

U.S. EPA, REGION 9

VECTOR-BORNE DISEASES
WORKSHOP

U.S. EPA OPENING REMARKS

BIOLOGY AND CONTROL
OF VECTORS AND
PUBLIC HEALTH PESTS

Vector-Borne Diseases

Biology and Control of Vectors and Public Health Pests

CDR Joe Laco, MSEH, RS/REHS

Environmental Health Officer

CDC National Center for Environmental Health

Division of Emergency Environmental Health Services

Environmental Health Services Branch



National Center for Environmental Health

Division of Emergency and Environmental Health Services



REGIONAL TRIBAL OPERATIONS COMMITTEE SUMMER MEETING SPECIAL SESSION: VECTOR-BORNE DISEASES WORKSHOP

Monday, August 8, 2016

CDR Joe Laco, RS/REHS, MSEH

The findings and conclusions in this presentation have not been formally disseminated by the Centers for Disease Control and Prevention and should not be construed to represent any agency determination or policy.



National Center for Environmental Health
Division of Emergency and Environmental Health Services



Brain Teaser –

What percentage of all diseases known to affect human-kind throughout history are zoonotic (of animal origin) and often transmitted by a vector?

60 Percent!

Brain Teaser – 2

What percentage of all new or emerging diseases that threaten human health today are zoonotic or vector-borne illnesses?

75 Percent!

What animals are responsible for more human illness and death than any other group of mammals?



Rats and Mice

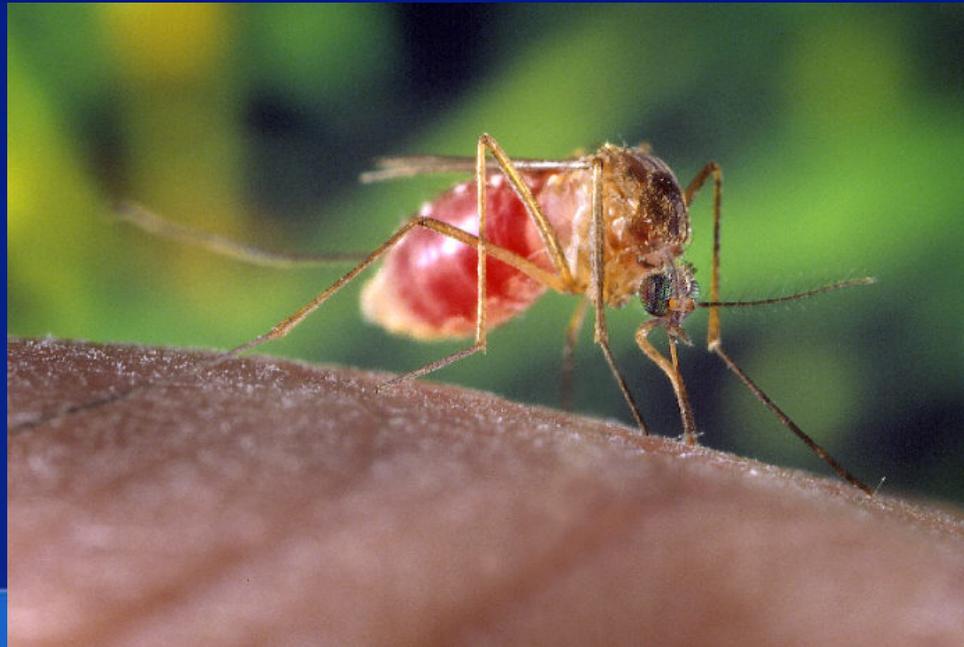
How many human diseases can be transmitted by rodents?



61

Using the current CDC statistical model,
how many West Nile infections occurred
in Texas in 2012?

118,160



Based on a published study in the October 2012 edition of *Epidemiology and Infection*, how many projected West Nile virus infections have occurred in the U.S. since 1999?

Over 3 Million!!!



What disease vector ranks #1
in pathogen diversity?

Ticks

Emergence/Resurgence of Vector-Borne Diseases

- Pesticide resistance
- Decreased resources for surveillance, prevention and control
- Deterioration of public health infrastructure
- Unprecedented population growth
- Uncontrolled urbanization
- Changes in agricultural practices
- Deforestation
- Increased travel

Vector

Transmitters of disease-causing organisms that carry a pathogen from one host to another

Vector-Borne Disease Transmission

Biological

- Most significant mode of transmission
 - Arthropod ingests a pathogen while taking a blood meal from an infected host
 - Pathogen multiplies within the arthropod (reservoir)
 - Pathogen is transmitted to another host when arthropod takes another blood meal



Aedes aegypti

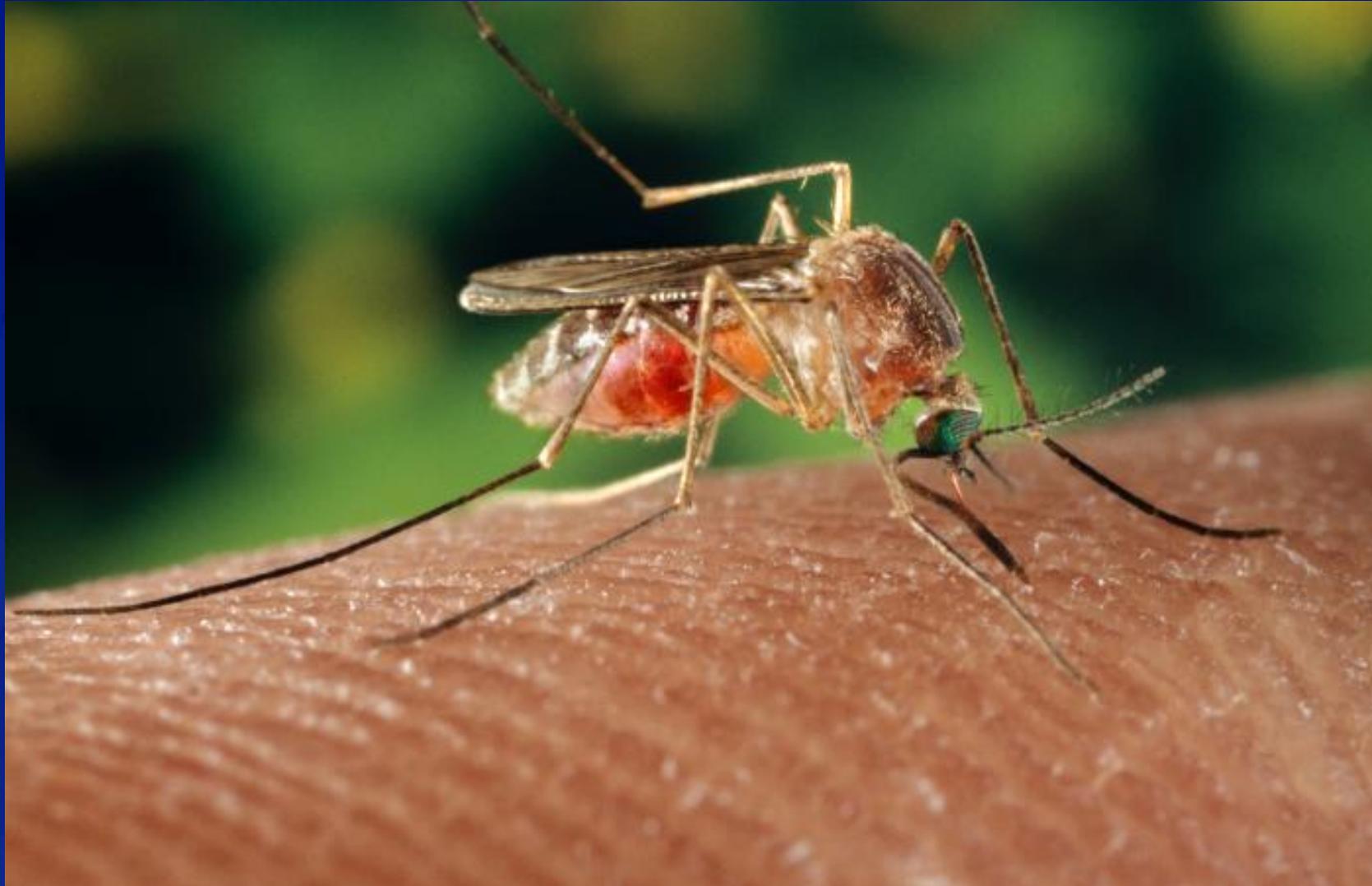
Vector-Borne Disease Transmission

Mechanical

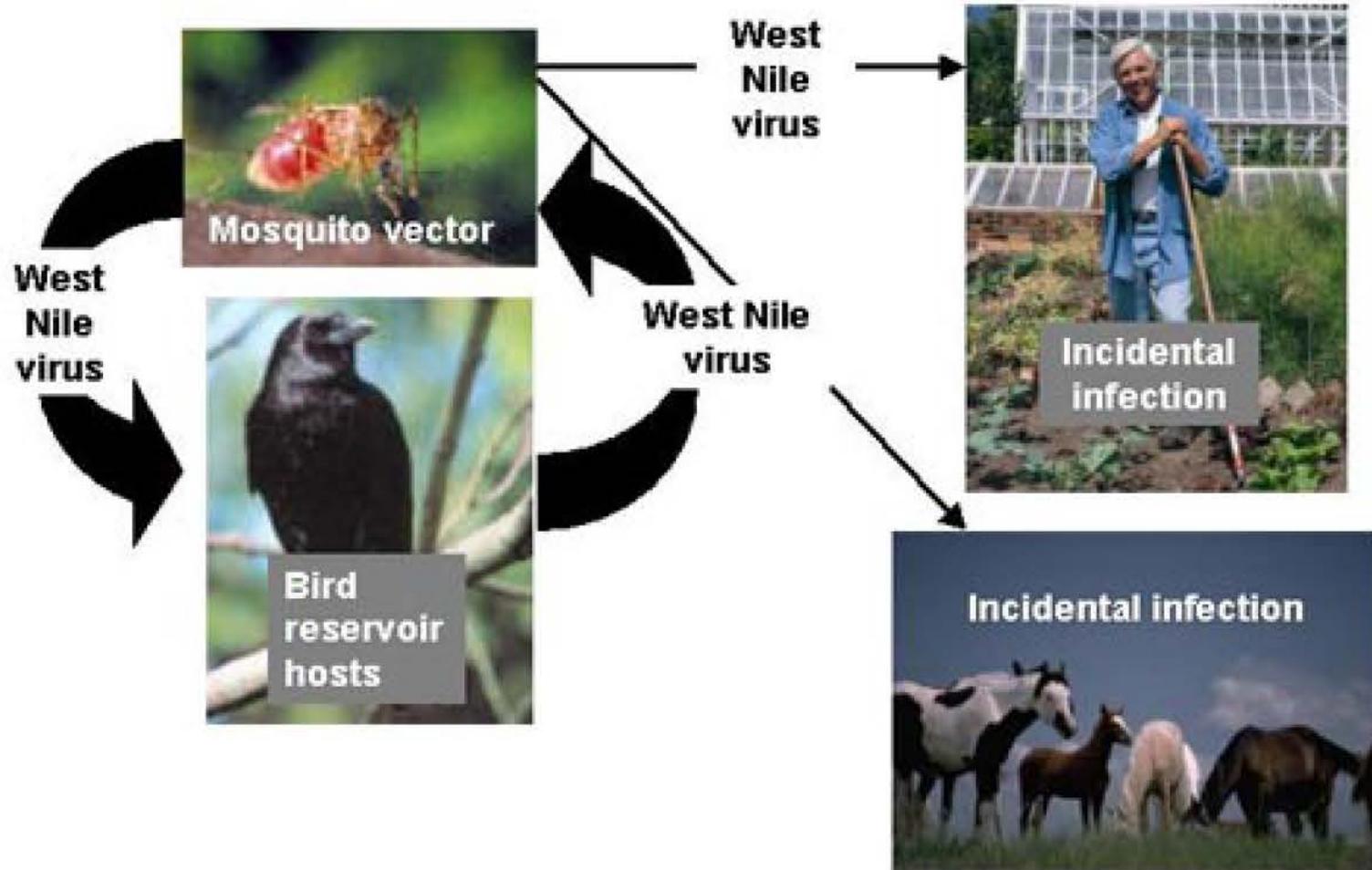
- Vector physically carries pathogens from one place or host to another, usually on body parts or through the gastrointestinal tract



Mosquito-Borne Disease



West Nile Virus Transmission Cycle



Clinical spectrum of human WNV infections

WNND = West Nile
Neuroinvasive Disease:
Meningitis,
Encephalitis,
Acute Flacid Paralysis

~ 1%
WNND

~ 10% of WNND are fatal

20 - 30%
“West Nile Fever”

1 WNND case =
140 - 250 infections

70 - 80%
Asymptomatic – Inapparent



WNV: Long-Term Outcomes

- **WN Encephalitis and WN Fever**
 - **Persistent disabling neurologic sequelae common**
 - **Tremors, movement disorders, cognitive problems in >50%**
 - **8 published studies show complaints frequently persist >1 year post infection (Some > 3 years)**
 - **Fatigue, pain, subjective memory / concentration problems**
 - **Higher all-cause mortality rates >1 year post-infection**

WNV Human Cases 1999-2012*

Year	WNND Cases	Fever Cases	Total cases
1999	59	3	62
2000	19	2	21
2001	64	2	66
2002	2946	1210	4156
2003	2866	6996	9862
2004	1148	1391	2539
2005	1309	1691	3000
2006	1495	2761	4256
2007	1227	2371	3598
2008	689	667	1356
2009	386	334	720
2010	629	392	1021
2011	474	216	690
2012	2734	2653	5387
Total	16,045	20,689	36,734

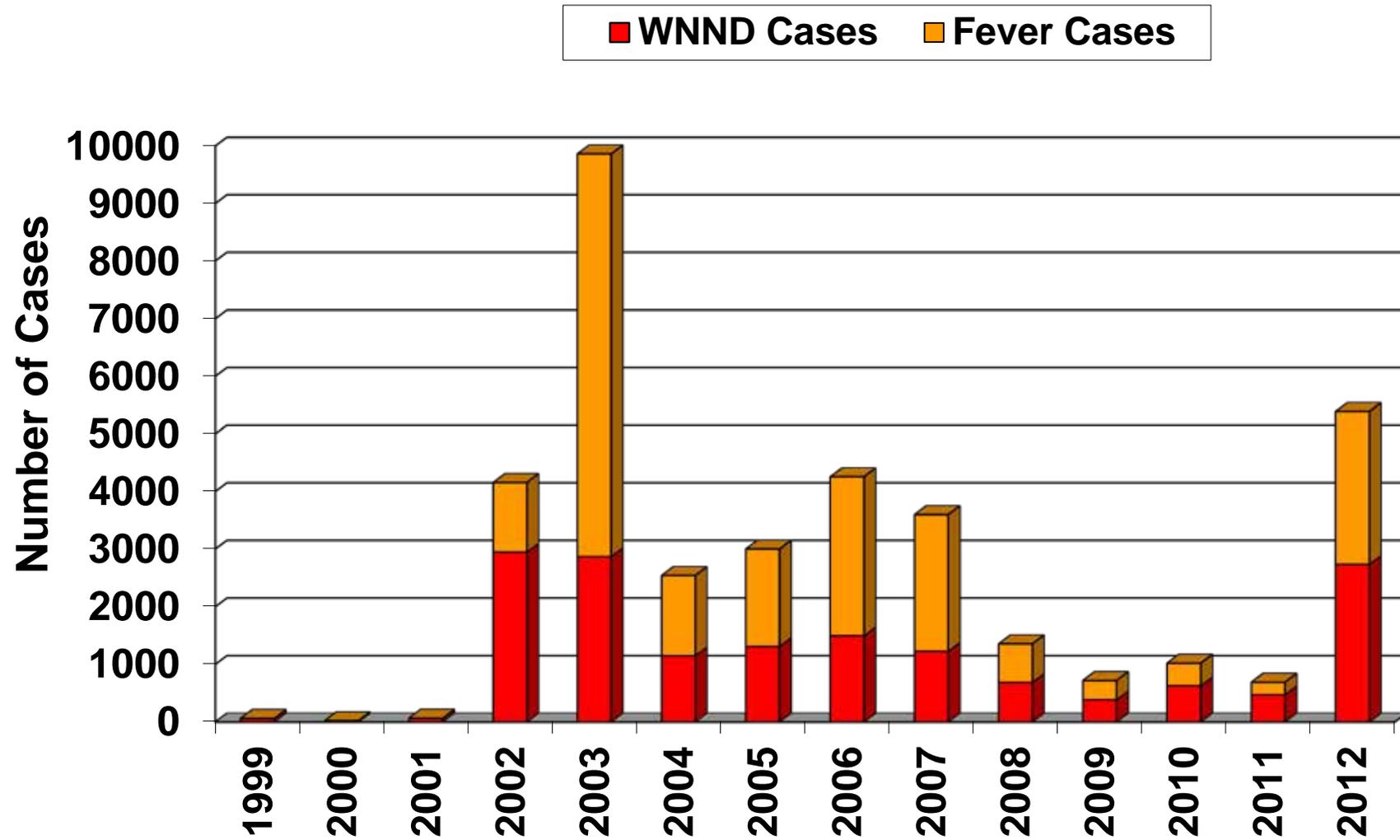
16,045 WNND Cases
x 140 Infections/WNND
~ 2.24 million infections

16,045 WNND Cases
x 250 Infections/WNND
~ 4.01 million infections

U.S. Population 311M
Estimate 0.7% - 1.2% of population
infected with WNV

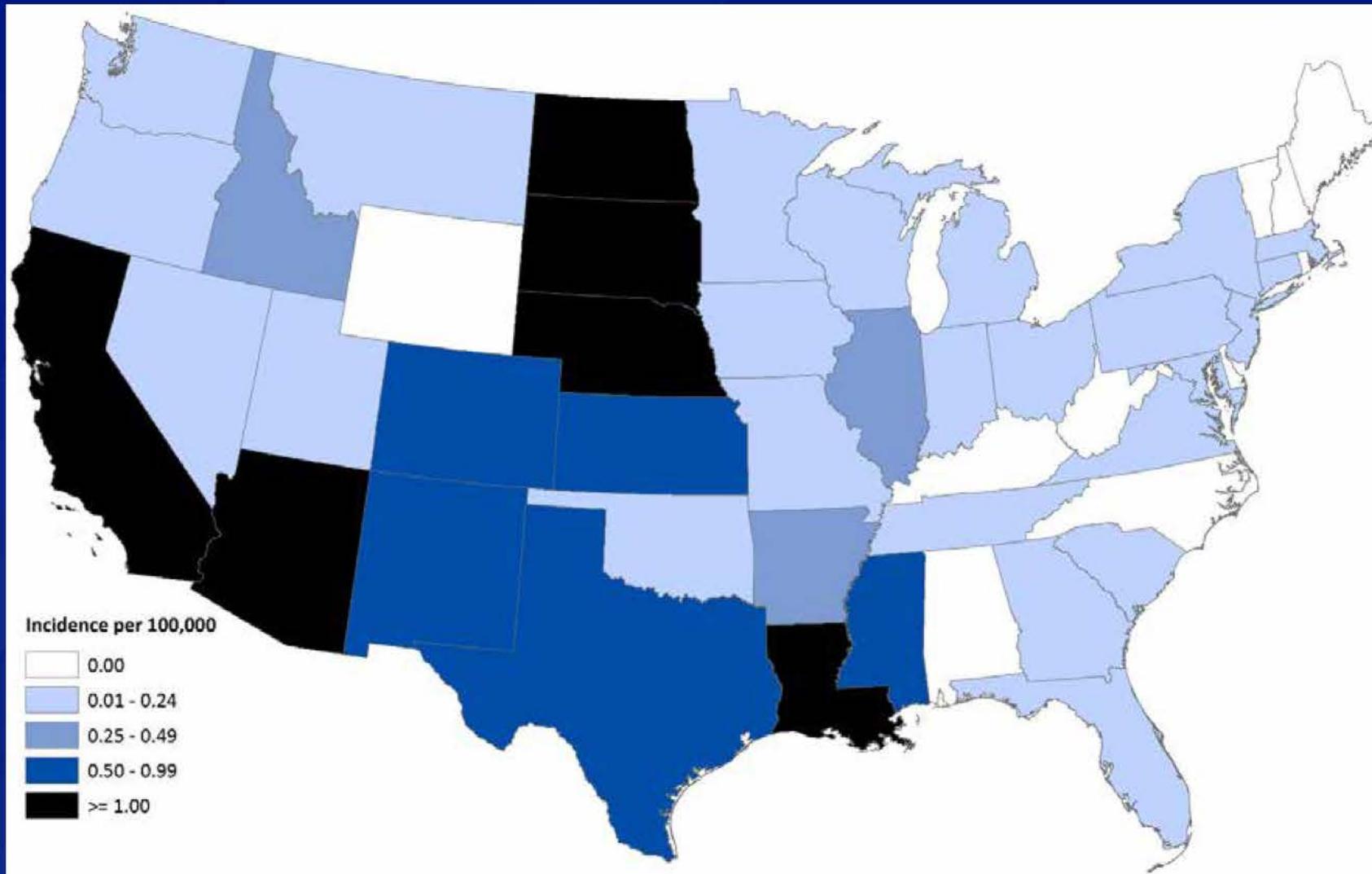
* data as of 12/11/2012

West Nile Virus Total (Neuroinvasive and Fever) Cases Reported in the United States 1999-2012*



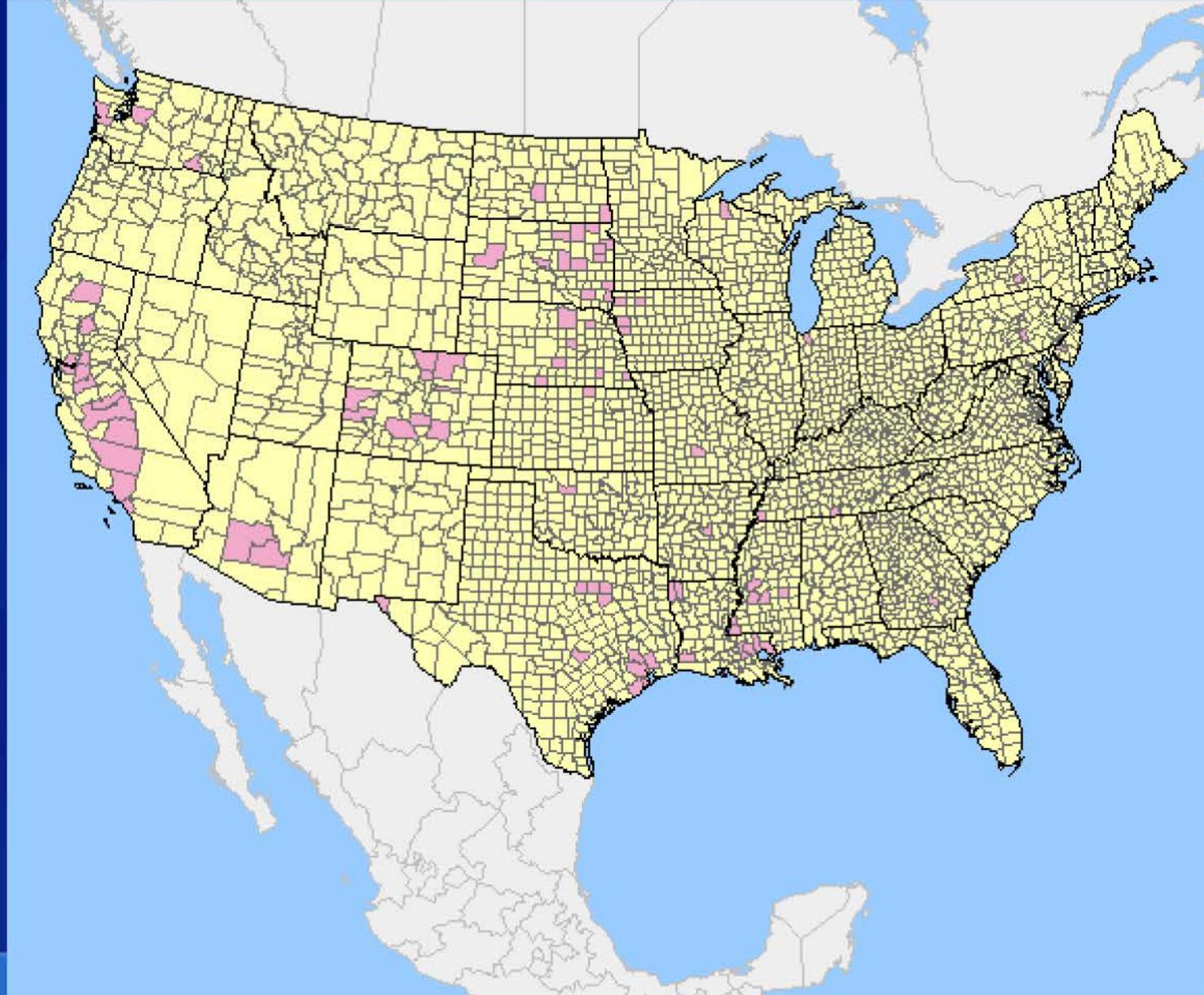
* data as of 12/11/2012

West Nile virus neuroinvasive disease incidence reported to ArboNET, by state, United States, 2014

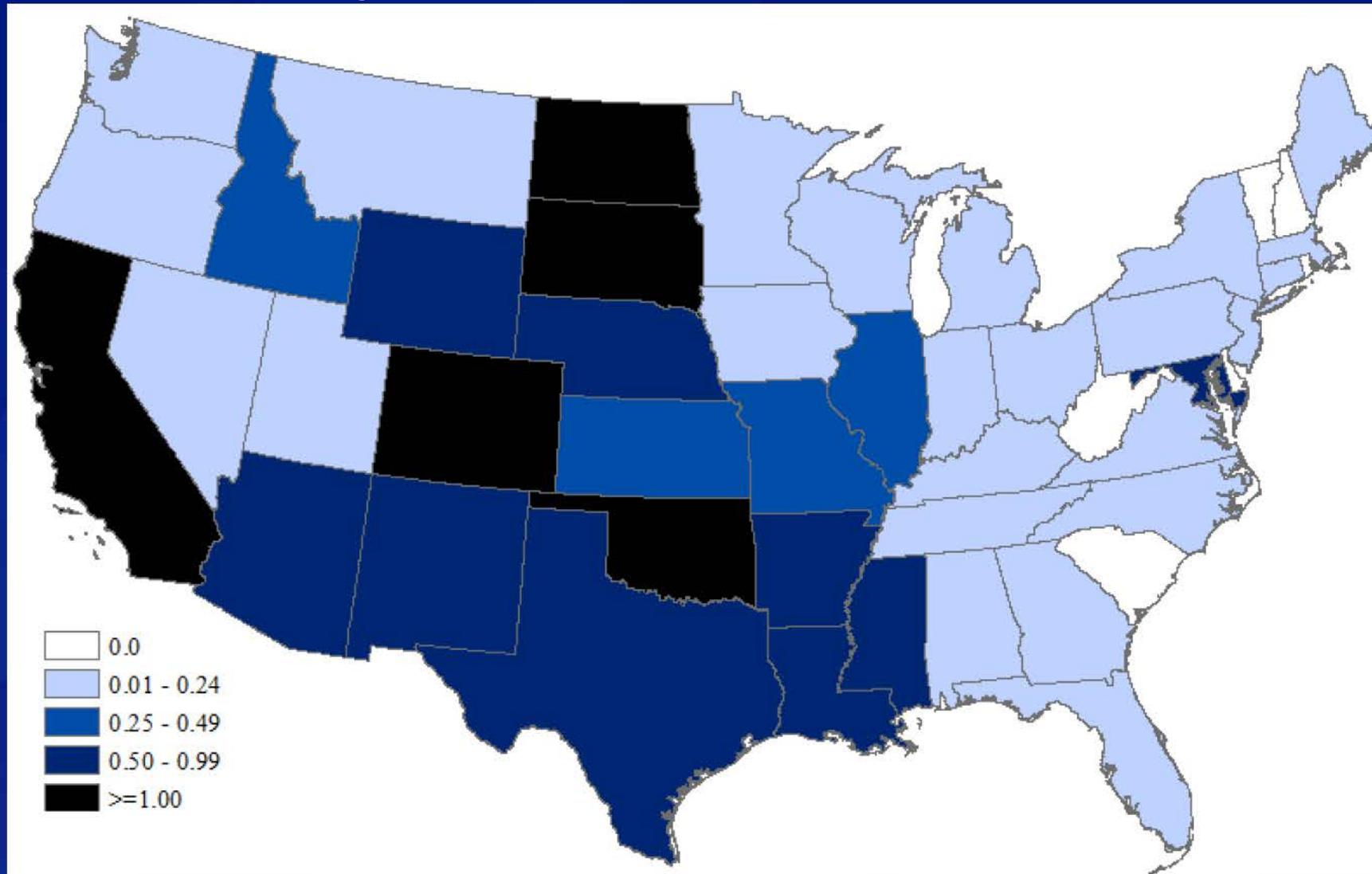


Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention

West Nile virus cases incidence reported to ArboNET, by county, United States, as of August 20, 2014



West Nile Virus Neuroinvasive Disease Incidence by State – United States, 2015 (as of January 12, 2016)



Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention

West Nile Virus Disease Cases by State – United States, 2014

State	Neuroinvasive	Non-Neuroinvasive	Total Cases	Deaths*
Arizona	80	27	107	13
California	561	240	801	31
Nevada	3	0	3	0
New Mexico	19	5	24	1
Texas	253	126	379	6**

* Over 1700 deaths from WNV since

** 89 deaths in Texas, 2012

1999

Source: ArboNET, Arboviral Diseases Branch, Centers for Disease Control and Prevention

Dengue

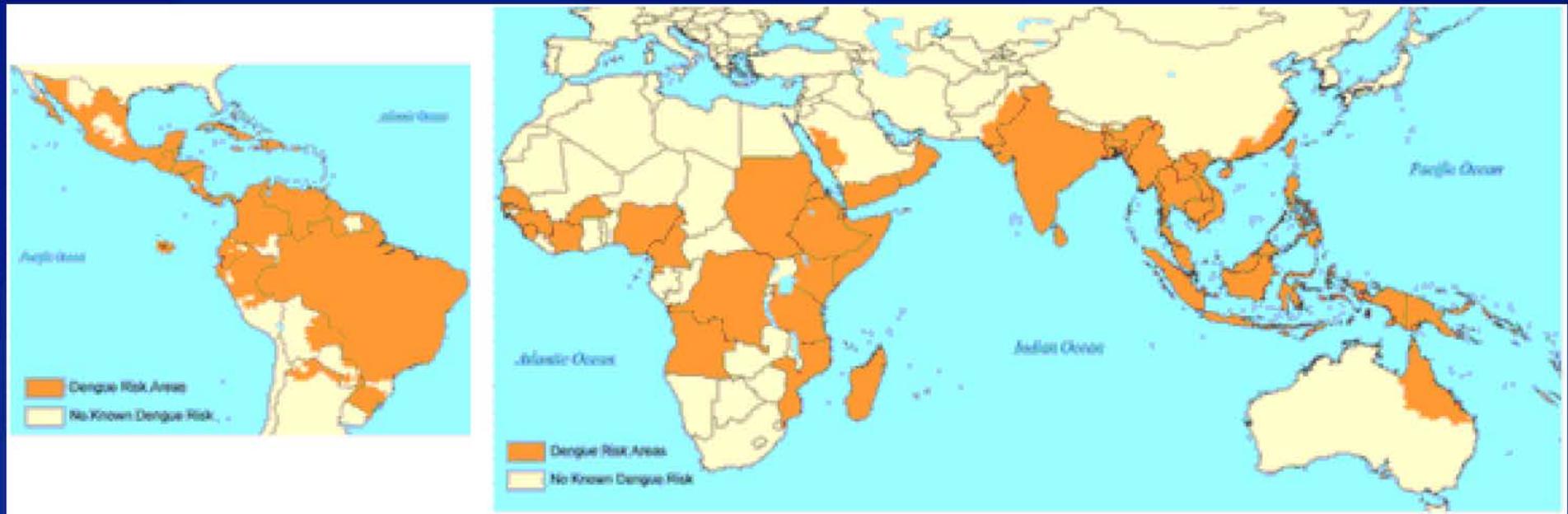
- Dengue is transmitted between people by *Aedes aegypti* and *Aedes albopictus*
- More than one-third of the world's population living in areas at risk for transmission
- Over 100 million people are infected yearly
- No vaccine and no specific treatment.



Dengue

- Dengue fever - high fever, severe headache, severe pain behind the eyes, joint pain, muscle and bone pain (“**break-bone fever**”), rash, and mild bleeding
- Dengue hemorrhagic fever – 2 to 7 days of high fever followed by persistent vomiting, severe abdominal pain and difficulty breathing. Next phase is a 24- to 48-hour period when capillaries become “leaky” leading to pleural effusions. May lead to circulatory system failure and shock, followed by death, if not treated.

Global Distribution of Dengue



Aedes Mosquitoes

- *Aedes (stegomyia)* species mosquitoes
 - *Ae. aegypti*
 - *Ae. albopictus*
- Transmit: dengue, Chikungunya, Zika



Aedes aegypti



Aedes albopictus

Aedes aegypti and *Aedes albopictus* Mosquitoes:

Estimated Range in the United States*



Aedes aegypti



Aedes albopictus

*Maps have been updated from a variety of sources. These maps represent CDC's best estimate of the potential range of *Aedes aegypti* and *Aedes albopictus* in the United States. Maps are not meant to represent risk for spread of disease.

Imported Acquired Dengue Human Cases – US 2015

State	Travel Associated Cases
Arizona	15
California	138
Nevada	1
New Mexico	3
Texas	32
Hawaii	19

Locally Acquired Dengue Human Cases – US 2015

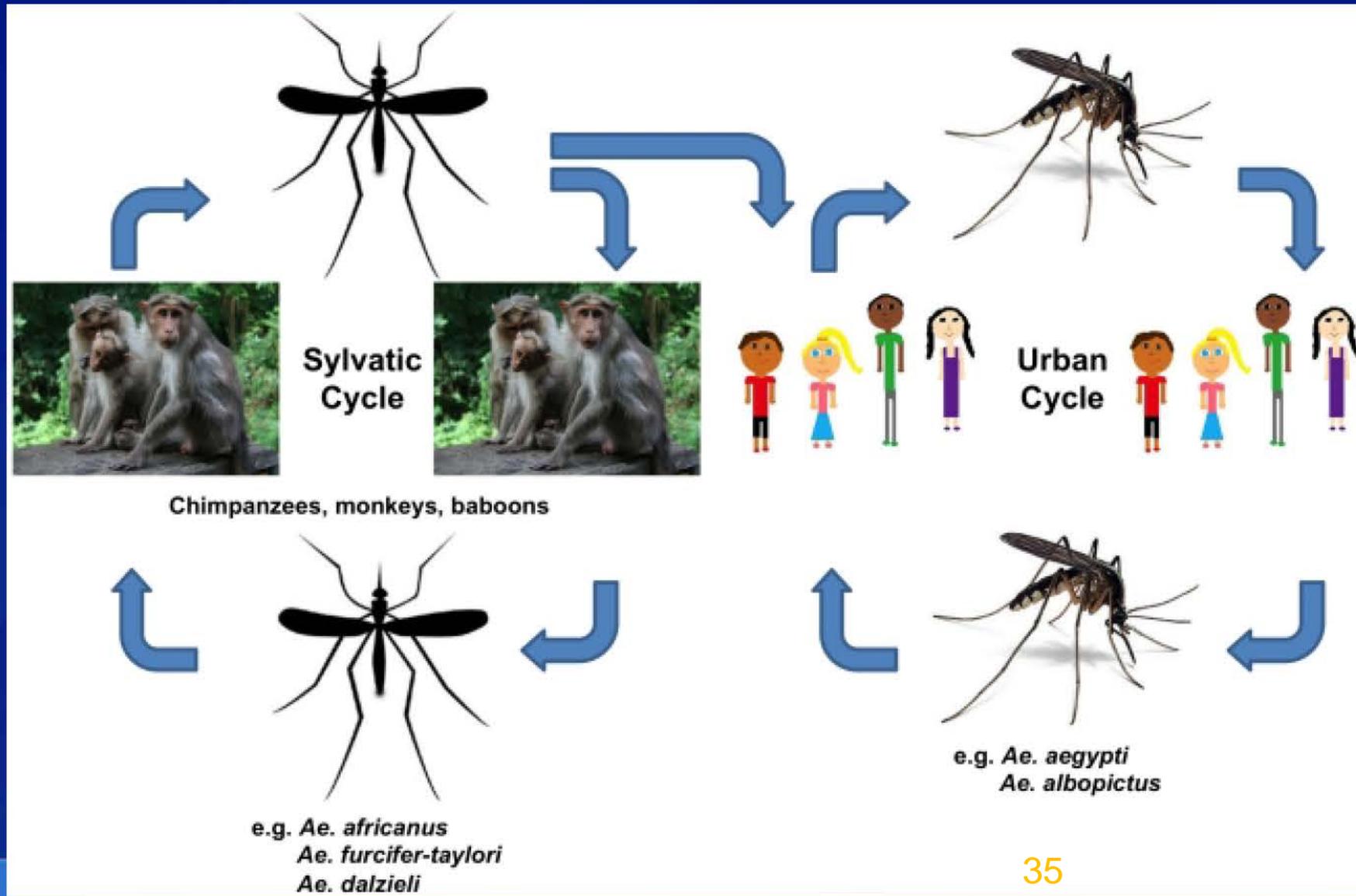
State	Local Cases
Arizona	0
California	0
Nevada	0
New Mexico	0
Texas	0
Hawaii	200

Chikungunya Virus (CHIKV)

- Mosquito-borne *alphavirus*
- Transmitted by *Aedes aegypti* and *Ae. albopictus*
- Main epidemic reservoirs are non-human and human primates
- Endemic in Asia and Africa



Chikungunya Transmission Cycles



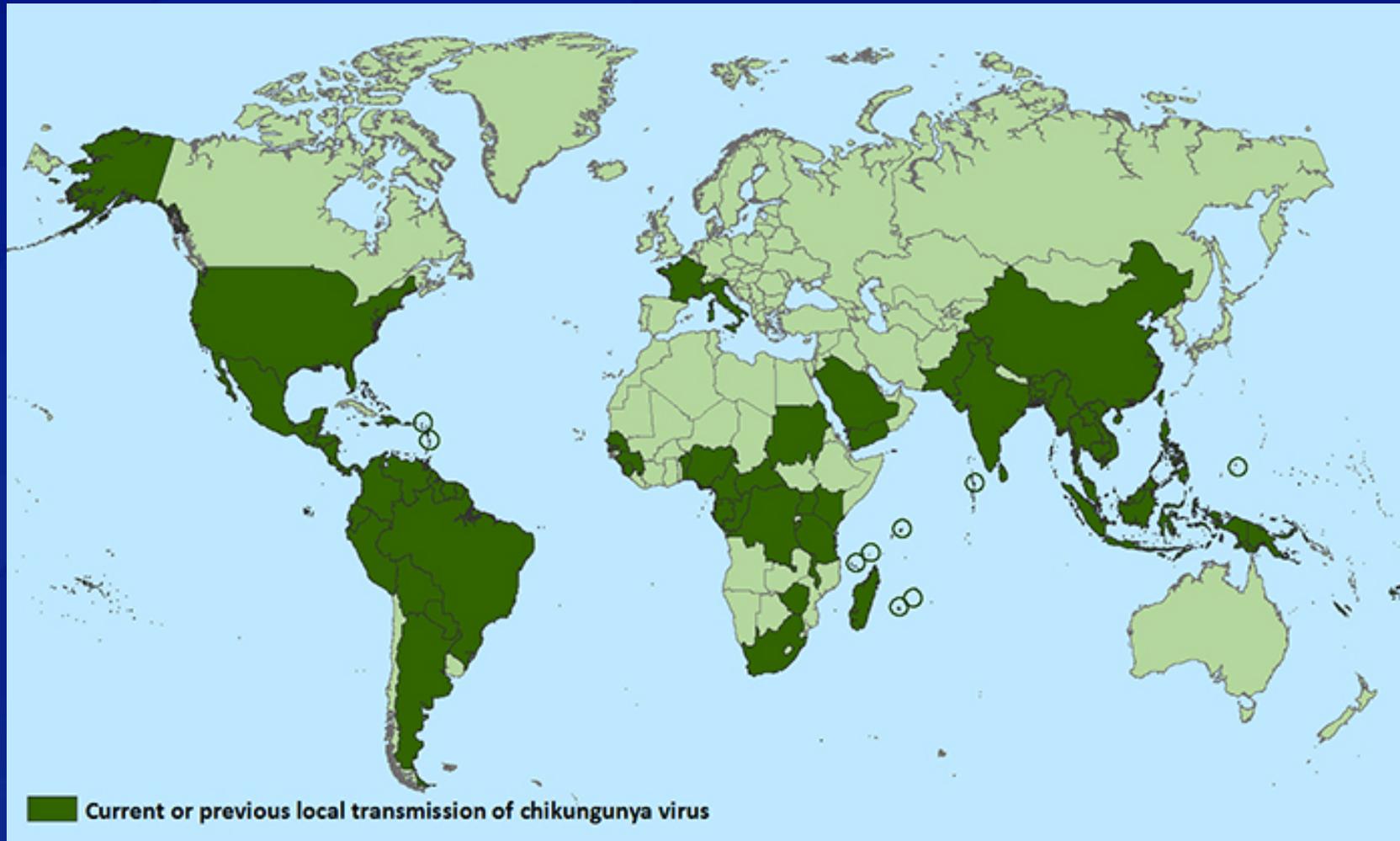
Chikungunya Virus Disease

- **Characterized by acute onset of fever and severe polyarthralgia**
 - **Acute symptoms typically resolve in 7–10 days**
 - **Mortality is rare; occurs mostly in older adults**
- **Variable proportions of patients report:**
 - **Relapse of rheumatologic symptoms* in the months following acute illness**
 - **Persistent joint pains for months or years**
- **Often occurs as large outbreaks with high attack rates**
 - **40-60% of population infected**
 - **Majority (72-97%) of infected persons are symptomatic**

*Polyarthralgia, polyarthritis, tenosynovitis, Raynaud's syndrome

Chikungunya

Countries with reported local transmission of Chikungunya virus (as of April 22, 2016)



Imported Acquired Chikungunya Human Cases – US 2015

State	Travel Associated Cases
Arizona	24
California	275
Nevada	1
New Mexico	0
Texas	54
Hawaii	7

Locally Acquired Chikungunya Human Cases – US 2015

State	Local Cases
Arizona	0
California	0
Nevada	0
New Mexico	0
Texas	0
Hawaii	0

Zika virus disease (Zika)

- Disease spread primarily through the bite of an infected *Aedes* mosquito.
- Many people infected with Zika virus won't have symptoms or will only have mild symptoms.
- However, Zika can cause birth defects and other problems such as stillbirth and miscarriage.



Zika

- Zika can be spread through:
 - Mosquito bites
 - *Aedes*

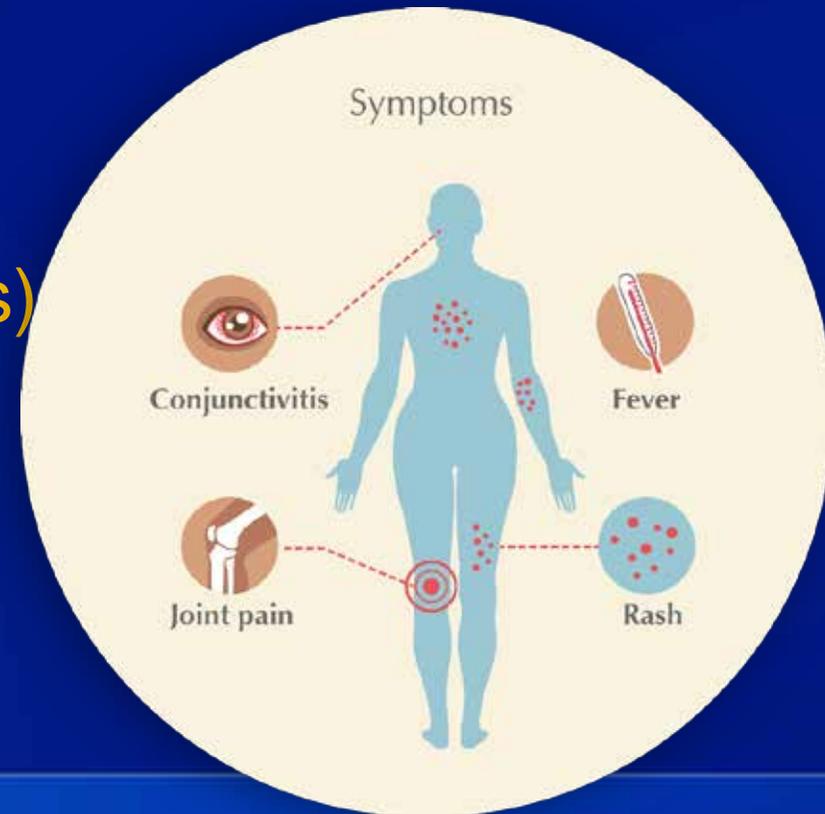


- From a pregnant woman to her fetus
- Sex with an infected man
- Possibly blood transfusion, organ and tissue transplant, fertility treatment, and breastfeeding

Zika

What are the symptoms?

- The most common symptoms of Zika are:
 - Fever
 - Rash
 - Joint pain
 - Conjunctivitis (red eyes)
 - Muscle pain
 - Headache



Zika

How does Zika affect pregnancies?

- Zika infection in pregnancy can cause microcephaly and other severe fetal brain defects.
- Microcephaly: birth defect in which a baby's head/brain is smaller than expected.
- No evidence that previous infection will affect future pregnancies.



Zika

How does Zika affect pregnancies?

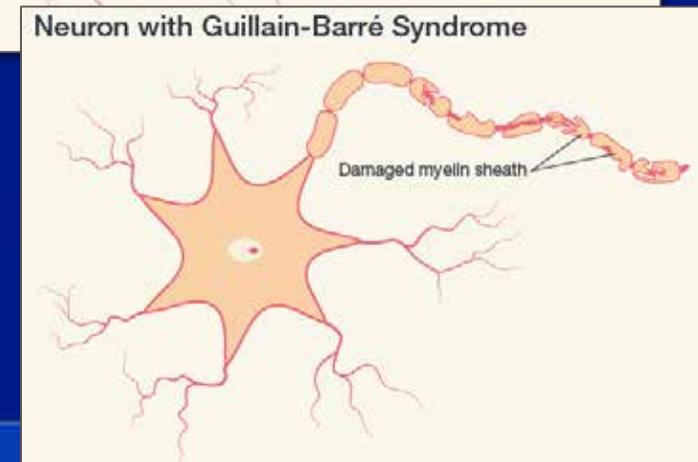
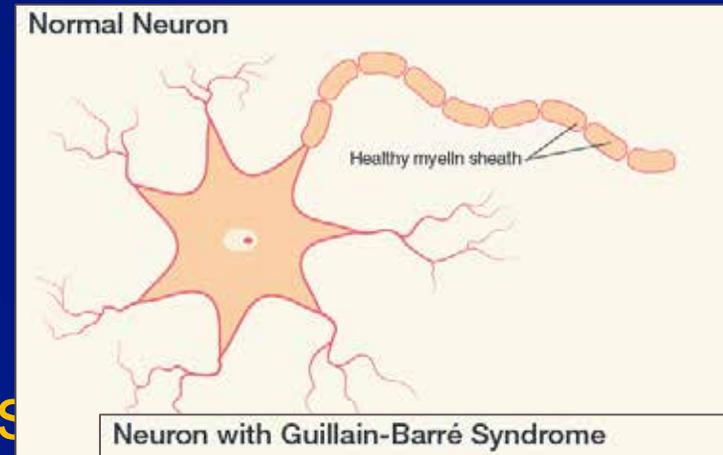
- Other problems have been detected in fetuses and infants infected with Zika virus before birth.
- Miscarriage, stillbirth, absent or poorly developed brain structures, eye defects, hearing deficits, and impaired growth
 - No reports of infants getting Zika through breastfeeding.



Zika

Does Zika cause Guillain-Barré syndrome?

- GBS is very likely triggered by Zika in a small proportion of infections.
- GBS is an uncommon sickness of the nervous system in which a person's own immune system damages the nerve cells, causing muscle weakness, and sometimes, paralysis.



Zika



Where Is Zika Found?

US States*

- 1657 travel-associated cases†
- 0 locally transmitted cases‡

- 433 pregnant women
- 5 case of Guillain-Barre syndrome
- 15 sexually transmitted cases

US Territories

- § 21 travel-associated cases†
- § 4729 locally transmitted cases‡

- § 422 pregnant women
- § 17 case of Guillain-Barre syndrome
- § 0 sexually transmitted cases

*46 states and District of Columbia

†Includes cases in travelers and their contacts with presumed sexual or in utero transmission

‡Presumed local mosquito-borne transmission

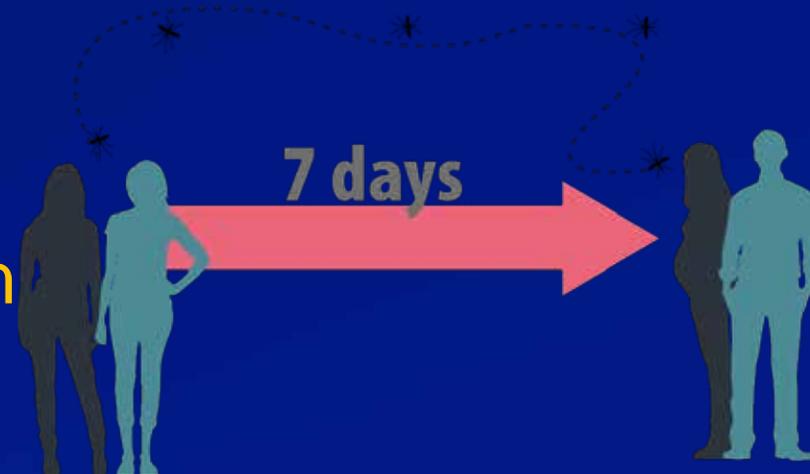
as of July 27, 2016

Imported Acquired Zika CONT US, as of July 27, 2016

State	Travel Associated Cases
Arizona	10
California	87
Nevada	11
New Mexico	3
Texas	76
Hawaii	10

Zika

- The virus can be passed from an infected person to a mosquito through bites.
- An infected mosquito can spread the virus to other people.
- Protect yourself from mosquito bites. During the first week of illness, Zika virus can be found in blood.



Zika virus can stay in blood for about a week, and mosquitoes can bite you and then infect others through bites.

Tick-Borne Disease



Brown dog tick



American dog tick



Rocky Mountain wood tick



Western blacklegged tick

Geographic Range of Tick Vectors



Transmits: Rocky Mountain spotted fever

Geographic Range of Tick Vectors



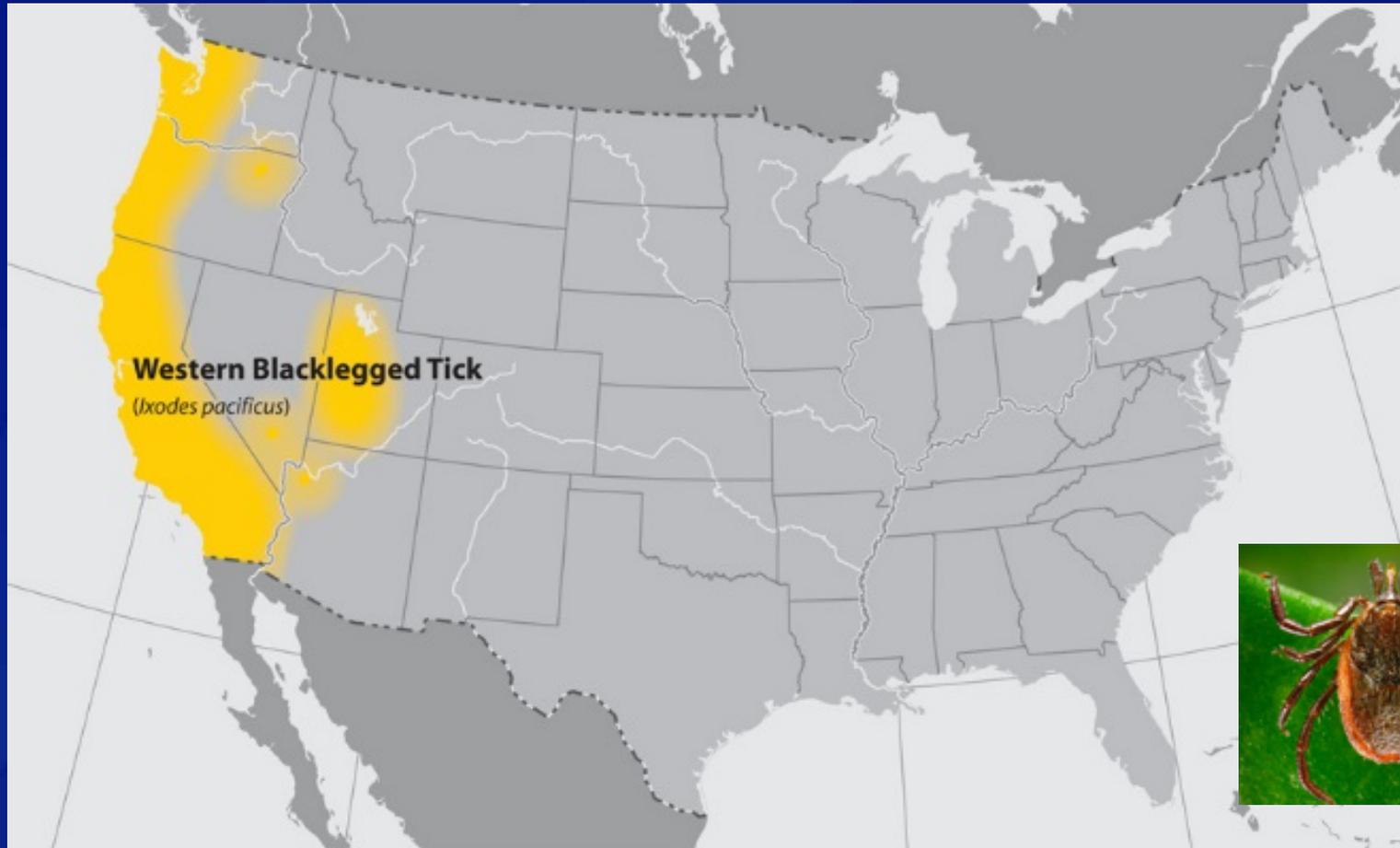
Transmits: Tularemia and Rocky Mountain spotted fever.

Geographic Range of Tick Vectors



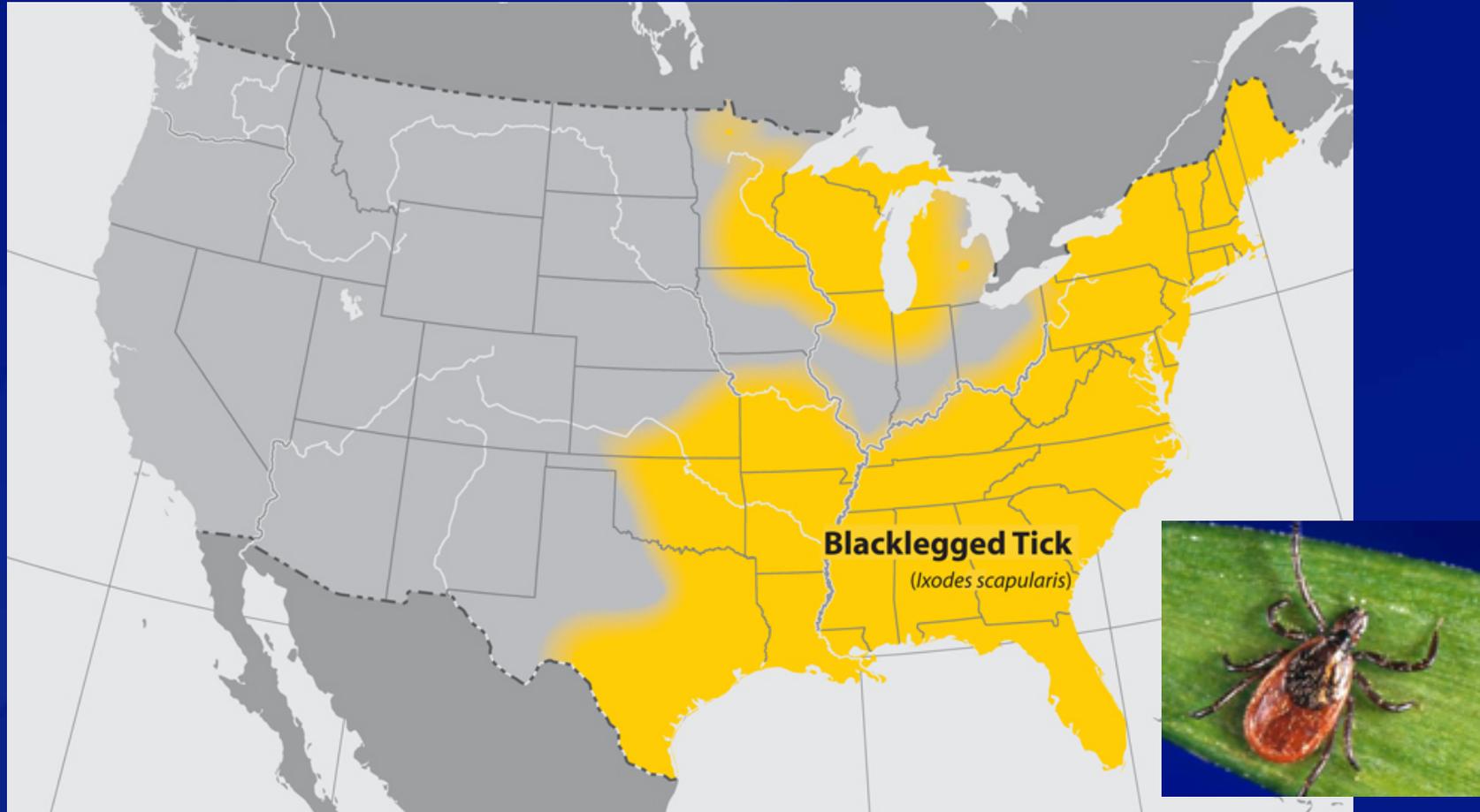
Transmits: Rocky Mountain spotted fever, Colorado tick fever, and tularemia.

Geographic Range of Tick Vectors



Transmits: Anaplasmosis and Lyme disease.

Geographic Range of Tick Vectors



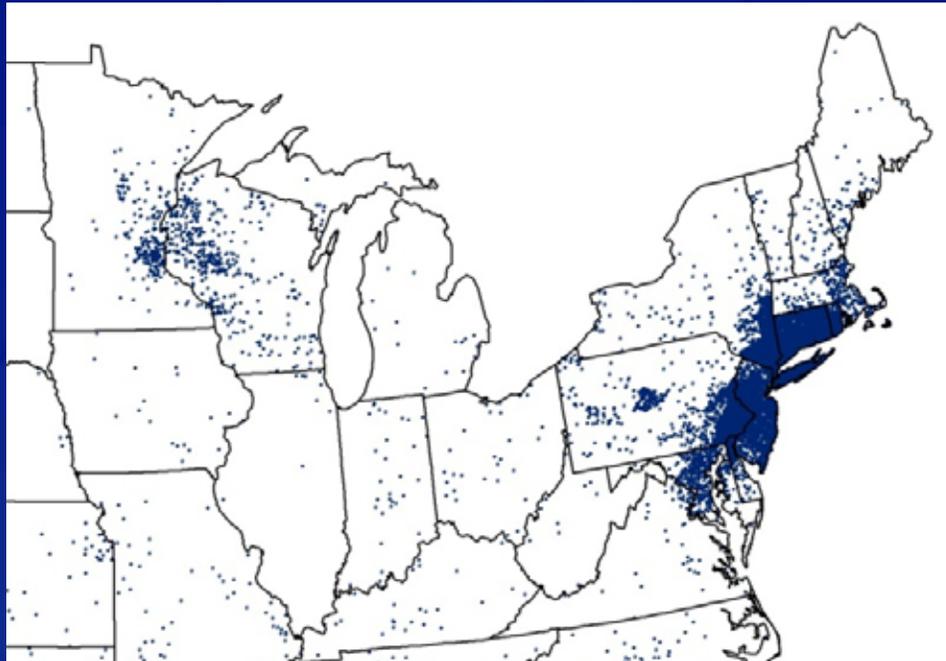
Transmits: Lyme disease, anaplasmosis, babesiosis, and Powassan disease.

Lyme Disease

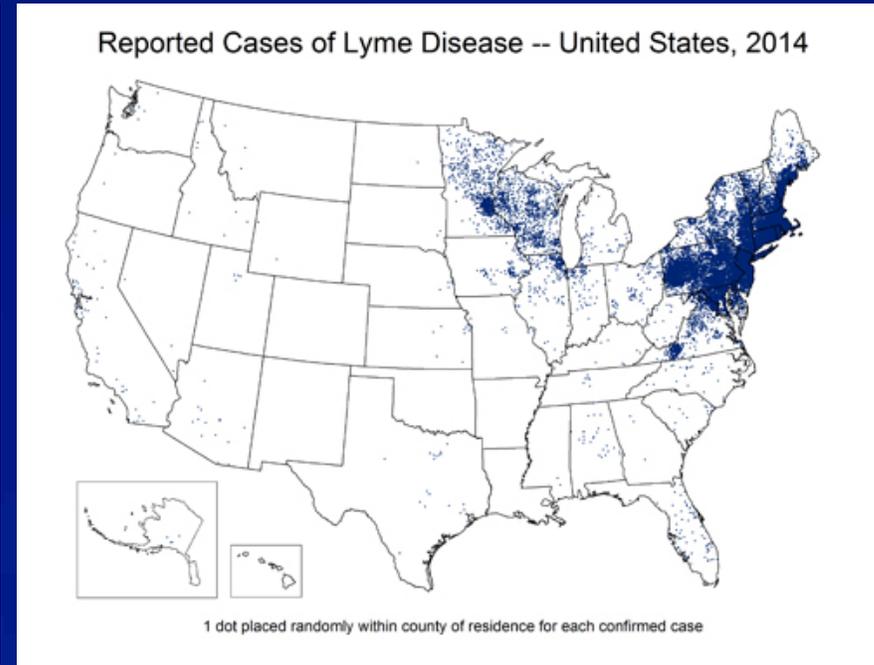
- Caused by the bacterium *Borrelia burgdorferi*
- Transmitted to humans through the bite of infected blacklegged ticks
- The deer tick, (*Ixodes scapularis*) spreads the disease in the northeastern, mid-Atlantic, and north-central United States, and the **western blacklegged tick** (*Ixodes pacificus*) spreads the disease on the Pacific Coast.
- Symptoms - fever, headache, fatigue, and a characteristic skin rash called erythema migrans (70 - 80% of infections)
- If left untreated, infection can spread to joints, the heart, and the nervous system
- #1 reportable vector-borne disease in the U.S. and the #6 most reported disease overall.



Reported Cases of Lyme Disease United States – 1996/2011



1996



2014

2012 – Texas, 33 cases
2012 – Pennsylvania, 4146
cases

Lyme Disease

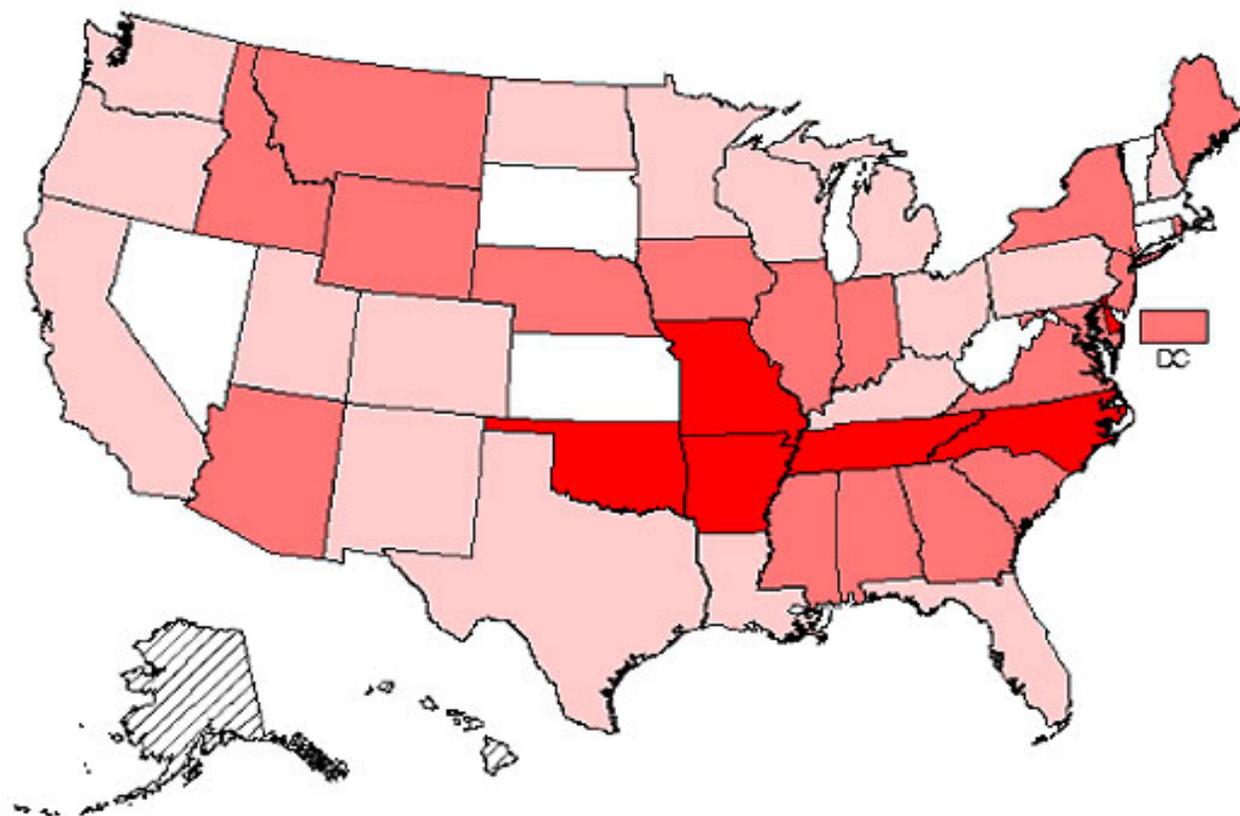
State	Confirmed Cases 2007	Confirmed Cases 2013
Arizona	2	22
California	75	90
Nevada	15	11
New Mexico	5	0
Texas	87	48
Hawaii	0	0
Pennsylvania	3994	4981
Wisconsin	1814	1447

Rocky Mountain Spotted Fever



- Caused by the bacterium *Rickettsia rickettsii*
- Transmitted in the U.S. by the American dog tick (*Dermacentor variabilis*), Rocky Mountain wood tick (*Dermacentor andersoni*), Lone Star tick (*Amblyomma americanum*) and brown dog tick (*Rhipicephalus sanguineus*)
- Symptoms - fever, headache, abdominal pain, vomiting, and muscle pain. A rash may develop, but is often absent in the first few days, and in some patients, never develops
- RMSF is a serious illness that can be fatal in the first eight days of symptoms if not treated correctly (doxycycline within 5 days)

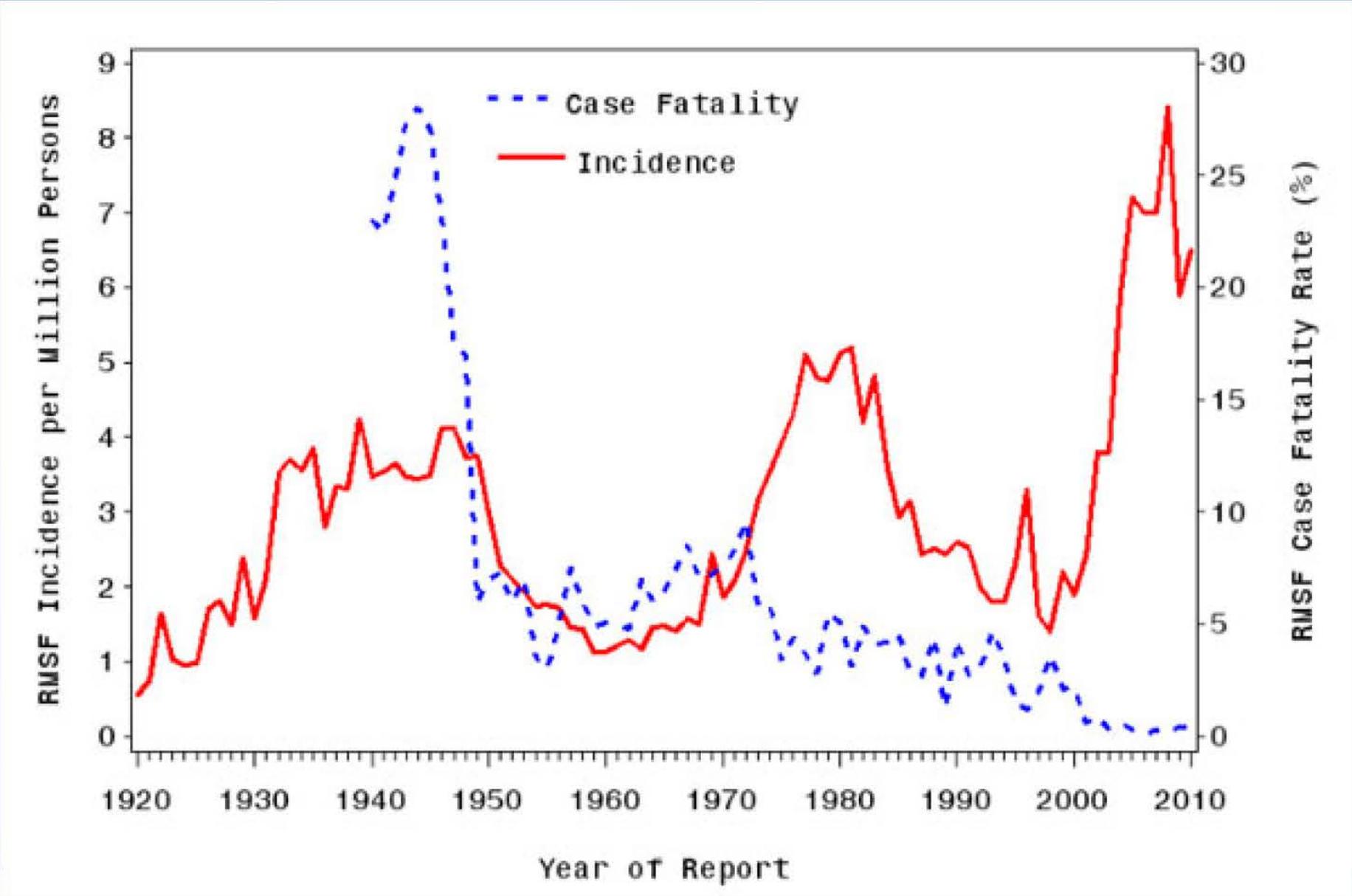
RMSF Incidence, 2010



Cases per million



RMSF in the United States, 1920–2010



Tularemia

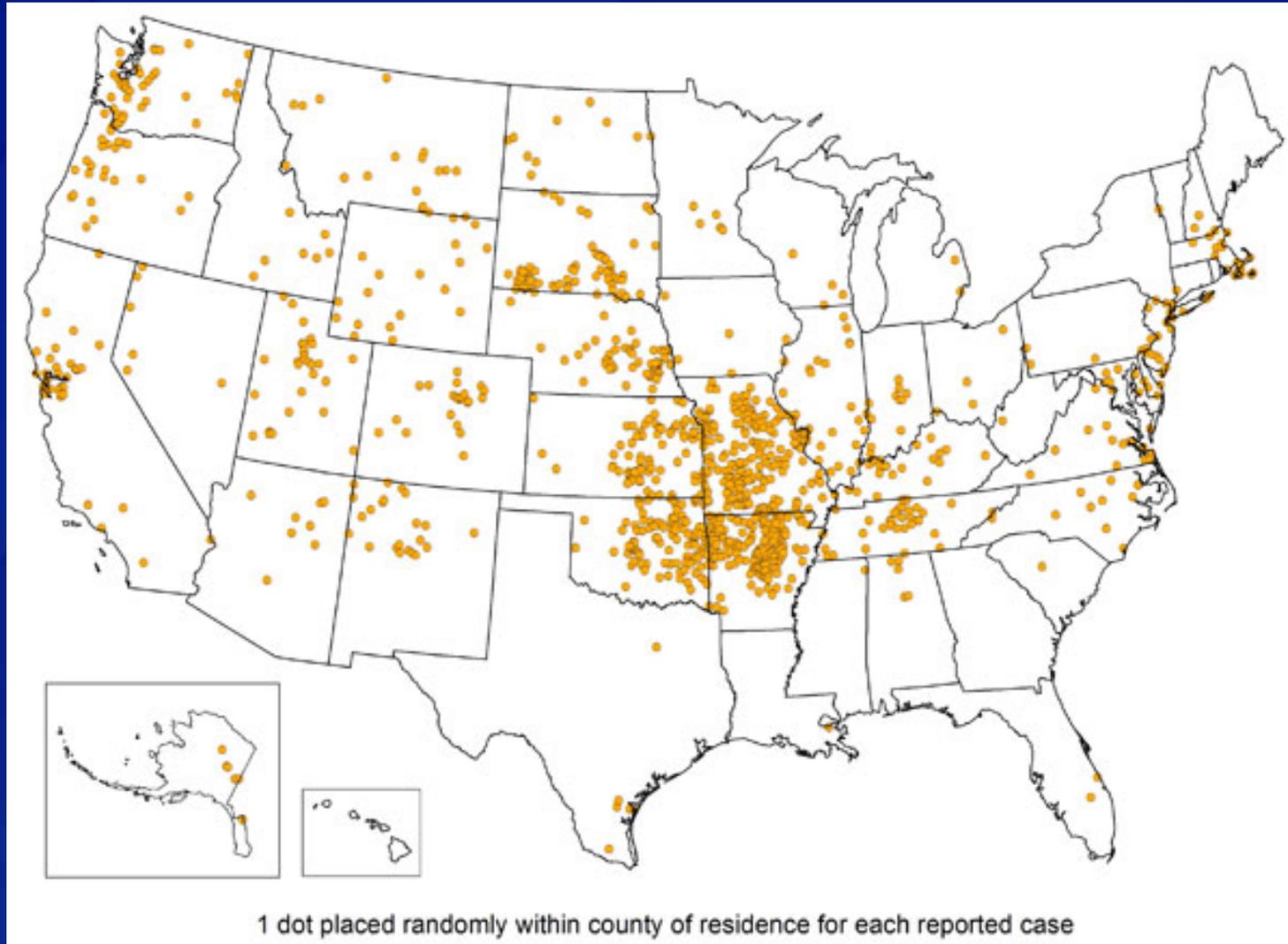
- Caused by the bacterium *Francisella tularensis*.
- Transmitted to humans by the dog tick (*Dermacentor variabilis*), the wood tick (*Dermacentor andersoni*), and the lone star tick (*Amblyomma americanum*).
- Deer flies (*Chrysops spp.*) have been shown to transmit tularemia in the western U.S.
- Highly infectious. A small number (10-50 or so organisms) can cause disease.
- Potential bio-terror weapon. Commonly occurs in nature. People who inhale an infectious aerosol would experience severe respiratory illness, including life-threatening pneumonia and systemic infection.

Tularemia



- **Ulceroglandular** - Occurs following a tick or deer fly bite or after handling of an infected animal. Skin ulcer appears where the organism entered the body (most common form).
- **Glandular** - Similar to ulceroglandular but without an ulcer.
- **Oculoglandular** - Bacteria enter through the eye. Can occur when touching the eyes while butchering an infected animal.
- **Oropharyngeal** - From eating or drinking contaminated food or water (sore throat, mouth ulcers, tonsillitis, and swelling of lymph glands in the neck.)
- **Pneumonic** - Most serious form. Symptoms include cough, chest pain, and difficulty breathing. Results from breathing dusts or aerosols containing the organism.

Reported cases of Tularemia, United States 2003-2012



Flea-Borne Disease



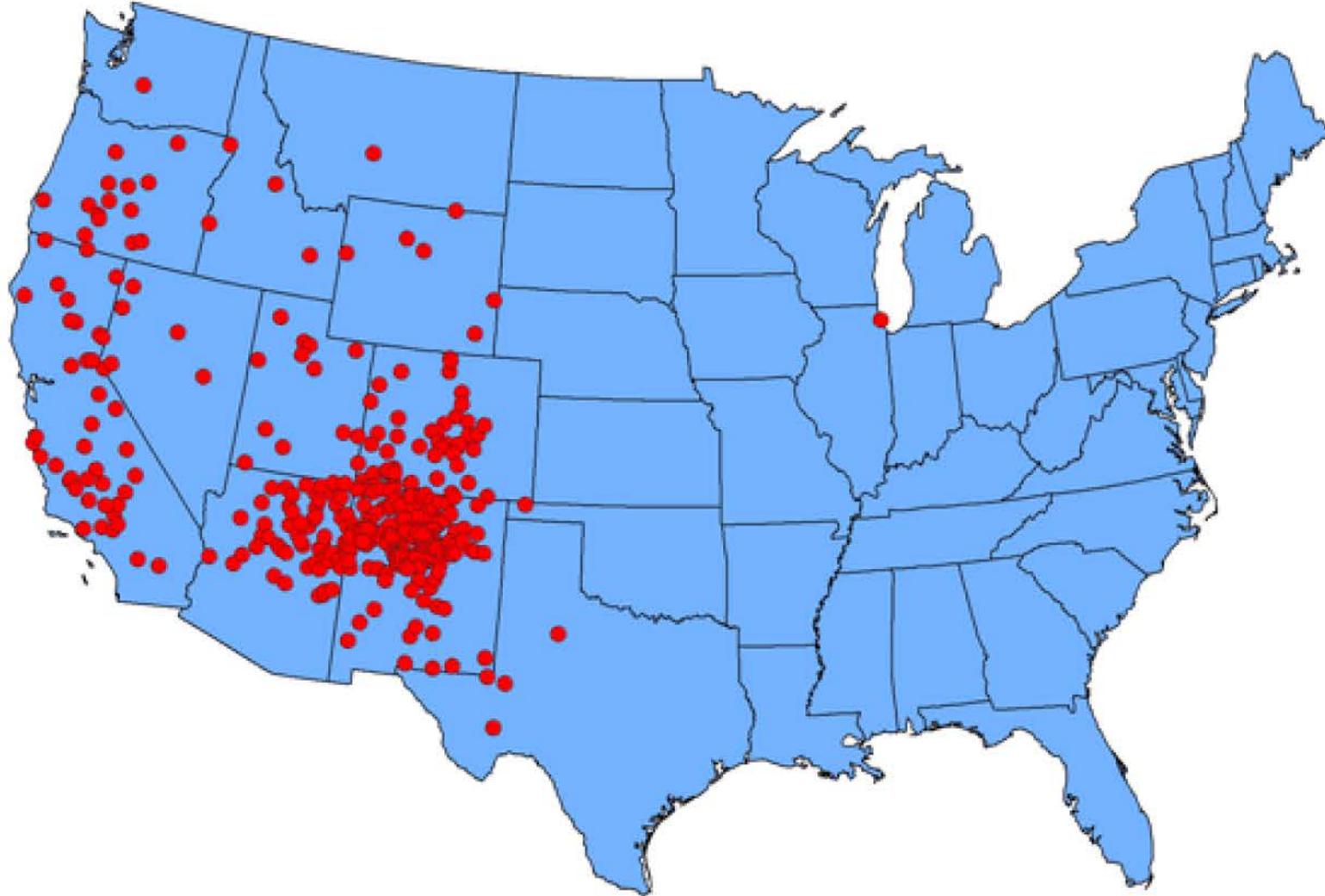
Plague

- Caused by the bacterium *Yersinia pestis*.
- Usually transmitted by the bite of an infected rodent flea or by handling an infected animal
- The last U.S. urban plague epidemic occurred in Los Angeles in 1924-25
- Most human cases in the United States occur in two regions: 1) northern New Mexico, northern Arizona, and southern Colorado; and 2) California, southern Oregon, and far western Nevada

Plague

- **Bubonic plague:** enlarged, tender lymph nodes, fever, chills and prostration (total exhaustion/collapse)
- **Septicemic plague:** fever, chills, prostration, abdominal pain, shock and bleeding into skin and other organs
- **Pneumonic plague:** fever, chills, cough and difficulty breathing; rapid shock and death if not treated early

Reported cases of human plague--United States, 1970-2012



1 dot placed in county of exposure for each plague case

RODENTS

Norway Rat

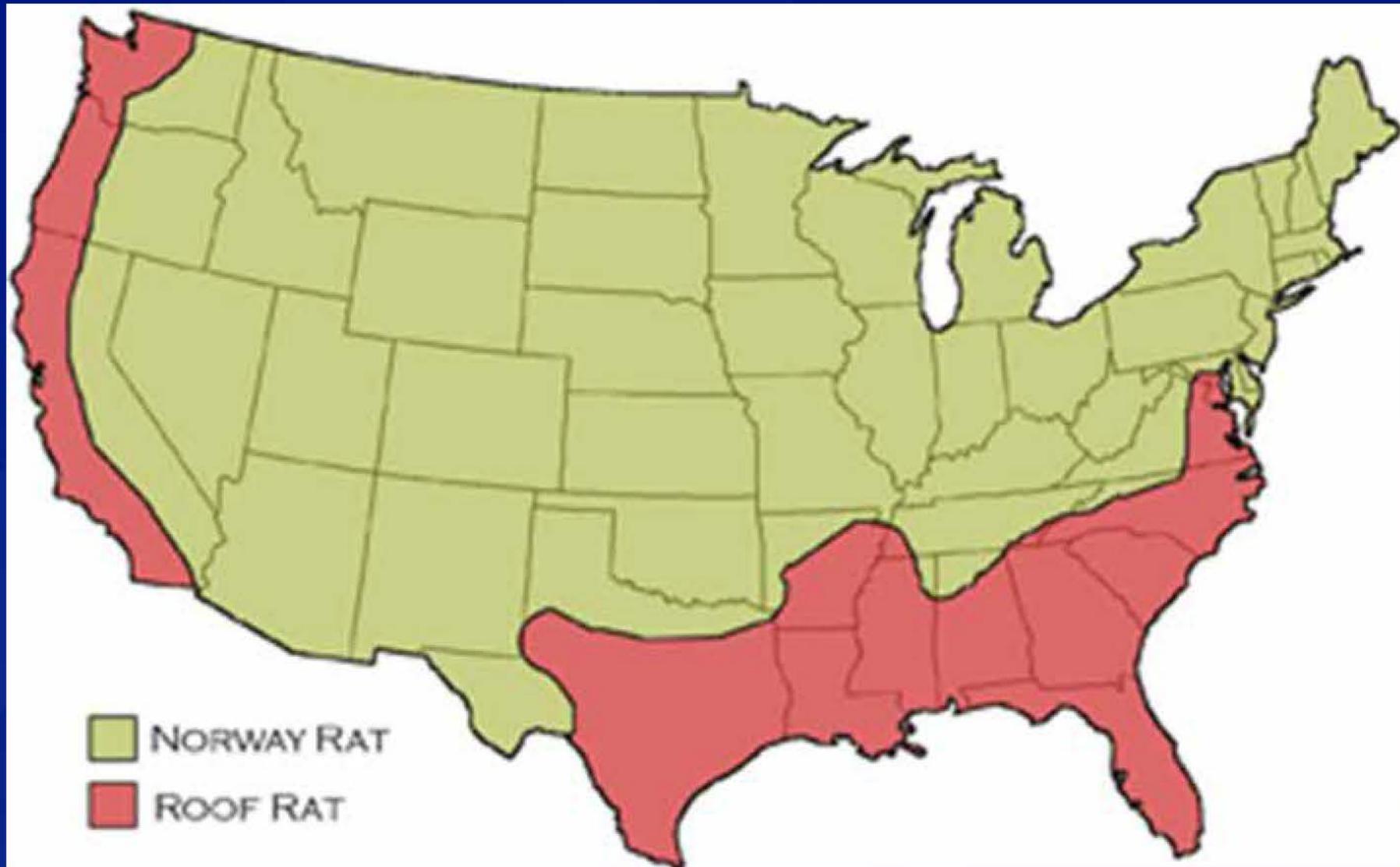


Roof Rat



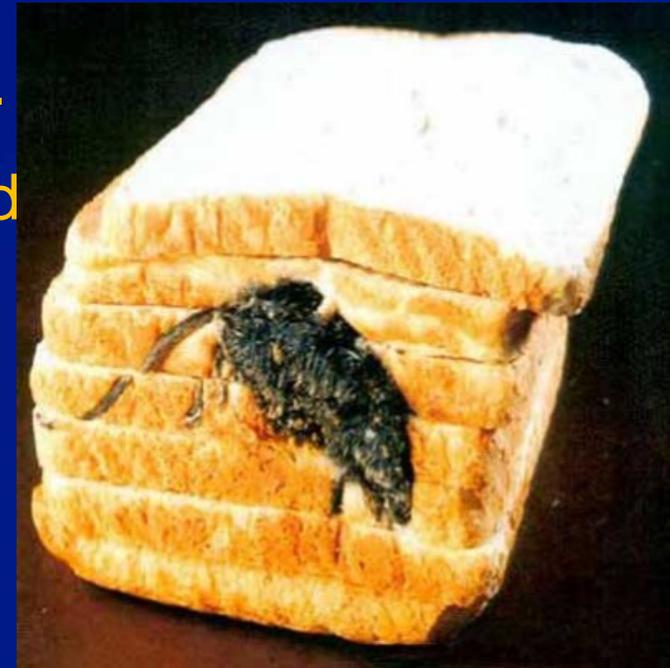
House
Mouse





ECONOMIC IMPORTANCE

- Rats in the human environment cause enormous economic loss
 - Consume and contaminate vast quantities of food
 - Cause fires by gnawing the insulation from electric wires
- Commensal rodents cost billions of dollars each year in the United States.
 - Internal destruction to computers and other sensitive equipment
 - Structural damage to homes and businesses



Human Health Impact



Human Health Impact



RODENT-BORNE DISEASES

- Rats and mice spread diseases in two distinct ways.
 - Directly - by contamination of food, water and air with their urine and feces
 - Indirectly – by way of rodent fleas, ticks and mites

Direct

- Rat bite fever
- Salmonellosis
- Leptospirosis
- Hantavirus

Indirect

- Plague
- Murine typhus
- Scrub typhus
- Tularemia

Bed Bugs

- Resurgence of a pest health departments have not dealt with in over 50



Why are they back?

- q Greater international and domestic travel
- q Lack of knowledge regarding control of bed bugs due to their prolonged absence
- q Increased resistance to available pesticides
- q The continuing decline or elimination of effective vector/pest control programs at state and local public health agencies

Photo courtesy of Dr. Harold Harlan, Armed Forces Pest Management Board Image Library (<http://www.afpmb.org>)





Photo courtesy of Dr. Harold Harlan
Armed Forces Pest Management Board



Courtesy: Jody Gangloff-Kaufmann, Allison Taisey
New York State IPM Program



2012 NPMA Bed Bug Survey

	<u>2010</u>	<u>2011</u>	<u>2012</u>
College dorms	35	54	47
Hotels/motels	67	80	75
Nursing homes	25	46	46
Office buildings	18	38	36
Schools /day care centers	10	36	41
Hospitals	12	31	33
Transportation (train/bus/taxi)	9	18	21
Movie theaters	5	17	10

- Survey respondents continue to treat bed bugs in retail stores, laundromats, libraries, restaurants and airplanes.

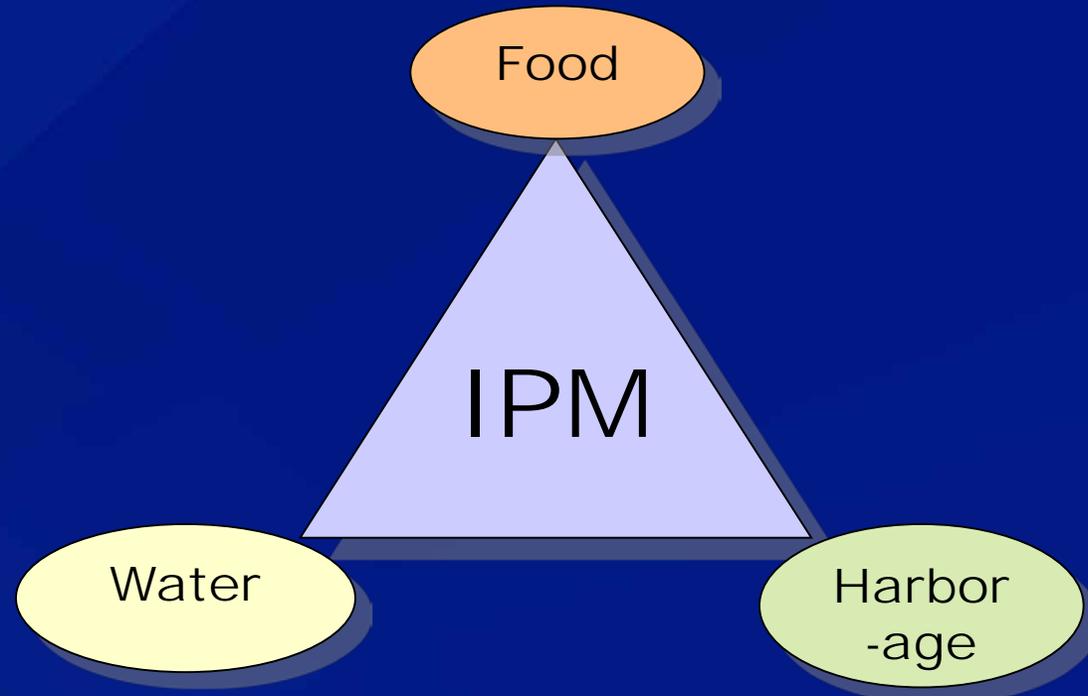
Integrated Pest Management

Integrated Pest Management (IPM) is the coordinated use of pest and environmental information with available pest control methods to prevent unacceptable levels of pest damage by the most economical means and with the least possible hazard to people, property, and the environment.

IPM

- Food
- Harborage
- Water

- Life Cycle



CONTROLLING MOSQUITOES

Understanding the Mosquito Life-Cycle

Eggs



Larvae



Pupae



Adult



CONTROLLING MOSQUITOES

Understanding Mosquito Breeding

Habitats



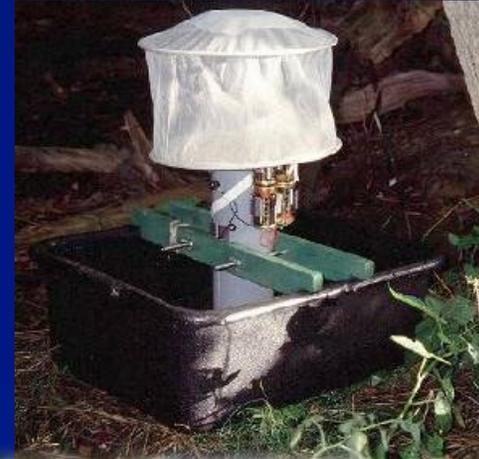
CONTROLLING MOSQUITOES

Understanding Mosquito Breeding Habitats



CONTROLLING MOSQUITOES

Monitoring and Surveillance



CONTROLLING MOSQUITOES

Source



CONTROLLING MOSQUITOES

Adulticide



CONTROLLING MOSQUITOES

ULV

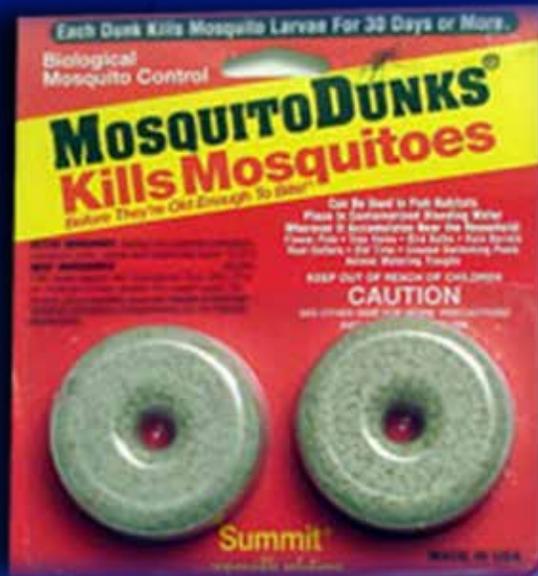


Mist Blowers



CONTROLLING MOSQUITOES

Larvicides



Oils

- Suffocation – mechanical barrier at surface
- Poisoning due to toxic properties of the volatiles

CONTROLLING MOSQUITOES

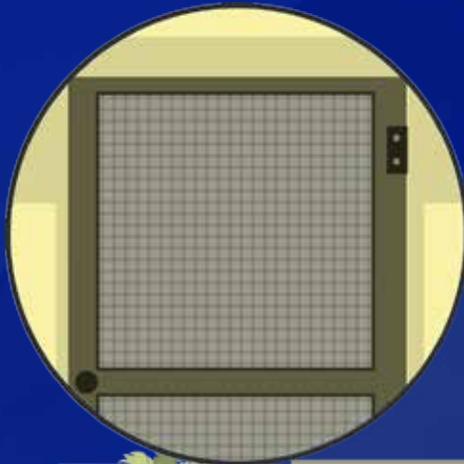
Larvicides



CONTROLLING MOSQUITOES

Preventing Mosquito Bites

Keep Mosquitoes Outside



CONTROLLING MOSQUITOES

Preventing Mosquito Bites

Cover Up



CONTROLLING MOSQUITOES

Preventing Mosquito Bites

Use Repellent

- Use Environmental Protection Agency (EPA)-registered insect repellents.
 - DEET, picaridin, IR535, or oil of lemon eucalyptus or para-menthane-diol



CONTROLLING MOSQUITOES

Preventing Mosquito Bites

Use Repellent

For babies and children

- Do not apply onto hands, eyes, mouth, and cut or irritated skin.
- Adults: Spray onto your hands and then apply to a child's face.
- Do not use insect repellent on babies younger than 2 months old.



Controlling Zika Infection



CONTROLLING TICKS

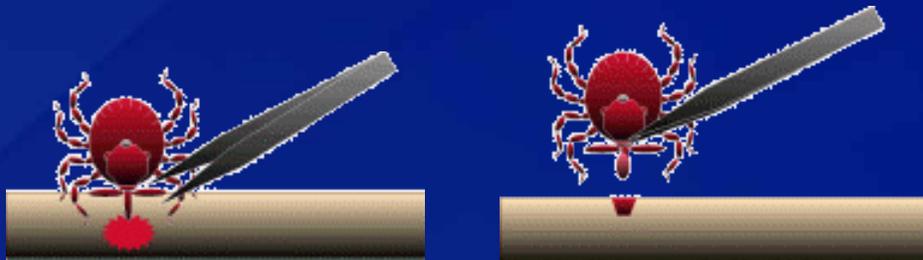
Preventing Tick Bites

- Repellents
 - EPA-Approved Products
 - DEET, Picaridin, Oil of Eucalyptus
- Clothing Applications
 - Permethrin
- Tick-Checks
 - Light-colored clothing



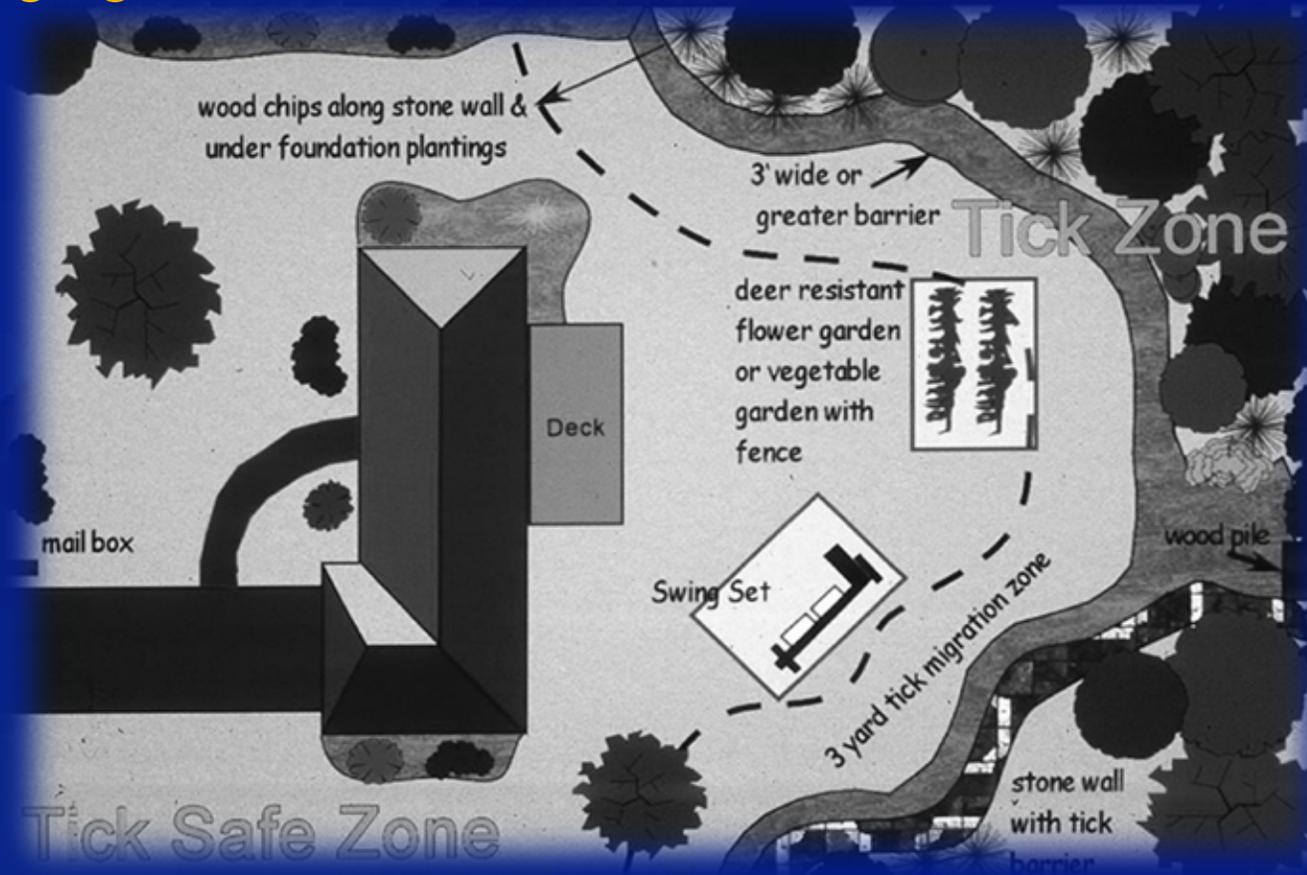
CONTROLLING TICKS

Removing Ticks



CONTROLLING TICKS

Managing Habitat



CONTROLLING TICKS

Managing Hosts



CONTROLLING RATS

Recognizing the Signs

Gnawing



Rub Marks



CONTROLLING RATS

Recognizing the Signs

Droppings



Sightings, Odors, Sounds



CONTROLLING RATS

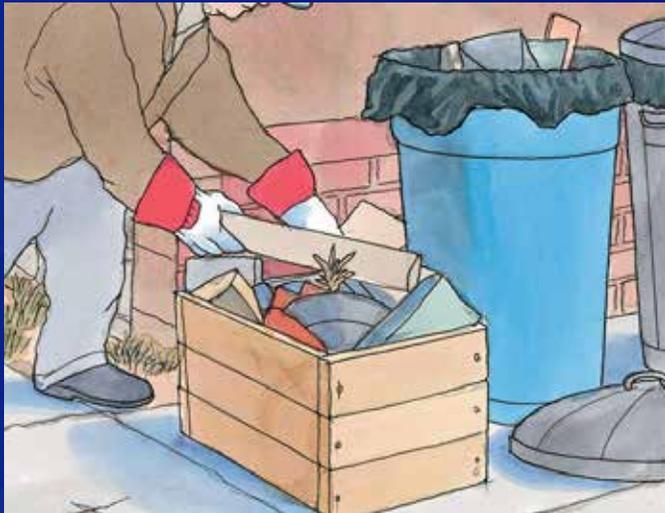
Recognizing the Signs

Burrows



CONTROLLING RATS

- Remove Harborage – No Place to Live!
 - Clean-Up
 - Sanitation



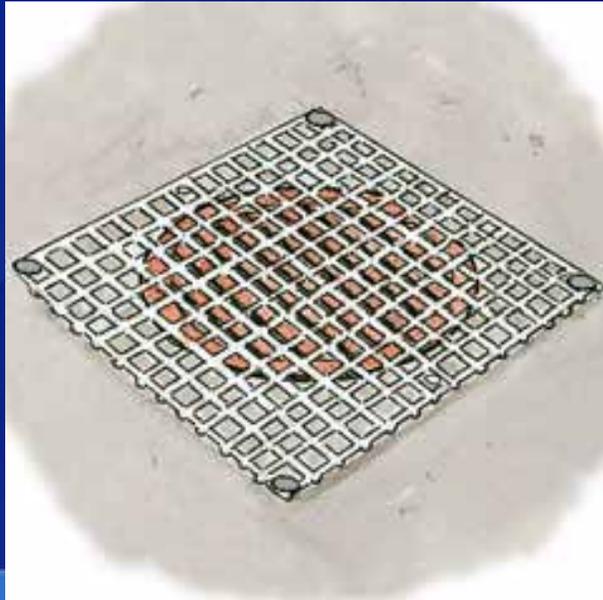
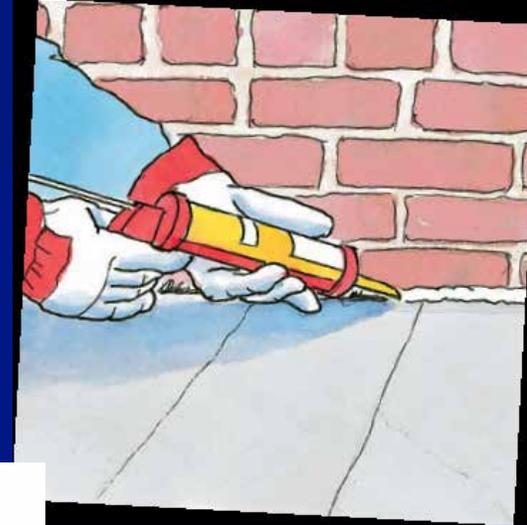
CONTROLLING RATS

- Eliminate Food and Water – Starve Them!



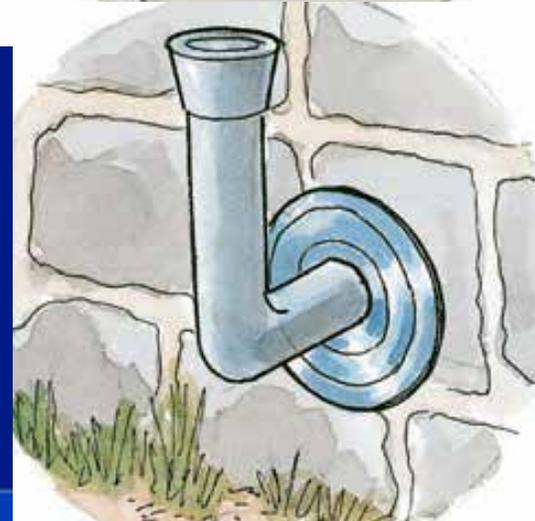
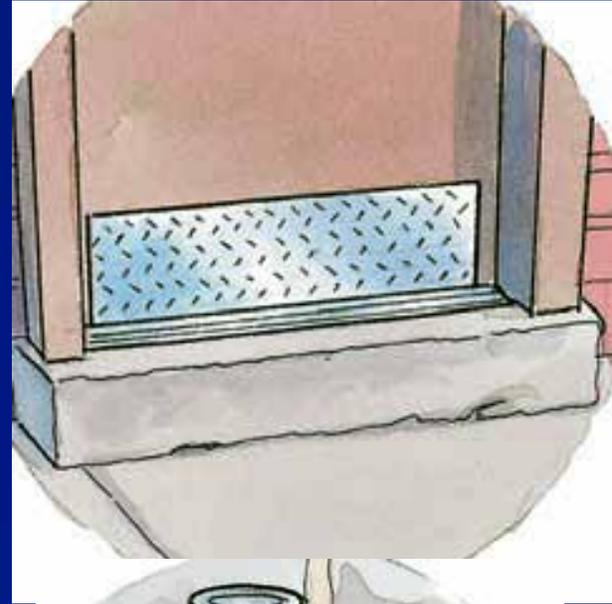
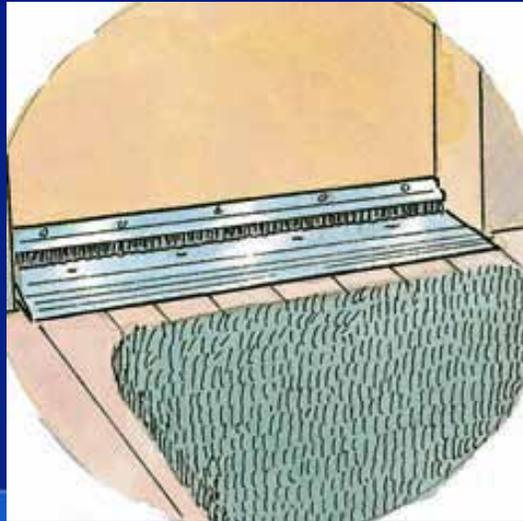
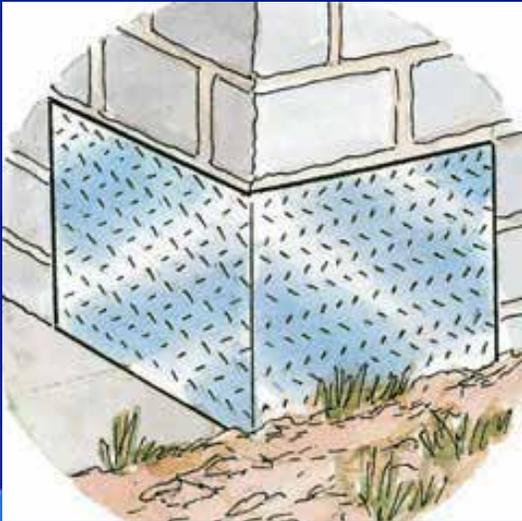
CONTROLLING RATS

- Prevent Entry
– Keep Them Out!



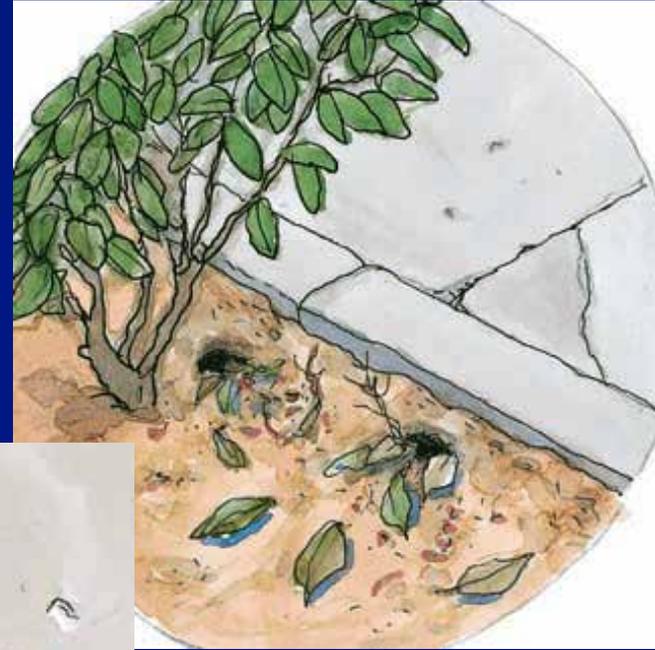
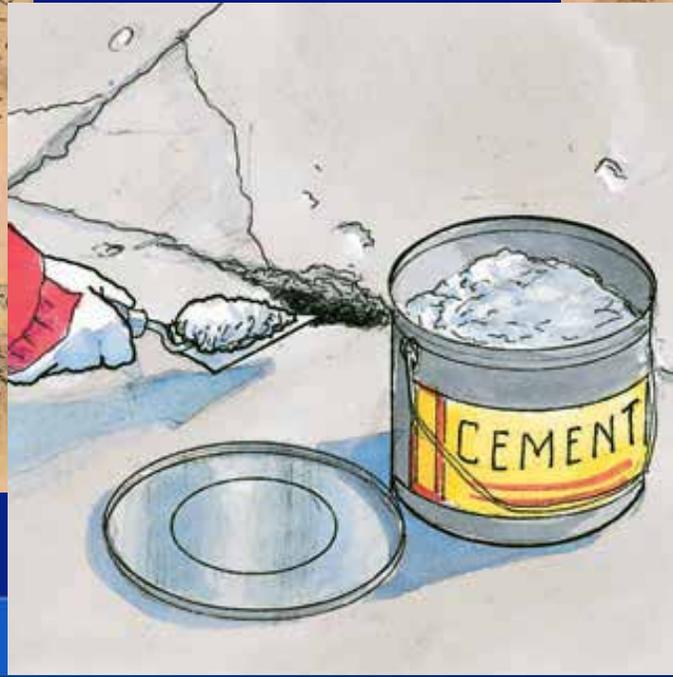
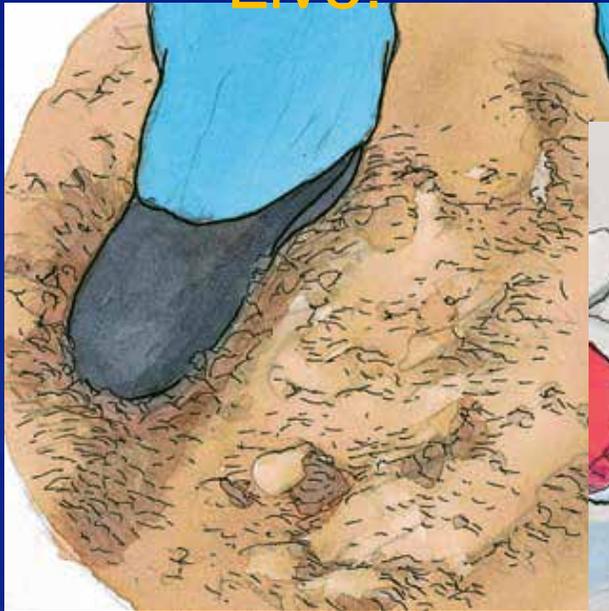
CONTROLLING RATS

- Prevent Entry
– Keep Them Out!



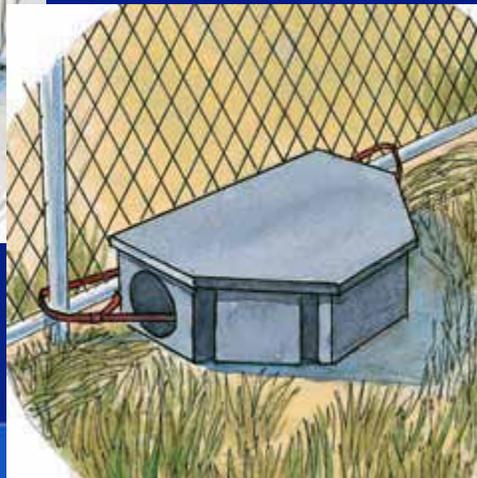
CONTROLLING RATS

- Prevent Entry –
No Place To
Live!



CONTROLLING RATS

- Traps and Bait Stations – Wipe Them Out!



CONTROLLING RATS

- Traps and Bait Stations – Wipe Them



CONTROLLING RATS

- Traps and Bait Stations – Wipe Them Out!



Questions?



FEDERAL AGENCY
PANEL

BRIDGET COYLE

ASSOCIATE DIRECTOR, U.S. EPA REGION 9 –
COMMUNITIES BRANCH, LAND DIVISION



U.S. EPA, REGION 9 VECTOR-BORNE DISEASE WORKSHOP

LAND DIVISION

Communities Branch & Pollution Prevention Branch

Bridget Coyle, Associate Director, Communities Branch

WHAT ROLE DOES YOUR AGENCY PLAY IN VECTOR CONTROL?

- General Assistance Program
 - Education and Outreach
 - Illegal Dump Clean-Up and Closure
 - Development of planning documents
- Zero Waste Program
 - Technical assistance and support to tribes on solid waste planning and cleanup and closure of dumps

- Pesticides Program
 - Education and Outreach
 - Technical Assistance
 - Pesticide Safety
 - Integrated Pesticide Management Plans
- Toxics Program
 - Children's Health Program
 - Environmental Education – Healthy Schools
- U.S. Mexico Border Program
 - Environmental Health Education
 - *RFP in Spring 2017*

CURRENT EPA EFFORTS:

- Tribal Program
 - Vector-Borne Disease Workshop August 8, 2016
 - General Assistance Program ~ \$700K in FY2017 Funding for:
 - Development and planning for Vector Management Programs
 - Clean-up and Closure of Illegal Dump to lower risk of VBDs
- Zero Waste Program
 - Technical Assistance on Open Dump Closure Forms and implementation
 - Technical Assistance on Integrated Solid Waste Management Plans

- Pesticides Program
 - Technical assistance to tribes
 - Applicator certification
- U.S. Mexico Border Program
 - Environmental Health Symposia
 - September 27 in Mexicali, Baja CA
 - October 14 in Nogales, Sonora

DO YOU HAVE ANY ADVICE FOR TRIBES ON THIS TOPIC?

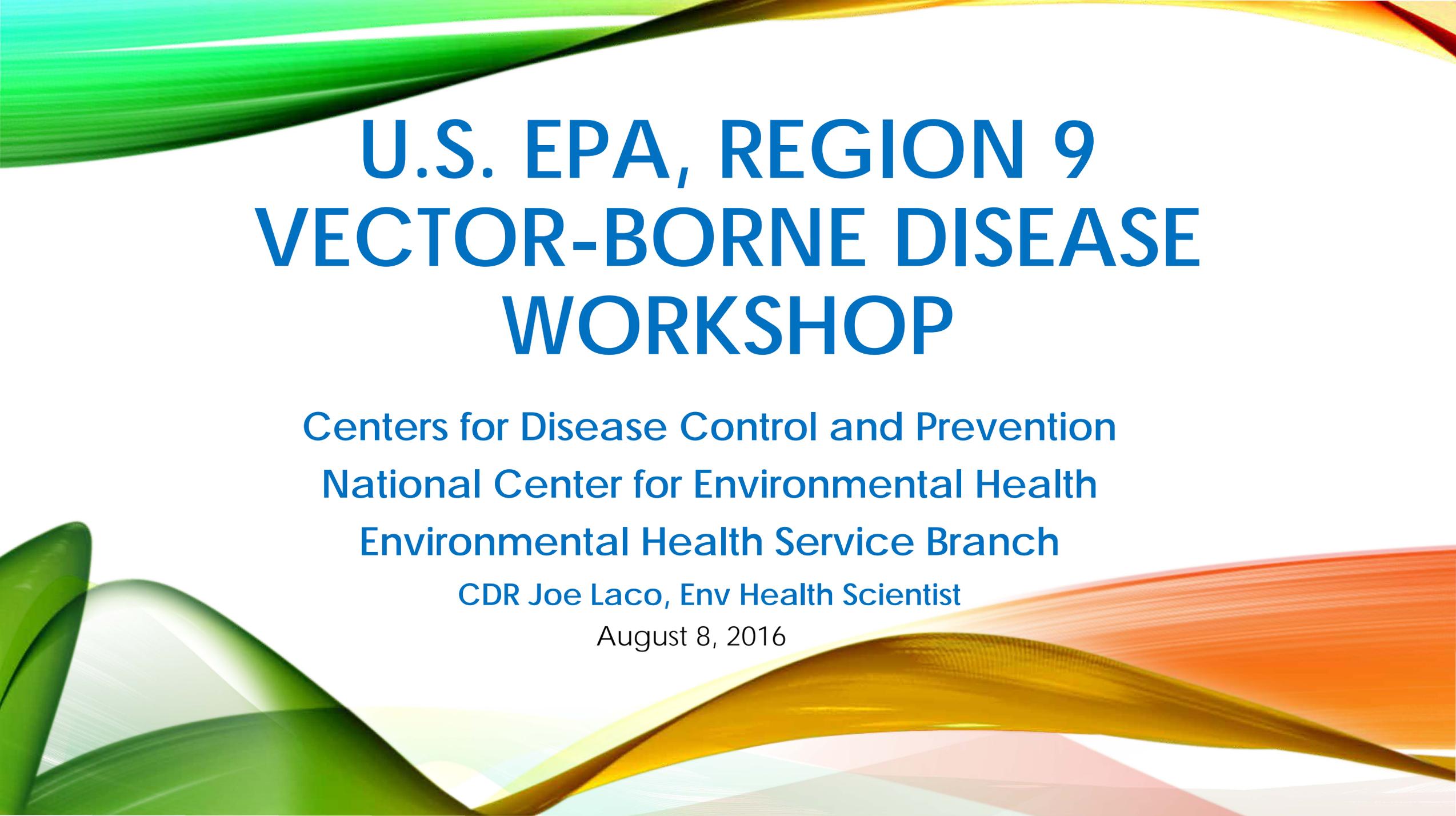
- Become Informed
 - Attend trainings
 - Participate in informational conference calls/webinars
 - Connect with your neighboring jurisdictions' vector and public health programs and find out what they are doing to prepare (*consider borrowing from their texts!*)
- Make a Plan
 - Pest Management Plan
 - Vector-Borne Disease Plan
 - Solid Waste Management Plan
- Inform your communities
 - Outreach to general population, elders, schools, neighboring jurisdictions
- Practice
 - Hold a tabletop exercise with all of your partners – refine and repeat as needed!



QUESTIONS?

JOSEPH LACO

CENTERS FOR DISEASES CONTROL (CDC)



U.S. EPA, REGION 9 VECTOR-BORNE DISEASE WORKSHOP

Centers for Disease Control and Prevention
National Center for Environmental Health
Environmental Health Service Branch

CDR Joe Laco, Env Health Scientist

August 8, 2016

WHAT ROLE DOES YOUR AGENCY PLAY IN VECTOR CONTROL?

Outbreak and Emergency Response

- NCEZID
 - Division of Vector-Borne Diseases
 - Arboviral Disease Branch
 - Bacterial Diseases Branch
 - Dengue Branch
 - Rickettsial Zoonoses Branch
 - Epidemiology
- CDC Emergency Operation Center
 - Response Logistics and Resources
 - SMEs

Support

- Laboratory
 - Biological
 - Chemical
 - Toxicology
- NCEH
 - Technical Support
 - Environmental Health Expertise
 - Medical Toxicology
- Partnerships
 - Tribal Nations, IHS, NAACHO, ASTHO, EPA, NEHA

ARE YOU CURRENTLY WORKING WITH TRIBES ON THIS TOPIC?

Outbreak and Emergency Response

- NCEZID
 - RMFS
 - CHIK
 - Dengue
- Office of State, Tribal, Local and Territorial Support
 - Project Funding and Research
- CDC EOC
 - Zika

Support

- NCEH
 - Technical Assistance
 - IPM Training
 - 3-Day Course
 - AZ, OK, AK
- ATSDR
 - Tribal Environmental Initiatives

WHAT RESOURCES ARE AVAILABLE?

CDC

- www.cdc.gov
 - CDC A-Z Index
 - Communication Tools
 - Materials for:
 - Providers
 - Parents
 - Churches
 - Daycares
 - Housing/Lodging
 - Infographics and Posters
 - Information, Education, Articles, Links
 - Disease and Vector Info
 - PREVENTION

NCEH

- Environmental Health Services Branch
 - EH Workforce Development/Training
 - [VCEHP Online Course](#)
 - Prevention Tools
 - IPM
 - Technical Support and Guidance
 - Needs/Gaps Identification
- NEHA
 - Tools/Resources/Training

DO YOU HAVE ANY ADVICE FOR TRIBES ON THIS TOPIC?

Understanding Vectors

- Biology and Ecology
 - What/When/Where
- Complete Life Cycles
- Vector Identification

- Monitoring and Surveillance
 - What is Truly There?
 - What Are the True Risks?

Education and Outreach

- Community Members
- Schools
- Healthcare Providers

- Communication Tools

- Prevent Exposures
 - IPM
 - Break the Cycle (Life Cycle)



QUESTIONS?

CAPTAIN KENNY HICKS
AND VINCENT GARCIA

PHOENIX AREA INDIAN HEALTH SERVICES

U.S Department of Health & Human Services
Phoenix Area Indian Health Service
Office of Environmental Health & Engineering

U.S. EPA, Region 9 Vector-borne Disease Workshop



Division of Environmental Health Services

CAPT Kenny Hicks, Director, Division of Environmental Health Services

CDR Vincent Slayton-Garcia, District Environmental Health Officer, Western AZ District

WHAT ROLE DOES YOUR AGENCY PLAY IN VECTOR CONTROL?

Public Health Advisor

- Facilitator
- Field Support
- Risk Communication
- Health Education
- Resource Manager



Environmental Health Services

• *Healthy Environments – Healthy People* •

ARE YOU CURRENTLY WORKING WITH TRIBES ON THIS TOPIC?

- **Arbovirus Surveillance**
 - Mosquito testing (WNV, SLE, Dengue, Chik, Zika)
 - Cross-training
- **Capacity Building**
 - Workforce development
 - Partnership building
- **Disease Monitoring**
 - Statewide health alerts
 - Healthcare facility notifications
- **Public Health Outreach**
 - Community presentations
 - Fact sheets and flyers
 - Press releases and PSAs



WHAT RESOURCES ARE AVAILABLE?

- **Internal**
 - Funding for field testing
 - Personnel
 - Projects (emergency funding)
- **External**
 - Federal, State, County, non-Gov Orgs and Tribal partners
 - CDC, HUD
 - ADHS
 - County Health Departments
 - Tribal Environmental Protection Offices
 - Universities
 - Bayer Corp.





DO YOU HAVE ANY ADVICE FOR TRIBES ON THIS TOPIC?

- Stay informed
- Be involved
- Identify partners
- Maintain existing partnerships
- Anticipate challenges (sustainability)



Environmental Health Services

• *Healthy Environments – Healthy People* •



Questions ?



Environmental Health Services

• *Healthy Environments = Healthy People* •



IHS DEHS

12300 Twinbrook Parkway, Ste. 610 Rockville, MD 20852
301-443-1054 <http://www.dehs.ihs.gov>

Aberdeen Area/DEHS
115 4th Avenue S.E.
Aberdeen, SD 57401
Ph. (605) 226 7597

Billings Area/OEHE
2900 4th Avenue North
Billings, MT 59101
Ph. (406) 247 7098

Oklahoma City Area/DEHS
701 Market Drive
Oklahoma City, OK 73114
Ph. (405) 951 3852

Alaska Area/OEHE
4141 Ambassador Drive
Suite 300
Anchorage, AK 99508
Ph. (907) 729 3501

California Area/DEHS
650 Capitol Mall
Suite 7 100
Sacramento, CA 95814
Ph. (916) 930 3945, ext. 336

Phoenix Area/DEHS
40 North Central Ave
Suite 720
Phoenix, AZ 85004
Ph. (602) 364 5078

Albuquerque Area/DEHS
5300 Homestead Rd, N.E.
Albuquerque, NM 87110
Ph. (505) 248 4947

Nashville Area/DEHS
711 Stewarts Ferry Pike
Nashville, TN 37214
Ph. (615) 467 1622

Portland Area/DEHS
1414 NW Northrup St
Suite 800
Portland, OR 97209
Ph. (503) 414 7774

Bemidji Area/EHSS
522 Minnesota Ave, N.W.
Bemidji, MN 56601
Ph. (218) 444 0503

Navajo Area/DEHS
P.O. Box 9020
Window Rock, AZ 86515
Ph. (928) 871 5807

Tucson Area/EHSB
7900 South J Stock Road
Tucson, AZ 85746 7012
Ph. (520) 295 5629



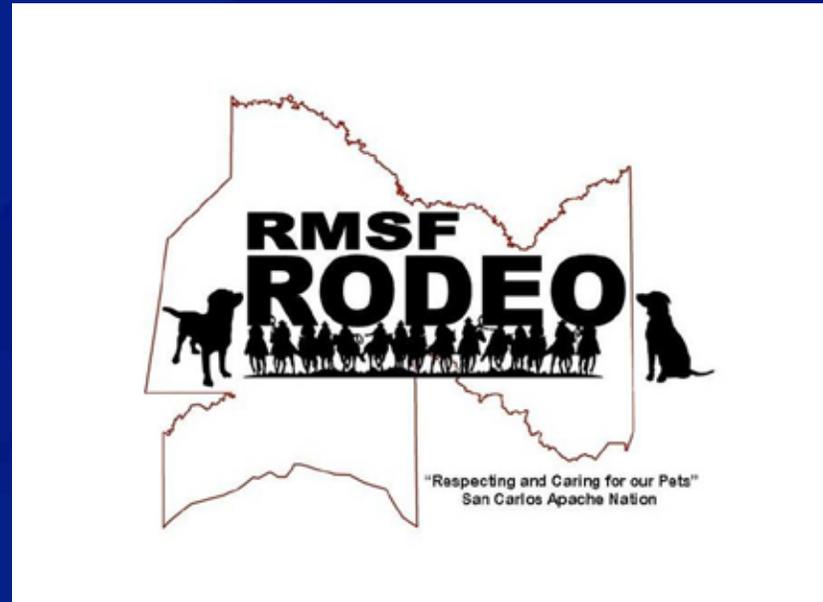
Environmental Health Services

• Healthy Environments – Healthy People •

EPI CASE STUDIES & BEST PRACTICES

Paul Mesa, Tohono O'odham Nation, Naomi Drexler, CDC,
Captain Kenny Hicks & Vincent Garcia, IHS, Dr. Kerry Padgett

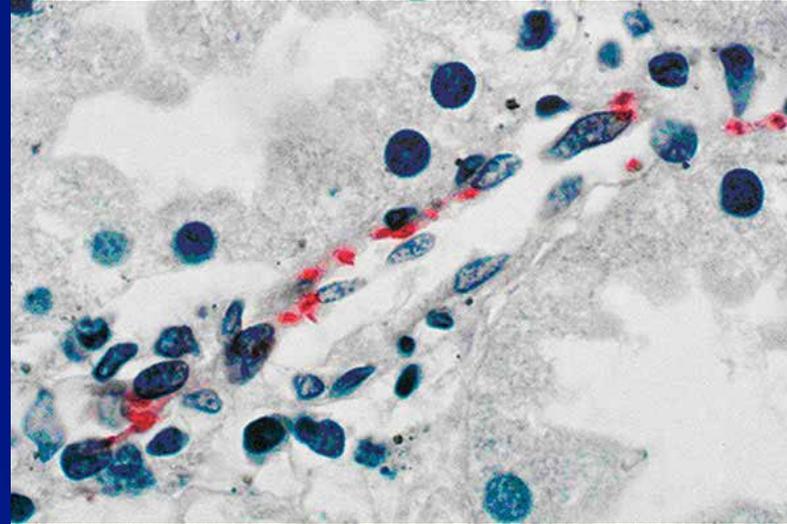
RMSF Rodeo: Field Trials and Lessons Learned



Naomi Drexler, MPH
Rickettsial Zoonoses Branch
Centers for Disease Control and Prevention

Rocky Mountain spotted fever

- q *Rickettsia rickettsii*: tickborne bacterium
- q Causes widespread vascular damage and multi-system organ failure
- q Rapidly fatal, yet difficult to diagnose



RMSF in Arizona

- q Epidemic RMSF: Incidence approximately **150** times the national average
- q High mortality, especially among children < 10 years
- q Cases occur year-round
- q Spread by *Rhipicephalus sanguineus* (brown dog tick)

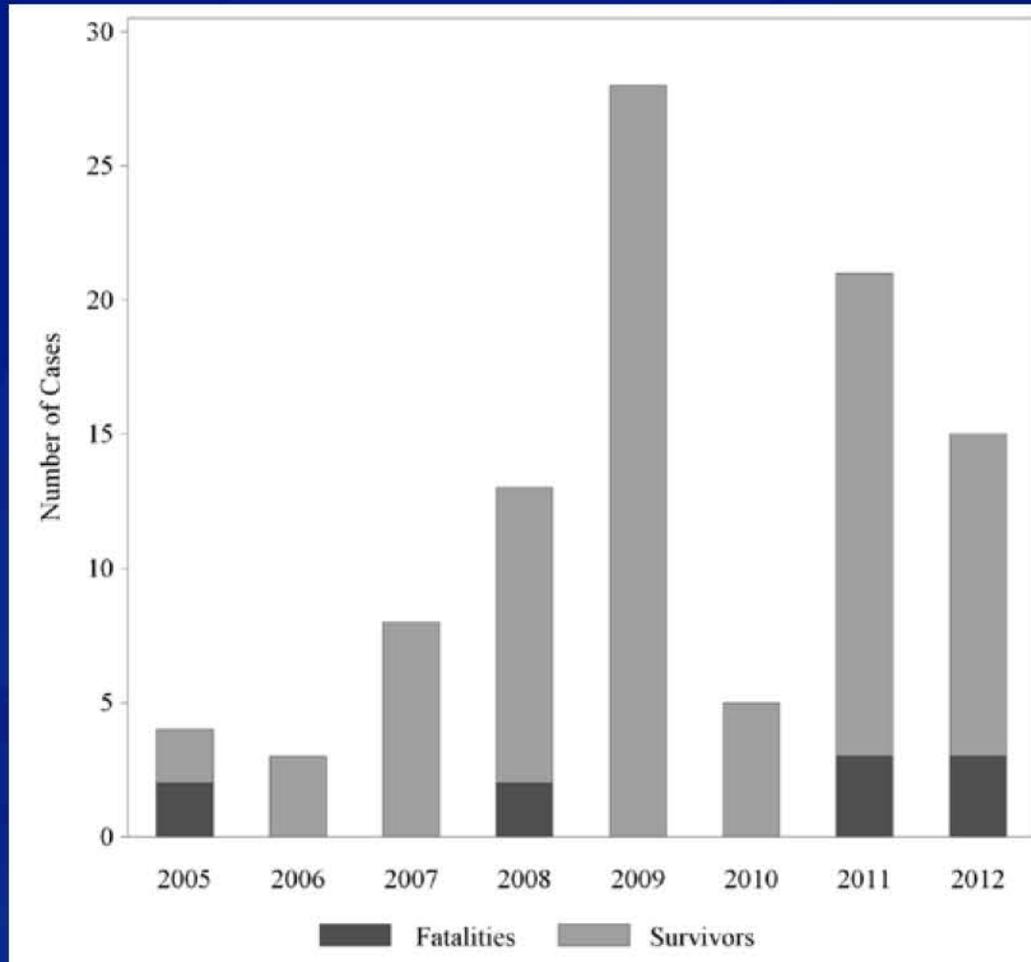


Rhipicephalus sanguineus

- q Global distribution
- q Feeds and breeds on dogs
- q Lives in and around home
- q *R. rickettsii* infected brown dog ticks documented
 - Mexico (1940s)
 - Southwestern USA (2003)
- q High rates of human exposure
 - Children are particularly vulnerable



The San Carlos Situation



- q Total population ~10,000 persons
- q 97 cases and 10 deaths in 8 years
- q 10.3% case- fatality rate

The San Carlos Situation, cont.

q The project area

- 600 households
- Estimated 1,000 dogs (66% free-roaming)
- 2 deaths in Spring, 2012
- No permanent vet services
- Animal control recently established
- Motivated community



The RMSF Rodeo: 2012-2013

- q **Goal: Improve human health by improving the health of dogs**
- q **PHASE I: control**
 - Monthly yard treatments
 - Long-lasting tick collars on all dogs
- q **PHASE II: sustainability**
 - Prove tick control can be maintained with collars alone



The RMSF Rodeo Plan: Properly Timed Pesticide Treatments

Once a Summer



May



June



July



August



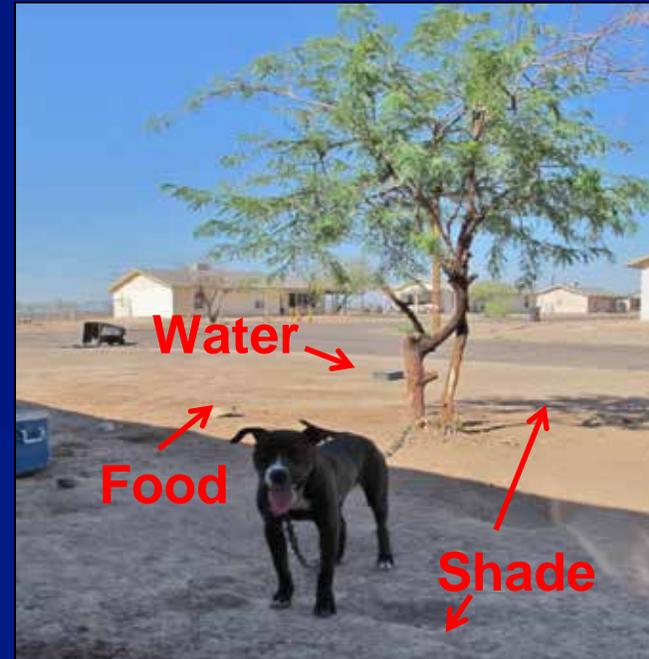
Yard Treatment

- q Bayer Ready To Spray Product
 - Beta cyfluthrin spray
- q 3 Gallon Sprayers
 - Spray around the house
 - Spray dog areas
- q ATVs



The RMSF Rodeo Plan: Improve Dog Health

- q Place a long-acting tick collar on every dog in a community
- q Encourage spay/neuter for population control
- q Identify and remove strays
- q Improved care and ownership
 - Tag, collar
 - Restrain pets (via fence or tether)

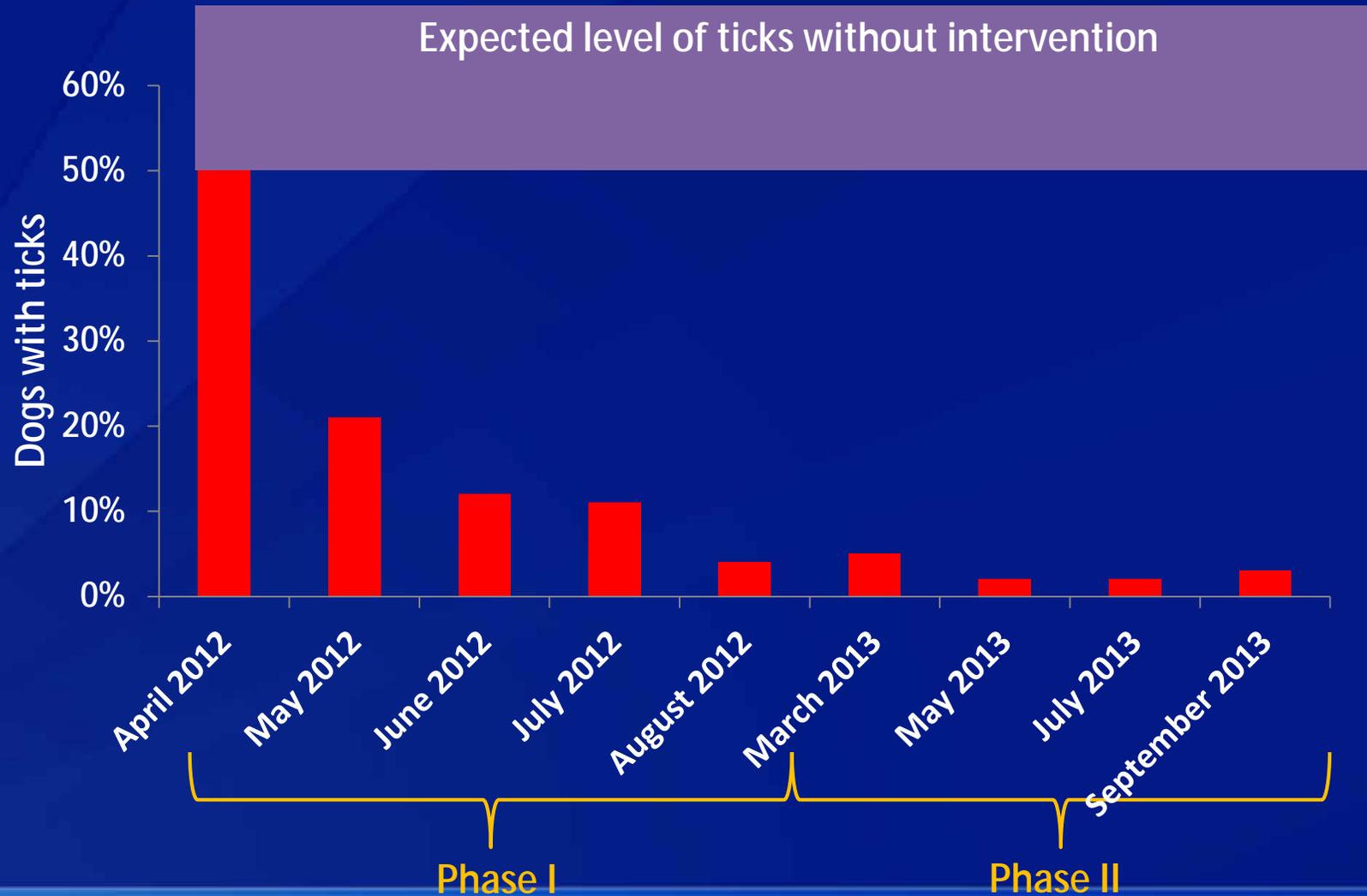


Long-acting Tick Collars

- q **Seresto ®**
 - 4.5% Flumethrin, 10% imidacloprid
 - Visible marker of treatment
 - 8 months of efficacy
- q **Other tick control products may be used**
 - Consider how often they need to be reapplied



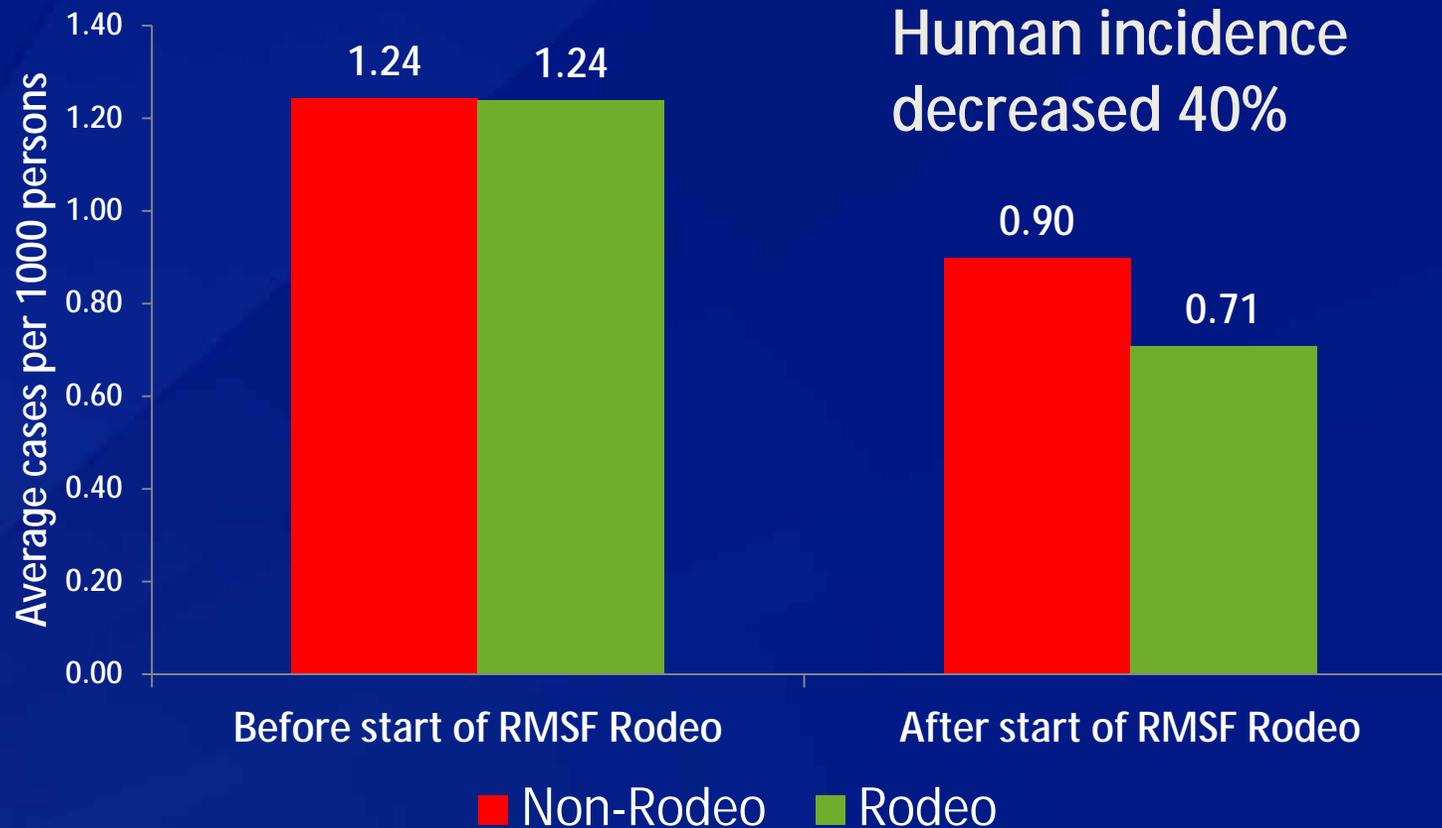
RMSF Rodeo Results: Tick Counts on Dogs



RMSF Rodeo Results: Environmental Burden

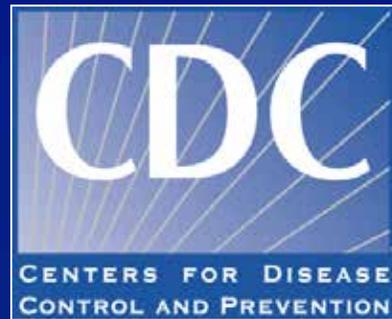


RMSF Rodeo Results: Human Incidence of *Rickettsia rickettsii*



Includes surveillance data 2 years prior to start of RMSF Rodeo, and 2 years after

RMSF Rodeo Partners



Keys to Effective RMSF Control

- q Controlling Ticks: Treat dogs with tick collars, and yards with routinely applied pesticides
- q Maintaining Low Levels of Ticks: Once ticks are controlled, maintaining low tick levels with collars alone. Monitor levels and apply pesticide if needed.
- q Improving Pet Health: Introduce regular spay/neuter programs, encourage pet restraint, and identify and remove strays
- q Establishing Programs: Hire staff, purchase permanent equipment



Other Tribal RMSF Prevention Efforts

- q **Tohono O'odham Nation**
- q **Hopi Tribe**
- q **Gila River Indian Community**
- q **Many more...**

Things to Consider

- q **Scope of intervention needed**
 - Total population or targeted approach?
- q **Current resources**
 - Personnel
 - Animal control
 - Monetary
- q **Product selection**
 - Over the counter or restricted use?
 - Water quality or agricultural restrictions?
 - Period of efficacy
 - Cost
- q **Documenting progress**



Addressing Sustainability

- q Affected tribes working to implement prevention programs based on lessons learned in RMSF Rodeo
- q IHS emergency funds awarded to Arizona tribes for RMSF prevention
- q Other public and private grants available
- q The big question: how can long-term vector control programs be funded and managed?

Progress in the Battle Against RMSF on Tribal Lands

- q Arizona tribes are at various stages of implementing RMSF prevention plans and programs
- q Increased awareness and prevention programs have led to:
 - Formation of interdisciplinary RMSF coalitions
 - Nearly 80% reduction in cases since the peak of the epidemic
 - Zero deaths since 2013!

One Health: The Way Forward for RMSF Prevention

- q RMSF is preventable, treatable, and fixable
- q Partnerships between healthcare providers, health departments, environmental health officers, veterinarians, and community members needed to prevent RMSF

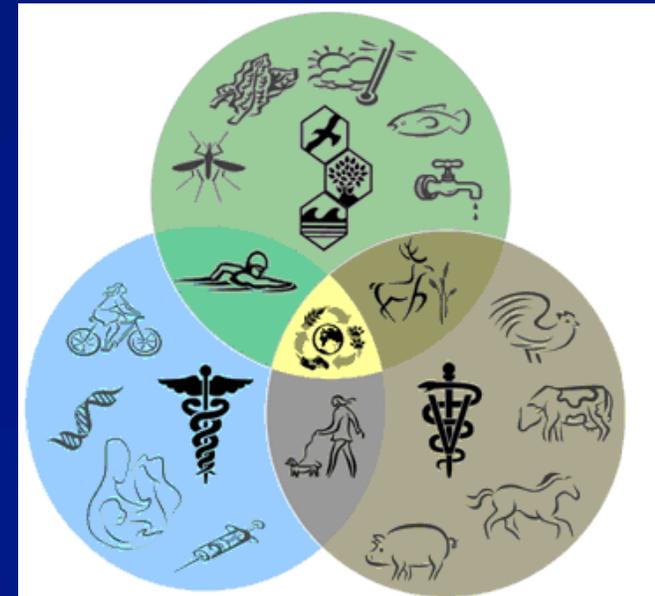


Figure 1. Complex zoonotic disease problems often cannot be solved without partnering with professionals from a number of disciplines to identify the often inter-related human, animal, and environmental risk factors



**For questions
please contact**

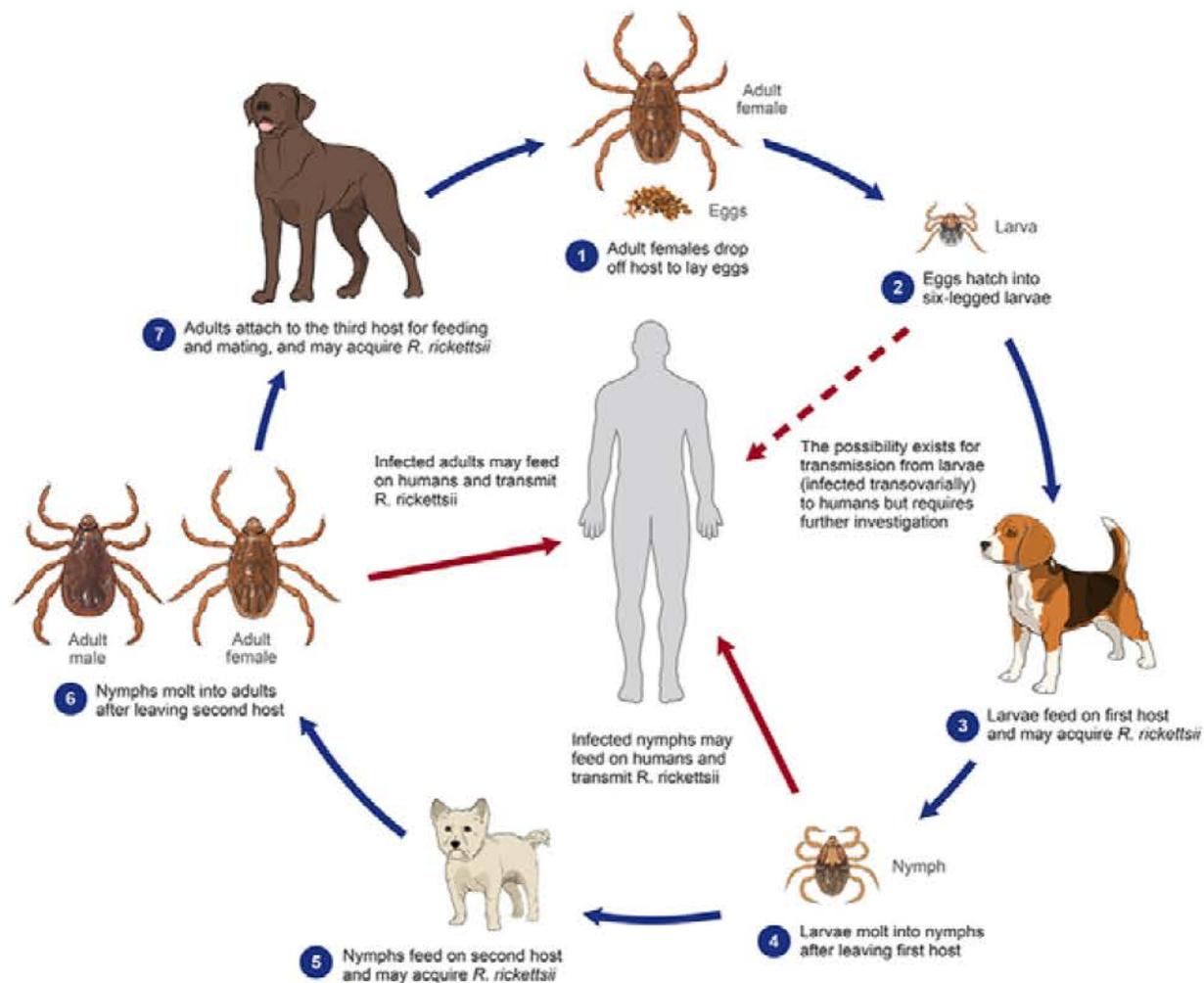
Naomi Drexler
ndrexler@cdc.gov

Rickettsial Zoonoses Branch
Division of Vector-Borne
Diseases, CDC

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention

Reference to specific commercial products, manufacturers, companies, or trademarks do not constitute its endorsement or recommendation by the U.S. Government, HHS, or Centers for Disease Control and Prevention.

Life cycle of *Rhipicephalus sanguineus* and the transmission of *Rickettsia rickettsii* (the causative agent of Rocky Mountain Spotted Fever)



Images are not drawn to scale. *R. sanguineus* can maintain *R. rickettsii* between life stages. Humans, as well as dogs, may become infected when bitten by a tick infected with *R. rickettsii*.



Estimated 5 Year Control Costs, Arizona

Tribe	Estimated number of Households	Estimated Outside Funding	Estimated Tribal Funding
Reservation 1	3,000	\$1,768,415	\$600,000
Reservation 2	2,000	\$1,430,915	\$600,000
Reservation 4	3,000	\$1,768,415	\$600,000
Reservation 5	2,000	\$1,430,915	\$600,000
Reservation 6	46,000	\$16,752,115	\$1,200,000
Reservation 3	3,000	\$1,768,415	\$600,000
State RMSF surveillance and education (for 5 years)		\$375,000	
	SUBTOTAL	\$25,294,190	\$4,200,000

RMSF in Mexico

- q Mid-1940s: Sinaloa, Sonora, Durango, and Coahuila
- q Case-fatality rates as high as 80%
- q Re-emergence of disease in early 2000s particularly states bordering the USA
- q Cases occur in impoverished communities with free-roaming dogs



Different country, same ecology



RMSF Prevention in Sonora

- q 2016 pilot project in highly affected community
- q 40% deaths from 2010-2014 occurred within 10 block radius
- q Modelled after RMSF Rodeo in San Carlos
 - q Seresto collars
 - q Routine pesticide
 - q Education
- q 500 household community, 600 dogs



VECTOR CONTROL

Pest Management & Pesticide Safety



Fabiola Estrada
Patti TenBrook
Land Division
US EPA R9

Overview

Integrated Pest Management (IPM)

Pesticides and Safety

IPM and Vector Control

EPA's Response to Zika

Resources

What is IPM?

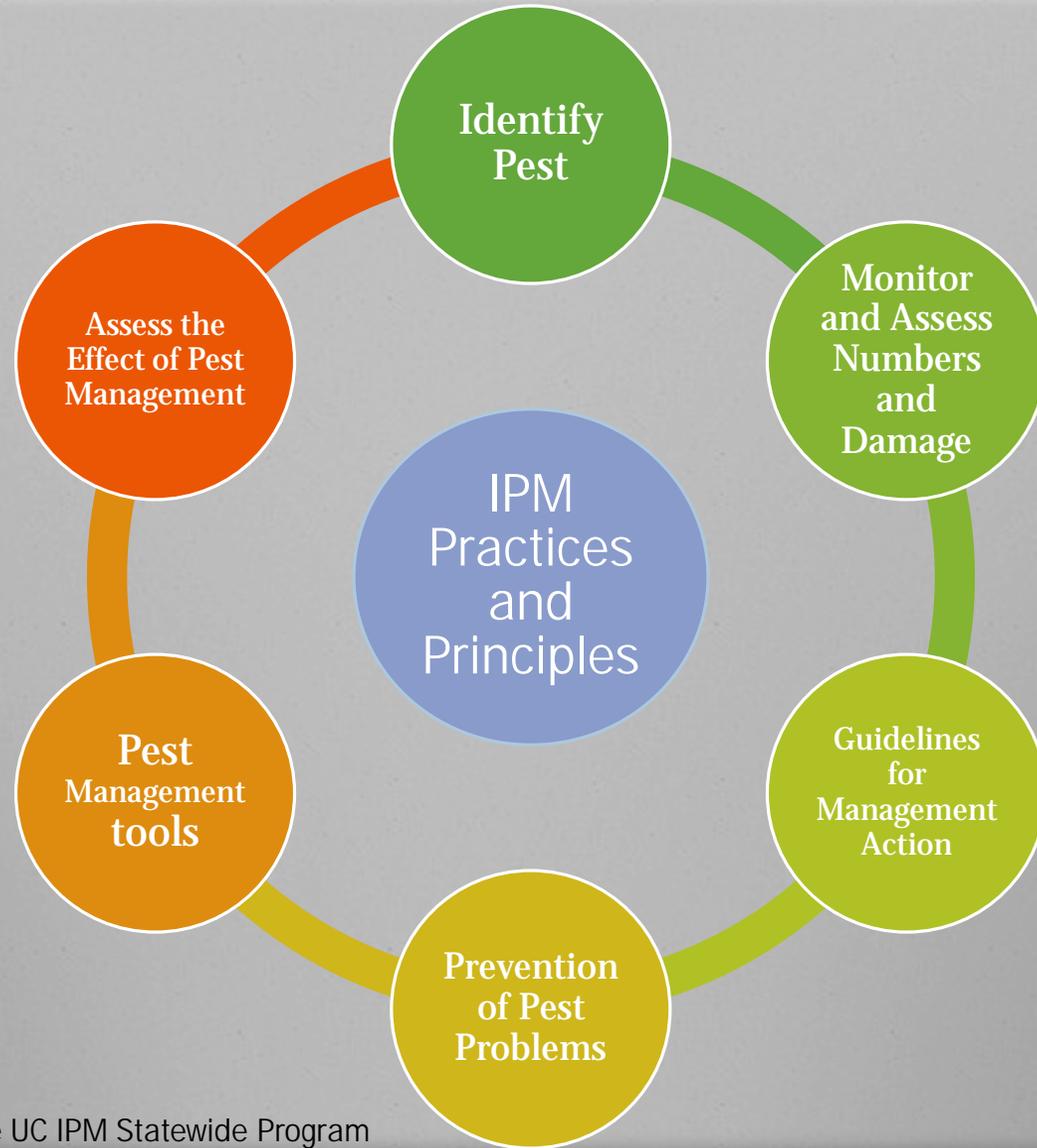
Common-
sense
strategy

Long-term
solutions

Better
understanding
of pests

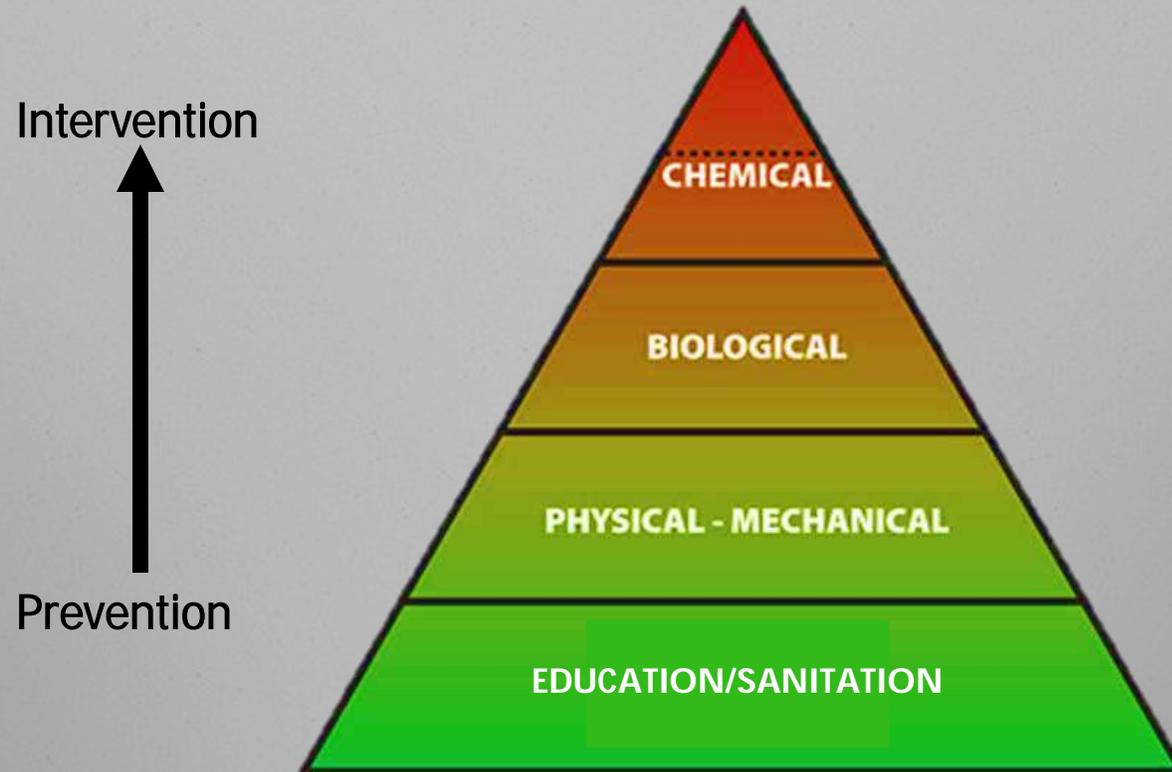
Low impact
on human
health &
the
environment





Adapted from the UC IPM Statewide Program

Integrated Pest Management



What is a Pesticide?

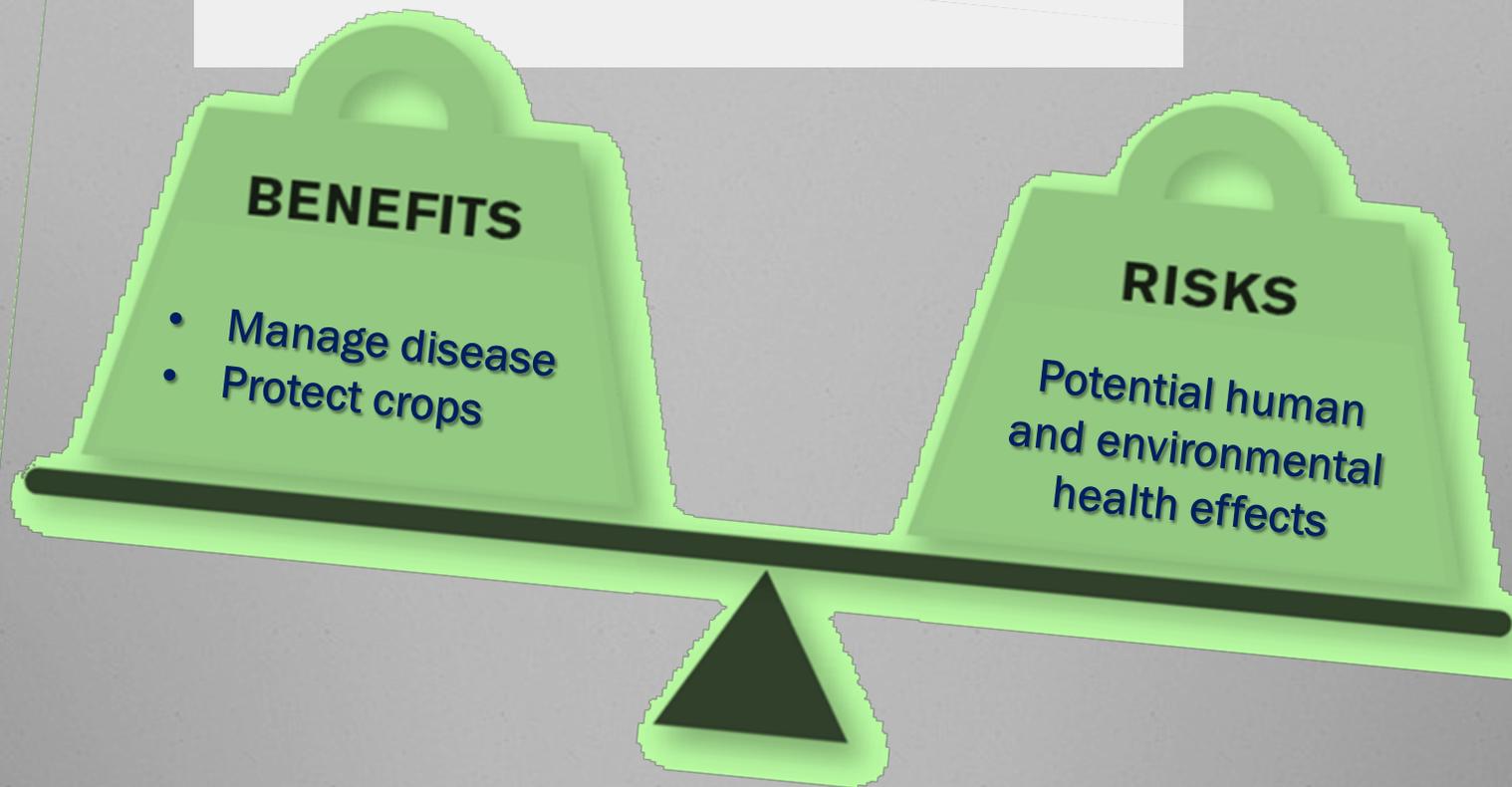


A pesticide is any substance "intended for preventing, destroying, repelling, or mitigating any pest...."

Pesticide Safety

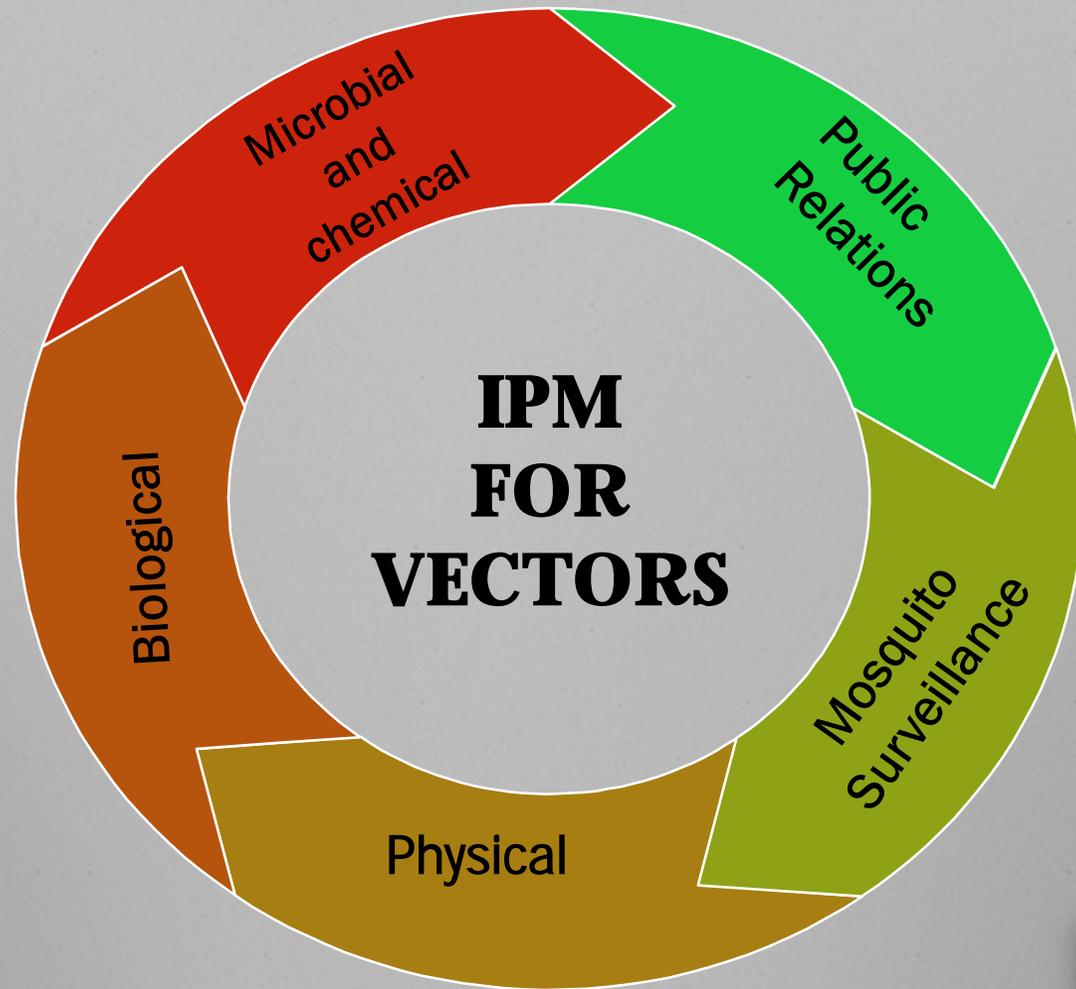


Pesticide Use



Pesticide Risk





Public Information and Education

Protect Yourself and Others

- Long Sleeves/Pants
- EPA-registered Repellents
- Window/Door Screens, Nets, A/C



- Media campaign/coverage.
- Participation in community events.
- A comprehensive school program

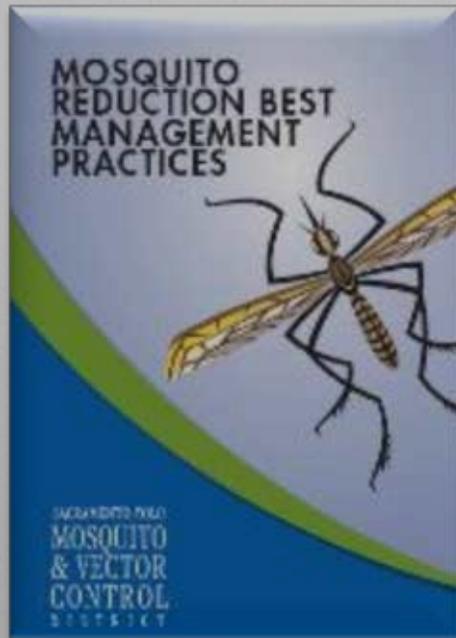


Mosquito Vector Surveillance

Four empty blue rounded rectangular boxes stacked vertically, likely intended for text or images.



Physical Control: Guidelines to Eliminate Mosquito Development Sites



For managed wetlands, stormwater and wastewater systems, swimming pools, cemeteries, and tire storage facilities.

Prevent or eliminate standing water, even very small containers.

Minimize emergent vegetation and surface debris on the water.



Biological



Microbial and Chemical



Bacillus thuringiensis (Bt)



Adulticides



Know Your Pest



Aedes Species

Zika, Chikungunya,
Yellow Fever,
Dengue

Daytime biters

Tropics/Southern US



Tipula genus

Not a Vector



Culex Species

Throughout US

Know Your Pest



EPA's Role in Zika Response

Provide Pest
Management Tools

Tire/Trash Cleanup

Support 

Registered Products
Factsheets

[Insect Repellent](#)
[Search Tool](#)



How much time will you need to be protected from biting insects? ⓘ

Any ▼

Do you need protection from mosquitoes, ticks or both ?

Mosquitoes and ticks ▼



All products work against mosquitoes, and not all against ticks.

You can refine your search by specifying one or more of the following options:

Which product are you interested in?

You can leave blank to get a list of all products which fall under your criteria

Are you interested in a particular active ingredient?

All Ingredients ▼

[https://www.epa.gov/insect-repellents/find-insect-repellent-right-you#search tool](https://www.epa.gov/insect-repellents/find-insect-repellent-right-you#search-tool)

Product Name	Hourly Protection Time for Mosquitoes	Hourly Protection Time for Ticks	Active Ingredient (AI)	AI% in Product Formula	Company Name	EPA Registration Number
Natrapel Sun	1	1	Citronella	4.2	Tender Corp.	1543-14-56575
Bug Block Sunscreen and Insect Repellent (SPF)	1	1	Citronella	4.2	W.F. Young Ince	1543-14
Morpel Outdoor Family Insect Repellent Unscented	2	2	DEET	7	Vertellus Performance Materials, Inc.	51147-23
Family DEET Wipe	2	2	DEET	5.6	S.C. Johnson & Son, Inc.	4822-552
OFF! Lotion	2	2	DEET	7.5	S.C. Johnson	4822-362

RESOURCES

Centers for Disease Control

<http://www.cdc.gov/zika/prevention/index.html>

EPA Fact Sheets for Mosquito Control

<https://www.epa.gov/mosquitocontrol>

California Vector Control Districts

Sacramento-Yolo Mosquito and Vector Control District:

<http://www.fightthebite.net/integrated-pest-management/>

Orange County Mosquito and Vector Control District

<http://www.ocvcd.org/InvasiveMosquitoes.php>

San Joaquin County Mosquito and Vector Control District:

<http://sjmosquito.org/assets/pdf/Integrated-Pest-Management2008.pdf>

RESOURCES

State Contacts for Mosquito/Vector Control

<http://npic.orst.edu/vecmlr.html>

School IPM Webinars

<https://www.epa.gov/managing-pests-schools/webinars-about-integrated-pest-management-schools>

National Pesticide Information Center

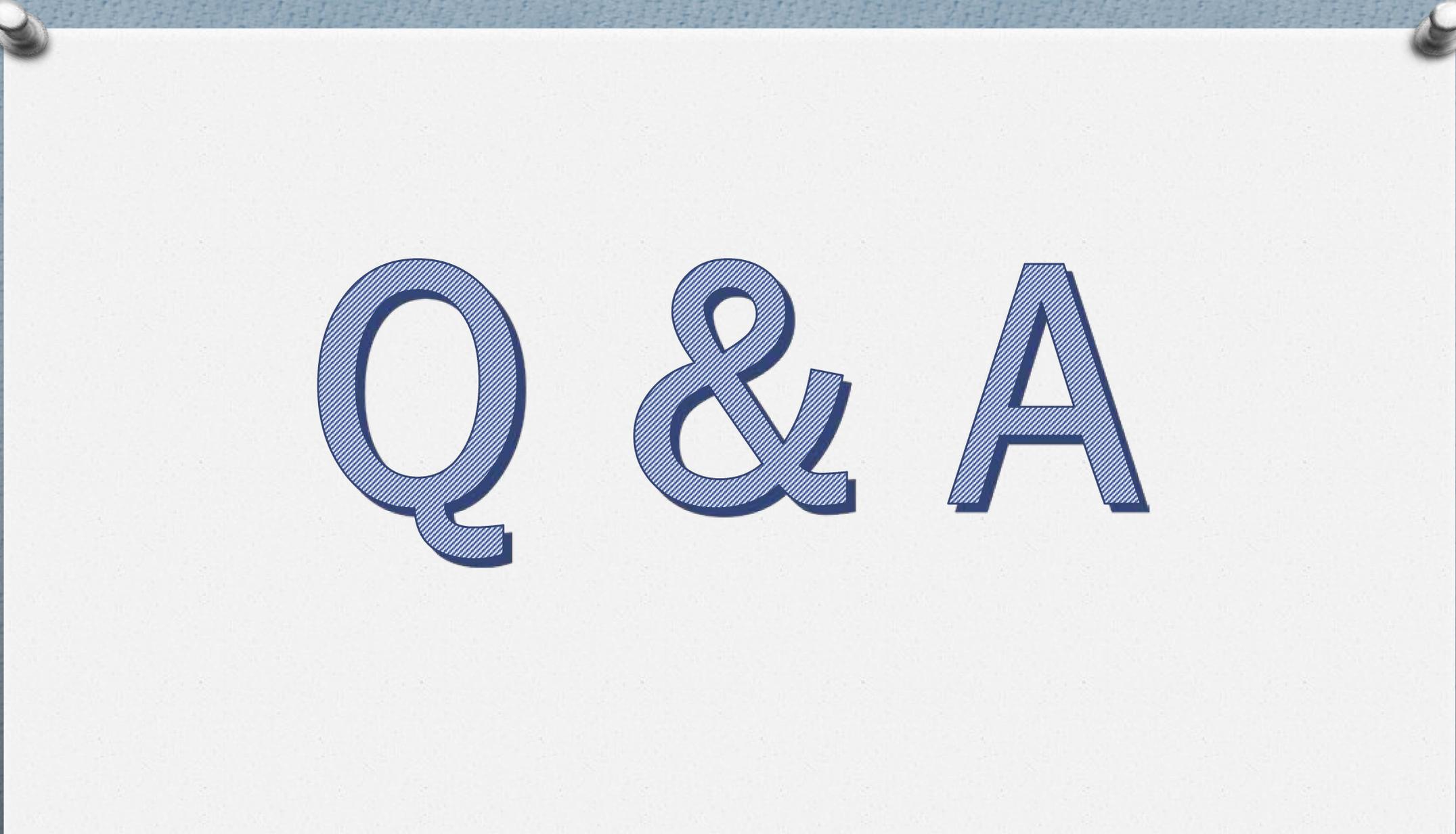
<http://npic.orst.edu>

University of California Statewide IPM Program

<http://ipm.ucanr.edu/>

The University of Arizona Urban IPM– Arizona Cooperative Extension

<http://ag.arizona.edu/urbanipm/>



Q & A



Fabiola Estrada, MS
Project Officer
R9 School IPM Coordinator
Estrada.Fabiola@epa.gov
(415) 972-3493

Patti L. TenBrook, Ph.D.
Manager, Pesticides Section
Land Division, U.S. EPA Region 9
TenBrook.Patti@epa.gov
415-947-4223

SOLID WASTE AND VECTORS

SOLID WASTE AND VECTORS

Tribal solid waste management tools to address vector issues

Deirdre Nurre & Sebastian Beshk

Region 9 Zero Waste Section – Tribal Solid Waste Team

This session will cover:

- How to complete an updated Open Dump Survey Form
- How to provide a plan for outreach and education around a cleanup event to cover vector-borne disease and prevention of future dumping
- How to provide a budget for cleanup by site which may include both cleanup costs and prevention-related costs

1. COMPLETING OPEN DUMP SURVEY FORMS

-- and how to include vector-borne disease analysis

How are survey forms used?

- Developing site universe information
- SDS and OMDS Lists
- Site-specific review by EPA HQ for GAP funding

Open Dump Survey Form

OPEN DUMP SURVEY FORM

Refer to OMDS field guide for definitions of terms

Version 12/05/2012

Site Name:	<input type="text"/>		
Community:	<input type="text"/>	Tribe:	<input type="text"/>
Site Status:	<input type="radio"/> Active (Open dump that is in use); <input type="radio"/> Inactive (Open dump that is no longer in use)		
Latitude: N	<input type="text"/>	(Decimal degrees format)	
Longitude W	<input type="text"/>	(Decimal degrees format)	
Land Status:	<input type="radio"/> Private <input type="radio"/> Trust (Individual) <input type="radio"/> Trust (Tribal) <input type="radio"/> Allotted <input type="radio"/> Fee		
Date Site was Surveyed: (MM/DD/YY):	<input type="text"/>		
<i>When Applicable - Date Site</i>	<input type="radio"/> <i>Cleaned-Up</i> , or <input type="radio"/> <i>Closed: (check one)</i> (MM/DD/YY) <input type="text"/>		
<i>Note: Site cleaned-up indicates waste was removed and site is no longer used as a dump.</i>			
<i>Site closed indicates waste was left in place, properly covered and site is no longer used as a dump.</i>			

Open Dump Survey: Estimate Site Size

HQ approach

Area of a football field...?

Site Characteristics

1. **Surface Area (Acres)**
 # of Acres (1ac. ~ 90% football field)
2. **Surface Volume (Cubic Yards) (1yd ~ pickup bed)**
 # of Yd³



Google



Search Google Earth Help

Earth Help

Measure area, distance, and elevation

Measure distances and areas in Google Earth

Use lines and shapes to check distances and estimate sizes of different features on Earth.

Find out what you can measure

In computer versions of Google Earth & Earth Pro, you can measure the length of the ground with a line or path.

In Earth Pro, you can also measure:

- Circumferences using circles
- Other areas using polygons
- 3D buildings

Take a measurement

1. Open Google Earth.
2. [Navigate to a spot on the globe](#) .
3. In the menu bar, click **Tools>Ruler**. A box will appear.
4. In the bottom left corner of the Ruler box, make sure that **Mouse Navigation** is checked.
5. Click the tab for what you want to measure:

Find latitude/longitude

- What do you want to find? If you know roughly where your dump is, use Google Earth to find the site.
- Zero in on tribe location, then use roads and natural features to find where you want to be.
- Example: an unauthorized landfill site



Use the pushpin in the tool bar to set a location, then ---



-- in lower right hand screen you find latitude & longitude



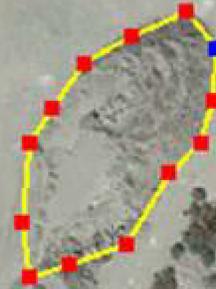
Use the polygon function in the toolbar to draw the area around the site – the finished shaped will calculate the area for you (next slide)



33.549722, -116.113055



Pierce St



Ruler ⊗

Line Path Polygon Circle 3D path 3D ◀ ▶

Measure the distance or area of a geometric shape on the ground

Perimeter: 0.11 Miles ▼

Area: 0.51 Acres ▼

Mouse Navigation Save Clear

More uses for GoogleEarth

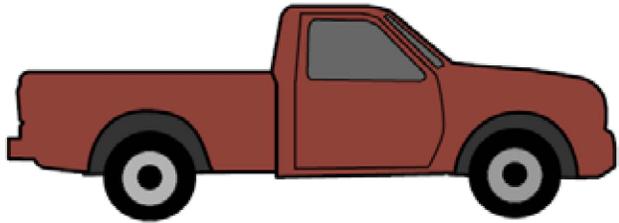
- Allows you to send photos of your site along with your site descriptions
- Allows you to go 'back in time' and view earlier photos of your site to show how site may have changed (although photos are updated with different frequency depending upon your area)

Open Dump Survey: Methods to Estimate Site Volume

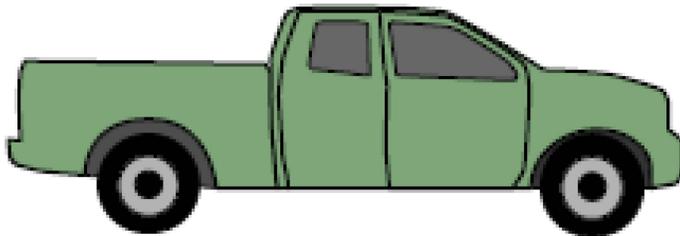
- Provide information in cubic yards
- A cubic yard can be estimated
- What about the volume of material you're dealing with? Various online resources can help you estimate a number.

Resources available to estimate volume based on truck bed size:

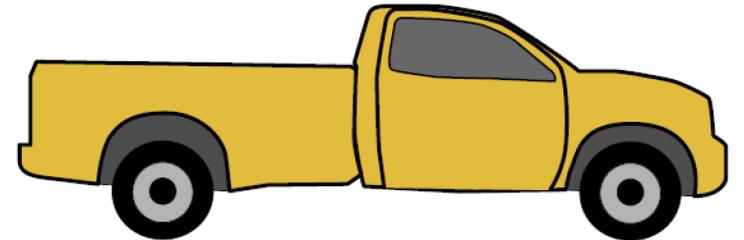
http://www.klickitatcounty.org/solidwaste/FilesHtml/Disposal/GateFee_PickupCapacityCuYd_1Up_Portrait.pdf



Compact Pickup: 4'x6' bed
filled to top of bed = 1.33 CuYd
filled to top of cab = 2.66 CuYd



Full Size Pickup: 5'x7' bed
filled to top of bed = 1.94 CuYd
filled to top of cab = 3.89 CuYd



Full Size Pickup: 5'x8' bed
filled to top of bed = 2.22 CuYd
filled to top of cab = 4.44 CuYd

Another tool to estimate volume of dump

Online Cubic Yard Calculator from
<http://www.todayshomeowner.com/cubic-yard-calculator/>

Cubic Yard Calculator

<input type="text"/>	Length of area in feet
<input type="text"/>	Width of area in feet
<input type="text"/>	Height of area in inches
<input type="button" value="Calculate"/>	

Hazard Factors

Pretty self-explanatory

Hazard Factors (check all that apply)

1. Contents

- Abandoned automobiles
- Abandoned trailers
- Animal carcasses
- Appliances/white goods
- Construction and demolition waste
- Drums/containers of unknowns/pesticide containers
- Electronics
- Fluorescent light bulbs
- Furniture
- Lead acid batteries
- Medical wastes
- Meth-lab wastes
- Municipal solid waste
- Scrap tires
- Sewage sludge/septic-tank pumpings
- Suspected asbestos or lead containing materials
- Suspected RCRA Subtitle C hazardous wastes
(treated wood, paints, solvents)
- Waste oil/oily wastes
- Yard/green wastes

Site Drainage & Leachate Potential

What are the risks to groundwater/surface water?

- field) High (>25 in/yr)
- bed) **3. Site Drainage and Leachate Potential** (Leachate is water escaping from a dumpsite which, if not collected, can contaminate natural water sources.)
 - Site drainage protects ground or surface water
 - Limited ponding, drainage effects are largely neutral
 - Site drainage increases ground or surface water contamination
- 4. Flooding Potential**
 - No potential for flooding
 - Debris movement from flooding unlikely

Other Factors

4. Flooding Potential

- No potential for flooding
- Debris movement from flooding unlikely
- Debris movement from flooding likely

5. Frequency of Burning

- Burning does not occur
- Burning less frequently than weekly
- Burning more frequently than weekly

6. Fenced site

- Yes
- No

7. Controlled Access

- Effectively controlled access
- Ineffective controls or poorly restricted access
- Unrestricted access

8. Public Concern

- No concern voiced
- Little concern voiced by the public
- Concern frequently voiced by the public

Other Factors

Proximity Factors

1. Vertical Distance to Drinking Water Aquifer (check one)

- Greater than 600 feet
- 51-599 feet
- Less than 50 feet

2. Horizontal Distance to Surface Water Bodies (check one)

- Greater than 1,000 feet
- 51-1,000 feet
- Less than 50 feet

3. Distance to Homes (check one)

- Greater than 5,000 feet
- 1,000-5,000 feet
- Less than 1,000 feet

General Description of your site: example

A Community member was allowing two non-Community members to dump ~~residential~~ household waste on his home site. On Tuesday, February 23, 2016, the ~~City~~ Police Department seized the truck and trailer belonging to the waste dumper. The ~~residential~~ waste was illegally burned by the dumper and Community member shortly after the truck and trailer were seized. The ~~residential~~ waste dumper has not been caught but likely will not return to the site, thus leaving a pile of solid waste ~~approximately~~ 60 feet long and 8 feet high. The piled waste is a risk to human health and the environment, and may become a fire hazard as summer weather approaches. Community members have complained about the waste pile and have expressed concerns of associated hazards. The site is on ~~Palm~~ Lane between ~~St. Paul~~ and ~~Home~~, north of ~~McD~~ Rd.

Example Site description: 'Backforty dumping area'

The Backforty dumping area are mounds of discarded materials approximately 7 feet high at the highest point, and a 25' x 10' trenched area containing burnt debris where garbage has been burned in the past. There are 4 residences in the area immediately around the site, the closest being 0.6 miles from the northeastern end of the Wash. The Backforty Dump is no longer used since an open top bin was made available in the town of Appaloosa in January of 1995. Household solid waste is accepted there for a fee. Because of the fee and the fact that there is no convenient alternative disposal for special wastes such as tires and white goods, casual disposal at Backforty Dumping Area still occurs from time to time. There are seven discrete waste disposal areas within the Backforty Dumping Area. They extend for approximately 1.5 miles along the length of Water Wash. The average width of the disposal areas is 50 feet and the average depth is 20 feet. There are no wells or other water sources within one mile, however, this area has the potential to become a watercourse after heavy rains. There is no sewage sludge or industrial waste at any of the disposal areas. See attached table for the area, volume of waste, distribution, and type of waste present for each disposal area. See also attached site photos.

Helpful Descriptive Elements

- Describe features of surrounding land: near arroyo, wash, canyon, intermittent stream or riverbed, pond, or lake? On or near hillside or hilltop? Distance from the site to these nearby features?
- Take pictures from each of the four sides of the site showing surrounding topography. Do any of the surrounding surface features show signs of wastes being wind blown or washed down from the disposal site?
- Identify and take pictures of any stressed vegetation near or down gradient from the site (possible sign of contamination). Identify and take pictures of any areas of stained soils (e.g., soils stained by used oil dumping, etc.).
- Characterize and describe any potential hazards or problems relating to clean up/removal in the vicinity of the site. Look for such things as water lines, gas lines, power lines, and accesses to the site. Will temporary roads need to be constructed to allow access for necessary equipment? What is the destination of excavated wastes and will they need to be hauled out through, or near residential areas?

Attach Vector-Borne risk assessment as a helpful descriptive element --

VECTOR-BORNE RISK ASSESSMENT

Use the questions below to help assess the risk of vector-borne illnesses in your community

1. What is the distance between residential dwellings and/or public dwellings (i.e. tribal offices, schools, etc.), and the open dump?

2. Are there materials that collect or retain rain water and/or moisture present at the residential dwellings and/or public buildings (i.e. pots, tires, equipment, fabric covered furniture, etc.)?

3. Have there been reported or confirmed cases in the past of vector born diseases (e.g. Dengue, West Nile, Zika, Chikungunya, Rocky Mountain Spotted Fever, etc.)?

4. If 'yes' from question 3, which apply (list)?

5. If you answered 'yes' to question 3: Are these cases new developments or have these cases been historically prevalent (explain below)?

6. Does the Tribe have an Integrated Pest Management Plan?

7. If 'yes' to question 6, explain how it is implemented

OUTREACH + PREVENTION

Region 9 - Tribal Solid Waste Team:

Deirdre Nurre

Sebastian Beshk

Jenny Stephenson

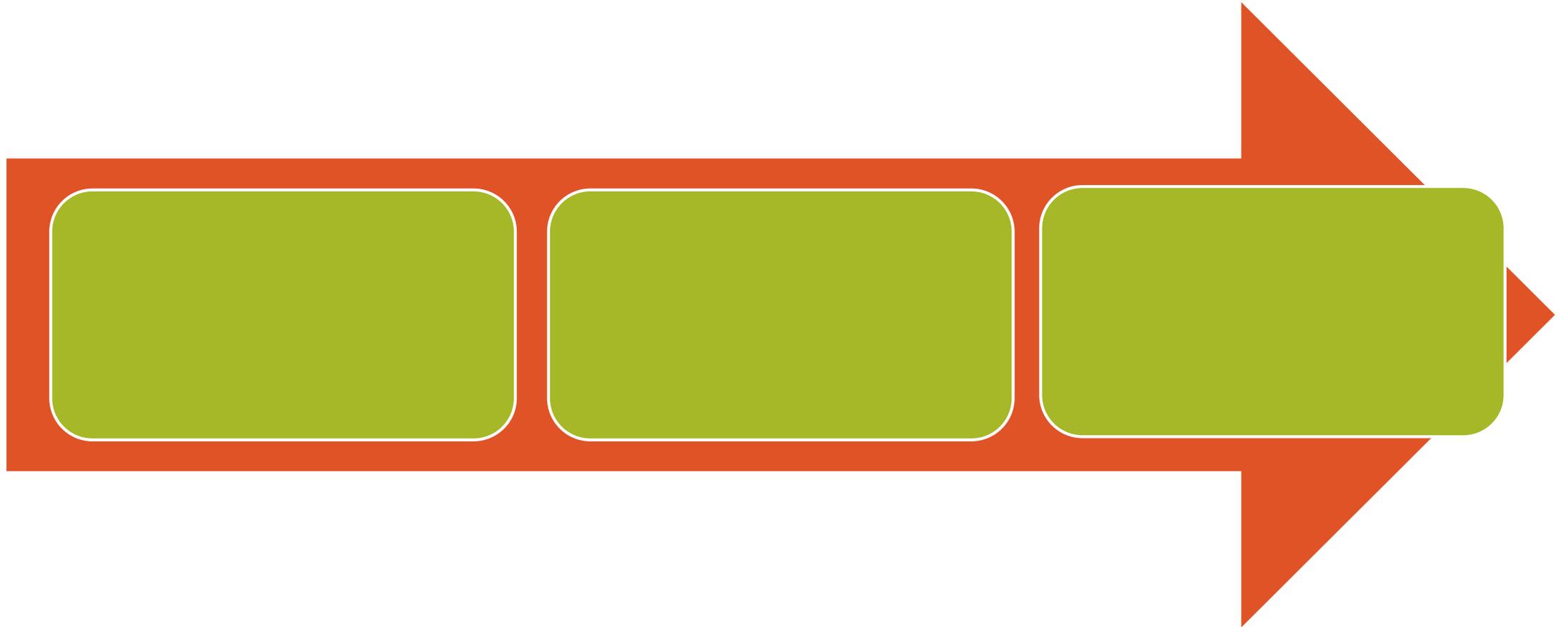
Shannon Davis

Causes of Illegal Dumping

- Convenience
- Cost
- Lack of Information
- Past Practice (i.e. routine)
- No Solid Waste Plan or infrastructure
- No codes nor enforcement



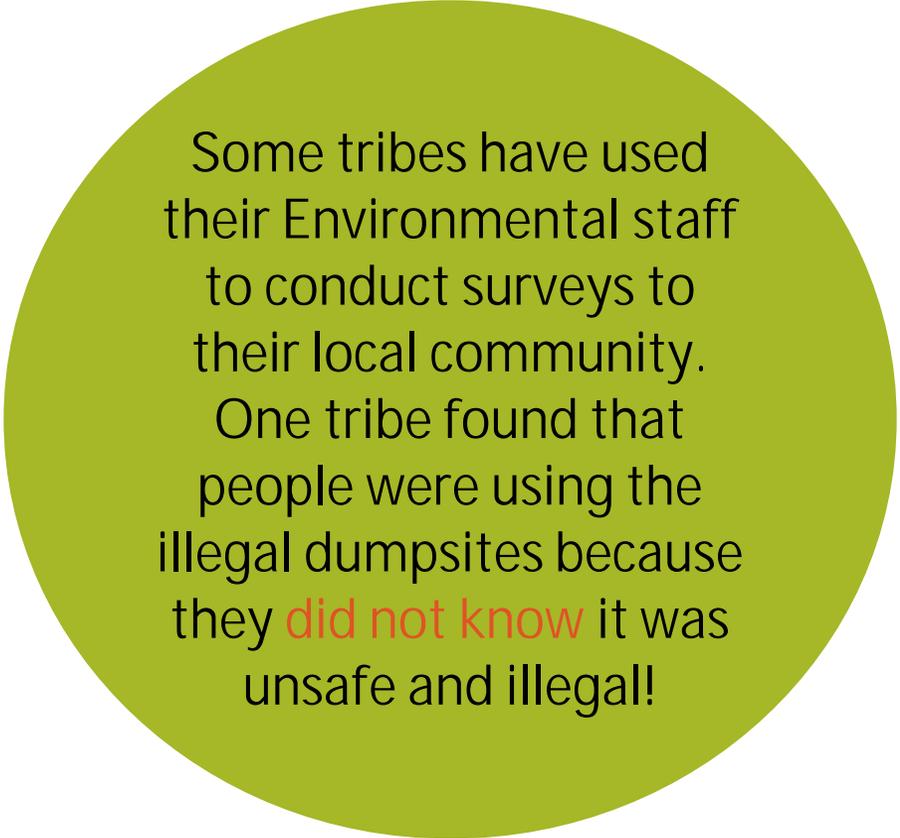
Developing a prevention + enforcement program



Step 1: Understand the problem

- **Tools:**

- Door-to-door survey
- Hold a community gathering
- Survey the dumpsites



Some tribes have used their Environmental staff to conduct surveys to their local community. One tribe found that people were using the illegal dumpsites because they **did not know** it was unsafe and illegal!

Step 2: Gain Tribal + Community Support

- **Tools:**

- Maps
- Pictures
- Press coverage
- Tours
- Explanation of cost



Step 3: Choose your strategy

We'll cover more on this topic in the following slides, but keep in mind how the selected strategy/strategies...

- Reflects the values and goals of the tribe
- Provides for tribal control and sovereignty
- Involves tribal government and community members
- Builds on local knowledge, experience and expertise
- Allows for continuous feedback including a complaint mechanism (!)
- Is feasible

NON-ENFORCEMENT MEASURES

What you can do...

Overview

- Community Outreach and Education
- Cleanup
- Dump Tracking
- Posting Signs
- Lighting
- Barriers
- Hotlines
- Rewards
- Monitoring and Surveillance Cameras

Community Outreach + Education

Outreach and education may include:

- Press releases
- Publicity photographs
- Outreach materials
- Public hotline
- Presentations
- Cleanup days



For more information and tips on starting a tribal outreach/education program, see **Chapter 6** of the *Tribal Decision-Maker's Guide to Solid Waste Management*

CDC Materials

Protect yourself and your family from mosquito bites (continued)



- Always follow the product label instructions.
- Reapply insect repellent every few hours, depending on which product and strength you choose.
 - Do not spray repellent on the skin under clothing.
 - If you are also using sunscreen, apply sunscreen first and insect repellent second.

Natural insect repellents (repellents not registered with EPA)

- EPA has not evaluated natural insect repellents for effectiveness.
- Examples of ingredients used in unregistered insect repellents include: citronella oil, cedar oil, geranium oil, peppermint oil, or soybean oil.

If you have a baby or child



- Always follow instructions when applying insect repellent to children.
- Do not use insect repellent on babies younger than 2 months of age.
- Dress your child in clothing that covers arms and legs, or
- Cover cribs, stroller, and baby carrier with mosquito netting.
- Do not apply insect repellent onto a child's hands, eyes, mouth, and out or irritated skin.
 - Adults: Spray insect repellent onto your hands and then apply to a child's face.

Treat clothing and gear



- Treat items such as boots, pants, socks, and tents with permethrin or purchase permethrin-treated clothing and gear.
 - Permethrin-treated clothing will protect you after multiple washings. See product information to find out how long the protection will last.
 - If treating items yourself, follow the product instructions.
 - Do not use permethrin products directly on skin.

Mosquito-proof your home



- Use screens on windows and doors. Repair holes in screens to keep mosquitoes outside.
- Use air conditioning when available.
- Keep mosquitoes from laying eggs in and near standing water.
 - Once a week, empty and scrub, turn over, cover, or throw out items that hold water, such as tires, buckets, planters, toys, pools, birdbaths, flowerpots, or trash containers. Check inside and outside your home.

www.cdc.gov/features/StopMosquitoes

PROTECT YOURSELF from MOSQUITO BITES

Mosquitoes spread chikungunya, dengue, and Zika viruses.



Mosquitoes that spread chikungunya, dengue, and Zika are aggressive daytime biters. They can also bite at night.



Use insect repellent. Look for the following active ingredients:

- DEET
- PICARIDIN
- IR3535
- OIL OF LEMON EUCALYPTUS
- PARA-MENTHANE-DIOL



Wear long-sleeved shirts and long pants or use insect repellent. For extra protection, treat clothing with permethrin.



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

For more information:

www.cdc.gov/chikungunya • www.cdc.gov/dengue • www.cdc.gov/zika

Sick with CHIKUNGUNYA, DENGUE, or ZIKA?

Protect yourself and others from mosquito bites during the first week of illness.

Protect family and friends

- During the first week of illness, chikungunya, dengue, or Zika virus can be found in the blood.
- A mosquito that bites you can become infected.
- An infected mosquito can bite a family member or neighbor and make them sick.



Watch for these symptoms

- See your doctor if you develop a fever with any of the following symptoms:
 - Muscle or joint pain
 - Headache, especially with pain behind the eyes
 - Rash
 - Conjunctivitis (red eyes)

Protect yourself from mosquito bites

- Wear long-sleeved shirts and long pants.
- Use door and window screens to keep mosquitoes outside.
- Use insect repellent.

For more information:
www.cdc.gov/chikungunya
www.cdc.gov/dengue
www.cdc.gov/zika



U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

Mosquito Bite Prevention (United States)



Not all mosquitoes are the same. Different mosquitoes spread different viruses and bite at different times of the day.

Type of Mosquito



Aedes aegypti,
Aedes albopictus

Viruses spread

Chikungunya,
Dengue, Zika

Biting habits

Primarily daytime, but
can also bite at night



Culex species

West Nile

Evening to morning

Protect yourself and your family from mosquito bites

Use insect repellent

Use an Environmental Protection Agency (EPA)-registered insect repellent with one of the following active ingredients. When used as directed, EPA-registered insect repellents are proven safe and effective, even for pregnant and breastfeeding women.

Active ingredient

Higher percentages of active ingredient provide longer protection

DEET

Some brand name examples*

Off!, Cutter, Sawyer, Ultrathon

Picaridin, also known as KBR 3023, Bayrepel, and icaridin

Cutter Advanced, Skin So Soft Bug Guard Plus, Autan (outside the United States)

Oil of lemon eucalyptus (OLE) or para-menthane-diol (PMD)

Repel

IR3535

Skin So Soft Bug Guard Plus Expedition, SkinSmart



* Insect repellent brand names are provided for your information only. The Centers for Disease Control and Prevention and the U.S. Department of Health and Human Services cannot recommend or endorse any name brand products.



Clean up + Dump tracking

- There are many considerations to be taken before a site clean up can occur, see:
 - **Technical Advice for Cleanup of Accumulated Waste Sites on Tribal Lands (2008)**
- Data collection should include, at least, the following:
 - **Location**
 - **Size & Contents**
 - **Responsible party (if known)**
 - **Enforcement actions taken**
 - **Resources expended**

Pinoleville Tribe converted a former dumpsite into a native garden. By beautifying the former dumpsite, the tribe is simultaneously reducing the likelihood that waste will again be left on the site and creating a special place on their tribal land for tribal members to experience nature!

Supplemental Language

Tribes can request for funds to host a community clean-up or to clean up an open dumpsite, **BUT** tribes must follow the procedures outlined in this presentation to clean up open dumps

Component 5. Supplemental Projects	<u>Outputs/Work Products</u> <u>Target Due Dates</u>
<p><i>Purpose and need:</i> <i>Aedes aegypti</i> are mosquitos known to carry the Zika virus and are common in Maricopa County. <i>Aedes</i> are crepuscular (active during twilight), so standard nighttime pesticide applications are not effective. The best control is removal of larval habitats. Rather than breeding on pools and ponds of stagnant water, <i>Aedes aegypti</i> are container mosquitos, meaning they prefer to breed in smaller areas such as tires, buckets, dog bowls, or cups. They have been known to breed in bottle caps holding just a small amount of liquid, and can produce up to 300 mosquitos in just one tablespoon of water.</p> <p>The Community has two large, active dumpsites consisting of household wastes, tires, buckets, toys, etc. which are prone habitats for <i>Aedes</i> and other disease carrying insects, scorpions, venomous snakes, rats and mice. Additionally, the Community has at least eight transient camps consisting of household and human waste, various-sized containers, buckets, furniture and debris. The dumpsites and transient camps are ideal habitats for <i>Aedes aegypti</i> and other disease-carrying mosquitos, venomous snakes, scorpions, mice and rats. In order to prevent cases of Zika virus, West Nile virus, and hantavirus, as well as bites and stings from venomous vectors, all wastes should be removed. In order to reach the transient camps to remove the wastes, brush will need to be removed.</p> <p><i>Commitment 5.5</i> Utilize a contractor to clean up the dumpsites and transient camps. Heavy equipment will be needed to remove the waste and haul trucks will be needed to haul the waste to the Salt River Landfill. The contractor will be certified for hazardous waste operations in the event any of the waste piles contain hazardous substances. Brush leading to the transient camps will be cleared and a chipper used at each site to mulch the brush, thus reducing disposal costs.</p>	<p>Landfill receipts of the disposed waste, contractor invoices, project photographs and the project report will be provided.</p> <p>July 1, 2017</p>

Signs + Lights + Barriers



Hotlines + Rewards

Example of a tribal
illegal dumping
prevention billboard
offering a reward



Monitoring

Monitoring can include:

- surveillance cameras
- motion sensing
- beepers
- patrolling by environmental rangers or police.





ENFORCEMENT MEASURES

What you can do...

Understand the problem

Choose your approach

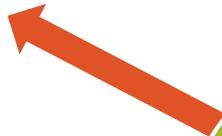
Implement

Measure

Outreach + education

Gain Tribal gov't + community support

Reassess Program



Overview

- Illegal Dumping Codes
 - Penalties
 - Enforcement Body
 - Judicial Body
- Strategy for Enforcement
- Resources

Illegal Dumping Codes

Components to Illegal Dumping Codes

- Dumping Code Purpose
- Dumping Definition
- Dumping Sanctions
- Dumping Enforcement Responsibility
- Dumping Adjudicative Responsibility



Tribes have
extensive
authority to
create illegal
dumping codes!

Sample Language- Hopi

Purpose

"2.1. The open dumping and open burning of solid wastes shows disrespect for the natural resources of the Reservation, and for the Reservation community; it causes irreparable damage to the land and the environment; it is a threat to the health and safety of Hopland residents."

Definition

"6.1. It shall be unlawful for any person ... to dump, scatter, or place, or cause to be dumped, scattered or placed any solid waste material, hazardous or not"

Sample Language- Hopi

Sanctions

"9.1. Any person who violates any of the provisions of this Code is subject to an assessment of civil damages for such unlawful activities.... Any person who is found by the court to have committed the alleged violations shall be subject to ... a civil penalty in an amount up to \$500.00 dollars for each day of each violation."

Common Sanctions Include

- Fines
- Legal action against property owners
- Property seizure and vehicle impoundment
- Community service
- Court-ordered cleanup and
- Exclusion from the tribe's land

GAP AND VECTORS

HOW TO USE THE GENERAL ASSISTANCE PROGRAM

for Vector Control Planning and Capacity Building,
and Solid Waste Implementation

EPA'S ROLE USING GAP

- Planning and Developing Programs
- Outreach and Education
- Capacity Building
- Implementing Solid Waste Programs



HOW CAN THOSE BE TOOLS FOR
VECTOR BORNE DISEASE
MANAGEMENT?

CAPACITY BUILDING

- Training
 - How to write plans, and develop programs for Vector Management
 - Pesticides Management
 - Integrated Waste Management
 - Writing Ordinances
 - And MORE!

PLANNING AND DEVELOPING PROGRAMS

- Planning
 - Integrated Solid Waste Management Plans
 - Integrated Pesticide Management Plans
 - ETEPs
 - Environmental Inventories
 - Emergency Response Plans



OUTREACH AND EDUCATION

- Methods for getting messages out to the community
 - Newsletters
 - Public Service Announcements
 - AND MORE!
- Conducting Outreach and Education
 - Youth
 - Elders
 - Entire Community – Community Cleanup Events



SOLID WASTE IMPLEMENTATION

Do you know the four implementation activities in order of priority according to the GAP Guidebook?

SOLID WASTE IMPLEMENTATION ACTIVITIES

1. Program Administration
2. Compliance and Enforcement
3. Solid Waste Management, Resource Recovery, and Resource Conservation Support
4. Cleanup and Closure

HOW CAN THAT HELP IN VECTOR-BORNE DISEASE MANAGEMENT?

- Program Administration
 - Ensuring that the tribe has a Solid Waste Program in place to do all the activities we will describe:
- Enforcement and Compliance
 - Creating Ordinances or Enforcement Programs
- Resource Recovery
 - Community Clean-Ups
 - White Good Clean Ups
 - Special Clean up Days for Elders
 - Clean up of Tire Piles

WHAT ABOUT CLEANUP AND CLOSURE?

- We can do cleanup and closure under GAP!
- There are some steps we need to follow AND we need approval from AIEO.



REVIEW HQS APPROVAL FORM FOR
SOLID WASTE CLEAN-UP & CLOSURE

ACTIVITY

Match your Capacity Indicators with
Associated Workplan Activities

QUESTIONS?

Thank you for joining us!!!

