

NOTE

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WEST NILE VIRUS (WNV): Partnering for Prevention

A West Marin Community Town Hall Forum

**Marin County WNV Task Force
May 11, 2005**



WNV: Presenters/Panelists

- Supervisor Steve Kinsey & Aide David Escobar, County of Marin
- Fred Schwartz, MD, Public Health Officer; Nathalie Bera, MD, MPH, Deputy Public Health Officer; & Andrew Horvath, MPH, Communicable Disease Epidemiologist, County of Marin Department of Health & Human Services (HHS)
- Jim Wanderscheid, Manager, & Ron Keith, Assistant District Manager, Marin/Sonoma Mosquito & Vector Control District (MSMVCD)
- Stacy Carlsen, Agricultural Commissioner, County of Marin
- Arthur Craigmill, PhD, Toxicology Specialist, UC Davis
- Gregg Tolliver, MD, Infectious Disease Physician, Marin General Hospital
- Armando Alegria, Supervising Environmental Health Specialist, County of Marin Environmental Health Services
- Elizabeth A. Goldblatt, PhD, MPA/HA, Chair, Mosquito and Vector Control Committee, Bolinas Community Public Utility District (BCPUD)



WNV: Other Acknowledgements

- Celia Golden, MD, MPH, Deputy Public Health Officer, Marin County HHS
- Phil Smith, Director, Environmental Health Services, County of Marin
- Stacey Henderson, BCPUD Representative to the Marin County WNV Task Force
- Marty Castro & Vicki Kramer, PhD, California Department of Health Services' Vector-Borne Disease Section
- Presenters at the Fifth & Sixth Annual WNV Conferences, June 2004 & February 2005
- Cover art: "West Marin View" with permission, Doug Herr (www.douglasherr.com)




WNV: Presentation outline

- Welcome
 - Purpose, Introductions & Ground rules
 - Marin County WNV Task Force
- Human illness
 - Risk factors, symptoms, diagnosis, treatment
- Surveillance & Epidemiology (Statistics & Trends)
- Q&A
- Prevention & Mosquito Control
 - Personal measures
 - General measures
 - Mosquito repellents
 - Environmental measures
 - Integrated Pest Management
 - Household measures including septic systems
 - Mosquito control products & health effect issues
- Educational Resources
- Q&A

Marin County WNV Task Force

- WNV a significant public health concern
 - Emerging disease, westward spread across USA
 - Impacts on bird (294 species), animal (horses and at least 9 other species), and human populations
- Convened August 14, 2002 to help the county prepare for the arrival of WNV
- Promoting awareness and prevention
- A collaboration of agencies directly involved in education, prevention, and integrated response



Marin County WNV Task Force
A Collaboration of Agencies

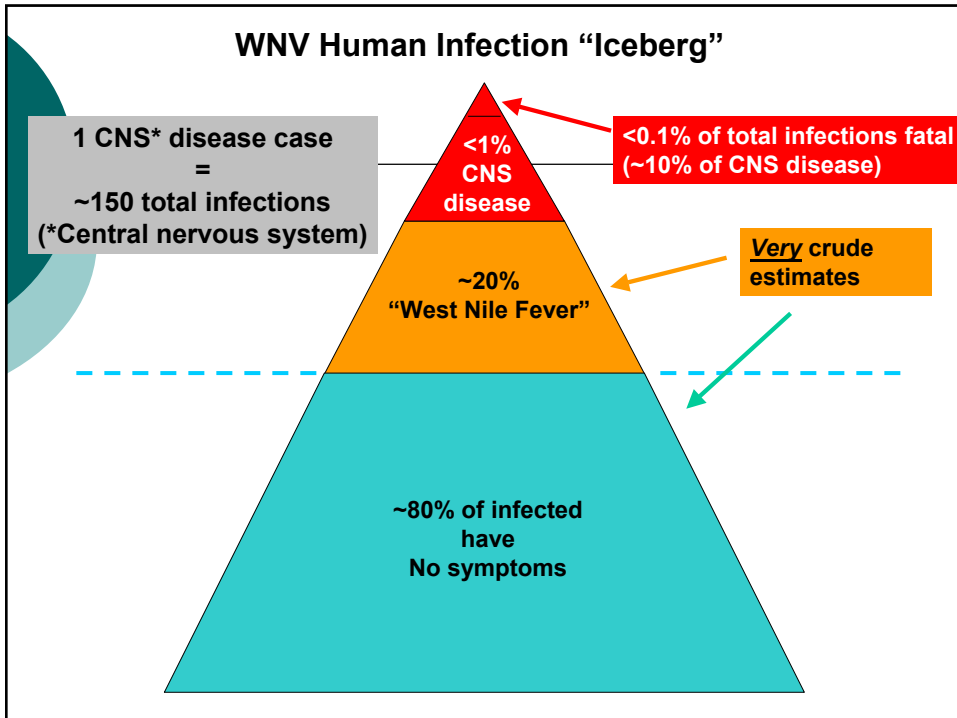
- **Marin Sonoma Mosquito and Vector Control District (MSMVCD)**
- **Marin County Department of Agriculture**
- **Marin County HHS (PHO, DPHO, PHL, CD/PHN, BT/PHP, EMS)**
- **Marin County CDA / EHS**
- **Marin County OES**
- **Hospitals (Kaiser, MGH, NCH)**
- **Marin County Veterinary Medical Assoc.**
- **Marin Humane Society**
- **Marin Medical Society**
- **Marin County Parks, Open Space and Cultural Services**
- **National Park Service**
- **Stinson Beach County Water District**
- **Bolinas Community Public Utility District**
- **Marin Municipal Water District**
- **California Dept of Health Services**

The map shows Marin County with various locations marked: Sausalito, Tiburon, San Anselmo, Inverness, Point Reyes, Point Reyes Station, Point Reyes - Petaluma, Novato, Novato Blvd., Lucas Valley Road, Sir Francis Drake, Rafael, Mill Valley, Golden Gate Bridge, Marin, Bolinas, Stinson Beach, and Moss Beach. Highway 101 is also indicated.

WNV Task Force Activities

- Develop resources and strategies for prevention and mosquito control
- HHS WNV educational campaign 2004
 - Mass mailing of educational materials
 - Op-Ed articles
- WNV Awareness Weeks 2004, 2005
- MSMVCD media campaign "Flip it, Dump it, Drain it"
- Community meetings and outreach
- Informational brochures in several languages
- Agency WNV websites www.co.marin.ca.us
- Risk communications plan
- Clinician guidelines for evaluation, lab testing and case reporting
- Promote vaccination of horses
- Reporting and testing of Dead Birds





WNV: Human illness

- **West Nile Fever** in 98 patients (case series):
- Incubation period of 2-14 days
- 96% had **fatigue** for a median of 36 days
- 81% had **fever** for a median of 5 days
- 71% had **headache** for a median of 10 days
- 61% had **muscle weakness** for a median of 28 days
- 53% had **difficulty concentrating** for a median of 14 days
- Thirty respondents reported **hospitalization**, with a median stay of 5 days



WNV: Human illness

- West Nile Fever in 98 patients (case series):
- 30 days after onset, 63% of respondents continued to have symptoms
- median duration of symptoms - 60 days
- Symptoms - (fatigue, HA, difficulty concentrating) per patient self-report
- Among the 72 patients who normally attended work or school, 57 (79%) could not attend because of illness
- median absence, 10 days

Ref: Watson, JT, Pertel, PE, Jones, RC, et al. Clinical characteristics and functional outcomes of West Nile Fever. Ann Intern Med 2004; 141:360.



WNV: Human illness

- **WNV Neuroinvasive disease** (severe neurologic illness) is in less than 1% of infections:
- **Meningitis** (infection of layers around brain)
 - Fever, neck stiffness
- **Encephalitis** (infection of brain)
 - Altered mental status, disorientation
- Other neurologic symptoms (e.g. **paralysis**)
- One study has indicated persistent neurological symptoms at 30 days after release from hospital
- Higher risk for these in older adults (age 50+) & immunocompromised
- Mortality rates 3-12%, generally in older age groups

Ref: Peperrell et al. CMAJ 168(11) ; 2003

WNV: Human illness

New Finding:

- **Rash** reported more frequently by specific patients with WNV disease - associated with disease category, age group, and gender:
 - Fever > Meningitis > Encephalitis
 - Younger age > Older age
 - Females > Males

Ref: Dayna Ferguson, MD, Colorado Dept. of Public Health & Environment, National WNV Conference 2005





WNV: Human illness - diagnosis

- First need clinical suspicion of infection (e.g. symptoms)
- Most efficient test: WNV antibody blood test
 - 90% samples positive within 8 days of onset
- Limitations to blood test:
 - close antigenic relationship with other flavivirus, thus...
 - need to rule out "false positive"
 - plaque reduction neutralization test (PRNT) can differentiate between flaviviruses








WNV: Human illness - treatment

- Treatment is primarily supportive care (IV fluids, respiratory support)
- Vast majority of infected individuals will mount an appropriate immune response, have no residual symptoms & will likely have long-term immunity
- No proven treatment for West Nile Fever or WNV Neuroinvasive disease
- Experimental treatments for the very sick
 - Antivirals such as Ribavirin not proven
 - Intravenous immunoglobulin (IVIG)
 - Interferon Alpha-2b -- clinical trials ongoing
- Prevention is best!

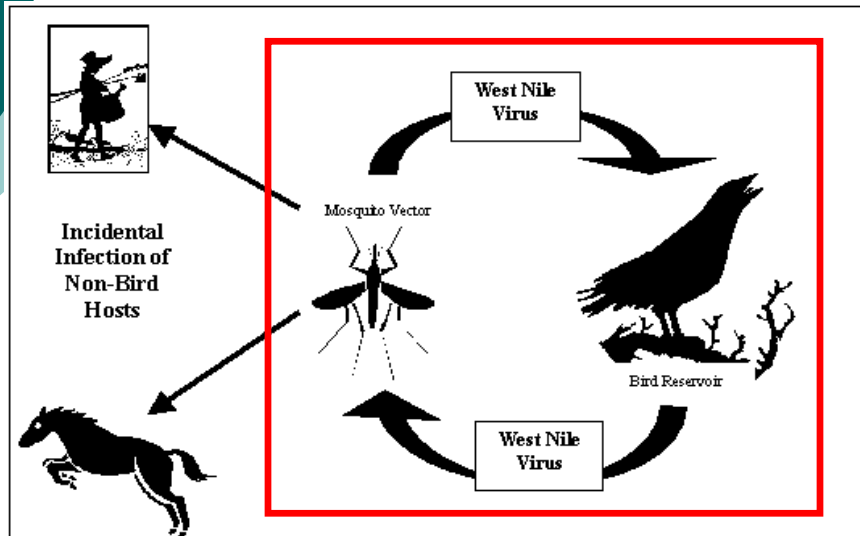
WNV: Surveillance in California

- Initiated in Summer 2000
- California Department of Health Services:
 - Vector Borne Disease Section, Veterinary Public Health Section, and Viral and Rickettsial Disease Laboratory
- Department of Food and Agriculture
 - California Animal Health and Food Safety Laboratory
- Local mosquito and vector control agencies
- University of California, Davis
 - Center for Vectorborne Diseases

WNV: California in 2003 & 2004

	Data Source	2003	2004
	Dead Birds	96	3,232
	Sentinel Chickens	70	805
	Mosquito pools	32	1,136
	Humans	3	830
	Equines	1	540

WNV Life Cycle



How does surveillance help us?

- Tracking geographic spread and distribution
- Detecting initial introduction
- Understanding who is at risk and when

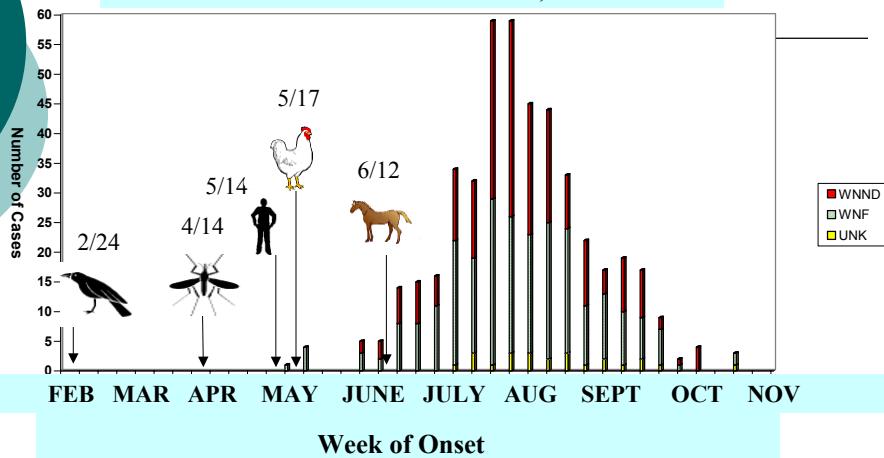
California Dead Bird Surveillance Program 2000 - 2004

Year	Reported	Tested	Positive
2000	40	20	0
2001	68	18	0
2002	3,666	653	0
2003	8,650	1,765	96
2004	93,057	5,728	3,232

Importance of WNV Dead Bird Surveillance Program in 2004

- Only surveillance element that covered ALL 58 counties
 - Mosquito and sentinel chicken testing limited to regions with vector control agencies
- In 22 counties, dead birds were the only evidence of WNV activity
- Early season WNV detection
 - Earliest indication of WNV activity in 53 / 58 California counties

Sequence of WNV detection events in California relative to human case onset, 2004

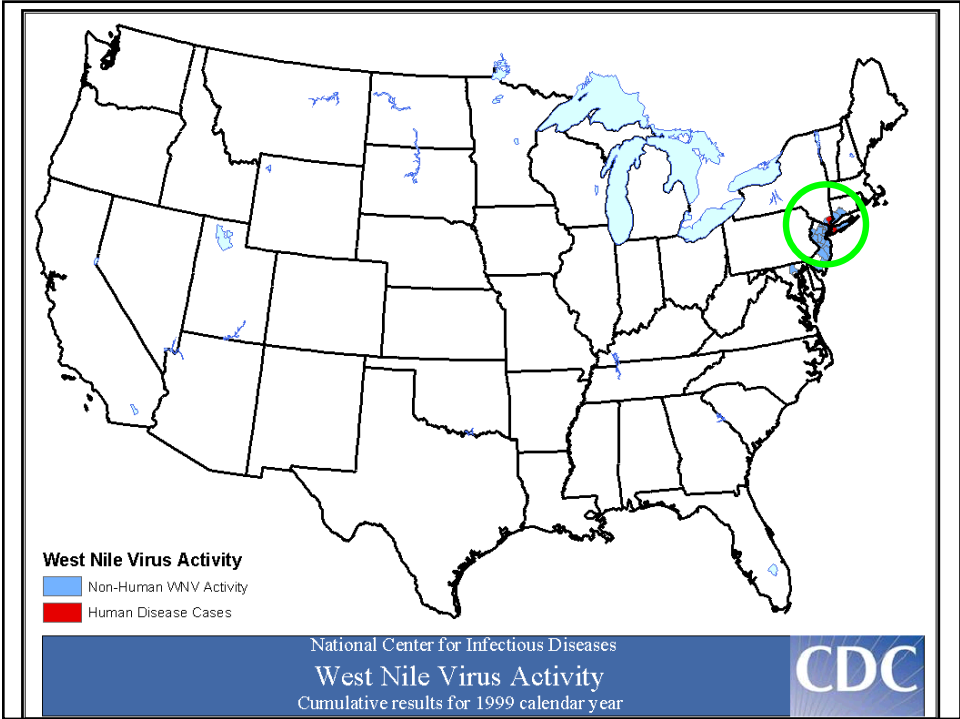
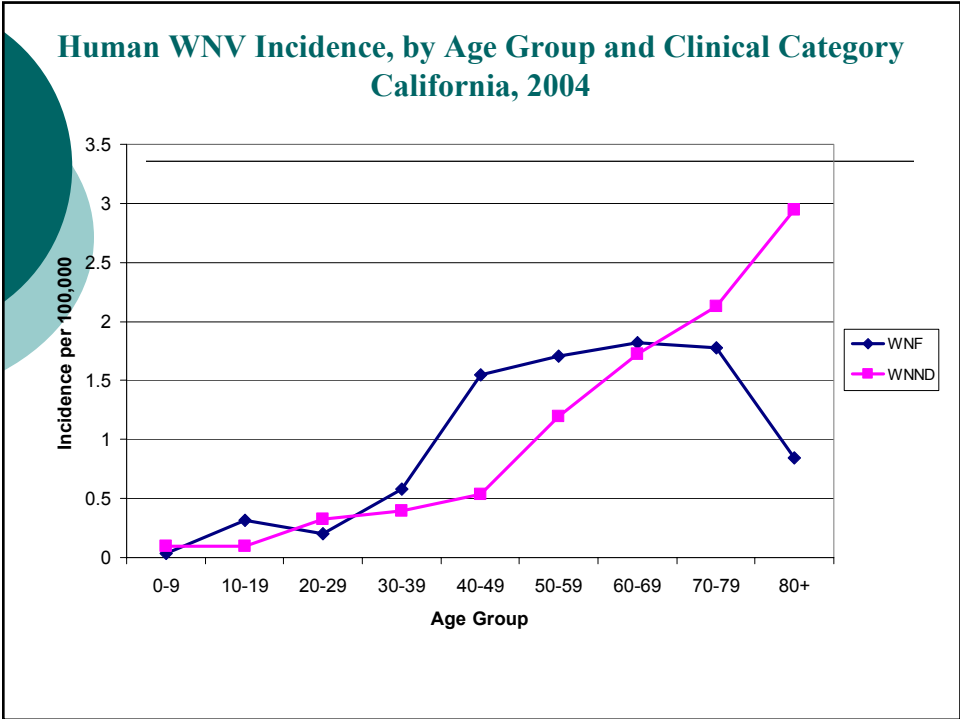


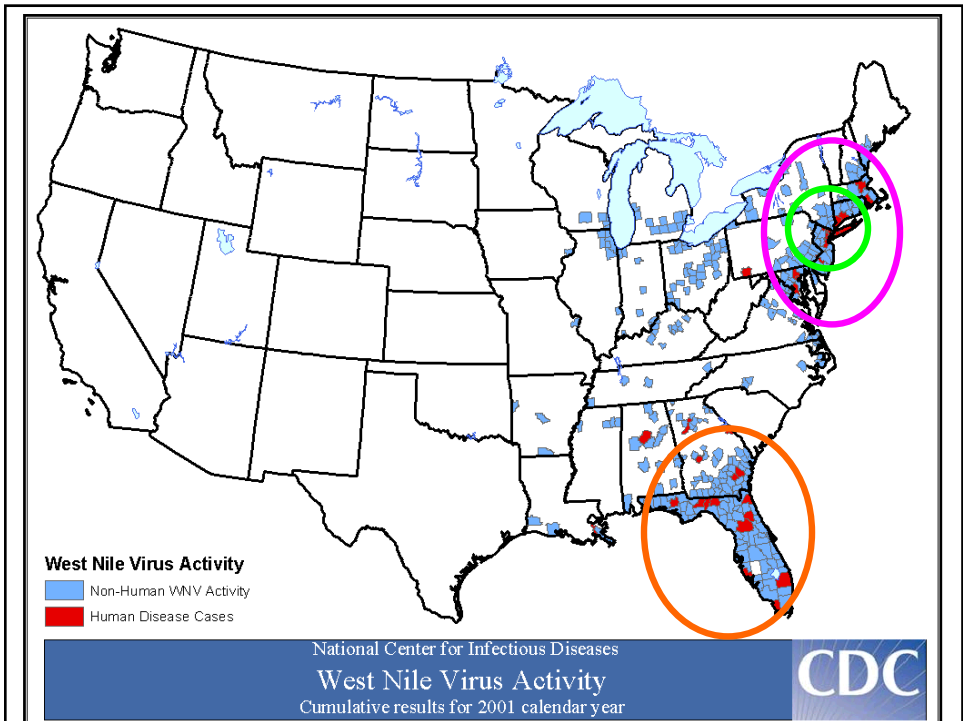
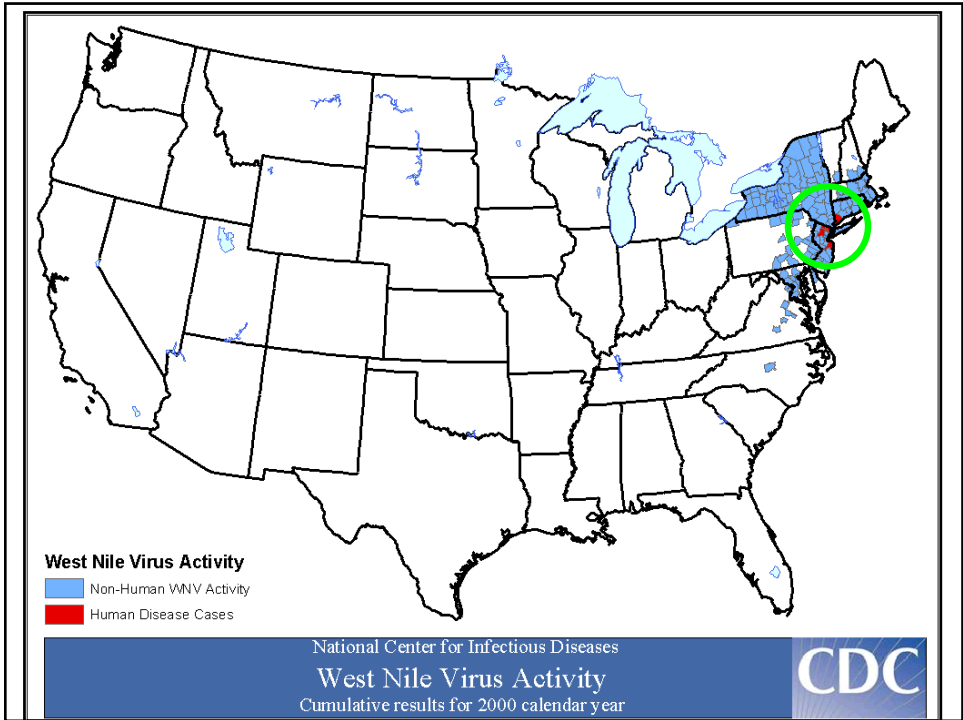
- Onset dates not available for all patients
- Birds, mosquitoes: date of collection
- Chickens: date of probable seroconversion

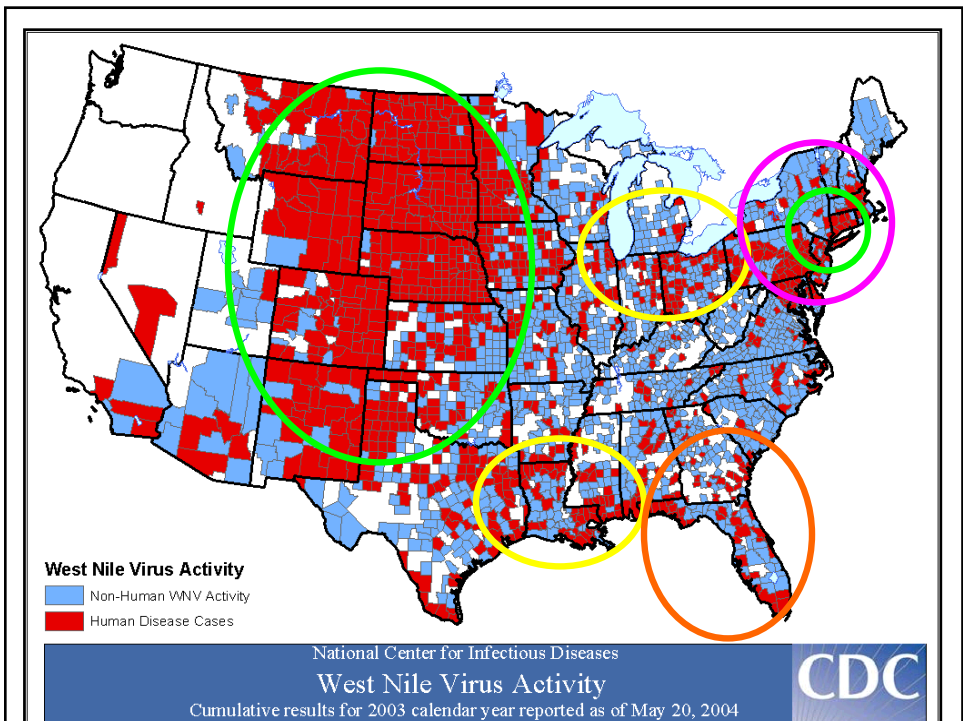
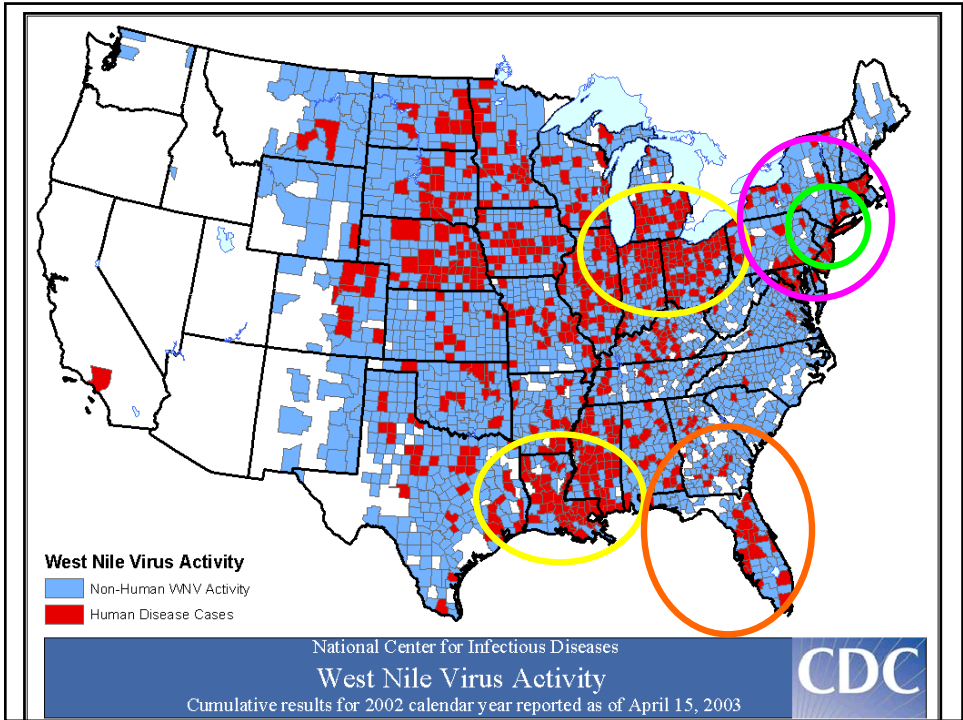
California Human Case Statistics, 2004

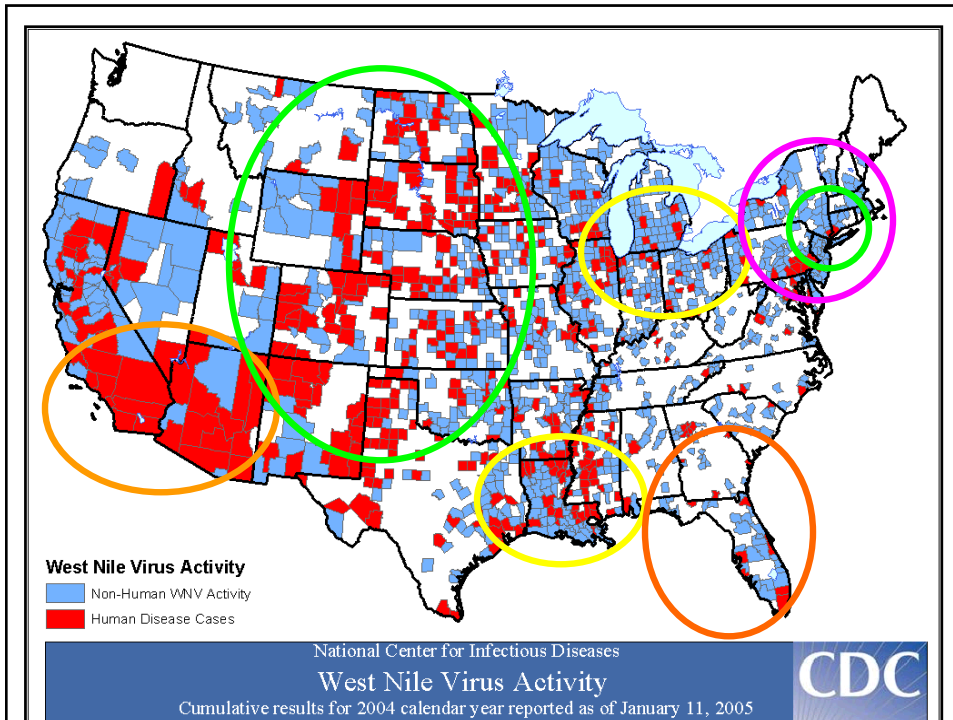
	<u>N</u>	<u>%</u>	<u>Median Age</u>
All Cases w/ symp	779	-	53
WNF	395	50.7%	50
WNNND	289	37.1%	58

- 62% of all cases were male
- 28 WNV-associated fatalities:
 - Median age = 76 yrs









WNV: Epidemiology - Reported WNV Disease Cases in Humans, U.S., 1999-2004*






Year	# States	# Cases	# Deaths
1999	1	62	7
2000	3	21	2
2001	10	66	9
2002	39**	4,156	263
2003	45**	9,862	262
2004	40**	2,470	90

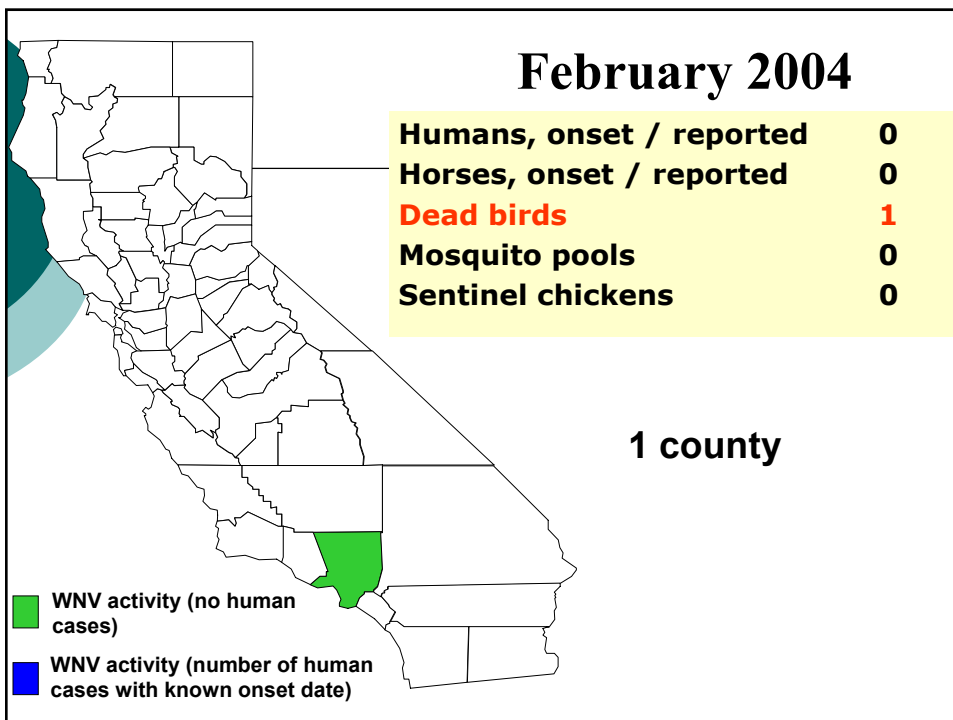
* Reported as of 1/11/2005

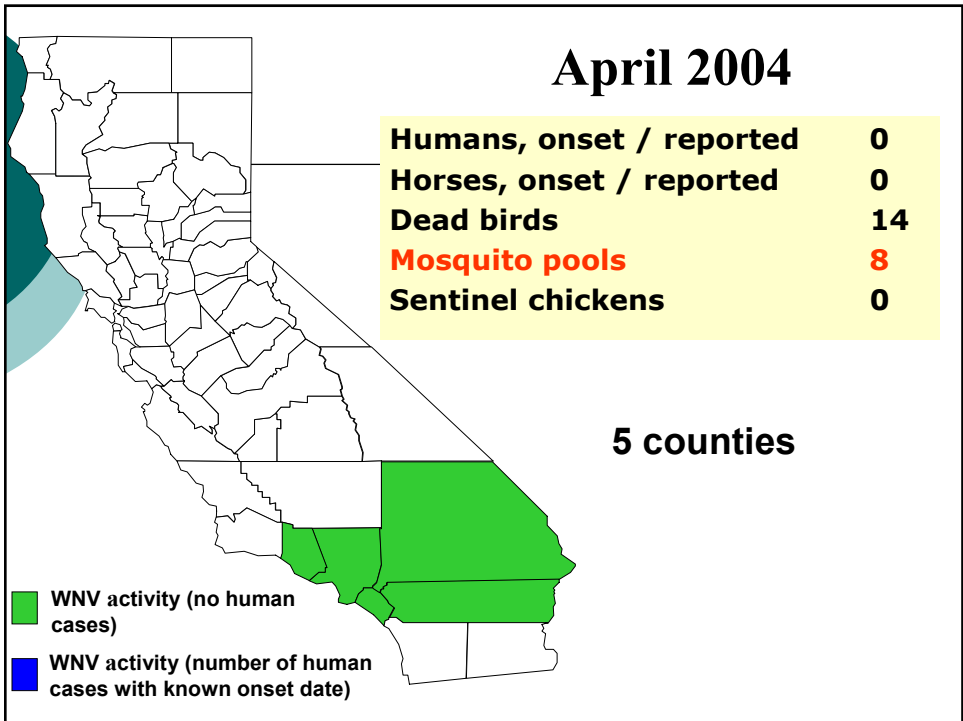
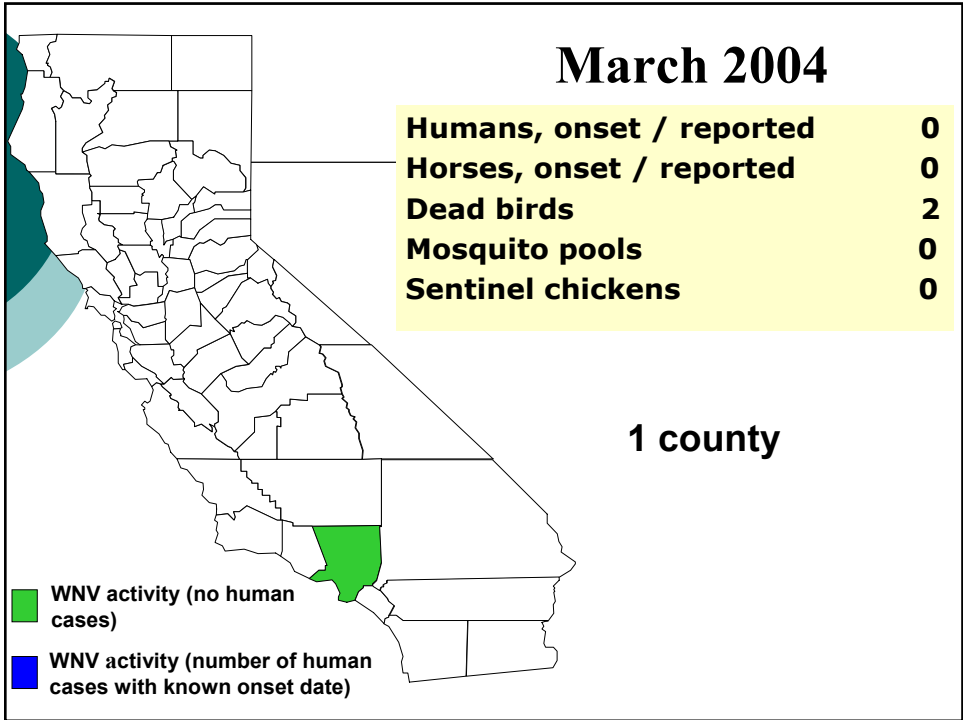
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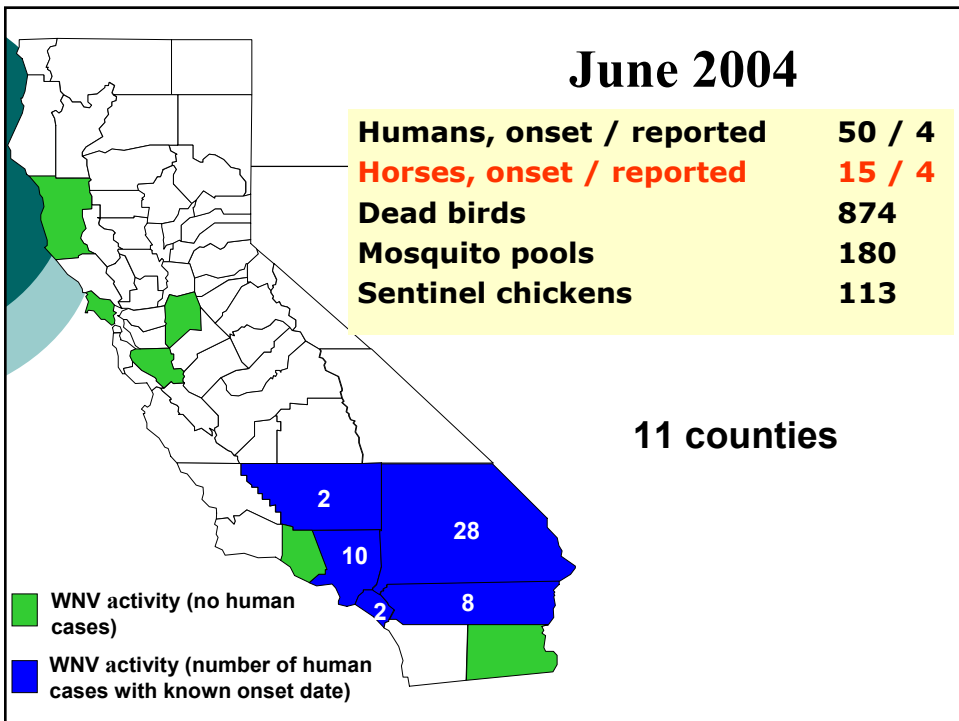
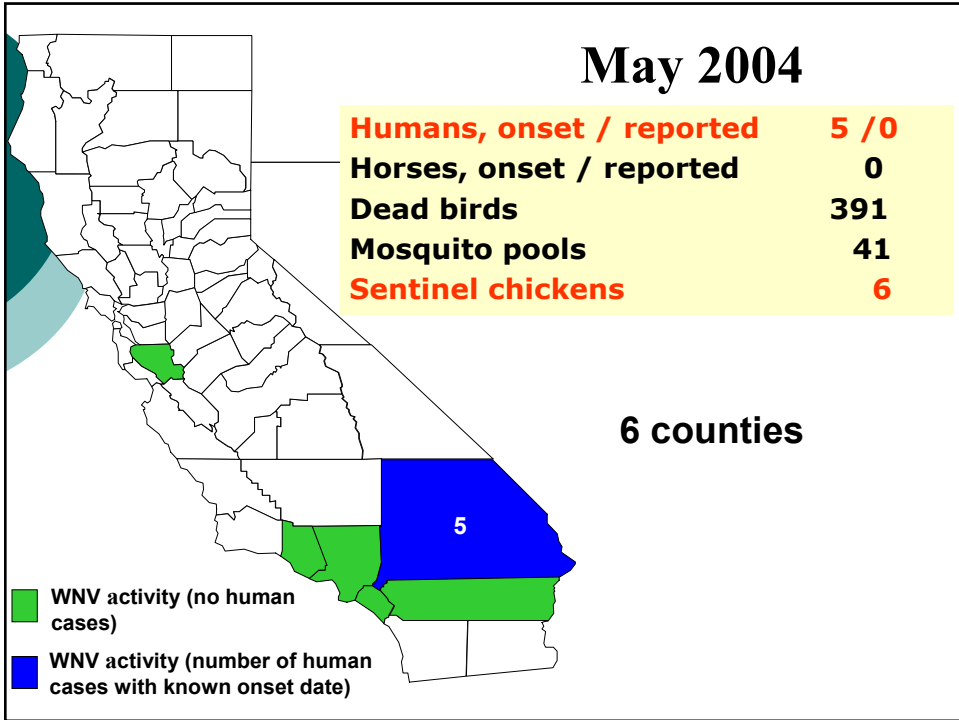
Ref: CDC ArboNet

California WNV Surveillance, 2004

	Dead Birds	3,232
	Sentinel Chickens	805
	Mosquito pools	1,136
	Humans	830
	Equines	540

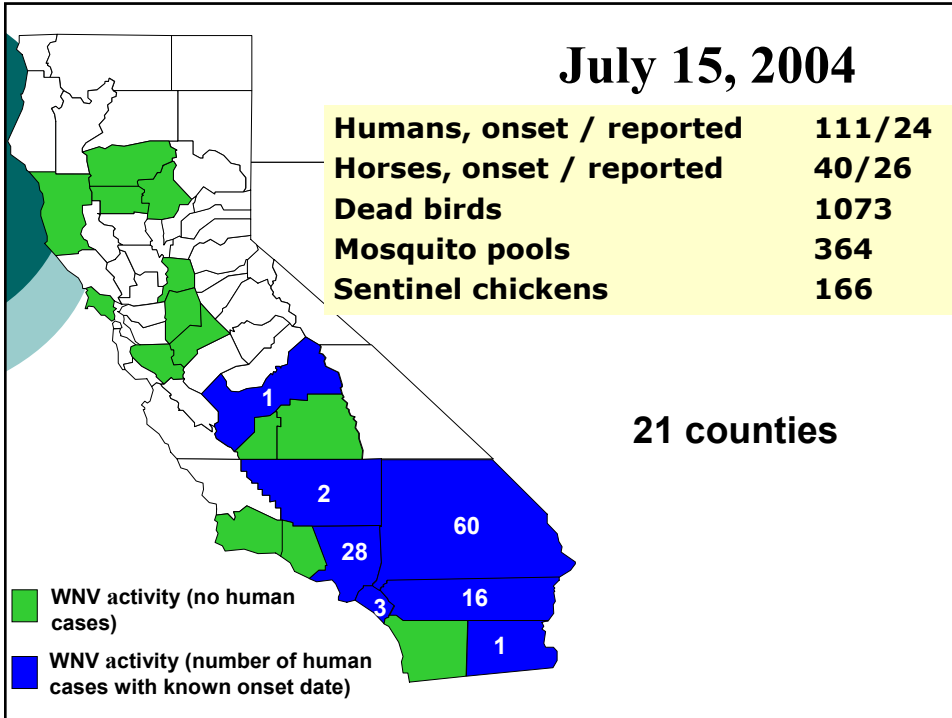






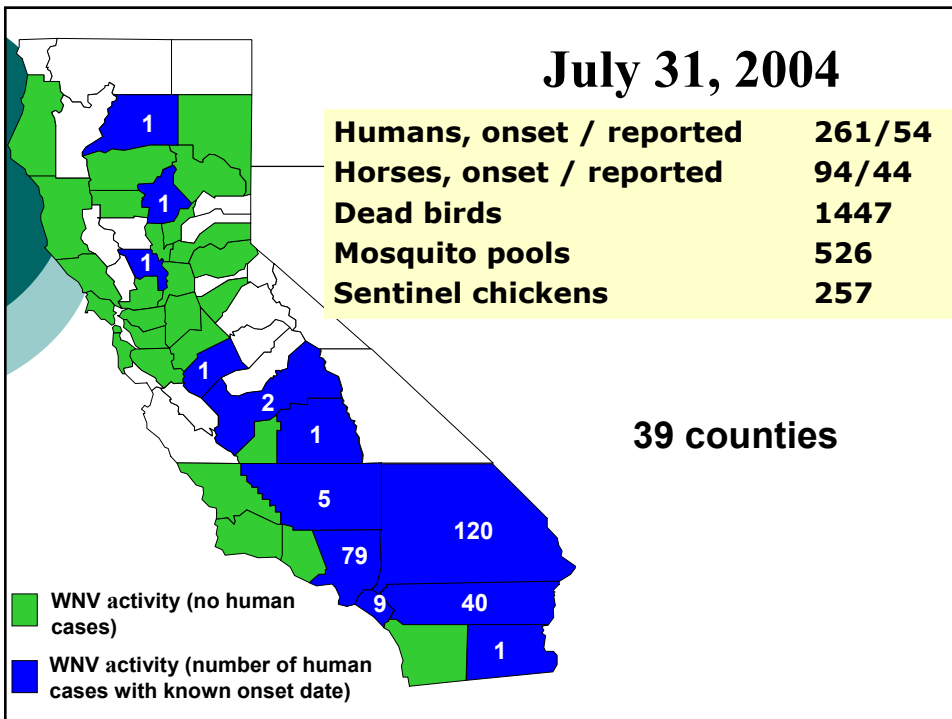
July 15, 2004

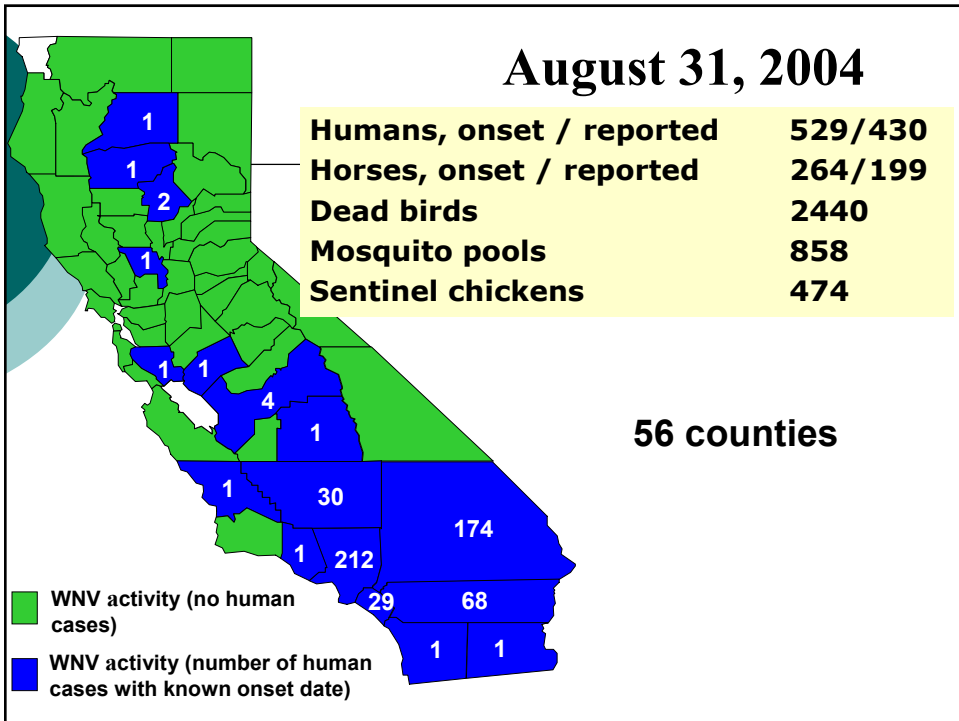
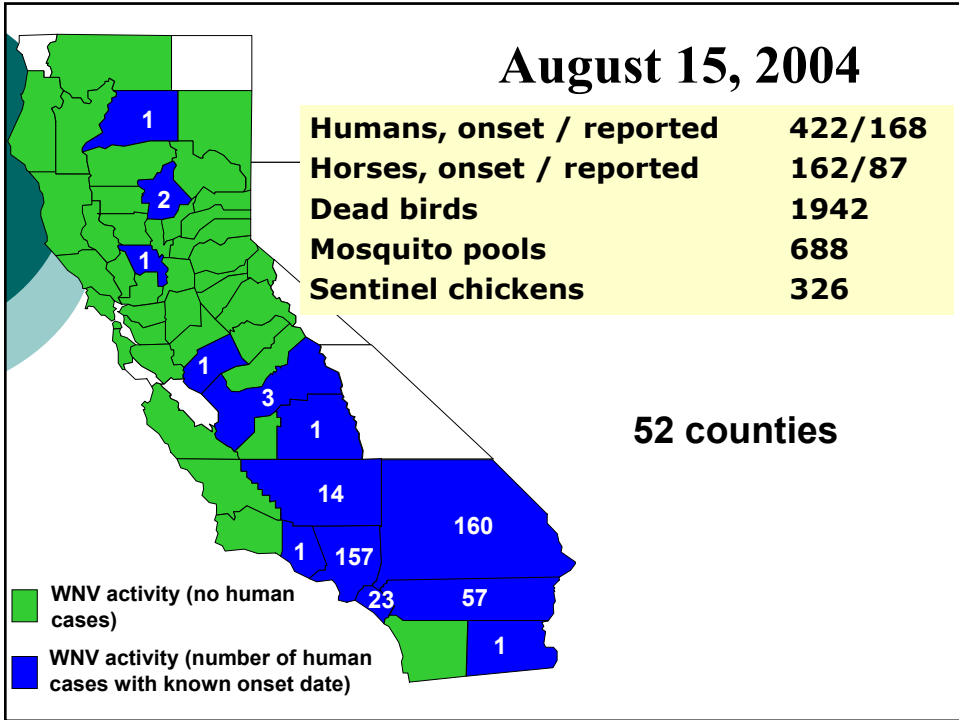
Humans, onset / reported	111/24
Horses, onset / reported	40/26
Dead birds	1073
Mosquito pools	364
Sentinel chickens	166

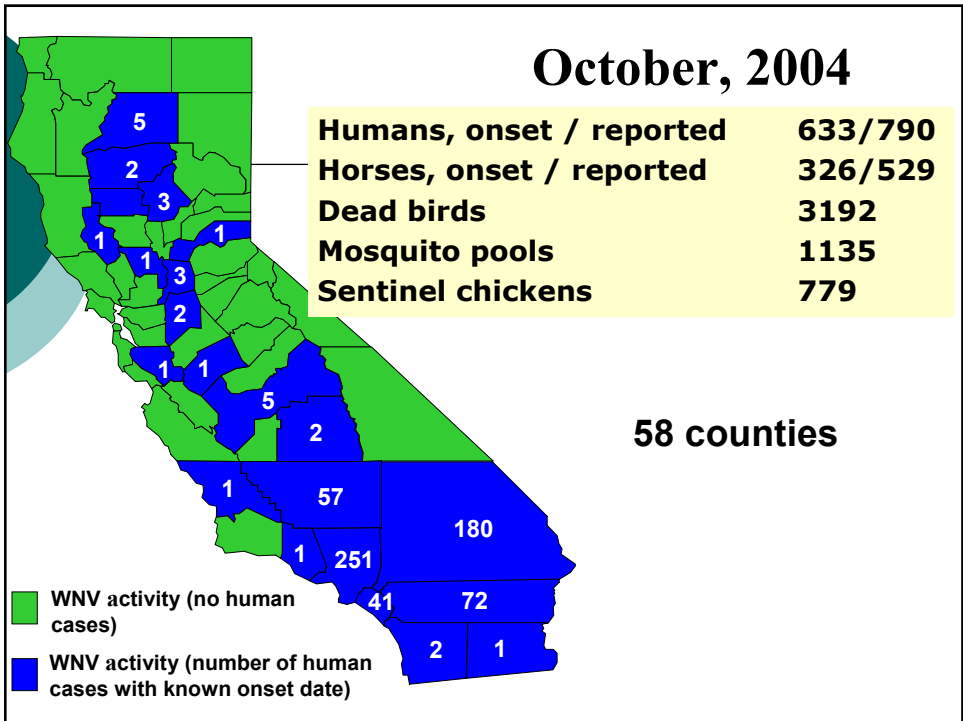
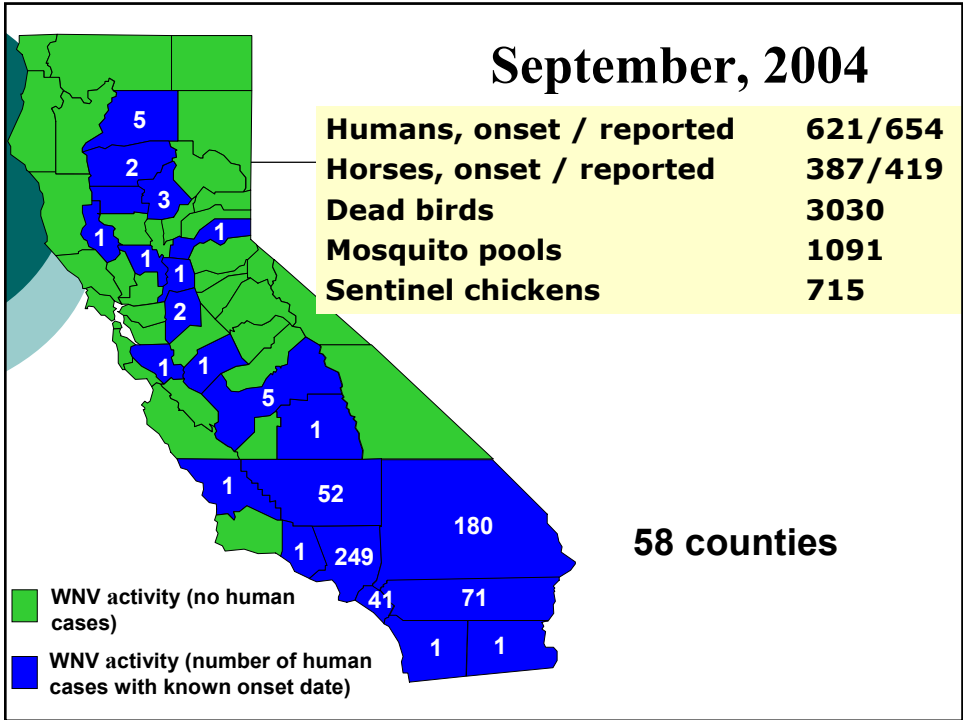


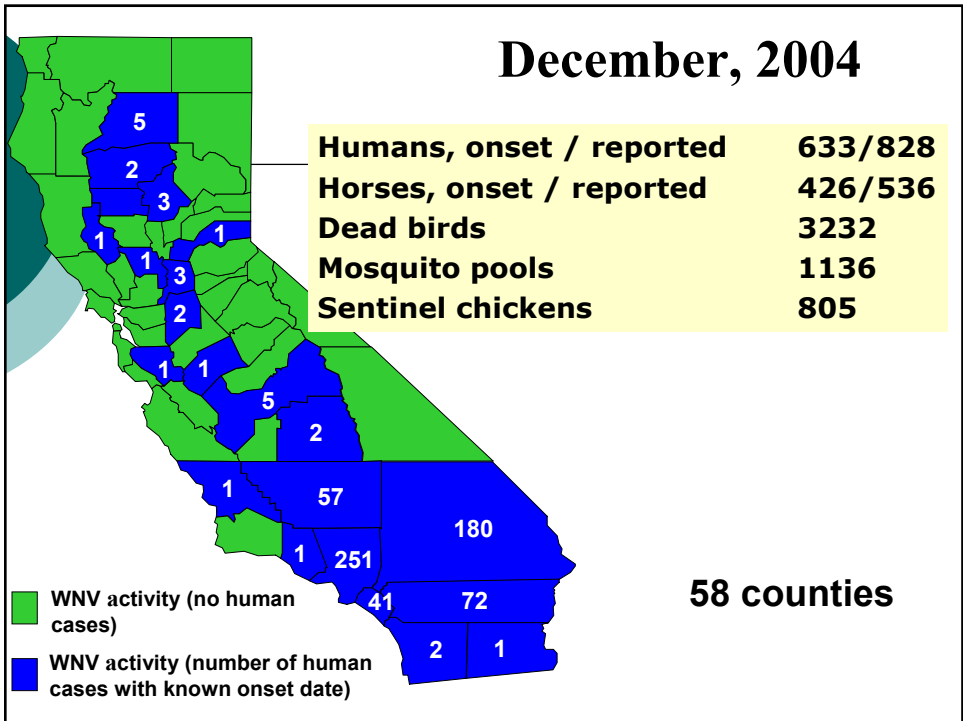
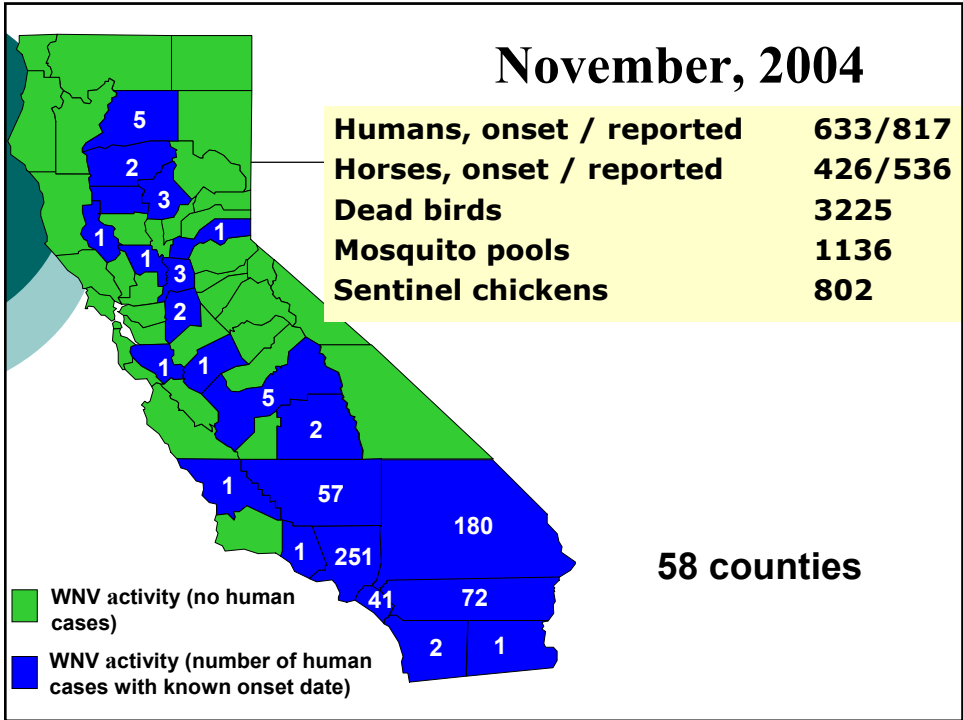
July 31, 2004

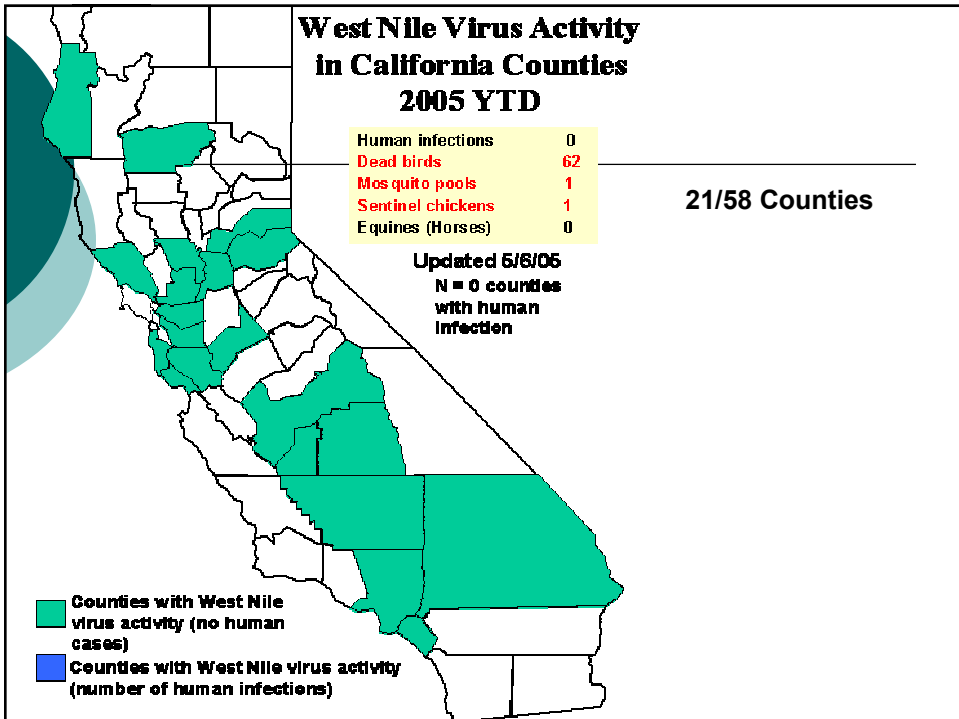
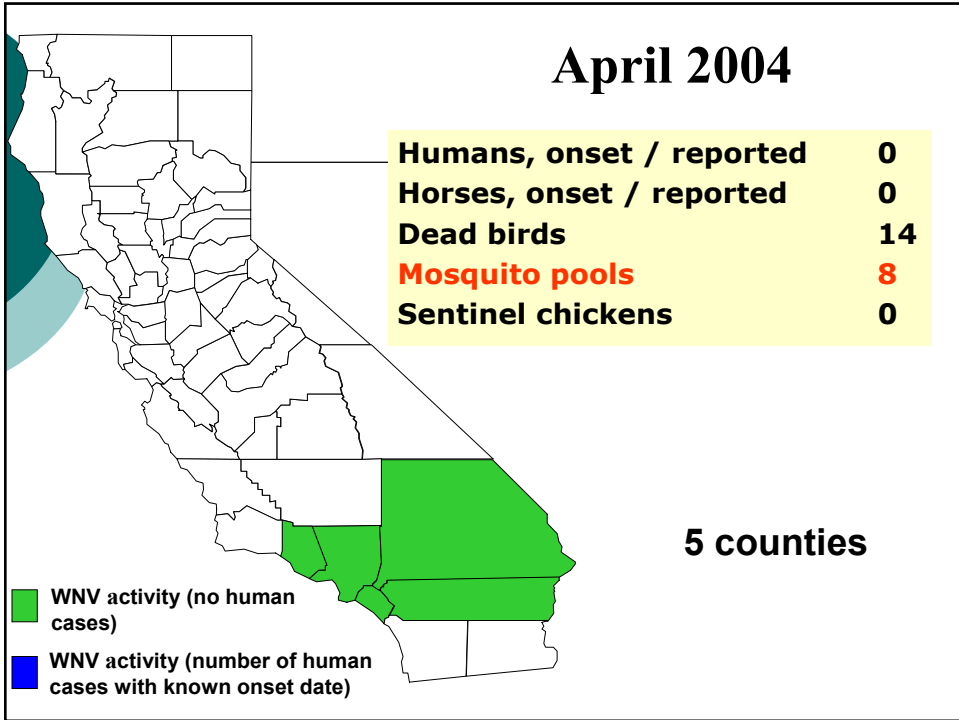
Humans, onset / reported	261/54
Horses, onset / reported	94/44
Dead birds	1447
Mosquito pools	526
Sentinel chickens	257

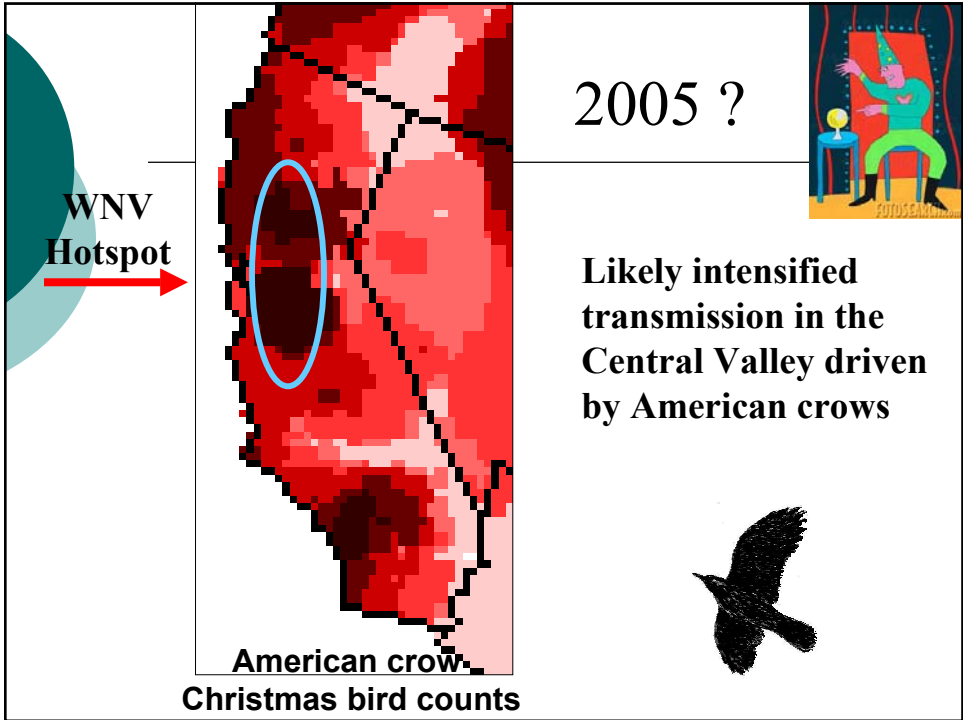












WNV: Individual Prevention

- **Avoid mosquitoes:**
- Avoid outside during dusk and dawn when mosquitoes are especially active
- Wear long sleeves, pants, socks & shoes when outdoors – or wear clothing made of insect netting (sporting goods stores, outdoor equipment catalogs)



WNV: Individual Prevention

- **Avoid mosquitoes:**
- Tight fitting screens without holes/tears on door and windows
- Use mosquito netting over infant carriers, playpens, strollers
- Use insect repellent, as instructed on product label, especially when out during dusk and dawn...





WNV: Individual Prevention

- Insect repellents:
 - DEET *
 - Picaridin *
 - Oil of lemon eucalyptus
 - Soybean oil
 - Permethrin-containing products
- All above are registered with the U.S. Environmental Protection Agency (US EPA)
- *Of the active ingredients registered with the EPA, these two have demonstrated a higher degree of efficacy in the peer-reviewed, scientific literature - products containing these active ingredients typically provide longer-lasting protection than others.



WNV: Individual Prevention

- **DEET** (N,N-diethyl-m-toluamide)
- The best-studied insect repellent available (Fradin & Day, 2002). Studies using humans and mosquitoes report long lasting protection after a single application:
 - 23.8% DEET ~ 5 hours of protection
 - 6.65% DEET ~ 2 hours of protection
 - 4.75% DEET and 2% soybean oil ~ 1.5 hrs of protection



WNV: Individual Prevention

- Over the long history of DEET use, very few confirmed incidents of toxic reactions to DEET have occurred when the product used properly as per label.
- Serious reactions have been related to using the product against the label instructions, such as swallowing it, using over broken skin, or using it multiple days without washing skin between uses.



WNV: Individual Prevention

- **Picaridin** (KBR 3023)
- An ingredient found in many mosquito repellents used in Europe, Australia, Latin America and Asia for some time
- Evidence indicates that it works very well and for long time, comparable with DEET products of similar concentration.
- Odorless & “light, clean feel”, may be less irritating than DEET esp on mucus membranes
- One product, containing 7% picaridin, is being distributed in the United States for the first time this year. Not yet registered in California.
- www.picardin.com



WNV: Individual Prevention

- **Oil of lemon eucalyptus** [p-menthane 3,8-diol (PMD)]
- Plant based repellent
- In two recent scientific publications, when oil of lemon eucalyptus was tested against mosquitoes found in the U.S. it provided protection similar to repellents with low concentrations of DEET.
- Not for children < 3 years old
- Has not been tested against mosquitoes that spread malaria and some other diseases which occur internationally
- www.frontiercoop.com/



WNV: Individual Prevention

- **Soybean oil**
- Soybean oil 2% "Blocker" products are equivalent to 5% to 10% DEET in efficacy, with products repelling mosquitoes for 1 to 4 hours
- Low toxicity, no age-associated restrictions on use, non-irritating but without a long history of use
- No known scientific studies in which soybean repellents have been tested for effectiveness against malaria-transmitting mosquito vectors
- www.biteblocker.com



WNV: Individual Prevention

- Certain products which contain **permethrin** are recommended for use on clothing, shoes, bed nets, and camping gear, and are registered with US EPA for this use.
- Highly effective as an insecticide and as a repellent
- Permethrin-treated clothing repels and kills ticks, mosquitoes, and other arthropods and retains this effect after repeated laundering.



WNV: Individual Prevention

- **Precautions when using insect repellents:**
- Apply repellents only to exposed skins and/or clothing (as directed on the product label.) Do not use repellents under clothing.
- Never use repellents over cuts, wounds or irritated skin.
- Do not apply to eyes or mouth, and apply sparingly around ears.
- Do not allow children to handle the product.

WNV: Individual Prevention

- **Precautions when using insect repellents (continued):**
- Use just enough repellent to cover exposed skin and/or clothing.
- After returning indoors, wash treated skin with soap and water or bathe.
- If you or your child get a rash or other bad reaction from an insect repellent, stop using the repellent, wash the repellent off with mild soap and water, and call your doctor and/or a local poison control center (800-222-1222) for further guidance.

WNV: Environmental Prevention - Vectors & Mosquito Life Cycle



WNV: Environmental Prevention - What the MSMVCD does

Control mechanisms:



- Education
- Source reduction
- Biological Control
- Larval control
- Adult control (emergency intervention)



WNV: Environmental Prevention - What the MSMVCD does

- Education
 - Educate community residents on how to eliminate mosquito breeding sites on their property



WNV Partnering for Prevention - What you in the community can do

- Source reduction (physical removal of breeding sources - "Flip It, Dump It, Drain It")
 - remove standing water in backyard
 - clean gutters
 - flipping & removing old tires & boats
 - sealing septic vents
 - seasonal & wetlands restoration by MSMVCD



WNV: Environmental Prevention - What the MSMVCD does

- Biological Control
 - mosquito fish
 - live friendly bacteria which kills mosquitoes = bacillus thurengensis (Bti)

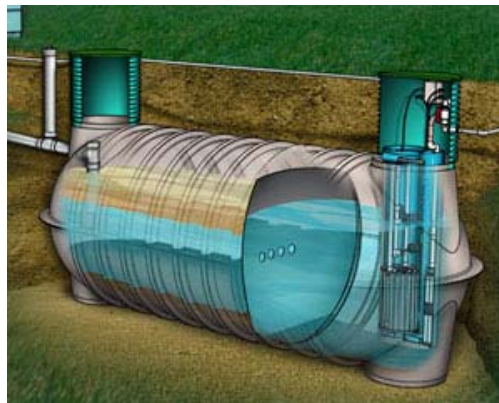


WNV: Environmental Prevention - What the MSMVCD does

- Larval control (site specific, e.g. septic systems, water under house)
 - mineral oil (golden bear)
 - live friendly bacteria which kill mosquitoes = bacillus sphericus
 - Site specific methoprene (does not leach into ground water, rapid breakdown in soil and by sunlight)
 - rosemary/wintergreen



WNV: Environmental Prevention - Septic Tank With Risers

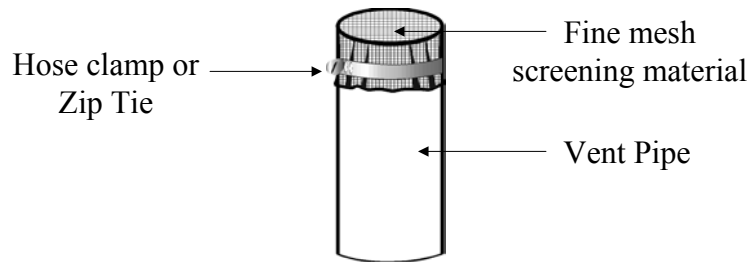


WNV: Environmental Prevention - Gas-Tight Access Covers & Lids



Image Courtesy of Zabel Technologies

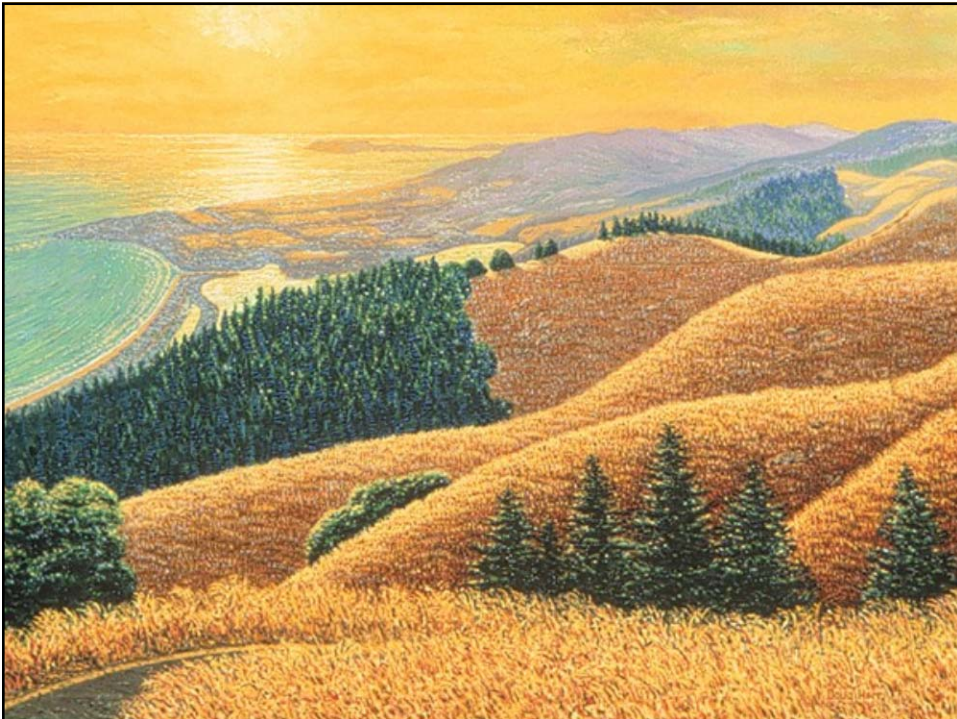
WNV: Environmental Prevention - An Easy and Inexpensive way to Exclude Mosquitoes



Original Image Courtesy: Stacey Henderson

WNV: Environmental Prevention - What the MSMVCD does

- Adult control
 - With good larval control activities in partnership with the community, the need for adult control activities less likely
 - Would only be considered in emergency circumstances
 - Every situation will need to be individually assessed; factors to be assessed include -
 - Humans test positive for WNV
 - Adult mosquitoes (if a species which carries WNV) test positive for WNV
 - Birds test positive for WNV
 - Done at very specific mosquito breeding sites



Toxicological View of Safety

Hazard = possibility of adverse effect

Risk = probability of adverse effect

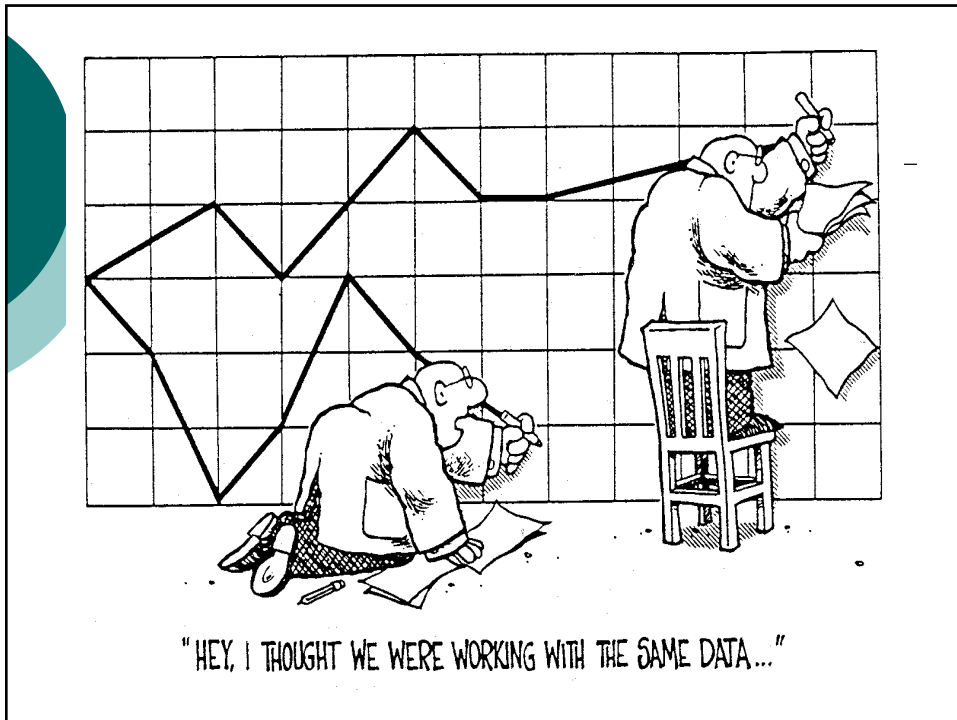
Risk is determined by the DOSE and the POTENCY (Dose-response relationship) of the chemical. $RISK = DOSE \times POTENCY$

Safety = $1 - Risk$

Safety = Acceptable Risk

Risk Assessment Overview

1. HAZARD IDENTIFICATION
2. DOSE RESPONSE ASSESSMENT
3. EXPOSURE ASSESSMENT
4. RISK CHARACTERIZATION



EXTOXNET

The Extension TOXicology NETwork

UCD, OSU, MSU, UM

Website Address:

<http://extoxnet.orst.edu/>

Pesticide Information Profiles

Toxicology Information Briefs

Newsletters, FAQs, links to good information!



WNV: References/Resources

- **County of Marin Department of Health and Human Services:**
www.co.marin.ca.us/depts/hh/main/hs/PublicHealth/WNV/WNV.cfm
Warmline # 415-499-3236 (English, Spanish, Vietnamese)
- **Marin/Sonoma Mosquito & Vector Control District:**
www.msosquito.com/westnile.html
#800-231-3236
- **California Department of Health Services:**
www.westnile.ca.gov/
#877-WNV-BIRD
- **Centers for Disease Control:**
www.cdc.gov/ncidod/dvbid/westnile/index.htm
#888-246-2675



WNV: References/Resources

- **National Pesticide Information Center** (for information on insecticides including DEET): <http://npic.orst.edu>
#800-858-7378
- **Environmental Protection Agency** Fact Sheets on Insecticides:
www.epa.gov/pesticides/factsheets/insectrp.htm
- **California Department of Pesticide Regulation**
www.cdpr.ca.gov/docs/factshts/repellents.htm
- EXTOWNET - The Extension TOXicology NETWORK (UCD, OSU, MSU, UM): <http://extownet.orst.edu/>

WNV: References/Resources

- Supplement, Canadian Recommendations for the Prevention and Treatment of Malaria Among International Travellers, Canada Communicable Disease Report, Public Health Agency of Canada, June 28, 2004
- Fradin MS, Day JF. Comparative efficacy of insect repellents against mosquito bites. *N Engl J Med.* 2002;347(1):13-8.
- Barnard DR, Xue RD. Laboratory evaluation of mosquito repellents against *Aedes albopictus*, *Culex nigripalpus*, and *Ochlerotatus triseriatus* (Diptera: Culicidae). *J Med Entomol.* 2004 Jul;41(4):726-30.

Questions?

