all applicable laws and with generally accepted accounting principles, the District should immediately implement all recommendations contained within the District's future financial reports.

It should be noted that the District's financial reports do not appear to comply with Governmental Accounting Standards Board (GASB) Statement 67 (*Financial Reporting for Pension Plans*) and Statement 68 (*Accounting and Financial Reporting for Pensions*), which requires that financial statements report specific financial information about an agency's pension plan. The District should ensure that all future financial reports/statements comply with the requirements of GASB Statements 67 and 68.

Future Challenges and Issues Related to Finances
As with other mosquito and vector control districts in California, DMAD faces numerous challenges and issues related to finance. One challenge is the amount of revenue the District receives. Revenues for the District primarily are received from property taxes and parcel assessments. The parcel assessment is a steady and reliable source of revenue, while the property tax revenues can be significantly reduced due to lower property values, as was experienced during the economic downturn that started in 2008. The quantity and quality of services the District provides are dictated by the revenue the District receives.

Another factor is the increased cost of complying with new regulations regarding mosquito abatement operations. As these costs increase, the District will have less operating revenue to provide services, which, unless new sources of revenue are found, may result in the District reducing service levels.

Another issue that may affect District finances is climate change, which appears to have resulted in the migration of warmer climate mosquitoes northwards from the equator and which are now established in California. As new mosquitoes and the new diseases they carry enters the United States, California, and Butte County, the District will face ongoing challenges on how to best protect the public's health, which may require a significantly larger number of District personnel, equipment, and pesticides, all at substantial additional cost to the District.

The District is also facing the effects of less effective public health pesticides due to mosquito and vector populations increasing tolerance and/or resistance, which has been dramatically increasing over the past five to ten years. New pesticides will be needed, all at a substantial cost to the District.

MSR DETERMINATION 4-1: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES - REVENUE	
	The primary sources of revenue for the District are property taxes and parcel assessments. Revenue from the parcels assessment is a steady source of revenue while property tax revenue can be significantly reduced due to decreased property values.

MSR DETERMINATION 4-2: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES - REVENUE	
	District revenues only provide sufficient funding for the District to provide basic, but not comprehensive mosquito abatement services to the more populated areas of the District. To provide comprehensive services to the whole of the District, including the large areas of rice fields, the District would need significantly greater revenues.

MSR DETERMINATION 4-3: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES - EXPENDITURES	
	Normal expenditures for the District include salaries, insecticides, pension and health insurance contributions, gas and oil, and the occasional purchases of new vehicles and equipment. The District's expenditures do not appear to be excessive and are necessary to provide services to the more populated areas of the District.

MSR DETERMINATION 4-4: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FUND BALANCE	
	As of the end of Fiscal Year 2015-16*, the District's General Fund had an unappropriated fund balance of $*121,275*, which is available for District operations. The District should endeavor to increase the unappropriated fund balance every fiscal year to ensure that there is adequate funding available for any unforeseen circumstances.*

MSR DETERMINATION 4-5: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FINANCIAL AUDIT	
	The Durham Mosquito Abatement District failed to have financial audits/financial reports prepared for Fiscal Years 2009-10 through 2013-14 in a timely manner. The District did have a comprehensive financial audit/financial report prepared for those fiscal years in July 2015. The lack of these financial audits could have resulted in the loss of District funds through either fraud or accounting errors. *The District's failure to have the financial audits preformed was in non-compliance with State law and with generally accepted accounting principles. The District should ensure that all future financial audits are prepared for each fiscal year in a timely manner consistent with State law and with general accepted accounting principles.*

MSR DETERMINATION 4-6: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FINANCIAL AUDIT	
	The District's comprehensive financial audit/financial report for Fiscal Years 2009-10 through 2013-14 identified one material deficiency and three significant deficiencies in the District's internal control of financial reporting. Additionally, the District's comprehensive financial audit/financial report for Fiscal Years 2014-15 and 2015-16 identified two significant deficiencies. *The identification of these deficiencies in the District's internal control of financial reporting may indicate an indifference to the District's financial accounting practices. The District should ensure that all future financial audits are prepared for each fiscal year in a timely manner consistent with State law and with general accounting and financial practices.*

MSR DETERMINATION 4-7: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FINANCIAL AUDIT	
	The District did not implement the recommendations of two Significant Deficiencies as identified in the comprehensive Financial Report for Fiscal Years 2009-10 through 2013-14. To ensure that the District complies with all applicable laws and with generally accepted accounting principles, the District should immediately implement all recommendations contained within the District's financial reports.

MSR DETERMINATION 4-8: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FINANCIAL AUDIT	
	The District should ensure that all future financial reports/statements comply with the requirements of GASB Statements 67 and 68.

MSR DETERMINATION 4-9: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FUTURE FINANCIAL CHALLENGES	
	The District faces numerous challenges to continue to provide effective and comprehensive mosquito abatement and vector control services to the residents of the District in light of new regulations, new mosquito species, and new mosquito-borne diseases. Due to these issues, there will be a greater need for the services the District provides in the coming years, which will require additional District staffing, equipment, and insecticides, all at substantial additional cost to the District. The District, along with all other mosquito abatement and vector control districts, will need to obtain additional funding to meet these challenges and continue to provide effective and efficient services.

MSR FACTOR NO. 5: STATUS OF, AND OPPORTUNITIES FOR, SHARED FACILITIES.

There are three mosquito abatement districts within Butte County – the Butte County Mosquito and Vector Control District (BCMVCD), the Durham Mosquito Abatement District (DMAD), and the Oroville Mosquito Abatement District (OMAD), each of which has its own governing board, staff, equipment, materials, and facilities. DMAD and OMAD are completely surrounded by the boundaries of the BCMVCD. Given that there are three mosquito abatement districts within Butte County, there could be many opportunities for these districts to share facilities, equipment, personnel, and costs.

All three districts, on a short-term basis, may be able to offer their services (staff, equipment, and expertise) to help control mosquitoes outside of Butte County in the event of a public health emergency, such as if an outbreak of West Nile disease cases occurred. As an example, the BCMVCD may be able to provide aerial spraying services to an area outside of Butte County if another district or county needed urgent assistance to control mosquitoes.

Sharing facilities, equipment, and personnel between the three districts could result in significant cost savings. However, very little in the way of shared facilities occurs between the three districts. The BCMVCD has shared costs with DMAD and OMAD to purchase bulk pesticides, repellents, mosquitofish food, and research. These shared bulk purchases results in lower material and shipping costs and in higher staff efficiencies. BCMVCD offers and attends joint training sessions with the other two districts, and performs spray equipment characterization and calibration for the two other districts.

BCMVCD owns and operates three airplanes for aerial spraying. The use of aerial spraying is a valuable resource for the District and provides an opportunity for shared resources with DMAD, since this district contains approximately 9,000 acres of rice fields and contains the Rancho Esquon wildlife area, which consists of 900+ acres of managed wetland habitat that provide significant mosquito breeding habitat. The Durham Mosquito Abatement District does not have any aircraft, and, on the occasion that aerial spraying is necessary, could contract with BCMVCD for such services.

BCMVCD has offered this service to DMAD at a reduced cost. It should be noted that BCMVD, without charge to DMAD, already performs aerial spraying of the 900-arce Rancho Esquon wetlands area in order to reduce mosquito populations that could and do migrate into the BCMVCD's service area.

The three mosquito abatement districts within Butte County should endeavor to increase shared resources between the districts. Doing so would result in better operational efficiencies and in lower costs for the districts.

MSR DETERMINATION 5-1: STATUS OF, AND OPPORTUNITIES FOR, SHARED FACILITIES	
	There are many opportunities for the sharing of resources (facilities, equipment, training, and staff) between the three mosquito abatement districts within Butte County, but very little sharing of resources occurs. All three districts should engage in immediate and meaningful discussions to increase shared resources between the districts. The failure of the districts to effectively engage in such discussions and achieve meaningful results may cause the Commission or another local agency to initiate a formal consolidation of the three districts.

MSR FACTOR NO. 6: ACCOUNTABILITY FOR COMMUNITY SERVICE NEEDS, INCLUDING GOVERNMENTAL STRUCTURE AND OPERATIONAL EFFICIENCIES.

DMAD BOARD OF TRUSTEES

The Durham Mosquito Abatement District is governed by a 5-member Board of Trustees. The Board of Trustees are appointed pursuant to California Health and Safety Code, Sections 2022 to 2025, with a term of office of two or four years at the discretion of the appointing authority, which is the Butte County Board of Supervisors.

The Board of Trustees is responsible for setting policy and general administrative procedures for the District, establishes and regulates fees, and selection of the District Manager, who serves at the will of the Board. The policies and procedures set by the Board of Trustees are administered by the District Manager.

Regular meetings of the Durham Mosquito Abatement District Board of Trustees are held on the 2nd Wednesday of each month, starting at 7:30 PM. The District office/shop is not conducive to holding meetings, so the District Board of Trustees meetings are held at the Durham Memorial Hall located at 9319 Midway, Durham.

The public notices for the Board of Trustees meeting are posted by the second Monday of every month on the door of the District building. The District should consider also posting the meeting notice at the Durham Memorial Hall, although this is not required if the notice is posted at the District office (California Government Code §56158). The District should also create a website where meeting notices/agendas can be posted.

Durham Mosquito Abatement District board members receive $50 per meeting for their service. Income taxes are withheld from this payment.

DMAD STAFFING

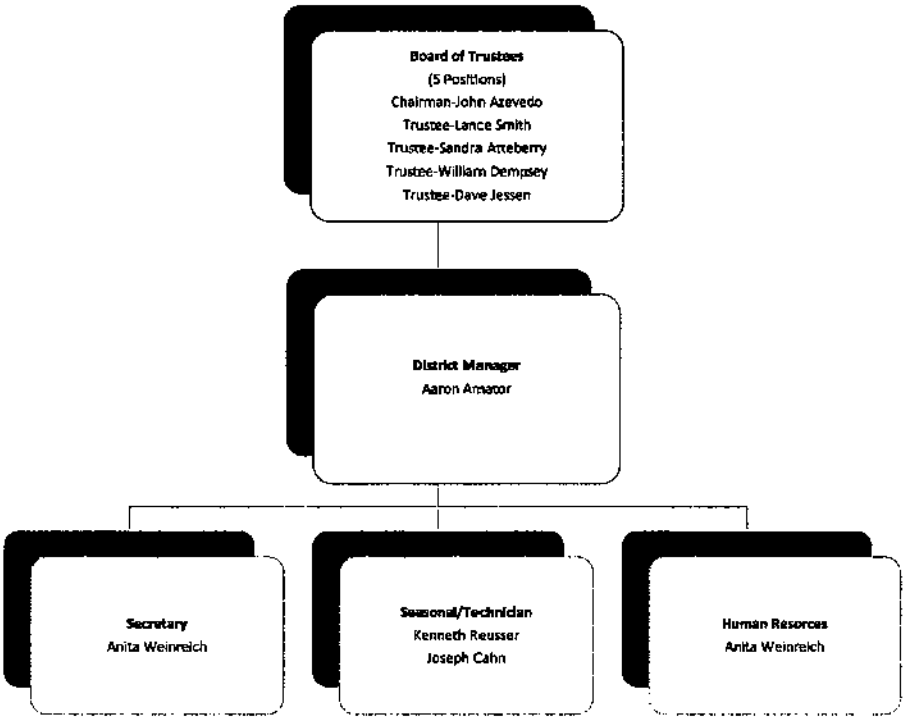
While public sector management standards vary depending on the size and scope of the organization, there are minimum standards. Well-managed organizations evaluate employees annually, track employee and agency productivity, periodically review agency performance, prepare a budget before the beginning of the fiscal year, conduct periodic financial audits to safeguard the public trust, maintain relatively current financial records, conduct advanced planning for future service needs, and plan and budget for capital needs.

DMAD is managed by the District Manager, who is appointed by the DMAD Board of Trustees and serves at the will of the Board. The current District Manager has been with the District for over 18 years.

The District has one full-time employee – the District Manager, one part-time administrative assistant/bookkeeper/secretary, and two seasonal employees during the mosquito season (usually May through October).

Durham Mosquito Abatement District

Organization



The District Manager is licensed by the California Department of Public Health to provide mosquito abatement services. The two seasonal employees are not certified or licensed and perform mosquito abatement duties under the license of the District

Manager. The District Manager's license requires continuing educational training and recertification every two years.

The management structure of DMAD is very simple and reasonable for the type of operations undertaken by the District. No alternative structures or reorganizations of staff would result in more efficient daily operations, and the existing structure is considered appropriate. It should be noted however, that if the District Manager has an extended absence for any reason such as an illness or extended vacation, the District would be effectively without leadership and services would be drastically impacted. The District Board should address this concern and adopt a contingency plan for an extended absence that may involve contractual services provided by the BCMVCD.

Only one employee of the District – the District Manager – is eligible to participate in the District's Miscellaneous Employee Pension Plan, cost-sharing multiple employer defined benefit pension plans administered by the California Public Employees' Retirement system (CalPERS).

DISTRICT TRANSPARENCY

Governmental transparency promotes accountability and provides information for citizens about what their government is doing. A public agency's transparency is necessary to provide the residents of the agency a thorough knowledge of the services the agency provides, how it operates, how and by who the agency is governed, and the financial status of the agency. Information on an agency should be easily accessible.

The District's transparency is very limited, which makes it difficult for the residents of the District to obtain information on the District. As required by State law, the District does provide notice of upcoming Board of Trustee meetings by posting a notice at the District office. DMAD also provides one notice, published in a newspaper before the start of the mosquito season, that the District will be conducting fogging operations within the District at undetermined times. Board of Trustee meeting minutes, and other information, can be obtained through the District Manager. All of these measures do require residents to make an effort to either attend District Board meetings or visit the District office.

To provide for greater transparency, many special districts within California have websites that allow for easy access to district services, information and documents. Approximately 50 percent of the special districts within California have a website and the primary reasons that districts do not have a website include money, personnel, legal requirements, and no penalties for not having a website.

DMAD does not have a website, but having one would provide an avenue for the residents of the District to easily obtain important information about the District, significantly increasing the District's transparency. The District should create and maintain a website that provides, at a minimum, the following information:

- District contact information, including the names of the District Manager and Board of Trustees.
- Board of Trustee meeting notices.
- Board of Trustee agendas and staff reports/memorandums
- Adopted annual budget
- Financial audits/reports
- Map of the District
- A notice for each individual fogging operation
- District by laws
- List of enterprise systems (SB 272)
- Financial Transaction Reports
- Compensation Reports
- ADA compliance

Due to cost and time considerations, the District may object to creating and maintaining a website. However, the benefits of having a website far outweigh the cost or the time it takes to maintain a website. There are numerous website designers that can create and host custom websites at a nominal monthly cost. One such website designer - Streamline™ Web – creates and hosts websites that are designed specifically for local government at a very affordable cost in the range of $1,500.[13] The District Manager has recently indicated that the District is in the process of creating a website.

LAFCo staff visited DMAD's office and observed that at least one truck did not have the District's emblem or name on the truck doors. All District vehicles should be clearly identified as belonging to the District so that the public can readily identify District vehicles and staff.

OPERATIONAL EFFICIENCIES

The District utilizes a variety of cost avoidance and facilities sharing measures in its operations. The District is a member of the Vector Control Joint Powers Agency (VCJPA). The VCJPA is a public entity formed by a joint powers agreement in accordance with the California Government Code. The purpose of this JPA is to provide insurance coverage to the District's real and personal property and liability coverage.

The District is a member of the Mosquito and Vector Control Association of California. This organization is comprised of 62 public agencies and provides its members with a number of valuable services, including cost avoidance opportunities relating to training services and publication materials. Other notable services offered by this organization include serving as a legislative advocate for statewide vector control and abatement issues and facilitating the exchange of service information between member agencies.

[13] http://www.getstreamline.com/web/

FUTURE CHALLENGES AND ISSUES TO OPERATIONAL EFFICIENCIES

As with other mosquito and vector control districts in California, DMAD faces numerous challenges and issues related to providing effective and efficient mosquito abatement service. As was discussed in more detail in MSR Factor No. 4 (Financial Ability of Agencies to Provide Services), these challenges and issues include:

- Reduction in revenues, which will result in reduced levels of service.
- The additionally cost of complying with new regulations regarding mosquito abatement operations.
- Climate change, which appears to have resulted in the migration of warmer climate mosquitoes northwards, bringing in new diseases.
- Less effective public health pesticides due to mosquito and vector populations increasing tolerance and/or resistance. New pesticides will be needed, all at a substantial cost to the District.

GOVERNMENTAL STRUCTURE - REORGANIZATION

There are three mosquito abatement districts within Butte County; one very large, well-funded district (BCMVCD) that surrounds the other two much smaller districts (OMAD and DMAD). This MSR/SOI plan is an opportunity to carefully evaluate and compare each district and consider any governance restructuring scenarios that may result in improved efficiencies and public health outcomes. Scenarios include,

1. The smaller districts (OMAD, DMAD) remain intact but contract all services through the BCMVCD, thus acting as a funding mechanism;
2. The three districts could be consolidated into one county-wide mosquito abatement district; or
3. Another approach that would result in just one county-wide abatement district would be the dissolution of the two smaller districts – DMAD and OMAD - and the annexation of those district's territory to the BCMVCD. It should be noted that BCMVCD's existing sphere of influence already encompasses the boundaries of DMAD and OMAD.

Potential positive impacts of a consolidation of the three districts may include a uniform county-wide mosquito abatement and vector control program, reduced administrative and operating costs, improved reserves, and greater public visibility, which could create an improved image of program accountability. A consolidation of the three districts would result in improved overall mosquito abatement and vector control services to the residents of the two smaller districts (DMAD and OMAD), who would have access to greater resources and more programs.

A consolidation may also have negative impacts such as increased operational complexities, particularly in light of the difference in services and philosophy between each agency. The opportunity to consolidate the district may be affected by limited funding, inability to expand into new areas based on existing funding levels, and/or political issues, especially regarding the loss of local control. Additionally, a consolidation of the three districts would require majority approval by the registered voters of all three districts, but such approval is not assured. Such governance reorganizations are not always readily accepted among affected constituents who

may feel current services are adequate and who have a type of brand loyalty to their current local agency and board of directors and perhaps more importantly, local agency personnel. Additionally, the costs to prepare a consolidation study and to hold an election could be cost prohibitive and funding would need to be secured before going forward with the consolidation process. The BCMVCD Manager has indicated that BCMVCD could provide mosquito and vector control services to these areas, and which could be accomplished without the need for the current employees, assets, and facilities of both the OMAD and DMAD. With the resources, assets, and staff that BCMVCD has to offer, the BCMVCD District Manager strongly believes that the protection of the public's health would increase within these two districts dramatically.

The 2004 Municipal Service Review adopted by the Commission determined that *"…reorganizing the three districts into one county-wide district would provide numerous advantages and with little to no disadvantages. There may be a slight limit of 'personalized' service in the Durham and Oroville areas, but that disadvantage is greatly outweighed by the advantages of a county-wide district with a large number of employees, regularly scheduled office hours, education and training programs, and aerial capability*."

Subsequent to adoption of the 2004 MSR, the Commission adopted Resolution No. 17 2004/05 that gave the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District a "Zero" Sphere of Influence. Pursuant to Butte LAFCo Policy 3.1.11, the Zero SOI designation indicates that one or more of the public service functions of the agency are either non-existent, inadequate, no longer needed, or should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved and that the Commission may initiate dissolution of an agency when it deems such appropriate. Resolution 17 2004/05 gave the Butte County Mosquito and Vector Control District an expanded sphere of influence, which took in the SOI of Durham Mosquito Abatement District and the Oroville Mosquito Abatement District. BCMVCD's SOI now encompasses all of Butte County and the Hamilton City area of Glenn County.

Numerous Butte County Grand Jury reports, including the most recent Grand Jury report, have included a review of one or more of the three mosquito abatement districts in the county. The following was extracted from the various Grand Jury reports regarding consolidation of the mosquito abatement districts in Butte County.

- **1971 Grand Jury Report** - *"…it is believed to be in the best interest of the entire County to eventually have all mosquito abatement controlled from one central plant, the Butte County Mosquito Abatement District*."
- **1972 Grand Jury Report** - "*The Grand Jury recommends consolidation of mosquito abatement districts into one Butte County Mosquito Abatement District.*"
- **1973-74 Grand Jury Report** - "*Previous grand juries have recommended consolidation of the three Mosquito Abatement Districts within Butte County.*

Research in the past years as to cost, efficiency, and tax rates show that consolidation is favorable and this Grand Jury concurs."

- **1979-80 Grand Jury Report** - "*Observation. Until such time as the Oroville and Durham Mosquito Abatement Districts, either through their respective Boards of Directors or the people within their service areas actively seek inclusion in the larger Butte County Mosquito Abatement District, no further consideration should be given the matter. The question of merger is basically a local government decision.*"
- **1980-81 Grand Jury Report** - "*Finding: Prior Grand Juries have recommended a merger of the Oroville Mosquito Abatement District with the Butte County Mosquito Abatement District. Recommendation: The committee found the Oroville Mosquito Abatement District very professionally managed with a professional dedicated employee. Cost containment was evident in all areas therefore no need or practical benefit can be seen for a merger at this time.*"

- **2007-08 Grand Jury Report** - "*This Grand Jury has chosen not to make a recommendation on whether the three districts should consolidate, but to try and make the voters aware of all options. In the event of future ballot measures for additional special parcel tax assessments, voters should be aware of the consolidation alternative.*"

- **2009-10 Grand Jury Report** – "*OMAD should continue to function as an independent mosquito abatement district and should not be consolidated with another mosquito abatement district.*"

- **2016-17 Grand Jury Report** – "*Recommendation R1. The Grand Jury recommends that pending the results of the 2017 MSR, LAFCo initiate the process of consolidating OMAD and DMAD under BCMVCD.*"

The 2016-17 Grand Jury report also stated:

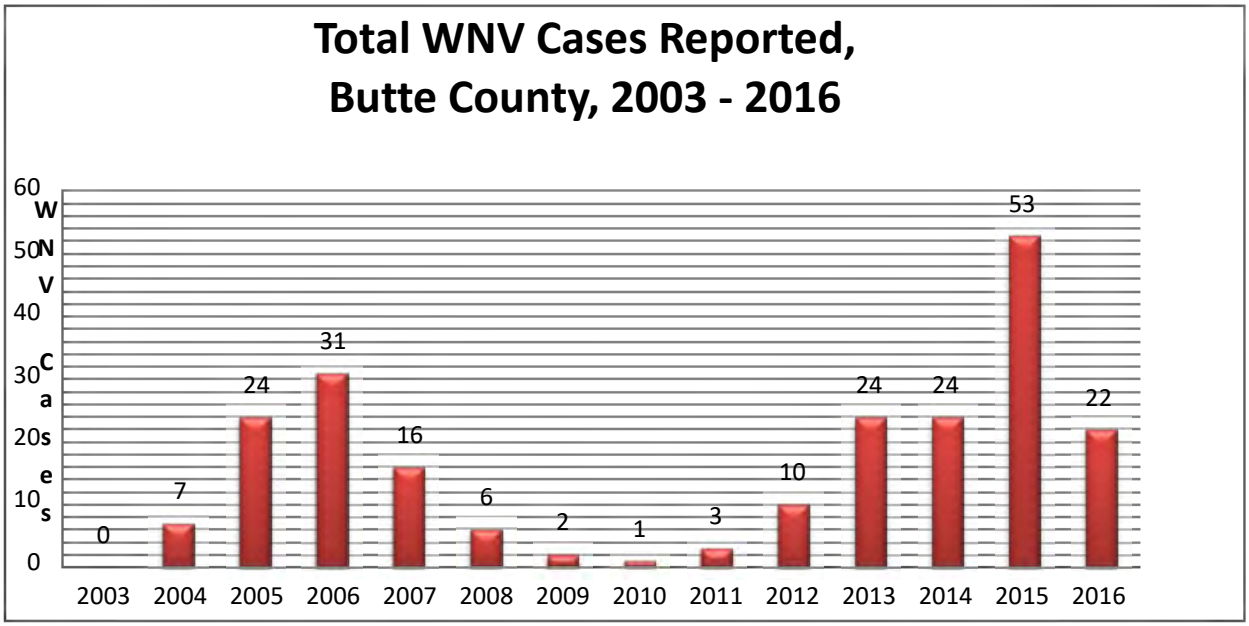
"Having three districts performing the same function in the same county brings redundancies. Each district has a board, is required to be compliant with all applicable labor and pesticide regulations, requires an annual audit, regular board meetings, budgets and bookkeepers. This encumbers each of the districts with a minimum level of costs, and the budgets of OMAD and DMAD are such that after covering the costs of these operational requirements, there is little funding left for actual control. Effectiveness would be greatly improved by consolidating the three districts under one set of policies and one management team.

In the past, when Grand Juries have recommended consolidation, or LAFCo released their MSR in 2004 recommending the districts be consolidated, no consolidation action was taken. The Grand Jury believes this is because there was no leadership to put the recommended changes into effect. The groups that benefit most from a consolidation are the residents within the OMAD and DMAD districts, however, they may not be aware of the potential improvements and thus not motivated to petition for policy change. Under California state

LAFCo policies, a petition for consolidation may be initiated by LAFCo itself. The Grand Jury recommends Butte LAFCo take this course of action pending the results of the 2017 MSR."

A reorganization of the three mosquito abatement districts into one county-wide district should be closely examined by LAFCo to determine if a reorganization would actually result in improved, more efficient, and more cost-effective comprehensive mosquito abatement and vector control services to the Durham and Oroville areas, and would result in improved public health benefits to the residents of the county as a whole. Mosquito abatement services in the Durham and Oroville areas consist primarily of the control of adult mosquitoes through fogging operations. The services provided by the Butte County Mosquito and Vector Control District are significantly more comprehensive, more effective at all aspects and stages of vector control, and more efficient than the services provided by the Durham and Oroville Mosquito Abatement Districts.

The public health benefits of having only one county-wide mosquito abatement district cannot be understated as supported by comments received from the Butte County Public Health Department (DPH), Community Health and Sciences Office, in their comment letter of May 31, 2017 (Attachment A to this MSR). The DPH is very concerned about the ongoing presence of West Nile Virus cases in the County and in their letter, DPH notes that Butte County consistently ranks among the state's counties with the highest West Nile virus case rates (number of cases by population). As shown on the following chart, the number of West Nile virus cases has fluctuated significantly over the years, but Butte County has seen a larger number of cases in the last four years. As of June 26, 2017, Butte County has had no reported human cases of West Nile virus.[14]



[14] California West Nile Virus Website - http://westnile.ca.gov/

The DPH believes that a close working relationship with local vector control agencies is critical to their efforts to detect, monitor and prevent WNV disease, further stating that "*Having one agency to work with would likely improve efficiencies and provide a more consistent approach*" to addressing the WNV concerns.

While reorganization options are being analyzed, the DMAD Board of Trustees could contract with the Butte County Mosquito and Vector Control District to provide mosquito abatement services within DMAD's jurisdictional boundaries. In this scenario, DMAD would transfer most of the revenues it receives to BCMVCD, which in turn would use those funds to provide mosquito abatement and vector control services to the DMAD service area. BCMVCD may be reluctant to agree to this plan and this scenario may result in the elimination of DMAD's District Manager position since there may be no duties for this person to perform. In this scenario, DMAD would continue to exist and the DMAD Board of Trustees would occasionally meet to handle administrative affairs, such as approving the District's annual budget.

MSR DETERMINATION 6-1: GOVERNMENTAL STRUCTURE	
	DMAD is governed by a five-member Board of Trustees appointed by the Butte County Board of Supervisors. DMAD holds meetings that are open and accessible to the public. DMAD maintains accountability and compliance in its governance, and public meetings appear to be held in compliance with Brown Act requirements.

MSR DETERMINATION 6-2: GOVERNMENTAL STRUCTURE	
	The District has a single full-time employee – the District Manager - who is responsible to manage all District functions. If the District Manager has an extended absence for any reason such as an illness or vacation, the District would be effectively without leadership, and services would be drastically impacted. The District Board should address this concern and adopt a contingency plan for an extended absence that may involve contractual services provided by the BCMVCD.

MSR DETERMINATION 6-3: TRANSPARENCY - WEBSITE	
	The Durham Mosquito Abatement District does not have a website, but is also not required to have one by law. Regardless, a website would allow the District to post District contact information, public meeting notices, Board of Trustee meeting minutes, financial documents (budgets, audits), and fogging notices and maps, greatly increasing the District's transparency. The District should create and maintain a comprehensive website.

MSR DETERMINATION 6-4: TRANSPARENCY – MEETING NOTICES	
	In addition to posting the Board of Trustee meeting notices at the District's office/shop, the District should consider posting meeting notices at the Durham Memorial Hall, where the District's Board of Trustees meets.

MSR DETERMINATION 6-5: TRANSPARENCY – FOGGING NOTICES	
	The Durham Mosquito Abatement District does not provide notification to the public of each insecticide fogging operation and instead, as allowed by State law, publishes a notice of fogging operations prior to the beginning of the mosquito season. For the benefit of the residents within the District, the District should consider providing email, text and website notification of each fogging application.

MSR DETERMINATION 6-6: TRANSPARENCY – IDENTIFICATION OF DISTRICT VEHICLES	
	The Durham Mosquito Abatement District should ensure that all District-owned/operated vehicles are clearly identified as belonging to the District so that the public can readily identify District vehicles and staff.

MSR DETERMINATION 6-7: OPERATIONAL EFFICIENCIES	
	The Durham Mosquito Abatement District operates with a full-time staff of one – the District Manager – a part time bookkeeper/clerk, and two seasonal employees. The overall management structure of DMAD is sufficient to perform basic mosquito abatement services to the more populated areas of the District.

MSR DETERMINATION 6-8: FUTURE CHALLENGES TO OPERATIONAL EFFICIENCIES	
	The District faces numerous challenges to continue to provide effective mosquito abatement services to the residents of the District. Loss of revenue, new regulations, climate change, and resistance to existing pesticides are some of the more significant challenges the District faces, which will have a significant effect on the level of services the District currently provides. Due to these issues, there will be a greater need for the services the District provides in the coming years, which may require additional District staffing, equipment, and insecticides, all at substantial additional cost to the District. In all likelihood, the District will need to obtain additional sources of revenue in order to continue to provide effective mosquito abatement services to the residents of the District.

MSR DETERMINATION 6-9: REORGANIZATION	
	The 2004 Municipal Service Review for Mosquito Abatement Districts in Butte County, numerous Butte County Grand Jury reports, including the most recent Grand Jury report (Fiscal Year 2016-17) released on May 19, 2017, and the May 30, 2017, letter from the Butte County Public Health Department all suggest or acknowledge the value reorganizing the three mosquito abatement districts into one county-wide district would provide numerous advantages and with little to no disadvantages.

MSR DETERMINATION 6-10: REORGANIZATION	
	Commission Resolution No. 17 2004/05 gave the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District "Zero" Sphere of Influences. At the same time, the Commission expanded the Sphere of Influence for the Butte County Mosquito and Vector Control District to encompass the boundaries of the Durham and Oroville Mosquito Abatement Districts. The Zero SOI designation indicates that one or more of the public service functions of the agency are either non-existent, inadequate, no longer needed, or should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved and that the Commission may initiate dissolution of an agency when it deems such appropriate.

MSR DETERMINATION 6-11: REORGANIZATION	
	Potential positive impacts of a reorganization of the three mosquito abatement districts may include a uniform county-wide mosquito abatement and vector control program, reduced administrative and operating costs, improved reserves, greater public visibility, and improved public health benefits.

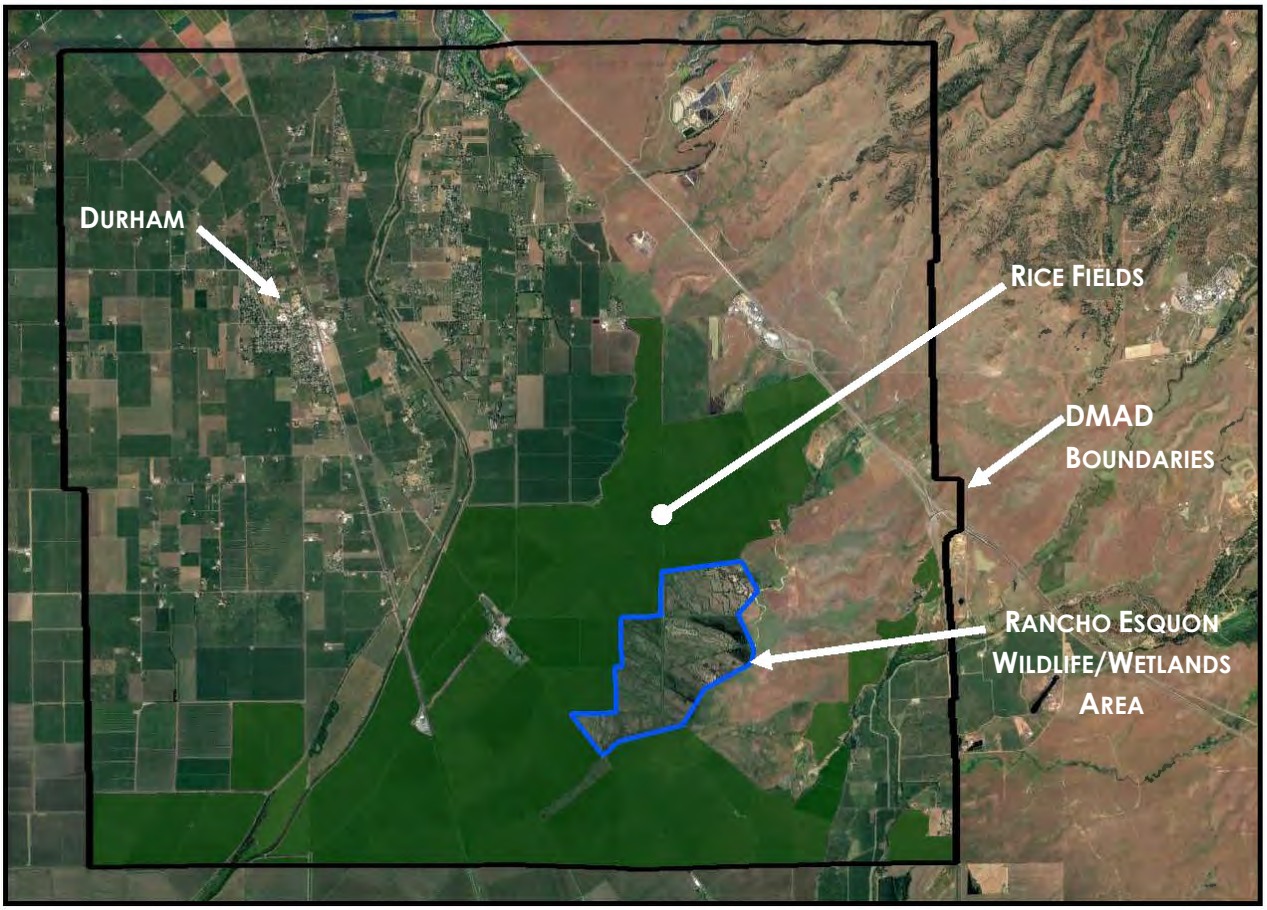
MSR FACTOR NO. 7: ANY OTHER MATTER RELATED TO EFFECTIVE OR EFFICIENT SERVICE DELIVERY, AS REQUIRED BY COMMISSION POLICY.

POTENTIAL BOUNDARY CHANGES

The Rancho Esquon wildlife area, which consists of 900+ acres of managed wetland habitat, is within the jurisdictional boundaries of the Durham Mosquito Abatement District. The map on the next page shows the location of the wildlife area. According to the District Manager of the Butte County Mosquito and Vector Control District (BCMVCD), the Rancho Esquon wildlife area has extraordinary high populations of mosquitoes that migrate to areas within the service area of BCMVCD. BCMVCD mosquito surveillance data showed that the mosquito populations originating from the wildlife area would migrate north into the south Chico area, affecting the residents of BCMVCD. Also in this area are numerous rice fields, which are significant breeding

habitat for mosquitoes. DMAD does not have the necessary revenue, equipment, and staff needed to provide effective mosquito abatement services to the wildlife area and to the numerous nearby rice fields.

The Butte County Mosquito and Vector Control District provides mosquito abatement services to the wetlands area, believing that it is in the best interest of the people residing within BCMVCD to reduce the numbers of mosquitoes originating from the wildlife area. BCMVCD has a cooperative memorandum of understanding with the owner of the Rancho Esquon Ranch, where the wildlife area is located. Rancho Esquon reimburses BCMVCD for the larviciding control costs and no BCMVCD tax dollars are expended within the DMAD service area. The Durham Mosquito Abatement District does not provide any funding to BCMVCD for providing mosquito abatement services to the Rancho Esquon wetlands area. It should be noted that BCMVCD does not provide mosquito abatement services to any of the rice fields located near the wetlands area. The following map shows the location of the Rancho Esquon wildlife area and the rice fields within DMAD's boundaries.



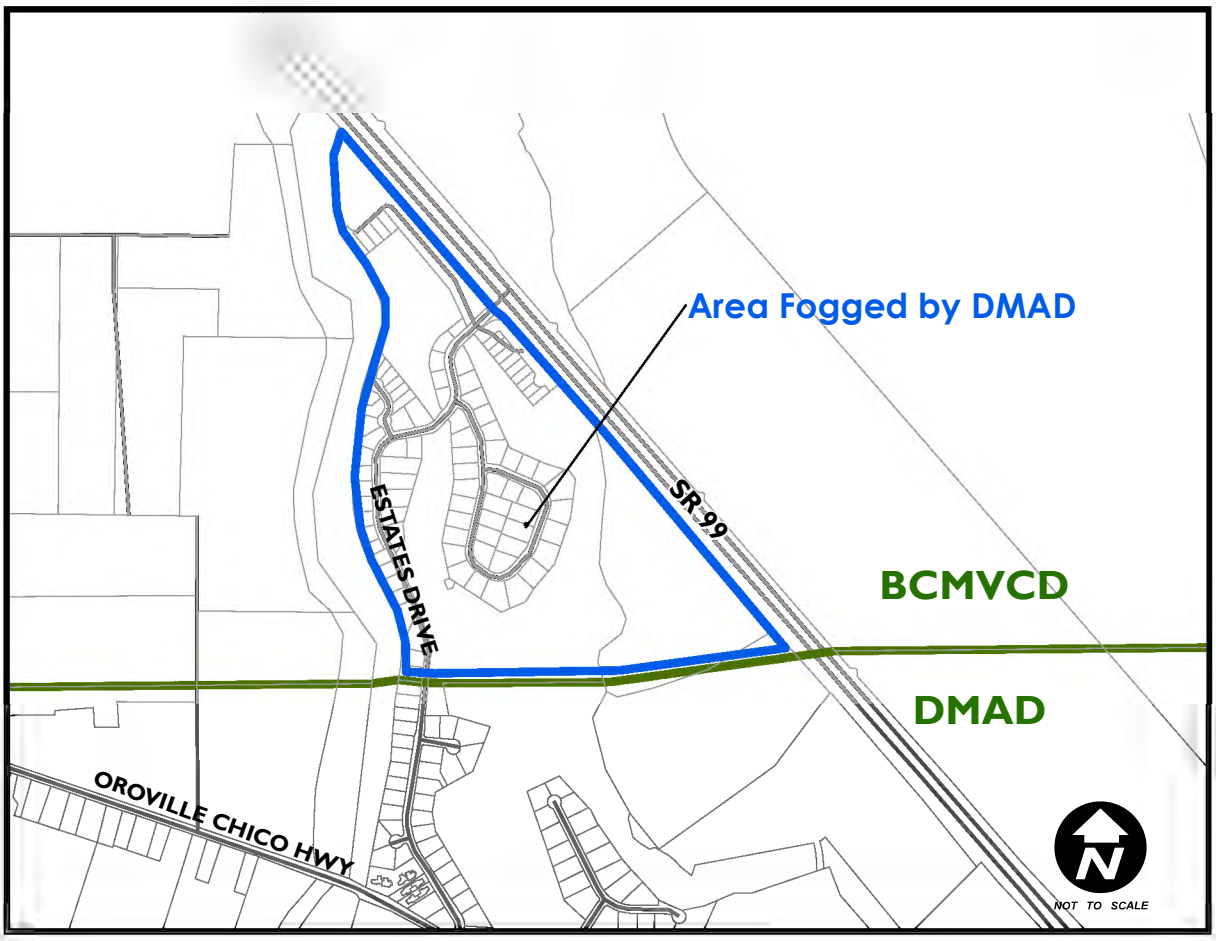
RANCHO ESQUON WETLANDS WITHIN DMAD BEING TREATED BY BCMVCD

Similarity, the DMAD provides mosquito abatement services within a small portion of BCMVCD's service area in the Butte Creek Estates Subdivision on Estates Drive, south of

Chico. The Butte Creek Estates Subdivision is bisected by the two districts, with roughly the south half of the subdivision, which consists of approximately 60 residential parcels, within DMAD and the north half of the subdivision, which consists of approximately 90 residential parcels, within BCMVCD.

This situation began with DMAD fogging the BCMVCD portion of the subdivision without notifying BCMVCD. DMAD started fogging all of Estates Drive because residents were complaining when the DMAD fogging operation would stop half way down this roadway. This situation could have resulted in excessive and fogging operations (some pesticide labels do not allow treatment more than once in a 24-hour, 48-hour, 72-hour, etc. period) or spraying properties that had requested "No Sprays" through BCMVCD.

To ensure compliance with pesticide label requirements and with the National Pollutant Discharge Elimination System (NPDES) regulations, BCMVCD managers informally agreed to not prevent DMAD from fogging the Estates Drive area without charge to BCMVCD. BCMVCD still continues to provide residents with other mosquito and vector control services, such as larval inspections, larvicides applications storm drain treatment, mosquitofish delivery and planting, virus surveillance, adult mosquito surveillance, and residual treatments. The BCMVCD would like DMAD to stop all fogging operations within BCMVCD's portion of the Butte Creek Estates Subdivision.



AREA WITHIN BCMVCD BEING FOGGED BY DMAD

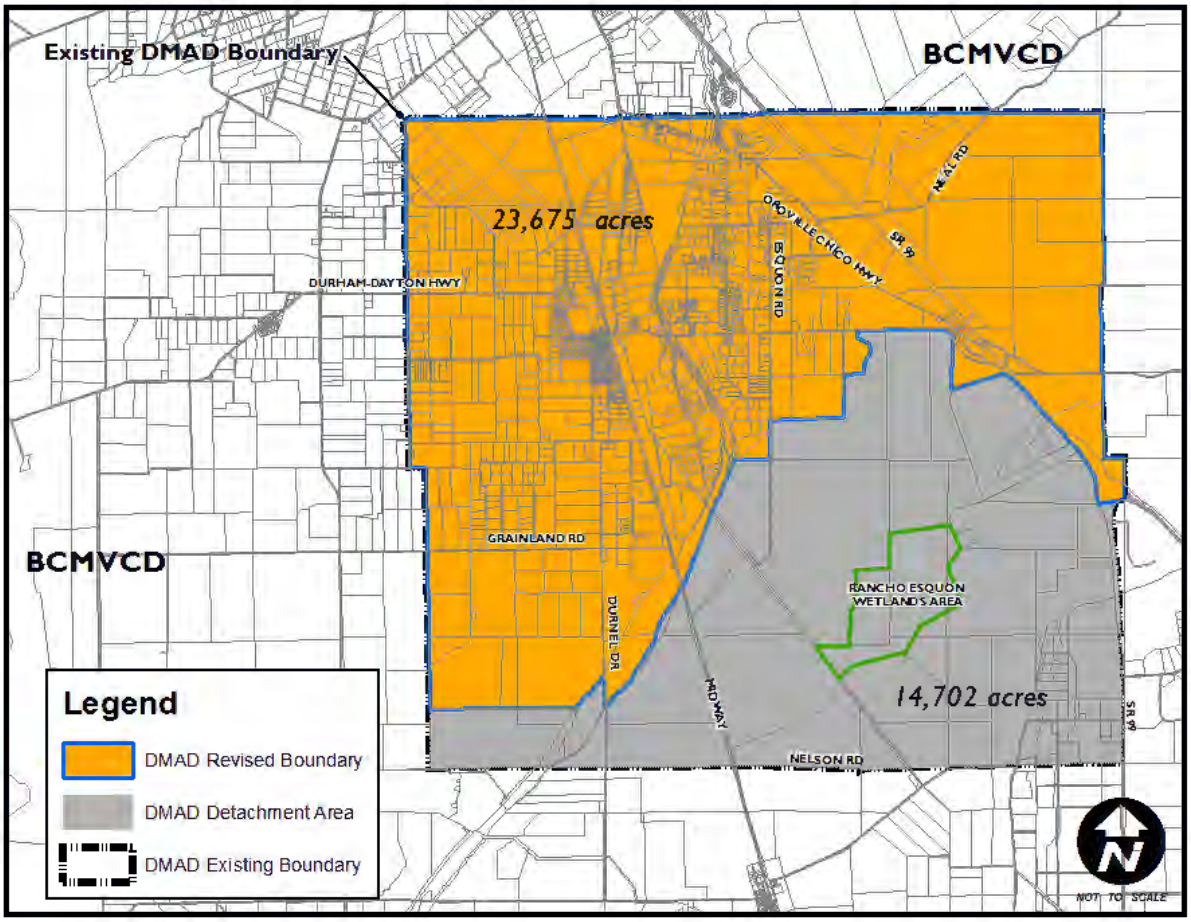
The BCMVCD and DMAD should consider changes to their jurisdictional boundaries so that all of the Butte Creek Estates is served by a single agency. It should be noted that DMAD has a "Zero" Sphere of Influence and that BCMVCD's Sphere of Influence encompasses the jurisdictional boundaries of DMAD. Annexation of the subject area to DMAD may require that DMAD be given a traditional "Growth" sphere of influence boundary or that the Commission make specific findings with regards to the Zero SOI boundary to allow the subject area to be annexed to DMAD. This scenario would solve a localized boundary concern, but is not consistent with the overall analysis that suggests BCMVCD provides comprehensive services that are superior to the smaller districts. The BCMVCD Board of Trustees does not agree with detaching their portion of the Butte Creek Estates Subdivision and annexing that area to DMAD. Annexing the DMAD portion of the Butte Creek Estates Subdivision to BCMVCD is feasible and would provide the residents of that area with comprehensive mosquito abatement services. However, annexing the DMAD portion of Butte Creek Estates Subdivision to BCMVCD would result in DMAD losing approximately $8,720 in tax revenue.

Discussions have taken place between BCMVCD, DMAD, and LAFCo regarding the detachment of the rice fields from DMAD and the subsequent annexation of that area

to BCMVCD. Both districts are in general agreement with detaching the rice fields from DMAD and annexing that area to BCMVCD. The BCMVCD Board of Trustees recently gave approval to the district manager to file an annexation application for the rice fields and authorized the district manager to participate in any future community meetings regarding annexation of the rice fields.

The rice field detachment/annexation area would be approximately 14,702 acres in size, consisting of approximately 87 parcels. The Rancho Esquon wetlands area, which is already being treated by BCMVCD, is within the detachment/annexation area. With the detachment, DMAD's service area would decrease from its current size of approximately 38,372 acres to approximately 23,675 acres (a 39% reduction). Annexing the rice field area to BCMVCD would result in DMAD losing approximately $14,900 in tax revenue. BCMVCD has stated that providing effective mosquito abatement services to the rice field area will cost the District approximately $350,000 or more annually.

The following map shows the potential rice field detachment/annexation area.



MSR DETERMINATION 7-1: BOUNDARY CHANGES - RANCHERO ESQUON WILDLIFE/WETLANDS AREA	
	BCMVCD currently provides mosquito abatement services to the Ranchero Esquon wildlife/wetlands area, which is within the boundaries of the Durham Mosquito Abatement District. The wildlife/wetlands area should be detached from DMAD and annexed to BCMVCD.

MSR DETERMINATION 7-2: BOUNDARY CHANGES – RICE FIELDS	
	Due to a lack of adequate funding, DMAD does not provide comprehensive mosquito abatement services to the numerous rice fields within their jurisdictional boundaries and in all likelihood will never have the ability to provide services to the rice fields. The rice fields should be detached from DMAD and annexed to BCMVCD, which has the funding, staffing, and equipment needed to service the rice fields.

MSR DETERMINATION 7-3: DUAL SERVICE PROVISIONS WITHIN THE BUTTE CREEK ESTATES SUBDIVISION	
	The Durham Mosquito Abatement District currently fogs for adult mosquitoes in a portion of the Butte Creek Estates Subdivision that is within the boundaries of the Butte County Mosquito and Vector Control District. DMAD should stop all fogging operations within the BCMVCD portion of the Butte Creek Estates Subdivision as this area is outside of DMAD's boundaries and because BCMVCD provides other mosquito abatement services to this area and clearly has the ability to provide fogging services. *DMAD and BCMVCD should work together to resolve the issue of the dual service provisions within the Butte Creek Estates Subdivision. If a mutually agreeable solution cannot be negotiated, BCMVCD should explore the annexation of the south portion of BCES to promote consistency in services throughout the residential subdivision.*

SPHERE OF INFLUENCE PLAN REVIEW FACTORS FOR THE DURHAM MOSQUITO ABATEMENT DISTRICT

There are numerous factors to consider in reviewing an SOI Plan, including current and anticipated land uses, facilities, and services, as well as any relevant communities of interest. Updates generally involve a comprehensive review of the entire SOI Plan, including boundary and SOI maps and the District's MSR. In reviewing an agency's sphere, the Commission is required to consider and prepare written statements addressing five factors enumerated under California Government Code Section 56425(e), as listed below.

1. The present and planned land uses in the area, including agricultural and open space lands;
2. The present and probable need for public facilities and services in the area;
3. The present capacity of public facilities and adequacy of public services which the agency provides, or is authorized to provide; and
4. The existence of any social or economic communities of interest in the area if the commission determines that they are relevant to the agency.
5. For an update of a SOI of a city or special district that provides public facilities or services related to sewers, municipal and industrial water, or structural fire protection, the present and probable need for those public facilities and services of any disadvantaged unincorporated communities within the existing sphere of influence.

As was noted previously, in 2005, the Commission adopted Resolution No. 17 2004/05 that gave the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District a Zero Sphere of Influence. Pursuant to Butte LAFCo Policy 3.1.11, the Zero SOI designation indicates that one or more of the public service functions of the agency are either non-existent, inadequate, no longer needed, or should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved and that the Commission may initiate dissolution of an agency when it deems such appropriate. Resolution 17 2004/05 gave the Butte County Mosquito and Vector Control District an expanded sphere of influence, which took in the SOI of Durham Mosquito Abatement District and the Oroville Mosquito Abatement District and BCMVCD's SOI now encompasses all of Butte County.

SOI FACTOR NO. 1: THE PRESENT AND PLANNED LAND USES IN THE AREA, INCLUDING AGRICULTURAL AND OPEN-SPACE LANDS.

DMAD's jurisdictional boundaries consist of the unincorporated community of Durham and the surrounding area. Land uses within the community of Durham include single-family residential uses, commercial uses, industrial uses, and public uses. Outside of the immediate Durham area, the predominant land use is agricultural, consisting of rice fields, orchards, row crops, irrigated pastures, and seasonal livestock grazing. A portion of the Butte Creek Estates Subdivision on Estates Drive is located within the District and consists of approximately 60 residential units and a golf course. Also found within the

District is a 70-acre industrial subdivision located at the intersection of SR 99 and Durham Dayton Highway.

Approximately 1,195 acres within the District consist of urban uses on smaller parcels, most of which are located within the community of Durham. Agricultural is the largest land use within the District, consisting of approximately 34,500 acres. Orchard crops (12,200 acres) are the largest agricultural use, followed by rice (9,000 acres), and grazing (6,650 acres). The District's mosquito abatement services do not have an impact on any development related to agricultural uses, however, agricultural lands are often irrigated and become a mosquito breeding source that impacts adjacent residential and commercial uses.

There is very little potential for significant new development within the boundaries of the District. A large portion of the community of Durham is zoned for medium and medium-high density residential uses. However, the lack of a public sanitary sewer system in the Durham area precludes the creation of small parcels or the construction of additional dwellings on existing developed parcels. The area of the District outside of the community of Durham is mostly zoned for agricultural uses on parcels with a minimum parcel size of 20 to 40 acres. One potential development within the District is located on a 40-acre parcel located on the east side of Durham, which is proposed to be developed with 40 1-acre single-family residential parcels.

SOI DETERMINATION 1-1: PRESENT AND PLANNED LAND USES	
	Land uses with the boundaries of the Durham Mosquito Abatement District include residential, commercial, industrial, public, and agricultural uses. Future growth within the boundaries of the District is expected to occur primarily within the unincorporated community of Durham. The provision of mosquito abatement services has no significant impact on existing or future land uses within the District, including agricultural uses.

SOI FACTOR NO. 2: THE PRESENT AND PROBABLE NEED FOR PUBLIC FACILITIES AND SERVICES IN THE AREA.

The Durham Mosquito Abatement District provides vital and necessary mosquito abatement services to the greater Durham area. The District's services are aimed primarily at preventing large numbers of adult mosquitoes from reaching the more populated areas of the District, such as the unincorporated urban community of Durham (population 1,450), the Lott Road area (population 800), and the Butte Creek Estates Subdivision (population 320). The abatement services the District currently provides results in reduced adult mosquito populations in the populated areas of the District. The mosquito abatement services the District provides to these areas does reduce the potential for mosquito-borne diseases affecting area residents.

Due to a lack of revenue, the District is unable to provide mosquito abatement services to the areas of the District that contain rice fields and wetlands, both of which are significant breeding habitat for mosquitoes. The District's inability to effective treat

these areas allows large populations of adult mosquitoes to migrate to the population areas of the District and to areas outside of the District's boundaries.

SOI DETERMINATION 2-1: THE PRESENT AND PROBABLE NEED FOR PUBLIC FACILITIES AND SERVICES IN THE AREA	
	DMAD provides vital and necessary mosquito abatement services to the more populated areas of the District, such as the unincorporated community of Durham. The District's services are crucial to the prevention of significant mosquito populations and the prevention of mosquito-borne diseases.

SOI DETERMINATION 2-2: THE PRESENT AND PROBABLE NEED FOR PUBLIC FACILITIES AND SERVICES IN THE AREA	
	DMAD does not have the ability to provide mosquito abatement services to the large number of rice field located within the District. The lack of mosquito abatement services to the rice fields results in extremely large mosquito populations, which represents a significant public health threat to people within, and outside, of the District boundaries.

SOI FACTOR NO. 3: THE PRESENT CAPACITY OF PUBLIC FACILITIES AND ADEQUACY OF PUBLIC SERVICES THAT THE AGENCY PROVIDES OR IS AUTHORIZED TO PROVIDE.

As presented in MSR Factor No. 3 (Present and planned capacity of public facilities, adequacy of public services, and infrastructure needs or deficiencies) the Durham Mosquito Abatement District has adequate facilities, equipment, staff, and funding to provide effective mosquito abatement services to the more population areas of the district, such as the unincorporated community of Durham. DMAD does not have the ability to provide mosquito abatement services to the large number of rice fields located within the District.

MSR Determination 3-2 determined that the Durham Mosquito Abatement District has not adopted an integrated pest management (IPM) program, which if followed would improve and enhance the mosquito abatement services the District provides. Implementation of an integrated pest management program would provide for greater public health benefits to the residents of the District. Determination 3-2 recommends that the District adopt and follow an integrated pest management program. The DMAD District Manager has recently indicated that the District will adopt and implement an integrated pest management program.

SOI DETERMINATION 3-1: PRESENT CAPACITY OF PUBLIC FACILITIES AND ADEQUACY OF PUBLIC SERVICES	
	The Durham Mosquito Abatement District has adequate facilities, equipment, staff, and funding to provide basic, but not comprehensive mosquito *abatement services to the more populated areas of the District. However, DMAD does not have the ability to provide mosquito abatement services to the large number of rice fields and wildlife habitat located within the District, which represents a significant public health threat to people within and outside of the District boundaries.*

SOI DETERMINATION 3-2: PRESENT CAPACITY OF PUBLIC FACILITIES AND ADEQUACY OF PUBLIC SERVICES	
	While DMAD aggressively pursues adult mosquito eradication through consistent fogging, it does not have a comprehensive vector control strategy that is based on an adopted and documented Integrated Vector Management Plan (IVMP). The District should immediately develop, adopt, and make publicly available an IVMP that clearly details its vector control strategy that includes a reasonable and effective plan to address currently unmet needs in the vast agricultural areas where mosquito breeding grounds surround populated areas of the District. The integrated vector management program should, at a minimum, include the following elements: *1. Outreach and education;* *2. Mosquito surveillance;* *3. Treatment thresholds;* *4. Biological and microbial control;* *5. Physical and cultural control; and* *6. Chemical control.* *The DMAD District Manager has recently indicated that the District will adopt and implement an integrated vector management program. It is vitally important to public accountability that the District maintain adequate records/documentation that demonstrates how each of the IVMP factors have been implemented and evaluated for effectiveness.*

SOI FACTOR NO. 4: THE EXISTENCE OF ANY SOCIAL OR ECONOMIC COMMUNITIES OF INTEREST IN THE AREA IF THE COMMISSION DETERMINES THAT THEY ARE RELEVANT TO THE AGENCY.

DMAD's jurisdictional boundaries consist of the greater Durham area, which includes the unincorporated urban community of Durham. Outside of the immediate Durham area, the District consists mostly of agricultural uses and rural residential uses.

SOI DETERMINATION 4-1: EXISTENCE OF ANY SOCIAL OR ECONOMIC COMMUNITIES OF INTEREST IN THE AREA	
	The jurisdictional boundaries of the Durham Mosquito Abatement District include the unincorporated community of Durham and a portion of the Butte Creek Estates Subdivision.

SOI FACTOR NO. 5: ***FOR AN UPDATE OF A SPHERE OF INFLUENCE OF A CITY OR SPECIAL DISTRICT THAT PROVIDES PUBLIC FACILITIES OR SERVICES RELATED TO SEWERS, MUNICIPAL AND INDUSTRIAL WATER, OR STRUCTURAL FIRE PROTECTION, THAT OCCURS PURSUANT TO SUBDIVISION (G) ON OR AFTER JULY 1, 2012, THE PRESENT AND PROBABLE NEED FOR THOSE PUBLIC FACILITIES AND SERVICES OF ANY DISADVANTAGED UNINCORPORATED COMMUNITIES WITHIN THE EXISTING SPHERE OF INFLUENCE.***

The Durham Mosquito Abatement District does not provide public facilities or services related to sewers, municipal and industrial water, or structural fire protection.

SOI DETERMINATION 5-1: DISADVANTAGED UNINCORPORATED COMMUNITIES	
	The Durham Mosquito Abatement District does not provide public facilities or services related to sewers, municipal and industrial water, or structural fire protection.

Sphere of Influence Findings and Recommendations

Based on the MSR and SOI determinations contained in this document, the Commission:

1. Finds that the Durham Mosquito Abatement District provides basic mosquito abatement services to only the more populated areas of the District.

2. Finds that the Durham Mosquito Abatement District does not provide effective mosquito abatement services to the wetland/wildlife areas and to the numerous rice fields within the District, which results in extremely large populations of breeding mosquitoes that represent a significant public health threat as they migrate both within and outside the District.

3. Finds that in 2005 the Commission gave the Durham Mosquito Abatement District a Zero Sphere of Influence boundary for many of the same reasons identified in this MSR and that there have been no substantial changes to the services provided by the District in 2017.

4. Finds that the 2004 Mosquito and Vector Control District Municipal Service Review determined that the three mosquito abatement districts in Butte County should be consolidated.

5. Finds that the 2016-17 Butte County Grand Jury determined that the Butte County Mosquito and Vector Control District, the Durham Mosquito Abatement District, and the Oroville Mosquito Abatement District should be consolidated into one district.

6. Finds that the residents of the Durham Mosquito Abatement District would be provided more effective, efficient, and comprehensive mosquito abatement and vector control services by the Butte County Mosquito and Vector Control District, which presently surrounds the Durham Mosquito Abatement District.

7. Concurs with the Butte County Department of Public Health's observations contained above and finds that the public health of the residents of the Durham Mosquito Abatement District, as well as the residents of Butte County as a whole, would be better protected from mosquito infestations by the Butte County Mosquito and Vector Control District, which has effective, efficient, and comprehensive mosquito abatement and vector control programs.

8. Finds the Durham Mosquito Abatement District should be dissolved, and the area subsequently annexed to the Butte County Mosquito and Vector Control District, or consolidated with the Butte County Mosquito and Vector Control District. It is acknowledged that this finding may be difficult to implement given the current state laws governing dissolutions and consolidations and therefore the item 10 below is considered a necessary action to improve public health outcomes.

9. Finds that the rice fields and the Rancho Esquon wetland area located within the boundaries of the Durham Mosquito Abatement District should be detached from DMAD and annexed to the Butte County Mosquito and Vector Control District, which has the ability to provide effective mosquito abatement services to these areas.

10. Finds that the Durham Mosquito Abatement District has recognized that the services it provides, and the public health of residents of the District, can be improved and enhanced through the adoption and ongoing implementation of a comprehensive integrated vector management program (IVMP), and through the creation and upkeep of a comprehensive website. Given these factors, the Commission finds that the Durham Mosquito Abatement District should be given a Probationary Sphere of Influence boundary for a period of one year following the adoption of this MSR/SOI Plan. At the end of the one year period, or sooner at the direction of the Commission, the Commission shall review the service provisions of the Durham Mosquito Abatement District to ensure that the District has adopted and implemented a measurable and documented comprehensive integrated vector management program and has created and maintained a comprehensive website. The integrated pest management program should, at a minimum, include the following elements:

    1. Outreach and education;
    2. Mosquito surveillance;
    3. Treatment thresholds;

4. Biological and microbial control;
5. Physical and cultural control; and
6. Chemical control.

It is vitally important to public accountability that the District maintain adequate records/documentation that demonstrates how each of the IVMP factors have been implemented and evaluated for effectiveness. Should the Commission determine that the District has adequately implemented the above measures, the Commission may give the District a traditional coterminous Sphere of Influence boundary. Should the Commission determine that the District has not adequately followed through with these measures and/or determine that District services are inadequate, the Commission can remove the Probationary Sphere of Influence and give the District a Zero Sphere of Influence. The Probationary Sphere of Influence shall exclude the DMAD's portion of the Butte Creek Estates Subdivision as shown on the map on Page 3-46 and shall also exclude the rice fields/wetlands area as shown on the map on Page 3-47 of this MSR.

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FINAL

MUNICIPAL SERVICE REVIEW AND SPHERE OF INFLUENCE PLAN

FOR THE

OROVILLE MOSQUITO ABATEMENT DISTRICT

Prepared by:
Butte Local Agency Formation Commission
ADOPTED DECEMBER 7, 2017

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DISTRICT DATA SHEET

OROVILLE MOSQUITO ABATEMENT DISTRICT

Contact: District Manager (vacant)[1]
Address: Current: 1275 Mitchell Avenue, Oroville, CA 95965
Future: 2635 South 5th Street, Oroville, CA 95965
Mailing Address: PO Box 940, Oroville, CA 95965
Phone: (530) 534-8388
Webpage: None

GOVERNING BOARD

Oroville Mosquito Abatement District Board of Trustees

Normal Board Meeting Date: Third Wednesday of each month at 4:00 p.m.

Board Meeting Location: The District Board of Trustee's currently meets at the Oroville City Council Chambers Hall, located at 1735 Montgomery Street, Oroville. The District Board of Trustees will meet at the District's new building, located at 2635 South 5th Street, Oroville, once the District's new building is completed.

FORMATION INFORMATION

The Oroville Mosquito Abatement District was formed in 1916.

PURPOSE

1. Enabling Legislation: GC §2000 et. seq.
2. Authorized Services:
   - Mosquito Abatement
3. Provided Services:
   - Mosquito Abatement
   - Mosquitofish Distribution
   - Public Education

AREA SERVED

1. Supervisorial Districts: 1 & 4
2. No. of Parcels: 8,140
3. District Size: 12 square miles
4. Estimated Population: 25,000
5. Location: City of Oroville and the surrounding area.
6. Sphere of Influence: None. OMAD has a "Zero" Sphere of Influence as assigned by the Commission in 2005.

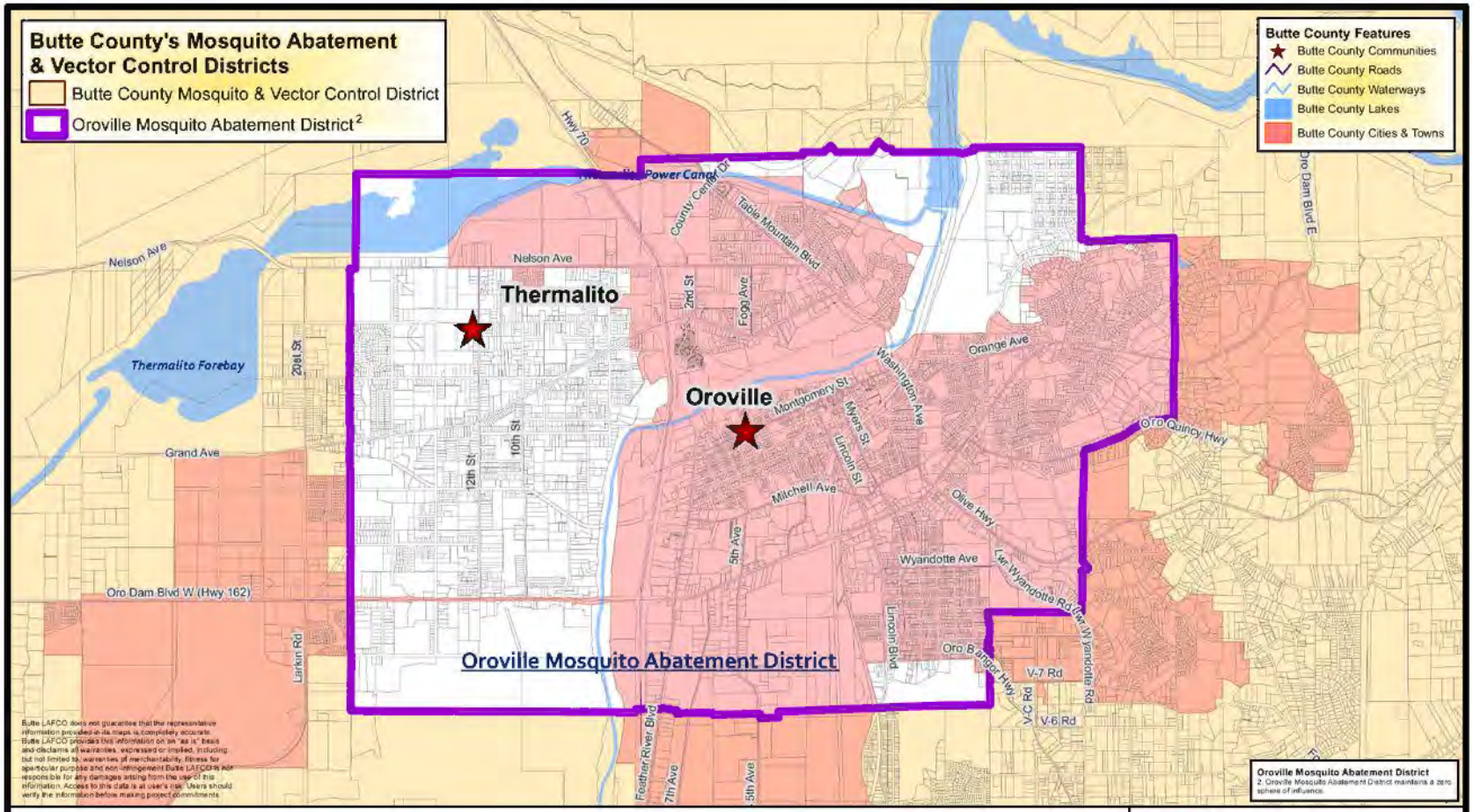
FINANCIAL INFORMATION

Fiscal Year 2015-16
Revenues: $195,180
Expenditures: $232,125
Available Fund Balance as of June 30, 2016: $89,318

Revenue Sources:

- Property taxes, annual per parcel assessments, and interest.

[1]The District Manager for the Oroville Mosquito Abatement District passed away in September 2017 and has not been replaced as of the date of this MSR.



BUTTE LOCAL AGENCY FORMATION COMMISSION

Oroville Mosquito Abatement District Jurisdictional Boundaries

Action:	Date:	Res.:	Agent:
MAD, VCD MSR, SOI Plan Adoption	12-07-2017	02 2017/18	Steve Lucas

Oroville Mosquito Abatement District Jurisdictional Boundaries

0 1,250 2,500 5,000 7,500 Feet

C:/Projects/lafco_projects/lafco_mosquito/be_mad_msr_oroville_landscape.mxd
Updated: 01/01/2018
Data: Butte County, LAFCO

DISTRICT SUMMARY

The Oroville Mosquito Abatement District was originally created in 1910 in reaction to an outbreak of malaria in Butte County. In 1916, the Oroville Mosquito Abatement District was officially formed in accordance with local authority provided by the Mosquito Abatement Act of 1915. The District's service area encompasses approximately 7,680 acres (12 square miles) consisting of approximately 8,140 parcels. The estimated population of the District is approximately 25,000.

Pursuant to Article 3 (Sections 2020 - 2030) of the Health and Safety Code, the Oroville Mosquito Abatement District has a five-member Board of Trustees who must reside within the District boundaries and shall meet at least once every three months. Four of the Trustees are appointed by the Butte County Board of Supervisors and one Trustee is appointed by the City of Oroville City Council and serve for a term of office of two to four years at the discretion of the appointing authority (H&S Code Section 2024).

California Health and Safety Code §2022(a) states that each person appointed by a board of supervisors to be a member of a board of trustees shall be a voter in that county and *a resident of that portion of the county that is within the district.* Section 2022(b) states that each person appointed by a city council to be a member of a board of trustees shall be a voter in that city and a *resident of that portion of the city that is within the district*. California Health and Safety Code §2022(d) states that it is the intent of the Legislature that persons appointed to boards of trustees have experience, training, and education in fields that will assist in the governance of the districts. Finally, §2022(e) states that all trustees shall exercise their independent judgment on behalf of the interests of the residents, property owners, and the public as a whole in furthering the purposes and intent of this chapter. The trustees shall represent the interests of the public as a whole and not solely the interests of the board of supervisors or the city council that appointed them. A mosquito abatement district trustee serves for a fixed term of office, and not merely at the pleasure or discretion of the appointing authority.[2]

The current OMAD Board of Trustees are[3]:

Position	Trustee Name	Term Ends
Trustee	Vacant	December 2017
Trustee	Marvin Mitchell	December 2017
Trustee	Chad Gunderson	December 2019
Trustee	Vacant	December 2017
Trustee	Jon Hottinger	December 2017

The OMAD Board of Trustees meetings are held the third Wednesday of each month at 4:00 p.m. The Board meetings are held at the City of Oroville Council Chambers located at 1735 Montgomery Street, Oroville. The District Board of Trustees intends to

[2] State of California, Office of the Attorney General, Opinion No. 09-502.
[3] On October 10, 2017, the Butte County Board of Supervisors vacated the seats of Oroville Mosquito Abatement District Trustees Damon and Wymore for not meeting residency requirements.

meet at the District's new building, located at 2635 South 5th Street, Oroville, once the new building is completed.

The services provided by the District were last reviewed in the Mosquito Abatement Services Municipal Service Review adopted by Butte LAFCo in 2004. The MSR contained numerous determinations regarding OMAD's operations, most notably *"…reorganizing the three districts into one county-wide district would provide numerous advantages and with little to no disadvantages. There may be a slight limit of 'personalized' service in the Durham and Oroville areas, but that disadvantage is greatly outweighed by the advantages of a county-wide district with a large number of employees, regularly scheduled office hours, education and training programs, and aerial capability."*

As a result of the determinations contained in the 2004 MSR, the District was given a "Zero" Sphere of Influence (SOI) boundary by the Commission in 2005. At the same time, the Commission expanded the SOI of the Butte County Mosquito and Vector Control District (BCMVCD) to encompass the Durham Mosquito Abatement District's and the Oroville Mosquito Abatement District's jurisdictional boundaries. Pursuant to Commission policies, a zero sphere of influence can be applied when a "districts functions are either non-existent, inadequate, no longer needed, or ***should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved."*** The Commission may initiate dissolution of an agency when it deems such appropriate. It for this reason that the BCMVCD SOI boundary overlaps the DMAD and the OMAD as the potential exists for the BCMVCD to serve these island areas in the event an agency reorganization is pursued.

OMAD SERVICES

The Oroville Mosquito Abatement District is an independent special district (not part of any county or city) that monitors and controls mosquitoes. The District protects the usefulness, desirability and livability of property and the inhabitants of property within its jurisdictional area through the abatement of mosquitoes. The District provides control for both disease carrying mosquitoes and non-disease carrying mosquitoes within its boundaries. The District's core services at varying levels, are summarized as follows:[4]

1. Early detection of public health threats through comprehensive mosquito and disease surveillance.
2. Elimination and control of mosquitoes to prevent or control disease transmission and to diminish the nuisance and harm caused by mosquitoes.
3. Reducing mosquitoes or exposure to mosquitoes that transmit diseases.
4. Appropriate, timely response to requests to prevent and control mosquitoes, and the diseases they can transmit.

[4] Oroville Mosquito Abatement District, Mosquito and Disease Control Assessment, Final Engineer's Report, FY 2016-17. June 2016

Based on the Notice of Intent and Pesticide Application Plan submitted to the State Water Resources Control Board, the District's primary services utilize the Best Management Practices for Mosquito Control in California (2010), which includes:

- Larvicide applications (control products applied directly to breeding sources).
- Adulticide applications (control products applied using ULV foggers. Ultra low volume (ULV) spraying is the process of putting very small amounts of liquid (typically 4 ounces per acre or less) into the air as a fine mist of droplets. These droplets float on the air currents for up to 1 hour and quickly kill mosquitoes that come into contact with them. ULV adulticides are applied when mosquitoes are most active – typically sunset and early evening).
- The District provides mosquitofish free of charge. The mosquitofish can be picked up at the District office and are distributed at several locations.
- Surveillance: The District uses light traps to track mosquito populations during the mosquito season (generally May through October). This surveillance data is used to coordinate effective applications of adult mosquito public health pesticides. The District collects and submits dead bird specimens to the State for testing of West Nile virus.
- District Manager provides public information talks to local groups and schools to keep the public informed.
- The District provides localized and personal mosquito abatement services for special events, plus continuous control for schools and parks.
- The District provides year round service.

These practices are not however, fully described in a District adopted, and publicly available, Integrated Vector Management Plan (IVMP). Nor is there a District policy to prepare or maintain such an IVMP or alternative written comprehensive vector management plan or strategy. Absent a current, locally adopted IVMP, it is difficult to verify what services are provided and at what level of sufficiency.

MUNICIPAL SERVICE REVIEW FACTORS FOR THE OROVILLE MOSQUITO ABATEMENT DISTRICT

Pursuant to California Government Code §56430, in order to update a Sphere of Influence (SOI) for a city or special district, the associated MSR must include written determinations that address various factors regarding the ability of the subject agency to provide services. The following provides an analysis of the seven categories or components required by §56430 for the Municipal Service Review for the Oroville Mosquito Abatement District:

MSR FACTOR NO. 1: GROWTH AND POPULATION PROJECTIONS FOR THE AFFECTED AREA.

OMAD's jurisdictional boundaries consist of a large portion of the City of Oroville and the surrounding unincorporated area, including a large portion of the community of Thermalito. It is estimated that the Oroville Mosquito Abatement District has a total population of approximately 25,000 people. The primary land uses within the District include single-family and multi-family residential uses, commercial uses, industrial uses, and public uses. Agricultural uses within the District are limited, consisting mostly of small

orchards and a few pastures. The District contains a large number of publically-owned parcels that are used for recreational purposes or for State water project purposes.

Development potential within the District is highly feasible given that a large portion of the District is designated for residential, commercial, and industrial uses. Most of the District is within the City of Oroville, the Lake Oroville Area Public Utility District, or the Thermalito Water and Sewer District, all of which provide sanitary sewer service to the parcels within their jurisdiction. The provision of sanitary sewer service facilitates development at urban densities.

The following table provides population data for the unincorporated area of Butte County, and for Butte County as a whole, for the years 2010 to 2017:[5]

	4/1/10	1/1/11	1/1/12	1/1/13	1/1/14	1/1/15	1/1/16	1/1/17	2010-2016 Growth Rate	Compound Annual Growth Rate 2010-2016
City of Oroville	15,546	15,532	15,524	15,989	15,994	16,139	17,999	18,037	16%	2.6%
Unincorporated	83,758	83,966	83,335	82,949	82,958	82,862	80,270	80,534	-3.8%	-0.5%
County Total	220,000	220,828	221,064	222,341	223,301	224,467	224,703	226,404	2.9%	.38%

The above table shows that the population of the Butte County as a whole has increased by approximately 2.9% since 2010, while the population of the unincorporated area of Butte County has decreased by approximately 3.8 percent since 2010. The decrease in the population of the unincorporated portion of Butte County is due to the annexation of populated areas to cities, primarily to the cities of Chico and Oroville. The high growth rate for the City of Oroville is due to the annexation of several high population areas to the city, one of which was the South Oroville Area that was annexed to the City of Oroville in 2015. The population growth rate for all of Butte County since 2010 was lower than previous years due to the slowdown in the economy and in the housing market that began in 2008.

In March 2017, the State of California Department of Finance released updated population growth projections for all of the counties within the state[6]. The population projection for Butte County shows that by 2060 the county may have a population of 292,892. The 2060 projected population is approximately 30.5 percent above the county's current population, which represents an approximate compound annual growth rate of 1.03 percent.

[5] State of California, Department of Finance, *E-4 Population Estimates for Cities, Counties, and the State, 2011-2017, with 2010 Census Benchmark*. Sacramento, California, May 2017.
[6] State of California, Department of Finance, *P-2: County Population Projections (2010-2060)*. Sacramento, California, March 8, 2017.

CALIFORNIA DEPARTMENT OF FINANCE POPULATION PROJECTIONS FOR BUTTE COUNTY 2020-2060

Estimates					Projections					
2010	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**2055**	**2060**
220,157	224,363	230,709	238,546	247,339	256,042	263,642	270,612	277,512	285,290	292,892

The population of the Oroville Mosquito Abatement District is expected to grow at a rate of approximately 1 percent a year, with most of that grown occurring within the City of Oroville and the unincorporated community of Thermalito. The following table shows estimated population projections for the Oroville Mosquito Abatement District.

POPULATION PROJECTIONS FOR OROVILLE MOSQUITO ABATEMENT DISTRICT - 2017-2030

2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
25,000	25,250	25503	25,758	26,015	26,275	26,538	26,803	27,071	27,342	27,616	27,892	28,171	28,452

As population increases, and growth occurs within Oroville and surrounding Butte County, demands and expectations for mosquito control services will increase. Urban areas provide abundant breeding habitats for mosquitoes (stagnant water), and treatment becomes more difficult and costly, as treatment efforts need to occur more frequently and on individual private properties. Expansion of services would be implemented through increases in revenues, including property tax income and the collection of assessment fees from new development. It is uncertain whether District revenue will increase on par with the need to fund increased service levels. This is especially true if the District wished to enhance its current service capabilities.

MSR DETERMINATION 1-1: POPULATION	
	The District has a current population of approximately 25,000 people.

MSR DETERMINATION 1-2: POPULATION GROWTH	
	The population of the District as a whole is expected to grow at a rate of approximately 1 percent annually. Future population growth within the District is expected to occur primarily within the City of Oroville and the Thermalito area.

MSR DETERMINATION 1-3: POPULATION GROWTH AND NEW SERVICE DEMANDS	
	As population increases, and growth occurs within the OMAD, service demands will increase. Expansion of services by OMAD would be facilitated by increases in revenues from property tax revenue and assessment fees from new development. It is uncertain whether District revenue will increase on par with the need to fund increased service levels. This would be especially difficult if the District wished to enhance its current service capabilities.

MSR FACTOR NO. 2: ***THE LOCATION AND CHARACTERISTICS OF ANY DISADVANTAGED UNINCORPORATED COMMUNITIES WITHIN OR CONTIGUOUS TO THE SPHERE OF INFLUENCE.***

Disadvantaged unincorporated communities (DUCs) are defined by statute as inhabited territory (meaning 12 or more registered voters), or as determined by commission policy, that constitutes all or a portion of a community with an annual median household income (MHI) that is less than 80 percent of the statewide annual MHI (Water Code Section 79505.5). The statewide MHI data is obtained from the US Census American Community Survey (ACS) 5-Year Data: 2010 - 2014. California's MHI for this period was $61,489, and 80 percent of that is $49,191.

Median household income data is available at the U.S. Census block group mapping level. Based upon the MHI data for the U.S. Census block groups within the boundaries of the District, there are several areas within the District that are identified as being disadvantaged unincorporated communities, including most of the unincorporated community of Thermalito, the remaining unincorporated portion of the Southside Neighborhood in south Oroville, and most of the Western Pacific Addition Subdivision located in the northeast Oroville area, north of Long Bar Road.

Most of the DUC areas within the District receive a wide range of municipal services, including domestic water, sanitary sewer, fire, and police services. The OMAD provides mosquito and vector control services to all of the parcels within the District's boundaries, including those identified as being within a disadvantaged unincorporated community. The existence of disadvantaged unincorporated communities within the District does not impact the District's ability to provide services, nor do the District's services impact the status of these communities as "disadvantaged".

MSR DETERMINATION 3-1: DISADVANTAGED UNINCORPORATED COMMUNITIES	
	Several areas within the Oroville Mosquito Abatement District have been identified as being disadvantaged unincorporated communities (DUC). The District provides the same level of service to the parcels within these disadvantaged unincorporated communities as the District provides to the non-disadvantaged communities within the District.

MSR FACTOR NO. 3: ***PRESENT AND PLANNED CAPACITY OF PUBLIC FACILITIES, ADEQUACY OF PUBLIC SERVICES, AND INFRASTRUCTURE NEEDS OR DEFICIENCIES INCLUDING NEEDS OR DEFICIENCIES RELATED TO SEWERS, MUNICIPAL AND INDUSTRIAL WATER, AND STRUCTURAL FIRE PROTECTION IN ANY DISADVANTAGED, UNINCORPORATED COMMUNITIES WITHIN OR CONTIGUOUS TO THE SPHERE OF INFLUENCE.***

FACILITIES

The District's office/maintenance shop is leased from the City of Oroville and is located at the City's corporation yard, at 1275 Mitchell Avenue, Oroville. The building occupied by the District is located within a fenced compound with a keypad entrance gate and

was never designed to be a government office. While it serves its basic purpose, it is very small and provides very little area for the storage of equipment and vehicles. Insecticides are stored in a large, locked, shipping container located outdoors adjacent to the building. The District's building does not contain adequate space for the District's Board of Trustees to meet in, but the building was never intended for that use. Overall, the facility/office is not welcoming or easily accessible to the public and is at times, completely inaccessible as the corporation yard fence is locked or closed.

EXISTING OROVILLE MOSQUITO ABATEMENT DISTRICT BUILDING

Knowing the shortcomings of its existing facility/office, in 2014, the District purchased two adjacent parcels (APN's 035-380-020 and 021) located on South 5th Street in Oroville and in 2016 began construction of an office/shop facility. The building, which is addressed as 2365 South 5th Street, is almost complete, but there remain outstanding building code issues with the City of Oroville. It is not known when the District will move into the new building. The building is 3,000 square feet in size and contains several offices, a large room where the District Board of Trustees can meet, and a large area for the District's vehicles and equipment.

OMAD's Future Office/Building (2365 South 5th Street, Oroville)

The District's office is generally open Monday through Friday, or Monday through Thursday, depending on times of peak mosquito activity. Hours of operation are generally between 7 a.m. and 3 p.m., or between 2 p.m. and 10 p.m. Occasionally, District staff will provide services on a Saturday or Sunday due to special public event. The District Manager may also at times adjust work schedules and hours throughout the mosquito season due to weather conditions to accommodate the operational needs of the District. While the varied schedule allows greater flexibility for the single full-time District employee (Manager) and seasonal workers, it does nonetheless result in office closures during normal business hours. Residents of the District can leave a voice mail if no one is in the office to receive visitors or answer the phone. The District Manager returns calls as soon as possible. In contrast to OMAD, the BCMVCD has a full-time office presence and maintains regular Monday through Friday business hours, albeit with a much larger budget base.

DISTRICT EQUIPMENT

The District has various types of equipment that is utilized to perform mosquito abatement services. Equipment includes standard office equipment, three pickup trucks, three ultra low volume truck-mounted foggers, and various tools, such as hand-held sprayers and gas-powered backpack sprayers.

OMAD ULTRA LOW VOLUME FOGGER

Maintenance of the foggers is performed by District staff. The foggers, which are mounted in the beds of the District's trucks, are gas-powered and are operated remotely via cable by the drivers.

OMAD TRUCKS

ADEQUACY OF PUBLIC SERVICES

As previously noted, OMAD indicates it provides the following services:

- Larvicide applications (control products applied directly to breeding sources).
- Adulticide applications (control products applied using ultra low volume foggers).
- The District provides mosquitofish free of charge. The mosquitofish can be picked up at the District office and are distributed at several locations.
- Surveillance: The District uses light traps to track mosquito populations during the mosquito season (generally May through October). This surveillance data is used to coordinate effective applications of adult mosquito public health pesticides. The District collects and submits dead bird specimens for testing of West Nile virus.
- District staff conducts annual public relations, outreach, and education campaigns. This includes making press releases, publishing brochures, responding to requests for interviews from all media, informing other government agencies, and giving presentations. The District has an elementary school program whereby the District visits classrooms to present information about mosquito and vector biology and control issues, as well as personal protection, and techniques used by the District to control pests of public health importance.
- The District provides localized and personal mosquito abatement services for special events, plus continuous control for schools and parks.
- The District provides year round service.

In 2006, District residents voted to approve a per parcel assessment fee to fund expanded mosquito abatement services. The following is an outline of the primary services and improvements that are funded by the assessments:

- Enhanced mosquito control program
- Enhanced existing mosquito surveillance program
- Quicker response to service requests
- Enhanced existing mosquitofish program
- Area breeding source inspections and control
- Mosquitofish for backyard, fish ponds and other appropriate habitats
- Increase public education and awareness
- Upgrading of the facilities and equipment utilized by the District

OMAD's District Manager has indicated that one of the benefits of a smaller local district to its residents (pop. 25,000) is the personalized service provided on an as needed basis.

SERVICE REQUESTS

A major factor influencing service demand is the presence of vectors (in particular mosquitoes) and vector-borne disease agents within the District and neighboring areas. The District responds to service requests within its boundaries. Any property owner, business, or resident in the District may contact the District to request mosquito abatement service and District staff will respond promptly to the particular property to evaluate the threat situation and to perform appropriate control services. The District

indicates it responds to all service requests in a timely manner, regardless of location, within its boundaries.

Although the primary goal of the District is to prevent adult mosquitoes from becoming nuisances and causing public health issues, it should be noted that the District does have a basic preventative program that controls larval mosquitoes in point sources before they emerge. With this program, the residents of the District will see fewer biting adult mosquitoes and perhaps fewer cases of vector borne diseases. Consequently, service requests alone are not a good indicator of the level of demand for the District's services. The preventative work that OMAD performs helps keep the number of service calls related to mosquito biting activity lower and thus reduces potential cases of disease.

MSR DETERMINATION 3-1: ADEQUACY OF PUBLIC SERVICES	
	OMAD's primary mosquito abatement strategy is to reduce the numbers of adult mosquitoes from becoming nuisances and causing public health issues, mostly by fogging operations to kill adult mosquitoes.

MSR DETERMINATION 3-2: ADEQUACY OF PUBLIC SERVICES	
	While OMAD adequately pursues adult mosquito eradication through consistent fogging, it does not have a comprehensive vector control strategy that is based on an adopted Integrated Vector Management Plan (IVMP). The District should immediately develop, adopt, and make publicly available an IVMP that clearly details its vector control strategies and methods.

MSR DETERMINATION 3-3: ADEQUACY OF PUBLIC SERVICES	
	OMAD appears to have sufficient facilities and resources to provide adequate mosquito abatement services, which consists primarily of fogging for adult mosquitoes. The approval of an annual per parcel assessment in 2006 allowed the District to provide enhanced mosquito abatement services.

MSR DETERMINATION 3-4: ADEQUACY OF PUBLIC SERVICES	
	District equipment appears to be adequately maintained and is replaced as necessary to ensure uninterrupted mosquito abatement operations.

MSR FACTOR NO. 4: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES.

This section analyzes the financial structure and viability of the District. Included in this analysis is the consideration of revenue sources, amount of revenue, stability of revenues, and expenditure sources.

Each year the District's Manager prepares and submits an operating budget to the Board of Trustees. Pursuant to California Health and Safety Code §2070, on or before August 1 of each year, the Board of Trustees must adopt a final budget, which must conform to the accounting and budgeting procedures for special districts contained in Subchapter 3 (commencing with Section 1031.1) of, and Article 1 (commencing with Section 1121) of Subchapter 4 of Division 2 of Title 2 of the California Code of Regulations.

As required by California Health and Safety Code §2027(c), the District's funds are deposited with and maintained by the Butte County Treasurer and Tax Collectors Department. The funds that the District deposits with the County Treasurer are placed in the County's Investment Trust Fund, which accounts for the assets of legally separate entities that deposit cash with the County Treasurer in an investment pool, which commingles resources in the investment portfolio for the benefit of all participants. The District receives dividends from the Investment Trust Fund. Because the County Treasurer and Tax Collectors Department maintains the District's funds, the District's annual budget is included as a part of the County's overall annual budget. California Health and Safety Code §2077(a) allows a district that has total annual revenues greater than two hundred fifty thousand dollars ($250,000) to withdraw its funds from the control of the county treasurer. However, OMAD's revenues have never been greater than $202,000.

The District's funds are deposited with and maintained by the Butte County Treasurer and Tax Collectors Department, but the County has no control over how the District's funds are utilized. The funds that the District deposits with the County Treasurer are placed in the County's Investment Trust Fund, which accounts for the assets of legally separate entities that deposit cash with the County Treasurer in an investment pool, which commingles resources in the investment portfolio for the benefit of all participants. The District receives dividends from the Investment Trust Fund. Because the County Treasurer and Tax Collectors Department maintains the District's funds, the District's annual budget is included as a part of the County's overall annual budget.

Revenues

The District receives revenue from two main sources:

- **Ad-valorem Property Taxes**. In Fiscal Year 2015-16, approximately 47 percent ($92,566) of OMAD's revenues were received from the District's share of the ad valorem property tax. Ad-valorem[7] property tax is a one percent general levy of the assessed market value of a property. This one percent is distributed among many agencies in the county. For cities and the county, this tax is usually deposited into their general funds, which can be used for any service. For special districts, this tax is also deposited into the district's general funds to be used for the district's sole purpose.

  The level of revenue from property taxes can be considered relatively consistent, as the taxes usually remain at the same level from year to year. However, property tax

[7] Latin for "according to value"

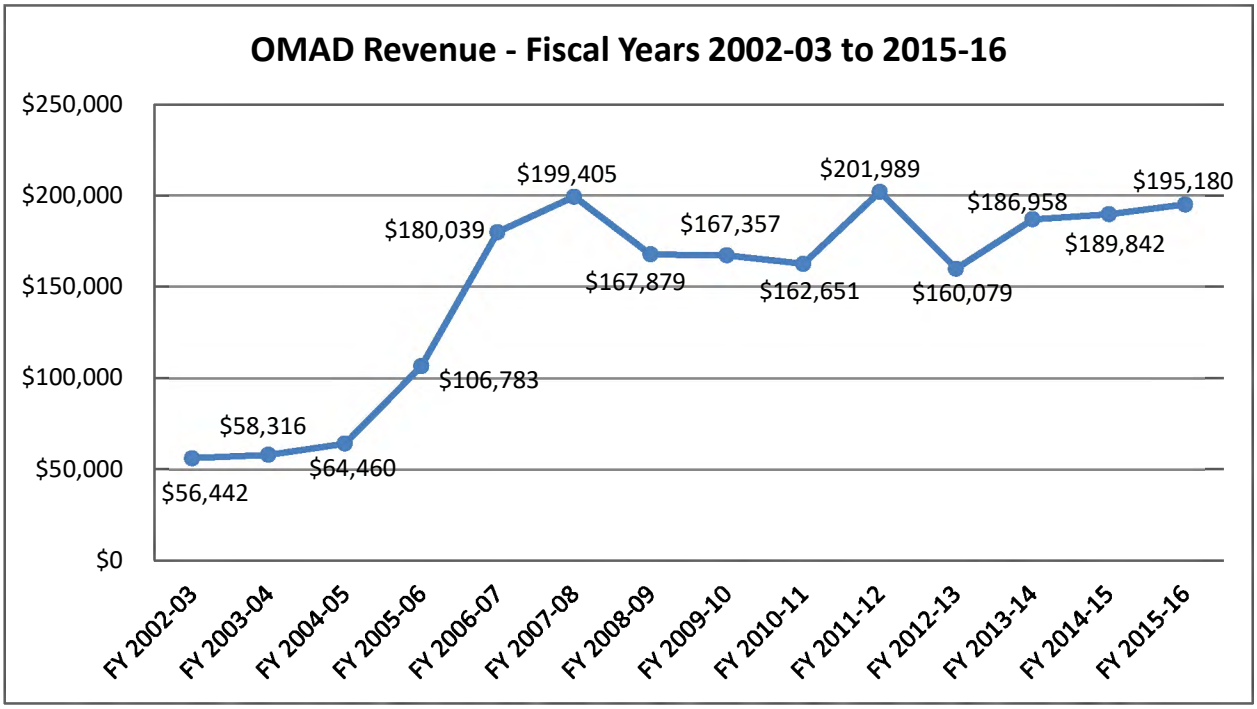
revenue can decrease due to decreasing property values, which is what occurred beginning in 2008 because of the downturn in the economy and housing market. Due to the downturn in the economy, properties were reassessed to a lower value, which reduced property tax revenue flowing to cities and special districts. Revenue from property taxes has been increasing over the last few years as properties are reassessed to a higher value, but remain below pre-2008 levels. New development on a property raises the property value of that parcel, with a corresponding increase in property tax revenues.

The Butte County Tax Collector's Office bills and collects the District's share of property taxes and assessments. The Butte County Treasurer's Office remits current and delinquent property tax collections to the District throughout the year.

- **Assessment Fees**. In Fiscal Year 2015-16, approximately 47.8 percent ($93,446) of OMAD's revenues were received from special benefit parcel assessments. In July and August of 2006, the District conducted an assessment ballot proceeding and 64.4% of the weighted ballots returned were in support of the assessment. On August 30, 2006, the District Board of Trustees approved the levy of the assessments. The following table shows the OMAD parcel assessment fees.

Property Type	Single Family Equivalent (SFE) Benefit Factor	Rate $12.76	Rate Factor
Single Family Residential (SFR)	1.0000	$12.76	per parcel. If parcel >1acre add $0.11 per acre
Mobile home on 1 parcel	0.4500	$5.74	per parcel. If parcel >1acre add $0.11 per acre
Mobile Home Park	0.5000	$6.38	per 1/4 acre for 1st 5 acres. If > 5 acres, then $6.38 for each acre after 5 acres
Condominium	0.8600	$10.97	per parcel
Duplex, Triplex, Fourplex	0.6000	$7.66	per unit. If parcel > l acre add $0.11 per acre
Multi-family Residential 5-plus units	0.5700	$7.27	per unit up to 20 units+ $1.27 per each addtl unit over 20
Commercial/Industrial	0.5000	$6.38	per 1/4 acre for 1st 5 acres. lf > 5 acres, then $6.38 for each acre after 5 acres
Office	1.4200	$18.12	per 1/4 acre for 1st 5 acres. If> 5 acres, then $18.12 for each acre after 5 acres
Vacant	0.1500	$1.91	per parcel
Parking/Storage	0.0210	$0.27	per 1/4 acre for 1st 5 acres. lf > 5 acres, then $0.26 for each acre after 5 acres
Agricultural Property / Rice Fields	0.0084	$0.11	per acre. If SFR on parcel add $12.76
Recreational/Golf Course	0.2520	$3.22	per acre
Open Space / Rangeland	0.0017	$0.02	per acre. If SFR on parcel add $12.76

Revenues for the District have remained relatively steady over the last five years, with some minor fluctuations. Revenue for the District in Fiscal Year 2015-16 was $195,180, and revenue for the current fiscal year (2016-17) is projected to be $190,400. District revenues rose dramatically after the District's special benefit assessment was approved in 2005. Prior to the approval of the assessment, annual District revenues were usually less than $65,000. The following chart shows the District's revenues for Fiscal Years 2003-04 to 2015-16.

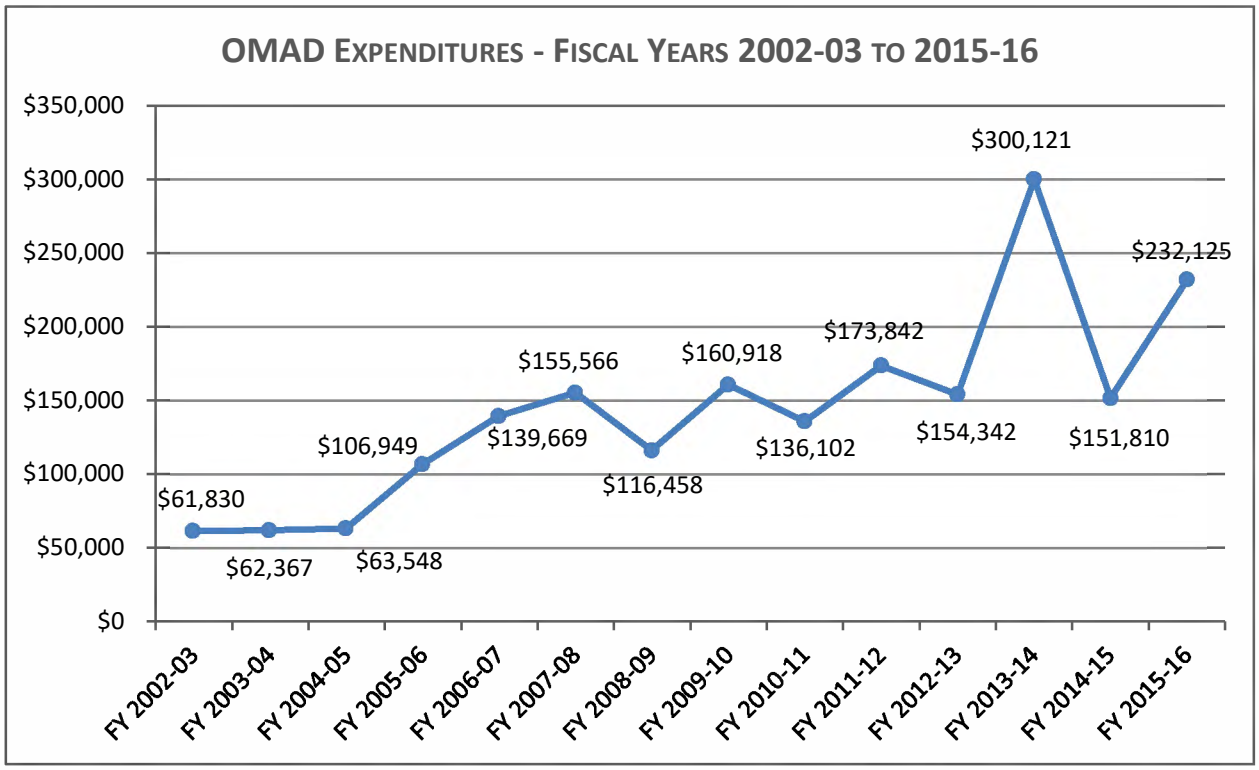


EXPENDITURES

Total operating and capital expenditures for the District for Fiscal Year 2015-16 was $232,125. Expenditures for OMAD generally consist of salaries and employee benefits, services and supplies (costs for pesticides, fuel, insurance, maintenance) and fixed (capital) assets expenditure (purchase of new vehicles or equipment). In Fiscal Year 2015-16, salaries and employee benefits ($121,937) accounted for 55.5% of the District's expenditures, services and supplies ($39,268) accounted for 17% of the District's expenditures, and fixed assets ($70,920) accounted for 30.5% of the District's budget.

It should be noted that the total expenditures for Fiscal Year 2013-14 were significantly higher than past years due to the District's purchase of two parcels to be used for the District's new office/shop building. Likewise, the expenditures for FY 2015-16 were significantly higher due to the fixed asset expenditure for that year, which was for construction costs for the new District office/shop building.

District expenditures vary from year to year, reflecting the amount of revenue received and any high-cost purchases, such as a vehicle or fogging equipment. Since Fiscal Year 2002-03, in which total expenditures were $61,830, District expenditures have gradually increased, reaching a high of $300,121 in Fiscal Year 2013-14. As shown on the following graph, District expenditures rose significantly after the District's special benefit assessment was approved in 2005.



OMAD maintains a fund balance, and as of June 30, 2016, the District had $89,318 in available (unappropriated) fund balance. The following table shows the District's available fund balance from Fiscal Year 2008-09 to the middle of Fiscal Year 2015-16.

Oroville Mosquito Abatement District Fund Balances	
As of 06-30-16	$89,318
As of 06-30-15	$59,612
As of 06-30-14	$22,075
As of 06-30-13	$25,490
As of 06-30-12	$38,770
As of 06-30-11	$624
As of 06-30-10	$0
As of 06-30-09	$18,099

For public agencies, unappropriated fund balances are not just money in a bank; they are fundamental resources for ensuring reliable core services and community security.[8] Public agencies designate money toward savings in order to balance their budget, respond to emergencies, keep rates affordable, maintain current infrastructure and plan for future public works projects. The following are the benefits of a public agency maintaining an adequate level of unappropriated fund balance:

[8]*Special District Reserve Guidelines - A Guide to Developing a Prudent Reserve*. Second edition. California Special Districts Association. 2013.

- Balancing Budgets – Over the course of the fiscal year, fund balances help balance the ebb and flow of revenues verse expenditures.
- Emergency Preparation – In the event of a disaster, communities can't afford not to have savings readily available to quickly repair critical local infrastructure and bring core services back online.
- Affordable Rates – With appropriate savings, special districts are able to use resources wisely and smooth out the highs and the lows of volatile economic conditions, rather than spend their entire surplus and then seek new revenue or jeopardize services.
- Infrastructure Maintenance – Reserves mean the pipes are fixed, roofs are patched, and worn equipment is replaced without going back to the taxpayers or ratepayers to pay for routine upkeep.
- Planning for the Future – A long-term, thoughtful approach to public infrastructure requires the foresight to plan for, and discipline to save for, future needs.

The District's unappropriated fund balance has varied significantly over the years in response to unanticipated expenses, budget deficits, and reduced revenues. The District should endeavor to increase the unappropriated fund balance every fiscal year to ensure that there is adequate funding available for any unforeseen circumstances.

OMAD ANNUAL BUDGETS

A special district's budget is a financial plan that details the district's projected revenues and expenditures for a defined period of time, usually one fiscal year (July 1 to June 30.) Special districts typically have operating budgets, which is a plan of current (annual) spending and the means to pay for it (taxes, fees, etc.). As previously noted, the District prepares a budget for each fiscal year that shows anticipated revenue and anticipated expenditures (appropriations).

The District's budgets for Fiscal Years 2012-13 to 2016-17 are shown in the following table. The budgets for FY 2012-13 to 2015-16 show the actual revenue and expenditure figures, while the FY 2016-17 budget shows the budget as adopted by the District Board of Trustees, which only reflects anticipated revenues and appropriations (anticipated expenditures).

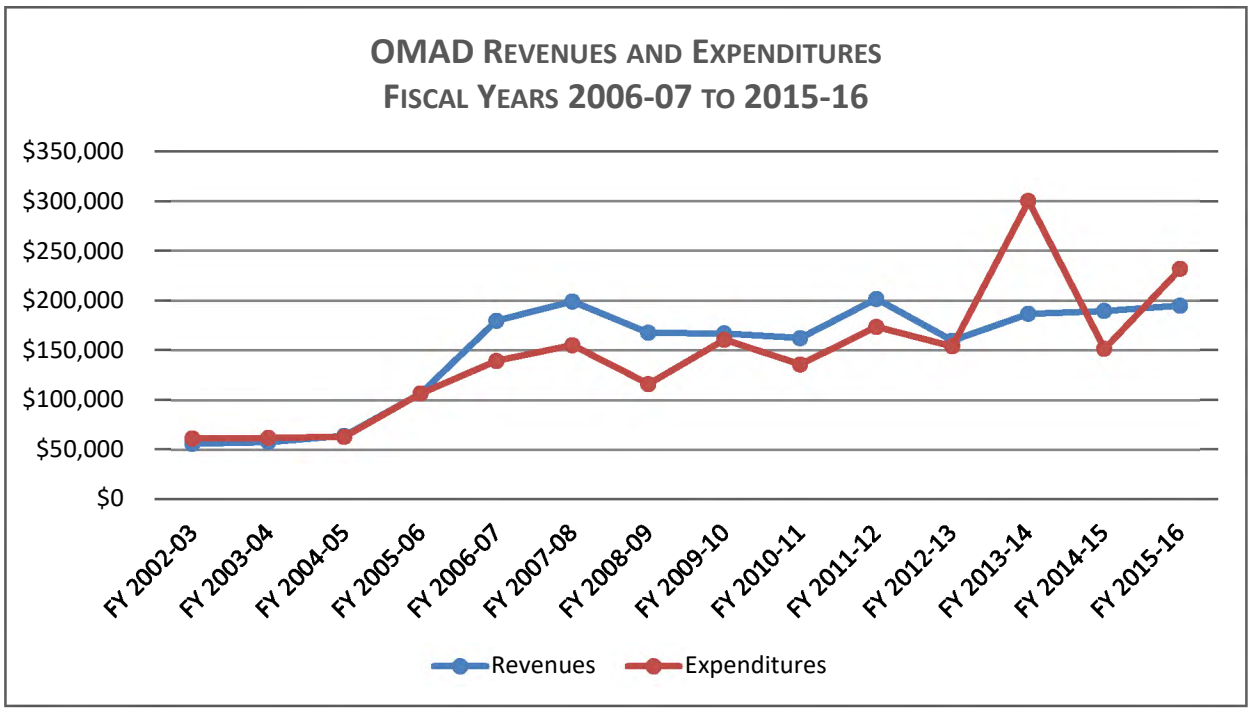
OROVILLE MOSQUITO ABATEMENT DISTRICT

Detail by Revenue Category and Expenditure Object	2012-13 Actuals	2013-14 Actuals	2014-15 Actuals	2015-16 Actuals	2016-17 Adopted By District Board
REVENUES					
Current Secured Property Tax	69,226	89,540	90,673	92,566	87,500
Current Supplemental Property Tax	288	334	1,414	869	-
Current Unsecured Property Tax	3,478	4,728	4,594	4,747	2,500
Prior Unsecured Property Tax	142	123	110	174	100
Pass Through Property Taxes	-	-	-	57,360	-
Miscellaneous Taxes	170	136	127	113	100
Interest	2,021	1,252	815	1,017	500
Fair Market Value Adj - Unrealized Gain (Loss)	(2,936)	1,197	14	801	-
Homeowners Property Tax Relief	1,171	1,465	1,424	1,344	1,000
Service Charge-CSA/SPEC Dis (Assessment)	86,280	88,183	90,479	93,446	98,700
Miscellaneous Revenue	0	0	192	103	-
Reimbursement of Prior Year Expense	240	-	-	-	
TOTAL REVENUES	**$160,079**	**$186,958**	**$189,842**	**$195,180**	**$190,400**
EXPENDITURES/APPROPRIATIONS					
Salaries and Employee Benefits	109,745	110,665	108,186	121,937	$118,500
Services and Supplies	44,597	58,657	43,624	39,268	40,000
Fixed Assets (Land parcels, vehicles, equipment)	0	130,800	0	70,920	15,000
Appropriation for Contingencies	-	-	-	-	9,000
TOTAL EXPENDITURES / APPROPRIATIONS	**$154,342**	**$300,121**	**$151,810**	**$232,125**	**$182,500**
NET COSTS / USE OF FUND BALANCE	**$5,737**	**($113,163)**	**$38,032**	**($36,946)**	**$7,900**

The budgets for Fiscal Years 2013-14 and 2015-16 show that expenditures exceeded revenues. According to the District, in Fiscal Year 2013-14, District expenditures exceeded revenues due to the purchase of the two parcels for the District's new office/shop. Expenditures exceeding revenues in Fiscal Year 2015-16 was due to costs associated with construction of the new building. The District created a separate fund for the purposes of reserving funds for the purchase of land and for the construction of a new building.

The annual expenditures of a special district should generally equal, or, ideally, be less than the revenue a district receives in any given fiscal year. When expenditures exceed revenues, which is referred to as a budget deficit, a non-enterprise district, such as OMAD, must resort to the use of fund balance, if available, or borrow money to cover the shortfall in revenues.

As shown in the following graph, OMAD experienced budget deficits two times from Fiscal Years 2006-07 to 2015-16. As stated above, the reasons for these budget deficits were due to the purchase of two parcels and for the construction costs for the District's new office/shop on the parcels.



A budget deficit, which can occasionally occur to even the best-funded special district, can be due to various factors, such as unanticipated expenses or erroneous revenue projections. An agency experiencing a budget deficit can use fund balance or other reserves, if available, to balance their budget. However, using the fund balance is a one-time course of action that cannot fix a structural imbalance. A district experiencing continuous budget deficits may be having financial difficulties that need to be identified and corrected. If the budget deficit cannot be corrected, a district may have to reduce service levels if new sources of funding cannot be obtained.

The District's budget deficits in two of ten fiscal years does not indicate that the District is experiencing ongoing financial problems as these deficits were due to the purchase of two parcels of land and the related construction costs for the District's new office/shop building on 5th Street in Oroville.

Net Pension Liability (CalPERS)

The OMAD District Manager is the only District employee with a CalPERS pension plan. CalPERS retirement benefits are funded through contributions paid by contracting employers, member contributions, and earnings from CalPERS investments. Employer contribution requirements are determined by periodic actuarial valuations under state law. Actuarial valuations are based on the benefit formulas the agency provides and the employee groups covered. The benefit formula for OMAD is 2.0% at age 55.

As of the fiscal year ended June 30, 2015, the District had $66,826 in net pension liabilities for its proportionate shares of the net pension liability of the District's pension plan. The net pension liability is defined as the unfunded liability for the pension benefits promised to current employees, retirees, and their beneficiaries. As of June 30, 2015,

the District's pension plan had an accrued liability of $430,190, which is the value of benefit earned for past service.

For Fiscal Year 2016-17 the District's normal cost (NC) rate for the District Manager's pension plan is 8.377% of the District's Manager annual salary.[9] For FY 2016-17, the District's estimated employer normal cost is $3,912. For the current fiscal year, the District's estimated unfunded accrued liability (UAL) annual payment is $5,943.[10] The total annual cost to the District for the District Manager's pension plan for FY 2016-17 is estimated to be $9,855 ($3,912 employer normal cost plus $5,943 unfunded accrued liability cost). The following table shows the District's current, past fiscal year, and the next fiscal year's unfunded accrued liability annual payment and the normal cost rate.

Employer Plan	NC Rate FY 2017-18	UAL 2017-18	NC Rate FY 2016-17	UAL 2016-17	NC Rate FY 2015-16	UAL FY 2015-16
Miscellaneous	8.418%	$4,885	8.377%	$3,912	8.003%	$3,259

The following table shows projected CalPERS employer contributions for OMAD up to Fiscal Year 2022-23.

	Required Contribution	Projected Future Employer Contributions				
Fiscal Year	**2017-18**	**2018-19**	**2019-20**	**2020-21**	**2021-22**	**2022-23**
Normal Cost %	8.418%	8.4%	8.4%	8.4%	8.4%	8.4%
UAL $	$4,885	$6,332	$7,862	$8,774	$9,814	$10,581

The District's CalPERS cost will gradually increase and by Fiscal Year 2022-13 the District's annual CalPERS costs will be $6,669 greater than the District's current cost. It should be noted that at its December 21, 2016 meeting, the CalPERS Board of Administration approved lowering the CalPERS discount rate assumption, which is the long-term rate of return, from 7.50 percent to 7.00 percent over the next three years. Lowering the discount rate means plans will see increases in both the normal costs (the cost of pension benefits accruing in one year for active members) and the accrued liabilities. These increases will result in higher required employer contributions, although the increased amount is not known at this time.

ANNUAL FINANCIAL AUDIT/FINANCIAL REPORTS

State Law requires that every public agency retrain the services of a certified public accountant to prepare that agency's annual financial audit. An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in an agency's financial statements. Financial statements include all transactions for which a public agency is financially accountable. The procedures selected depend

[9] Normal Cost (NC) Rate represents the annual cost of service accrual for the upcoming fiscal year for active CalPERS employees. Normal cost is shown as a percentage of payroll and is paid as part of the payroll reporting process.

[10] Annual payment on the Unfunded Accrued Liability (UAL) is the amortized dollar amount needed to fund past service credit earned (or accrued) for members who are currently receiving benefits, active members, and for members entitled to deferred benefits, as of the valuation date. The UAL is billed monthly.

on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of significant accounting estimates made by management, as well as evaluating the overall presentation of the financial statements.

Although requested to do so, OMAD has not provided any recent financial reports. The District Manager indicated that the District has not had any audits completed for the last three or four fiscal years. The District Manager stated that the District retained the services of a certified public accountant to prepare the financial audits/reports, but the accountant has been unable to complete the audits/reports due to an extended illness.

The District's failure to have financial audits preformed in a timely manner is in non-compliance with State Law (California Health and Safety Code §2079(a) and (b)) and with generally accepted accounting principles. The lack of timely completion of the District's financial audits/reports could result in the loss of District funds through fraud or through accounting errors.

The lack of having financial audits/reports prepared is a significant issue that must be corrected by the District immediately. The District must take all necessary steps, including finding a new certified public accountant to prepare the reports, to ensure that the financial audits/reports are completed for the missing fiscal years in a timely manner. A determination to this effect has been prepared, which requires the District to submit a comprehensive financial audit/report, within two months of approval of this MSR by the Commission, for the fiscal years that have not been audited.

FUTURE CHALLENGES AND ISSUES RELATED TO FINANCES

As with other mosquito and vector control districts in California, OMAD faces numerous challenges and issues related to finance. One challenge is the amount of revenue the District receives. Revenues for the District primarily are received from property taxes and parcel assessments. The parcel assessment is a steady and reliable source of revenue, while the property tax revenues can be significantly reduced due to lower property values, as was experienced during the economic downturn that started in 2008. The quantity and quality of services the District provides are dictated by the revenue the District receives.

Another factor is the increased cost of complying with new regulations regarding mosquito abatement operations. As these costs increase, the District will have less operating revenue to provide services, which, unless new sources of revenue are found, may result in the District reducing service levels.

Another issue that may affect the District finances is climate change, which appears to have resulted in the migration of warmer climate mosquitoes northwards from the

equator and which are now established in California. As new mosquitoes and the new diseases they carry enters the United States, California, and Butte County, the District will face ongoing challenges on how to best protect the public's health, which may require a significantly larger number of District personnel, equipment, and pesticides, all at substantial additional cost to the District.

The District is also facing the effects of less effective public health pesticides due to mosquito and vector populations increasing tolerance and/or resistance, which has been dramatically increasing over the past five to ten years. New pesticides will be needed, all at a substantial cost to the District.

MSR DETERMINATION 4-1: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES - REVENUE	
	The primary sources of revenue for the Oroville Mosquito Abatement District are property taxes (47%) and parcel assessments (48%). Revenue from the parcels assessment is a steady source of revenue while property tax revenue can be significantly reduced due to decreased property values as seen during the recent national recession.

MSR DETERMINATION 4-2: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES - EXPENDITURES	
	Normal expenditures for the District include salaries, insecticides, pension and health insurance contributions, gas and oil, and the occasional purchases of new vehicles and equipment. The District's expenditures do not appear to be excessive and are necessary to provide adequate levels of services.

MSR DETERMINATION 4-3: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FUND BALANCE	
	As of June 30, 2016, the District's General Fund had an unassigned fund balance of $89,318, which is available for future District operations. This fund balance could be used for any unforeseen expenditures or to cover revenue shortfall. The District should consider increasing the fund balance, which would provide a greater cushion if revenues decrease or if District expenses significantly increase.

MSR DETERMINATION 4-4: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FINANCIAL AUDIT/FINANCIAL REPORT	
	The Oroville Mosquito Abatement District did not provide any recent financial audit reports as was requested, and it appears that the District has not had financial audits prepared for the last three or four fiscal years. These financial audits/reports are needed to analyze the District's financial position and to ensure that the District is complying with generally accepted accounting principles. *The District shall take all necessary steps to have financial audits/reports prepared for the missing fiscal years. The District shall submit the completed financial audits/reports to LAFCo no later than two months from LAFCo approval of this MSR/SOI Plan. Once the financial audits/reports are submitted to LAFCo, LAFCo staff shall submit to the Commission for review and approval any revisions to Section 4.0, or to any other applicable section, of this MSR to reflect the findings of the financial audits/reports.*

MSR DETERMINATION 4-5: FINANCIAL ABILITY OF AGENCIES TO PROVIDE SERVICES – FUTURE FINANCIAL CHALLENGES	
	The District faces numerous challenges to continue to provide effective mosquito abatement and vector control services to the residents of the District in light of new regulations, new mosquito species, and new mosquito-borne diseases. Due to these issues, there will be a greater need for the services the District provides in the coming years, which will require additional District staffing, equipment, and insecticides, all at substantial additional cost to the District. The District, along with all other mosquito abatement and vector control districts, will need to obtain additional funding to meet these challenges and continue to provide effective and efficient services.

MSR FACTOR NO. 5: STATUS OF, AND OPPORTUNITIES FOR, SHARED FACILITIES.

There are three mosquito abatement districts within Butte County – the Butte County Mosquito and Vector Control District (BCMVCD), the Durham Mosquito Abatement District (DMAD), and the Oroville Mosquito Abatement District (OMAD), each of which has its own governing board, staff, equipment, materials, and facilities. DMAD and OMAD are completely surrounded by the boundaries of the BCMVCD. Given that there are three mosquito abatement districts within Butte County, there could *and should* be, opportunities for these districts to share facilities, equipment, personnel, and costs. This is especially important related to mosquito control services as the services address a transient nuisance that is not restricted by political boundaries.

All three districts, on a short-term basis, may be able to offer their services (staff, equipment, and expertise) to help control mosquitoes outside of Butte County in the

event of a public health emergency, such as if an outbreak of West Nile disease cases occurred. As an example, the BCMVCD may be able to provide aerial spraying services to an area outside of Butte County if another district or county needed urgent assistance to control mosquitoes.

Sharing facilities, equipment, and personnel between the three districts could result in significant cost savings. However, very little in the way of shared facilities occurs between the three districts. The BCMVCD has in the past shared costs with DMAD and OMAD to purchase bulk pesticides, repellents, mosquitofish food, and research, but this is not the normal operating procedure. These shared bulk purchases results in lower material and shipping costs and in higher staff efficiencies. BCMVCD offers and attends joint training sessions with the other two districts, and performs spray equipment characterization and calibration for the two other districts.

The three mosquito abatement districts within Butte County should endeavor to increase shared resources between the districts. Doing so would result in better operational efficiencies and in lower costs for the districts.

MSR DETERMINATION 5-1: STATUS OF, AND OPPORTUNITIES FOR, SHARED FACILITIES	
	There are many opportunities for the sharing of resources (facilities, equipment, training, and staff) between the three mosquito abatement districts within Butte County, but very little documented sharing of resources occurs. All three districts should engage in immediate and meaningful discussions to increase shared resources between the districts. The failure of the districts to effectively engage in such discussions and achieve meaningful results may cause the Commission or another local agency to initiate a formal reorganization of the three districts.

MSR FACTOR NO. 6: ACCOUNTABILITY FOR COMMUNITY SERVICE NEEDS, INCLUDING GOVERNMENTAL STRUCTURE AND OPERATIONAL EFFICIENCIES.

OMAD BOARD OF TRUSTEES

The Oroville Mosquito Abatement District is governed by a 5-member Board of Trustees. The Board of Trustees are appointed pursuant to California Health and Safety Code, Sections 2022 to 2025, with a term of office of two years. Four of the Trustees are appointed by the Butte County Board of Supervisors and one Trustee is appointed by the City of Oroville City Council. Oroville Mosquito Abatement District board members receive $75 per meeting for their service.

The Board of Trustees is responsible for setting policy and general administrative procedures for the District, establishes and regulates fees, and selection of the District Manager, who serves at the will of the Board. The policies and procedures set by the Board of Trustees are administered by the District Manager.

Regular meetings of the Oroville Mosquito Abatement District Board of Trustees are held on the third Wednesday of each month, starting at 4:00 PM. The District office/shop is

not conducive to holding meetings, so the District Board of Trustees meetings are held at the City of Oroville Council Chambers located at 1735 Montgomery Street, Oroville. The District Board of Trustees will meet at the District's new building, located at 2635 South 5th Street, Oroville, once the new building is completed. It should be noted that the OMAD Board of Trustees recently held a meeting at a location outside of the District boundaries, which is not in compliance with State law.

The public notices for the Board of Trustees meeting are posted at least 72 hours prior to the meeting at the City of Oroville Council Chambers. It should be noted that the OMAD Board of Trustees recently held a meeting that was not noticed, which is not in compliance with State law. When the District's new office/building on South 5th Street is completed, the meeting notices will be posted there. The District should create a website where meeting notices/agendas can also be posted.

The 2009/2010 Butte County Grand Jury Report reviewed the Oroville Mosquito Abatement District due to citizen complaints regarding local government actions. The Grand Jury Report observed that the District Board of Trustees was not holding regular meetings due to a lack of a quorum. The lack of a quorum was due to the appointing authorities (Butte County Board of Supervisors and Oroville City Council) not filling vacancies on the OMAD Board. This issue appears to have been resolved since there have been no known citizen complaints or concerns about the OMAD Board not holding regular meetings and there are no vacancies on the OMAD Board.

During the preparation of this MSR, LAFCo determined that two OMAD Board of Trustees were not eligible to serve on OMAD's Board because they did not reside within the boundaries of the district, as required by California Health and Safety Code §2022. On October 10, 2017, the Butte County Board of Supervisors vacated the seats of these two Trustees for not meeting the residency requirements. As of the date of this MSR, the County Board of Supervisors has not yet taken action to fill the two vacated seats.

OMAD STAFFING

While public sector management standards vary depending on the size and scope of the organization, there are minimum standards. Well-managed organizations evaluate employees annually, track employee and agency productivity, periodically review agency performance, prepare a budget before the beginning of the fiscal year, conduct periodic financial audits to safeguard the public trust, maintain relatively current financial records, conduct advanced planning for future service needs, and plan and budget for capital needs.

OMAD is managed by the District Manager, who is appointed by the OMAD Board of Trustees and serves at the will of the Board. The OMAD District Manager passed away during the preparation of this MSR and as of the date of this MSR the OMAD Board of Trustees has not filled this position. The OMAD District Manager who passed away had been with the District for over 18 years.

The District has one full-time employee – the District Manager, two seasonal personnel – an entomologist and a mosquito control assistant, and two contract personal – a bookkeeper and a clerk.

The District Manager is licensed by the California Department of Public Health to provide mosquito abatement services. The seasonal mosquito control assistant is not certified or licensed and performs work under the license of the District Manager. The District Manager's license requires continuing educational training and recertification every two years.

The management structure of OMAD is very simple and reasonable for the type of operations undertaken by the District. No alternative structures or reorganizations of staff would result in more efficient daily operations, and the existing structure is considered appropriate. It should be noted however, that if the District Manager has an extended absence for any reason such as an illness or extended vacation, the District would be effectively without leadership and services would be drastically impacted. The recent passing of the OMAD District Manager significantly impacted the ability of the District to provide vital mosquito abatement services during the mosquito season. The District Board should address this concern and adopt a contingency plan for an extended absence that may involve contractual services provided by the BCMVCD.

Only one employee of the District – the District Manager – is eligible to participate in the District's Miscellaneous Employee Pension Plan, cost-sharing multiple employer defined benefit pension plans administered by the California Public Employees' Retirement system (CalPERS). CalPERS derives its income from investments, from member contributions, and from employer contributions.

DISTRICT TRANSPARENCY

Governmental transparency promotes accountability and provides information for citizens about what their government is doing. A public agency's transparency is necessary to provide the residents of the agency a thorough knowledge of the services the agency provides, how it operates, how and by who the agency is governed, and the financial status of the agency. In short, information about a government agency should be current and easily accessible.

The District's transparency is very limited, which makes it difficult for the residents of the District to obtain information on the District. As required by State law, the District does provide notice of upcoming Board of Trustee meetings by posting a notice at the Oroville City Council Chambers where the Trustees hold their meetings. OMAD also provides one notice, published in a newspaper before the start of the mosquito season, that the District will be conducting fogging operations within the District at undetermined times (in contrast with BCMVCD which publishes each fogging event individually when it occurs). Board of Trustee meeting minutes, and other information, must be requested from the District Manager. All of these measures do require residents to make an effort to either attend District Board meetings or visit the District office. Access to the current District office is difficult because the office is located within the City of Oroville's corporation yard, which is completely fenced and requires a pass code to enter. This impediment will be removed once the District occupies its new facility on 5th Street in Oroville.

To provide for greater transparency, many special districts within California have websites that allow for easy access to district services, information and documents. Approximately 50 percent of the special districts within California have a website and the primary reasons that districts do not have a website include money, personnel, legal requirements, and no penalties for not having a website.

OMAD does not have a website, but having one would provide an avenue for the residents of the District to easily obtain important information about the District, significantly increasing the District's transparency. The District Manager has indicated that the District is in the early stages of having a website created. The District should create and maintain a website that provides, at a minimum, the following information:

- District contact information, including the names of the District Manager and Board of Trustees
- Board of Trustee meeting notices and minutes
- Board of Trustee agendas and staff reports/memorandums
- Adopted annual budget
- Financial audits/reports
- Map of the District
- A notice for each individual fogging operation
- District bylaws
- List of enterprise systems (SB 272)
- Financial Transaction Reports
- Compensation Reports
- ADA compliance

Due to cost and time considerations, the District may object to creating and maintaining a website. However, the benefits of having a website far outweigh the cost or the time it takes to maintain a website. There are numerous website designers that can create and host custom websites at a nominal monthly cost. One such website designer - Streamline™ Web – creates and hosts websites that are designed specifically for local government at a very affordable cost in the range of $1,500.[11]

Easily identifiable personnel and equipment are essential to community awareness and trust in local government. LAFCo staff visited OMAD's building and observed that at least one truck did not have the District's emblem or name on the truck doors. All District vehicles should be clearly identified as belonging to the District and personnel should wear uniforms, hats or other work wear with their names and District logo or name affixed so that the public can readily identify District vehicles and staff.

OPERATIONAL EFFICIENCIES

The District utilizes a variety of cost avoidance and facilities sharing measures in its operations. The District is a member of the Vector Control Joint Powers Agency (VCJPA). The VCJPA is a public entity formed by a joint powers agreement in accordance with the California Government Code. The purpose of this JPA is to

[11] www.getstreamline.com

provide insurance coverage to the District's real and personal property and liability coverage.

The District is a member of the Mosquito and Vector Control Association of California. This organization is comprised of 63 public agencies and provides its members with a number of valuable services, including cost avoidance opportunities relating to training services and publication materials. Other notable services offered by this organization include serving as a legislative advocate for statewide vector control and abatement issues and facilitating the exchange of service information between member agencies.

FUTURE CHALLENGES AND ISSUES TO OPERATIONAL EFFICIENCIES

As with other mosquito and vector control districts in California, OMAD faces numerous challenges and issues related to providing effective and efficient mosquito abatement service. As was discussed in more detail in MSR Factor No. 4 (Financial Ability of Agencies to Provide Services), these challenges and issues include:

- Reduction in revenues, which will result in reduced levels of service.
- The additionally cost of complying with new regulations regarding mosquito abatement operations.
- Climate change, which appears to have resulted in the migration of warmer climate mosquitoes northwards, bringing in new diseases.
- Less effective public health pesticides due to mosquito and vector populations increasing tolerance and/or resistance. New pesticides will be needed, all at a substantial cost to the District.

Governmental Structure - Reorganization

There are three mosquito abatement districts within Butte County; one very large, well-funded district (BCMVCD) that surrounds the other two much smaller districts (OMAD and DMAD). This MSR/SOI plan is an opportunity to carefully evaluate and compare each district and consider any governance restructuring scenarios that may result in improved efficiencies and public health outcomes. Scenarios include,

- The smaller districts (OMAD, DMAD) remain intact but contract all services through the BCMVCD, thus acting as a funding mechanism;
- The three districts could be consolidated into one county-wide mosquito abatement district; or
- Another approach that would result in just one county-wide abatement district would be the dissolution of the two smaller districts – DMAD and OMAD - and the annexation of those district's territory to the BCMVCD. It should be noted that BCMVCD's existing sphere of influence already encompasses the boundaries of DMAD and OMAD.

Potential positive impacts of a consolidation of the three districts may include a uniform county-wide mosquito abatement and vector control program, reduced administrative and operating costs, improved reserves, and greater public visibility, which could create an improved image of program accountability. A consolidation of the three districts would result in improved overall mosquito abatement and vector control

services to the residents of the two smaller districts (DMAD and OMAD), who would have access to greater resources and more programs.

A reorganization may also have negative impacts such as increased operational complexities, particularly in light of the difference in services and philosophy between each agency. The opportunity to reorganize the district may be affected by limited funding, inability to expand into new areas based on existing funding levels, and/or political issues, especially regarding the perceived loss of local control. Additionally, a consolidation of the three districts would require majority approval by the registered voters of all three districts, but such approval is not assured. Such governance reorganizations are not always readily accepted among affected constituents who may feel current services are adequate and who have a type of brand loyalty to their current local agency and board of directors and perhaps more importantly, local agency personnel. Additionally, the costs to prepare a consolidation study and to hold an election could be cost prohibitive and funding would need to be secured before going forward with the consolidation process. The BCMVCD Manager has indicated that BCMVCD could provide mosquito and vector control services to these areas, and which could be accomplished without the need for the current employees, assets, and facilities of both the OMAD and DMAD. With the resources, assets, and staff that BCMVCD has to offer, the BCMVCD Manager strongly believes that the protection of the public's health would increase within these two districts dramatically.

The 2004 Municipal Service Review adopted by the Commission determined that *"...reorganizing the three districts into one county-wide district would provide numerous advantages and with little to no disadvantages. There may be a slight limit of 'personalized' service in the Durham and Oroville areas, but that disadvantage is greatly outweighed by the advantages of a county-wide district with a large number of employees, regularly scheduled office hours, education and training programs, and aerial capability*."

Subsequent to adoption of the 2004 MSR, the Commission adopted Resolution No. 17 2004/05 that gave the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District a "Zero" Sphere of Influence. Pursuant to Butte LAFCo Policy 3.1.11, the Zero SOI designation indicates that one or more of the public service functions of the agency are either non-existent, inadequate, no longer needed, or should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved and that the Commission may initiate dissolution of an agency when it deems such appropriate. Resolution 17 2004/05 gave the Butte County Mosquito and Vector Control District an expanded sphere of influence, which took in the SOI of Durham Mosquito Abatement District and the Oroville Mosquito Abatement District. BCMVCD's SOI now encompasses all of Butte County and the Hamilton City area of Glenn County.

Numerous Butte County Grand Jury reports, including the most recent Grand Jury report, have included a review of one or more of the three mosquito abatement districts in the county. The following was extracted from the various Grand Jury reports regarding consolidation of the mosquito abatement districts in Butte County.

- **1971 Grand Jury Report** - *"...it is believed to be in the best interest of the entire County to eventually have all mosquito abatement controlled from one central plant, the Butte County Mosquito Abatement District*."

- **1972 Grand Jury Report** - "*The Grand Jury recommends consolidation of mosquito abatement districts into one Butte County Mosquito Abatement District.*"

- **1973-74 Grand Jury Report** - "*Previous grand juries have recommended consolidation of the three Mosquito Abatement Districts within Butte County. Research in the past years as to cost, efficiency, and tax rates show that consolidation is favorable and this Grand Jury concurs*."

- **1979-80 Grand Jury Report** - "*Observation. Until such time as the Oroville and Durham Mosquito Abatement Districts, either through their respective Boards of Directors or the people within their service areas actively seek inclusion in the larger Butte County Mosquito Abatement District, no further consideration should be given the matter. The question of merger is basically a local government decision*."

- **1980-81 Grand Jury Report** - "*Finding: Prior Grand Juries have recommended a merger of the Oroville Mosquito Abatement District with the Butte County Mosquito Abatement District. Recommendation: The committee found the Oroville Mosquito Abatement District very professionally managed with a professional dedicated employee. Cost containment was evident in all areas therefore no need or practical benefit can be seen for a merger at this time*."

- **2007-08 Grand Jury Report** - "*This Grand Jury has chosen not to make a recommendation on whether the three districts should consolidate, but to try and make the voters aware of all options. In the event of future ballot measures for additional special parcel tax assessments, voters should be aware of the consolidation alternative.*"

- **2009-10 Grand Jury Report** – "*OMAD should continue to function as an independent mosquito abatement district and should not be consolidated with another mosquito abatement district.*"

- **2016-17 Grand Jury Report** – "*Recommendation R1. The Grand Jury recommends that pending the results of the 2017 MSR, LAFCo initiate the process of consolidating OMAD and DMAD under BCMVCD.*"

  The 2016-17 Grand Jury report also stated:

  "Having three districts performing the same function in the same county brings redundancies. Each district has a board, is required to be compliant with all applicable labor and pesticide regulations, requires an annual audit, regular board meetings, budgets and bookkeepers. This encumbers each of the districts with a minimum level of costs, and the budgets of OMAD and DMAD are such that after covering the costs of these operational requirements, there is little

funding left for actual control. Effectiveness would be greatly improved by consolidating the three districts under one set of policies and one management team.

In the past, when Grand Juries have recommended consolidation, or LAFCo released their MSR in 2004 recommending the districts be consolidated, no consolidation action was taken. The Grand Jury believes this is because there was no leadership to put the recommended changes into effect. The groups that benefit most from a consolidation are the residents within the OMAD and DMAD districts, however, they may not be aware of the potential improvements and thus not motivated to petition for policy change. Under California state LAFCo policies, a petition for consolidation may be initiated by LAFCo itself. The Grand Jury recommends Butte LAFCo take this course of action pending the results of the 2017 MSR."

A reorganization of the three mosquito abatement districts into one county-wide district should be closely examined by LAFCo to determine if a reorganization would actually result in improved, more efficient, and more cost-effective comprehensive mosquito abatement and vector control services to the Durham and Oroville areas, and would result in improved public health benefits to the residents of the county as a whole. Mosquito abatement services in the Durham and Oroville areas consist primarily of the control of adult mosquitoes through fogging operations. The services provided by the Butte County Mosquito and Vector Control District are significantly more comprehensive, more effective at all aspects and stages of vector control, and more efficient than the services provided by the Durham and Oroville Mosquito Abatement Districts. This one agency approach is also supported by the City of Oroville City Council that offered the following letter to LAFCO:

Butte LAFCo
APR 05 2017
Oroville, CA

City of Oroville

COMMUNITY DEVELOPMENT DEPARTMENT

Donald Rust
DIRECTOR

1735 Montgomery Street
Oroville, CA 95965-4897
(530) 538-2401 – FAX (530) 538-2426
www.cityoforoville.org

April 4, 2017

Steve Lucas, Executive Officer
Butte County Local Agency Formation Commission
1453 Downer, Suite C
Oroville, CA 95965

RE: LETTER OF SUPPORT FOR THE CONSOLIDATION OF THE MOSQUITO ABATEMENT AND VECTOR CONTROL DISTRICTS IN THE COUNTY OF BUTTE

Dear Mr. Lucas,

The City of Oroville would like to express its support for the consolidation of the Butte County Mosquito and Vector Control District (BCMVCD), Durham Mosquito Abatement District (DMAD) and the Oroville Mosquito Abatement District (OMAD). As identified in the Statement of Written Determinations attached to Resolution No. 28 2003/04 adopted by the Butte LAFCO Commission on May 6, 2004, consolidation will help improve service efficiencies in consideration of financial constraints, provide an opportunity to better manage costs by reorganizing the three districts into one, and improve public access to the DMAD and the OMAD. The determination that the reorganization of the three districts into one county-wide district would provide numerous advantages with little to no disadvantages is supported by the City of Oroville.

If you have any questions regarding the information contained in this letter, please contact Donald Rust at (530) 538-2433 or at drust@cityoforoville.org.

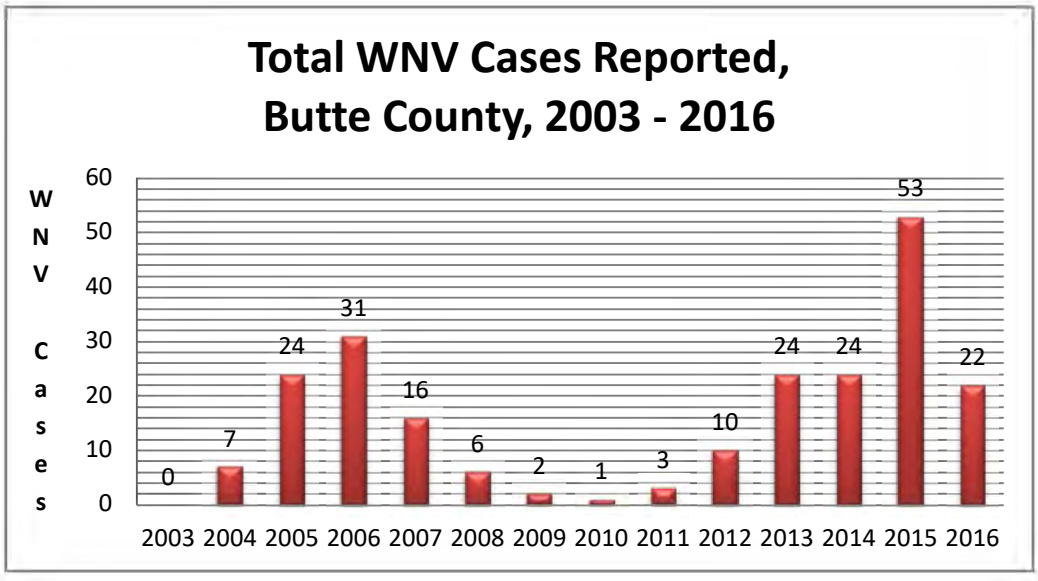
Sincerely,

Donald L. Rust, Director
Community Development Department

Page 1

The public health benefits of having only one county-wide mosquito abatement district cannot be understated as supported by comments received from the Butte County Public Health Department (DPH), Community Health and Sciences Office, in their comment letter of May 31, 2017 (Attachment A to this MSR). The DPH is very concerned about the ongoing presence of West Nile virus cases in the County and in their letter, DPH notes that Butte County consistently ranks among the state's counties with the highest West Nile virus case rates (number of cases by population). As shown on the

following chart, the number of West Nile virus cases has fluctuated significantly over the years, but Butte County has seen a larger number of cases in the last four years. As of June 26, 2017, Butte County has had no reported human cases of West Nile virus.



The DPH believes that a close working relationship with local vector control agencies is critical to their efforts to detect, monitor and prevent WNV disease, further stating that "*Having one agency to work with would likely improve efficiencies and provide a more consistent approach"* to addressing the WNV concerns.

While reorganization options are being analyzed, the OMAD Board of Trustees could contract with the Butte County Mosquito and Vector Control District to provide mosquito abatement services within OMAD's jurisdictional boundaries. In this scenario, OMAD would transfer most of the revenues it receives to BCMVCD, which in turn would use those funds to provide mosquito abatement and vector control services to the OMAD service area. BCMVCD may be reluctant to agree to this plan and this scenario may result in the elimination of OMAD's District Manager position since there may be no duties for this person to perform. In this scenario, OMAD would continue to exist and the OMAD Board of Trustees would occasionally meet to handle administrative affairs, such as approving the District's annual budget.

The recent passing of OMAD's District Manager significantly impacted the ability of the District to provide mosquito abatement services during the mosquito season. The District Manager's passing left the District basically unmanaged as there was no other District staff to perform the district manager duties, which included performing fogging operations. As of the date of this MSR, the OMAD Board of Trustees has not filled the District Manager position. The District Manager for the Durham Mosquito Abatement District did perform some duties for OMAD in an attempt to keep the District functioning. The District Manager for the Butte Mosquito and Vector Control District offered his assistance to the OMAD Board of Trustees.

In light of the recent death of the OMAD District Manager (which has significantly impacted the District operations), the inability of the District to complete require financial reports for numerous years, and the recent removal of two OMAD Board of Trustees due to residency requirements, it is increasingly clear that the administrative and the organizational and service capacity of OMAD is seriously impacted. These problems provide amble evidence that OMAD should be dissolved and their service area annexed to the Butte County Mosquito and Vector Control District, which clearly has the capability to provide efficient and effective mosquito abatement services to the Oroville area.

The BCMVCD Board of Trustees recently gave permission to their District Manager to discuss a contractual arrangement with OMAD's attorney. If approved by both Districts, the contractual arrangement would provide for BCMVCD to provide mosquito abatement services with OMAD's service area. OMAD would provide funding to BCMVCD to perform these services. The contractual agreement appears to be a reasonable way for effective mosquito abatement services to be provided to the Oroville area. However, the contractual agreement should only be a short-term measure, with dissolution of OMAD and annexation of their service area to BCMVCD being the ultimate goal.

MSR DETERMINATION 6-1: GOVERNMENTAL STRUCTURE	
	OMAD is governed by a five-member Board of Trustees, four of whom are appointed by the Butte County Board of Supervisors and one appointed by the City of Oroville City County. OMAD holds meetings that are open and accessible to the public. OMAD maintains accountability and compliance in its governance, and public meetings appear to be held in compliance with Brown Act requirements.

MSR DETERMINATION 6-2: GOVERNMENTAL STRUCTURE	
	The District has a single full-time employee – the District Manager - who is responsible to manage all District functions. If the District Manager has an extended absence for any reason such as an illness or vacation, the District would be effectively without leadership, and services would be drastically impacted. The District Board should address this concern and adopt a contingency plan for an extended absence that may involve contractual services provided by the BCMVCD.

MSR DETERMINATION 6-3: TRANSPARENCY - WEBSITE	
	The Oroville Mosquito Abatement District does not have a website, but is also not required to have one by law. Regardless, a website would allow the District to post District contact information, public meeting notices, Board of Trustee meeting minutes, financial documents (budgets, audits), and fogging notices and maps, greatly increasing the District's transparency. The District should create and maintain a comprehensive website.

MSR DETERMINATION 6-4: TRANSPARENCY – FOGGING NOTICES	
	The Oroville Mosquito Abatement District does not provide notification to the public of each insecticide fogging operation and instead, as allowed by State law, publishes a notice of fogging operations prior to the beginning of the mosquito season. For the benefit of the residents within the District, the District should consider providing email, text and website notification of each fogging application.

MSR DETERMINATION 6-5: TRANSPARENCY – IDENTIFICATION OF DISTRICT VEHICLES	
	The Oroville Mosquito Abatement District should ensure that all District vehicles be clearly identified as belonging to the District and that district personnel wear uniforms or other work wear with their names and District logo or name affixed so that the public can readily identify District vehicles and staff.

MSR DETERMINATION 6-6: OPERATIONAL EFFICIENCIES	
	The Oroville Mosquito Abatement District operates with a full-time staff of one – the District Manager, two seasonal employees (an entomologist and a mosquito control assistant), and two contract personal (a bookkeeper and a clerk). The overall management structure of OMAD is sufficient to perform mosquito abatement services to the more population areas of the District.

MSR DETERMINATION 6-7: FUTURE CHALLENGES TO OPERATIONAL EFFICIENCIES	
	The District faces numerous challenges to continue to provide effective mosquito abatement services to the residents of the District. Loss of revenue, new regulations, climate change, and resistance to existing pesticides are some of the more significant challenges the District faces, which will have a significant effect on the level of services the District currently provides. Due to these issues, there will be a greater need for the services the District provides in the coming years, which may require additional District staffing, equipment, and insecticides, all at substantial additional cost to the District. In all likelihood, the District will need to obtain additional sources of revenue in order to continue to provide effective mosquito abatement services to the residents of the District.

MSR DETERMINATION 6-8: REORGANIZATION	
	The 2004 Municipal Service Review for Mosquito Abatement Districts in Butte County, numerous Butte County Grand Jury reports, including the most recent Grand Jury report (Fiscal Year 2016-17) released on May 19, 2017, the April 17, 2017, letter from the City of Oroville and the May 30, 2017, letter from the Butte County Public Health Department all suggest or acknowledge the value reorganizing the three mosquito abatement districts into one county-wide district would provide numerous advantages and with little to no disadvantages.

MSR DETERMINATION 6-9: REORGANIZATION	
	Commission Resolution No. 17 2004/05 gave the Durham Mosquito Abatement District and the Oroville Mosquito Abatement District "Zero" Sphere of Influences. At the same time, the Commission expanded the Sphere of Influence for the Butte County Mosquito and Vector Control District to encompass the boundaries of the Durham and Oroville Mosquito Abatement Districts. The Zero SOI designation indicates that one or more of the public service functions of the agency are either non-existent, inadequate, no longer needed, or should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved and that the Commission may initiate dissolution of an agency when it deems such appropriate

MSR DETERMINATION 6-10: REORGANIZATION	
	Potential positive impacts of a reorganization of the three mosquito abatement districts may include a uniform county-wide mosquito abatement and vector control program, reduced administrative and operating costs, improved reserves, greater public visibility, and improved public health benefits.

MSR DETERMINATION 6-11: DISSOLUTION	
	In light of the recent death of the OMAD District Manager (which has significantly impacted the District operations), the inability of the District to complete require financial reports for numerous years, and the recent removal of two OMAD Board of Trustees due to residency requirements, it is increasingly clear that the administrative and the organizational and service capacity of OMAD is seriously impacted. These problems provide amble signs that show that OMAD should be dissolved and their service area annexed to the Butte County Mosquito and Vector Control District, which clearly has the capability to provide efficient and effective mosquito abatement services to the Oroville area.

MSR FACTOR NO. 7: ANY OTHER MATTER RELATED TO EFFECTIVE OR EFFICIENT SERVICE DELIVERY, AS REQUIRED BY COMMISSION POLICY.

None.

SPHERE OF INFLUENCE PLAN REVIEW FACTORS FOR THE OROVILLE MOSQUITO ABATEMENT DISTRICT

There are numerous factors to consider in reviewing an SOI Plan, including current and anticipated land uses, facilities, and services, as well as any relevant communities of interest. Updates generally involve a comprehensive review of the entire SOI Plan, including boundary and SOI maps and the District's MSR. In reviewing an agency's sphere, the Commission is required to consider and prepare written statements addressing five factors enumerated under California Government Code Section 56425(e), as listed below.

1. The present and planned land uses in the area, including agricultural and open space lands;
2. The present and probable need for public facilities and services in the area;
3. The present capacity of public facilities and adequacy of public services which the agency provides, or is authorized to provide; and
4. The existence of any social or economic communities of interest in the area if the commission determines that they are relevant to the agency.
5. For an update of an SOI of a city or special district that provides public facilities or services related to sewers, municipal and industrial water, or structural fire protection, the present and probable need for those public facilities and services of any disadvantaged unincorporated communities within the existing sphere of influence.

As was noted previously, the Oroville Mosquito Abatement District has a "Zero" Sphere of Influence boundary. In 2005, the Commission adopted Resolution No. 17 2004/05 that gave the Oroville Mosquito Abatement District and the Durham Mosquito Abatement District a Zero Sphere of Influence. Pursuant to Butte LAFCo Policy 3.1.11, the Zero SOI designation indicates that one or more of the public service functions of the agency are either non-existent, inadequate, no longer needed, or should be reallocated to some other agency of government. Adoption of a "zero" sphere indicates the agency should ultimately be reorganized or dissolved and that the Commission may initiate dissolution of an agency when it deems such appropriate. Resolution 17 2004/05 gave the Butte County Mosquito and Vector Control District an expanded sphere of influence, which took in the SOI of the Oroville Mosquito Abatement District and the Durham Mosquito Abatement District and BCMVCD's SOI now encompasses all of Butte County.

SOI FACTOR NO. 1: THE PRESENT AND PLANNED LAND USES IN THE AREA, INCLUDING AGRICULTURAL AND OPEN-SPACE LANDS.

OMAD's jurisdictional boundaries consist of a large portion of the City of Oroville and the unincorporated community of Thermalito. Land uses within the District include single-family residential uses, multi-family residential uses, commercial uses, industrial uses, and public uses. Agricultural uses within the District are limited, consisting mostly of small orchards and a few pastures. The District contains a large number of publically

owned parcels that are used for recreational purposes or for State water project purposes and represent significant mosquito breeding habitat.

Development potential within the District is highly feasible given that a large portion of the District is designated for residential, commercial, and industrial uses at urban densities. Additionally, most of the District is located within the boundaries of the City of Oroville, the Lake Oroville Area Public Utility District, and/or the Thermalito Water and Sewer District, all of which provide sanitary sewer service to the parcels within their jurisdiction. The provision of sanitary sewer service facilitates development at urban densities.

SOI DETERMINATION 1-1: PRESENT AND PLANNED LAND USES	
	Land uses with the boundaries of the Oroville Mosquito Abatement District include residential, commercial, industrial, public, and a few agricultural uses. Future growth within the boundaries of the District is expected to occur primarily within the boundaries of the City of Oroville and the unincorporated Thermalito area. The provision of mosquito abatement services has no impact on existing or future land uses within the District, including agricultural uses.

SOI FACTOR NO. 2: THE PRESENT AND PROBABLE NEED FOR PUBLIC FACILITIES AND SERVICES IN THE AREA.

The Oroville Mosquito Abatement District provides vital and necessary mosquito abatement services to the greater Oroville area. The District's services are aimed primarily at reducing large populations of adult mosquitoes to prevent them from becoming a nuisance and a threat to public health. The mosquito abatement services the District provides does reduce the potential for mosquito-borne diseases affecting area residents.

SOI DETERMINATION 2-1: THE PRESENT AND PROBABLE NEED FOR PUBLIC FACILITIES AND SERVICES IN THE AREA	
	OMAD provides vital and necessary mosquito abatement services to the residents of the District. The District's services are crucial to the prevention of significant mosquito populations and the prevention of mosquito-borne diseases.

SOI FACTOR NO. 3: THE PRESENT CAPACITY OF PUBLIC FACILITIES AND ADEQUACY OF PUBLIC SERVICES THAT THE AGENCY PROVIDES OR IS AUTHORIZED TO PROVIDE.

As presented in MSR Factor No. 3 (Present and planned capacity of public facilities, adequacy of public services, and infrastructure needs or deficiencies) the Oroville Mosquito Abatement District has adequate facilities, equipment, staff, and funding to provide basic, but adequate levels of mosquito abatement services to the residents of their district.

SOI DETERMINATION 3-1: PRESENT CAPACITY OF PUBLIC FACILITIES AND ADEQUACY OF PUBLIC SERVICES	
	The Oroville Mosquito Abatement District has adequate facilities, equipment, staff, and funding to provide basic mosquito abatement services to the residents of the District.

SOI DETERMINATION 3-2: PRESENT CAPACITY OF PUBLIC FACILITIES AND ADEQUACY OF PUBLIC SERVICES	
	The residents of the greater Oroville urban area would be provided enhanced comprehensive mosquito abatement and vector control services if provided by the Butte County Mosquito and Vector Control District, which presently surrounds the Oroville Mosquito Abatement District.

SOI FACTOR NO. 4: THE EXISTENCE OF ANY SOCIAL OR ECONOMIC COMMUNITIES OF INTEREST IN THE AREA IF THE COMMISSION DETERMINES THAT THEY ARE RELEVANT TO THE AGENCY.

OMAD's jurisdictional boundaries consist of the greater Oroville area, which includes a large portion of the City of Oroville and the surrounding area, including the unincorporated community of Thermalito.

SOI DETERMINATION 4-1: EXISTENCE OF ANY SOCIAL OR ECONOMIC COMMUNITIES OF INTEREST IN THE AREA	
	The jurisdictional boundaries of the Oroville Mosquito Abatement District includes a large portion of the City of Oroville and the unincorporated urban community of Thermalito.

SOI FACTOR NO. 5: ***FOR AN UPDATE OF A SPHERE OF INFLUENCE OF A CITY OR SPECIAL DISTRICT THAT PROVIDES PUBLIC FACILITIES OR SERVICES RELATED TO SEWERS, MUNICIPAL AND INDUSTRIAL WATER, OR STRUCTURAL FIRE PROTECTION, THAT OCCURS PURSUANT TO SUBDIVISION (G) ON OR AFTER JULY 1, 2012, THE PRESENT AND PROBABLE NEED FOR THOSE PUBLIC FACILITIES AND SERVICES OF ANY DISADVANTAGED UNINCORPORATED COMMUNITIES WITHIN THE EXISTING SPHERE OF INFLUENCE.***

The Oroville Mosquito Abatement District does not provide public facilities or services related to sewers, municipal and industrial water, or structural fire protection.

SOI DETERMINATION 5-1: DISADVANTAGED UNINCORPORATED COMMUNITIES	
	The Oroville Mosquito Abatement District does not provide public facilities or services related to sewers, municipal and industrial water, or structural fire protection.

Sphere of Influence Findings and Recommendations

Based on the MSR and SOI determinations contained in this document, the Commission:

1. Finds that the Oroville Mosquito Abatement District provides basic mosquito abatement services to only the more populated areas of the District.

2. Finds that in 2005 the Commission gave the Oroville Mosquito Abatement District a Zero Sphere of Influence boundary for many of the same reasons identified in this MSR and that there have been no substantial changes to the services provided by the District in 2017.

3. Affirms the existing Zero Sphere of Influence boundary for the Oroville Mosquito Abatement District as shown on the Sphere of Influence map on page 4-2 as an indication that the District does not have the capability to provide comprehensive mosquito abatement services to all areas within its current territory.

4. Finds that the 2004 Mosquito and Vector Control District Municipal Service Review determined that the three mosquito abatement districts in Butte County should be consolidated.

5. Finds that the 2016-17 Butte County Grand Jury determined that the Butte County Mosquito and Vector Control District, the Durham Mosquito Abatement District, and the Oroville Mosquito Abatement District should be consolidated into one district.

6. Finds that the residents of the Oroville Mosquito Abatement District would be provided more effective, efficient, and comprehensive mosquito abatement

and vector control services by the Butte County Mosquito and Vector Control District, which presently surrounds the Oroville Mosquito Abatement District.

7. Concurs with the Butte County Department of Public Health's observations contained above and finds that the public health of the residents of the Oroville Mosquito Abatement District, as well as the residents of Butte County as a whole, would be better protected from mosquito infestations by the Butte County Mosquito and Vector Control District, which has effective, efficient, and comprehensive mosquito abatement and vector control programs.

8. Finds the Oroville Mosquito Abatement District should be dissolved, and the area subsequently annexed to the Butte County Mosquito and Vector Control District, or consolidated with the Butte County Mosquito and Vector Control District.

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5.0 - ADOPTING RESOLUTION

RESOLUTION NO. 02 2017/18

ADOPTION OF MOSQUITO ABATEMENT DISTRICTS MUNICIPAL SERVICE REVIEWS AND WRITTEN DETERMINATIONS, AND ADOPTION OF SPHERE OF INFLUENCE PLANS

WHEREAS, a municipal service review mandated by Government Code Section 56430 and a sphere of influence update mandated by Government Code Section 56425 for the three mosquito abatement districts within the County of Butte have been conducted by the Local Agency Formation Commission of the County of Butte (hereinafter referred to as "the Commission") in accordance with the Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000 (Government Code Sections 56000 et seq.); and

WHEREAS, at the times and in the form and manner provided by law, the Executive Officer has given notice of the public hearing by the Commission on this matter; and,

WHEREAS, the Executive Officer, pursuant to Government Code Section 56428 and 56430, has reviewed this proposal and prepared a report, including his recommendations thereon, and has furnished a copy of this report to each person entitled to a copy; and

WHEREAS, this Commission held public hearings regarding the Public Review Draft Mosquito Abatement Districts Municipal Service Reviews/Sphere of Influence Plans on August 3, September 7, October 5, November 2, and December 7, 2017, and at the time and place specified in the notice of public hearing and as continued open by the Commission; and

WHEREAS, at the above noted hearings, this Commission heard and received all oral and written protests; the Commission considered all plans and proposed sphere of influence amendments, objections and evidence which were made, presented, or filed; and all persons present were given an opportunity to hear and be heard in respect to any matter relating to the proposal, in evidence presented at the hearing; and

WHEREAS, acting as Lead Agency pursuant to the California Environmental Quality Act (CEQA) Guidelines, the Commission finds that the Mosquito Abatement Districts Municipal Service Reviews/Sphere of Influence Plans are Categorically Exempt from the provisions of CEQA under Section 15306, "Information Collection" and under Categorically Exempt from the provisions of CEQA under Section15061(b)(3) – General Rule Exemption, respectively; and

WHEREAS, Municipal Service Review determinations for each Mosquito Abatement District are made in conformance with Government Code Section 56430 and local Commission policy; and

WHEREAS, Sphere of Influence determinations for each Mosquito Abatement District are made in conformance with Government Code Section 56425 and local Commission policy; and

WHEREAS, based on presently existing evidence, facts, and circumstances considered by this Commission, including the findings as outlined above, the Commission adopts written determinations as set forth. No changes to the Butte County Mosquito and Vector Control District's existing Sphere of Influence boundary is proposed and the Oroville Mosquito

Abatement District shall continue to have a Zero Sphere of Influence boundary. The Commission grants a Probationary Sphere of Influence boundary to the Durham Mosquito Abatement District as shown in the DMAD MSR section and as shown in the staff memorandum for the Commission's December 7, 2017, meeting. The Probationary Sphere of Influence boundary for the Durham Mosquito Abatement District is subject to the following conditions:

1. The Durham Mosquito Abatement District shall adopt a comprehensive integrated pest management program within six months of the Commission's approval of the Mosquito Abatement Districts Municipal Service Reviews/Sphere of Influence Plans. The Durham Mosquito Abatement District shall continuously implement the provisions of the adopted integrated pest management program;
2. The Durham Mosquito Abatement District shall create a comprehensive website within six months of the Commission's approval of the Mosquito Abatement Districts Municipal Service Reviews/Sphere of Influence Plans. The Durham Mosquito Abatement District shall keep the website current;
3. Within two (2) months of Commission's adoption of the Mosquito Abatement Districts Municipal Service Reviews/Sphere of Influence Plans, the Durham Mosquito Abatement District and/or the Butte County Mosquito and Vector Control District shall submit an application to LAFCo to detach the rice field area of the Durham Mosquito Abatement District from that district and annex the rice field area to the Butte County Mosquito and Vector Control District.
4. The Probationary Sphere of Influence shall be for a period of one year from the date of adoption of the Mosquito Abatement District's Municipal Service Reviews/Sphere of Influence Plans.
5. At the end of the one year period, or sooner at the direction of the Commission, the Commission shall review the service provisions of the Durham Mosquito Abatement District to ensure that the District has adopted and implemented the comprehensive integrated pest management program and has created and maintained a comprehensive website. Should the Commission determine that the District has adequately implemented these measures, the Commission may give the District a traditional Coterminous Sphere of Influence boundary. Should the Commission determine that the District has not adequately followed through with these measures and/or determine that District services are inadequate, the Commission can remove the Probationary Sphere of Influence and give the District a Zero Sphere of Influence.
6. During the probationary period, the Butte County Mosquito and Vector Control District and the Durham Mosquito Abatement District will have an overlapping Sphere of Influence boundary. Should the Commission give the Durham Mosquito Abatement District a coterminous Sphere of Influence boundary, the Sphere of Influence boundary for the Butte County Mosquito and Vector Control District shall be modified to remove the overlapping Sphere of Influence area.

NOW, THEREFORE, BE IT RESOLVED, that pursuant to powers provided in §56425 and §56430 of the Cortese-Knox-Hertzberg Local Government Reorganization Act of 2000, the Local Agency Formation Commission of the County of Butte adopts written determinations as set forth in the Mosquito Abatement District Municipal Service Reviews and Sphere of Influence Plans, dated November 27, 2017, and adopts the Mosquito Abatement District Municipal Service Reviews and Sphere of Influence Plans, adopted by the Commission on December 7, 2017.

PASSED AND ADOPTED by this Local Agency Formation Commission of the County of Butte, on the 7th day of December 2017 by the following vote:

AYES: Commissioners Lotter, Onken, Connelly, Lando, Dahlmeier, Lambert & Chair Leverenz

NOES: None

ABSENT: None

ABSTAINS: None

ATTEST:

Clerk of the Commission

CARL LEVERENZ, Chair
Butte Local Agency Formation Commission

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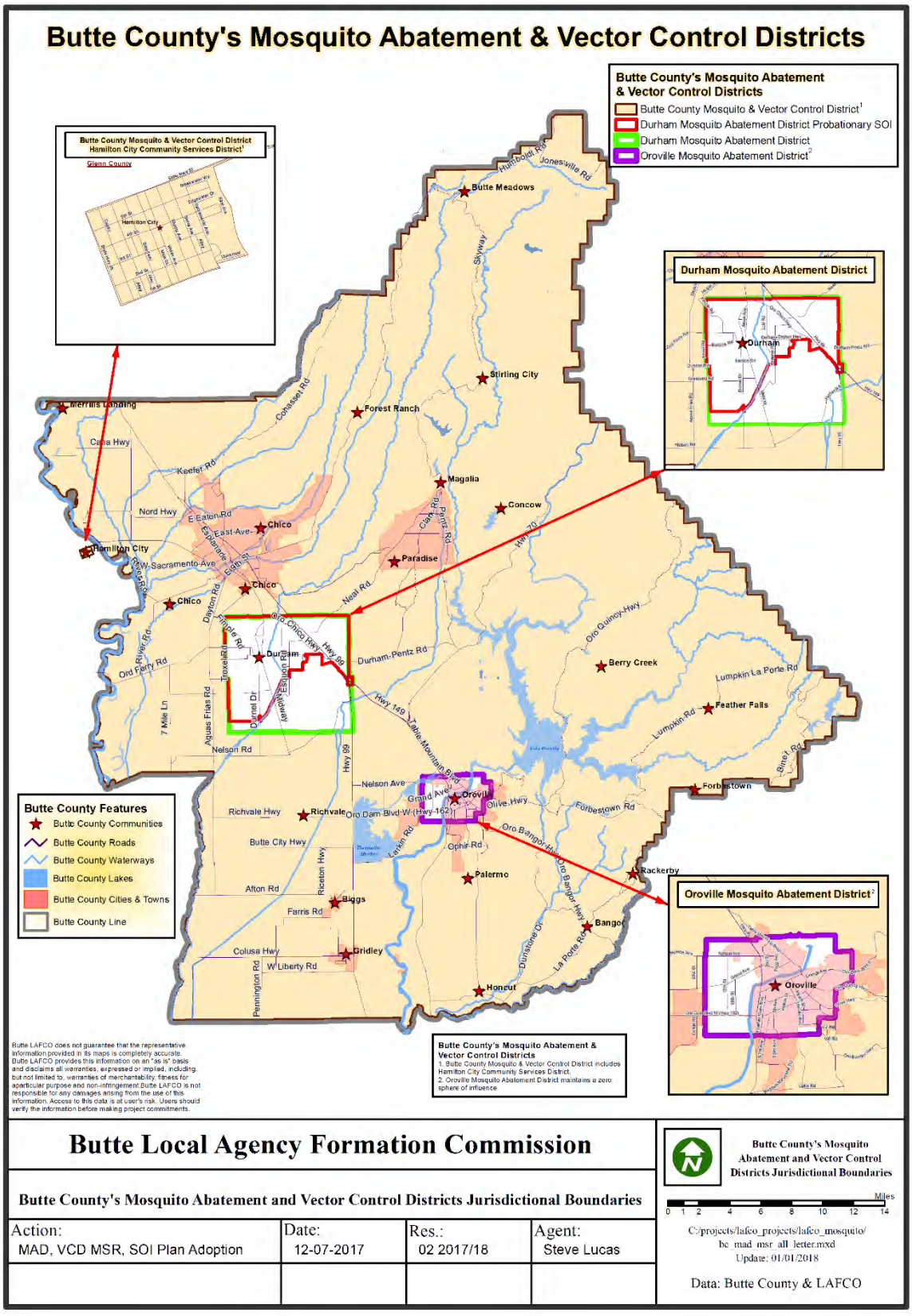
6.0 - SPHERE OF INFLUENCE MAP



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SECTION 7.0 - COMMENTS RECEIVED

Butte County Mosquito and Vector Control District

5117 Larkin Road • Oroville, CA 95965-9250
Phone: 530-533-6038 • Fax: 530-534-9916
www.BCMVCD.com

Matthew C. Ball
Manager

July 24, 2017

Stephen Betts
Deputy Executive Officer
Butte Local Agency Formation Commission (LAFCo)
1453 Downer St., Suite C, Oroville, CA 95965-4950

Dear Mr. Betts,

I have reviewed the Public Review Draft MSR/SOI Plan for the Mosquito Abatement Districts within Butte County: Butte County Mosquito and Vector Control District, Durham Mosquito Abatement District, and Oroville Mosquito Abatement District. This letter is intended to provide clarification to various areas of the MSR/SOI Plan.

On page 1-3, the District is reported to receive in excess of $3.5 million and expenditures in excess of $4.3 million. The District never anticipates spending Appropriations for Contingencies, and if the District's expenditures exceed revenues it is due to allocating and transferring allocated reserves to Special Services and/or Capital for projects for which the District has planned.

On page 1-5, the Plan states, *"...reorganizing the three districts into one county-wide district would provide numerous advantages and with little to no disadvantages. There may be a slight limit of 'personalized' service in the Durham and Oroville areas, but that disadvantage is greatly outweighed by the advantages of a county-wide district with a large number of employees, regularly scheduled office hours, education and training programs, and aerial capability."* The District argues that there would be no limit of 'personalized' service. In 2016 the District has record of completing 2,142 resident generated service requests. The District personally services each resident that requests service regardless of location within the service area and this is usually completed in less than three days.

On page 1-19, the Plan states that as of April 28, 2016, there has been no local transmission of Zika virus in the continental United States. However, several months after April 2016, two Zika outbreaks occurred in Florida and local transmission is also believed to have occurred in Texas. 224 cases acquired through presumed local mosquito-borne transmission in Florida (N=218) and Texas (N=6). In 2016, California had 421 symptomatic imported human Zika infections and to date in 2017, 17. With the detections of several *Aedes* spp. in 11 California counties (and growing), Zika is becoming a greater concern to California. The District has continued to expand and enhance its surveillance system to identify these new invasive mosquito species (*Aedes agyepti* and *Aedes albopictus*) in California. The District's hope is to identify these species early on, before they can become established. Once established, eradication efforts have

been extremely costly and have yielded poor results in other parts of California. The key to lowering the risks of Zika virus, chikungunya virus, yellow fever, and dengue fever are to keep these two species of mosquitoes out of Butte County.

On page 1-24, the District Manager still agrees that the District could provide mosquito and vector control services to the areas DMAD and OMAD without the need for the current employees, assets, and facilities of DMAD and OMAD. With the resources, assets, and staff that the District can offer, the District strongly believes that the protection of the public's health versus mosquito-borne disease would increase within the service areas of DMAD and OMAD.

On page 1-30, the Plan states, *"at the very minimum, the three mosquito abatement districts should fully cooperate with each other, and share facilities, equipment, personnel, and costs, to ensure that mosquito abatement services are provided effectively, equally and efficiently to all residents of Butte County. This level of cooperation/coordination should begin immediately with regularly scheduled coordination meetings between the District managers."* The District has offered to assist DMAD and OMAD in the past and will continue to offer assistance when and where applicable and feasible. The District has offered to create fog maps, aerial surveillance at a reduced cost, trap construction, training opportunities, and aerial ULV for reduced costs. The District has and continues to submit all of the dead birds in the county as DMAD and OMAD stopped participating in the states dead bird program. The District does not understand how to share facilities, equipment, personnel, and costs any further than what has already transpired and/or been offered. The District's tax dollars are to be used for the betterment and public health protection of the tax payers of the Butte County Mosquito and Vector Control District. Equipment, personnel and costs are used to provide the services of the District to the District's service area. The sharing of facilities is not currently covered by the District's general and liability insurance. The District would prefer to not assume added liability for the storage and/or use of the District's facilities. The District has been, and remains, a partner that will assist DMAD, OMAD, and other regional MVCDs in the time of emergency for a vector-borne disease outbreak.

On page 2-27, the Plan states the District received $652,729 in revenues from the RDA residual pass through. *"It should be noted that the revenue from the RDA residual pass through funds received by the District in FY 2015-16 was significantly greater than that received in the three prior fiscal years, when $351,004, $361,199, and $383,754 was received."* This is correct. The District received two installments on the same fiscal year when the RDAs were abolished. This was a one-time revenue source and the District does not anticipate this happening again.

On page 2-35, opportunity of shared resources and facilities: the District has and will continue to offer expertise, advice, and some services mentioned above for free and/or at a reduced cost. As mentioned before, the District's tax dollars are to be used for the betterment and public health protection of the tax payers of the Butte County Mosquito and Vector Control District.

On page 2-36, *"The District Board of Trustees recently approved switching the Board meeting packets from paper to electronic format and the District is currently in the process of purchasing tablet computers for this purpose. Switching to the electronic meeting packets will reduce staff time in preparing the Board meeting packets and will reduce costs as no paper or photocopying will be required."* After some discussion and issues ordering the tablets, the Board agreed to switch back to paper Board meeting packets at the June 14, 2017, Regular Meeting of the Board of Trustees.

On page 4-12, the District adamantly disagrees with the statement, *"which operates at a county-wide level and cannot reasonably and immediately respond to each and every inquiry for service."* As stated before, the District responds to each and every request regardless of location, usually completing the request within three business days.

The Butte County Mosquito and Vector Control District Board of Trustees has maintained the same position in regards to consolidation for over 40 years. The Trustees do not wish to require residents of the other districts to join the Butte County Mosquito and Vector Control District, unless they voted to do so, or the districts were dissolved or eliminated by their trustees or residents. This opinion remains in force today.

The District thanks you for this opportunity to comment on the Public Review Draft and MSR/SOI Plan for the Mosquito Abatement Districts within Butte County. Should you have any questions, please do not hesitate to contact me.

Respectfully,

Matthew C. Ball
District Manager

Page 3-1
Area Served:
3. District Size: 64 Square Miles

Page 3-3
1st Paragraph:
64 Square Miles

Page 3-4
1st Paragraph
DMAD not OMAD

Page 3-5
MSR Factor No. 1:
Acreage doesn't add up:
34,500 acres in Agriculture
12,200 (orchard Crops) + 9,000 (rice) + 6,650 (grazing) = 27,850. Even if you add the 900 Acres in Wetlands this only comes to 28,750.
64 square miles = 40,960 in Acreage. Less the urban number you provide of 1,195 = 39,765.

Page 3-6 Last paragraph – we are unincorporated

Page 3-8 Facilities:
Meetings were and could still be held in our building

Page 3-10
We do treat rice fields by adulticiding them.

Page 3-11
Paragraph 3- Given the District's very limited funding.
Since our assessments in 2004 this statement is no longer true

Page 3-12
Paragraph 2 - When the mosquito activity is high between March through October the district tries to go down every populated street and least once per week. Every resident in the district will be covered sometime throughout the year. Even the most rural and remote ones will be covered.

Page 3-12
Paragraph 3- Because DMAD does treat the rice fields, it is addressing the root cause.

Page 3-14 – Paragraph 4 - the statement that rice is not being treated is factually wrong. The district does treat rice fields we just don't larvacide them. We fog the rice and the borders of the rice fields killing as many adults before they come north to populated areas.

Page 3-15 – MSR Determination 3-4
See Notes from page 3-14 Paragraph 4

Page 3-18 – Expenditure for DMAD not BCMVCD
On the Graph the years of 2012-13, 2013-14 and 2014-15 revenue is incorrect and does not match the revenue stated on page 3-22

Page 3-23 Net Pension Liability (CalPERS)
Paragraph 1- DMAD not OMAD (last sentence).

Page 3-29 – The District has implemented all deficiencies and it should be noted that even though the audit showed problems with the bookkeeping methods, there was not any loss of money or evidence of fraud.
Paragraph 3 – The District has no control over the Financial Reports created by the County. There is a QuickBooks file that is kept at the Bookkeeper's office that has detail about the amounts paid for the pension plan. The LACFO representative did not ask to see these books. These books are submitted to the CPA firm doing the audit to make sure all balances with the county financial statements. There have not been any issues reported about the QuickBooks file.

Page 3-30 – Paragraph 2 – This issues will affect all three districts equally

Page 3-31 – MSR Determination 4-5 – This has been implemented, the District is conducting audits every two years, just completed 2015/2016 and 2016/2017.

Page 3-32 – MSR Factor No. 5

The BCMVD does not share costs with DMAD. They do not perform spray equipment characterization or calibration for DMAD. DMAD carries out its own calibration in consultation with the adulticide vendor.

Last paragraph: The goal of mosquito abatement is to control mosquitoes and minimize disease. To that end, rather than spread BCMVC even thinner than it already is, let us maximize the strengths of all three mosquito abatement districts. DMAD should spray all of Butte Creek Country Club as well as Dayton. DMAD is better suited to spray these two areas by virtue of the proximity of DMAD to both. Indeed DMAD already sprays all of Butte Creek CC and Dayton is less than a 10 minute drive from Durham. In return BCMVC should control all the area encompassed by Rancho Esquon.

Page 3-33 – Paragraph 1 – Arce should be Acre at the end of Line 2

BCMVCD does aerial spray the 900 acre wetlands area on Esquon Ranch. They were willing to do it at cost and no markup like a private business would do. We could have taken care of it but in the best interest of the landowner and saving him money. It should be made a note that they are defiantly reimbursed for there activities on the wetlands.

Page 3-33 – MSR Determination 5-1 –

We do work with each other. There is much more cooperation between the districts than indicated in the opinion.

Page 3-36 – paragraph 2 –

The Vehicle does have an emblem on their trucks. When LAFCO visited, the truck had just been washed and the magnetic sign had not been put back on yet as the truck was drying.

Page 3-37 - Governmental Structure – Reorganization – See Page 3-32 Last Paragraph

District Boundary Changes – DMAD would like to do a line swap with BCMVCD.

Page 3-38 – Paragraph 1

This report is a report by LAFCO and their findings and opinions. Not a report by the BCMVCD Manager – why is his opinion stated here?

Page 3-39 Paragraph 1

60% of our expenditures goes to actual control.

Page 3-41 – Paragraph 1

DMAD provides a service to the Durham residents that BCMVCD could not – community networking, a presence and responsiveness in the community. This scenario would not be one the Town of Durham would be happy about.

Page 3-41 MSR Determination 6-2

The Temporary help that is employed by the District has been trained to run the abatement portion of the Manager's job in his absence. The Bookkeeper has been trained to handle issues with the County and State regarding our licensing and budgeting. If the Manager had to be replaced, the District could be managed temporarily until a replacement was found.

Page 3-42 – MSR Determination 6-8

This determination will affect all three Districts equally. But, Property values in Durham are more likely to remain stable than in other parts of Butte County. Should property values reduce in Butte County, DMAD would lose less revenue than BCMVC because property values are more stable in Durham.

Page 3-43 –MSR Determination 6-11

The LAFCO report suggested that there would be greater public visibility, and improved public health benefits. It would actually be quite the opposite. People in the Durham area observe mosquito control a regular basis. Further, it would be difficult to find one resident who does not know the DMAD regularly sprays. DMAD prides itself on that. DMAD wants the residents of the District to not just perceive, but know that they are getting the most care and control for their investment. Indeed, there are large portions of areas outside of the DMAD area that do not know what mosquito control is nor have they ever seen someone working. That is because these areas are "serviced" by BCMVCD which has a very large area with far fewer personnel on the ground per sq mile than does DMAD. BCMVD also refuses to spray the most heavily populated areas due to fear of public backlash and as a result has the highest number of West Nile Virus cases (85, figure on page 3-13). The city of Chico is rarely ever fogged because of public opinion of them. DMAD does not have this problem. Durham residents welcome our spray rigs and want us to come by to treat for mosquitoes.

Page 3-48 –

SOI Factor No. 2 The report says that DMAD does not treat the rice fields. This is completely inaccurate. DMAD treats the rice fields with adulticide.

Page 3-49 –

Again, DMAD does indeed treat the rice fields. DMAD does not use aerial treatment

Page 3-50 –

The report states that DMAD provides only basic service... That statement is inaccurate. DMAD covers not only the populated areas, but also the peripheral areas of Rancho Esquon (as stated above).

As suggested above, the three districts can play to their strengths. Because BCMVC has planes and DMAD does not, perhaps the best solution is for the boundaries to be shifted such that BCMVC can aerially spray the wetlands and rice fields of Rancho Esquon while DMAD can spray both Dayton and all of Butte Creek Country club, both of which DMAD is more capable of doing than BCMVC.

From: Lori Murasko [redacted]
Sent: Wednesday, June 14, 2017 11:01 AM
To: Lucas, Steve
Subject: Mosquito Abatement

Hello Mr Lucas,

My name is Lori Murasko, and I have been a resident of Durham for over 15 years. I strongly feel that Durham Mosquito Abatement should remain separate from the rest of the county.

Thank you,
Lori Murasko

From: Michelle Paris [redacted]
Sent: Wednesday, June 14, 2017 10:53 AM
To: Lucas, Steve
Subject: Durham Mosquito Abatement

Dear Mr. Lucas,

We would like to see Durham Mosquito Abatement kept separate from the rest of the county. The District does a great job keeping mosquito levels down and are very responsive to community needs. Please don't change a thing.

Michelle and Bill Paris
Durham Residents

Sent from my iPhone

From: Melissa Shuler [redacted]
Sent: Wednesday, June 28, 2017 2:28 AM
To: Lucas, Steve
Subject: Durham mosquito abatement

Mr.Lucas, I cannot tell you how important it is to the residents of Durham to keep services exactly how they are. I have spoken to many of the residents who whole heartedly agree. Butte Creek has been my back yard for the last 20 years. The guys at the abatement office are wonderful in the fact that they have done a fantastic job at taking care of our needs for spraying in a timely manner. I have small grandchildren that are susceptable to any harm the chemicals may cause. I can call Aaron anytime and if there aren't mosquitos and my grandchildren are here or if the mosquitos are unusually heavy I can request(day of) them to spray 2 days in a row or not spray that particular day. The system in place works perfectly! These guys know their job,know Durham residents and are cohesive as a team! Please don't "fix us" because we aren't broken! Thanks,Melissa Shuler [redacted]Durham Dayton hwy[redacted]Durham 530- [redacted]PLEASE Leave us alone!

From: Gloria Rose
To: Betts, Steve
Subject: Durham Mosquito Abatement

Date: Wednesday, July 19, 2017 10:11:55 AM

ATTN: Stephen Betts
I have been a resident of Durham for 45 years so I have a lot of background regarding the mosquitos. I truly do NOT want Chico or any other agency to take over our Mosquito Abatement service. We are VERY happy with the job our agency is doing and actually I don't trust any arguments supporting taking it away!! I think who ever the powers that be just want our money. I am so happy with the mosquito population down, as it is now. I plan to attend the meeting August 3rd.

Thank you, Gloria Rose [redacted]
Gloria

From: Janice Boeger Peterson
To: Betts, Steve
Subject: DMAD
Date: Wednesday, July 19, 2017 10:01:18 AM

Dear Mr. Betts

I am a long time Durham resident and I am very sorry to hear that you are considering doing away with The Durham Mosquito Abatement District. I have over the years called on the local office numerous times to help with our local mosquito problems. They have always responded rapidly and helped us efficiently. Because of the agricultural nature of our area we are very prone to mosquito infestation and having an office in town is very helpful. If you remove our local office we will be a small community that no one will care about and our needs will be forgotten, or at least moved to the bottom of the list. Please understand that this is important to us and reconsider.

Janice Peterson
[redacted] Midway
[redacted] Durham, Ca

July 20, 2017

To: Steve Lambert, Supervisor 4th District

RE: LAFco report on Durham Mosquito Abatement District

I am a Trustee on the Durham Mosquito Abatement District Board and have been for over 20 years. **I am against the proposed consolidation of the three Mosquito Districts.**

This consolidation has been talked about and brought up by several Grand Juries over the years and nothing has ever happened. DMAD will be 100 years old next year, having been started in 1918.

One of the basic reasons, I believe, LAFco is again pushing this again is that Butte County Mosquito & Vector Control District is looking for more money. Each District took advantage in 2004 of Proposition 218 that allowed districts to assess property owners in their districts. This did help our budgets and enabled us to be more visible and viable.

Durham has had a shop building for several years for which we paid the county annually. When I started as a trustee, we met in that shop building summer and winter monthly. Our manager keeps on top of the communications from our citizens when there is a problem or an activity at the parks, schools, or Patrick Ranch. During Mosquito infestations he is on top of spraying the area to protect our children and citizens. I know that our manager sprays the borders at the rice fields, uses larvacide or adulticide and mosquito fish as needed. We can hire an aerial spray as needed. We had a few bumps when we changed office personnel but we are on top of it now.

I read in the Chico ER when BCMVCD is spraying and in what area. How often does each area get sprayed?? This is one of the big questions from our Durham residences. I understand that aerial spray cannot be used over populated areas.

I believe that if there were some Jurisdictional Boundaries and Sphere of Influence adjustments that there would be no need to consolidate. We would be able to keep our Durham Mosquito Abatement District with some added areas as a viable resource for mosquito and vector control.. As I live in Durham and have the benefit of our DMAD spraying, I have been pleased with the service.

Sandra Atteberry, Trustee
[redacted] Midway
Durham, CA 95938

From: Kathy horn
To: Betts, Steve
Subject: Durham Mosquito Issue
Date: Tuesday, July 25, 2017 8:58:08 AM

The idea of Durham being rolled into the. County program is not acceptable. It is funded by Durham area residence. Works well, please leave it as is. The information put forth from Grand Jury I understand had some flawed information provided to them and was corrected after the report was written.
I do NOT want any change, thank you.
Kathryn Horn
[redacted] Serviss Street
Durham, California
95938
Sent from my iPhone

From: Troy Hetherwick
To: Betts, Steve
Subject: Durham
Date: Tuesday, July 25, 2017 12:24:58 PM

Joseph,
The Durham mosquito abatement district is managing the problem well. There is just no room for error in this matter; the health issues are too serious, too prevalent, deadly.
Don't mess with it.

Thank you.
Troy Hetherwick
PO Box [redacted]
Durham

Sent from my iPad

From: steve@galevineyards.com
To: BOS District 4; Betts, Steve
Subject: Durham Mosquito Abatement District
Date: Thursday, July 27, 2017 4:39:00 PM

Dear Mr. Betts and Mr. Lambert,

This email is in regards to the Durham Mosquito Abatement District. The DMAD is and has been a valuable entity for the people of Durham CA. We have voted and paid for this service.

This DMAD provides protection against diseases to our residences, employees, guests and customers. As a business entity, Gale Vineyards, in Durham, the district has been invaluable in mosquito protection for our outdoor venue, winery and vineyard. The DMAD is a large part of our business due to the eradication of mosquitoes. This allows people to enjoy Durham and all the services this town provides.

We are sprayed by DMAD on a weekly basis and I am not sure Butte County can continue with this service. Not having the DMAD will cause a decrease in business for us and other venues and services in our area.

The DMAD has done such a fantastic job that Durham is now attracting and retaining quality citizens since Durham can provide a safer and more comfortable outdoor lifestyle due to having much less of a mosquito population.

Please contact me if you have any questions. We are looking forward to our continued successful service of DMAD.

Steve Gale
Gale Vineyards
9345 Stanford Lane
Durham CA 95938

530-891-1264

www.galevineyards.com
steve@galevineyards.com

SECTION 8.0 - GLOSSARY

ABATEMENT The removal or elimination of a problem, nuisance, or other disturbance especially of public health or safety significance.

ADOPTED BUDGET The spending plan approved by resolution of the Board of Supervisors after the required public hearing and deliberations on the Recommended Budget. The Adopted Budget must be balanced with Total Financing Sources equal to Total Financing Uses.

ADULTICIDE A pesticide targeted to eliminate an insect pest in the adult stage.

ANNEXATION The inclusion, attachment, or addition of a territory to a city of district.

BOARD OF SUPERVISORS The elected board of supervisors of a county.

BUDGET The planning and controlling document for financial operation with appropriations and revenues for a given period of time, usually one year.

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) The California Environmental Quality Act (CEQA) is intended to inform governmental decision-makers and the public about potential environmental effects of a project, identify ways to reduce adverse impacts, offer alternatives to the project, and disclose to the public why a project was approved. CEQA applied to projects undertaken, funded, or requiring issuance of a permit by a public agency.

CONTINGENCY An amount appropriated for unforeseen expenditure requirements.

DISTRICT OR SPECIAL DISTRICT An agency of the state, formed pursuant to general law or special act, for the local performance of government or proprietary functions within limited boundaries. "District" or "special district" includes a county service area.

EXPENDITURES Expenditures occur when the County buys goods and services and pays its employees. Expenditures can be categorized into three types: operating expenditures,

capital expenditures, and debt service expenditures. Operating expenditures are the day-to-day spending on salaries, supplies, utilities, services, and contracts. Capital expenditures are generally for acquisition of major assets such as land and buildings or for the construction of buildings or other improvements. Debt expenditures repay borrowed money and interest on that borrowed money.

FISCAL YEAR — Twelve-month period for which a budget is prepared, generally July 1 through June 30 of each year.

FUND BALANCE — The difference between assets and liabilities reported in a governmental fund.

GENERAL PLAN — A document containing a statement of development policies, including a diagram and text setting forth the objectives of the plan. The general plan must include certain state mandated elements related to land use, circulation, housing, conservation, open-space, noise, and safety.

INTEGRATED PEST MANAGEMENT (IPM) — IPM is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.

INTERFUND TRANSFER — A transfer made between budget units in different funds for services rendered and received. The service rendering budget unit shows these transfers as revenue, as opposed to expenditure reduction.

LAFCO — Local Agency Formation Commission. A state mandated local agency that oversees boundary changes to cities and special districts, the formation of new agencies including incorporation of new cities, and the consolidation of existing agencies. The broad goals of the agency are to ensure the orderly formation of local government agencies, to preserve agricultural and open space lands, and to discourage urban sprawl.

LARVICIDE	A pesticide targeted to eliminate an insect pest in the larval stage.
LOCAL ACCOUNTABILITY AND GOVERNANCE	The term "local accountability and governance," refers to public agency decision making, operational and management styles that include an accessible staff, elected or appointed decision-making body and decision making process, advertisement of, and public participation in, elections, publicly disclosed budgets, programs, and plans, solicited public participation in the consideration of work and infrastructure plans, programs or operations and disclosure of results to the public.
MANAGEMENT EFFICIENCY	The term "management efficiency," refers to the organized provision of the highest quality public services with the lowest necessary expenditure of public funds. An efficiently managed entity (1) promotes and demonstrates implementation of continuous improvement plans and strategies for budgeting, managing costs, training and utilizing personnel, and customer service and involvement, (2) has the ability to provide service over the short and long term, (3) has the resources (fiscal, manpower, equipment, adopted service or work plans) to provide adequate service, (4) meets or exceeds environmental and industry service standards, as feasible considering local conditions or circumstances, (5) and maintains adequate contingency reserves.
MOSQUITO-BORNE	Delivered by a mosquito.
MUNICIPAL SERVICE REVIEW (MSR)	A study designed to determine the adequacy of governmental services being provided in the region or sub-region. Performing service reviews for each city and special district within the county may be used by LAFCO, other governmental agencies, and the public to better understand and improve service conditions.
PUBLIC AGENCY	The state or any state agency, board, or commission, any city, county, city and county, special district, or other political subdivision.
RESERVE	(1) For governmental type funds, an account used to earmark a portion of the fund balance, which is legally or contractually restricted for a specific use or not appropriate for expenditure. (2) For proprietary type/enterprise funds, the portion of retained earnings set

	aside for specific purposes. Unnecessary reserves are those set aside for purposes that are not well defined or adopted or retained earnings that are not reasonably proportional to annual gross revenues.
REVENUE	Funds received to finance governmental services from various sources and treated as income to the County. Examples: property taxes, sales taxes, and per parcel service charges.
SPHERE OF INFLUENCE (SOI)	A plan for the probable physical boundaries and service area of a local agency, as determined by the LAFCO
SPHERE OF INFLUENCE DETERMINATIONS	In establishing a sphere of influence the Commission must consider and prepare written determinations related to present and planned land uses, need and capacity of public facilities, and existence of social and economic communities of interest.
ULV	Ultra Low Volume. A method of pesticide dispersal using small amounts of concentrated material to treat a large area.
VECTOR	Any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including, but not limited to, mosquitoes, flies, mites, ticks, other arthropods, and rodents and other vertebrates (Health and Safety Code Section 2002(k)).
VECTOR CONTROL	Any system of public improvements or services that is intended to provide for the surveillance, prevention, abatement, and control of vectors as defined in subdivision (k) of Section 2002 of the Health and Safety Code and a pest as defined in Section 5006 of the Food and Agricultural Code (Government Code Section 53750(l)).
ZONE OF BENEFIT	A geographic area within a special district that provides a particular service or services to the parcels within that area.
ZONING	The primary instrument for implementing the general plan. Zoning divides a community into districts or "zones" that specify the permitted/prohibited land uses.

Attachment A

Public Health Department

Cathy A. Raevsky, Director
Andy Miller, M.D., Health Officer

Community Health & Sciences- Oroville
202 Mira Loma Drive
Oroville, California 95965

T: 530.538.2840
F: 530.538.5387

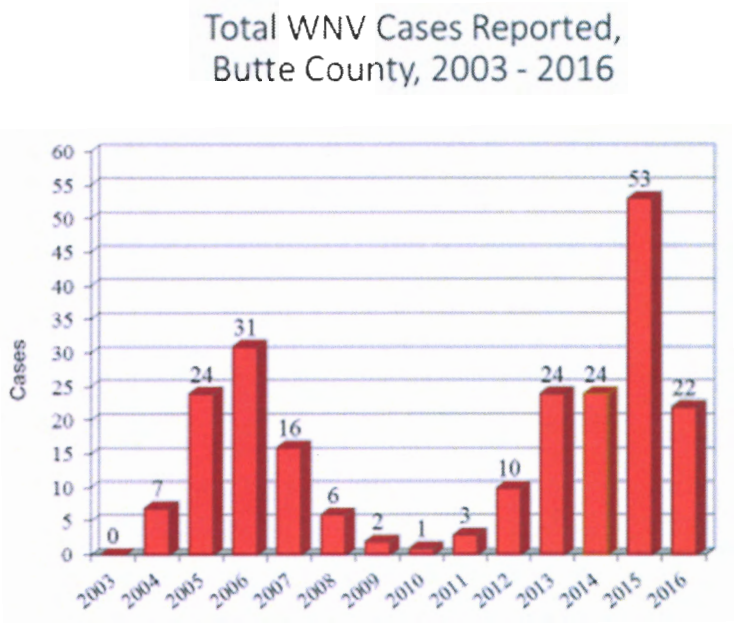
buttecounty.net/publichealth

May 31, 2017

Butte Local Agency Formation Commission (LAFCO)
1453 Downer Street, Suite C
Oroville, California 95965-4950

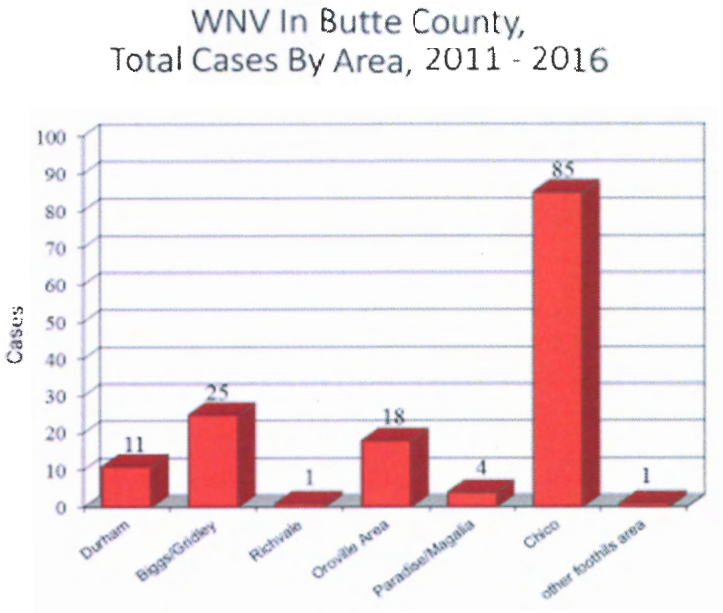
Dear LAFCO:

The Butte County Public Health Department (BCPHD) conducts surveillance and investigation of human West Nile Virus (WNV) cases. WNV is one of many emerging vector borne diseases that pose a threat to residents of Butte County. Butte County consistently ranks among the state's counties with the highest WNV case rates (number of cases by population). Below is a graph illustrating the trend in number of WNV cases reported to BCPHD from years 2003 – 2016.



Working closely with the local vector control agencies is critical in our collective efforts to detect, monitor and prevent WNV disease in our community. Having one agency to work with would likely improve efficiencies and provide a more consistent approach.

WNV is not restricted by geographic borders; however, the current structure of the county's multiple mosquito control agencies does create borders. The following table represents WNV cases (by residence), over the past six years, for towns and cities within Butte County (it must be noted that the infection may not have occurred at the place of residence).



Ensuring uniform vector control services throughout Butte County could improve the overall approach to combating WNV and other vector borne diseases. A single, comprehensive vector control agency, offering high-quality services, could serve as a public health benefit to the residents of Butte County.

Thank you for your interest in and concern for the health of our community. Please feel free to contact us with questions or for more information.

Sincerely,

Cathy A. Raevsky, Director
Butte County Public Health Department

Andy Miller, M.D., Health Officer
Butte County Public Health Department

Cc: Clerk of the Board
Bill Connelly
Doug teeter
Larry Wahl
Steve Lambert
Maureen Kirk

Attachment B

Public Health Administration

Cathy A. Raevsky, Director
Andy Miller, M.D., Health Officer

202 Mira Loma Drive
Oroville, California 95965

T: 530.538.7581
F: 530.538.2164

buttecounty.net/publichealth

September 28, 2017

To Whom It May Concern,

Mosquito borne diseases pose an increasing threat to the residents of Butte County. The recent detections of Saint Louis Encephalitis Virus in Butte County and Aedes Aegypti as far north as Merced County are evidence of this threat. Butte County Public Health believes the best protection from these threats is an integrated and comprehensive mosquito control program. We write this letter urging that all mosquito control efforts in the county include the service components described in this letter.

Based on information from the Centers for Disease Control and a recent article from the Journal of Public Health Management & Practice, Butte County Public Health believes that our entire county should be protected with the following service components:

1) Routine mosquito surveillance, standardized trapping and species identification.
2) Larviciding and adulticiding efforts
3) Routine vector control
4) Species specific activities
5) Pesticide resistance testing

Thank you for your continuing efforts to protect the residents of Butte County.

Signed,

Dr. Andrew Miller, Public Health Officer

Cathy Raevsky, Public Health Director

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Attachment C

BUTTE COUNTY MOSQUITO AND VECTOR CONTROL DISTRICT

2016 ANNUAL REPORT

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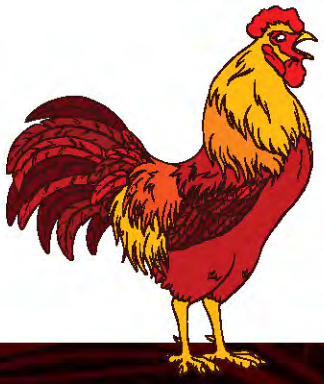
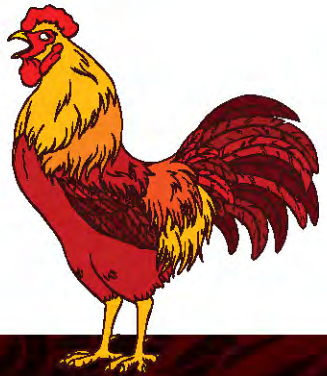


CONTACT INFORMATION

Butte County Mosquito
and Vector Control District
5117 Larkin Road, Oroville, California 95965
(530) 533-6038 (530) 342-7350
Fax (530) 534-9916
Visit us on the web at www.BCMVCD.com



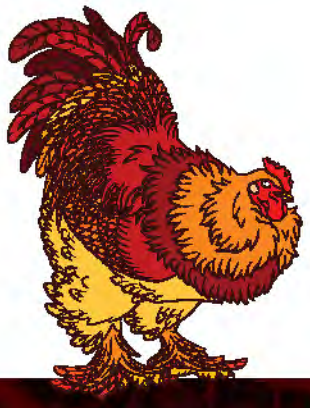
BCMVCD JURISDICTION

HISTORY

The Butte County Mosquito Abatement District was formed in June of 1948. The District covers 1600 square miles, and includes all of Butte County, except the small areas served by the Durham and Oroville Mosquito Abatement Districts, which were formed earlier. The District also includes the Hamilton City area of Glenn County. In April of 1994, “Vector Control” was added to the District name to reflect the additional disease surveillance and information now provided.

MISSION

The mission of BCMVCD is to primarily suppress mosquito-transmitted disease and to also reduce the annoyance levels of mosquitoes and diseases associated with ticks, fleas and other vectors through environmentally compatible control practices and public education.



MAIN OFFICE LOCATION

5117 Larkin Road
Oroville, CA. 95965

FOREWORD

Looking forward to 2017, the year of the rooster, presents an opportunity to reflect the past year. It is with great pleasure that I submit the 2016 Annual Report for the Butte County Mosquito and Vector Control District (District). The District had a very successful year serving the residents of Butte County and Hamilton City by utilizing an integrated vector management (IVM) approach that included public education and outreach, vector surveillance, reduction of breeding grounds by physical and cultural control by altering the environment and/or management practices, and by using sound biological and chemical control methods. This report outlines the work conducted by the District to accomplish its primary goal of protecting public health.

The prevention of vector-borne disease outbreaks remains the District's primary goal and it's most important responsibility to the public. West Nile virus (WNV) is now considered to be endemic in the state of California and remains the District's largest public health concern. As of December 14, 2016, the state has reported 407 WNV human infections in 2016. Butte County's human infections for 2016 is currently at 21. Butte County has had confirmation of 229 WNV human infections with 8 fatalities since the virus arrived in 2004. Since 2003 when WNV first appeared in California, 5999 human infections with 247 fatalities have been confirmed.

The extraordinary efforts to combat WNV epidemic in California should be credited to the combined efforts of more than 60 mosquito and vector control districts and local health departments, working in close cooperation with the California Department of Public Health and numerous other agencies indirectly related to mosquito and vector control.

"The Mission of the Butte County Mosquito and Vector Control District is primarily to suppress mosquito-transmitted disease and to also reduce the annoyance levels of mosquitoes and diseases associated with ticks, fleas, and other vectors through environmentally compatible control practices and public education." To achieve this goal the District provides continual surveillance of mosquitoes and other vectors to ascertain the threat of disease transmission and annoyance levels and then uses integrated vector management methods to keep mosquitoes and other vectors below those levels. The District continues to work in cooperation with property owners, residents, social groups, and other governmental agencies to minimize mosquito breeding and to reduce the threat of mosquito-transmitted diseases.

In a Rooster Year, all of the Chinese animals can reap great rewards by tapping into Rooster traits. Loyalty, commitment, hard work, family values, and top-notch appearances are just some of the characteristics that will be rewarded this year. The District will strive to continue and enhance such characteristics in hopes of lowering mosquito populations and vector-borne disease.

The Board of Trustees and employees continue to plan for the future and search for better ways to improve our programs to be prepared for future disease outbreaks that would be a threat to the health of Butte County and Hamilton City residents. We look forward to providing our services to you in the future and if you have any questions or need more information please visit our website at www.BCMVCD.com or call us at 530-533-6038 or 530-342-7350.

Respectfully,

Matthew C. Ball
District Manager

BOARD OF TRUSTEES

Standing, left to right: Carl Starkey, Bruce Johnson, Jack Bequette, Terry Mallan, Assistant Secretary Bo Sheppard, Gordon Andoe, Secretary Tom Anderson.
Seated, left to right: President Dr. Albert Beck, Dr. Suzanne Hanson, Dr. Thomas Vickery. Not pictured: Vice President Dr. Larry Kirk.

STAFF

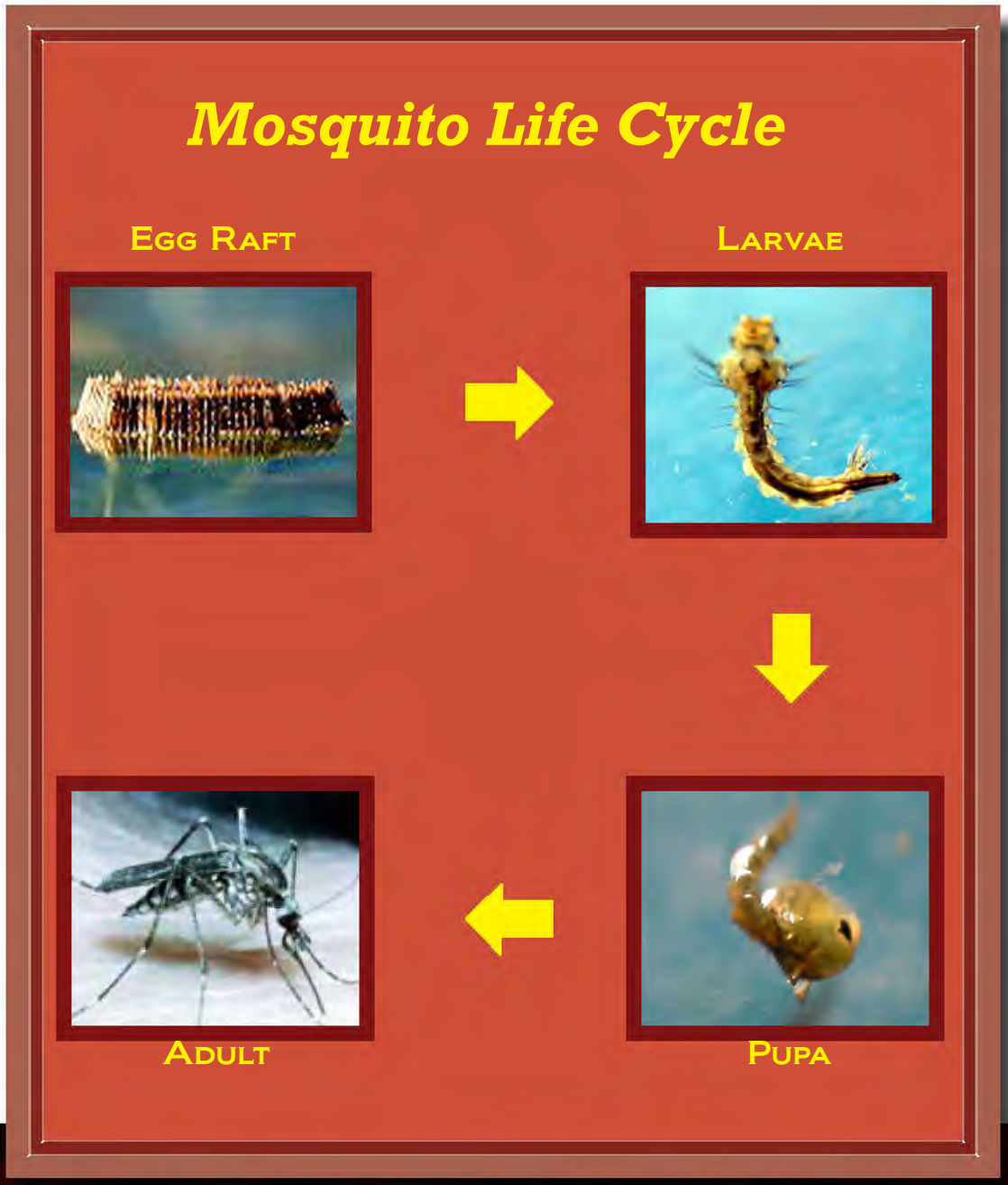
Left to right: Glen Williams, MVCS; AAron Lumsden, MVCS; Eric Dillard, MVCS; Aaron Goff, MVCS; Shane Robertson, MVCS; Phillip Henry, MVCS; Jim Richards, Regional Supervisor; Beth Vice, MVCS; Del Boyd, Pilot 2; Don Lasik, MVCS; Bill Kunde, Regional Supervisor; (MVCS: Mosquito and Vector Control Specialist, licensed by the California Department of Public Health).

ADMINISTRATIVE STAFF

Left to right: Matt Ball, District Manager; Chris Ocegueda, Fish Biologist/ Vector Ecologist; Darlene Starkey, Office Manager; Doug Weseman, Assistant Manager; Eric Gohre, Entomologist.

MOSQUITO BIOLOGY

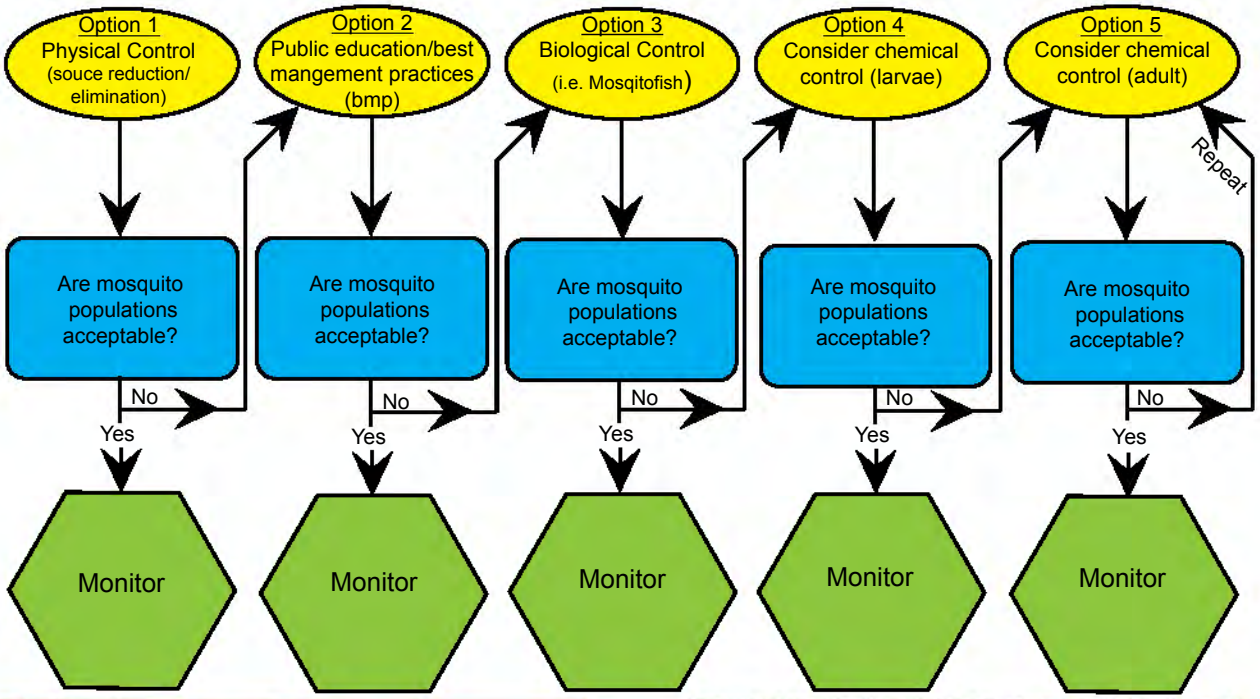
There are approximately 3,500 species of mosquitoes distributed worldwide. In California there are 53 species of mosquitoes and 25 of these are commonly found in Butte County. Mosquitoes, like other animals, must have water, food and some protection from the elements to survive. Mosquitoes undergo complete metamorphosis with four different life stages, egg, larva, pupa, and adult. Mosquito eggs and pupa are unable to feed. Larvae and adults however must feed to survive. Adult female mosquitoes need a blood meal to produce eggs, while adult male mosquitoes feed on plant nectar and juices. The time it takes for a mosquito to develop from an egg to an adult varies with different species and environments. Generally, it takes 3-5 days under optimal conditions for a mosquito to complete it's life cycle. The adult then lives between three weeks and one year. Some egg species have been known to survive for over fifty years. Female mosquitoes can have up to three or four broods of eggs in their lifetime.



INTEGRATED VECTOR MANAGEMENT (IVM) PROGRAM

Integrated Vector Management (IVM) is an effective and environmentally sensitive approach to vector management that relies on a combination of common sense practices. The District's IVM program uses current, comprehensive information on the life cycles of vectors and their interaction with the environment. This information, in combination with available vector control methods, is used to manage vector nuisance and public health threats by the most economical means and with the least possible hazard to people, property, and the environment. The District's IVM program includes public education/best management practices, physical control (source reduction and/or elimination), biological control, chemical control, and monitoring.

Each time one of the District's state certified Mosquito and Vector Control Specialists locates a mosquito breeding source the site is accessed and the flow chart below is followed. If the mosquito breeding source can be eliminated then the flow chart stops and the source is monitored.



Identifying and Sorting Mosquitoes

Co2 Trap

PHYSICAL CONTROL / SOURCE REDUCTION AND/OR ELIMINATION

The best method of mosquito control is source elimination (the complete removal of standing water). All mosquitoes need water to breed, unfortunately water is vital to keep lawns green, to grow crops, to sustain life, and to provide habitat for other aquatic insects and animals. District Mosquito and Vector Control Specialists actively work with property owners, land managers, and municipalities to reduce the amount of water needed for irrigation, to observe or consider best management practices, to actively participate in the design of new developments, and the overall reduction of standing water on a property.

Using Agrosoke to fill a tree hole

PUBLIC EDUCATION / OUTREACH AND BEST MANAGEMENT PRACTICES

The District's mission is to protect residents from mosquitoes and other vectors that transmit disease. Public education and information is an important part in the success of combating diseases such as West Nile virus and Lyme disease. The District's education program consists of public appearances at local city and county fairs, participation in the state Mosquito and Vector Awareness week, and presentations at schools and local civic groups. In addition to the above, the public education and outreach strives to find new and more effective ways of better educating the public by arming residents with knowledge to prevent mosquito bites and reduce or eliminate mosquito-breeding through informational pamphlets, website information, best management practice manuals, repellent suggestions, one on one interaction, and homeowner safeguards.

In 2010, the District and the Board of Trustees adopted a final version of a Best Management Practices (BMP) to Reduce Mosquitoes manual. The manual provides property owners with tools and techniques to minimize mosquito populations through the proper use of land management practices while reducing the use of pesticides. The BMP's contained in the manual are assembled from a number of sources including scientific literature, state and inter-agency documents, and from experienced vector control professionals. The BMP manual includes general guidance to all properties that can, have, and will breed mosquitoes. A copy of the BMP manual can be viewed on the District's website at www.BCMVCD.com. The manual has sucessfully been used to reduce mosquito populations/public health threats without the need of additional pesticides.

2016 PUBLIC EDUCATION

2016 was another successful year for the Butte County Mosquito and Vector Control District's (District) Public Education Department.

The District partnered with Stott Advertising for the eighth year in a row on a county-wide mosquito prevention billboard advertising campaign. This year's slogan for the billboards was "Mosquitoes are a Dish for Mosquitofish". The six billboards ran from May to September and rotated throughout the county on a monthly basis.

In 2016 the District was represented at several fairs and special days. These included the Spring Home and Garden Show in Chico, Gold Nugget Days in Paradise, Feather Fiesta Days in Oroville, Red Suspenders Day in Gridley, Biggs National Night Out, Berry Creek Berry Festival, Butte County Fair in Gridley, and the Salmon Festival in Oroville. All of the events that the District attends have an excellent insect display put together by District Entomologist Eric Gohre, as well as a mosquitofish and mosquito larvae display. At these events the District also hands out, free of charge, fly/mosquito swatters, tick identification cards, recyclable shopping bags, and mosquito repellent.

The PR Department has done several TV, radio, and newspaper interviews, has issued several press releases, and published public notices. The television interviews were granted to KHSL 12 News, KNVN 24 News, and KRCR News Channel 7. Radio interviews were granted to KPAY radio in Chico. Newspaper/internet interviews were granted to the Chico Enterprise Record, the Chico News and Review, the Oroville Mercury News, and the Paradise Post. A group presentation was also given to/at the California Conservation Corps. in Chico, the Fellows Club in Oroville, and the Kelly Ridge Homeowner's Association.

The District, in partnership with the Butte County Public Health Department, ran advertisements in the Chico ER and the Chico News and Review. The District is also advertised with Deer Creek Broadcasting on 103.5 FM, 97.7 FM, 95.1 FM, and KPAY 1290. This program started on June 1 and ran through the end of October. The District also advertised with Radio Chico on stations 93.9, 92.7, 96.7, 107.5, and 107.9, and did mobile Device Advertising with CBS Broadcasting.

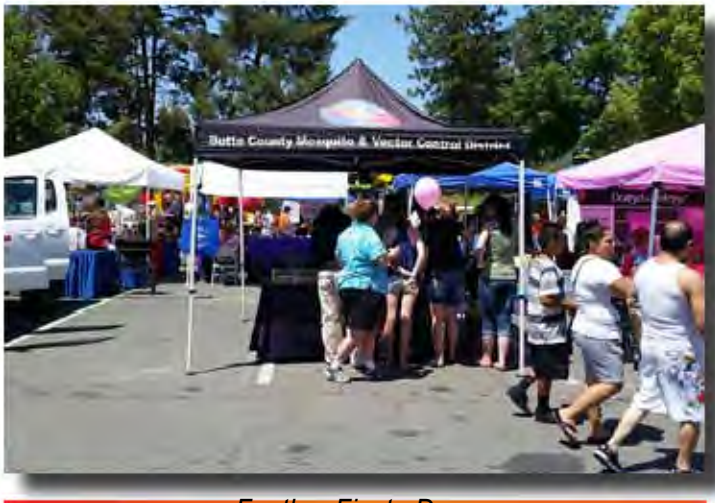
The District gave several School presentations on Mosquitoes and Ticks throughout the District.

With this year's high number of West Nile virus cases, the District believes that it is imperative to get the mosquito bite prevention message out to the public. That message states that if a person can avoid getting bitten by a mosquito, they can avoid getting any mosquito-borne illness, including West Nile virus. Some of the ways the District suggests that residents prevent mosquito bites are staying inside at dusk and dawn when mosquitoes are most active, wearing repellent and/or long sleeves and pants when outside during peak mosquito activity, and making sure their door and window screens are in good working condition. Residents are also asked to check their property for possible mosquito breeding sources, and draining any unnecessary standing water.

2016 PUBLIC EDUCATION HIGHLIGHTS

- **Billboard Advertising (Throughout the County)**
- **Butte County Fair, Gridley (Booth)**
- **Gold Nugget Days, Paradise (Booth)**
- **Feather Fiesta Days, Oroville (Booth)**
- **Berry Creek Berry Festival (Booth)**
- **Salmon Festival, Oroville (Booth)**
- **Red Suspenders Day, Gridley (Booth)**
- **K-6 Classroom Presentations on Ticks and Mosquitoes (Throughout the County)**
- **Chico News and Review, and Chico Enterprise Record Print Advertising**
- **Chico Home and Garden Show (Booth)**
- **Fellows Club (Presentation)**
- **Kelly Ridge Homeowner's Association, Oroville (Presentation)**
- **MVCAC Mosquito and Vector Control Awareness Week (Open House at District Office)**
- **California Conservation Corps, Chico (Presentation)**
- **Several Print, Radio, and Televison Interviews**
- **Biggs National Night Out, Biggs (Booth)**
- **Radio Advertising with Deer Creek Broadcasting and Radio Chico**
- **Mobile Device Advertising with CBS Broadcasting**

PUBLIC EDUCATION PICTURES



Feather Fiesta Days

School Presentation

The District providing the Jesus Center in Chico with free mosquito wipes for the homeless.

Salmon Festival

District Tour

GIS/GPS SYSTEM

Over the past seven years the District has formed a close partnership with the CSUC Geographic Information Center (GIC) in Chico, CA. to create a new geographic information system (GIS) for the District. GIS is a system that captures, stores, analyzes, manages, and presents data that is linked to a location (spatial data). In 2010 the District went “live” with the new sytem. This system took the place of the old system which utilized map books, handwritten reports, and outdated handheld electronic devices called “Timewands”. The new system consists of a laptop computer for each Mosquito and Vector Control Specialist, including seasonal workers, that runs ESRI Corporations ArcMobile software and a GPS unit that connects to the laptop computer. The new GIS system also includes a data management server that is housed at the GIC in Chico and a new in-house computer that runs ESRI’s ArcGis version 10.1. This computer is used to manage source data collected from the laptops in the field and is also used as a link to the District’s Office Managers computer and the Microsoft Access database that it controls. The new system increases accuracy, facilitates user friendly reporting, minimizes data manipulation and corruption, and maximizes time efficiency.

WWW.BCMVCD.COM

The District’s website continues to be an important tool in educating the public about mosquitoes and other vectors and the practices of the District. On the website the user can make a service request, sign up for email notification of upcoming fogging operations, and view maps of where the District will be fogging and where the District has fogged in the past. The user can also view Board of Trustee agendas and minutes, read the latest news that affects the District and their constituents, and view information on viruses and other diseases that are transmitted by mosquitoes and other vectors such as ticks. Visitors to the website may also be interested in the mosquitofish page, as well as, the services page which lists the locations in Butte County and Hamilton City where residents can pick up free mosquitofish. The services page also includes yellowjacket and wasp nest removal, tick and insect identification, and a public education section where interested parties can find out how to request the District come to their school or service group for a presentation. The website also has links to the pesticide labels and MSDS sheets for the public health pesticides that it uses, as well as, a frequently asked questions page and a “contact us” page.

Laptop mounted inside vehicle

District website home page

EMAIL NOTIFICATION SYSTEM

In 2011 the District continued to improve the mosquito fogging notification system. The email notification system was created to meet public concerns and expectations, to enhance media coverage, and to help inform other agencies that need to know when and where the District is mosquito fogging. The Chico Enterprise Record uses these fogging notifications in their newspaper to inform their readers of the planned fogging operations. To meet these needs the District used Constant Contact software, modeled after the award winning Contra Costa Mosquito and Vector Control District's email notification system, to compose and send out the fogging notifications via email. These email notifications are sent out, in most cases, 30 plus hours before a fogging operation takes place. The notifications include maps of the areas to be fogged, links to the labels and material safety data sheets of the public health pesticides used, the dates and times of the fogging operations, and a link to the District website. The public can sign up for email notifications on the District website, www.BCMVCD.com. The District website also has the fogging notifications, as well as links to the public health pesticides. The District also makes phone calls to notify residents and agencies that do not use email or have access to a computer.

MOSQUITO FOGGING NOTIFICATION

Mosquito Fogging will take place on 08/11/2016 in the Nelson, Richvale and Thermalito areas. Please see the attached map(s) for detailed information. If you are unable to open or view the map(s) because of browser, memory space, or software problems please see the same map(s) at our website at www.BCMVCD.com. The fogging will take place from approximately 8:00 PM to 11:00 PM. Fogging operations may be cancelled due to unfavorable weather conditions.

Product(s) used in these areas will be Duet.

Links To Duet:

Label

SDS

Additional information can be obtained by viewing the manufacturers website at:

Clarke Mosquito Control

For more information please call the Butte County Mosquito and Vector Control District at (530) 533-6038 (from Oroville, Richvale, Biggs, Gridley, Berry Creek) or (530) 342-7350 (from Chico, Paradise, Cohasset, Forest Ranch) or visit www.BCMVCD.com

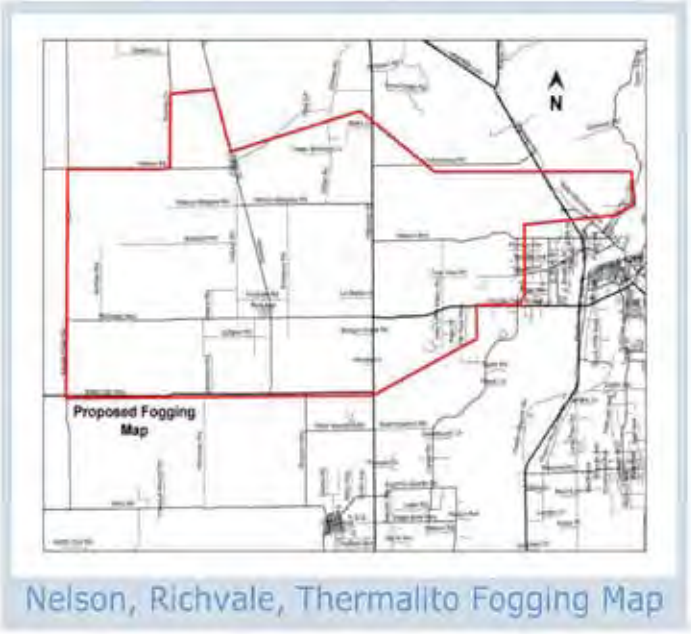
Free Mosquitofish

As a reminder, the District has a FREE Mosquitofish program. FREE Mosquitofish are available for pick up in the following communities; (1) Concow, (3) Paradise, (1) Magalia, (1) Hamilton City, (1) Gridley, (3) Chico. Additionally FREE Mosquitofish can be picked up by appointment at the District's Chico substation at 444 Otterson Drive or any time during business hours at the District's main office located at 5117 Larkin Road in Oroville. Also, Mosquitofish can be delivered to you just by visiting the District's website or by calling the District office. For more information, locations of the FREE mosquitofish pickup locations, and/or delivery of FREE Mosquitofish, please contact us at 530-533-6038 or 530-342-7350 visit the District website at www.BCMVCD.com

MOSQUITOFISH ARE ONLY TO BE USED ON PRIVATE PROPERTY and ARE NOT TO BE PLANTED IN CREEKS, STREAMS, RIVERS, and LAKES.

SUSPECTED MOQUITO-BREEDING
Should you observe and/or see a water source that you believe or could produce mosquitoes, please call us at 530-533-6038 or 530-342-7350 or visit www.BCMVCD.com. Reporters of suspected mosquito-breeding sources have the option to remain anonymous.

Butte County Mosquito and Vector Control District
| (530) 533-6038, (530) 342-7350 | www.BCMVCD.com



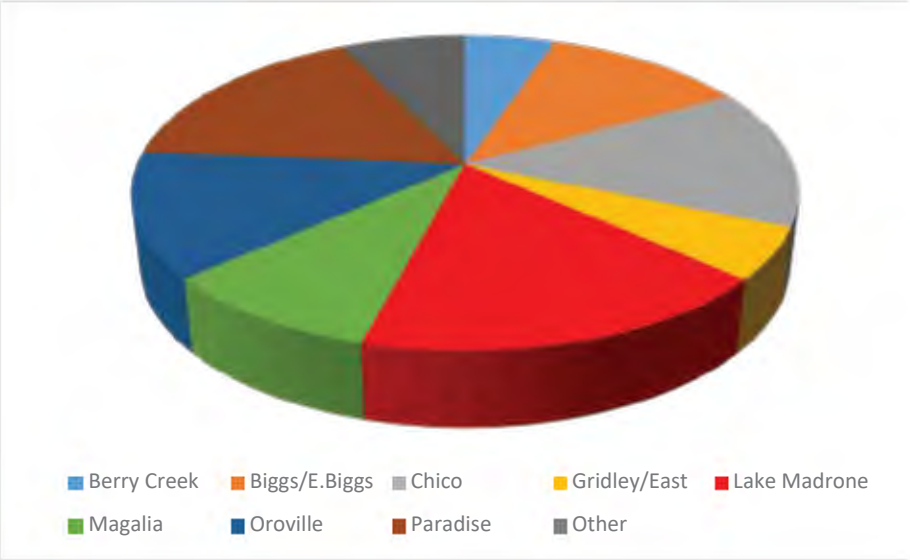
For a more detailed fogging map, please visit our website at
www.bcmvcd.com
website

Thank you,

Butte County Mosquito and Vector Control District

Example of Constant Contact email notification

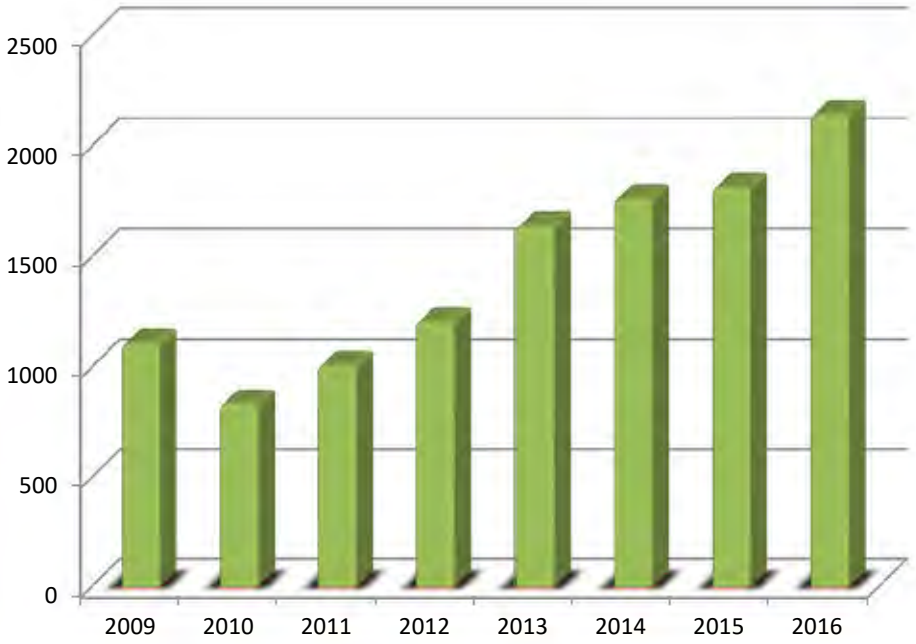
2016 SERVICE REQUEST PERCENTAGES



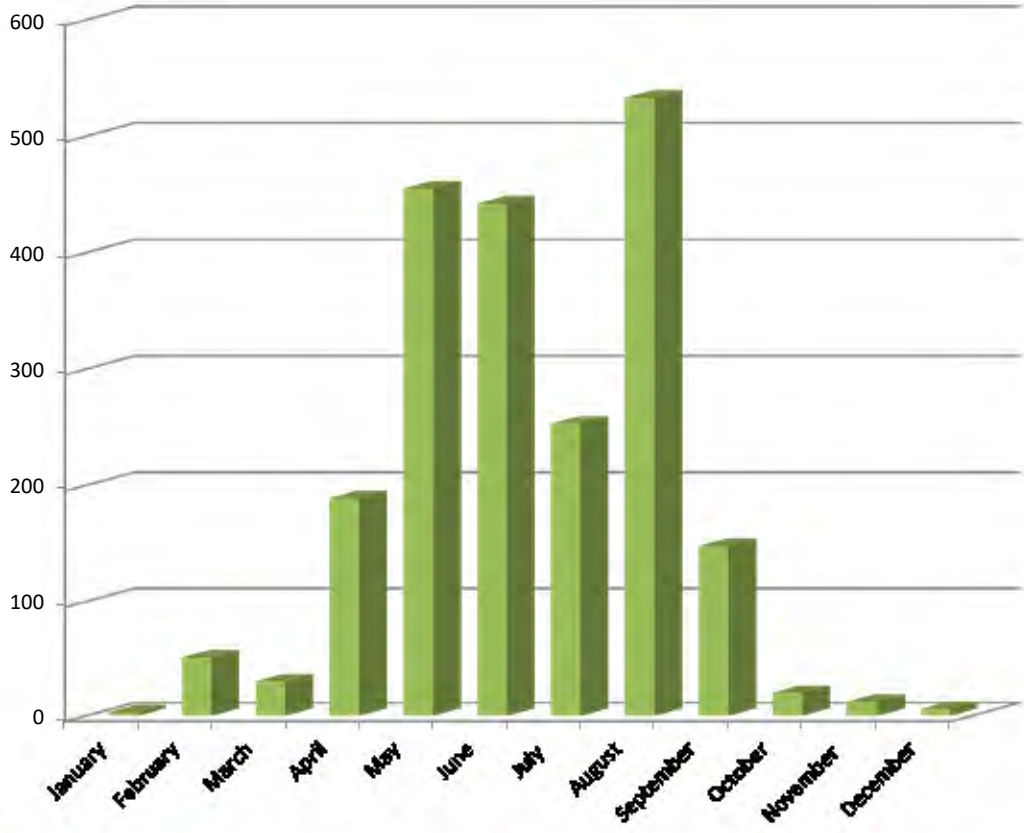
2016 SERVICE REQUESTS

Area	*Number of Service Requests*	*Percentages*
Bangor	7	0.3%
Berry Creek	112	5.2%
Biggs/E.Biggs	251	11.7%
Brush Creek	6	0.3%
Chico	308	14.4%
Clipper Mills	4	0.2%
Cohasset	13	0.6%
Dayton	10	0.5%
Durham	1	0.0%
Forbestown	7	0.3%
Forrest Ranch	17	0.8%
Gridley/East	113	5.3%
Hamilton City	4	0.2%
Honcut	2	0.1%
Lake Madrone	376	17.6%
Magalia	200	9.3%
Nelson	3	0.1%
Oroville	275	12.8%
Palermo	17	0.8%
Paradise	351	16.4%
Richvale	35	1.6%
Stirling City	27	1.3%
Yankee Hill	3	0.1%
Totals	**2142**	**100%**

2016 ANNUAL SERVICE REQUESTS



2016 SERVICE REQUESTS BY MONTH



VECTOR AND VECTOR-BORNE DISEASE SURVEILLANCE

The definition of a vector is any animal capable of producing discomfort or injury, including, but not limited to, mosquitoes, flies, other insects, ticks, mites, and rats but not including domestic animals according to the California State Health and Safety Code, Section 2002(K). Surveillance of vectors is a vital component of the District's Integrated Vector Management (IVM) Program and a considerable amount of time and effort is devoted to conducting vector surveillance. The District's surveillance program consists of a scientific approach for locating vector populations usually focusing on mosquito-breeding sources, monitoring mosquito populations, and mosquito-borne disease. Data collected from the surveillance program is analyzed to determine maximum and minimum risk periods of public exposure to mosquito-borne disease, evaluates control efforts, and seasonal changes in relative abundance of mosquito species. Surveillance data is collaborated in the District's database which provides historical information on mosquito dynamics and mosquito-borne disease within the District.

The District utilizes an extensive surveillance program for both adult and immature (larval) mosquitoes. Throughout Butte County and the Hamilton City area of Glenn County, the District uses 26 New Jersey light traps, 21 gravid traps, over 40 CO2 traps, and 7 sentinel chicken flocks to monitor adult mosquito populations and virus activity. District Mosquito and Vector Control Specialists monitor larval mosquito populations throughout the entire District on a daily basis utilizing a standard one-pint dipper. District Mosquito and Vector Control Specialists spend the majority of their day inspecting standing water such as rice, wetlands, storm drains, ponds, ditches, swimming pools, bird baths, fountains, seasonal and/or other man made containers for larvae.

The District utilizes an entomology department (Lab) that is staffed with an Entomologist and a Lab Assistant. The District's entomology department is responsible for the identification of the trapped mosquito collections and reporting the population numbers to the California Department of Public Health. The Lab conducts virus testing on live mosquitoes, dead wild birds, and sentinel chicken flocks. These tests are the District's eyes to monitor and detect mosquito-borne viruses in and around the county. The Lab also conducts scientific pesticide trials to monitor the chemicals effectiveness on targeted mosquitoes and to assess the possible effects on non-targets and trials on new chemical methodology and/or new chemicals. The Lab is also at your service to identify ticks, arachnids, and other insects/arthropods of public health significance.

Entomologist Eric Gohre checking a CO2 trap

Checking a light trap

VIRUS SURVEILLANCE

2016 VIRUS SURVEILLANCE REPORT

The District monitors for Western equine encephalitis (WEE), St. Louis encephalitis (SLE), California encephalitis (CE), and West Nile virus (WNV) activity by collecting blood samples from sentinel chicken flocks strategically placed throughout the District, collecting live mosquitoes trapped throughout the District, and collecting dead wild birds District wide.

New Chicken Coop

SENTINEL CHICKEN FLOCKS

Annually the District maintains seven sentinel chicken flocks of six birds each. The flocks are located in Palermo, Honcut, Gridley, Biggs, South Chico, West Chico, and Hamilton City. Bi-weekly blood samples are taken from the sentinel chickens by the entomology staff and sent to U.C. Davis for testing. The blood sample is tested for SLE, WEE, CE and WNV. In 2016, 38 of the 43 sentinel chickens from all 7 District flocks tested positive for WNV.

Sentinel Chicken

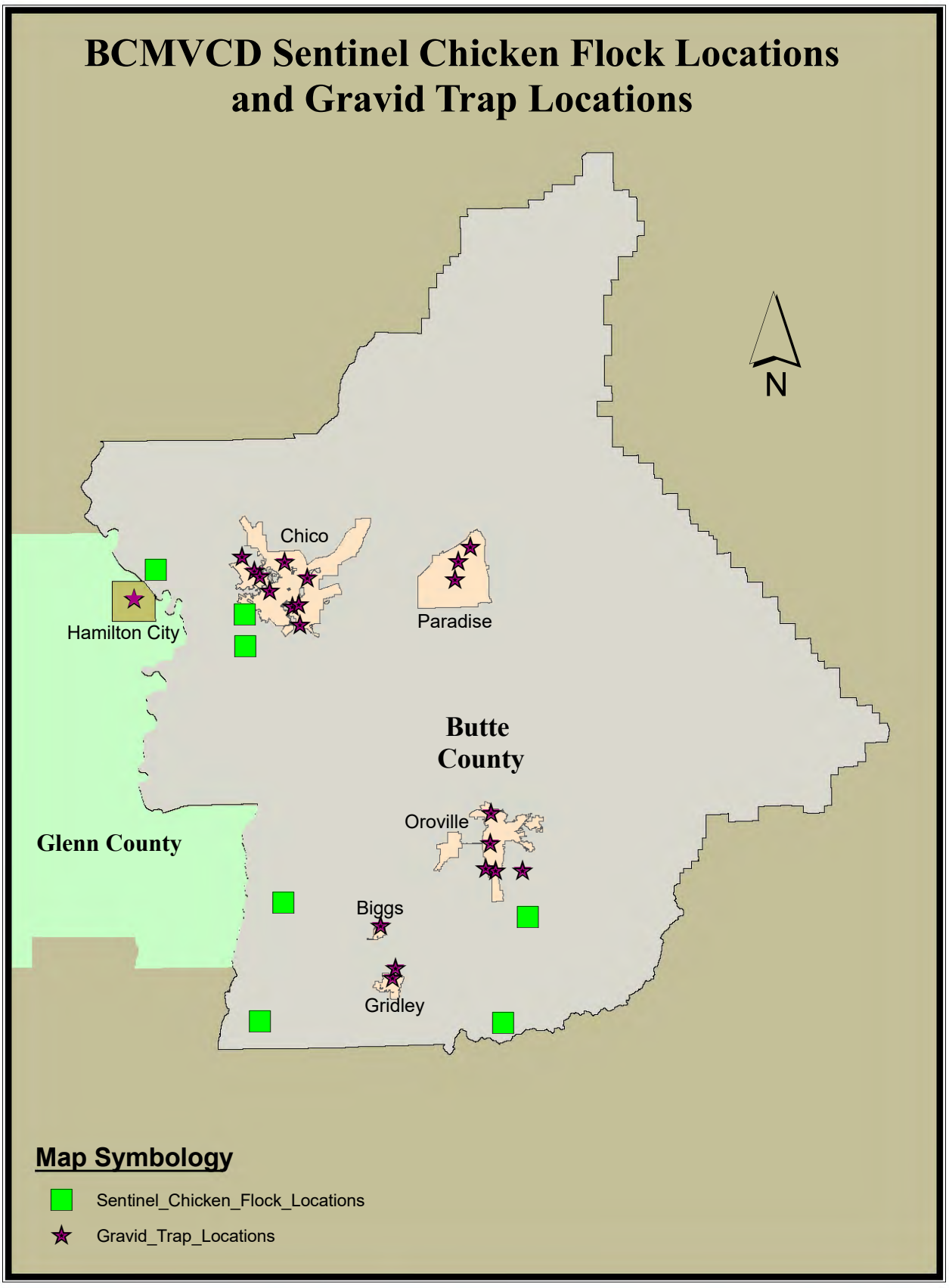
MOSQUITO POOLS

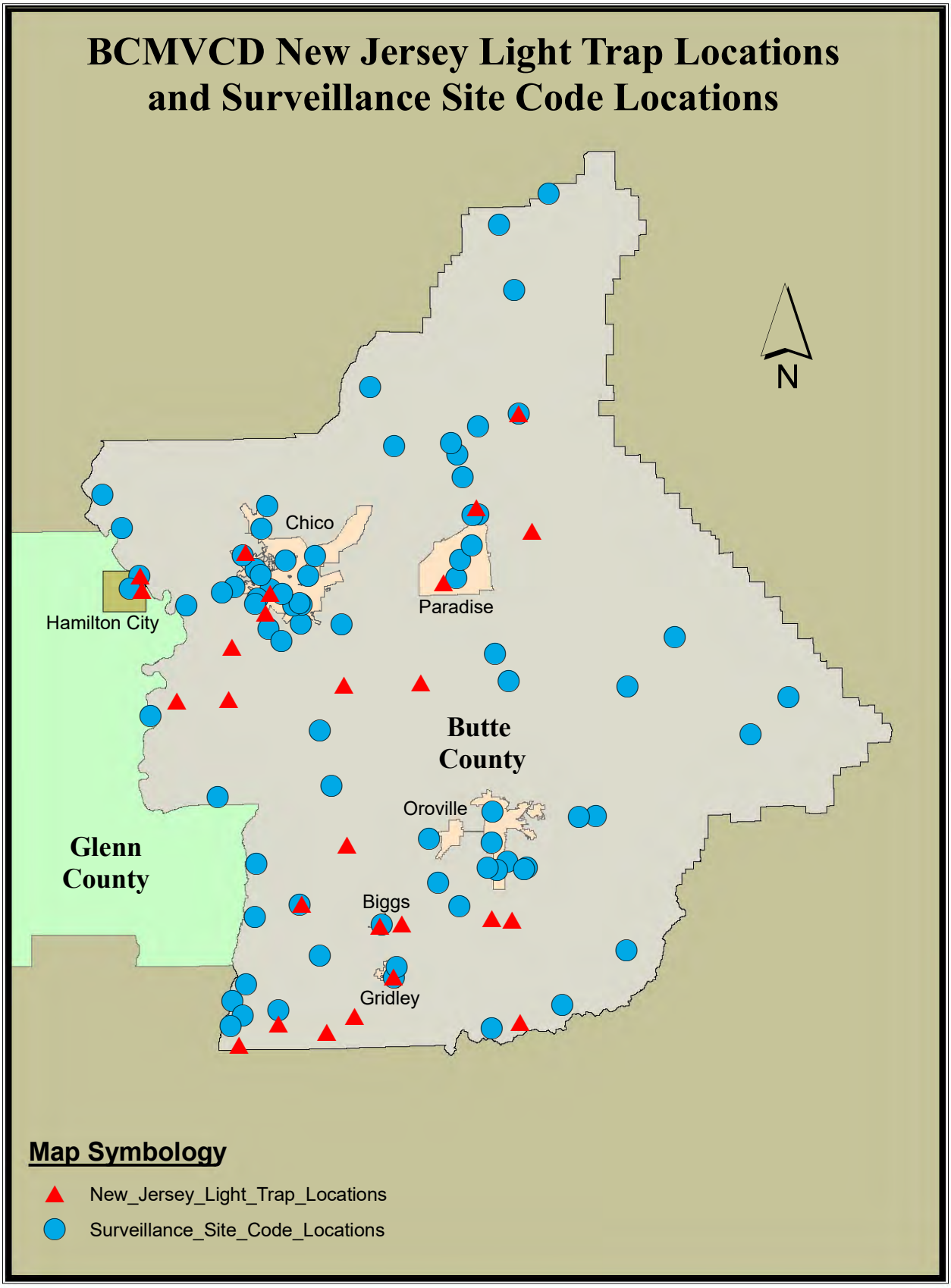
Each week the District's entomology staff strategically places traps known as encephalitis virus surveillance (EVS) or carbon dioxide traps (CO_2) around the District. Traps are posted overnight and retrieved the next morning and the collections are returned to the Lab for identification. The entomology staff will identify and sort the trapped mosquitoes and pool the collections for virus testing. A pool consists of 1 to 50 adult female mosquitoes of the same specie. Pooled mosquitoes are transferred to numbered vials and sent to the Center for Vector-Borne Disease Research (CVBDR) at the University of California, Davis. At the CVBDR lab the pools are tested for WEE, SLE, CE, and WNV. In 2016 the District sent 407 mosquito pool samples with 48 returning positive for WNV. This is the highest number of WNV positive mosquito pools ever recorded in the District service area.

DEAD BIRD SURVEILLANCE AND TESTING

For more than ten years the District has participated in the California Department of Public Health's (CDPH) WNV dead bird testing program. County residents participate in the program by calling CDPH's dead bird hotline (1-877-WNV-BIRD) each time they find a dead bird in the District or by submitting an online form at one of these two websites, (***www.westnile.ca.gov***) or (***www.BCMVCD.com***). After a dead bird has been reported, CDPH notifies the District and District staff retrieves the bird and submits it for WNV testing.

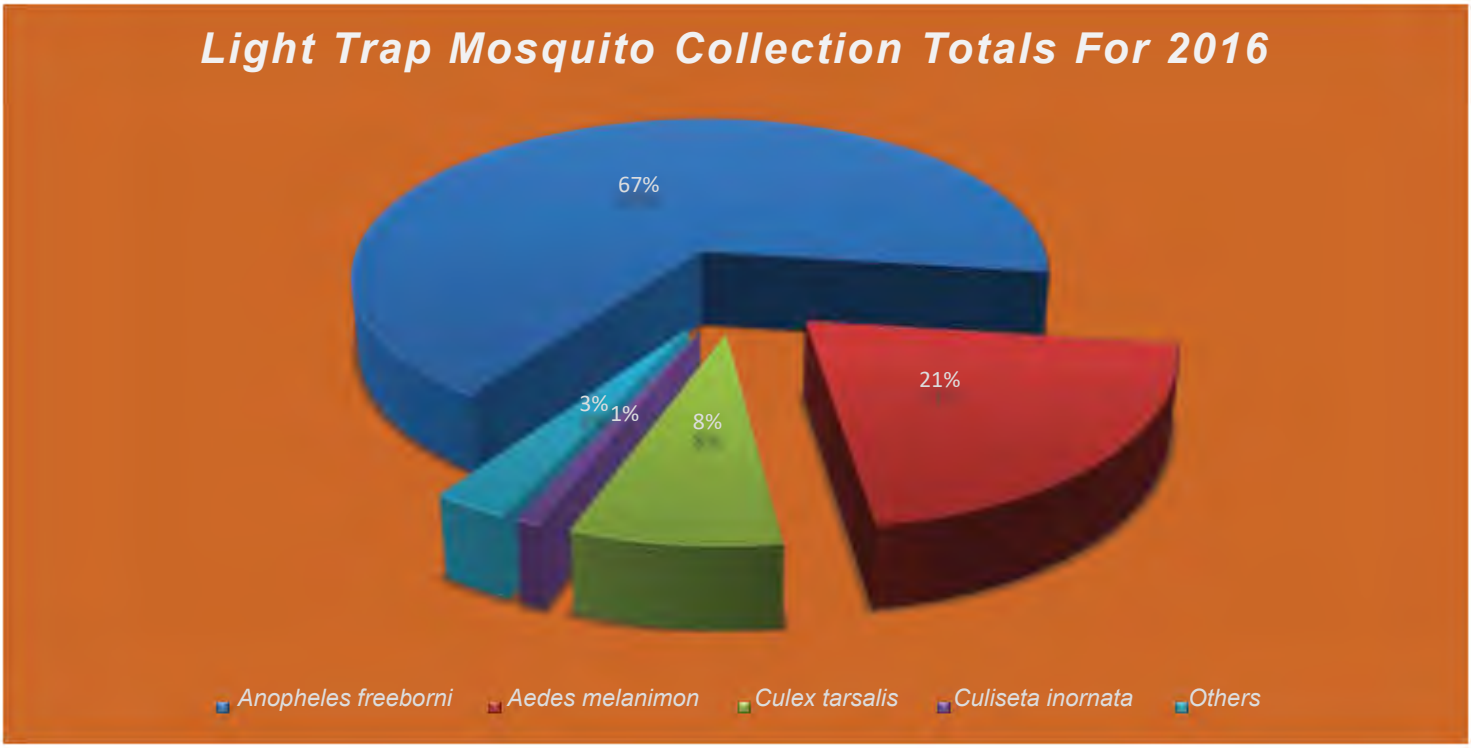
	Humans	Horses	Dead Birds	Dead Squirrels	Mosquito Pools	Sentinel Chickens
2004	7	18	118	0	1	50
2005	25	7	79	0	4	15
2006	34	0	40	1	1	49
2007	16	0	27	0	5	32
2008	6	0	38	0	5	31
2009	2	0	13	0	5	36
2010	1	1	6	1	7	7
2011	3	0	0	0	1	20
2012	10	2	53	2	27	43
2013	24	0	42	1	38	57
2014	25	0	22	0	43	37
2015	55	0	38	0	101	37
2016	21	0	22	0	48	38
Totals	**229**	**28**	**498**	**5**	**286**	**452**


BCMVCD Sentinel Chicken Flock Locations
and Gravid Trap Locations
N
Chico
Paradise
Hamilton City
Butte
County
Glenn County
Oroville
Biggs
Gridley
Map Symbology
Sentinel_Chicken_Flock_Locations
Gravid_Trap_Locations


BCMVCD New Jersey Light Trap Locations
and Surveillance Site Code Locations
N
Chico
Paradise
Hamilton City
Butte
County
Oroville
Glenn
County
Biggs
Gridley
Map Symbology
New_Jersey_Light_Trap_Locations
Surveillance_Site_Code_Locations

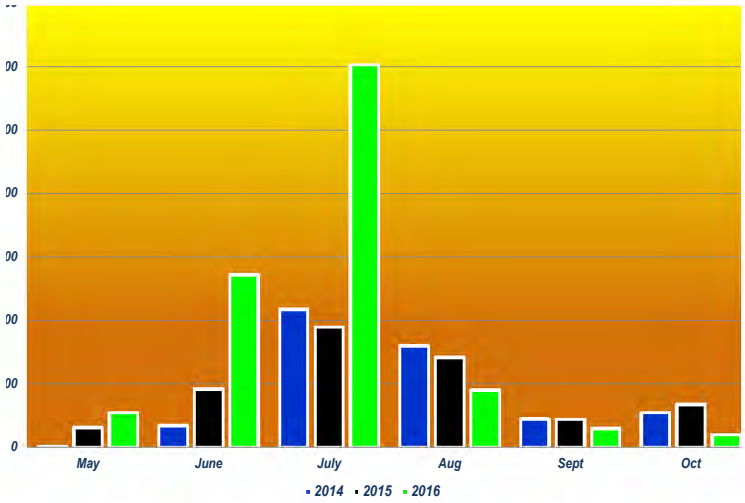
2016 NEW JERSEY LIGHT TRAP COLLECTIONS (FEMALES ONLY) MARCH 2016 - NOVEMBER 2016

Ranking	Mosquito Species	Number Collected	% (Rounded)
1	*Anopheles freeborni*	168099	68%
2	*Aedes melanimon*	52349	21%
3	*Culex tarsalis*	21900	8%
4	*Culiseta inornata*	2435	1%
5	*Culex pipiens*	591	<1%
6	*Culiseta incidens*	406	<1%
7	*Culex Erythrothorax*	58	<1%
8	*Aedes sierrensis*	50	<1%
9	*Aedes Vexans*	48	<1%
10	*Anopheles punctipennis*	34	<1%
11	*Culex stigmatosoma*	23	<1%
12	*Aedes washinoi*	2	<1%
13	*Aedes nigromaculis*	2	<1%
14	*Anopheles franciscanus*	0	0%
	Total Identified =	***245997***	***100.00%***

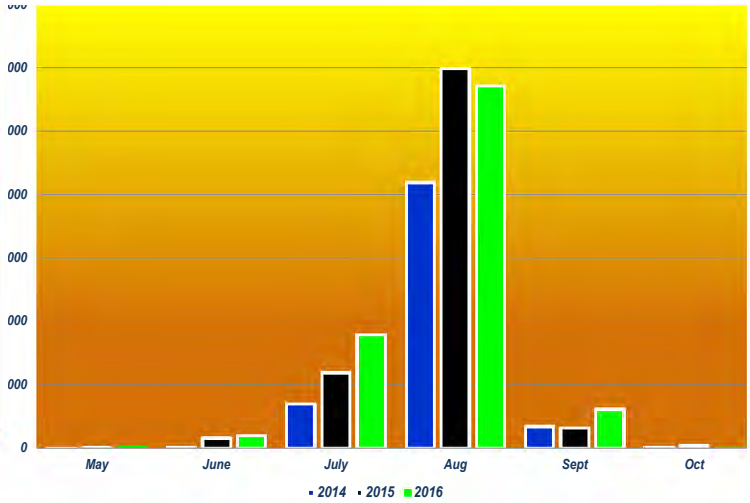


NEW JERSEY LIGHT TRAP SEASONAL FLUCTUATION OF VECTOR-BORNE DISEASE VECTORS

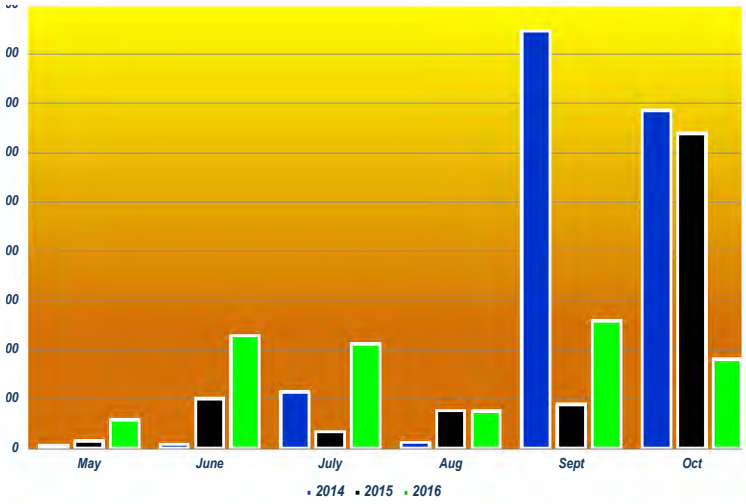
CULEX TARSALIS



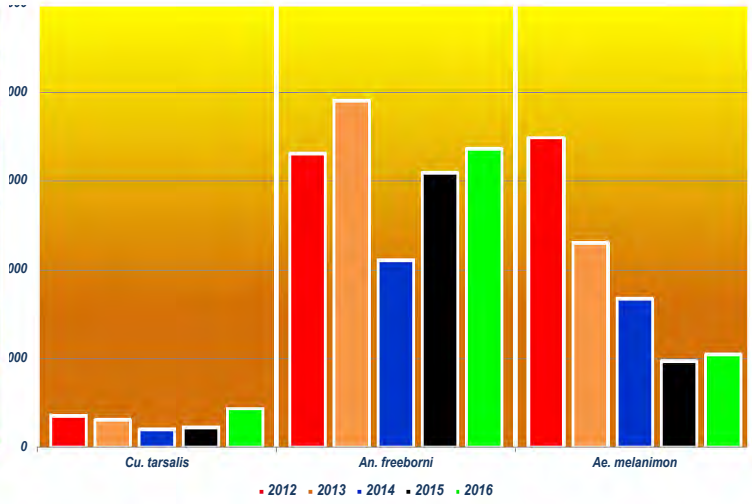
ANOPHELES FREEBORNI



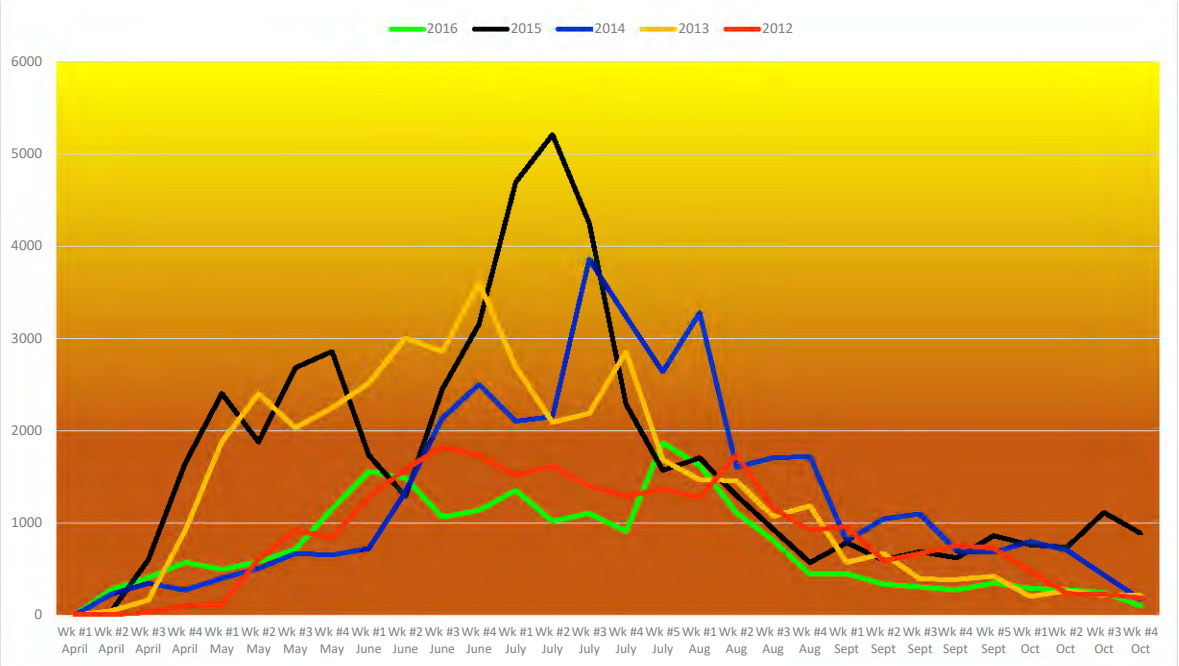
AEDES MELANIMON



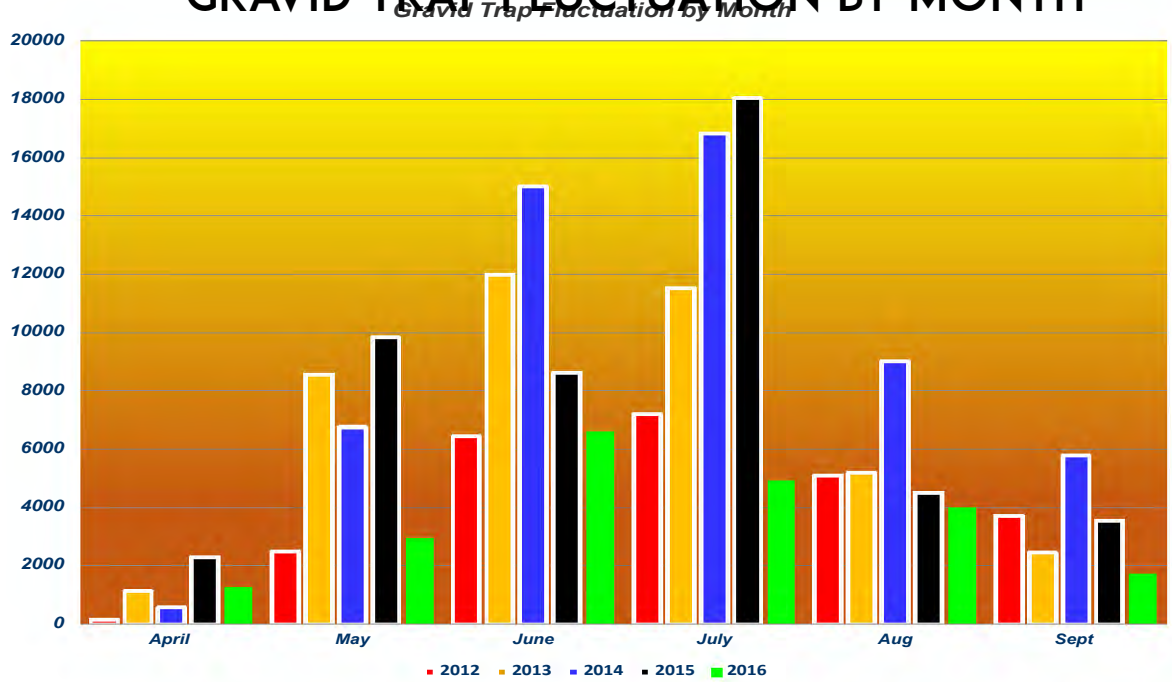
ANNUAL TOTAL FEMALE MOSQUITOES



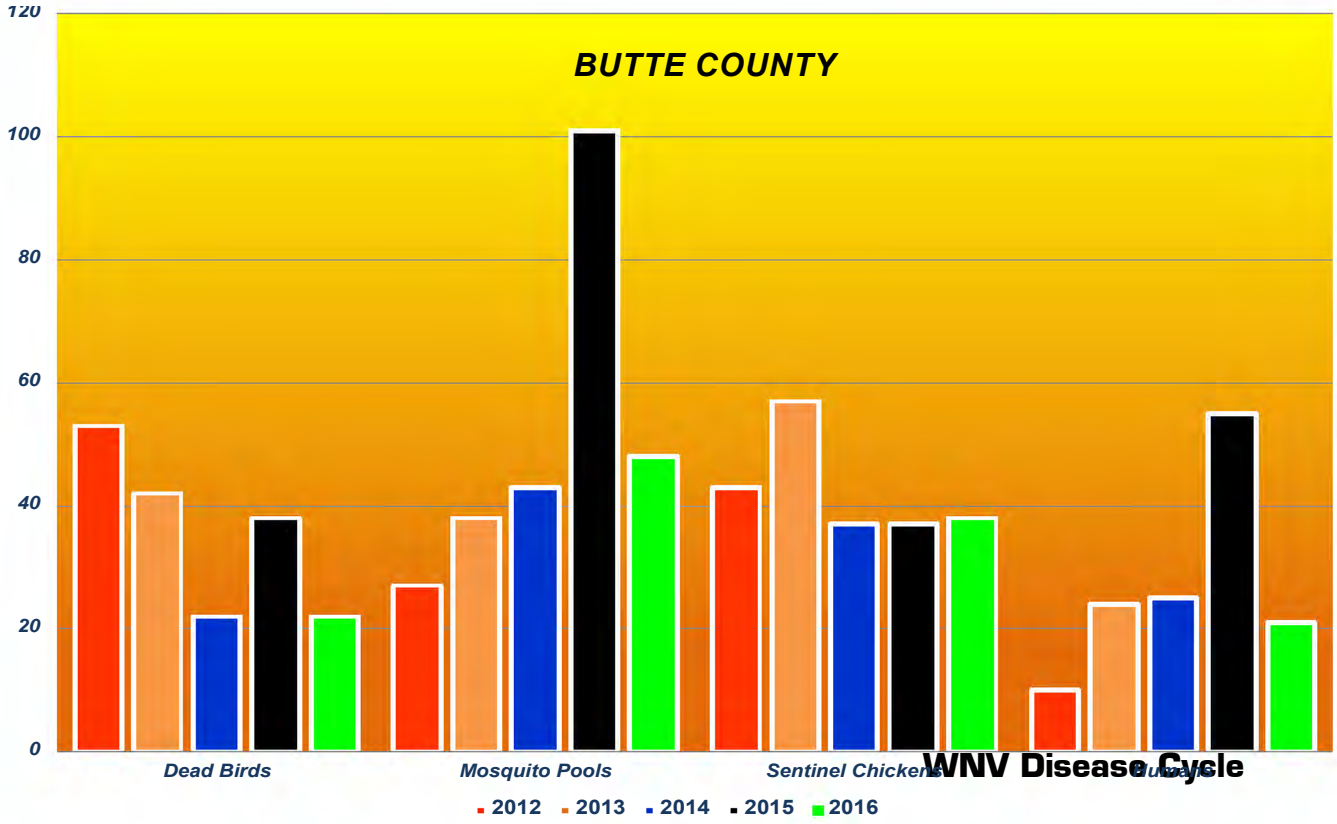
GRAVID TRAP FLUCTUATION BY WEEK

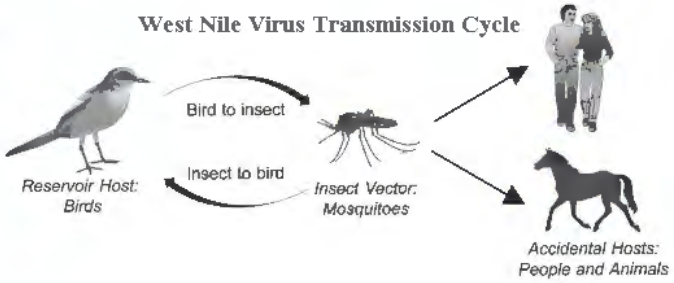


GRAVID TRAP FLUCTUATION BY MONTH



WEST NILE VIRUS ACTIVITY





WNV Disease Cycle

WEST NILE VIRUS SYMPTOMS

SERIOUS SYMPTOMS IN A FEW PEOPLE

About one in 150 people infected with West Nile virus (WNV) will develop severe illness. The severe symptoms can include high fever, neck stiffness, stupor, disorientation, coma, tremors, convulsions, muscle weakness, vision loss, numbness, and paralysis. These symptoms may last several weeks, and neurological effects may be permanent. WNV infection can be fatal.

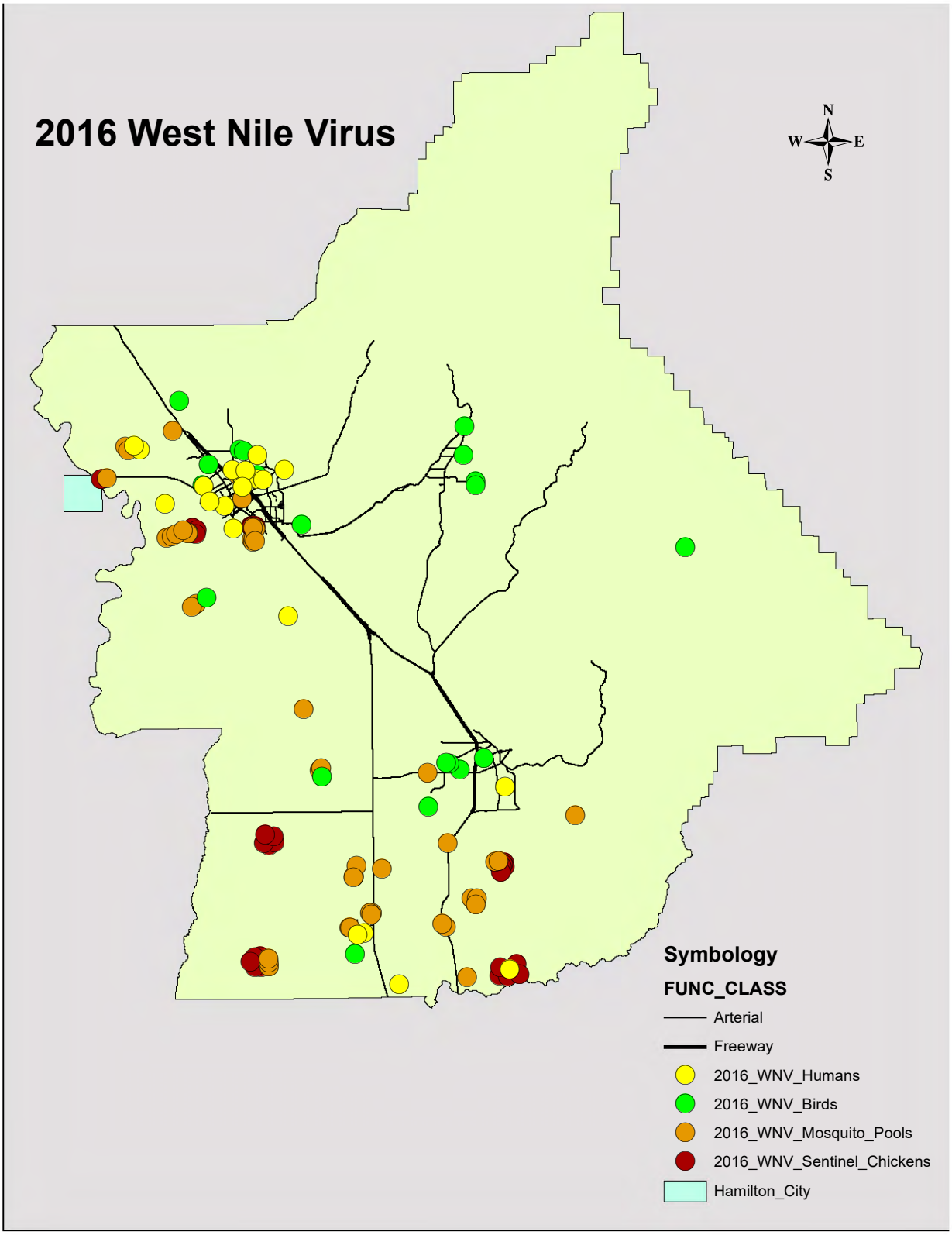
MILDER SYMPTOMS IN SOME PEOPLE

Up to 20 percent of the people who become infected will display symptoms including fever, headache and/or body aches, nausea, vomiting, and sometimes swollen lymph glands or a rash on the chest, stomach, and back. Symptoms can last as little as a few days to several weeks.

NO SYMPTOMS IN MOST PEOPLE

Approximately 80 percent of people (about 4 out of 5) who are infected with WNV will not have any symptoms at all.

2016 BUTTE COUNTY WEST NILE VIRUS MAP

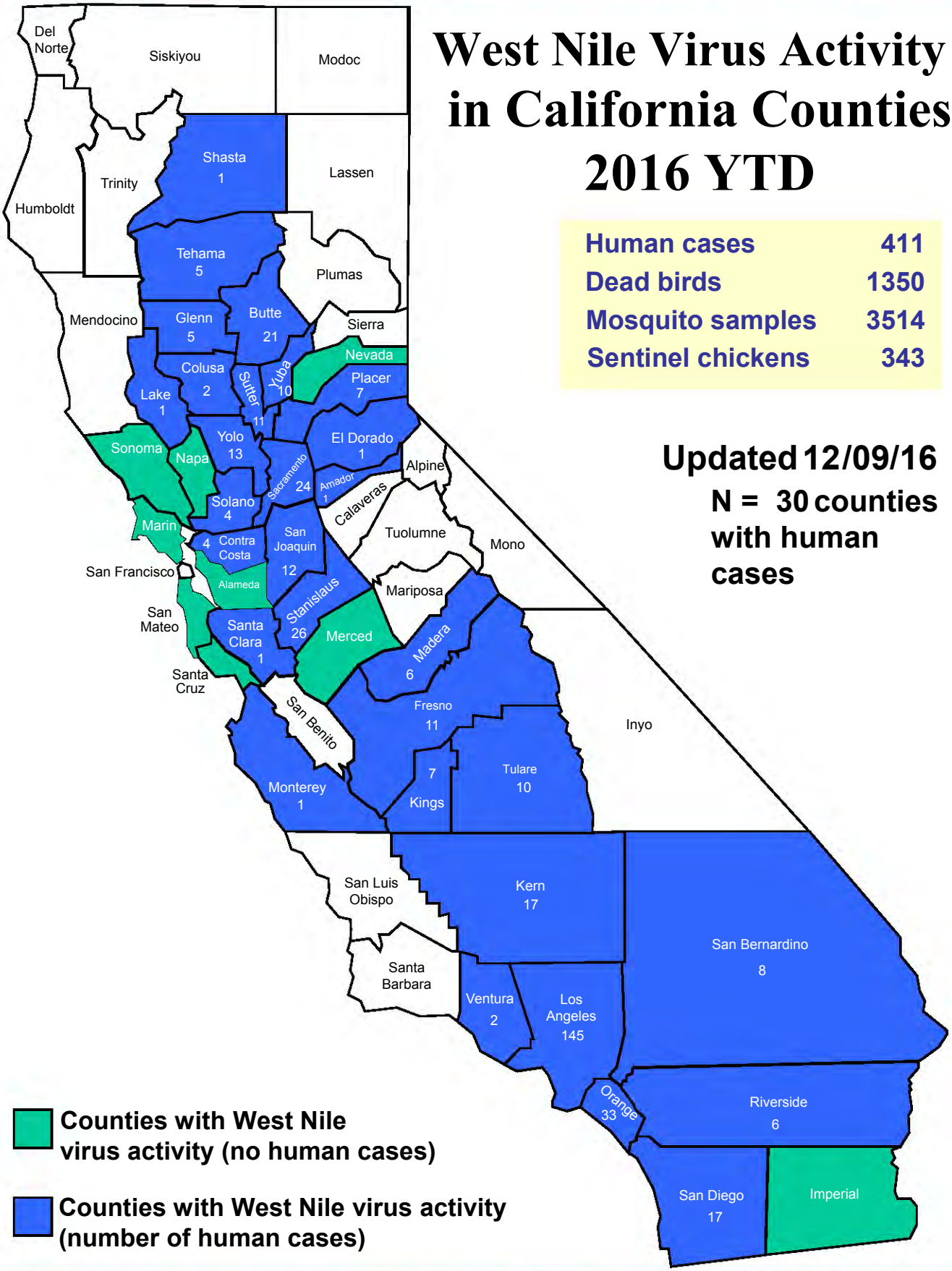


West Nile Virus Activity in California Counties 2016 YTD

Human cases	411
Dead birds	1350
Mosquito samples	3514
Sentinel chickens	343

Updated 12/09/16

N = 30 counties with human cases



Counties with West Nile virus activity (no human cases)

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

BIOLOGICAL CONTROL

Biological control is the intentional use of mosquito pathogens, parasites or predators to reduce the size of target mosquito populations to tolerable levels. The most popular and successful biological tool that is used by the District is the mosquitofish, *Gambusia affinis.* The District has tried other biological control methods and will continue to fully explore any new options that come along, but the most effective biological tool the District currently uses is the mosquitofish. Butte County Mosquito and Vector Control District maintains six fishponds at the Oroville Headquarters. These ponds produce hundreds of pounds of mosquitofish each year. The mosquitofish are routinely stocked and planted by District Mosquito and Vector Control Specialists to control mosquito populations in sources such as irrigation ditches, industrial, ornamental and artificial ponds, un-maintained swimming pools, semi-permanent and permanent urban sources, and at times in rice fields and wetlands. Mosquitofish are omnivorous and have a voracious appetite for mosquito larvae. The flattened head and protruding mouth enable the fish to readily prey on surface feeding mosquito larvae and pupae. A large female can consume up to 300 larvae per day! All ages, sexes, and sizes of these fish eat mosquito larvae, other small aquatic invertebrates, and algae. The fish are visual predators and feed during daylight hours.

Due to insecticide resistance and environmental concerns associated with chemical control methods, biological control methods are expanding as an effective tool used in the control of mosquitoes. populations.

Mosquitofish (Gambusia affinis) 2016

Mosq. Breeding Source Treated	lbs. Planted	Acres	Apps.
Stock Pond	1	3	8
Dredger Pit/ Ponds	2	5	4
Irrigation (Canal, Ditch, Pond,)	33	135	441
Managed Wetlands	92	336	75
Seepage	3	6	22
Water Trough	3	5	62
Field Drain	25	67	216
Dist. Grounds/Fish Ponds	263	370	22
Residential Fish Pond	9	18	112
Swimming Pool/Spa	4	7	59
Residential Misc. Container	1	1	10
Public Domain/Flood Control	0	0	0
Freeway/Road Drain	3	0	2
Sewage Ponds	2	4	13
Retention Detention/Ponds	1	2	7
Industial Commercial	2	1	4
Natural Sources/Wildlife Area	2	3	12
Organic Rice	14	59	4
Pond, Seepage, Slough, Creek	33	120	165
Public Fish Tanks	250	12	224
Large Area/Many Source Type	1	2	4
Annual Totals	***743***	***1156***	***1466***

Mosquitofish

Did You Know? Male mosquitoes usually live about five to seven days, while females can live two weeks to a month, under ideal conditions. However, the females of some species hibernate during winter, so they can live several months.

MOSQUITOFISH PICK UP LOCATIONS

Skyway Feed and Supply
5990 Foster Road
Paradise 877-1019

Foothill Mill and Lumber Company
1698 Wagstaff Road
Paradise 877-3395

Mendon's Nursery
5424 Foster Road
Paradise 877-7341

Paradise Pines True Value Hardware
14086 Skyway
Magalia 873-1008

C Bar D Feeds
3388 Hwy 32
Chico 342-5361

Magnolia Gift & Garden
1367 East Avenue
Chico 894-5410

Wilbur's Feed & Seed
139 Meyers Street
Chico 895-0569

The Pine's Yankee Hill
11300 Miller Flat Road
Oroville 534-1265
Hwy 70 just east Concow Road

Rosa's Nursery
585 Main Street
Hamilton City 826-0559

Harshbarger Ace Hardware
1626 Highway 99
Gridley 846-3625

District Office
5117 Larkin Road
Oroville 533-6038

Chico Substation (By Appointment)
444 Otterson Drive
Chico 342-7350

*Mosquitofish are not to be planted in creeks, streams, and rivers.

District fish tank

Mosquitofish

District Fish Ponds

CHEMICAL CONTROL

Chemical control is the use of target specific insecticides to reduce immature and adult mosquito populations. These chemicals are only applied when physical control, public education, and biological control methods are unable to keep mosquito populations tolerable or when emergency control measures dictate the use of chemicals to rapidly terminate or disrupt the transmission of disease to humans. There are two categories of chemicals used by the District, larvicides and adulticides. Larvicides target mosquito larvae and pupae. Adulticides target adult mosquitoes. The chemicals used by the District are registered with the United States Environmental Protection Agency (EPA), as well as the California Environmental Protection Agency (CAL EPA). The District relies mainly on larviciding as the primary means of chemical mosquito control. However, there are limitations to larviciding as a main control strategy. In Butte County where mosquito breeding occurs over large areas, the practical application of larvicides is not feasible and periodic adulticiding is necessary to protect nearby communities from the attack of adult mosquitoes. Also, there are areas that are environmentally sensitive and limit the use of larvicides. In these areas peripheral adulticiding is the only available option.

Ag-Cat treating a wetland for mosquito larvae

Residual treatment

Fogger Calibration

Calibration Training

MATERIALS USED 2016

Materials	Amount of Materials	Acres Treated	Number of Applications
Larvicides			
Abate 4E	0.07 gal.	6.00	6
Agnique	18.95 gal.	61.17	100
Altosid XR Briquettes	1.14 lbs.	0.02	4
Cocobear Oil	1,045.21 gal.	333.96	1,169
Fourstar CRG	6.10 lbs.	0.61	1
Natular G	400.00 lbs.	44.34	2
Natular XRT	309.86 lbs.	8.06	322
VectoBac 12AS	4,315.01 gal.	64,356.08	826
VectoBac G	6,236.85 lbs.	546.61	12
VectoBac GR	79,765.86 lbs.	7,434.06	178
VectoLex WDG	2.00 lbs.	3.50	3
VectoMax WSP	33.92 lbs.	1.77	240
VectoPrime	640.00 lbs.	72.46	2
		72,796.19	**2,863**
Adulticides			
Duet	1,205.16 gal.	256,184.26	2,397
Perm X ULV	132.01 gal.	11,400.48	375
Trumpet	1,079.97 gal.	137,901.09	422
		405,485.83	**3,194**
Barrier Sprays			
Suspend	12.34 gal.	36.29	315
		36.29	**315**
Yellow Jacket Control			
Drione	0.75 lbs.	0.11	11
Knox Out 2FM	0.08 gal.	0.08	33
		0.19	**44**
Herbicides			
Round Up Pro Max	0.74 gal.	1.19	10
Envoy Plus	0.84 gal.	4.37	10
Finale	2.50 gal.	8.32	13
Dimensinon 2EW	0.28 gal.	1.17	4
		15.05	**37**

Aircraft Spraying

Total Acres Treated	**210,354.03**
Total Acres Rice	**64,355.449**
Managed Wetlands	**8,097.49**
Total Acres ULV	**137,901.09**

Inspections, Applications- Ground and Aerial

	Hours
Ground Larvicide Treatments	1,006.85
Fish Plants	244.40
Aerial Larvicide	317.67
Ground Adulticide	4,420.64
Residual Sprays	210.07
Aerial Adulticide	13.20
Inspections	4,389.75

TICK SURVEILLANCE

Tick surveillance in Butte County is done primarily because of the diseases that ticks can transmit. In the United States ticks are known to transmit 14 human illnesses. The two that infect humans most often are Lyme disease and Rocky Mountain Spotted Fever (RMSF). Lyme disease is an infectious disease caused by a bacterium known as a *Borrelia burgdorferi*. People get Lyme disease when a tick infected with the Lyme disease bacterium attaches and feeds on them. The tick that is responsible for spreading Lyme disease in Northern California is the Western Black-legged tick. RMSF is a bacterial disease caused by the bacterium, Rickettsia. Transmission of the RMSF bacteria is primarily from the Pacific Coast tick. Both of these ticks can be readily found in Butte County.

District tick surveillance consists of “flagging” and identifying. “Flagging” is where a 3 x 2 piece of thick, fibrous cloth, is dragged along the edge of a trail or dirt road. The ticks attach themselves to the cloth while they are “questing” for a blood meal. Like a mosquito, the female tick needs a blood meal to lay her eggs. Once the ticks are attached to the cloth they are identifed, counted, and recorded. This information can lead to risk assessmant warnings to residents in areas that have high tick activity.

Tick “flagging”

Locating tick on the “flag”

Collecting the Tick

Western Black Legged tick

YELLOW JACKET SURVEILLANCE

Yellowjackets are medium sized black and yellow wasps (sometimes black and creme) that are often confused with honey bees, paper wasps, mud daubers, and other wasps. Yellowjackets are social insects that are considered beneficial. They can feed on garden pests and pollinate crops through daily foraging. Yellowjackets can become a public health concern because of their territorial behavior and their affinity for human food and drinks. Yellowjackets can restrict or prevent outdoor activities in areas such as campgrounds, picnic areas, and backyards.

The District will respond to reports of high yellowjacket activity. Mosquito and Vector Control Specialists will then inspect the area and decide if control is appropriate. Control measures may include placing traps or bait, treating nests with an approved insecticide, or physically removing the nest. All pesticide applications are made by state-certified technicians using materials that are registered for use by the Environmental Protection Agency.

Locating the nest entrance

"Dusting" the nest

Yellowjacket

Hornet

GOING GREEN

In an effort to reduce it's "carbon footprint" the District continually looks for ways to "go Green". One of the first steps in doing this was the purchase of an electric powered Zap pickup. This pickup is currently being used as a yard utility vehicle at the District headquarters in Oroville. This pickup is used for many applications where a gas powered pickup or a forklift were used in the past. Additionally, the pickup is used during mosquito season in urban areas for larval surveillance and control. The District has also purchased an electric powered forklift for it's Chico substation. Another step in the District's going green plan was the purchase of four bicycles. The four bikes are used mainly in Chico to treat storm drains. These bikes are especially handy in the downtown Chico area where parking and accessability can be an issue. The Mosquito and Vector Control Specialists that ride the bikes can triple their days workload, reaching many more mosquito populations in much less time.

Checking a storm drain via bicycle

Smart car

PROGRAMMATIC ENVIRONMENTAL IMPACT REPORT

In 2011, the District completed its Programmatic Environmental Impact Report (PEIR). The District held a public hearing to receive comments on the District's Draft PEIR on February 9, 2011. After receipt of comments from the State of California Department of Public Health, and from trustees, the draft PEIR was revised and a Final PEIR was available for review between February 10, 2011 & August 5, 2011. Upon conclusion of the second review period and a second public hearing on August 10, 2011 the District's Board of Trustees adopted the District's Final PEIR report compiled by Westech Company with changes and mitigations. This report will be used as an educational component for the District. Residents can view the PEIR on the District's website at www.BCMVCD.com.

Airplane larvacide calibration

Fogger calibration

DISTRICT SHOP

The District's shop provides the maintenance and repairs for 30 vehicles, 3 forklifts, 1 backhoe, 3 ATV's, 2 amphibious Tritons, 1 loader truck and 4 utility trailers. Additionally, the shop is responsible for the maintenance and repairs to the District's electric ULV foggers, gas ULV foggers, back cans, power sprayers, small engines such as chain saws, weed eaters, lawn mowers, etc. and other mechanical items.

The shop is also responsible for repairing and installing improvements to the District facilities and grounds when and where necessary. Often the shop will repair the District's security system, lighting fixtures, plumbing fixtures, and other items as needed.

DISTRICT AIR OPERATIONS

At the Oroville facility, the District employs one full time Pilot II. On average the planes make applications to over 150,000 acres each year. During down time, the 3 planes receive repairs and technological improvements such as new instruments and instrument panels, installation of new technology (altimeter, Satloc, Ag-Nav), repainting, replacing engine parts, and routine annual maintenance. The Pilot II also is responsible for renting a passenger plane and providing aerial surveillance flights over seasonally flooded wetlands and duck clubs for the District's Mosquito and Vector Control Specialists.

DISTRICT ADMINISTRATION

Greeted by a nice smile and a pleasant tone, professional and courteous customer service is the number one priority for the District's administration staff. The District employs one full time Office Manager. The tasks of the administrative personnel involve serving the residents of Butte County and Hamilton City, as well as, the employees of the District. Accounting, budgeting, responding to telephone inquiries, maintaining public records, coordinating policies, and reporting to the Board of Trustees are just a few of the many duties the department performs.

2016 BUTTE COUNTY MOSQUITO AND VECTOR CONTROL DISTRICT BOARD OF TRUSTEES

Name	Title	Area Represented	Term Expires
Albert Beck	Board President	County at Large	December 31, 2017
Carl Starkey	Board Trustee	County at Large	December 31, 2016
Suzanne Hanson	Board Trustee	County at Large	December 31, 2018
Jack Bequette	Board Trustee	County at Large	December 31, 2016
Thomas Vickery	Board Trustee	County at Large	December 31, 2019
Bo Sheppard	Board Assistant Secretary	City of Biggs	December 31, 2018
Larry Kirk	Board Vice President	City of Chico	December 31, 2017
Bruce Johnson	Board Trustee	City of Gridley	December 31, 2019
Terry Mallan	Board Trustee	Town of Paradise	December 31, 2016
Tom Anderson	Board Secretary	Hamilton City	December 31, 2017
Gordon Andoe	Board Trustee	City of Oroville	December 31, 2017

2016 BUTTE COUNTY MOSQUITO AND VECTOR CONTROL DISTRICT EMPLOYEES

Name	Title
Matt Ball	Manager
Doug Weseman	Assistant Manager
Del Boyd	Pilot II
Darlene Starkey	Office Manager
Eric Gohre	Entomologist II
Bill Kunde	Regional Supervisor
Jim Richards	Regional Supervisor
Chris Ocegueda	Vector Ecologist/Fish Biologist
Beth Vice	MVCS
Phillip Henry	MVCS
Shane Robertson	MVCS
Don Lasik	MVCS
Aaron Goff	MVCS
Glen Williams	MVCS
AAron Lumsden	MVCS
Eric Dillard	MVCS
Kellen Larson	Shop Assistant Seasonal
Kenneth Armstrong	Shop Assistant Seasonal
Tina Weseman	Lab Assistant Seasonal
Anthony Visconte	MVC Assistant Seasonal
Frank Lopez	MVC Assistant Seasonal
Shane Cassity	MVC Assistant Seasonal
Brian Jackson	MVC Assistant Seasonal
Dacoda Quinn	MVC Assistant Seasonal
Jordan Delatorres	MVC Assistant Seasonal
Charlie Favilla	MVC Assistant Seasonal
Dan Mayer	MVC Assistant Seasonal
Alex Miller	MVC Assistant Seasonal
Stetcyn Arrington	MVC Assistant Seasonal

Keeping the Equipment Running

Building a New Chicken Coop

SPECIAL BENEFIT ASSESSMENT

To address the growing needs placed upon the District and to expand and enhance existing services, the District attempted and passed a Special Benefit Assessment on all properties within the District's Service Area. With these additional revenues the District will have the ability to enhance/improve all services provided by the District. Below is a non-exhaustive list of services that would be improved and/or enhanced:

- Increase seasonal staff and possibly permanent staff to better the services the District provides (e.g. surveillance, control, education, etc.).
- Expand the District's public education and outreach program to better educate those that the District serves to the services provided, the elimination of mosquito and other vector habitat, and how to protect oneself from mosquito and vector-borne disease.
- Expand the District's mosquito surveillance program to better identify mosquitoes of medical importance, increase the number of traps used, increase the amount of mosquitoes tested, commence with the surveillance of invasive species surveillance such as the Asian Tiger Mosquito and Yellow Fever Mosquito (both of which have been introduced into California in the past 3 years) and also to expand mosquito testing of newly introduced mosquito-borne disease such as chikungunya virus, Rift Valley fever, dengue fever, and others.
- Expand the District's tick surveillance to monitor more public use lands, test collected ticks for the presence of tick-borne disease, and conduct tick control trials.
- Expand and improve on the District's mosquitofish program. Purchase mosquitofish rearing tanks to provide an environment in which mosquitofish propagate year round rather than seasonally allowing the District to keep up with the demand requests of the public and to have more fish available to District staff to stock in mosquito-breeding areas to lower larval mosquito populations.
- Increase the amount of public health pesticide applications should surveillance data indicate a need based on treatment thresholds and/or resident service requests. Possibly lower the treatment thresholds for larvae and adult mosquitoes.
- Purchase new capital such as spray equipment and vehicles to lower maintenance costs, increase fuel mileage, and increase the reliability of service.
- Continue to and enhance investing in mosquito control research and new technology to identify better ways of protecting the public's health.

This funding measure has strengthened, enhanced, and improved the District's baseline services provided. With newly introduced invasive species as well as new and reemerging vector-borne disease, mosquito and vector controls importance will only continue to grow.

Did You Know? All mosquitoes require water to breed. Some species can breed in puddles left after a rainstorm. Just a tablespoon of water is all it takes for a female to deposit her eggs. Tiny mosquito larva develop quickly in bird baths, roof gutters, and old tires dumped in vacant lots. If you want to keep mosquitoes under control around your home, you need to be vigilant about dumping any standing water every few days.

TRANSPARENCY CERTIFICATE OF EXCELLENCE AWARD

For the 4th year in a row, the Butte County Mosquito and Vector Control District (District) received the Transparency Certificate of Excellence by the Special District Leadership Foundation (SDLF) in recognition of the District's outstanding efforts to promote transparency and good governance.

"This award is a testament to the Butte County Mosquito and Vector Control District's commitment to open government," said Matthew Ball, District Manager. "The District's entire Board of Trustees and staff are to be commended for their contributions that empower the public with information and facilitate engagement and oversight."

In order to receive the award, a special district must demonstrate the completion of eight essential governance transparency requirements, including conducting ethics training for all board members, properly conducting open and public meetings, and filing financial transactions and compensation reports to the State Controller in a timely manner.

The Butte County Mosquito and Vector Control District also fulfilled fifteen website requirements, including providing readily available information to the public, such as board agendas, past minutes, current district budgets, and the most recent financial audit.

Finally, the District must have demonstrated outreach to its constituents that engages the public in its governance, through regular district newsletters and community engagement projects.

District Transparency
Certificate of Excellence

January 2016 – January 2018

This 31st day of January 2016

The Special District Leadership Foundation is proud to present this
District Transparency Certificate of Excellence to

Butte County Mosquito & Vector Control District

In recognition of the district's completion of all transparency program requirements designed to promote transparency in their operations and governance to the public and other stakeholders.

David Aranda, SDLF Board President

Neil McCormick, SDLF Chief Executive Officer

CALIFORNIA INVASIVE SPECIES

Over the past several years, two invasive (non-native) mosquito species have been found in 126 California cities (up from 84 at the beginning of June, 2016) and there is potential for them to spread into other areas of California. They are named *Aedes aegypti* (the yellow fever mosquito) and *Aedes albopictus* (the Asian tiger mosquito). They are relatively easy to tell apart from native mosquito species because of their color and their biting habits. Unlike most native mosquito species, *Aedes aegypti* and *Aedes albopictus* bite during the day and are extremely aggressive. Both species are small black mosquitoes with white stripes on their back and on their legs. Currently, neither of the species have been located within the District's Service Area. The District has purchased, constructed, and deployed specie specific traps to provide surveillance of these two species. These mosquitoes are responsible for transmitting chikungunya virus, dengue fever, yellow fever, Zika virus, and other viruses. Below is an update on these viruses:

Zika

For 2015-2016 CDPH has reported 328 cases of Zika. All 328 individuals contracted Zika while traveling outside of the United States or through contact with a Zika-infected returned traveler. These infections are in residents of 30 California counties, including 10 with invasive Aedes mosquito detections. Of the 328 infected persons, 213 are residents in counties with known invasive Aedes. There are 28 countries and U.S. territories or states with Zika exposure. The top 5 countries include Mexico (85), Nicaragua (44), Guatemala (33), El Salvador (27), and the Dominican Republic (24).The median age of the infected persons is 35 years, and 63% of the infections occurred in females. Of the 328 infected persons, 309 were symptomatic, with at least one symptom of fever, rash, conjunctivitis, or joint pain. CDPH updates our case numbers every Friday and posts them on the CDPH Zika website.

Chikungunya

To date for 2016, 22 cases of chikungunya have been reported in California. These cases are from 10 counties, 7 with invasive *Aedes.*

Dengue

To date for 2016, 126 cases of dengue have been reported in California. These cases are from 30 counties, 10 with invasive *Aedes.*

Aedes albopictus

Aedes aegypti

Butte County Mosquito and Vector Control District
For The Year Ended June 30, 2016

		Budgeted	Actual	Variance Favorable (Unfavorable)
Revenue		$ 3,303,209	$ 3,755,533	$ 452,324
SALARIES & BENEFITS				
Salaries		$ 1,220,700	$ 1,276,806	$ (56,106)
Workers Compensation		$ 60,000	$ 52,732	$ 7,268
FICA & U I		$ 112,200	$ 109,807	$ 2,393
Health Insurance		$ 285,500	$ 261,308	$ 24,192
Health Ins Reimbursement		$ 20,500	$ 11,242	$ 9,258
PERS		$ 303,000	$ 273,334	$ 29,666
	TOTAL	$ 2,001,900	$ 1,985,230	$ 16,670
SERVICES & SUPPLIES				
Gas & Oil		$ 100,000	$ 86,229	$ 13,771
Repairs & Parts-Airplane		$ 20,000	$ 21,847	$ (1,847)
Repairs & Parts		$ 30,000	$ 28,237	$ 1,763
Office Supplies		$ 15,000	$ 12,834	$ 2,166
Education & Publicity		$ 30,000	$ 26,508	$ 3,492
Insecticides		$ 633,000	$ 733,059	$ (100,059)
Expendable Equipment		$ 50,000	$ 35,343	$ 14,657
Communications		$ 20,000	$ 23,619	$ (3,619)
Travel		$ 15,000	$ 5,503	$ 9,497
Utilities		$ 25,000	$ 19,831	$ 5,169
Rent		$ 5,000	$ 4,200	$ 800
Special Services		$ 80,000	$ 95,792	$ (15,792)
Trustee Allowance		$ 13,200	$ 12,500	$ 700
General Insurance		$ 75,000	$ 65,710	$ 9,290
Employee Trng & Dues		$ 10,000	$ 11,581	$ (1,581)
District Fees and Permits		$ 30,000	$ 22,838	$ 7,162
Miscellaneous		$ 12,000	$ 15,205	$ (3,205)
Research Supplies		$ 45,000	$ 58,213	$ (13,213)
Alternate Technology		$ 1,000	$ -	$ 1,000
Special Discretionary		$ 10,000	$ 11,605	$ (1,605)
Gambusia		$ 5,000	$ 9,957	$ (4,957)
	TOTAL	$ 1,224,200	$ 1,300,610	$ (76,410)
CAPITAL OUTLAY				
Bldg & Improvements		$ 50,000	$ 34,454	$ 15,546
Vehicles		$ 95,000	$ 103,794	$ (8,794)
Spray Equipment		$ 25,000	$ 21,514	$ 3,486
Aircraft		$ 5,000	$ -	$ 5,000
Office Equipment		$ 1,000	$ -	$ 1,000
Laboratory Equipment		$ 1,000	$ -	$ 1,000
Shop Equipment		$ 1,000	$ -	$ 1,000
Education & Publicity		$ 3,000	$ -	$ 3,000
Miscellaneous		$ 5,000	$ 5,920	$ (920)
Communications		$ 1,000	$ -	$ 1,000
	TOTAL	$ 187,000	$ 165,682	$ 21,318
Appropriation for contingencies		$ 852,025		$ 852,025
Grand Total		$ 4,265,125	$ 3,451,522	$ 813,603
Excess(Deficiency) of Revenue over Expenditures		$ (961,916)	$ 304,011	$ 1,265,927
Fund Balance 2015			3,036,133	
Fund Balance 2016			3,388,721	

2016 FINANCIALS

Butte County Mosquito and Vector Control District
Balance Sheet Audit Information
For The Year Ended June 30, 2016

	General Fund	Reclassification Eliminations	Statement of Net Position
Current Assets			
Cash and Investments	3,118,190		3,118,190
Accrued Interest Receivable	6,449		6,449
Accounts receivable	22,350		22,350
Material & Supplies Inventories	310,103		310,103
Prepaid Expenses	21,838		21,838
Total Current Assets	3,478,930		3,478,930
Non-currrent Assets			
Capital Assets not being depreciated		615,403	615,403
Capital assets, being Depreciated		2,269,384	2,269,384
Totan Non current Assets	-	2,884,787	2,884,787
Total assets	3,478,930	2,884,787	6,363,717
Deferred outflows of resources			
Deferred pension outflows		377,709	377,709
Total deferred outflows of resources	-	377,709	377,709
Current Liabilities			-
Accounts payable & accrued expenses	19,099		19,099
Accrued Salaries and Benefits	71,110		71,110
Long term-liabilites due within 1 year compensated absences		130,952	130,952
Total Current Liabilities	90,209	130,952	221,161
Non-current liabilities			
Long term liabilities-due in more than 1 year-compensated absences		392,855	392,855
Net pension liability		2,390,965	2,390,965
Total non-current liabilities	-	2,783,820	2,783,820
Total Liabilities	90,209	2,914,772	3,004,981
Deferred inflows of resources			
Deferred pension inflows		140,759	140,759
Total deferred inflows of resources	-	140,759	140,759
Fund Balance			
Nonspendable:	331,941	(331,941)	-
Assigned - compensated absences	523,807	(523,807)	-
Unassigned, reported in:			-
General Fund	2,532,973	(2,532,973)	-
Total Fund Balance	3,388,721	(3,388,721)	-
Total Liabilities and Funds Balance	3,478,930		
Net position:			
Net investment in capital assets		2,884,787	2,884,787
Unrestricted		710,899	710,899
Total net position		3,595,686	3,595,686


Butte County Mosquito
& Vector Control District
Since 1948

Attachment D

Integrated Pest Management of Mosquitoes

A Case Study of West Nile Virus in California

Matthew Baur
Amanda Crump
Steve Elliott
James Farrar

October 2017

Western IPM Center

INTRODUCTION

There are 72 mosquito control districts covering most of California. Many were created more than a century ago to protect people from the risks associated with mosquitoes. The control efforts were first directed against vectors of malaria (*Plasmodium vivax*), an endemic disease in California transmitted by the western malaria mosquito (*Anopheles freeborni*) (Reisen 2012). While malaria no longer poses a public health threat in California, mosquitoes remain a nuisance pest and a public health risk because they transmit viruses that can cause encephalitis such as West Nile virus (Reisen et al. 2008).

The context in which the districts function and the communities they serve have changed over the past century. The population in California has expanded from nearly 2.4 million in 1910 to over 39 million in 2016. Education levels, indicated by the proportion of residents with a bachelor's degree or higher, have been increasing over the past decade. The expansion of the Internet has made data and information more accessible. An increasing population with higher levels of education and increased access to information, coupled with increasing concerns about pesticide use and environmental impacts, means that districts are under increasing pressure to minimize the risks posed by pesticides to human and environmental health and at the same time continue to manage mosquitoes effectively with tightening budgets. To simultaneously control costs and minimize both the risks posed by the mosquitoes and the risks posed by mosquito-management tactics to human and environmental health, the districts use integrated pest management.

We present case studies of three mosquito control districts in California following the rapid expansion of West Nile virus in California in the early 2000s. The case-study format was chosen because the districts efforts to manage mosquito populations are specific to the communities they serve (Mirriam 2009). Districts must align their efforts with the values and goals of the communities they serve and management tactics used in one district may not be publicly acceptable in another.

We focus here on three districts representing two urban centers and three rural counties within California: Sacramento-Yolo, Orange, and Sutter-Yuba. They were chosen because of the incidence of West Nile virus outbreaks, the availability of information on disease impact, and the availability of data and information about their control programs. These three districts also demonstrate how different districts must balance the public perception of the risks posed by mosquitoes and the materials used to control those mosquitoes. West Nile virus was chosen because it has been an important driver of mosquito control in California today.

This report documents the many integrated pest management tools used by the three districts, and how recent changes in decision-tools, mapping and surveillance, area-wide management, and outreach, have further reduced the exposure of humans and the environment to mosquitoes and the products used to control them.

Data sources used for this report included: Center for Disease Control (cdc.gov), Census Bureau (www.census.gov), USDA National Agricultural Statistics Service (www.nass.usda.gov), California Pesticide Use Reporting database (ziram.lawr.ucdavis.edu/PURwebGIS.html), California Department of Public Health (www.cdph.ca.gov), California Health and Human Services Agency (www.chhs.ca.gov), Mosquito and Vector Control Association of California (www.mvcac.org), and California Department of Agriculture (www.cdfa.ca.gov), and the California Irrigation Management Information System (CIMIS).

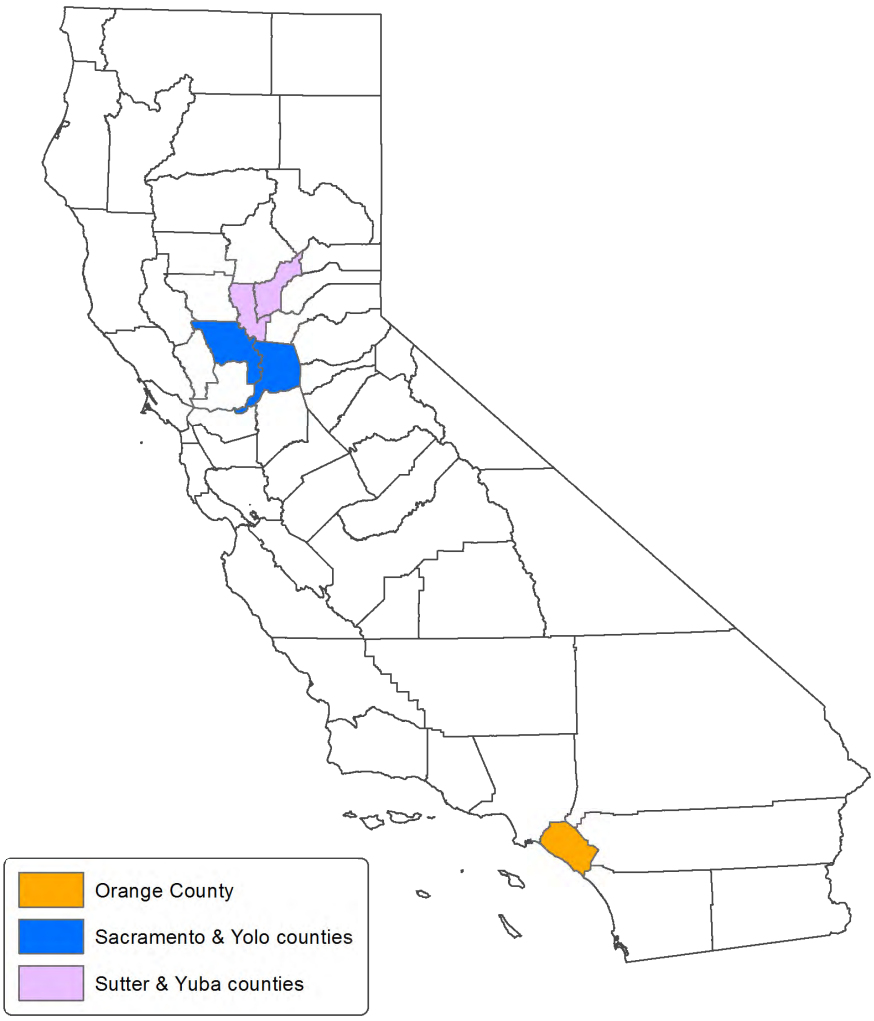


Figure 1. Location of mosquito and vector control districts included in this case study

BACKGROUND INFORMATION

Mosquito Control District Overviews

The Orange County Mosquito and Vector Control District protects more than 3.1 million residents in the largely metropolitan area of 791 square miles. The district is bordered by Los Angeles County to the north and San Bernardino and Riverside counties to the east and San Diego County to the south (Figure 1). Orange County is considered to be part of the greater Los Angeles metropolitan area. Orange County's climate is typically maritime Mediterranean, with mild winter temperatures and warm, dry summers moderated by easterly winds from the Pacific Ocean. The mean annual temperature is 65 F and an average of 14 inches of rain fall annually. On average, measurable rainfall occurs on 22 days per year. Nearly 38% of the population in the county possesses a bachelor's degree or higher. Very little agricultural activity occurs in the county. Nursery production is the predominant agricultural activity followed by limited fruit and vegetable production that covers nearly 3,500 acres (2015 Orange County Crop and Livestock Report accessed through the California Department of Food and Agriculture). The Orange County district had the highest number West Nile cases in California in 2014 with 280 cases and nine deaths (Nguyen et al. 2015).

The Sutter-Yuba Mosquito and Vector Control District protects most of Sutter County and about half of Yuba County, covering 706 square miles and about 130,000 residents. The largest city in the district is Yuba City with 68,000 inhabitants. The majority of the district is on the Sacramento Valley floor where gentle flatlands typify the topography. The district is bordered by Butte, Plumas, and Sierra counties to the north, Nevada County to the east, Sacramento, Yolo and Placer counties to the south, and Colusa County to the west (Figure 1). The confluence of the Sacramento and Feather rivers runs next to Yuba City. The climate is generally Mediterranean with hot, dry summers — high temperatures in summer average 90 F. Prevailing winds are moderate and predominantly from the south. In winter, daytime highs average 50 F and night time temperatures can drop below freezing. North winds are more frequent in winter. Rain is frequent from October to May, with an average accumulation of 17 to 22 inches per year. Nearly 16% of the population possess a bachelor's degree or higher. The Sutter-Yuba district is considered rural because more than 75% of the total acreage in the district is devoted to agriculture, and rice accounts for nearly half of that agricultural acreage (Anon 2011). With 95% of historic wetlands lost in the Sacramento Valley, rice fields act as an alternate habitat for wildlife species and mosquitoes (Anon 2011).

The Sacramento-Yolo Mosquito and Vector Control District has about 1.7 million residents spread over about 2,000 square miles. The largest city is Sacramento with nearly 500,000 inhabitants spread over 97 square miles. The two counties are bordered by Colusa, Sutter, and Placer counties to the north, El Dorado and Amador counties to the east, San Joaquin and Solano counties to the south, and Napa County to the west (Figure 1). The district borders the Sacramento-San Joaquin Delta and the Suisan Bay. Summer temperatures are moderated by delta breezes coming from the San Francisco Bay through Suisan Bay and the Sacramento-San Joaquin Delta. The average temperature in the district is around 60 F. Over the past ten years the district has averaged about 15 inches of rain per year — less than normal because of several years of drought. More than one-third (34%) of the population possesses a bachelor's degree or higher. In terms of agricultural production, rice is an important field crop in both counties with 23,000 acres harvested in Yolo County and 8,000 acres harvested in Sacramento County in 2015 (2015 Crop and Livestock Reports for Sacramento and Yolo Counties). Sacramento County had the state's highest number of cases of West Nile virus in 2005, with 177 of the nearly 900 cases in California (Carney et al. 2008).

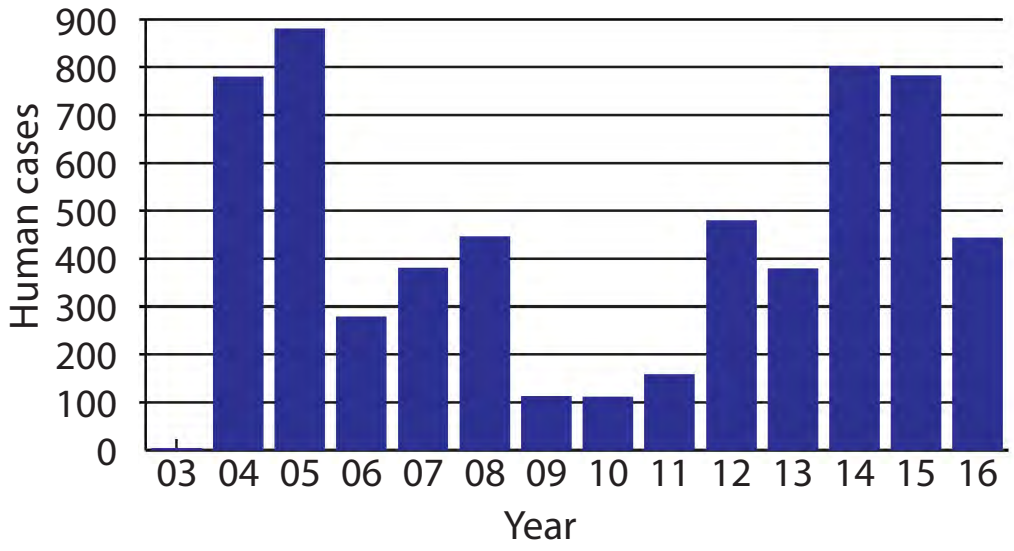


Figure 2. Human cases of West Nile virus in California

West Nile Virus in the West

West Nile virus is primarily a bird virus and mosquitoes spread the virus within bird populations and to nearby human populations. It is one of many flaviviruses known to cause disease in humans including Zika, yellow fever, dengue, and St. Louis encephalitis. Most cases of West Nile virus infection are asymptomatic. About 25% of the cases of West Nile virus infection develop into West Nile fever. In a smaller percentage of West Nile virus infections, the severe neuroinvasive disease develops resulting in encephalitis, meningitis, poliomyelitis or death. Risk factors for developing West Nile fever or neuroinvasive disease are poorly understood.

The spread of West Nile virus in the West following its introduction in the United States in 1999 resulted in several severe outbreaks with significant health implications (Reisen 2012). The outbreak of West Nile virus in Colorado in 2003 accounted for nearly 30% of the cases nationwide, of which more than 20% (621 out of 2,947) were the severe neuroinvasive form. The outbreaks in California in 2004 and 2005 accounted for nearly 30% of the cases nationwide, of which 37% (291/779) in 2004 and 35% (305/880) in 2005 were the severe neuroinvasive form. California has been among the states with the highest incidence and percentage (13%) of neuroinvasive disease caused by West Nile virus (Adams et al. 2013). Following the initial outbreaks in California in 2004 and 2005, the number of cases declined to a low of about 110 in 2009-10, but increased to 158 in 2011, and to over 800 cases in 2014 (Figure 2).

The medical costs associated with the virus outbreaks in California are staggering, and therefore prevention is the most cost effective way to deal with West Nile virus. For instance, in Sacramento County in 2005, the cost of the West Nile virus outbreak was nearly $3 million (Barber et al. 2010) or about $17,000 per case. The Sacramento-Yolo district calculated that the cost of the effort to control the northern house mosquito and the encephalitis mosquito was equal to the medical costs of 15 human cases. Therefore, preventing more than 15 cases results in a net cost savings and that cost savings continues to increase as more cases are prevented. The costs savings associated with prevention may be higher now compared to 2005 because medical costs have increased.

Mosquito Vectors of West Nile Virus in California

There are about 48 species of mosquitoes in four genera (*Aedes*, *Anopheles*, *Culex*, and *Culiseta)* in California. Of those, only the *Aedes* and *Culex* species are known to carry the West Nile virus in California, and we will focus on the *Culex* species because they seem to be the primary drivers of West Nile virus outbreaks in California. Within the *Culex* genus, the different species vary in where they live (urban and rural, Northern and Southern California) and the animals on which they tend to feed (birds and mammals) (Reisen 2012). In Northern California, the northern house mosquito and the encephalitis mosquito spread West Nile virus (Anon 2013). The northern house mosquito (*Cx. pipiens*) prefers to feed on birds in urban centers and is a problem in the greater Sacramento metropolitan area in Sacramento County. The encephalitis mosquito (*Cx. tarsalis*) prefers to feed on mammals and inhabits rural areas, and tends to be more of a problem in Yolo, Sutter and Yuba counties. In Southern California, the southern house mosquito (*Cx. quinquefasciatus*) is one of the most common species collected (Krueger et al. 2015) and although a less efficient vector of West Nile virus compared to the encephalitis mosquito (Goddard et al. 2002), it is the vector driving West Nile virus outbreaks in Orange County (Kwan et al. 2010, Anon 2013).

The human populations and habitats within the counties, the different mosquito species, and aspects of the virus itself all affect how the three districts combat this threat.

Box 1. The PAMS approach to measuring the level of IPM adoption

The four practices included in PAMS are prevention, avoidance, monitoring, and suppression. Prevention is the practice of keeping mosquitoes out of an area (wetland, drainage ditch, house, pool, backyard). Changing the habitat to make it unsuitable for mosquito breeding is a good example of prevention. If mosquitoes are in an area, avoidance is used to prevent bites and transmission of disease, such as the use of window and door screens to prevent mosquitoes from entering homes. Measuring the size of the mosquito populations and the extent of virus activity in an area is considered monitoring. Examples include trapping adult mosquitoes to measure the size of the population and testing the mosquitoes for virus to measure virus activity. These trap numbers are compared to the threshold value to make a decision about suppression activities including the use of pesticides. Suppression is used to keep mosquito populations below threshold levels. Mosquito thresholds are based on the risk that they will cause disease in human populations. Examples include the use of biological (mosquito fish), microbial (*Bacillus* species), and chemical (pesticide) treatments.

CASE STUDY ANALYSIS

Integrated Pest Management used by California Mosquito and Vector Control Districts

Integrated pest management (IPM) is a best management practice that reduces the risks associated with pests and pest management (Philips et al. 2014). Best management practices used by the districts are often referred to as "integrated vector management" and "integrated mosquito management." In this section, we document how the best management practices used by the districts align with the elements of integrated pest management. Several metrics have been developed to measure IPM adoption based on the number of IPM tools used by a program, and we use these metrics to quantify IPM in these case studies. The IPM continuum describes different levels of IPM adoption ranging from low-level adoption and complete reliance on pesticides to high-level adoption where numerous tools are used to manage the pest population and pesticides are used only when the pest population has exceeded a treatment threshold (Philips et al. 2014). As we outline in this article, the mosquito and vector control districts are high-level adopters because their programs incorporate all of the elements of IPM including outreach and education, mosquito surveillance, treatment thresholds, biological and microbial control, physical and cultural control, and chemical control. Chemical treatments, especially pesticides applied by air over urban areas to manage adult mosquitoes, are used only when the surveillance data demonstrates that mosquito populations will exceed the treatment threshold and pose a significant risk to public health.

Another widely accepted system used to measure the level of IPM adoption was proposed by Harold Coble (2003), and is currently used by National Agricultural Statistics Service pest-management practice survey (USDA NASS). This system is referred to by the acronym PAMS (Box 1), where the letters in PAMS stand for prevention, avoidance, monitoring, and suppression. Measuring the district adoption of IPM using the PAMS approach similarly suggests high-level IPM adoption (Table 1).

Therefore, mosquito districts can be classified as high-level IPM adopters using either metric used to measure IPM adoption. The remainder of this report will highlight specific IPM tools or elements used by the three districts to protect people and the environment from harm caused by mosquitoes and the products used to control mosquitoes during the outbreaks of West Nile virus in California over the past decade.

Table 1. Examples of how the mosquito control districts use different elements of the PAMS approach

	Sacramento Yolo	Orange	Sutter-Yuba
Prevention			
Modification of agricultural and natural areas to reduce standing water	✔	✔	✔
Neighborhood notification campaigns to eliminate sources such as abandoned pools, standing water around container plants, underground storm drains	✔	✔	✔
Avoidance			
Outreach to promote the use of protective clothing and repellents, avoiding outside activities when mosquitos are active, and repairing or sealing routes of entry into houses	✔	✔	✔
Monitoring			
Tracking West Nile virus in human, bird, and mosquito populations	✔	✔	✔
Trapping adult mosquitoes	✔	✔	✔
Larval mosquito sampling with dip cups	✔	✔	✔
GIS mapping of human infections or mosquito and virus activity	✔	✔	✔
Dead bird surveillance program	✔	✔	✔
Suppression			
Biological control (mosquito fish) of larval mosquitoes	✔	✔	✔
Bio-rational or microbial control of larval mosquitoes	✔	✔	✔
Use of thresholds for making treatment decisions	✔	✔	✔
Ground applications of pesticides to control adult mosquitoes	✔	✔	✔
Aerial applications of pesticides to control adult mosquitoes	✔		✔

District Outreach

In a typical year, the Orange County Mosquito and Vector Control District spends about 10% of its budget on outreach (Table 2). The district produces more than 150 media publications in multiple languages, prints more than 30,000 informational fliers in multiple languages and participates in more than 50 community-outreach events each year. In 2016, district employees visited more than 26,000 homes in a door-to-door campaign, and its web site had 65,000 visits. The district routinely provides information for stories in the Orange County Register that has a daily readership of about 116,000 (circulation statistics available at ocr.scng.com/media kits). The county has about 2.4 million residents over the age of 18 and likely to read newspapers or look up information about mosquitoes on the Internet. There's evidence that these outreach efforts are succeeding: a recent survey of 500 Orange County residents suggests that 50% of the population know of the vector control program and nearly 80% have contacted the district for help (Anon 2017).

Table 2. The amount and proportion of the total annual budget allotted to outreach efforts in three mosquito control districts in California

District	Total annual budget	Communications budget (and as a percentage of total annual budget)	Information source
Orange	$10.7 million	$1.1 million (10%)	2015 budget
Sacramento-Yolo	$11.0 million	$330,000 (3%)	2015 budget
Sutter-Yuba	$2.8 million	$40,000 (1.5%)	2015 budget

The Sacramento-Yolo County Mosquito and Vector Control District spends about 3% of its overall budget on outreach (Table 2). The district produces media publications and informational fliers, and participates in community outreach events. The Sacramento-Yolo District web site has about 53,000 visits per year. The district routinely provides information for stories in the Sacramento Bee that has a daily readership of about 280,000 readers. There are approximately 1.1 million inhabitants over the age of 18 years old in the Sacramento-Yolo Mosquito Control District area and likely to read newspapers or look up information about mosquitoes on the web.

The Sutter-Yuba County Mosquito and Vector Control District spends about $40,000 on outreach every year, and that accounts for about 1.5% of its annual budget (Table 2). The district produces mailers, brochures and pod casts, and maintains a website. The district participates in community-outreach events and provides information for stories in the Sacramento Bee. The Sacramento Bee serves the entire Sacramento Valley including Sutter and Yuba counties.

District outreach through printed and electronic media and in-person participation at community events successfully prevents mosquito bites and transmission of disease by raising awareness of the importance of preventing mosquitoes from entering the home through the use of screens, avoiding times of day when mosquitoes are active, wearing protective clothing, using mosquito repellents, and draining standing water around homes to limit breeding sites (Center for Disease Control).

Boy Scouts visiting the Orange County Mosquito and Vector Control District office

Supplying information for newspaper articles is critical for collecting crowdsourced information on virus activity in wild bird populations through the "dead bird surveillance" program. Because the West Nile virus exists as a disease that regularly affects birds, finding dead birds and submitting them for analysis is crucial for monitoring the activity and location of hot spots and predicting the risk of virus spread to humans. There is clear correlation between news releases and the number of reported dead birds (Foss and Padgett 2016), so district outreach efforts affect public behavior — by increasing submissions of dead birds — which in turn leads to better monitoring of virus activity in bird populations.

The news media remains a critical partner for the districts in their outreach efforts. News stories generate interest in the subject of mosquitoes and mosquito-borne illnesses leading to successful prevention efforts and a successful dead bird surveillance program. Unfortunately, media attention does not closely track outbreaks. Newspaper coverage increased during the early outbreaks in 2004 and 2005, but has continued to decrease in recent years despite the rise in West Nile cases (Figure 3). Many possible explanations for the decrease in news coverage of West Nile virus exist. It is possible that a decades-old public health issue is no longer newsworthy when more recent public health concerns exist, such as Zika. It is also possible that staff changes, changing news focus, and decreasing space in newspapers has led to the decline in news coverage of West Nile virus. Regardless of the reason for the decline, the trend suggests that it may be difficult to maintain a high level of public interest through traditional news outlets over long periods of time. Other outreach outlets are being explored by the districts, such as social media platforms. However, there are no data showing social media efforts can sustain interest in public health issues such as West Nile virus over long periods of time.

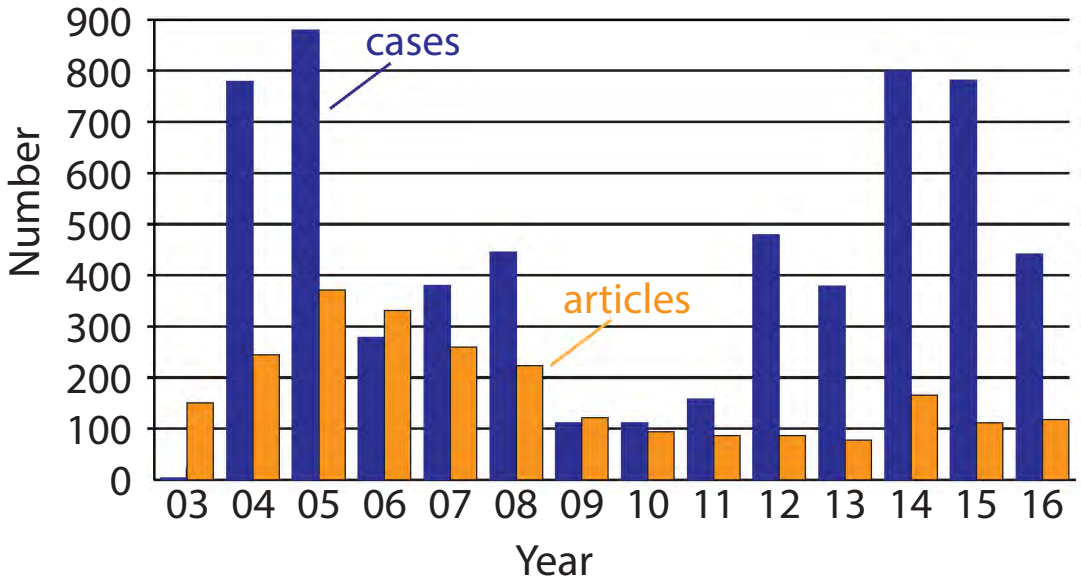


Figure 3. Number of human cases in California (blue bars) and the number of newspaper articles about mosquitoes and West Nile virus in the Sacramento Bee and Orange County Register (orange bars). Newspaper articles about mosquitoes and West Nile virus were searched through NewsBank (infoweb.newsbank.com). The Sacramento Bee serves as a primary news source for the counties of Sacramento, Yolo, Sutter and Yuba. The Orange County Register serves as a primary news source for Orange County.

Surveillance

Surveillance includes monitoring mosquito abundance, monitoring virus activity in mosquito and vertebrate hosts, and mapping. Surveillance is important because more mosquitoes and higher virus activity means a higher risk of disease outbreak (Godsey et al. 2012). But the precise relationship between surveillance data and risk of human disease remains an area of active debate and scientific investigation. This relationship between surveillance data and disease risk is important because treatment thresholds — triggers for suppression activities such as pesticide applications — are built on it.

Recent advances have greatly improved the precision of the surveillance data. Sampling strategies that provide high degrees of certainty, crowdsourcing the surveillance of dead birds, and increased availability of geographic information system (GIS) tools have significantly improved the ability of districts to assess the risk for human disease and pinpoint those areas where the risk is highest (Nguyen et al. 2015). Accurate prediction of the area requiring treatment leads to reduced risk of disease and reduced exposure to pesticides. Disease risk is reduced because an accurate strike against a mosquito population effectively eliminates most or all of the mosquitoes, and pesticide exposure is reduced because only the specific area of risk is treated.

Mosquito control districts track adult mosquito populations using adult mosquito traps and the different traps vary in their effectiveness at catching different mosquito species. However, it is generally accepted that increasing trap density, the number of traps per unit area, is the best way to increase the precision of the surveillance data. Increased trap density comes at a cost and those districts with smaller budgets because of lower population densities and lower tax bases are not in a position to easily increase trap density. The Orange County district runs between 150 to 300 traps per week [0.2 to 0.4 traps per square mile (150 to 300 traps divided by 791 square miles)]. The Sacramento-Yolo district runs about 80 traps within the city of Sacramento, leading to a trapping density of 0.8 traps per square mile (80 traps divided by 97 square miles). The Sutter-Yuba district runs about 53 traps for a trapping density of 0.07 traps per square mile (53 traps divided by 706 square miles). Healy and colleagues (2015) demonstrated that more precise estimates of West Nile virus infection prevalence in mosquito populations could be attained at a trap density of 0.3 traps per square mile. Therefore, the trapping densities in Sacramento City and Orange County are high enough to precisely delineate areas of West Nile virus risk. And, as we will show later, the increased precision and certainty leads to lower pesticide exposure because areas targeted for adult mosquito suppression using pesticides are smaller.

Table 3. Number of public health articles in PubMed (www.ncbi.nlm.nih.gov) citing the use of QGIS (open source GIS software) and ESRI ArcView from 2014 to present

Date Range	Number of articles in PubMed citing the use of QGIS (and as a percentage change)	Number of articles in PubMed citing the use of ESRI ArcView (and as a percentage change)
2016 to present	9 (350)	90 (-55)
2014 to 2016	2	200

The dead bird surveillance program employs the help of citizens to report dead birds sightings. This crowdsourcing effort was initiated in 2000 and has been essential in detecting and monitoring virus activity (Anderson et al. 2010). In 2004 and 2005, more than 90,000 reports were submitted through the program (Anderson et al. 2010). In 2015, nearly 11,000 reports were submitted (Foss and Padgett 2016). Healy and colleagues (2015) estimate that the dead bird surveillance program is one of the most cost-effective ways to monitor West Nile virus activity. The program has provided significantly more data leading to improved precision of mosquito suppression efforts. There is a clear correlation between news releases and the number of reported dead birds (Foss and Padgett 2016), and therefore the success of the dead bird surveillance program is dependent, in part, upon media coverage.

Open source geographic information system (GIS) software and free imagery have improved the usability of mapping tools making them more accessible to public health organizations including mosquito control districts. Open source GIS software has been available for more than a decade (Steiniger and Hunter 2012), and the quality of these programs has increased substantially in the past several years (Dempsey 2016, Altaweel 2017). The large number of customizations has led to increased usage, especially in the public health arena (Table 3). The use of QGIS in the past 2 years has increased dramatically compared to the two years prior to 2016 (Table 3), a trend that was noted at the recent National Extension Technology Conference (NETC 2016) in Kissimmee, Florida. Industry standards such as ESRI ArcView cost several thousand dollars and require significant technical expertise. QGIS, and other open source software, are free and do not require significant technical expertise to operate (Feygin 2011). Landsat images that used to cost hundreds to thousands of dollars are now freely available through the U.S. Geological Survey. The accessibility of these tools has resulted in the mapping of areas based on risk — identified by indicators such as dead bird surveillance, mosquito trapping and human cases — that in turn have led to better precision in deploying mosquito suppression tactics.

Managing Mosquito Larvae

The two mosquito life stages, larva and adult, targeted for suppression are discussed separately because the goals and strategies for managing them differ. Management of mosquito larvae aims to prevent the emergence of adult mosquitoes, the stage injurious to people. Larval mosquito management includes habitat modification, mosquito fish, bio-rational products, and chemical treatments. The different management options fit together into the different programs used by the three districts — like pieces of a puzzle. Although the management options available for larval suppression are relatively benign to humans and the environment, their drawbacks and strengths define how they can be used most effectively in an overall integrated approach.

Modifying habitats to increase flows and reduce stagnant water can effectively suppress mosquito larvae by limiting the availability of breeding sites. But habitat modification tools and restrictions on their use differ between rural and urban communities. In predominantly rural districts, larval mosquito management efforts may occur in natural and conservation areas and rice fields, and the mosquito control districts align their goals of reducing mosquito populations with the habitat-preservation goals of wetlands managers (including the National Marine Fisheries Service, Department of Fish and Wildlife, and Army Corps of Engineers) seeking to preserve critical habitats, and the production goals of agricultural producers (Shanahan 2013). Wildlife managers and mosquito control districts work together to develop environmental assessments and management plans that satisfy the goals of both groups. In urban communities, habitat modification might be the removal of debris in a culvert to decrease pooling water, or draining of abandoned or unused swimming pools. Districts have broad authority to eliminate breeding sites on private land, but must use court-approved methods and due process to gain entry to privately owned property.

Dipper sampling for larval mosquitoes (Orange County Mosquito and Vector Control District)

Areawide pest management has proven to be effective in agriculture (Elliott et al. 2008). For instance, the management of Lygus bug, beet leafhopper and whiteflies in the safflower, cotton, tomato rotation in Fresno County, California is achieved by areawide management (Anon 2016c). The Sutter-Yuba district currently employs a highly effective areawide management strategy as well. By quickly flooding wildlife habitats on a landscape scale, an entire generation of mosquitoes hatches synchronously. The district can then time its larval and adult treatments to eliminate an entire generation of mosquitoes. Areawide management in metropolitan areas such as Sacramento City and Orange County may be more difficult because of the complexity of the habitat and the number of stakeholders that would need to be engaged.

Biological controls are widely used by mosquito control districts, and districts maintain active programs in rearing and distributing different species of mosquito fish including western mosquitofish or *Gambusia affinis*, guppies or *Poecilia reticulata*, and threespined stickleback or *Gasterosteus aculeatus.* These fish-rearing programs are well established and releasing fish effectively eliminates larval mosquito populations. But western mosquitofish can be invasive and appropriate precautions are needed to prevent negative impacts on sensitive wetland habitats and fish species (Schleier et al. 2008).

Districts track larval mosquitoes populations in water sources using dip-cup samples to inform the decision to treat a water source with bio-rational or chemical products. The dip-cup is a one-pint cup attached to the end of a dowel and water is dipped or sampled for the presence of mosquitoes. Technicians in the districts check new and known habitats for mosquitoes at regular intervals that may depend on how remote or accessible the site is. The decision to treat larval mosquito populations is based on the treatment threshold. The threshold currently used by the three districts for *Culex* species is more than one mosquito larva in 20 dip-cup samples (Boyce 2005, Anon 2010). But the decision to treat is not solely based on mosquito abundance and also takes into account the presence of sensitive non-target and biological control organisms (Boyce 2005, Anon 2010). The larval thresholds used to make treatment decisions are revisited frequently and refined to incorporate new information.

Bio-rational suppression products are based on naturally occurring microbes. These microbial controls include a variety of products based on *Bacillus thuringiensis israeliensis*, *B. sphaericus*, and *Saccharopolyspora spinosa*. The products based the *Bacillus* bacteria contain dead bacteria or live spores that can remain effective in the water for several weeks. The products based on *S. spinosa* contain spinosins — chemicals that are lethal to mosquito larvae and kill quickly. We calculated the risks of the microbial products to environmental and human health using the ipmPRiME risk assessment tool (Guzy et al. 2014). The ipmPRiME tool calculates the likelihood that a product will impact an organism using the species sensitivity to that material and the level of pesticide exposure — more exposure and higher sensitivity leads to a higher risk of moderate to severe impact. The ipmPRiME tool estimates environmental risks — risks posed to birds, small mammals, fish, earthworms, crustaceans and algae — and human health risks. The risk assessment tool indicated that the bio-rational or microbial products used by the districts all pose low environmental and human health risks (Table 4).

Chemical treatments have an important fit in larval mosquito management programs. The chemical treatments include surface agents and insect growth regulators. Surface agents, such as refined mineral oils and monomolecular films act by suffocating the mosquito larvae and work well in stagnant water with little to no wind. The insect growth regulators such as S-methoprene and

Table 4. Risks of acute and chronic toxicity for invertebrates and vertebrates (including humans) calculated using the ipmPRiME risk assessment tool

Product name	Chemical	EPA number	Risk to vertebrates	Risk to invertebrates
Vectobac 12AS	*Bacillus thuringiensis*	73049-38	Low	Low
Teknar HP-D	*Bacillus thuringiensis*	73049-404	Low	Low
Vectolex WDG	*Bacillus sphaericus*	73049-57	Low	Low
Dimilin 25 W	diflubenzuron	400-465	Low	Low
Natular 2 EC	spinosad	8329-82	Low	Low
Altosid liquid larval concentrate	S-methoprene	2724-446	Low	Low
Altosid briquette	S-methoprene	2724-375	Low	Low

Shown here is the risk that a material will exceed the "no observed adverse effect" level set by EPA. For this analysis we used the highest labeled rate for the specific use of each material. The materials listed were used in at least one of the five California counties in this report from 2004-2015 (California Pesticide Use Reporting database). Risk is summarized for each of the following vertebrate and invertebrate categories. The vertebrate category summarizes data for birds (chance of bird kill or reduced reproduction), small mammals (chance of population declines), fish (chance of population declines and reduced reproduction), and humans (inhalation risk to bystanders). The invertebrate category summarizes data for earthworms (chance of kill), aquatic crustaceans (chance of population declines), and algae (chance of population declines). Risks were placed into categories of high (probability greater than 50%), moderate (probability between 10 and 50%), and low (less than 10%).

Raising mosquito fish in the Orange County Mosquito and Vector Control District facility

pyriproxyfen function by interfering with the normal development of the larvae because they mimic juvenile hormone. The Altosid briquettes based on S-methoprene remain effective in the water for more than a month — very useful for remote locations that are infrequently visited. Diflubenzuron interferes with normal development of the insect cuticle by disrupting chitin synthesis. The insect growth regulators pose little risk to human and environmental health (Table 4). The risk of surface agents to non-target organisms could not be tested in the ipmPRiME tool, but these are relatively nonspecific in how they kill mosquitoes and therefore could affect other aquatic invertebrates as well.

Managing Mosquito Adults

Mosquito districts initiate adult mosquito suppression when the threat to human health exceeds a threshold level. The three districts use similar thresholds based on mosquito trap captures, the prevalence of virus-infected mosquitoes, the prevalence of virus in the wild bird populations or sentinel chicken flocks, and the presence of human cases (Boyce 2005, Anon 2010).

Treatment thresholds track the human health risk posed by mosquitoes, and therefore, treatment intensity — measured by the number of acres treated — should increase with increase risk. This trend was observed from 2004 to 2007 in both rural and urban areas (Figure 4). However, when the risk of disease again increased in 2012 to 2015, treatment intensity tracked risk in rural areas, but not for aerial applications over the urban areas of Sacramento (Figure 4). The Sacramento-Yolo district was able to reduce treatment intensity in urban settings by adjusting its sampling strategy. More importantly, Sacramento did not experience a West Nile virus outbreak in the human population despite the lower treatment intensity. By increasing the trapping density and by using mapping tools, the district precisely delineated areas of risk and pinpointed its treatment. The district minimized the risks to human health by effectively reducing the number of host-seeking adult mosquitoes in the area of concern and minimized the environmental and human exposure and economic costs associated with the pesticide application by limiting the treatment area (Carney et al. 2008, Macedo et al. 2010).

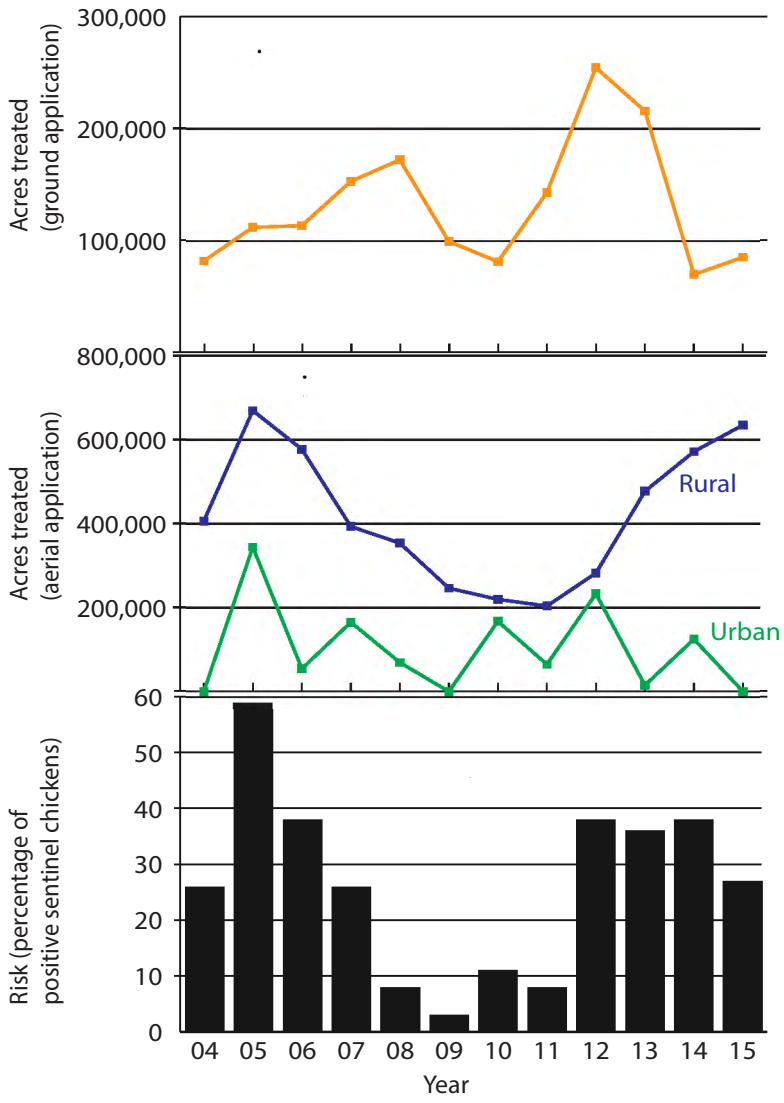


Figure 4. Risk (indicated by the proportion of the sentinel chicken population seropositive for West Nile virus) and acres treated with adulticides (by ground and by air) in the Sacramento-Yolo Mosquito and Vector Control District. Ground and rural aerial sprays have tracked risk, whereas the number of urban acres treated has been minimized despite increasing risk from 2012 to 2015. Data from the Sacramento-Yolo Mosquito and Vector Control District database on pesticide use in the counties.

The same treatment threshold is used in rural areas and this is clearly demonstrated by plotting risk and treatment intensity in the rural areas of the Sacramento-Yolo district (Figure 4). As the human health risk posed by mosquitoes increases, so do the number of acres treated (Figure 4). The same trend is true for the Sutter-Yuba district (data not shown). But rural districts restrict treatments to relatively unpopulated areas and instead use border sprays around towns to reduce the risk to human health from pesticide applications. The border spray technique is successful in northern California rural communities because of the species of mosquito and its behavior. The encephalitis mosquito resides in the agricultural fields surrounding smaller urban centers and moves from agricultural fields into urban centers seeking mammalian hosts. Border treatments around urban centers effectively reduce the bridge for the virus and minimize human exposure to pesticides used to control adult mosquitoes.

The public tolerance to risk posed by mosquitoes appears to vary with their perception of the severity of the disease the mosquitoes carry. In most cases, there are no symptoms of West Nile virus infection, or at most a fever. The more severe and life-threatening neuroinvasive form occurs at a relatively low rate in California when averaged across years (13%). Therefore, the perceived risk of West Nile virus is relatively low, and this leads to opposition to the use of pesticides to control adult mosquitoes. In Orange County, the majority of people who contacted the hotline after the announcement that the district would begin aerial treatment in 2015 were opposed to the action. There are also websites specific to Orange County that are opposed to the use of pesticides to control mosquitoes (such as nontoxicirvine.org). Although these anecdotal data suggest opposition to treatment with pesticides, they do not indicate the proportion of the population in Orange County that is opposed to aerial spraying. The Orange County Mosquito and Vector Control District did not conduct an aerial spray in 2015 because of permitting issues. It is currently able to perform aerial sprays, but requires a specific vote by its 35-member Board of Trustees to authorize every aerial application.

The human health risks and environmental risks posed by the pesticides used to manage adult mosquitoes are low (Peterson et al 2006, Weston et al. 2006, Davis et al. 2007, Antwi and Peterson 2009, Macedo et al. 2010, Peterson 2010, Preftakes et al. 2011, Geraghty et al. 2013). To further reduce the risks associated with pesticide application, mitigation strategies are used to prevent exposure of non-target organisms (Davis et al. 2007). These mitigation strategies include spraying at times of day when mosquitoes are active and non-target species are inactive, communication with stakeholders and others, and border spraying around towns in rural areas. The impact on non-target organisms such as honeybees can be high if mitigation strategies are not employed (Ginsberg et al. 2017).

Continuing Needs

Effective control efforts against yellow fever mosquito, *Aedes aegypti*, in the Americas may have led to complacency and abandonment of mosquito control programs, and this complacency may have led to a resurgence of mosquito populations and widespread disease transmission, including West Nile virus and more recently Zika and chikungunya (Anon 2016a). It has been proposed that the recent outbreak of dengue fever in Hawaii resulted from the economic downturn in 2008-2009 and the removal of funding from the mosquito control program (Anon 2016b). Continued vigilance of disease vectors is crucial to maintaining human health, and IPM will continue to be one of the best ways to combat these threats while also minimizing environmental impacts and economic costs.

The correlation between reports to the dead bird surveillance program and media attention measured by the number of articles in newspapers and television demonstrates the importance of local media as a partner in protecting the general public from risks such as mosquitoes and West Nile virus. However, maintaining media interest in mosquitoes during non-outbreak years can be difficult, and finding other venues that will help to maintain public interest in the risks posed by mosquitoes will be important. The districts are active on social media platforms and an analysis of the data will help understand the impact of these efforts. For instance, can social media posts sustain interest in the dead bird surveillance program in the same way as the print media did?

The stories and interest in West Nile virus in the news media may have diminished because of newer vector-borne diseases with more significant human health impacts, such as Zika virus. And certainly the loss of media interest in West Nile virus could be viewed as negative because the campaign to promote behaviors that limit exposure to mosquitoes, and crowdsource efforts to monitor West Nile virus rely on news media to maintain awareness. But new diseases such as Zika could raise general awareness of mosquitoes and the diseases they vector and thereby benefit district efforts to control all mosquito species, including those that transmit West Nile virus.

Pesticides, both pyrethroids and organophosphates, used for adult mosquito control were developed in part by the U.S. Department of Defense to protect troops from mosquito-borne illness in theaters of war. But these pesticides were developed more than 50 years ago and have human health concerns related to their use. Because these pesticide groups have been in use for a long time and many generations of mosquitoes have been exposed to them, there are also concerns about mosquito resistance. Therefore, new low-risk, narrow-spectrum pesticides are needed for control of adult mosquitoes. Currently, legislative and research efforts are under way to develop new materials that can be used to control adult mosquitoes. It is crucial that new control materials are available because public opinion, regulatory restrictions, and the development of insecticide resistance in mosquito populations will make the use of organophosphates and pyrethroids more difficult in the future.

Interest in biopesticides or bio-rational products has been strong over the past several decades and new products in vector control may be available relatively soon. For example, *Wolbachia pipientis* is a rickettsial bacterium that naturally infects insects, and in mosquitoes, it has been shown to reduce the spread of disease (Walker et al. 2011, Caragata et al. 2016). In the United States, the *Wolbachia* bacterium is currently being tested against the yellow fever mosquito (*Aedes aegypti*) in California (Dobson 2015, Anon 2016d) and registration is under way for a product to control Asian tiger mosquito (*Ae. albopictus*) in the U.S. (Waltz 2016). Because the current work is focused on the yellow fever mosquito and Asian tiger mosquito, it might not immediately help in the fight against West Nile virus. But success of a biopesticide against yellow fever mosquito may spur additional research efforts against other mosquito targets and the diseases they carry.

Education about the concept of risk, associated with both pesticide use and mosquitoes, is necessary to assure that the risks and benefits associated with vector control are broadly understood. The public perception of the risk of West Nile virus appears to be low, but the data support a higher level of risk both in terms of the proportion of neuroinvasive cases during outbreak years and in terms of the medical costs associated with the disease. The annual rate of neuroinvasive disease in California is 13%, but rises to nearly 40% in outbreak years, and the medical costs associated with the outbreak in Sacramento City was nearly $3 million. The public perception of the risk associated with pesticide use is relatively high (compared to the perceived risk of disease), and yet the scientific evidence does not indicate significant risk posed by the pesticides used for adult mosquito control. The scientific evidence clearly demonstrates the risk to human health posed by mosquitoes is higher than the risk posed by pesticides used to control the mosquitoes (Peterson et al 2006, Peterson 2010). People in the United States have become increasingly concerned about the effects of pesticides (Pimentel and Acquay 1992), and the assurances provided by regulatory agencies that pesticides pose little risk to public health have been undermined by data showing pesticide contamination in soil, water and air, and data that link these materials to a wide range of poor human-health outcomes (Harrison 2014).

Summary

Integrated pest management mitigates the risks to human health and the environment associated with pests and their management in the most economical way possible. The core of IPM is evidence-based decision making. As defined above, and from all of the evidence presented here, it is clear that these three mosquito control districts employ high-level IPM. And in so doing, the districts are achieving their goals of protecting the public from the risk of mosquito-borne illness, protecting people and the environment through the judicious use of pesticides, and ensuring the public trust by achieving these goals in the most economical way possible. However, the districts continue to face new challenges including new or resurgent diseases and mosquito species, and rapidly increasing human populations, while working under increasingly restrictive regulations and shrinking budgets.

Technology will undoubtedly solve some of the problems faced by the districts. New control strategies including the mosquito-infecting bacterium, *Wolbachia*; remotely controlled or completely autonomous vehicles for detecting and controlling mosquito populations; and low-risk pesticides for adult and larval control are not far in the future. These technologies should provide more efficient control at a lower cost. In addition, districts will have additional cost savings as newer technologies become less expensive as already demonstrated by the decreased cost of using GIS tools.

In this case study we have documented the many management tools used by the districts and tried to show how the districts fit these tools together into an overall integrated pest management program that aligns with the goals of the communities they serve. The districts use outreach, surveillance, areawide management, habitat and breeding site management, biological and bio-rational controls, treatment thresholds, and pesticides. In addition, we have highlighted how the districts continue to incorporate new science and information, management techniques, and technologies in their integrated pest management programs, and how these advances have reduced costs and improved efficiency, and improved the ability of the mosquito abatement districts to protect people and the environment from risks posed by mosquitoes and the mosquito management tools.

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Literature Cited

Adams DA, Gallagher KM, Jajosky RA, Kriseman J, Sharp P, Anderson WJ, Aranas AE, Mayes M, Wodajo MS, Onweh DH, Abellera JP. 2013. Summary of notifiable diseases – United States 2011. MMWR 2011; 60(53); 1-117. Available at cdc.gov/mmwr (viewed on August 9, 2017)

Altaweel M. 2017. Where is open source GIS going? GIS Lounge. July 31, 2017. Available at www.gislounge.com/open-source-gis-going (viewed on August 9, 2017)

Anderson J, Parker E, Aquino E, Kramer V, Padgett K. 2010. West Nile virus dead bird surveillance program, 2010 survey results. Proceedings and Papers of the Mosquito and Vector Control Association of California, 78:75–77.

Anonymous 2017. Is Orange County ready for Zika? It takes a village to handle mosquito-borne viruses. County of Orange, California Grand Jury Report 2016-2017. Available at www.ocgrandjury.org/reports.asp (viewed on August 9, 2017)

Anonymous 2016a. Zika virus: What you need to know about its vector – the *Aedes aegypti* mosquito. Entomological Society of America Open Letter, February 2016. Available at: entomologychallenges.files.wordpress.com/2016/02/background-on-mosquito-borne-diseases.pdf (viewed on August 9, 2017)

Anonymous 2016b. Hawaii faces challenges fighting dengue outbreak. 11 March 2016. Available at www.cbsnews.com/news/hawaii-faces-challenges-fighting-dengue-outbreak/ (viewed on August 9, 2017)

Anonymous 2016c. An area-wide pest management strategic plan for safflower production in the southern San Joaquin Valley of California. Available at ipmdata.ipmcenters.org/documents/pmsps/CASafflowerPMSP2016.pdf (viewed on August 9, 2017)

Anonymous 2016d. EPA Amendments, extensions, and/or issuances of experimental use permits. Federal Register 81 (193): 69059-69060 (number 2016-24101).

Anonymous 2013. West Nile Virus in the United States: Guidelines for surveillance, prevention, and control. CDC Division of Vector-Borne Diseases. June 14, 2013. Available at www.cdc.gov

Anonymous 2011. Programmatic Environmental Impact Report for the Integrated Vector Management Practices of the Sutter-Yuba Mosquito and Vector Control District. November 20, 2011. Available at www.sutter-yubamvcd.org/sites/default/files/files/Final_Programmatic_EIR.pdf (viewed on August 9, 2017).

Anonymous 2010. Integrated Vector Management & Response Plan. Orange County Vector Control District. Available at www.ocvector.org/documents/environmental/OCMVCD_Emergency_FINAL.pdf (viewed on August 9, 2017)

Antwi FG, Peterson RKD. 2009. Toxicity of delta-phenothrin and resmethrin to non-target insects. Pest Manag Sci 65: 300-305. doi 10.1002/ps.1688

Barber L, Schleier J, Peterson R. 2010. Economic cost analysis of West Nile virus outbreak, Sacramento County, California, USA, 2005. Emerging Infectious Diseases, 16: 480-486.

Boyce KW. 2005. Mosquito and mosquito-borne disease management plan. Sacramento-Yolo

Mosquito and Vector Control District. Available at www.fightthebite.net/download/Mosquito_Management_Plan.pdf (viewed on August 9, 2017)

Caragata EP, Heverton LCD, Moreira LA. 2016. Exploiting intimate relationships: Controlling mosquito-transmitted disease with *Wolbachia*. Trends in Parasitology 32: 207-218. dx.doi.org/10.1016/j.pt.2015.10.011

Carney RM, Husted S, Jean C, Glaser C, Kramer V. 2008. Efficacy of aerial spraying of mosquito adulticide in reducing incidence of West Nile Virus, California, 2005. Emerging Infectious Diseases, 14: 747-754.

Coble H. 2003. The practice of integrated pest management (IPM); The PAMS approach. Available at www.ipmcenters.org/Docs/PAMS.pdf

Davis RS, Peterson RKD, Macedo PA. 2007. An ecological risk assessment for insecticides used in adult mosquito management. Integrated Environ Assess Management, 3: 373-382.

Dempsey C. 2016. Open source GIS and freeware GIS applications. GIS Lounge. March 20, 2016. Available at www.gislounge.com/open-source-gis-applications (viewed on August 9, 2017)

Dobson S. 2015. Efficacy of biopesticides for the control of mosquitoes. 2015 Report. Available at ir4.rutgers.edu/Biopesticides/pnnFinalReport/B00075-15-KY01.pdf (viewed on August 9, 2017)

Elliott NC, Onstad DW, Brewer MJ. 2008. History and ecological basis for areawide pest management. In Koul O, Cuperus G, Elliot N (eds.), Areawide pest management: theory and implementation. CABI International. Oxfordshire, UK.

Feygin S. 2011. How to go from GIS novice to pro without spending a dime. GIS Lounge. September 15, 2011. Available at www.gislounge.com/how-to-go-from-gis-novice-to-pro-without-spending-a-dime (viewed on August 9, 2016)

Foss L, Padgett K. 2016. Public usage of the West Nile virus dead bird hotline and website in 2015. Proceedings and Papers of the Mosquito and Vector Control Association of California, 84: 37-42.

Geraghty EM, Margolis HG, Kjemtrup A, Reisen W, Franks P. 2013. Correlation between aerial insecticide spraying to interrupt West Nile virus transmission and emergency department visits in Sacramento County, California. Public Health Reports, 128: 221-230.

Ginsberg HS, Bargar TA, Hladik ML, Lubelczyk C. 2017. Management of arthropod pathogen vectors in North America: Minimizing adverse effects on pollinators. J Med Entomol tjx146. doi.org/10.1093/jme/tjx146

Goddard LB, Roth AE, Reisen WK, Scott TW. 2002. Vector competence of California mosquitoes for West Nile virus. Emerging Infectious Diseases. 8: 1385-1391

Godsey MS, Burkhalter K, Young G, Delorey M, Smith K, Townsend J, Levy C, Mutebi JP. 2012. Entomologic investigations during an outbreak of West Nile virus disease in Maricopa County, Arizona, 2010. Am J Trop Med Hyg. 87: 1125-1131.

Guzy MR, Jepson PC, Mineau P, Kegley S. 2014. The http://ipmPRiME.org pesticide use risk assessment tool at Oregon State University, Integrated Plant Protection Center and Biological and Ecological Engineering, 2008-2014.

Harrison JL. 2014. Neoliberal environmental justice: Mainstream ideas of justice in political conflict over agricultural pesticides in the United States. Environmental Politics, 23: 650-669.

Healy JM, Reisen WK, Kramer VL, Fischer M, Lindsey NP, Nasci RS, Macedo PA, White G, Takahashi R, Khang L, Barker CM. 2015. Comparison of the efficiency and cost of West Nile virus surveillance methods in California. Vector-Borne Zoonotic Disease, 15: 147-155.

Krueger L, Sims J, Morgan T, Nguyen K, Levy L, Semrow A, Shaw L, Hearst M, Cummings R. 2015. Lessons learned from investigating suspected West Nile virus exposure sites, Orange County, California 2014. Proceedings and Papers of the Mosquito and Vector Control Association of California 83: 89-93.

Kwan JL, Kluh S, Madon MB, Reisen WK. 2010. West Nile virus emergence and persistence in Los Angeles, California, 2003-2008. Am J Trop Med Hyg, 83: 400-412.

Macedo PA, Schleier JJ, Reed M, Kelley K, Goodman GW, Brown DA, Peterson RKD. 2010. Evaluation of efficacy and human health risk of aerial ultra-low volume applications of pyrethrins and piperonyl butoxide for adult mosquito management in response to West Nile virus activity in Sacramento County, California. J Am Mosquito Control Assoc, 26: 57-66.

Mirriam S. 2009. Qualitative Research. Jossey-Bass, A Wiley Imprint. San Francisco.

Nguyen K, Krueger L, Morgan T, Newton J, Semrow A, Levy L, Cummings R. 2015. Not just dots on a map! Cluster analysis of human West Nile Virus cases, 2004 to 2014, Orange County, California. Proceedings and Papers of the Mosquito and Vector Control Association of California 83: 25-32.

Peterson RKD. 2010. Mosquito management and risk. Wing Beats 21:28-31.

Peterson RKD, Macedo PA, Davis RS. 2006. A human-health risk assessment for West Nile virus and insecticides used in mosquito management. Environmental Health Perspectives 114: 366-372.

Philips CR, Kuhar TP, Zalom FG, Hallberg R, Herbert DA, Gonzales C, Elliott S. 2014. Integrated Pest Management. eLS. doi: 10.1002/9780470015902.a0003248.pub2

Pimentel D, Acquay H. 1992. Environmental and economic costs of pesticide use. Bioscience 42: 750-761.

Preftakes CJ, Schleier JJ, Peterson RKD. 2011. Bystander exposure to ultra-low-volume insecticide applications used for adult mosquito management. Int J Environ Res Public Health 8: 2142-2152. doi: 10.3390/ijerph8062142

Reisen WK. 2012. The contrasting bionomics of *Culex* mosquitoes in Western North America. J Am Mosquito Control Assoc 28(4s): 82-91. doi.org/10.2987/8756-971X-28.4.82

Reisen W, Lothrop H, Wheeler S, Kennsington M, Gutierrez A, Fang Y, Garcia S, and Lothrop B. 2008. Persistent West Nile Virus transmission and the apparent displacement of St. Louis encephalitis virus in southeastern California, 2003-2006. J. Med. Entomol. 45: 494-508. doi: 10.1603/0022-2585(2008)45[494:PWNVTA]2.0.CO;2.

Schleier JJ III, Sing SE, Peterson RKD. 2008. Regional ecological risk assessment for the introduction of *Gambusia affinis* (western mosquitofish) into Montana watersheds. Biol Invasions 10: 1277-1287. doi: 10.1007/s10530-007-9202-1

Shanahan RP. 2013. Federal, state and local regulation of California mosquito and vector control agencies. Available at www.mvcac.org/amg/wp-content/uploads/FEDERAL-STATE-AND-LOCAL-REGULATION-OF-CALIFORNIA-MOSQUITO-AND-VECTOR-CONTROL-AGENCIES.pdf (viewed on August 9, 2017)

Steiniger S, Hunter AJS. 2012. The 2012 free and open source GIS software map – A guide to facilitate research, development, and adoption. Computers, Environment and Urban Systems, 39: 136-150. doi.org/10.1016/j.compenvurbsys.2012.10.003

USDA NASS. Agricultural Chemical Use Program. Available at www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Chemical_Use

Walker T, Johnson PH, Moreira LA, Iturbe-Ormaetxa I, Frentiu FD, McMeniman CJ, Leong YS, Dong Y, Axford J, Kriesner P, Lloyd AL, Ritchie SA, O'Neill SL, Hoffmann AA. 2011. The *w*Mel *Wolbachia* strain blocks dengue and invades caged *Aedes aegypti* populations. Nature 476: 450-453. doi: 10.1038/nature10355

Waltz, E. 2016. US reviews plan to infect mosquitoes with bacteria to stop disease. Nature 533: 450-451. May 26, 2016. doi:10.1038/533450a

Weston DP, Amweg EL, Mekebri A, Ogle RS, Lydy MJ. 2006. Aquatic effects of aerial spraying for mosquito control over an urban area. Environ Sci Technol, 40: 5817-5822.

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