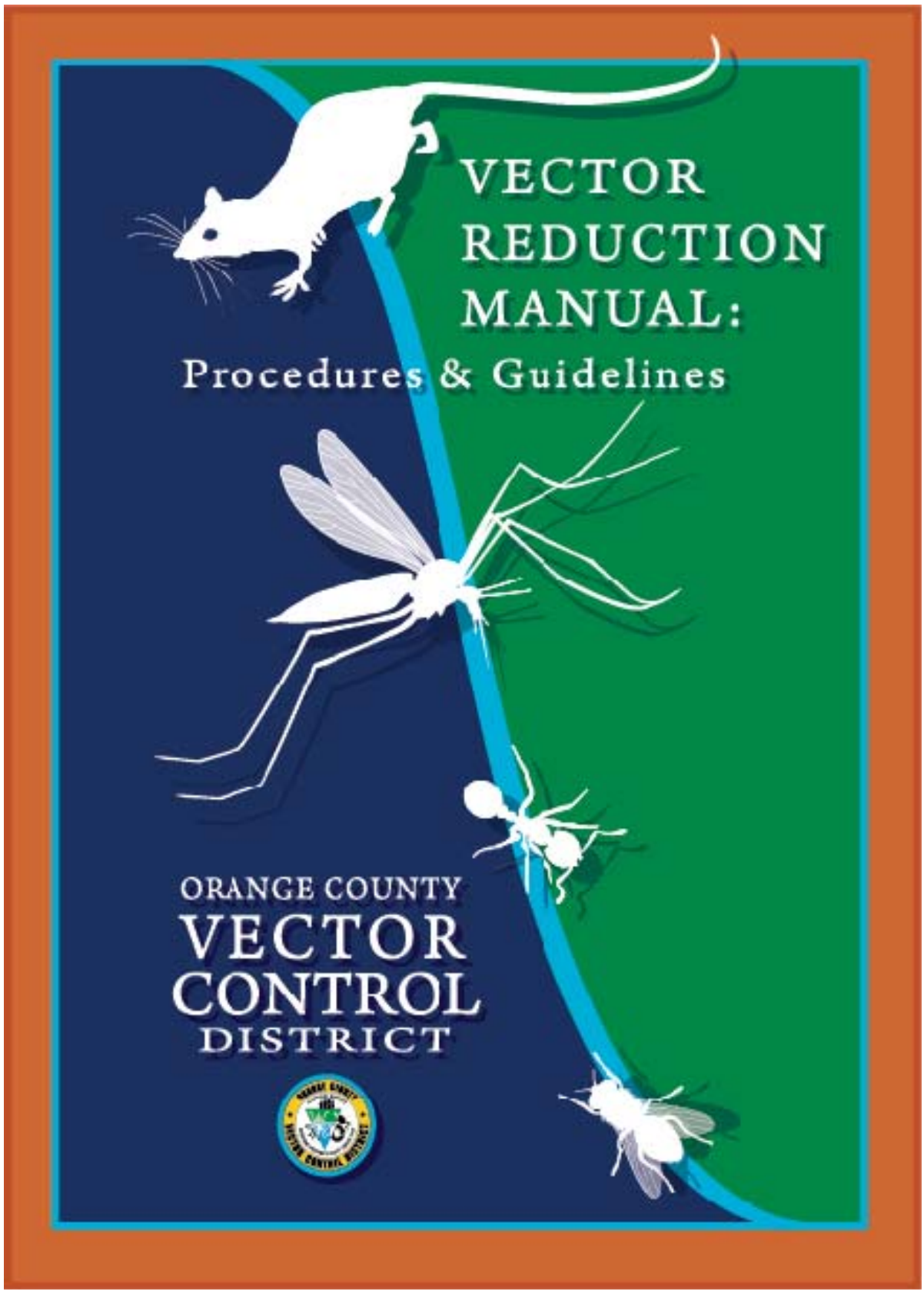

VECTOR
REDUCTION
MANUAL:
Procedures & Guidelines
ORANGE COUNTY
VECTOR
CONTROL
DISTRICT

Vector Reduction Guidelines

The Vector Reduction Guidelines contained in this manual are assembled from a number of sources including scientific literature, state and inter-agency documents, pesticide label and use requirements, and from experienced vector control professionals. The intended use of this document is to provide general guidance, not site-specific requirements. The Vector Reduction Guidelines that are most applicable to a specific vector-breeding source may be selected from the list and incorporated into a specific Vector Management Plan for a specific source in consultation with District personnel.

Vector Reduction Program

VECTOR REDUCTION PROGRAM POLICIES

The Orange County Vector Control District (the District) recognizes that cooperative land management practices can reduce vector[1] populations. Long-term costs are reduced because smaller populations require less staff time and lower pesticide use. These practices help to protect public health and are an integral part of the District's Integrated Vector Management (IVM) approach to mosquito and vector control.

Integrated Vector Management is a process that focuses on site-specific, scientifically sound strategies to manage vector populations. These policies and procedures have been adopted by the District as effective control measures for vectors. Landowners and land managers can use these guidelines to address vector control problems that are identified by the District.

Integrated Vector Management techniques vary at each site depending on the conditions found at the site. These techniques are commonly grouped into four categories:

1. Cultural Control – Change the behavior of people so that their actions prevent the development of vector populations or the transmission of vector-borne disease.
2. Source Reduction or Physical Control – Environmental manipulation that results in a reduction of vector development sites.
3. Biological Control – Use of biological agents to limit vector populations
4. Chemical Control – Pesticides that target different life stages of vector populations

The Vector Reduction Guidelines referred to in this document are the recommended land management practices that can provide a reduction in vector populations by various means including: reducing or eliminating breeding areas, or harborages, increasing the efficacy of biological controls, increasing the efficacy of chemical controls, and improving access for control operations. These Vector Reduction Guidelines have been developed based on the District's experiences with stakeholder groups including landowners, land managers, regulatory agencies, and other interest groups. As a result of this process, the District is prepared to offer practical and appropriate Vector Reduction Guidelines for the variety of land uses that exist in Orange County. Not all vector reduction guidelines included in this document will apply equally to all vector sources; however, they serve as a starting point in the cooperative development of a site-specific Vector Management Plan.

The District encourages those responsible for Significant Vector Sources on properties under their control to develop and implement a cooperative Vector Management Plan with the District

[1] A vector means any insect or other 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, red imported fire ants, and rats.

to avoid the need for the formal enforcement actions authorized under the California Health and Safety Code (HSC). In some situations, the District must employ the HSC in order to ensure safe conditions and to carry out its public responsibilities. However, it has been the District's experience that a cooperative approach to source reduction results in effective and long-lasting vector management.

The Vector Reduction Guidelines are designed to address vector sources including, but not limited to, managed wetlands, stormwater structures, wastewater facilities, residential properties, cemeteries, and golf courses. Many of these sources provide favorable habitats for vectors and produce significant vector populations.

Vector populations in Orange County can be reduced through the widespread implementation of vector reduction strategies and techniques. The policies and procedures outlined in this document specifically target Significant Vector Sources, but can be applied to any vector sources.

In circumstances where the implementation of a Vector Management Plan would cause economic hardship or technical difficulties, the District may choose to offer assistance in the form of technical advice, or other resources. Vector reduction projects can be planned in stages to provide time for budgeting considerations and obtaining any necessary regulatory permits. The level of assistance offered will be determined on a case-by-case basis.

SIGNIFICANT VECTOR SOURCES

Significant Vector Sources will be identified based on the following criteria:

- Vector production from the source is more than similar land uses, and exceeds treatment thresholds outlined in the Vector Management Plan;
- Treatment costs incurred by the District are increased due to problems caused by management practices;
- The source is in close proximity to areas of significant population density; and/or
- Vector Reduction Guidelines exist to address the land management practices and can be reasonably utilized to reduce vector production, harborage, or other vector favorable conditions.

If left untreated, a Significant Vector Source would be considered a public nuisance as defined in the California Health and Safety Code (HSC) §2002(j). Sources adjacent to and within population centers will be selected for inclusion in the Vector Reduction Program. Other factors, such as treatment costs, vector-borne disease status, vector species produced, and the efficacy of available treatment options will be considered when evaluating a Significant Vector Source, as defined above.

Surveillance data will be used to determine vector abundance prior to, and after implementation of, the Vector Management Plan for a Significant Vector Source. When mosquitoes are the problem, a combination of larval dip data and adult mosquito surveillance data will be used to assess vector abundance. When rats are the problem, signs of a rodent infestation, such as feces and gnawing, availability of food sources, and potential harborage will be used. If Red Imported Fire Ants (RIFA) are the cause of a Significant Vector Source, mound counts and presence of foraging workers will be used to assess Vector Management Plan success. Adult flies and presence of larval fly sources will be used to assess a significant fly source. In cases where existing data or current sampling methods are not sufficient to determine the efficacy of a particular Vector Management Plan, a specific monitoring plan will be established to meet the needs of the Significant Vector Source.

Management practices that contribute to increased vector production include, but are not limited to, poor water management, lack of emergent vegetation control, buildup of debris that restricts water conveyance, poor condition of water conveyance or drainage structures, practices that impede access to the source, and lack of notification of practices that would affect vector control operations.

VECTOR MANAGEMENT PLAN

Once the District has identified a Significant Vector Source, staff will present a draft Vector Management Plan to the responsible party, in consultation with state and federal biologists, if appropriate, proposing a course of action based on one or more Vector Reduction Guidelines that, if implemented, can reduce or eliminate the Significant Vector Source.

The draft Vector Management Plan will contain at least the following:

- Justification for requested actions.
- Description of the proposed Vector Reduction Guidelines, including specific guidance regarding method and timing of implementation.
- District resources available to assist with Vector Reduction Guideline implementation.
- Assessment method.

The responsible party will have the opportunity to review and comment on the draft plan. Reasonable adjustments may be negotiated between the responsible party and the District to achieve a mutually agreeable plan. A reasonable time limit will be set at the beginning of the negotiation phase, at which time the District will finalize any unresolved issues at its discretion. This time limit may be extended if all parties agree that there is reasonable cause to do so.

If the responsible party is unwilling to accept the terms of this cooperative process, the District will proceed to the legal Vector Abatement Process under the California Health and Safety Code

§2060-2067 and District Resolution No. 340: Orange County Vector Control District's Nuisance Abatement Procedures (see Appendix 1).

CHARGES FOR TREATMENT COSTS

The District is authorized by the Health and Safety Code to recover treatment costs for vector control operations. Since properties in the District pay for a base level of vector control through the payment of property taxes, the District would consider charging for treatment costs that are above and beyond the normal level of treatment required by a similar vector source with a similar land use. Since one of the primary goals for the Vector Reduction Program is to reduce pesticide use in Orange County, the District would only consider accepting charges for additional treatment in lieu of implementing Vector Reduction Guidelines on a case-by-case basis for a limited time. As new Vector Reduction Guidelines are developed and efficacy of existing Vector Reduction Guidelines are researched further, the expectation would be that the charges for pesticide treatment would be replaced by non-pesticide based, long-term Vector Management Plans.

APPEAL PROCESS

The responsible party may submit comments in writing to the Director of Operations before the implementation deadline indicated on the draft Vector Management Plan presented to the responsible party in Step #2 on Figure 1 (Flow Chart). After review, the Director of Operations will issue a determination which may include; 1) no change in the content of the draft Vector Management Plan; 2) an extension of the implementation deadline; 3) a waiver of fees; or 4) other appropriate action, such as the implementation of an abatement process leading to civil action (see Appendix 1).

If the responsible party is a state agency, appeals may be made to the State Department of Public Health, pursuant to the California Health and Safety Code.

VECTOR REDUCTION PROGRAM IMPLEMENTATION PROCESS FOR SIGNIFICANT VECTOR SOURCES

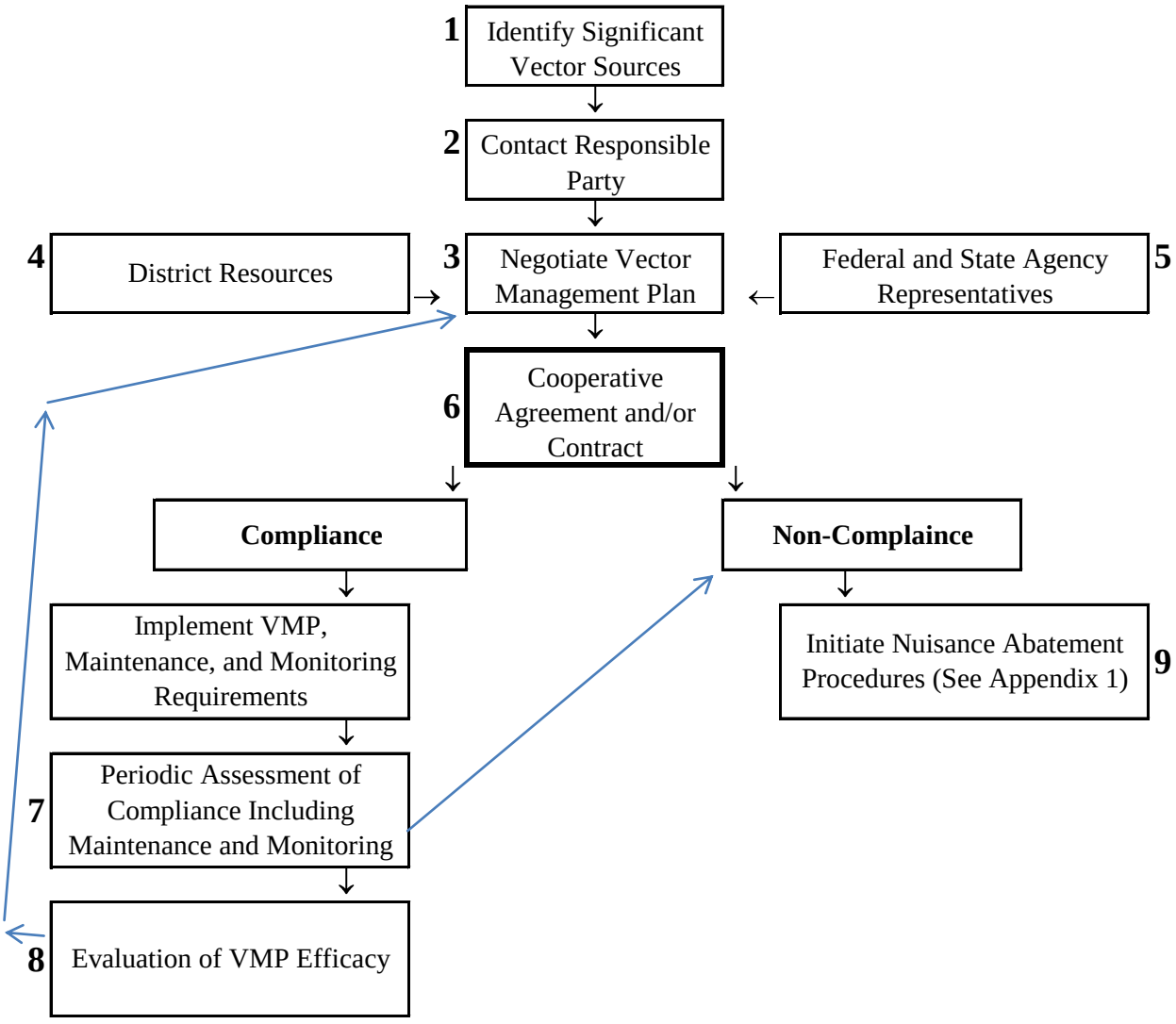
The following items represent a chronological progression of the Vector Reduction Program actions after a Significant Vector Source is identified.

Note: The numbered items correspond to the numbers on Figure 1.

1. **Identify a Significant Vector Source** – The District will identify Significant Vector Sources based on the previously defined criteria.
2. **Contact Responsible Party** – The District will contact the responsible party (as defined in the California Health and Safety Code §2060) of properties in Orange County that have been identified as a Significant Vector Source, that if untreated, would become a public nuisance. The District will also contact state and federal agencies that have a vested interest in the property, such as a conservation easement, habitat management plan, or other habitat maintenance agreement. A draft Vector Management Plan will be provided to the responsible parties. This plan will include an explanation of why the site was determined to be a Significant Vector Source, including vector surveillance data, if requested.
3. **Negotiate Vector Management Plan** – The District will work with the responsible party to determine a course of action to address the vector source including specific Vector Reduction Guidelines, implementation timeline, maintenance requirements, and monitoring plan. A defined negotiation period will be designated at the start of the negotiations.
4. **District Resources** – At the discretion of the District, resources may be made available to assist in complying with the Vector Management Plan requirements. In cases where District resources are used, specific maintenance requirements will be specified in the cooperative agreement, and will be signed by the responsible party and the District. In some cases, the District will use a Vegetation Agreement or Source Reduction Agreement to establish a contract with the property owner. The Agreement will contain the name of the responsible party, location of the property, description of the work to be done, the cost of the work, if any, to be paid by the responsible party, and requirements for maintenance to be performed by the responsible party. These agreements shall be subject to the same requirements as any other agreement covered by these policies.
5. **Coordinate and Assist with Other Regulatory Agencies** – Coordinate with other local, state, federal, and conservation agencies during the negotiation process to avoid or address any potential regulatory conflicts with the draft Vector Management Plan.
6. **Cooperative Agreement and/ or Contract** – A cooperative agreement and/or contract will formalize the relationship between the District and the responsible party. This document will also outline the consequences of non-compliance with the Vector Management Plan under the California Health and Safety Code.
7. **Monitoring** – After successful implementation of the requirements, regular inspections of the property will be conducted to assess continued maintenance and compliance with the site's Vector Reduction Guidelines as identified in the Vector Management Plan. The District reserves the right to renegotiate the Vector Management Plan if it is determined that adequate vector control is not being achieved. In this case, the process would return to Step 2. As long as the responsible party is in compliance with the terms of the cooperative agreement, no additional charges or penalties will be assessed by the District.

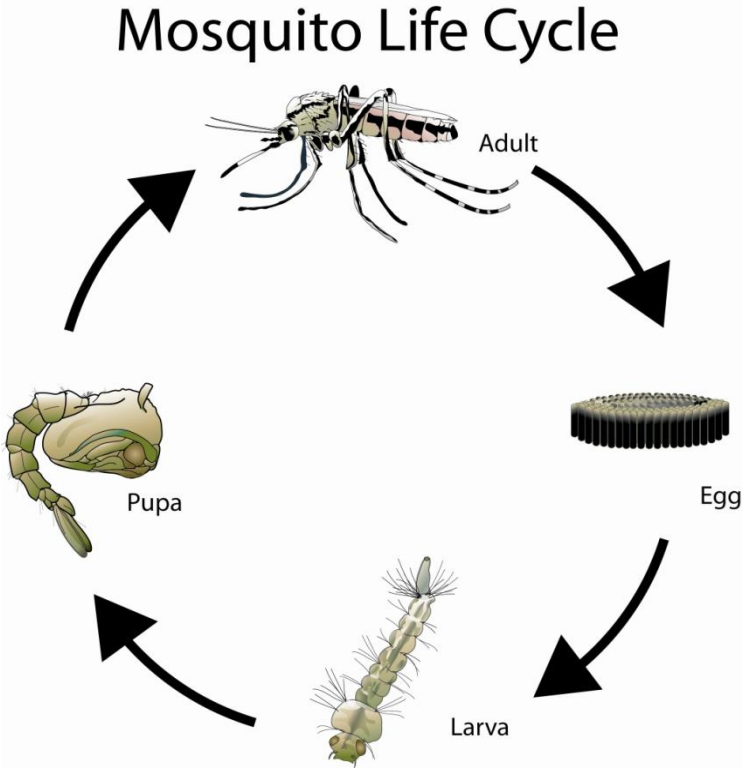
8. **Evaluation of Vector Management Plan Efficacy** – An effective vector control plan requires regular assessment and adaptive management to address changing conditions or unforeseen effects. The District will evaluate each Vector Management Plan to determine if the Vector Reduction Guidelines are meeting the needs of both the responsible party and the District. Based on this evaluation, either party may initiate a review of the Vector Management Plan pursuant to the terms of the cooperative agreement.
9. **Abatement Process** – if the responsible party does not take corrective action or does not provide a reasonable explanation for the continued lack of compliance with the cooperative agreement, the case may be brought to the District Manager pursuant to the District's Nuisance Abatement Procedures (see Appendix 1) to begin the Formal Abatement process as defined in HSC §2061.

Figure 1. Vector Reduction Program Implementation Process Flow Chart



MOSQUITO REDUCTION GUIDELINES

There are over 20 species of mosquitoes that occur in Orange County. Fortunately, only 13 species are of significant concern in our area. It is important to realize that each species of mosquito has different habitat requirements and behaviors that affect its ability to transmit disease, bite humans, and be controlled by a specific Vector Reduction Guideline.



Mosquito Biology

All mosquitoes share a similar life cycle with an aquatic stage (larvae) and an aerial stage (adult). Nearly all Vector Reduction Guidelines focus on managing the aquatic stage of the mosquito by creating conditions that are less favorable for mosquito development. This usually involves manipulating the amount or timing of standing water, decreasing the amount of vegetation in and around the standing water, and creating situations where natural or introduced predators can consume the mosquito larvae. Since each species of mosquito has slightly different habitat requirements, it is important to understand which mosquitoes favor which habitats to understand how a particular mosquito reduction guideline reduces the population.

To understand mosquito reduction guidelines, it is useful to think of mosquitoes as belonging to one of the following three categories.

Standing –Water Mosquitoes prefer water commonly found in ornamental ponds, unmaintained swimming pools, freeway drains, stormwater systems, natural waterways, and flood control channels.

Common Mosquito Reduction Guidelines:

a. Drain standing water.
b. Reduce or eliminate emergent vegetation in and along the edges of the water.
c. Hold water level constant to encourage natural predators or biological control agents (e.g. mosquito fish).
d. Contact the District to coordinate mosquito prevention with other mosquito control operations.

Container Mosquitoes prefer contained areas of water, such as tree holes, buckets, tires, etc. Some standing water mosquitoes will also develop in containers.

Common Mosquito Reduction Guidelines:

a. Drain containers of standing water.
b. Cover, overturn, or create drainage holes that prevent standing water in the container.
c. Identify and prevent water from refilling containers.
d. Contact the District to coordinate mosquito prevention with other mosquito control operations.

Salt Water Mosquitoes lay their eggs on moist soil. When they become submerged, due to tidal fluctuations, the eggs hatch.

Common Mosquito Reduction Guidelines:

a. Flood when air temperatures do not encourage rapid mosquito development (late fall rather than summer).
b. Reduce or eliminate emergent vegetation.
c. Flood quickly to encourage all eggs to hatch at once and minimize the need for multiple larvicide applications.
d. Contact the District to coordinate mosquito prevention with other mosquito control operations.

RESIDENTIAL AND COMMERCIAL MOSQUITO SOURCES

Common Mosquito Development Sites

- Backyard Sources
- Low Impact Developments (e.g., Rain Barrels)
- Pools & Spas
- Ornamental Ponds & Water Features
- Tire storage
- Unmaintained swimming pools and spas
- Decorative ponds and fountains
- Bird baths
- Water–filled containers
- Clogged rain gutters
- Poorly designed or damaged landscape irrigation systems
- Cemetery vases
- Koi ponds
- Stored or waste tires
- Small Drains

Common Mosquito Species

- Cleaner water sources: *Culex tarsalis.*
- Water with more organic material*: Culex quinquefasciatus, Culex stigmatosoma,* and *Culiseta incidens.*

Special Concerns

Urban and suburban mosquito sources are especially problematic because they produce mosquitoes in areas of high population density where many people live and work. This can quickly lead to vector–borne disease transmission since the vector (mosquito) and host (human) are often in close proximity. These sources may be in and around private residences which are not easily seen or accessed by District staff. Economic or social changes in a neighborhood can result in an increase in mosquito sources, such as unmaintained swimming pools and spas. Fortunately, many of the Mosquito Reduction Guidelines for residential areas are relatively inexpensive and easy to implement.

General Mosquito Reduction Principles

1. Prevent or eliminate unnecessary standing water that remains for more than 96 hours.
2. Maintain irrigation systems to avoid excess water use and runoff into storm drains.
3. Maintain water features such as ponds and fountains to circulate water with pumps that run at least eight hours a day. If the feature has no pump, water should be changed every 96 hours to prevent mosquito breeding and/or pesticide treatment may be necessary.

4. Maintain access for District staff to monitor and treat mosquito breeding sources.
5. Contact District staff for technical guidance or assistance in implementing Vector Reduction Guidelines for large mosquito breeding sources.
6. If unable to control mosquito breeding contact, the District for advice and help.

Residential and Commercial Mosquito Reduction Guidelines

RC-1 Drain all containers of standing water, including pet dishes, potted plant drip trays, boats, birdbaths, and tires and buckets at least once per week. Mosquitoes can develop in as little as a 1/8" of standing water. Be aware of containers and objects that are subject to collecting water. If possible, drill drainage holes, cover, or invert any container, or object, that holds standing water and must remain outdoors. Be sure to check for containers or trash in places that may be hard to see, such as under bushes or buildings.

RC-2 Dispose of unwanted or unused artificial containers, and properly dispose of old tires.

RC-3 Maintain pools and spas. Use skimmers and filter systems to remove egg rafts and mosquito larvae.

RC-4 If a pool or spa is not going to be operational for any reason, notify the District so that the pool or spa can be inspected regularly and treated with an appropriate larvicide and/or stocked with mosquito fish, if needed. These services are provided at no additional charge and are supported by property taxes.

RC-5 Notify the District of any ponds or water features (including ponds with ornamental fish such as Koi or goldfish) with permanent water. Allow District Inspectors to inspect and periodically stock mosquito fish or other biological control, as necessary, for the control of mosquito larvae.

RC-6 Landscape irrigation drainage should be managed such that no water stands for more than 96 hours.

RC-7 All underground drain pipes should be laid to grade to avoid low areas that may hold water for longer than 96 hours.

RC-8 Maintain rain gutters and other gutter structures by removing leaves, debris, and standing water from these features, as necessary, following rain events.

RC-9 Provide safe access for District staff to all pools, spas, ponds, landscape irrigation structures, catch basins, storm drains, drainage pipes, sewer cleanouts, or any other potential mosquito breeding source.

RC-10 Repair leaks or damaged drainage system components to prevent standing water for more than 96 hours.

RC-11 Notify District staff of any condition that may produce mosquitoes on the property such as flooding, broken pipe, damaged septic tank cover, or a leaking outdoor faucet if it results in standing water for more than 96 hours.

RC-12 Small Drains – screen and keep free of water and debris.

Low Impact Developments (e.g., Rain Barrels)

RB-1 Prevent mosquito breeding in rain barrels by properly screening all openings to prevent mosquito access to the stored water. If larvae are observed in a rain barrel, contact the District.

Ornamental Ponds and Water Features

P-1 All ponds should be surrounded by land of adequate width to allow safe passage of District staff and/or equipment.

P-2 Banks should be steeply sloped and lined to three feet below the water level with a suitable material such as concrete or clay, or be regularly treated with residual herbicides to ensure permanent weed prevention[2].

P-3 To minimize invasive emergent vegetation in ponds, use a slope angle of at least 2:1. Bank slopes of 2.5:1 to 4:1 (vertical: horizontal) and minimum depths of four to five feet to significantly reduce bottom-rooted aquatic plants.

P-4 Large ponds and lakes should have raised embankments a minimum width of 12 feet and be adequately constructed to support maintenance vehicles.

P-5 Ponds or ornamental water features should be stocked with mosquito fish when possible. Contact the District for an assessment.

P-6 Vegetation should be controlled regularly to prevent overgrowth of emergent vegetation and vegetative barriers for District access. This includes vegetation control to maintain access to lanes and paths, interior pond embankments, and any weed growth that might become established within the pond.

Tire Storage

TS-1 Never allow water to accumulate in tires. Tires should be stored in a covered location or covered by a tarp in order to prevent accumulation of water.

[2] Per National Pollutant Discharge Elimination System (NPDES) authorization, or other approval if needed.

TS-2 Tires should never be stored in a pile. Tires should be stored on racks or in a stack not more than two rows wide.

TS-3 Tires should be stored in a manner that allows inspections of each individual tire.

TS-4 Waste tires should be picked up by the proper disposal entity on a regular basis.

TS-5 Those responsible for stored tires should inspect and dump out any water that may have accumulated inside tires on their premises on a weekly basis.

TURF AND LANDSCAPE

Common Mosquito Development Sites

- Sprinklers & Irrigation Systems
- Small Drains
- Nurseries
- Cemeteries
- Golf Courses
- Equestrian Facilities
- Parks
- Agriculture

Common Mosquito Species

- Cleaner water sources: *Culex tarsalis.*
- Water with more organic material*: Culex quinquefasciatus, Culex stigmatosoma,* and *Culiseta incidens.*

Special Concerns

Turf and landscape sources are especially important because they occur near areas of high population density and contain vector sources (e.g., ponds, vases, plant containers) that may not be easily accessible to the District. These sources occur in areas where people recreate and/or work during dusk and dawn which are periods of high mosquito activity. Additionally, these sources can add significant water to the underground storm drain system, thereby increasing vector habitat.

General Mosquito Reduction Principles

1. Prevent or eliminate unnecessary standing water that remains for more than 96 hours.
2. Maintain irrigation systems to avoid excess water use and runoff into storm drains.
3. Maintain water features, such as ponds and fountains, to circulate water with pumps avoid stagnate water conditions. If the feature has no pump, water should be changed every 96 hours to prevent mosquito breeding and/or pesticide treatment may be necessary.
4. Maintain access for the District to monitor and treat mosquito breeding sources.
5. Contact the District for technical guidance or assistance in implementing mosquito reduction strategies for larger mosquito breeding sources.
6. If unable to control mosquito breeding, contact the District.

Sprinkler & Irrigation Systems

SL-1 Landscape irrigation drainage should be managed such that little or no water enters the stormwater system.

SL-2 Avoid over-irrigation to prevent accumulation of wastewater that results in pooling and runoff.

SL-3 All underground drain pipes should be laid to grade to avoid areas that may hold water.

SL-4 Repair leaks or damaged drainage system components to prevent standing water.

Nurseries

N-1 Follow all recommendations for mosquito breeding reduction in sprinkler and irrigation sources.

N-2 Inspect to ensure that all containers drain properly and contain no standing water, including potted plants and potted plant bases.

N-3 Inspect plants imported from outside of Orange County for standing water and/or mosquito eggs (e.g., *Aedes albopictus*).

N-4 Notify the District immediately if employees are being bitten by mosquitoes.

N-5 Back-fill tire ruts and other low areas that hold water for more than 96 hours.

N-6 Keep drainage ditches free of excessive vegetation and debris to promote rapid drainage.

N-7 Repair and seek to improve irrigation systems to increase water use efficiency.

Cemeteries

C-1 Empty all flower vases weekly.

C-2 Seek alternatives to in-ground or mounted flower vases which hold water for more than 96 hours.

C-3 Switch flower vases to wire stands that hold flowers or plants above ground surface.

C-4 Notify District staff immediately if employees or visitors are bitten by mosquitoes.

Golf Courses

GC-1 Land grades should have sufficient fall to prevent mid-field ponding, especially in soils with high clay content.

GC-2 Irrigate only as frequently as is needed to maintain proper soil moisture. Check soil moisture regularly.

GC-3 Manage irrigation to prevent ponding of water.

GC-4 Drains should have gradients from 1 in 40 to 1 in 110 to provide good water flow and be maintained free of clogs and vegetation.

GC-5 Do not over fertilize. Over-fertilization can leach into irrigation run-off which may facilitate mosquito production in ditches and/or become contamination further downstream.

GC-6 Keep equipment off soil when the ground is soft. Mosquito habitat is created when water collects in tire ruts.

GC-7 Refer to Pond section for information regarding reduction of mosquito breeding in water hazards.

Equestrian Facilities

EF-1 Identify areas on the property where water can accumulate and remain standing for more than 96 hours. Mark these areas on a site map and assess them after rainfall or irrigation.

EF-2 Eliminate containers that accumulate and hold water for more than 96 hours. When containers cannot be eliminated, drain standing water every 96 hours, or place mosquito fish.

Agriculture

A-1 Water allotments to farming operations should be limited to reasonable needs for the size of fields, type of soil, and crop requirements.

A-2 Plantings watered by drip irrigation should be checked to ensure that the system is not over watering and causing standing water that could produce mosquitoes.

A-3 Land grades should have sufficient fall to prevent mid-field ponding, especially in soils with high clay content, except where drip irrigation is being used.

A-4 Graded ditches should be located at the low ends of fields for draining and proper management of rainwater runoff and tail water.

A-5 Remove vegetation and other blockages from V ditches on the property on a regular basis to prevent stagnant water from pooling and becoming a mosquito breeding site.

A-6 Provisions should be made to drain irrigation ditches, pipelines, and other features of water after each use to prevent mosquito breeding habitats.

A-7 Animal confinement operations should be designed with sloped loafing and feeding corrals for proper drainage. If water troughs are being used, they should be monitored to detect potential mosquito production.

A-8 Inform the District of organic agriculture practices so that the District can provide control.

STORMWATER SYSTEMS AND URBAN RUNFOFF

Common Mosquito Development Sites

- Detention/retention basins
- Treatment wetlands
- Catch basins/storm drains
- Underground water storage devices
- Underground drain systems
- Clogged sediment screens
- Blocked culverts
- Roadside ditches

Common Mosquito Species

- Above ground/clean–water sources: *Culex tarsalis.*
- Underground/polluted or nutrient rich water*: Culex quinquefasciatus, Culex stigmatosoma,* and *Culiseta incidens.*

Special Concerns

Management of mosquitoes and other vectors in stormwater management structures, such as flood control basins and other structural stormwater Best Management Practices (BMPs) is critical for protecting public health. With careful planning, such structures can be designed, built, operated, and maintained in a manner that minimizes opportunities for the proliferation of vectors. The District stresses the importance of identifying and resolving potential mosquito sources in stormwater structures at the planning stages of new development.

General Mosquito Reduction Principles

1. Maintain access for District staff to monitor and treat mosquito breeding sources.
2. Consider mosquito reduction standards during the design and construction of stormwater infrastructure and allocate funds to maintenance of the infrastructure.
3. Manage sprinkler and irrigation systems to minimize runoff entering stormwater infrastructure.
4. Avoid intentionally running water into stormwater systems (e.g., washing sidewalks and driveways, washing cars on streets, etc.).
5. Minimize emergent vegetation and surface debris in the water.
6. Provide the District access to accumulated water allowing for mosquito treatment and control.

Above Ground Structures

AG-1 Build shoreline perimeters as steep and uniform as practicable to discourage excessive plant growth.

AG-2 Whenever possible, maintain stormwater ponds and wetlands at depths in excess of four feet to limit the spread of invasive emergent vegetation, such as cattails (*Schoenoplectus* spp.) and bulrush (*Typha* spp.).

AG-3 Eliminate floating vegetation conducive to mosquito production (e.g., water hyacinth *Eichhornia* spp., duckweed *Lemna* and *Spirodela* spp., and filamentous algal mats).

AG-4 Perform routine maintenance to reduce and contain emergent plant densities to facilitate the ability of mosquito predators (i.e., fishes) to move throughout vegetated areas.

AG-5 Keep or make shorelines accessible for periodic maintenance, control, and removal of emergent vegetation, as well as for routine mosquito monitoring and abatement procedures, if necessary.

AG-6 Design in drainage systems and obtain necessary approvals for all stormwater ponds and wetlands to allow for complete draining when needed for periodic maintenance and silt removal.

AG-7 The effective swath width of most backpack or truck–mounted larvicide sprayers is approximately 20 feet on a windless day. Because of these equipment limitations, all–weather road access (with provisions for turning a full size work vehicle) should be provided along at least one side of large above–ground structures that are less than 25 feet wide.

AG-8 Access roads should be built as close to the shoreline as possible. Vegetation or other obstacles should not be permitted between the access road and the stormwater treatment device that might obstruct the application of larvicides to the water. Access roads and paths need to be maintained and free of vegetation overgrowth.

AG-9 Vegetation should be controlled (by removal, thinning, or mowing) periodically to prevent barriers to access.

AG-10 Design structures so they do not hold standing water for more than 96 hours. Special attention to groundwater depth is essential to prevent groundwater seepage and permanent standing water.

AG-11 Allow water to flow by gravity through the structure by use of a hydraulic grade line. Pumps are not recommended, are subject to failure, and often require sumps that hold water.

AG-12 Avoid the use of loose riprap or concrete depressions that may create and hold standing water.

AG-13 Avoid barriers, diversions, or flow spreaders that may retain standing water.

AG-14 Use concrete or liners in shallow areas to discourage unwanted plant growth where vegetation is not necessary.

AG-15 Where feasible, compartmentalize managed treatment wetlands so that the maximum width of ponds does not exceed two times the effective distance (40 feet) of land–based application technologies for mosquito control agents.

AG-16 Incorporate features that prevent or reduce the possibility of clogging discharge orifices (e.g., debris screens). The use of weep holes is not recommended due to rapid clogging.

AG-17 Design distribution piping and containment basins with adequate slopes to drain fully and prevent standing water. The design slope should take sediment accumulation into consideration between maintenance periods. Compaction during grading may also be needed to avoid slumping and settling.

AG-18 Catch Basins, drop inlets, storm drains, and other structures originally designed to fully drain water should be regularly checked and maintained to function as designed.

AG-19 Basins designed to be dry, but remain wet, should be corrected by retrofit, replacement, repair, or more frequent maintenance.

AG-20 Coordinate cleaning of catch basins, drop inlets, or storm drains with mosquito treatment operations.

AG-21 Enforce the prompt removal of silt screens installed during construction when no longer needed to protect water quality.

Underground Structures (Sumps, vaults, drop inlets, catch basins, driveway sump drains)

US-1 Completely seal structures that retain water permanently or longer than 96 hours to prevent entry of adult mosquitoes.

US-2 Stormwater structures utilizing covers should be tight fitting, with maximum allowable gaps 1/16 inch, to exclude entry of adult mosquitoes.

US-3 If the sump, vault, or basin is sealed against mosquitoes, with the exception of the inlet and outlet, submerge the inlet and outlet completely to reduce the available surface area of water for mosquito egg–laying (female mosquitoes can fly long distances through pipes to access water).

US-4 Design structures with the appropriate pumping, piping, valves, or other necessary equipment to allow for easy dewatering of the unit.

Flood Channels

FC-1 Provide proper grades to ensure that water flows freely.

FC-2 Low-flow channels should be maintained free of debris.

FC-3 Perform regular maintenance to remove vegetation, debris, trash, and sediment accumulated inside the channel to ensure that water flows freely.

FC-4 Remove or trim vegetation that overhangs the channel to minimize the amount of material that naturally falls into the channel.

FC-5 Avoid the use of loose rock riprap that may create and hold standing water.

FC-6 Maintain clear access along the entire length of the channel for the District to conduct surveillance and control activities.

Natural Watercourses

NW-1 Perform frequent maintenance as needed to trim or remove vegetation, debris, trash, and sediment accumulated inside the natural watercourse to ensure that water flows freely.

NW-2 Perform routine maintenance to reduce emergent plant densities to facilitate the ability of mosquito predators (e.g., fishes) to move throughout vegetated areas.

NW-3 Assure accessibility to maintenance and vector control crews for periodic maintenance, control, and trimming or removal of emergent vegetation, as well as for routine mosquito monitoring and abatement procedures, if necessary.

NW-4 Coordinate with Orange County Flood Control Division on areas under their jurisdiction for maintenance. Report blockages and problematic vegetation to Orange County staff to perform needed maintenance.

Freeway Drains

FD-1 Provide proper grades to ensure that water flows freely and does not stand for more than 96 hours.

FD-2 Perform frequent maintenance as needed to remove vegetation, debris, trash, and sediment accumulated inside the drain to ensure water flows freely.

FD-3 Remove or trim vegetation that overhangs the freeway drain to minimize the amount of material that naturally falls into the structure.

FD-4 Avoid the use of loose rock riprap that may hold standing water.

FD-5 Maintain clear access along the entire length of the freeway drain for District staff to conduct surveillance and control activities.

Wastewater Management

WM-1 Monitor all treatment ponds for mosquito larvae – particularly in areas of emergent vegetation.

WM-2 Remove emergent vegetation from edges of aerated ponds.

WM-3 Immediately incorporate sludge into soil through plowing or disking.

WM-4 Ensure all water distributed onto evaporation ponds dries completely in less than 96 hours.

WM-5 Check abandoned ponds or tanks weekly to ensure they are completely dry.

WM-6 Prevent the formation of any crust on treatment ponds or tanks.

WETLANDS

Common Mosquito Development Sites

- Permanent wetlands for habitat or species conservation
- Constructed vernal pools and other wetlands
- Seasonal wetlands
- Tidal marshes

Common Mosquito Species

- Permanent wetlands: *Culex tarsalis, Culex erythrothorax, and Culiseta incidens*.
- Seasonal wetlands: *Aedes* species.

Special Concerns

Wetlands vary depending on the management goals for the habitat, and may be subject to additional regulations, including state and federal conservation easements and policies, and habitat mitigation or management plans. Vector Reduction Guidelines attempt to balance the management goals of land managers, land owners, and other regulatory agencies with the ultimate goal of creating and maintaining habitat that is least-suitable for mosquito breeding. The District is committed to working with wetland managers and state and federal regulatory agencies to implement mosquito control practices in a proactive and cooperative manner.

General Mosquito Reduction Principles

1. Maintain access for District staff to monitor and treat mosquito breeding sources.
2. Minimize emergent vegetation and surface debris on the water.
3. Contact the District for technical guidance, assistance in implementing vector reduction guidelines, or to coordinate flood/treatment schedules with mosquito control operations.

Design and Maintenance

DM-1 Maintain all open ditches by regularly removing trash, silt, and vegetation, including roots to maintain efficient water delivery and drainage.

DM-2 Provide reasonable access along existing roads and levees to allow the District access for monitoring, and control activities. Make shorelines of natural, agricultural, and constructed water bodies accessible to crews for periodic maintenance, control, and removal of emergent vegetation.

DM-3 Inspect, repair, and clean water-control structures of debris. Remove silt and vegetation build–up in front of structures that impede drainage or water flow. Completely close, board, or fill in to prevent unnecessary water flow, except where water circulation is necessary.

DM-4 Perform regular pump efficiency testing and make any necessary repairs to maximize output, if pumps are required.

DM-5 Ensure adequately sized water control structures are in place. Increase size and number of water control structures, if necessary, to allow for complete draw–down and rapid flooding.

DM-6 Inspect and repair roads and levees, at least annually.

DM-7 Design managed wetland projects to include independent inlets and outlets for each wetland unit.

DM-8 Construct or enhance swales so they are sloped from inlet to outlet and allow the majority of the wetland to be drawn down.

DM-9 Excavate deep channels or basins to maintain permanent water areas (> 2.5 feet deep) within a portion of seasonal managed wetlands. This provides year–round habitat for mosquito predators which can inoculate seasonal wetlands when they are irrigated or flooded.

Vegetation Management

VM-1 Control floating vegetation conducive to mosquito production (e.g., water hyacinth, water primrose, parrot's feather *Eichhornia* spp., duckweed *Lemna* and *Spirodela* spp., and filamentous algal mats).

VM-2 Perform routine maintenance to reduce problematic emergent plant densities and to remove dead top-killed vegetation from periodic freezing weather conditions to facilitate the ability of mosquito predators (e.g., fishes) to move throughout vegetated areas and allow good penetration of pesticides.

Water Management

WM-1 Maintain stable water level by ensuring constant flow of water into pond or wetland to reduce water fluctuation due to evaporation, transpiration, outflow, and seepage.

WM-2 Delay fall flooding to avoid increasing late–season mosquito production (Kwasny et. al., 2004).

WM-3 Flood managed wetlands as fast as possible and as deep as possible (18–24”). Shallow water levels can be maintained during winter months.

WM-4 Maintain permanent or semi–permanent water where mosquito predators can develop. Discourage the use of broad spectrum pesticides.

WM-5 Where feasible, have an emergency plan that provides for immediate drainage into acceptable areas, if a public health emergency occurs.

Coordination with District

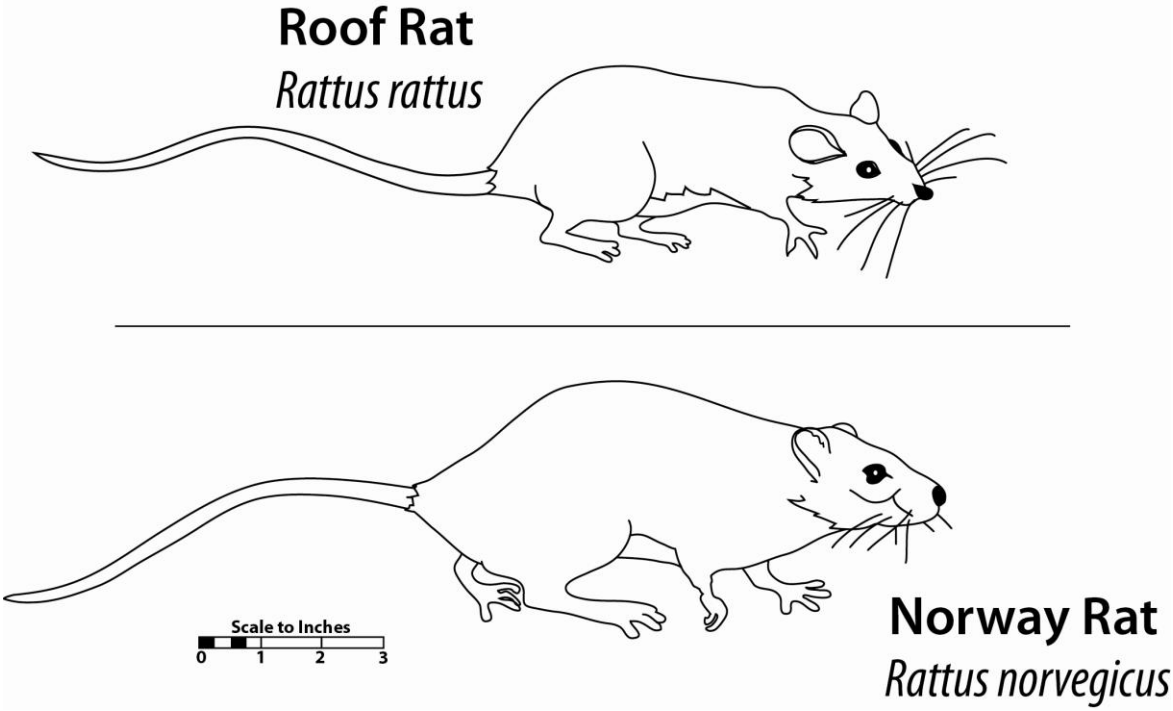
CD-1 Consult with the District on agency-sponsored habitat management plans on private lands (and on the timing of wetland flooding on public and private lands); urge private landowners to do the same.

CD-2 Identify problem locations that produce mosquitoes, with the aid of the District, and work to implement mosquito reduction guidelines. Identify potential cost–share opportunities prior to implementing mosquito reduction guidelines.

CD-3 Consult with the District on the design of restoration and enhancement projects that have the possibility of affecting mosquito production or control operations.

RAT REDUCTION GUIDELINES

Rat Species:
Norway rat: *Rattus norvegicus*
Roof rat: *Rattus rattus*



Rat Biology

Rats are mostly active at night. They have poor eyesight, but they make up for this with their keen senses of hearing, smell, taste, and touch. Rats constantly explore and learn about their environment, memorizing the locations of pathways, obstacles, food and water, shelter, and other elements in their domain. They quickly detect and tend to avoid new objects placed into a familiar environment. Thus, objects, such as traps and baits often are avoided for several days or more following their initial placement. Both Norway and roof rats may gain entry to structures by gnawing, climbing, jumping, or swimming through sewers and entering through the toilet or broken drains.

Roof rats *(Rattus rattus)*, sometimes called ship rats or house rats, are the most common rat in Orange County. Unlike Norway rats, sometimes called brown or sewer rats, their tails are longer than their heads and bodies combined. Roof rats are very agile climbers and usually live and nest above ground in shrubs, trees, and dense vegetation such as ivy. In buildings, they are most often found in enclosed or elevated spaces in attics, walls, false ceilings, and cabinets.

Norway rats *(Rattus norvegicus)* are stocky burrowing rodents that dig burrows into the ground or take advantage of existing burrows of other animals. The burrows are found along building

foundations, beneath rubbish or woodpiles, and in moist areas in and around gardens and fields. While Norway rats are more powerful swimmers, roof rats are more agile and are better climbers. Rats may grab food and carry it off to feed elsewhere. Rats of either species, especially young rats, can squeeze beneath a door with only a 1/2-inch gap. If the door is made of wood, the rat may gnaw to enlarge the gap, but this may not be necessary.

Norway rats eat a wide variety of foods but mostly prefer cereal grains, meats, fish, nuts, and some fruits. When searching for food and water, Norway rats usually travel an area of about 100 to 150 feet in diameter; seldom do they travel any further than 300 feet from their burrows or nests. Roof rats eat a wide variety of foods, but prefer fruits, nuts, berries, slugs, and snails. The average female Norway rat has four to six litters per year and may successfully wean 20 or more offspring annually. The average number of litters a female roof rat has per year depends on many factors, but generally is three to five with from five to eight young in each litter.

Roof rats are especially fond of avocados and citrus and often eat fruit that is still on the tree. When feeding on a mature orange, they make a small hole through which they completely remove the contents of the fruit, leaving only the hollowed out rind hanging on the tree. Their favorite habitats are attics, trees, and overgrown shrubbery or vines. Roof rats prefer to nest in locations off the ground and rarely dig burrows.

Roof rats routinely travel up to 300 feet for food. They may live in the landscaping of one residence and feed at another. They can often be seen at night running along overhead utility lines or fence tops. They have an excellent sense of balance and use their long tails for balance while traveling along overhead utility lines. They may live in trees or in attics and climb down to a food source.

Special Concerns

The roof rat is the major pest species in Orange County. This agile rat frequently enters buildings and moves about neighborhoods using utility lines and fences as runways. They prefer to feed on wild bird seed, pet food, and many of the fruits and nuts (including those that people do not eat) commonly found in residential backyards. Rats and their fleas are capable of transmitting a variety of human diseases making them vector species. Among the diseases transmitted by rats, plague is perhaps the best known and the most serious. The potential of a plague outbreak increases as rat populations increase. Rats can also transmit a variety of bacteria, including rat bite fever and food-borne illness. Rats have no control over their bowels so the presence of droppings is a sure sign of rat activity, as is gnaw marks on food sources, and ingress and egress into buildings.

Guidelines for the Prevention of Rat Infestations

1. Eliminate food and water sources (e.g., pet food, bird food, snails, bird bath, and close garbage cans).
2. Exclude rats from structures.
3. Control rat populations through trapping and rodenticide bait use.
4. Remove rat harborage (e.g., overgrown plants, wood piles, abandoned sheds, old furniture).

Elimination of Food & Water Sources

RF-1 Remove potential food sources from the premises. This includes pet foods, bird seed left out for birds, snails, and dog and cat feces that can be eaten by rats.

RF-2 Maintain fruit trees and fruiting ornamentals. Routinely harvest ripe fruit and dispose of all fruit that has fallen to the ground

RF-3 Maintain vegetable gardens. Routinely harvest produce from gardens.

RF-4 Store pet food in metal containers with tight sealing lids indoors and do not leave uneaten pet food, or water, outdoors overnight.

RF-5 Keep trash cans closed at all times with tightly fitted lids.

RF-6 Repair leaky faucets and eliminate any other unnecessary standing water

Rat Control

RC-1 Trap rats if they are inside a residence or building. Poisoning with rodenticide bait indoors is not recommended because a rat may die inside an inaccessible area of the structure and create an odor and fly problem.

RC-2 Place traps near nesting areas, or where rats are likely to hide. Do not place traps where children or pets will disturb or be harmed by them.

RC-3 Use the following guidelines when placing poison baits outside; 1) Use tamper-resistant bait stations; 2) Secure bait stations so they cannot be carried away or moved and so bait will not spill out; 3) Place bait stations in areas where rats are found, such as behind shrubbery. These formulations are *POISONOUS* and must be placed where pets and children cannot reach them.

Remove Harborage

RS-1 Remove harborage and nesting areas after the rats have been controlled. It is important to wait until after the rats have been eliminated because they will disperse into the surrounding area when the harborage is disturbed during removal.

RS-2 Periodically thin, trim or eliminate completely Algerian ivy, palm trees, yucca, bougainvillea, and other dense shrubbery away from roofs, walls, fences, utility poles, and trees and/or eliminated completely.

RS-3 Stack firewood and lumber piles at least 18" off the ground and 12" away from fences and walls.

RS-4 Close off all openings to potential harborage areas that cannot be removed (like structures), with 1/4 inch hardware cloth screen or stainless steel scrubbing pads. Harborage areas can include barbecues, pool heaters, air conditioners, old furniture, block wall fences, pool sheds, water heater closets, hose storage, crawl areas, attics, and vents.

Excluding Rats From Structures

RP-1 Screen all access openings with 1/4 inch galvanized hardware cloth and inspect at least once a year for condition. Common rat access points to structures include gaps under doors, turbine vents, roof openings, attic louvers and wire openings, pipe openings, gaps between roof and chimney, warped or missing shingles, air conditioning pipe openings, air ducts, and missing or torn vent covers.

RP-2 Seal gaps around pipes and electrical conduits, and weatherproof cracks around doors and windows.

RP-3 Keep tree limbs away from the eaves, roof, and exterior walls of the house.

Maintaining a Rat Free Property

RF-1 Eliminate harborage and food and water sources after rats have been exterminated.

Proper Disposal of a Rat Carcass

CD-1 Using a plastic bag, place your hand in the bag like a glove, pick up the carcass with the bag, invert the bag or turn bag inside out, tie a knot at the end of the bag, place bag in another bag, and dispose of rat in a trash container with a secure lid.

RED IMPORTED FIRE ANT REDUCTION GUIDELINES

Ant Species: *Solenopsis invicta*

Red Imported Fire Ant (RIFA) Biology

The life span of RIFA workers depends on their size. Minor workers may live 30 to 60 days, media workers 60 to 90 days, major workers 90 to 180 days, and queens may live two to six years. Complete life cycle from egg to adult takes between 22 and 38 days. Mating flights are the primary means of colony propagation, secondarily, budding can occur in which a portion of a split off satellite colony becomes an autonomous unit. After the colony reaches one year of age, reproductive alates are produced. Six to eight mating flights consisting of up to 4,500 female or queen alates each occur between the spring and fall. Mating flights usually occur midday on a warm (>74ºF/24ºC), sunny day following rain. Mating occurs during flight and the males die soon after mating with females. In the southern United States, as many as 97,000 queens may be produced per acre of infested land per year. By six months the colony has reached several thousand workers and the mound can be seen in a field or lawn. Colonies of this size generally contain a few large workers (major workers), many medium sized workers (media workers), and a majority of small workers (minor workers). The queen is the single producer of eggs and is capable of producing as many as 1,500 eggs per day. Mature RIFA colonies may contain as many as 240,000 workers with a typical colony consisting of 80,000 workers. The food collection of foraging workers consists mostly of insects and earthworms. RIFA have also been known to attack immobile and dead vertebrates. Workers also collect honeydew and will forage for sweets, proteins, and fats in homes. Fire ants will attach to the skin using their mandibles and will subsequently lower the tip of their abdomen to inject the stinger into the victim. Thus, fire ants both bite and sting, but only the sting is responsible for the painful burning and pustule.

Special Concerns

The RIFA is a quarantined pest in California and is subject to various federal and state laws and regulations. A native of South America, this imported fire ant was first introduced in the southeastern United States and eventually found its way into Orange County. The colony or nest is very distinctive and easily recognized as a loosely compacted, finely granular dome (18 inches in diameter and six to ten inches high) of soil that somewhat resembles wet coffee grounds. This mound will become hardened as rain and sprinkler waters dries on its surface. Lawn mowing often chops and spreads the mound so be aware that it may take many shapes. Gopher mounds may be similar in size to a RIFA mound but have larger (coarser) soil particles and rocks than RIFA mounds. This ant is considered a vector because, unlike most ants, it delivers a venomous sting that produces immediate pain, a burning/ itching sensation, and raised pustules that often last for several days. The venom is relatively toxic and potentially lethal to pets, wildlife, and sensitized humans. Because of the number and severity of their stings, residents of Orange County should be aware of the existence of RIFA on their property and the potential hazards posed by accidental contact.

Guidelines for Red Imported Fire Ant Pre and Post Treatments

Before Survey and/or Pesticide Ant Bait Treatment for RIFA

BR-1 Do not disturb nests and/or foraging workers. RIFA is an aggressive and defensive pest that will bite and sting to defend its self and the colony. Disturbing a mound prior to, or during, a treatment can cause treatments to fail and distract the foraging ants from collecting the bait.

BR-2 Provide the District access to the property for treatment of the fire ant mounds, and/or, if required, the entire property.

BR-3 Sprinkler systems must be turned off the night before the RIFA treatment and not turned on until the day after treatment is complete. The treatment area must be dry for the pesticide ant bait to work effectively.

BR-4 Keep people, pets, and/or companion animals away from the area being treated during the application. People and animals can return to the area immediately after treatment.

After Pesticide Ant Bait Treatment for RIFA

AR-1 Do not irrigate the property for 24 hours after treatment.

AR- 2 Do not apply pesticides to the treated area for one week following treatment.

AR- 3 Do not mow or disturb the area for 24 hours after treatment. Do not use blowers or mowers that may move bait from the treated area, especially within close proximity to a pond or other water feature. The pesticide ant bait is not to come into contact with water, and/or

conditions that favor runoff, areas where surface water is present, or to intertidal areas below the mean high water mark.

Coordination with District

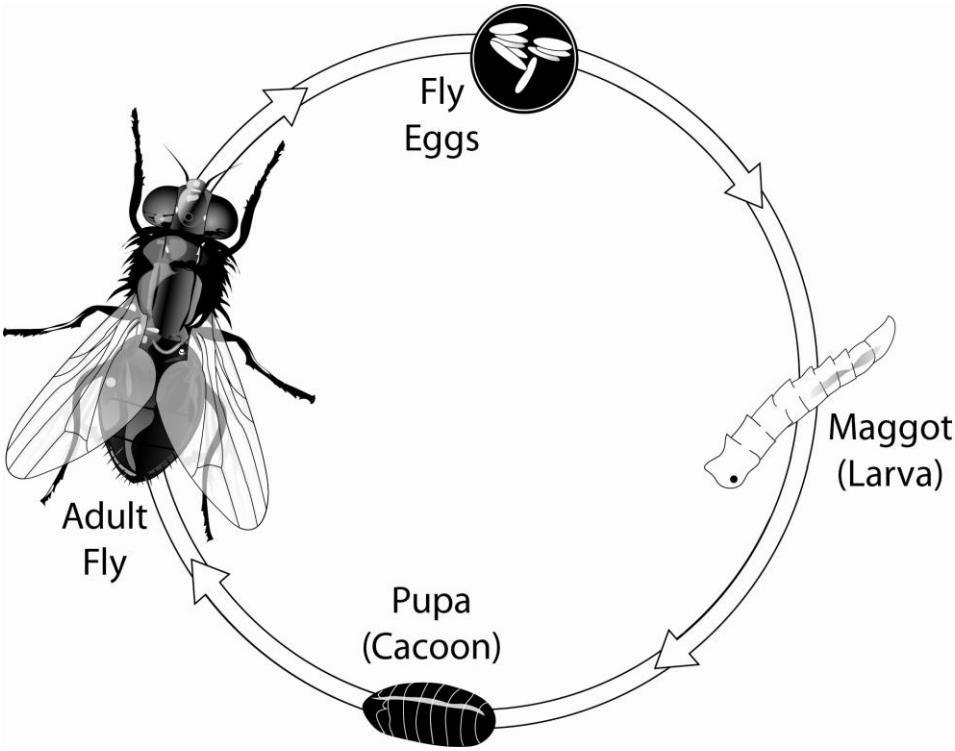
CD-1 Consult with the District on special concerns regarding RIFA and provide access for the District to monitor and treat the site.

CD-2 Working with the District, identify RIFA locations and work to implement the RIFA Reduction Guidelines. Identify potential cost–share opportunities to implement the RIFA Reduction Guidelines.

CD-3 Consult with the District on projects that have the possibility of affecting RIFA populations or control operations.

FLY REDUCTION GUIDELINES

Fly Species:
House Fly: *Musca domestica*
Little House Fly: *Fannia canniculari*s
Blow Flies: *Phormia* spp., *Calliphora* spp., *Phaenicia* spp.
Black Garbage Fly: *Ophyra* spp.
Stable Fly: *Stomoxys calcitrans*
False Stable Fly: *Muscina stabulans*
Flesh Fly: *Sarcophagidae* spp.
Oriental Latrine Fly, *Chrysomyia megacephala*



Fly Biology

Flies undergo complete metamorphosis that includes development from an egg, larva, pupa, and adult. Larval stages of flies are uniquely adapted to living in various sources. Some flies do not lay eggs but deposit live larvae directly to the food source. Eggs deposited by egg laying species usually hatch in one to two days and subsequently grow and molt depending on the existing environmental conditions like temperature, nutrient availability, and competition from other species. The larval development stage usually includes five instars. The final instar eventually ceases feeding and seeks a sheltered area near the source for pupation. When the adult is fully

developed, it emerges from the puparium and crawls to a site to expand its wings and cure the cuticle. The fly then mates and begins laying eggs. Fly populations can reach large numbers quickly, depending on the previously listed environmental conditions. Different species of adult flies are able to fly varying distances from the original source. Often flies are seen resting on southern facing surfaces to warm themselves in the morning. They rest at night in sheltered areas like bushes, trees, and eaves of buildings.

Special Concerns

Flies and fly larva feed on a wide range of food sources including blood, flesh, carrion, fecal material, organic waste products, and decomposing vegetable matter to include composting materials. Because flies feed on these foods, they have the ability to mechanically transmit pathogens and vector-borne diseases to humans. Flies found inside of food establishments are a violation of the California Retail Food Code and can be reported to the Orange County Health Care Agency. Flies have an amazing reproductive capacity that allows them to produce tremendous populations when optimal environmental conditions are present. In situations where flies are breeding prolifically, their populations can reach such high numbers as to become nuisance pests at parks, schools, and in residential neighborhoods. Some fly species are attracted to methane gas and may congregate in an area with a natural gas leak.

Guidelines for the Prevention of Fly Problems

1) Remove or eliminate fly breeding sources.
2) Exclude flies from structures.

Eliminate Fly Breeding Sources

F-1 Place garbage in plastic bags inside of trash receptacles. Keep trash receptacle lids closed.

F-2 Dispose of trash every seven days.

F-3 Pick up pet droppings and place in a sealed plastic bag at least once every seven days. Dog droppings should be picked up daily, while pet birds kept in outdoor aviaries should be cleaned weekly. Cat litter boxes should be changed weekly.

F-4 Do not leave pet food outside, as it can attract flies and serve as a larval fly source.

F-5 Quickly dispose of small animal carcasses such as rats, opossums, and birds by placing them in a plastic bag in the trash. An alternative may be to bury the carcass if space is available and

allowed by local ordinance. Contact the local animal care agency for information on disposing of large animal or pet carcasses.

F-6 Dispose of fruits and vegetables that drop from gardens and trees at least once per week by placing them in a plastic bag in the trash.

F-7 Remove animal manure from property every three days, according to local ordinances.

F-8 Compost decaying vegetable matter in a way that minimizes fly breeding, such as deep burial, tilling, or rapid drying of fruit and vegetable culls.

F-9 Contact the District for an inspection if flies are found on a property.

Exclusion

F-10 Keep the lids on garbage containers closed. Check to make sure there are no openings for fly entry.

F-11 Screen all windows and doors.

F- 12 Keep things that attract flies, such as pet food, bright colors, and attractive scents, away from unscreened doorways.

REFERENCE MATERIAL

Best Management Practices for Mosquito Control in California Recommendations of the California Department of Public Health and the Mosquito and Vector Control District of California. 2010. California Department of Public Health.

Best Management Practices for Mosquito Control on California State Properties. 2008. California Department of Public Health.

Dever, T., Hagele, C. A., Mellor, K. S., and Middleton, K. Are you raising a killer in your cemetery? 2007. American Cemetery, April 2007.

Kwasny, D. C., Wolder, M., and Isola, C. R. *Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands,* Central Valley Joint Venture. 2004. U.S. Bureau of Reclamation.

Lawler, S. P. *UC IPM Pest Management Guidelines: Rice*. 2005. UC ANR, Publication #8117.

Lawler, S. P. and Lanzaro, G.C. *Managing Mosquitoes on the Farm*. 2005. UC ANR, Publication #8158.

Metzger, M. E. *Managing Mosquitoes in Stormwater Treatment Devices.* 2004. UC ANR Publication #8125.

Meyer, R. P., and Madon, M. B. Arthropods of Public Health Significance in California. 2002. MVCAC Publication.

Mosquito Reduction Best Management Practices. 2008. Sacramento-Yolo Vector Control District.

Salmon, T. P., Marsh, S. P., and Timm, R. M. *Pest Notes: Rats*. 2003. UC ANR Publication #74106

Walton, W. E. *Managing Mosquitoes in Surface Flow Constructed Treatment Wetlands*. 2003. UC ANR Publication #8117.