HOW TO

Help Your Community Create an Effective Mosquito Management Plan

A Xerces Society Guide

Simple signs placed in a community can go a long way toward informing local residents of the steps they can take to protect themselves from mosquitoes. Personal protective measures are a key part of effective mosquito management. (Photograph: iStockphoto/sebastianiov.)

Acknowledgements

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Introduction

Insecticides are the default method for mosquito control across millions of acres of wetlands in the United States, with millions of pounds of pesticides applied each year. Their use is often reactive, ineffective, and harmful to water quality and wildlife. Mosquito control uses products that kill the adult (adulticides) or immature (larvicides and pupacides) form of the insect. The most commonly used adulticides are organophosphates and pyrethroids, which have broad-spectrum toxicity and severely impact nontarget invertebrates, fish, amphibians, and birds. These adulticides have been implicated in declines in wetland-associated and terrestrial wildlife, including endangered species that live near treated areas. Even less-toxic products used to control immature mosquitoes can have a negative impact on the wetland community by disrupting local food webs when they are applied repeatedly.

Protecting our remaining wetlands is critical. Nearly half of U.S. states have lost over 50% of their wetlands, and several have lost more than 80%. It is increasingly important to develop wetland management techniques that sustain the integrity and biodiversity of these vulnerable ecosystems while simultaneously providing effective management of an insect with serious public health and nuisance impacts.

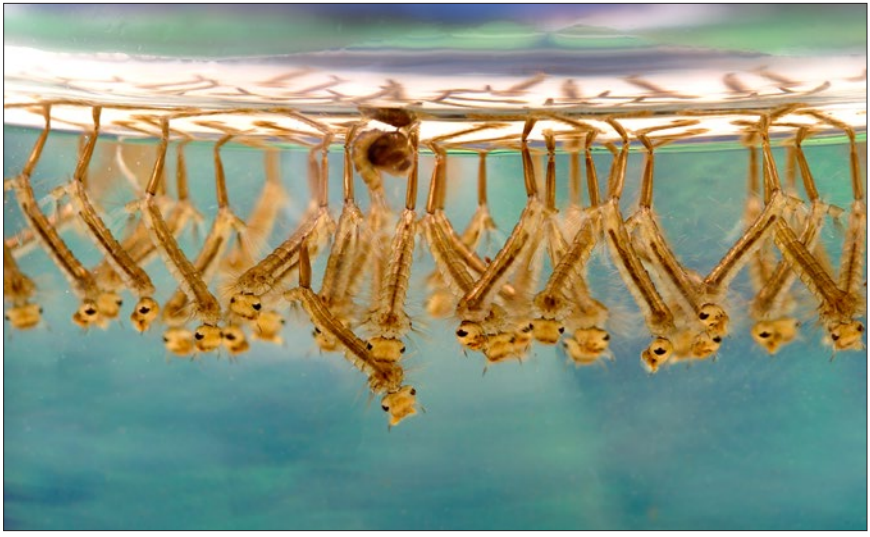
What You'll Learn From This Guide

This guide is designed to help people learn about safe and effective mosquito management. It outlines ways to advocate for management that protects people and wildlife from both the risks posed by mosquitoes and the pesticides used to control them. The guide describes the basic components of an ecologically sound mosquito management plan, and helps you find out how your community is managing mosquitoes and how to work toward more effective and sustainable practices. Detailed information on managing mosquitoes can be found in the Xerces Society's detailed report, *Ecologically Sound Mosquito Management in Wetlands. An Overview of Mosquito Control Practices, the Risks, Benefits, and Nontarget Impacts, and Recommendations on Effective Practices that Control Mosquitoes, Reduce Pesticide Use, and Protect Wetlands*. This can be downloaded from http://www.xerces.org/wp-content/uploads/2013/02/MosMan_Mar13_XercesSociety.pdf.

Understanding Mosquitoes

Knowing the mosquito species present in your area and understanding their breeding, dispersal, and disease-transmitting habits is an essential first step in assessing the risk of mosquito-borne disease and creating an effective and sustainable management plan. Sadly, municipalities and land managers often respond to complaints about mosquito bites with repeated, widespread applications of broad-spectrum pesticides that do little to control the real source of the mosquito problem. These pesticides, designed to kill a wide range of insects, also have negative impacts on people, as well as non-target organisms such as bees, butterflies, and other wildlife. Pesticides may be one component of a mosquito management plan, but pesticide use alone is reactionary, ineffective, and harmful to the environment, water quality, and wildlife.

Fortunately, there are many examples of how mosquito populations can be managed effectively using a multi-pronged approach called Integrated Pest Management (IPM), also known as Integrated Mosquito Management or Integrated Vector Management. For more information on IPM for mosquitoes, go to www.xerces.org/pesticides.



Larvae of many species of mosquito, including those in the genus *Culex*, use a siphon tube to breathe at the surface of the water. (Photograph: Wikimedia Commons; James Gathany, CDC.)

Elements of an Effective and Ecologically Sound Mosquito Management Plan

Mosquito IPM plans combine cultural, physical, and least-toxic biological and chemical control strategies. Control measures are enacted only after regular surveillance determines that mosquito numbers have risen to a point where public health is likely to be compromised. Natural systems are preserved as undisturbed as possible to protect biodiversity and to sustain populations of natural enemies that help control mosquitoes. Eradication of mosquitoes is not the goal of IPM as it is not possible, desirable, or necessary.

When a community implements a mosquito IPM approach, management plans are in place before mosquito eggs hatch. Potential breeding sites are monitored regularly to know if and when mosquitoes are present, and to determine abundance and species; this also reveals if any disease-vectoring species are in the area. Action may be taken to eliminate or minimize areas where mosquitoes breed. Public education will be ongoing, and will address the risk of disease, nuisance biting, how to reduce exposure to mosquitoes, and how to remove mosquito breeding sites in and around the home. If pesticides are part of the control program, their use will be site-specific, targeted, and timely, using the least-toxic materials possible. Each of these IPM components is described in detail in the following pages.

1 Monitoring

Monitoring consists of documenting and tracking mosquito populations by collecting, counting, and identifying mosquito larvae and adults in an area. It allows the community to

- Find the microhabitats (i.e., “hotspots”) where mosquitoes are breeding.
- Identify which mosquito species are present.
- Determine if vector mosquitoes and disease organisms are present (see below).
- Determine when, and if, mosquito levels are high enough to warrant intervention.
- Decide if pesticide use is needed.
- Establish when and where to treat.
- Track mosquito numbers to understand seasonal changes.
- Investigate local communities of natural enemies that prey on mosquitoes.
- Evaluate the efficacy of management techniques.

It is also possible to create maps that combine this monitoring data with related factors such as rainfall, temperature, topography, vegetation, and hydrology. Such maps help in prioritizing control efforts, understanding long-term trends in mosquito populations, and evaluating the success of management practices.

2 Disease Surveillance

Public health agencies play an ongoing role in surveillance of mosquito-borne diseases. Where vector species are present, public health departments and/or partner vector control agencies or academic entomology departments collect and

analyze adult female mosquitoes to determine whether they are carrying any disease pathogens. Blood samples from sentinel birds and livestock are also analyzed to assess the presence of disease in a community. Hospital and veterinarian admissions are monitored, and patients presenting with symptoms suggestive of a mosquito-borne disease are examined more closely. In this way, the risk of mosquito-borne diseases can be determined, and the presence of a disease-causing agent in a community is detected before vector abundance and infection rates have risen to levels where an outbreak occurs.

CDC RECOMMENDATIONS FOR MOSQUITO MANAGEMENT

The Centers for Disease Control and Prevention (CDC) stress the importance and efficacy of sanitation and site management to reduce mosquito larval abundance, and recommend effective public education about residential source reduction and personal protective measures. The CDC state that "although IPM may include the use of pesticides, the primary components of IPM clearly separate it from typical pest control practices that rely exclusively on trapping and poisoning."

3 Source Reduction

When places with significant numbers of breeding mosquitoes have been identified, efforts can be made to eliminate, modify, or better manage those spots, a process known as source reduction. Source reduction efforts differ according to the community you live in and the types of mosquitoes and habitats found there. For example, many *Culex* mosquitoes breed in containers of stagnant water, and significant source reduction is accomplished when homeowners clean out neglected wading pools, bird baths, dog bowls, gutters, and plant pots.

Source reduction efforts may include:

- Public education campaigns to inform local residents about where mosquitoes breed and how to eliminate these sites around the home and yard. To be effective, such campaigns must target those residents most at risk from mosquito-borne disease, and be made available in multiple languages and formats (see examples on page 7).
- Public sanitation efforts to remove mosquito breeding sites at neglected or abandoned properties.
- Managing the type and density of vegetation in wetlands and stormwater retention basins where mosquitoes are breeding.
- Constructing stormwater retention and detention wetlands according to established guidelines to reduce mosquito production.
- Restoring tidal flow to salt marshes.

Appropriate source reduction activities vary significantly depending on mosquito species and geographic location. Effective community-based mosquito management has been shown to successfully decrease disease incidence. Look online for source reduction options in your area.

Further information can also be found at:

- The Centers for Disease Control and Prevention's Integrated Pest Management webpage: http://www.cdc.gov/nceh/ehs/eLearn/IPM.htm.
- The Association of State and Territorial Health Officials report, *Public Health Confronts the Mosquito: Developing Sustainable State and Local Mosquito Control Programs*, found at: http://www.astho.org/Display/AssetDisplay.aspx?id=2333.

THE KEY TO GOOD MOSQUITO MANAGEMENT IS TO PROMOTE PERSONAL PREVENTIVE MEASURES

The New York State Department of Health's mosquito-borne illness response plan states: "Aerial adulticiding has uncertain and potentially, very limited benefits for preventing illness among humans… Given the limitations of adulticiding, the primary strategy to prevent mosquito-borne illness among humans must continue to be promotion of personal preventive measures."

You can find the 2012 New York State plan at: http://www.health.ny.gov/diseases/west_nile_virus/docs/2012_mosquito_borne_illness_surveillance_and_response_plan.pdf.

4 Public Education

Public education is a critical component of both mosquito management and public health. Informed community members play an active role in removing places where mosquitoes breed around the home and yard, take personal protection measures to avoid being bitten, and understand the risk of mosquito-borne disease in their community. Knowing the facts and the "big picture" of mosquito management plans can also increase community buy-in and cooperation.

The CDC has been at the forefront of designing public education materials in multiple languages and formats. The CDC recommends that people take responsibility for their own protection by:

- using mosquito repellant,
- dressing in long sleeves and pants,
- draining standing water sources around the home, and
- avoiding outside activities at dusk and dawn, when many mosquito species feed.

Any entity that manages mosquitoes in your community should be able to answer questions about its control activities. Plans that include pesticide use should have transparent information about:

- why pesticides are required (for example, when a stated threshold number of female mosquitoes have tested positive for the presence of virus),
- which specific pesticide products are proposed and why they were selected,

- the method and timing of application, and
- potential public health and environmental risks associated with the proposed products.

You can learn more about commonly used mosquito pesticides by reading *Ecologically Sound Mosquito Management in Wetlands*, which can be downloaded at www.xerces.org/pesticides.

Additionally, mosquito management plans that include pesticides should offer

- notification for residents and businesses at least one week prior to any pesticide application,
- information about how people can minimize pesticide exposure, and
- an option for people to "opt out" of the spray program, although some communities choose to suspend such options if the local government considers the health risk from mosquito-borne disease too grave.

Opt-out plans allow people to submit their own management plans in lieu of the local or state plan. For example, you can learn more about Idaho's opt-out law, and see sample opt-out language for organic farmers, city residents, and small landowners at: http://www.pesticide.org/Alternatives/home-and-garden-toolbox/pest-solutions/mosquito-spray-opt-out-program-of-idaho.

CASE STUDY: FORT COLLINS, COLORADO

Personal Protective Measures Reduce Incidence of West Nile Virus Infection

A 2003 outbreak of West Nile virus in Colorado led to a study on the efficacy of using personal protective measures to prevent infection. A survey of residents' use of personal protection (e.g. applying repellant, wearing long pants and sleeves, avoiding outdoor activities when mosquitoes are most active) in the adjacent towns of Loveland and Fort Collins, Colorado found that Fort Collins residents were much more likely than those in Loveland to implement personal protective measures. Interestingly, even though Fort Collins had a greater abundance of both mosquitoes and West Nile-positive mosquitoes than Loveland did, Loveland's incidence of severe disease was over twice as high as Fort Collins'.

Though the reasons Fort Collins residents took more preventative actions than those in Loveland are not known, researchers have suggested that a longer history of pesticide-based mosquito control in Loveland resulted in residents becoming more complacent about mosquito issues and feeling less urgency to take individual action. The lower rate of severe disease in the city that had a greater abundance of infected mosquitoes makes a strong argument for the benefits of personal protection. You can read the full study at http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2725886/.

To learn more about the Fort Collins mosquito management program, go to: http://comosquitocontrol.com/FtCollins.html.

An example of multi-lingual posters (in English, Korean, Spanish) from Multnomah County Vector Control in Oregon.

5 Natural Enemies

The benefits of sustaining wildlife that prey on mosquitoes have been well-demonstrated. Natural enemies of mosquitoes include dragonflies, aquatic bugs, aquatic beetles, crustaceans, amphibians, fish, bats, and birds. All of these animals feed on a variety of prey, but their feeding activities can have a significant impact on mosquito populations, such that many wetlands may consistently produce few to no mosquitoes. In some cases, treating a wetland with pesticides may make the mosquito problem worse, as natural enemies are also killed.

Protecting and sustaining diverse communities of wetland wildlife can provide effective natural control of mosquitoes or greatly limit the need for treatment. Some natural enemies, such as the tiny but voracious crustaceans called copepods, have been used successfully in the targeted control of container-breeding mosquitoes.

Many of these predators are just as mobile as the mosquitoes they hunt, and colonize both natural and artificial habitats where mosquitoes are found. For example, the predatory backswimmer bug is quick to find livestock water troughs where mosquitoes are breeding, providing effective control.

AUGMENTING ARTIFICIAL WATER SOURCES WITH NATURAL ENEMIES

There have been both positive and negative results from augmenting artificial water sources with natural enemies. The use of small but insatiable crustaceans called copepods has been successful in the targeted control of container-breeding mosquitoes. Research in New Orleans showed significant benefit to including copepods in control efforts in artificial containers such as old tires. The success in New Orleans also prompted the state of New Jersey to explore the use of native copepods in containers to control mosquito larvae of *Culex pipiens*, a major vector of West Nile virus.

Caution must be exercised when using nonnative organisms in mosquito control. Nonnative predators have been used frequently by homeowners and vector control agencies, but these species can cause more harm than good. *Gambusia*, commonly known as the mosquito fish, is easy to rear and has a large appetite, and has been used for decades in mosquito control programs. Unfortunately, this practice has allowed *Gambusia* to invade many waterways, where they displace native fish and decrease populations of native frogs. In some cases, use of *Gambusia* has worsened the mosquito problem, because these ravenous and non-selective fish consume all the other mosquito predators in the habitat. With native predators available, including native fish, mosquito management authorities should not resort to the use of nonnative predators. For more information about natural predators, see pages 30–36 of the report *Ecologically Sound Mosquito Management in Wetlands*.

Natural enemies can reduce or eliminate the need for pesticide treatments. It is important to select the correct pesticide to use in conjunction with natural enemies, as some pesticides also harm predators. See Table 1 on pages 11–12 of *Ecologically Sound Mosquito Management in Wetlands* for more about pesticides and their impacts on nontarget organisms, including natural enemies.

CASE STUDY: NEW ORLEANS, LOUISIANA

Using Native Copepod Predators of Mosquito Larvae as a New Mosquito Management Practice

Small artificial containers can breed large numbers of mosquitoes, and old tire dumps are among the biggest offenders. Because accessing and treating tire dumps can be difficult and costly, the New Orleans Mosquito Control Board began using tiny native freshwater crustaceans called copepods to control mosquito larvae in old discarded tires where rainwater collected. The effort was so successful that the New Jersey State Mosquito Control Commission also began experimenting with the use of native copepods to control mosquitoes in waste tires. Adding a natural enemy to the system allowed less pesticide to be used, which also represented a saving for the city, as tire piles are a persistent problem for mosquito production. Copepods may provide all the mosquito control needed, but they can also be combined successfully with less-toxic larvicides such as Bti to increase mosquito control—in some instances superior control to that seen with either copepods or Bti alone—while reducing the amount of costly pesticide needed.

New Jersey is currently working with New York to further expand the use of copepods.

You can read more about ongoing efforts in New Jersey to control mosquitoes using copepods at: http://www.nj.gov/dep/newsrel/2012/12_0072.htm.

Copepods, like this *Macrocyclops albidus*, were successfully used in New Orleans as a natural way to control mosquitoes breeding in waste tires. (Photograph: Wikimedia Commons; Dr. Ralf Wagner.)

6 Common Pesticides Used in Mosquito Management Efforts

Mosquito populations may increase to a level where economic or public harm is done, such as when severe nuisance biting of livestock lowers their condition or weight, or when a disease outbreak occurs. If this does occur, the IPM techniques described above are still effective—in fact, several municipalities have successfully managed mosquitoes without resorting to pesticides, even in the face of West Nile virus—but the decision may be made to apply pesticide nevertheless. In such cases, the pesticide selected should be the least toxic available and should be applied in a

targeted manner that will have the greatest impact on the mosquitoes and the smallest on nontarget organisms and the environment.

Larvicides and pupacides control immature mosquitoes in their aquatic habitats before they become biting adults. Applications of larvicides and pupacides generally cause less human and wildlife exposure in comparison to adulticides because they can be applied in a more targeted way in waters where larvae and/or pupae are present. However, many larvicides and pupacides can have a substantial impact on other members of the aquatic community, including aquatic bugs and beetles that prey on mosquito larvae.

Adulticides are generally applied from the ground or air as a spray of ultra-fine droplets that must either contact the mosquito directly to cause death or create a "barrier" on treated foliage that will kill mosquitoes when they land. Some communities use adulticides to decrease a breeding population, or when a disease outbreak has occurred. In the midst of a localized epidemic, such as when the incidence of infection with West Nile virus is high among mosquito and human populations, adulticiding has an immediate "knock-down" effect of short-term reduction in the number of potentially infective female mosquitoes. However, adulticiding in the absence of other management methods is ineffective because new populations of adults can emerge and disperse each day from a distant breeding site, creating a cycle of repeated spraying. The CDC strongly recommends an integrated approach for managing mosquitoes in which chemical use is only one option, stating that IPM "implies that all of the tools available for managing mosquito populations should be considered for use as needed to maintain vector populations at low levels."

The CDC's guidelines for IPM can be found at http://www.cdc.gov/nceh/ehs/eLearn/IPM.htm. The CDC's 2013 guidelines for management of West Nile virus also contain important information regarding the value of IPM. These can be downloaded at http://www.cdc.gov/westnile/resources/pdfs/wnvGuidelines.pdf.

Decades of widespread appliation of pesticides, insect growth regulators, surface oils, and bacterial toxins have had extensive impacts on wetlands and the animal communities that rely on them. (Photograph: istockphoto/isgoodmyfrnds.)

WETLANDS

Wetlands are transition zones between water and land; they may be seasonal or permanent, and include a variety of habitats such as lakes, ponds, marshes, bogs, swamps, and fens. They provide important ecological functions of flood control, water storage, water purification, and are critical habitat for a variety of wildlife. Almost half of federally listed endangered animals rely on wetlands for their survival, including over 50% of North America's protected migratory bird species. Wetlands are also economically important. Many commercially harvested fish and shellfish rely on wetlands and estuaries for food and shelter, and wetlands generate substantial tourism revenue through recreational opportunities like canoeing, bird watching, wildlife viewing, fishing, hiking, hunting, and photography.

Temporary or seasonal wetlands, such as these vernal pools in California, are often home to unusual invertebrate species. Millions of people in the United States live close to wetlands. The management of these areas affects not only neighbors but also the myriad wildlife living in and around them. (Photograph: Matthew Shepherd, The Xerces Society).

Wetlands are among the most threatened freshwater habitats, and more than half of the 200 million acres of wetlands that existed in the United States prior to European settlement have already been lost. In the past, wetlands were often viewed as unhealthy places filled with mosquitoes and disease, fit only to be drained or filled. In reality, while wetlands can be home to mosquitoes, many wetlands produce few to no mosquitoes, and a healthy wetland can sustain a rich community of wildlife that includes a diversity of natural enemies that prey on larval and adult mosquitoes and help keep mosquito numbers in check. Unfortunately, negative perceptions of wetlands can lead a poorly informed public to blame mosquito problems on a nearby lake or marsh, when in fact abundant numbers of mosquitoes may be breeding in their own backyards.

Who Manages Mosquitoes in Your Area?

Finding out which agency is responsible for mosquito management in your area may be a challenge, as the establishment, organization, implementation, and funding of mosquito control agencies differ from state to state and even county to county. Most mosquito control occurs locally through entities created at the city or county level. Many states have statutes that allow establishment of voter-approved mosquito abatement districts, which may operate across cities or counties. Funding sources are equally varied and can include support from the state, special voter-approved taxation districts, county or city general funds, surcharges on utility bills, local sales taxes, or private grants. Depending on funding and perceived need, abatement districts may operate continuously or only during periods when public health concerns and/or mosquito-transmitted disease incidences are high. Decisions about local mosquito control may be made by city council members and county commissioners, who often consult further with public health officials and entomologists.

To find out who makes decisions about mosquito control in your area, contact your county or city public health department. The National Pesticide Information Center has assembled a list of vector control agencies that can be searched by state at http://npic.orst.edu/pest/vector_agencies.html#map. The American Mosquito Control Association has a compilation of links to mosquito control districts and associations in various states at http://www.mosquito.org/links. You can also search the internet using the name of your state and "mosquito control district."

Be aware that if you live near state or federal lands, these sites may fall under different mandates for mosquito management established by the state fish and wildlife agency, the department of environmental quality, or by a federal agency like the U.S. Forest Service or the U.S. Fish and Wildlife Service. Guidelines for sensitive sites such as federal wildlife refuges include not treating native mosquito populations—even if nuisance biting species are present—unless there is a public health emergency. Other land managers of sites without explicit guidelines may be pressured to spray for nuisance biters, especially if they think the mosquitoes will dissuade the public from visiting a site for recreational purposes.

Once you know who is responsible for mosquito management in your area, you can investigate the details of existing or developing plans and help advocate for an effective and ecologically sound mosquito management program. Best Management Practices (BMPs) for mosquito control based in IPM are often published at the state level by health departments or mosquito control boards. These BMPs can provide additional information about developing and implementing IPM-based mosquito management plans. Regional mosquito control districts are encouraged to adopt these BMPs but actual local practices may vary widely and are affected by differences in funding, staffing, and training, as well as entomological and biological expertise. Links to examples of state-level mosquito BMPs are given on page 14. To find out if your own state has a mosquito BMP, contact your public health department or search online.

Public health takes precedence where mosquito control is concerned, but it is important to note that several cities across the country have eliminated or severely curtailed the use of adulticides in mosquito management, even in the face of mosquito-borne disease. These decisions were based on the risks to people and the environment, as well as lack of evidence that adulticide use reduces disease prevalence. These cities emphasize monitoring, source reduction, and public education as alternatives to scheduled pesticide applications.

Local governments that have curtailed adulticide use include Boulder, Colorado; Lynhurst and Shaker Heights, Ohio; Fort Worth, Texas; and the District of Columbia. A community-based mosquito management program founded in public education, community involvement, accurate data on mosquito populations and species, and scientifically based information on the best controls can achieve effective mosquito and disease control without the need to abandon IPM practices and engage in widespread spraying.

A century ago, salt marshes like these in Cape May, New Jersey, were being ditched and drained. Now mosquito management focuses on restoring daily tidal flows. (Photograph: Celeste Mazzacano, The Xerces Society).

EXAMPLES OF STATE-LEVEL BEST MANAGEMENT PRACTICES

CALIFORNIA

Best Management Practices for Mosquito Control in California
http://www.cdph.ca.gov/HealthInfo/discond/Documents/BMPforMosquitoControl07-12.pdf

MASSACHUSETTS

Best Management Practices and Guidance for Freshwater Mosquito Control
http://www.mass.gov/eea/docs/agr/mosquitos/docs/mepa/document-2-freshwater-bmp-to-me-pa-oct-24-2008.pdf

NEW JERSEY

Best Management Practices for Mosquito Control and Freshwater Wetlands Management
http://www.nj.gov/dep/mosquito/docs/bmp_complete.pdf

WASHINGTON

Best Management Practices for Mosquito Control
https://fortress.wa.gov/ecy/publications/publications/0310023.pdf

Ways to Get Involved

If your community already has a mosquito IPM plan, you can help strengthen it by assisting in public education efforts. These may include any of the following:

- Distributing community education materials: If your community does not have materials you can use those designed by the CDC or your state. One example is the brochure "West Nile virus is a risk you can do something about," produced by the CDC and available in English and Spanish.
    - http://www.cdc.gov/westnile/resources/pdfs/HealthEducation/WestNilevirusisariskyoucandosomethingabout_508.pdf
    - http://www.cdc.gov/westnile/resources/pdfs/HealthEducation/VirusdelNiloOccidentalProtejasecontralaspicaduras508.pdf
- Encouraging your neighbors to get involved in prevention efforts: Find out if there are neighborhood associations where you live and attend a meeting to speak and distribute information.
- Organizing a work party: help recycle old tires, clean gutters, repair or replace window screens, and overturn containers that could hold water.
- Get the word out: use local newspapers, radio and television stations, and social networking websites. These often have calendars to announce community events, and you may be able to air public service announcements as well. Be sure to investigate local newspapers and radio stations that serve neighborhood populations for whom English is not their first language.

If you are concerned that your community is not using sustainable methods to control mosquitoes, you may need to be more vocal.

- Make a public comment at a City Council or County Commissioner meeting. See the breakout section on the next page for more details.
- Write a letter to the editor of your local paper to raise awareness of the issue (see page 17 for tips).
- Involve state or federal elected officials that represent your local area. The message to these public representatives will be similar to the message you'd send to local politicians. Send them a copy of your public testimony with a cover letter.
- Don't give up. You have the right to be involved in the decisions that affect you, your family, your community, and the environment.

Messages and Tips to Provide Testimony to Local Governing Bodies

ADVANCE PREPARATION PRIOR TO THE MEETING

- Prepare a written statement. If possible, link to a personal story. Keep it positive by explaining what you support. Include links to resources for people to learn more.
- Find out the length of time allotted for individual public statements.
- Prepare a 1–3-minute presentation based on your written statement. Practice out loud and time yourself to be sure you won't run over your allotted time.

AT THE MEETING

- Arrive early and sign up to testify.
- Bring enough copies of your written testimony for each committee member as well as a few extra to distribute. Keep a copy for yourself.
- When it is your turn to speak, introduce yourself and thank the committee for considering your input.
- Be prepared to answer questions. If you don't know the answer, tell them you will follow up and find answers for them. It is better to say "I don't know" than to guess.
- Follow up quickly with any further information and, if possible, contact them a week later with a phone call or e-mail to learn if any decisions have been made.

POSSIBLE MESSAGES TO INCLUDE IN TESTIMONY

- Urge the use of Integrated Pest Management (IPM) practices to manage mosquitoes, and describe some examples that could work in your community.
- Tell them why the issue is important to you. Is it concern for the health of your family? A desire to protect a sensitive wetland or an organic garden? Interest in having effective controls in place?
- Provide background:
    - IPM is a multi-pronged, effective way to manage mosquitoes.
    - IPM is supported by the Centers for Disease Control and Prevention, and implemented by many local vector control entities across the country.
    - IPM includes monitoring larval and adult mosquitoes; source reduction to help eliminate mosquito breeding grounds; public education; and, when needed, targeted use of insecticides.
    - Source reduction, public education and the use of larvicides when necessary are often enough to manage mosquitoes. The use of adulticides can complement these core elements of management, but when used in isolation adulticides are neither sustainable nor the most effective management.

HOW TO WRITE AN EFFECTIVE LETTER TO THE EDITOR

- If possible, write in response to a recently published article. Start your letter by referencing the article's title and publication date.
- Respond within 3–5 days of the article being published.
- Keep it short—150 words is an ideal length.
- Keep to a single message, e.g., "as a community, we can deal with these annoying but not harmful mosquitoes in a safe and effective manner."
- Provide facts. The CDC does not recommend pesticide-only methods.
- Mention the decision-makers you are trying to influence by name. Is vector control determined by the County Commissioners? If so, ask them specifically to make the change you are asking for.
- Provide a call to action, such as: "The County Commissioners will be discussing this issue at their next meeting. Please write a letter urging the commissioners to institute a plan that does not involve aerial pesticide applications."
- Stay away from acronyms and jargon.
- Assume your letter is the readers' introduction to the issue and that they have little prior knowledge.
- Learn the requirements your paper has for letters. Usually there is a word limit, and you must provide your name and contact information. The paper may also give you tips to help get your letter printed.
- Read other letters in your local paper to see what it publishes and to get ideas for what you think is effective.

The Xerces Society

for invertebrate conservation

Protecting the life that sustains us

The Xerces Society for Invertebrate Conservation is a nonprofit organization that protects wildlife through the conservation of invertebrates and their habitat. Established in 1971, the Society is at the forefront of invertebrate protection, harnessing the knowledge of scientists and the enthusiasm of citizens to implement conservation programs worldwide. The Society uses advocacy, education, and applied research to promote invertebrate conservation.

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