

Effectively Communicating About Mosquito Control: A Guide for Mosquito Control Partners | SECOND EDITION

Introduction

Diseases spread by mosquitoes impact human health, animal health, tourism, outdoor recreation and fitness activities, and even natural disaster recovery efforts. Many at-risk communities, however, do not have adequate protective programs in place today and building support for appropriate and scalable programs is not an easy task.

The Association of State and Territorial Health Officials (ASTHO) and the Centers for Disease Control and Prevention (CDC) developed this guide to help states and communities across the nation explore and expand their mosquito control capacity. Based on research and expert communications guidance, this guide is intended to further on-the-ground mosquito control efforts and provide tools that mosquito control partners can use to educate others about the need for adequate mosquito protection. ASTHO sought the expertise of policymakers and community decisionmakers to create the [first edition](#) of this guide, published in 2009.

Mosquito-spread diseases impact human health, animal health, tourism, outdoor recreation and fitness activities, and even natural disaster recovery efforts. When communities do not have adequate protective programs, people, businesses, governments, and pets are all at risk.

For this updated second edition, ASTHO also consulted with and relied heavily on the expertise of the ASTHO Vector Control Workgroup, comprised of vector experts across state and territorial health agencies.

This guide features two risk communication tools. The first tool uses a question and answer (Q&A) format to meet the immediate and varied demands for information associated with emerging disease threats, such as Zika virus. The second tool uses a factsheet format for conveying information on a wide range of adverse impacts caused by mosquitoes.

The guide also includes advice on identifying opportunities for promoting messages about related environmental health issues, using simple terms and social math to describe complex issues, and innovative ways to finance mosquito control activities. When reviewing this guide, consider how you might use these tools in your community to both convey information and to bolster support for a community-based mosquito control program.

Mosquito Programs Vary Based on the Community They Serve

Varying geography, movement patterns of mosquitoes, local climates, and differing incidence rates for West Nile virus (WNV) and other human health effects are all factors that show why mosquito control programs need to match the local risk of infection. Communities also vary in how local economies can be affected by either infectious or nuisance mosquitoes. Some communities depend heavily on tourism, outdoor recreation, and the livestock industry.

Other communities can be severely impacted by the healthcare costs of mosquito-spread diseases, whether from regular outbreaks or from outbreaks following natural disasters. The factors that determine risk of infection and threats to local economies illustrate the local nature of mosquito control programs.

Communities need to develop a mosquito control program that is responsive to local threats and scalable should the situation change.

Involve Multiple Stakeholders

These community characteristics also determine if citizens, community groups, churches, schools, businesses, and policymakers can be mobilized to action. As you develop your program, it is critical to involve multiple stakeholders in your efforts. It is also important to develop close relationships with nontraditional partners, examples of which you will find listed on the **Impact Factsheets** in the appendix, starting on page 11. Lastly, those jurisdictions who have sustainable mosquito control programs strongly advise others to develop relationships with environmental advocacy groups to address concerns about environmental hazards early on. A more detailed document, [Public Health Confronts the Mosquito](#), provides excellent guidance on how to involve others in your effort.

ASTHO's work recommends that communities need to develop a mosquito control program that is responsive to local threats and scalable should the situation change. State and local vector control officials can use a three-tier scalable system to determine the types of resources needed for such a program. These levels are based on the first edition of [Public Health Confronts the Mosquito](#) and are explained in more detail on each Impact Factsheet. ASTHO encourages at-risk communities to start by developing a Tier One program for mosquito monitoring and prevention. Scaling up to Tier Two and Tier Three can then be applied should the data from Tier One indicate need for change.

Using a Question and Answer Tool

When Zika virus initially emerged, state and territorial health officials (S/THOs) were expected to provide credible, timely information to members of the public, healthcare providers, and public health partners involved in responding to this threat. To assist them with this communication challenge, ASTHO worked with risk communication and public health experts to produce [Top Questions on Zika: Simple Answers](#).

Several aspects of these Q&A's made them particularly effective and useful to S/THOs, including:

- Easy to understand responses written at the sixth- to eighth-grade level.
- Accurate information reviewed by public health and risk communication experts.
- Responses that reflect the needs of diverse audiences.
 - Each question receives an answer in both a short and longer format. Short format answers suit the needs for brief sound bites. Longer format answers provide the detail needed by policymakers.
 - Public acceptance of information is enhanced by making messaging caring and compassionate.
- Answers do not overstate certainty. By acknowledging unknowns, information can be edited and updated without a loss of credibility.

One example of the Zika Q&A is provided below:

Can pets and livestock be infected with Zika virus?

Short answer:

1. It is possible for pets and livestock to be exposed to Zika, but the risk of infection is very low.
2. To date, only non-human primates, such as monkeys and apes, have shown the ability to become infected with Zika.
3. There is no evidence that Zika is spread to people from contact with animals.

Long answer:

1. It is possible for pets and livestock to be exposed to Zika, but the risk of infection is very low.

- Being exposed to the virus is not the same thing as being infected—or becoming ill—as a result of coming into contact with Zika virus.
- There is no evidence to date that pets and livestock can get sick from Zika virus exposure.
- To date, there have not been reports of pets or livestock being infected with Zika virus or having illness as a result of being infected with Zika virus.
- There is limited evidence that horses, cows, goats, ducks, and bats could become infected with Zika, but no evidence that they develop disease or that they could spread Zika virus to humans.

2. To date, only non-human primates, such as monkeys and apes, have shown the ability to become infected with Zika.

- Zika was first discovered in a monkey with a mild fever in the Zika Forest of Uganda in 1947.
- Only a few naturally and experimentally infected monkeys and apes have had any signs of illness from Zika.
- The most common symptom of Zika infection among non-human primates is a short, mild fever without any other symptoms.
- An abnormally small head associated with incomplete brain development (microcephaly) has not been reported among monkeys or apes in areas where Zika is present.

3. There is no evidence that Zika is spread to people from contact with animals.

- Zika virus is transmitted to people primarily through the bite of infected Aedes species of mosquito: Aedes aegypti or Aedes albopictus.
- Aedes mosquitoes generally prefer feeding off humans rather than pets or livestock.
- Pets that spend time outside as well as inside can be bitten by mosquitoes.
- Using insect repellants, flea or tick collars, or topical treatments for dogs and cats can kill mosquitoes.

Using the Impact Factsheets

Community leaders and policymakers are influenced mostly by issues that have multiple stakeholders and implications for their jurisdiction. This suggests that mosquito control advocates must present data on multiple issues that are impacted by mosquitoes. Focusing only on the health impacts will make it harder for a traditionally low priority issue, like mosquitoes, to be valued. Additional impact issues, along with human health impacts, can attract and interest more stakeholders in communities and form a more robust foundation of support.

ASTHO developed Impact Factsheets because leading global health organizations and others [suggest](#) that involving the business community is critical to gaining widespread support for mosquito control programs. Each Impact Factsheet focuses on the economics of an industry threatened by infectious or nuisance mosquitoes. These potential economic impacts may not only immediately and directly impact businesses, but also affect a community as a whole.

Impact Factsheets can be used to introduce your local business community, community leaders, and policymakers to the mosquito control issue. You may wish to customize the factsheet with data and photographs more consistent for your state or local area.

Impact Factsheets can be used to introduce your local business community, community leaders, and policymakers to mosquito control issues. Impact Factsheets and the accompanying materials created for the first edition cover each of the primary topics of business and community concern:

- Human Health
- Animal Health
- Outdoor Living (local residents)
- Tourism (visitors)
- Natural Disasters

These can be found in the appendix, starting on page 11. Each Impact Factsheet includes 10 specific messages or message components, including:

1. How mosquitoes are linked to an economic issue of interest to a specific locale.
2. The economic impact of the issue, not mosquitoes, on the selected state and the United States.
3. Social math examples to highlight the economic impacts (e.g., comparing costs of WNV to child care insurance coverage).
4. Graphic “Did You Know?” box with related economic impact information.
5. Strong positive visuals of the economic issue—not of mosquitoes.
6. Strong metaphors for describing what monitoring mosquitoes means, e.g., “weather tracking.”
7. Emphasis on the scalable and community-based nature of mosquito control.
8. Use of preferred language, such as “monitoring” versus “surveillance,” or “scalable” versus “comprehensive.”
9. Reminder that the entire community needs to be involved.
10. Series of next steps for community leaders, policymakers, or advocates.

How to Use the Impact Factsheet Backgrounder

Impact Factsheet **Backgrounders** provide the basic information ASTHO collected to develop each Impact Factsheet and are also included in the appendix. If you decide to customize the Impact Factsheets for your community, these Backgrounders are a useful template for collecting the kind of information you will need. For the second edition of this guide, ASTHO researched and compiled information for an Impact Factsheet Backgrounder on Zika virus and health outcomes. State and territorial public health agencies can use this Impact Factsheet Backgrounder as a template for an Impact Factsheet displaying the data for their state. Research for this project strongly indicates that local- or state-level data is more compelling to businesses, policymakers, and community leaders. Vector control and surveillance is primarily a local issue, so customizing your Impact Factsheet with data and photographs more consistent for your state or local area is likely to increase its effectiveness.

There is also additional information in the Backgrounders that may be useful to your local efforts. For example, there is a list in each Backgrounder of suggested partners related to the economic issue at hand. This list of “unusual partners” is designed to provide you with ideas for where to find additional support in your state. ASTHO also provided website links to important source documents.

Zika Virus

Impact Factsheet *Backgrounder* Template

Economic Impact Focus	Human health and the associated healthcare costs.
Focus for Factsheet	Of primary concern are those areas which have experienced locally-acquired cases of Zika virus disease: the states of Florida and Texas, the territories of the U.S. Virgin Islands and Puerto Rico. All states and territories need to be able to respond to cases of travelers from areas affected by Zika virus.
Photo Example	Healthy mothers and infants.
Facts on Zika Virus Impact Areas Impacted by Local Transmission	<p>Between 2015 and 2017, over 42,000 cases of Zika virus disease occurred in the United States and its territories. Reports of new cases peaked during the summer of 2016. Most cases occurred through local transmission of the virus in U.S. territories of the Virgin Islands and Puerto Rico.</p> <p>During this period, U.S. states reported over 5,500 cases of Zika virus disease of which 225 (<5%) were locally acquired. Of these cases, 219 were from Florida and six from Texas, with all but one case occurring in 2016.</p> <p>Health risks from Zika virus disease differ from other mosquito-borne disease. Sexual transmission of the virus is possible and the primary health concern is birth defects associated with the transmission of the virus from a mother to the fetus. Because of the serious nature of these birth defects, which can include microcephaly and vision and hearing loss, CDC established special registries to track Zika virus disease in pregnant women and the health of their babies. As of Oct. 17, 2017, of the 7,749 registered cases of pregnant women with Zika Virus disease, 198 babies were born with birth defects and 16 women experienced pregnancy losses with birth defects.</p>
Facts on Zika Virus Disease Impact Nationwide	<p>The costs associated with caring for babies born to mothers with Zika virus disease are largely unknown. The majority of these babies were born without noticeable birth defects. Registries will track these babies to determine if the Zika virus impacts healthy development. For those infants born in the United States with microcephaly, the cost of treating a single case is estimated to be \$1 to \$10 million or more.</p> <p>Few mosquito control programs across the nation have budgets that approach these costs of microcephaly treatment. The special Congressional appropriation to respond to the Zika threat in 2016 was \$1.1 billion. Note that this investment to prevent the emergence of Zika virus benefits programs that combat other mosquito-borne illnesses including encephalitis, Dengue fever, chikungunya fever, and West Nile Virus.</p> <p>Researchers used models to estimate the economic burden of Zika across</p>

	the six states which are at greatest risk of Zika emergence. At an attack rate of one percent, medical costs and productivity losses would result in an estimated \$1.2 billion impact.
Sources of Information	<p>CDC. “Zika Virus.” Available at: https://www.cdc.gov/zika/index.html</p> <p>ArboNet. “Cumulative Zika Virus Disease Case Counts in the United States, 2015-2017: Provisional Data as of October 18, 2017.” Available at: https://www.cdc.gov/zika/reporting/case-counts.html</p> <p>CDC. “U.S. Zika Pregnancy Registry.” Available at: https://www.cdc.gov/zika/reporting/registry.html</p> <p>Lee BY, Alfaro-Murillo JA, Parpia AS, Asti L, Wedlock PT, Hotez PJ, et al. “The potential economic burden of Zika in the continental United States.” <i>PLoS Negl Trop Dis</i>. 2017. 11(4): e0005531. Available at: https://doi.org/10.1371/journal.pntd.0005531</p>
Suggested Partners	<ul style="list-style-type: none"> • Healthcare organizations • Health insurance organizations • Elementary and secondary schools • Public health schools • Nursing schools and organizations • Birth defect prevention advocates • Foreign travel organizations

Involving Partners

Mosquito control programs need broad support from an informed public. Positive relationships between mosquito control programs and the communities they serve enhances this support. Open communication with the public shows a respect for the community and requires both listening to public concerns as well as informing the public about the risks and impacts of mosquito-borne disease.

Creating a task force or advisory committee is a common method for involving others. For controversial or contentious issues, task forces or advisory committees can provide a forum for advocates and opponents to voice their concerns. Consider participation from other agencies, universities, cooperative extension offices, technical and industrial partners, neighboring jurisdictions, those impacted by mosquito control activities, environmental advocacy groups, and members of the public. CDC’s Vector-Borne Disease Centers for Excellence provide an opportunity for local and state committees to expand to regional partnerships. Public listening sessions, information-sharing open houses, or focus groups are alternatives that can also be helpful for addressing difficult issues.

Regardless of the forum, state and territorial health agencies (S/THAs) can be a source of credible scientific, technical, and medical information to support mosquito control decisions.

Environmental Cross-Promotion Messages

Interviewing public health officials helped identify additional opportunities for promoting mosquito control key messages. Interviewees reported both perceived and real connections between various environmental threats and mosquito-spread diseases. Embedding mosquito messages into high profile environmental messages may increase visibility for mosquito control.

Embedding mosquito messages into high profile environmental messages may increase visibility for mosquito control.

ASTHO selected the topic of natural disasters because our original research demonstrated that, of the top five environmental concerns, this one provided one of the best opportunities for legitimate cross-promotion of mosquito messages based on the available evidence. The topic of Integrated Pest Management (IPM)/Integrated Mosquito Management (IMM) has been added to this updated edition.

Natural Disasters

- Mosquito control early warning systems help identify the best actions for reducing threats from mosquito-spread diseases that may occur after flooding or during clean-up activities.
- Mosquito populations usually [increase](#) after flooding, potentially increasing the risk of exposing humans and animals to diseases and hindering recovery and clean-up activities. The [health impacts](#) of natural disasters hinge on the vulnerabilities and recovery capacities of the natural environment and the local population. An early warning system can help track mosquito population size, specific type of mosquitoes, and movement patterns. This can help ensure that the most appropriate action is taken when a natural disaster occurs. CDC's website offers messaging to ensure effective communication about these measures. See more at: www.cdc.gov/zika/vector/mosquitoes-and-hurricanes.html.

Integrated Pest Management/Integrated Mosquito Management

- Address community concerns about the impacts of pesticides on human health and the environment by promoting Integrated Pest Management (IPM). IPM methods focus on surveillance, habitat modification, control of mosquitoes at each life stage (eggs, larvae, pupae and adults), monitoring the effectiveness of control programs and community involvement. By applying IPM principles to mosquito control, IMM can address public concerns about both human pesticide exposures and impacts on wildlife.
- Declines in populations of some beneficial insects, like honeybees, are associated with economic impacts on crops that rely on insects for pollination. IMM methods effectively reduce mosquito populations with minimal impacts to bee populations.
- When threats of mosquito-borne disease warrant spraying for adult mosquitoes with pesticides that harm bees, knowledge of bee activity, habitat, and biology can inform decisions with respect to timing, formulation, location, and methods of spraying, to minimize bee impacts.
- Integrated Mosquito Management methods are continually evolving. The latest CDC guidance is available at www.cdc.gov/zika/vector/integrated_mosquito_management.html and supplants the discussion found in the original Impact Factsheets found in the appendix.

Guidance on Terminology

Work with ASTHO’s partners and affiliates suggests that there are preferred words in this arena, along with a number of words that carry negative connotations. The following table should be used along with good judgment. There are no hard and fast rules about using or not using specific words, only general guidance about the tone, feel, and association with the words.

Instead of...	Consider using...	Why?
Surveillance	Monitoring Tracking	“Surveillance” sounds like intrusive spying. “Monitoring” or “tracking” sound more like detective work on the ground, in my community.
Comprehensive	Scalable or Multi-pronged	“Comprehensive” can sound like a large, expensive program. “Scalable” sounds like a program that can grow or decrease with the threat, allowing communities to use dollars more efficiently, while “Multi-pronged” shows that the program uses more than one strategy to address the problem.
National Program	Community-based	“National program” sounds like a one-size fits all program and most communities have unique needs. “Community-based” is a more locally informed approach that engages the community in creating solutions.
Mosquito-borne	Mosquito-spread	Using the word “mosquito-borne” when referring to diseases that are spread by mosquitoes, can be confusing for many audiences. The spelling of the word “born(e)” is also harder on low literate audiences. “Mosquito-spread” clearly communicates that mosquitoes spread the disease.
Adulticiding	Adult mosquito control or spraying	“Adulticiding” is a difficult and unfamiliar word for many people. “Adult mosquito control” or “spraying” indicates that the spraying is for grown mosquitoes.

Social Math

Social math helps audiences quickly understand the scope and scale of numbers that might otherwise be incomprehensible. For example, the Human Health Impact Factsheet for WNV states that “...short-term medical care costs of WNV will approach \$30 million in 2007...an amount that might otherwise be better used, for example, to provide health insurance to more than 25,000 children each year.” Comparing nationwide WNV healthcare costs to something people can relate to on a local or individual level is a good social math tactic. Try to use social math whenever you are quoting large numbers or statistics.

Innovative Financing of Mosquito Control Programs

In areas where the risks of mosquito populations are high and where threat to local economies and human health are high, a special tax district is often the most feasible long-term sustainable funding mechanism, according to ASTHO's [Analysis of Express Legal Authorities for Mosquito Control in the States, the District of Columbia, and Puerto Rico](#). The majority of states already have enabling laws that outline processes for local jurisdictions to create new districts or join existing ones. These processes can be time consuming, but once established, the tax districts are permanent fixtures in the community and provide dedicated funding for mosquito control activities, most commonly through a property tax levy or assessment. When the risk and threat are not as high, innovative financing to establish a scalable program, starting with Tier One may be the most feasible plan. Other successful funding strategies include fees on tire disposal (e.g., Florida and Illinois) and legislative mandates regarding use of boat registration fees for mosquito control (Vermont). Memorandum of Agreements (MOAs) or Memorandums of Understanding (MOUs) between agencies can offer both opportunities for collaboration mechanisms to share or help offset costs.

Habitat alteration to reduce mosquito breeding sites may have ancillary wildlife, flood control, or other environmental benefits. In some cases, these activities are eligible for grant funding from federal (e.g., NOAA) or state agencies (e.g., state departments of transportation).

For more information:

Please visit the following websites for additional information and related tools:

Federal Agencies and National Organizations

- Association of State and Territorial Health Officials: www.astho.org
- CDC: www.cdc.gov
 - Zika Virus: www.cdc.gov/zika/index.html
 - West Nile Virus: www.cdc.gov/westnile/index.html
- American Mosquito Control Association: <https://www.mosquito.org/>

State Mosquito Control Programs

- New Jersey: www.nj.gov/dep/mosquito/
- California: <http://westnile.ca.gov/>
- Florida: [http://mosquito.ifas.ufl.edu/Florida Mosquito Control Districts.htm](http://mosquito.ifas.ufl.edu/Florida_Mosquito_Control_Districts.htm)
- Texas: www.dshs.texas.gov/lab/arbointro.shtm
- Illinois: www.dph.illinois.gov/topics-services/diseases-and-conditions/west-nile-virus/vector-control
- Louisiana: www.dhh.louisiana.gov/index.cfm/page/611

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Appendix:

Impact Factsheets and Backgrounder Templates

These documents have been adapted from the first edition of ASTHO's report on [Communicating About Effective Mosquito Control](#), published in 2009.

In this appendix, you will find five **Impact Factsheet Backgrounders** and their corresponding **Impact Factsheets**. You may use the *Backgrounders* as templates for the information you will need to develop your own *Impact Factsheet*, which you can then disseminate and use to communicate with the public.

Why? Strategic Investments in Mosquito Control Saves Lives and Dollars

There are several components to an effective mosquito control program:

Community-Centered Approaches

Because regions vary in geography and climate, and because each community's economy is supported by different industries, the need for mosquito control is a local matter. In fact, the type of mosquito control program your community needs may change over time. This means you will need a program that is tailored and flexible.

Scalable Plans Ready for Rapid Response

Best practices in mosquito control suggest that communities consider a three-tiered approach. A scalable mosquito control program is one that may readily be increased in size and scope should an outbreak occur or decreased when threats diminish.

Tier One is a basic level of protection that helps communities monitor what type, how many, and where mosquitoes are located in your community and encourages the community to practice preventative actions, such as managing irrigation and drainage water. These preventative actions that mosquitoes and humans have limited interaction.

Continual tracking in Tier One programs prepares communities for Tier Two, should the need arise.

Tier Two programs protect communities through continued monitoring and more focused management of dangerous larvae using biological or safe chemical methods.

Should an outbreak be predicted based on experience gained in Tier Two, communities can scale up to Tier Three programs.

Tier Three programs include increased use of techniques to rid the community of adult mosquitoes when disease threat indicators are high, through means such as expanded public outreach, and targeted use of safe chemicals. Programs can work closely with community leaders and environmental advocates so that all understand the elevated nature of the threat and can help support the most effective techniques for controlling the mosquitoes and reducing the risk of human illness and death.

Diverse Partners and Stakeholders

Partners in mosquito control efforts are easy to find because mosquitoes affect many people and industries. Boards of tourism and hospitality industry business leaders are interested in protecting tourism revenue and their businesses by ensuring mosquitoes are kept in check.

Ranchers, livestock farmers, and veterinary scientists share a concern for animal health and see the benefit to their industry of keeping mosquitoes under control. Public health and health care practitioners are concerned with protecting people from diseases and caring for the ill. Gardeners, golfers, youth sports groups, and other outdoor enthusiasts are more likely to engage in healthy physical activity when mosquitoes are absent. Local environmental advocates can also be important supporters and advisers to your efforts.

Including members of groups like these in dialogue is essential. Local economies may be harmed when human and animal health is at risk, or when disease outbreaks discourage tourism. Leaders in these groups make ready partners for mosquito control initiatives that cut across a community's stakeholders.

Start Today!

When not monitored and controlled, dangerous mosquito outbreaks can cause illness and cost lives, threaten livestock industries, dampen tourism, and discourage active living. That's why it is important to get started now on a mosquito control program for your area.

1. Learn more. Call or visit a successful mosquito control program or a credible website. Even if you have few resources for mosquito control, the Association of State and Territorial Health Officials (ASTHO) can refer you to information that demonstrates successful mosquito control programs of varying size and circumstance.
2. Ask others what they think. Discuss what you've learned about mosquito control with colleagues and leaders in public health, veterinary medicine, tourism, environmentalism, outdoor living, emergency preparedness, and public policy to gather expertise and assess resources.
3. Develop a local coalition and a champion. Build on the relationships developed while gathering information and identify motivated stakeholders who can help drive mosquito control policy improvement. Look for a champion who will take the lead.
4. Develop a program that is tailored to local needs. Conduct an assessment with your team to determine what kind or level of mosquito control program makes the most sense for your state or area. Because the mosquito threat is different in every region, you will want a program adapted to meet local needs and resources.

For more information and resources, please visit ASTHO's website at www.astho.org or the CDC's Division of Vector-borne Infectious Disease website at www.cdc.gov/ncidod/dvbid/westnile/index.htm.

Human Health and Mosquitoes

Impact Factsheet *Backgrounder* Template

Economic Impact Focus	Human health and the associated healthcare costs.
Focus for Factsheet	Louisiana and South Dakota were selected because they were among the top ten states for WNV incidence in 2007. West Nile Virus (WNV) was selected because it was the highest profile U.S. disease associated with mosquitoes and can cause significant health care costs if not controlled quickly. Also, health care costs are a major concern to most states, including Louisiana and South Dakota.
Example of a Photo to Include in the Factsheet	Healthy people and children.
Facts on WNV Impact in Louisiana	In 2002, a total of 4,156 WNV cases were reported in the United States; 329 were in Louisiana. The estimated cost of the Louisiana epidemic was \$20.1 million from June 2002 to February 2003, including a \$10.9 million cost of illness (\$4.4 million medical and \$6.5 million nonmedical costs) and a \$9.2 million cost of public health response.
Facts on WNV Impact Nationwide	<p>An analysis of costs from a 2002 Louisiana outbreak showed the short-term inpatient care costs of WNV was about \$4 million. Extrapolating that across the U.S., the authors concluded that the short-term nationwide medical care costs would have been about \$61 million in 2002.</p> <p>This \$61 million might otherwise be better used to provide health insurance to more than 51,500 children across the U.S. each year.</p> <p>Further, mosquitoes can carry encephalitis and other illnesses, increasing their impact on health and health care costs.</p> <p>In 2004, the average annual premium for private health insurance for children under 18 was \$1,183.</p> <p>The risk of Dengue fever, chikungunya fever, and other mosquito-related diseases increases with poor mosquito control. While these diseases may sound exotic and foreign, globalization and modern-day travel are making U.S. communities more vulnerable to these diseases and associated health care costs every day.</p>
Sources of Information	<p>Zohrabian A, Meltzer MI, Ratard R, <i>et al.</i> "West Nile Virus Economic Impact, Louisiana, 2002." <i>Emerging Infectious Diseases</i>. 2004;10(10):1736-1744. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3323281. Accessed 10-3-2018.</p> <p>America's Health Insurance Plans, "Individual Health Insurance: A Comprehensive Survey of Affordability, Access, and Benefits." Available at https://www.ahip.org/research/. Accessed 10-3-2018.</p>

Suggested Partners	<ul style="list-style-type: none">• Healthcare organizations• Health insurance organizations• Elementary and secondary schools• Public health schools• Nursing schools and organizations• Senior citizens' organizations – local AARP chapters• Foreign travel organizations
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Human Health and Mosquitoes

Impact Factsheet - SAMPLE

Mosquito Control Protects Health and Supports Local Economies

Human Health and Healthcare Costs at Risk

Mosquito-related diseases threaten human health and are expensive to treat. These diseases can be avoided with proper action. In recent years, mosquito-spread West Nile virus (WNV) has expanded across the United States. There is now an increasing need to strengthen mosquito control programs to protect our health from WNV and other dangerous mosquito-spread diseases.

People's health—even their lives—may be threatened by WNV, and it is financially costly as well. For example, Louisiana and South Dakota, because of their climate and terrain, rank among the top ten states for new WNV cases—increasing health care costs in the states for WNV as well as other mosquito-spread diseases.

The good news is we have many tools to manage mosquitoes, minimize human suffering and death, and reduce health care costs. Today, communities are developing locally-tailored mosquito control programs that may be scaled to adapt to changing conditions. For many areas, this means providing the basic level of protection by monitoring mosquito movement, population size, and infection rates. Just as we keep an eye on our checkbook to prevent overdrafts, or track hurricanes to avoid weather disasters, knowing how many and what kinds of mosquitoes are in your area helps communities respond more effectively when threatened.

Did You Know...?

An [analysis](#) of costs from a 2002 Louisiana outbreak showed the short-term inpatient care costs of WNV was about \$4 million. Extrapolating that across the United States, the authors concluded that the short-term nationwide medical care costs would have been about \$61 million in 2002. This \$61 million might otherwise be better used to provide [health insurance](#) to more than 51,500 children across the U.S. each year.

The risk of Dengue fever, chikungunya fever, and other mosquito-related diseases increases with poor mosquito control. While these diseases may sound exotic and foreign, globalization and modern-day travel are making U.S. communities more vulnerable to these diseases and associated healthcare costs every day.

Animal Health and Mosquitoes

Impact Factsheet *Backgrounder* Template

Economic Impact Focus	Animal (livestock) health and costs associated with the industry.
Focus for Factsheet	<p>Texas, Colorado, and Missouri were selected as examples because they have high incidence of West Nile Virus (WNV). Texas also has high levels of mosquito related diseases in horses. Texas had 29 eastern equine encephalitis (EEE) cases and 94 equine West Nile Virus (EWNV) cases in 2007 - almost 10% of the total 206 EEE cases and over 20% of the EWNV caseload.</p> <p>The horse industry was selected because horse health is at risk if infectious mosquitoes spread diseases; because horses are a pastime that many enjoy; and because the horse industry is economically important to Texas, Colorado, and Missouri, as our examples.</p>
Example of a Photo to Include in the Factsheet	Horses in the countryside.
Facts on Horse Industry Impact in Texas, Colorado, or Missouri	<p>There is no treatment for WNV once a horse becomes infected. About two out of every three horses that become ill will survive.</p> <p>The economic costs of WNV in Texas can be estimated at \$2,300 per horse.</p> <p>A 2002 study in Nebraska and Colorado showed that the costs of WNV on the horse industry alone was over \$1.2M.</p> <p>In 2005, the horse industry contributed approximately \$39 billion in direct economic impacts to the U.S., \$5.2 billion to Texas, \$1.6 billion to Colorado, and \$1.3 billion to Missouri economies.</p>
Facts on Horse Industry Nationwide	<p>There is no treatment for WNV once a horse becomes infected. About two out of every three horses that become ill will survive. For horses that survive, a full recovery is likely. Horses vaccinated against EEE, Western Equine Encephalitis (WEE), or Venezuelan equine encephalitis are NOT protected against WNV.</p> <p>The total number of U.S. EWNV cases in 2007 was 468.</p>
Sources of Information	<p>USDA. "National Animal Health Reporting System (NAHRS)." Available at https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/monitoring-and-surveillance/SA_Disease_Reporting. Accessed 10-3-2018.</p> <p>USDA. "Equine West Nile Virus Case Reporting and Surveillance Information." Available at https://www.aphis.usda.gov/aphis/ourfocus/animalhealth/animal-disease-information/horse-disease-information/sa_west_nile_virus/ct_wnv_index. Accessed 10-3-2018.</p>

	<p>APHIS. “Economic Impact of West Nile Virus on the Colorado and Nebraska Equine Industries: 2002.” Available at https://www.aphis.usda.gov/animal_health/nahms/equine/downloads/wnv2002_CO_NB.pdf. Accessed 10-3-2018.</p> <p>The American Horse Council. “Most Comprehensive Horse Study Ever Reveals A Nearly \$40 Billion Impact on the US Economy”. Available at http://www.americanequestrian.com/pdf/American_Horse_Council_2005_Report.pdf. Accessed 10-3-2018.</p> <p>The American Horse Council. “Economic Impact of the United States Horse Industry.” Available at http://www.horsecouncil.org/economics/. Accessed 10-3-2018.</p> <p>Horse Industry Statistics. “National Economic Impact of the U.S. Horse Industry.” Available at http://www.kaufmanzoning.net/AMERICAN%20HORSE%20COUNCIL2005.htm. Accessed 10-4-2018.</p> <p>USDA. “2007 Equine West Nile Virus Final Summary Report.” Available at https://www.aphis.usda.gov/vs/nahss/equine/wnv/2007_equine_west_nile_virus_final.pdf. Accessed 10-3-2018.</p> <p>Texas A&M University. “Report on the Texas Horse Industry.” Available at http://aglifesciences.tamu.edu/animalscience/wp-content/uploads/sites/14/2012/04/equine-report-on-tx-horse-industry10.pdf. Accessed 10-3-2018.</p>
<p>Suggested Partners</p>	<ul style="list-style-type: none"> • USDA Animal Health Division • American Horse Council • Texas Horse Council • Colorado Horse Council • Missouri Equine Council

Animal Health and Mosquitoes

Impact Factsheet - SAMPLE

Mosquito Control Protects Animal Health and Supports Agriculture Rural Economies at Risk from Disease Outbreaks

Mosquito-related diseases threaten animal health and are expensive to treat. These diseases can be avoided with proper action. For example, the health of horses and the equine industry are at risk from mosquito-spread illnesses including West Nile virus (WNV), the equine encephalitis virus. In this age of global trade and travel, even a foreign disease like Rift Valley Fever (RVF) could potentially jump to the United States and rapidly affect states like Texas, Colorado, or Missouri—states where the horse industry is an important economic force and where incidence of WNV is above average. Stronger mosquito control programs are needed to protect animal health and human health in these states and many others.

The good news is we have many tools to manage mosquitoes, protect animal health, avoid needless illness, and reduce veterinary costs. Today, communities are developing locally-tailored mosquito control programs that may be scaled to adapt to changing conditions. For many areas, this means providing the basic level of protection by monitoring mosquito movement, population size, and infection rates. Just as we keep an eye on our checkbook to prevent overdrafts, or track hurricanes to avoid weather disasters, knowing how many and what kinds of mosquitoes are in your area helps communities respond more effectively when threatened.

Did You Know...?

There is no [treatment](#) for West Nile virus (WNV) once a horse becomes infected. About one out of every three horses that become ill will not survive.

The economic costs of WNV in Texas can be [estimated](#) at \$2,300 per horse.

A 2002 study in Nebraska and Colorado showed that the [costs](#) of WNV on the horse industry alone was over \$1.2 million in those states.

The horse industry contributes approximately [\\$39 billion](#) in direct [economic impacts](#) to the United States, \$5.2 billion to the Texas economy, and \$1.3 billion to the Missouri economy.

Outdoor Living and Mosquitoes

Impact Factsheet *Backgrounder* Template

Economic Impact Focus	Outdoor living; primarily in-state activities for residents, e.g., mountain biking, gardening, golf, etc.
Focus for Factsheet	<p>Montana and Nebraska were selected because they have high incidence of mosquito-related diseases.</p> <p>Biking was selected because it is an activity that is at risk of reduction if mosquitoes annoy residents and if infectious mosquitoes spread diseases. Biking is also an activity that a large number of Montanans and Nebraskans enjoy, and it has a large economic impact on those states.</p>
Example of a Photo to Include in the Factsheet	Biking
Facts on Biking Impact in Montana and Nebraska	<p>Over 30% of the population of Montana ride mountain bikes.</p> <p>Montana profits economically from mountain bike tourism. Mountain bike recreation provides a green and sustainable economy for rural communities surrounded by public lands. Survey findings document the economic power of mountain biking and verify the potential benefits for towns across the state.</p> <p>Bike Ride Across Nebraska is an example of one bike ride event that attracts recreational dollars. The amount of money spent by riders has ranged from \$10,000 to \$16,000 each year.</p>
Facts on Biking Impact Nationwide	<p>50 million mountain bikers pump \$26 billion into the American economy – more than 1.5 times the actual total discretionary budget authority for NASA.</p> <p>Biking is consistently more popular than golf across the nation.</p> <p>Contributes \$133 billion annually to the U.S. economy.</p> <p>Supports nearly 1.1 million jobs across the United States.</p> <p>Generates \$17.7 billion in annual federal and state tax revenue.</p>
Sources of Information	<p>Montana Mountain Bike Alliance. “MTB Economics.” Available at http://www.montanamountainbikealliance.com/mtb-economics. Accessed 10-4-2018.</p> <p>BRAN. “About Bran.” Available at http://bran-inc.org/wp/?page_id=25. Accessed 10-3-2018.</p> <p>Outdoor Industry Foundation. “Exploring the Active Lifestyle.” Available at</p>

	<p>https://outdoorindustry.org/wp-content/uploads/2017/03/2004-ResearchActiveLifestyle.pdf . Accessed 10-3-2018.</p> <p>Outdoor Industry Foundation. “Outdoor Recreation Participation Study 2004, 6th Edition.” Available at https://outdoorindustry.org/wp-content/uploads/2017/05/2004-Outdoor-ParticipationStudy.pdf. Accessed 10-3-2018.</p> <p>League of American Bicyclists. “The Economic Benefits of Bicycle Infrastructure Investments.” Available at https://www.aarp.org/content/dam/aarp/livable-communities/learn/transportation/economic-benefits-bicycle-infrastructure-report.pdf. Accessed 10-3-2018.</p> <p>United Bicycle Institute. “Industry Links.” Available at https://www.bikeschool.com/index.php/resources/industry-links. Accessed 10-3-2018.</p>
Suggested Partners	<ul style="list-style-type: none"> • Montana Mountain Bike Alliance Error! Hyperlink reference not valid. • Local cycling clubs: <ul style="list-style-type: none"> ○ Adventure Cycling Missoula, MT ○ Yellowstone Valley Cycling Club Billings, MT ○ Gallatin Valley Bicycle Club Bozeman, MT ○ Helena Bicycle Club Helena, MT • Western Canada Mountain Bike Tourism Association (MBTA) • Nebraska Game and Parks Commission • Nebraska Recreational Trails • Bike Ride Across Nebraska (BRAN) • League of American Bicyclists • United Bicycle Institute

Outdoor Living and Mosquitoes

Impact Factsheet - SAMPLE

Mosquito Control Encourages Active Outdoor Lifestyles Healthy Living and Jobs May Be Threatened

Health experts encourage outdoor activity, such as biking, walking, gardening, and golf, as an important part of a healthy lifestyle. Activities like this are growing in popularity especially as people are trying to address childhood and adult obesity. But outdoor activities are threatened when people fear exposure to mosquitoes that may spread illnesses. While mosquitoes are certainly a nuisance for outdoor enthusiasts, more worrisome are the health risks and health care costs associated with the spread of West Nile virus (WNV), encephalitis, and other diseases that may be carried by mosquitoes.

Outdoor sports and leisure activities contribute significantly to local economies in nearly every corner of the country, including Montana and Nebraska. Effective mosquito control planning is vital for protecting local economies, and for preventing costly diseases that threaten human and animal health.

The good news is we have many tools to manage mosquitoes, protect people and communities, and avoid harmful and expensive illnesses. Today, communities are developing locally-tailored mosquito control programs that may be scaled to adapt to changing conditions. For many areas, this means providing the basic level of protection by monitoring mosquito movement, population size, and infection rates. Just as we keep an eye on our checkbook to prevent overdrafts, or track hurricanes to avoid weather disasters, knowing how many and what kinds of mosquitoes are in your area helps communities respond more effectively when threatened.

Did You Know...?

50 million mountain bikers pump \$26 billion into the American [economy](#) annually – more than 1.5 times the actual total discretionary budget authority for NASA.

An [analysis](#) of costs from a 2002 Louisiana outbreak showed the short-term inpatient care costs of WNV was about \$4 million. Extrapolating that across the United States, the authors concluded that the short-term nationwide medical care costs would have been about \$61 million in 2002.

Bike ride across Nebraska is an example of one bike ride that attracts recreation dollars. Riders [spend](#) an average of \$10,000 to \$16,000 per event in each overnight town.

Tourism and Mosquitoes

Impact Factsheet *Backgrounder* Template

Economic Impact Focus	Tourism; primarily out of state tourism (to separate this from outdoor living activities), i.e., camping, park visits, rafting, kayaking, and other activities.
Focus for Factsheet	Wyoming was selected because they have one of the highest incidences of WNV. Camping and park visits were selected because these are activities that may be curtailed if infectious or nuisance mosquitoes spread. The potential decline in camping and park visits could have a negative economic impact on Wyoming.
Example of a Photo to Include in the Factsheet	Camping or state park visit (no landmarks in the photo).
Facts on Tourism Impact in Wyoming and North Dakota	<p>If not for the contribution of the tourism industry, every household in Wyoming would pay \$510 in additional taxes.</p> <p>Wyoming’s tourism industry accounted for \$894 million earnings in 2016 and supported 32,000 full time and part time jobs.</p> <p>Tourism accounts for nearly 20% of North Dakota’s economic base.</p>
Facts on Tourism Impact Nationwide	<p>In total, out-of-area park visitors spent \$9.4 billion in the local regions surrounding surveyed parks in FY 2005.</p> <p>Visitors spending supported about 235,000 jobs in gateway regions in 2005.</p>
Sources of Information	<p>The Wyoming Office of Tourism. “Discover Impact of Tourism in Wyoming.” Available at https://www.travelwyoming.com/industry. Accessed 10-3-2018.</p> <p>Dean Runyan Associates. “Wyoming Travel Impacts 2000-2016.” Available at https://www.travelwyoming.com/sites/default/site-files/files/uploads/industry/State%20and%20County%20Travel%20Impacts%202016.pdf. Accessed 10-4-2018.</p> <p>Coon, RC, Bangsund, DA, Hodur NM. “Estimating North Dakota’s Economic Base.” Available at http://www.ndtourism.com/sites/default/master/files/pdf/EconBase2014Tourism.pdf. Accessed 10-3-2018.</p> <p>National Park Service. “Visitor Spending Effects-Economic Contributions of National Park Visitor Spending.” Available at https://www.nps.gov/subjects/socialscience/vse.htm. Accessed 10-3-2018.</p>
Suggested Partners	<ul style="list-style-type: none"> Wyoming Business Council http://www.wyomingbusiness.org/ Wyoming State Tourism Office http://www.wyomingtourism.org/ North Dakota Tourism Division https://www.ndtourism.com/

	<ul style="list-style-type: none">• Parks and Receptions Departments (state and local)• U.S. Travel Association https://www.ustravel.org• American Automobile Association http://www.aaa.com/• Go Camping America www.gocampingamerica.com/• US Office of Travel and Tourism Industries http://tinet.ita.doc.gov/about/index.html
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Tourism and Mosquitoes

Impact Factsheet - SAMPLE

Tourism Supported Through Better Mosquito Control Hospitality at Risk from Mosquito-Spread Disease

A vibrant travel and hospitality economy depends on the good will of tourists and their enjoyment of camping, parks, and other outdoor activities. Mosquitoes and the potential diseases they spread not only get in the way of positive outdoor experiences for travelers, but they threaten human health and are expensive to treat.

Nuisance mosquitoes may discourage travelers from returning. However, when visitors are frightened about mosquito-spread illnesses, such as West Nile virus or encephalitis, they may never make the trip at all. And in today's Internet world, a mosquito-riddled trip for one family can end up being broadcast around the world through popular travel Web sites in seconds. That's why stronger mosquito control programs can help protect states like Wyoming and North Dakota where tourism is an important part of their economies.

The good news is we have many tools to manage mosquitoes, protect a vibrant tourism economy, make travel more relaxing, and avoid harmful and expensive illnesses. Today, communities are developing locally-tailored mosquito control programs that may be scaled to adapt to changing conditions. For many areas, this means providing the basic level of protection by monitoring mosquito movement, population size, and infection rates. Just as we keep an eye on our checkbook to prevent overdrafts, or track hurricanes to avoid weather disasters, knowing how many and what kinds of mosquitoes are in your area helps communities respond more effectively when threatened.

Did You Know...?

Wyoming's [tourism industry](#) accounted for \$894 million earnings in 2016 and supported 32,000 full time and part time jobs. If not for the contribution of the tourism industry, every household in Wyoming would pay \$730 in additional taxes per year.

[Tourism](#) accounts for nearly 20% of North Dakota's economic base.

Across the U.S., out-of-area U.S. park visitors [spent](#) \$9.4 billion in the local regions surrounding surveyed parks in FY 2005.

Natural Disasters and Mosquitoes

Impact Factsheet *Backgrounder* Template

Economic Impact Focus	Natural disasters; primarily water-related events that threaten mosquito population increases and migration shifts.
Focus for Factsheet	Mississippi and Louisiana were selected because they have a high incidence of West Nile Virus (WNV) and flooding is a recurring problem. Flood clean-up activities were selected because those who conduct these activities can be exposed to infectious mosquitoes if preventive actions are not taken. Also, nuisance mosquitoes often increase after flooding, exposing local residents to nuisance and potentially infectious mosquitoes during difficult periods of recovery.
Example of a Photo to Include in the Factsheet	Flood water clean-up activities, not flooding.
Facts on Natural Disasters	<p>After Hurricane Katrina, the number of reported cases of West Nile neuroinvasive disease (WNND) sharply increased in the hurricane-affected regions of Louisiana and Mississippi.</p> <p>We used data on the costs of WNV from the human health and animal health Impact Factsheet backgrounders for economic facts because specific studies on the economic impact of WNV following a flood were difficult to find.</p>
Facts on Tourism Impact Nationwide	<p>After a flood, mosquitoes may be more abundant than usual and could pose potential health problems. Filth and debris left by a flood create excellent breeding conditions for mosquitoes, some of which may be capable of spreading diseases.</p> <p>In the summer of 2008, there were twenty times the normal number of mosquitoes in Iowa, and five times more than usual in Chicago.</p> <p>The key to managing potential disease outbreaks is to first have a monitoring system in place so that professionals know the species of mosquitoes that may spread diseases. Mosquitoes can then be better controlled using the safest insecticide matched to the local mosquito species. This will better and more safely reduce young and adult mosquitoes before they can do harm to humans and animals.</p>
Sources of Information	<p>Caillouët KA, Michaels SR, Xiong X, et al. "Increase in West Nile Neuroinvasive Disease after Hurricane Katrina." <i>Emerging Infectious Diseases</i>. 2008.14(5):804-807. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2600257/. Accessed 10-3-2018.</p> <p>Tanner L. "Midwest under attack by pesky mosquitoes." <i>The Spokesman-Review</i>. July 3, 2008. Available at</p>

	<p>http://www.spokesman.com/stories/2008/jul/03/midwest-under-attack-by-pesky-mosquitoes/. Accessed 10-3-2018.</p> <p>CDC. “Fact Sheet: Protect Yourself from Animal- and Insect- Related Hazards After a Disaster.” Available at https://www.cdc.gov/disasters/animalhazards/facts.html. Accessed 10-3-2018.</p> <p>CDC. “Mosquitoes & Hurricanes.” Available at https://www.cdc.gov/zika/vector/mosquitoes-and-hurricanes.html?permalink=https://www.cdc.gov/zika/vector/mosquitoes-and-hurricanes.html. Accessed 10-3-2018.</p> <p>ASTHO. “Public Health Confronts the Mosquito.” Available at http://www.astho.org/Programs/Environmental-Health/Natural-Environment/confrontsmosquito/. Accessed 10-3-2018.</p>
Suggested Partners	<ul style="list-style-type: none"> • Federal Emergency Management Agency (FEMA) • State and County Emergency Management or Preparedness Offices • Churches and religious organizations that respond to disasters • American Red Cross • Military and National Guard units in local and regional area • School systems • The Ready Store https://www.thereadystore.com • Americorps • CDC’s Office of Public Health Preparedness and Response https://www.cdc.gov/phpr/index.htm • Local and regional weather experts/TV personalities

Natural Disasters and Mosquitoes

Impact Factsheet - SAMPLE

Mosquito Control Vital Before and After Natural Disasters As Flood Waters Rise, So Do Mosquito Populations

Floods, hurricanes and other water-related disasters cost lives and devastate communities in states like Mississippi and Louisiana. In the days and weeks following such storms, a serious threat to human health and local economies can build quietly as the number of mosquitoes, and the diseases they may spread, increases. That's why an effective emergency response plan includes mosquito monitoring and control.

After a flood, mosquitoes may be more abundant than usual. The filth and debris left by flood waters create excellent breeding conditions for mosquitoes. Some mosquitoes may carry and spread serious illnesses, including West Nile virus (WNV) and encephalitis, and these diseases are dangerous to human and animal health. Good mosquito control planning before and prompt action after a disaster can help a community recover from flooding more quickly.

The good news is we have many tools to manage mosquitoes, protect people and communities before and following natural disasters, and avoid harmful and expensive illnesses. Today, communities are developing locally-tailored mosquito control programs that may be scaled to adapt to changing conditions. For many areas, this means providing the basic level of protection by monitoring mosquito movement, population size, and infection rates. Just as we keep an eye on our checkbook to prevent overdrafts, or track hurricanes to avoid weather disasters, knowing how many and what kinds of mosquitoes are in your area helps communities respond more effectively when threatened, especially in the aftermath of flooding and clean-up activities.

Did You Know...?

After Hurricane Katrina struck Louisiana and Mississippi in 2005, the number of [reported cases](#) of a specific West Nile disease sharply increased in hurricane-affected regions, impacting healthcare costs for both states at an already difficult time.

Residents in states surrounding flood-stricken regions may also be at risk when mosquitoes carrying disease spread over a larger area.

In the summer of 2008, following [widespread spring flooding](#) in the upper Midwest, there were 20 times the normal number of mosquitoes in Iowa, and five times more than usual in Chicago.