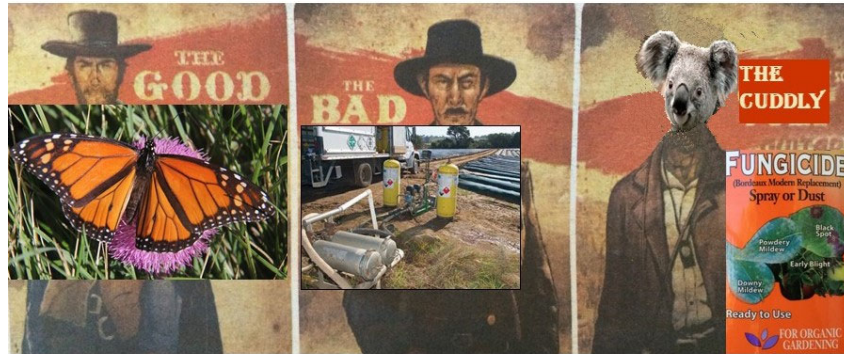


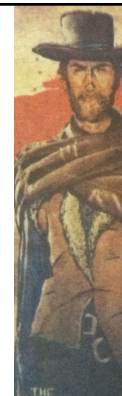
## Pesticides and the Environment



1

## THE GOOD

- **Pesticides must provide some benefit to society or why would we use them?**



2

## Malaria

- ◆ Panama: In 1898-1904, the use of draining and oiling water bodies, screening structures and using pyrethrum and sulfur, mortality of canal workers dropped from 6% to 1%.
- ◆ Malaria is spreading to areas previously free of the disease. **1960s - only 10% the world's population was at risk of contracting malaria. Risk is now 40%**
- ◆ 1 - 3 million die of malaria each year
- ◆ Malaria is responsible for as many as half the deaths of African children under the age of five.
  - 1,337 cases of malaria, including 8 deaths, were reported for 2002 in the United States, even though malaria has been eradicated in this country since the early 1950's.
  - Gates Foundation/Bayer implementing distribution of pyrethroid treated nets for use around beds. Big challenge.



Source: CDC and WHO

3

## Scientists hail malaria breakthrough as bed nets prove deadly to mosquitoes

**Clinical malaria cases in Burkina Faso drop by 12% after trial of nets treated with new chemical combination**




▲ A bed net treated with pyrethroid insecticide and pyriproxyfen, an insect growth regulator, is seen hanging up in a living space in Burkina Faso. Photograph: Steve Lindsay/Durham University

A bed net designed to kill insecticide-resistant mosquitoes could prevent millions of cases of malaria across sub-Saharan Africa, scientists have found.

The Guardian

4



## Medical and Economic Cost of Asthma

The New England Journal of Medicine

THE ROLE OF COCKROACH ALLERGY AND EXPOSURE TO COCKROACH ALLERGEN IN CAUSING MORBIDITY AMONG INNER-CITY CHILDREN WITH ASTHMA

DAVID L. ROSENSTREICH, M.D., PEYTON EGGLESTON, M.D., MEYER KATTAN, M.D., DEAN BAKER, M.D., M.P.H., RAYMOND G. SLAVIN, M.D., PETER GERGEN, M.D., HERMAN MITCHELL, Ph.D., KATHLEEN McNIFF-MORTIMER, M.P.H., HENRY LYNN, Ph.D., DENNIS OWNBY, M.D., AND FLOYD MALVEAUX, M.D., Ph.D., (1997)  
FOR THE NATIONAL COOPERATIVE INNER-CITY ASTHMA STUDY\*

~30 million affected,  
~9 million children  
~\$13 billion for related health care


5

## Pesticides (baits) help reduce asthma



Journal of Allergy and Clinical Immunology

Volume 113, Issue 1, January 2004, Pages 109–114




Environmental and Occupational Disorders

**Abatement of cockroach allergens (Bla g 1 and Bla g 2) in low-income, urban housing<sup>2</sup>: Month 12 continuation results**

Samuel J Arbes, Jr, DDS, MPH, PhD<sup>1</sup>, Michelle Sever, BS<sup>2</sup>, Jigna Mehta, BA<sup>1</sup>, J Chad Gore, MS<sup>2</sup>, Coby Schai, PhD<sup>3</sup>, Ben Vaughn, MS<sup>2</sup>, Herman Mitchell, PhD<sup>1</sup>, Darryl C Zeldin, MD<sup>4</sup>

[Show more](#)

DOI: 10.1016/j.jaci.2003.10.042 [Get rights and content](#)



**Conclusions**

Reductions in cockroach allergen concentrations achieved through the combined intervention of occupant education, insecticide application, and professional cleaning can be maintained with continued cockroach control. Surprising,.... [insecticide application alone significantly lowered allergen concentrations in the crossed-over control homes.](#)

6

## Typhus – A disease from antiquity

### Transmitted by the Human Body

#### Louse in close quarters



- 1489 – Granada War – Catholic Monarchs lost 3,000 to enemy action and 17,000 to typhus
- 1847 – 27,000 deaths in Canada – Irish immigrants held in “fever sheds,” quarantined.

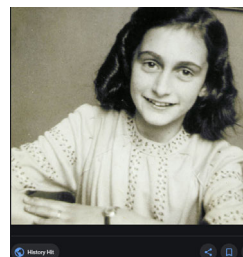


Source: Wikipedia

7

## Typhus Disease

- WWI – 3 million Russian deaths
- WW2 – Thousands of deaths in German concentration camps (including Ann Frank)



8

## DDT saved thousands of lives during WWII

### Killed lice in Europe & mosquitoes in the South Pacific

(typhus vaccine not introduced until mid-1943)



A U.S. soldier is demonstrating DDT-hand spraying equipment. DDT was used to control the spread of typhus-carrying lice.



9

## Rocky Mt. Spotted Fever Outbreak

### AZ Tribal Lands, 2003-2014



Male (above) and Female (below) adult brown dog tick (*Rhipicephalus sanguineus*) – Photos by Centers for Disease Control (CDC)

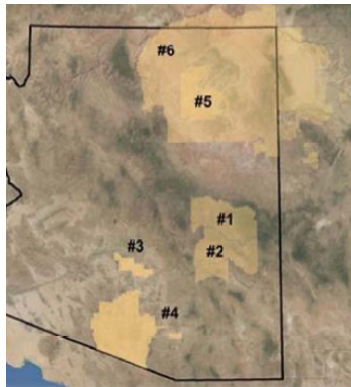


Between 2003 and 2012, there were 250 cases and 19 fatalities in AZ, most on six Tribal Lands and associated with free-roaming dogs and severe tick infestations. The incidence was 200x the national average.

2 The University of Arizona Cooperative Extension

10

## Rocky Mt. Spotted Fever Outbreak AZ Tribal Lands, 2003-2014



11

11

## New cases of RMSF on "Reservation B" (580 households) in northern Arizona Relatively high mortality rate

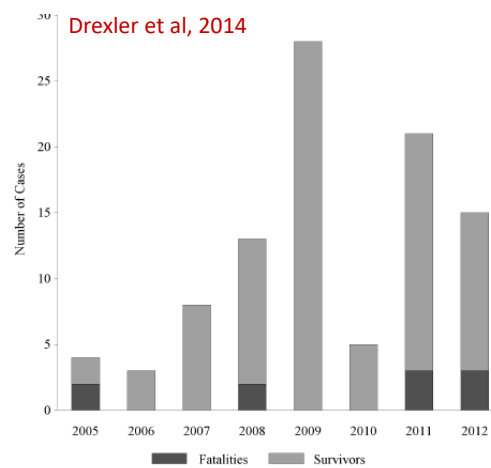
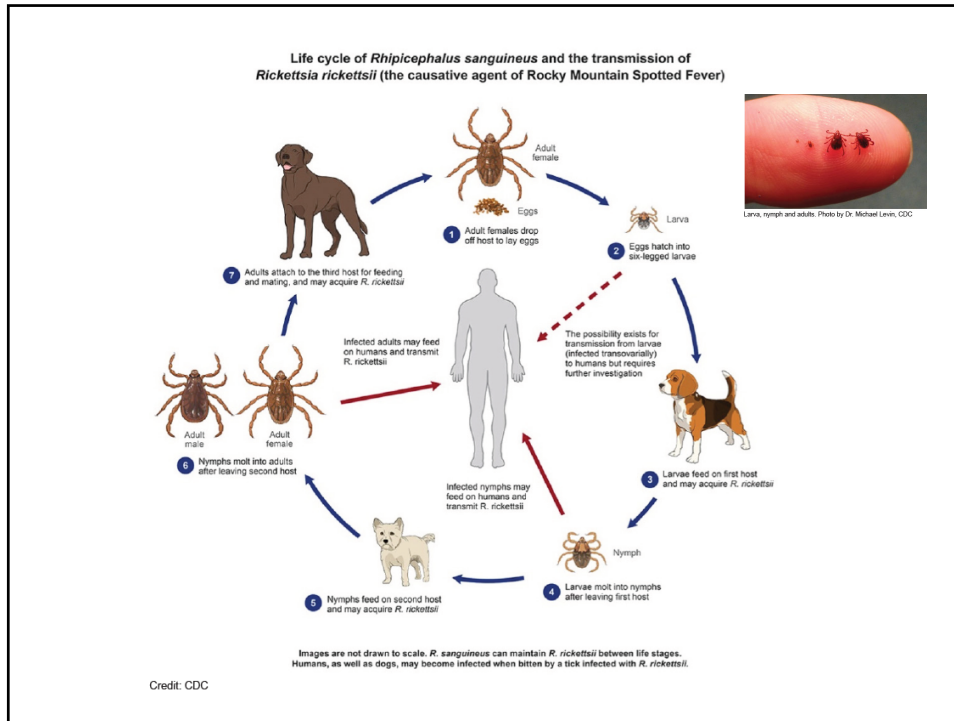


Figure 1. Human cases of Rocky Mountain spotted fever on Reservation B as reported by the Arizona Department of Health Services.

doi:10.1371/journal.pone.0112368.g001

12



13

## TRIBAL LAND Rocky Mountain Spotted Fever public/Private partnership





Stephanie Darnell




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## Implementation of a Community Outreach Program

### What is RMSF?

- Tickborne bacterium "Rickettsia rickettsii"
- **Brown Dog Tick** can bite and infect a dog or a person
- Fast-acting disease can cause death in a week
- Quickly attacks blood vessels
- Impacts multiple organ systems in a short time.

### Responsible Dog Owner

- Provide food, water and shelter daily
- Monitor dog health with regular scheduled veterinary checkups, vaccines and deworming
- Spay / Neuter to prevent unwanted litters (furry dog overpopulation)
- Use Tick Collar / Spot-On treatment to protect the dog from ticks
- Purchase a NH dog license and collar
- Report dog attacks / roaming dogs to the NN Animal Control Office
- Secure dog on a leash when walking
- Prevent dog roaming by keeping dog inside a fence or on a runline (wash)

### Rocky Mountain Spotted Fever (RMSF) on the Navajo Nation

### Signs & Symptoms

- ⇒ Fever lasting more than 2 days
- ⇒ Headaches or muscle aches
- ⇒ Stomach problems: loss of appetite, diarrhea, nausea and vomiting
- ⇒ Spotted Rash, Red Bumps
- ⇒ If you have any of these signs/symptoms: Go see a health care provider

### Protect Your Home

- Do yardwork by cutting high grass and weeds
- Put up a fence to keep roaming dogs out and keep your dogs in
- Remove mattresses and old furniture from the yard because ticks can live inside them
- Keep wood piles and dog house away from the house

developed by:

## FAD Task Force

Foreign Animal Disease (FAD) Task Force was established by the Navajo Nation Emergency Response Plan to initiate planning, preparedness and education to protect families and communities from RMSF. Navajo Nation Departments, Programs and Partners work together to increase public health awareness on tick bite prevention and education.

### The Arizona History of RMSF

- Since 2003, there are over 250 human cases and 19 deaths
- Impacts many tribes:
  - Fort Apache
  - San Carlos Apache
  - Tonto O'odham Nation
  - Gila River Indian Community
  - Hopi Nation

### CONTACT

Navajo Nation Veterinary and Livestock Program (NNVLP) - (505) 371-5214  
 Navajo Animal Control Program - (928) 871-4451  
 Navajo EPA Pesticide - (928) 871-7183  
 Navajo Health Education - (928) 871-7967  
 Community Health Representatives - (928) 729-4027

Modified: 4/23/13

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## Pesticide Community-wide Treatment Strategy

Treat yards & apply pesticide-treated-collars

(Seresto: neonic/pyrethroid)



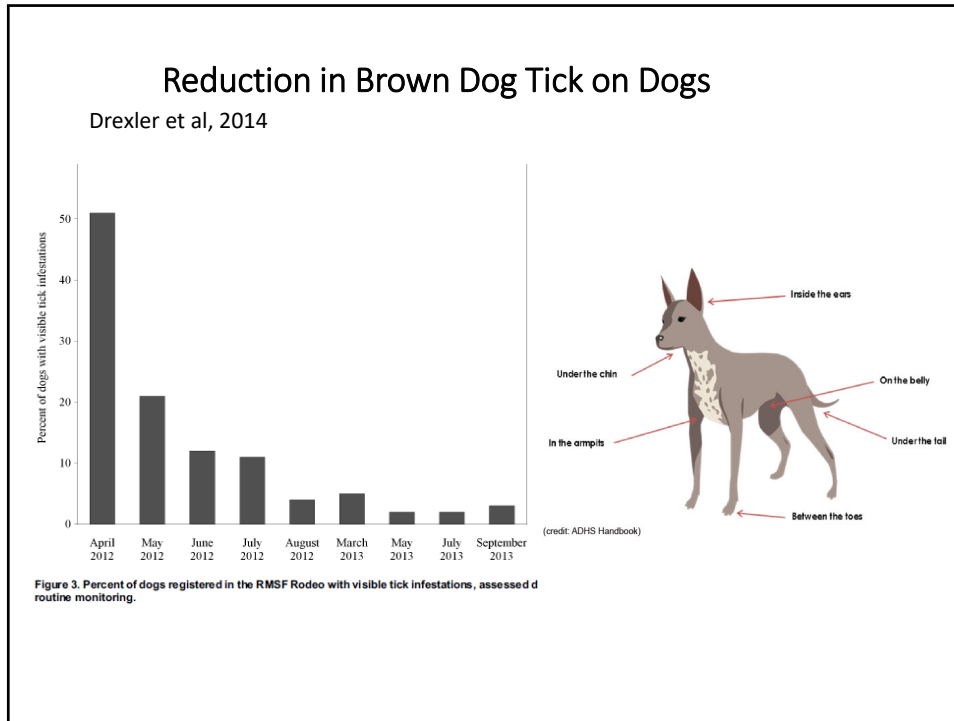
USA Today



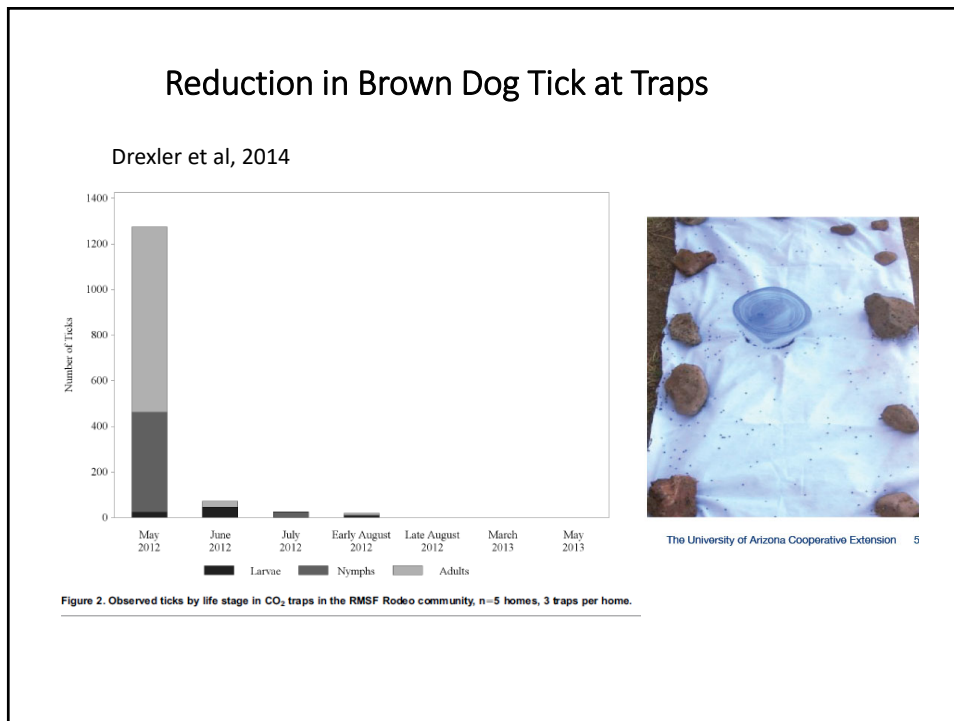
Photo Credit: Dawn Gouge

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## Reduction in RMSV Cases at “Reservation B”

From before treatment (April 2010-March 2012) to after treatment (April 2012-March 2014)

- New cases dropped 43% in the community-wide treatment area compared with a 27% drop in the non community-wide area
- Number of cases dropped from 1.2/1000 to 0.7 in the treated area
- 1.2/1000 to 0.9 in the non-treated area



Quora.com

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## *Pesticide baits are critically important in controlling fire ants*

*•I recently published research in the Annals of Internal Medicine about the consequences of fire ants. These insects sting more than 50% of people living in fire ant prevalent areas.....Many stings result in local discomfort, however, a small number of people experience severe allergic reactions, some of which are fatal’.*

*•Richard deShazo, M.D. Dept. of Medicine, Univ. of MS Medical Center*



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## Insect growth-regulator baits & conventional pesticides are the only effective control strategies for termites.

- Subterranean and drywood termites are the most economically important wood destroying pests in the U.S.
- Every year attack about 4 million homes in U.S., and cost >\$5 billion in property damage.
- Termites cause more damage each year than tornadoes, hurricanes, hail, flooding and windstorms combined



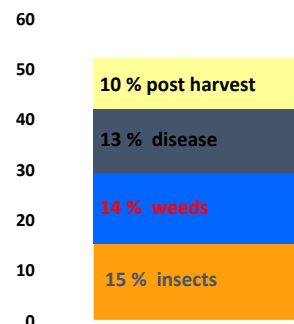
Source: Bayer Corporation

21

## Feeding the World/Organic production is limited

- ◆ World's population today is 6.5 bn; 8.5 bn by 2025.
- ◆ World must produce as much food in the next 40-80 years as it has in the past 12,000 years combined, on less land.
- ◆ Without modern crop production technologies...more than 50% of all harvested crops would be lost to pests; using these tools, farmers can improve plant health and reduce loss to 10% of total production.
- ◆ Without modern agricultural practices, (crop protection and biotechnology), feeding the current world population would require an additional 2.5 bn acres of land for cultivation of food, fiber and feed crops. Current cultivated land: 2.7 bn acres\*
- ◆ Additional land requirements for crop cultivation would further deplete the natural resource areas that we are trying to preserve.

Yield losses in %



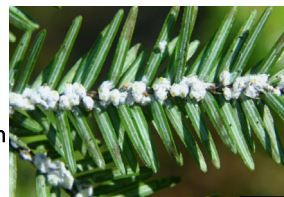
Source: Bayer Corporation, \*ourworldindata.org (2017)

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## Preserving Endangered Species

Hemlock Woolly Adelgid on the Carolina Hemlock (in localized areas in TX, SC, NC, VA,GA)

First discovered in 1951 on Eastern and Carolina hemlocks in the Appalachians from Japan.



Clemson University



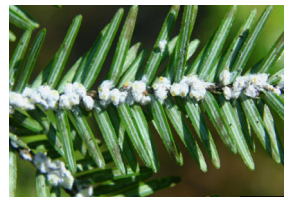
Figure 14. A stand of dead eastern hemlock trees in the Great Smoky Mountains National Park. (Photo: Scott M. Salom, Virginia Tech.)

- Hemlocks are foundation species that control ecosystem dynamics
- Huge recreational value

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## Preserving Endangered Species

Hemlock Woolly Adelgid on the Carolina Hemlock (in localized areas in TX, SC, NC, VA,GA)



Clemson University

BIOLOGY AND CONTROL OF HEMLOCK WOOLLY ADELGID

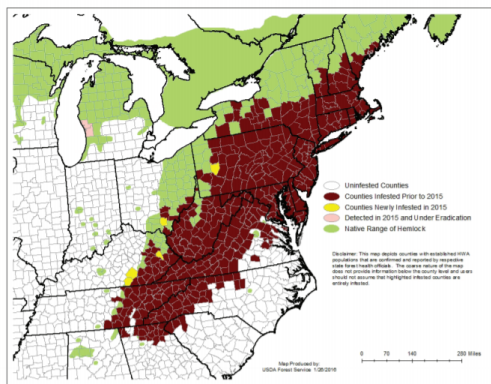




Figure 4. Map of eastern hemlock distribution and range of HWA. (2016)

Distribution of the Eastern and Carolina Hemlocks

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## Preserving Endangered Species Hemlock Woolly Adelgid

- Damage:
- Sucks nutrients from the base of needles causing twig dieback
- Produces a hypersensitive response that restricts water transport
- Eventual death results

Figure 2. Slide-mounted HWA adult (left) and first instar (right) (Photos: Nathan Havill, USDA Forest Service).

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## Neonics used as trunk, soil injections

Doccoia et al.: Trunk-Injected Imidacloprid for Hemlock Woolly Adelgid



Arboriculture & Urban Forestry 2007, 33(1):12-21.

**Efficacy and Duration of Trunk-Injected Imidacloprid in the Management of Hemlock Woolly Adelgid (*Adelges tsugae*)**

Joseph J. Doccoia, Eric J. Bristol, Samantha D. Silleot, Joseph Lojko, and Peter M. Wild

**Abstract.** Hemlock woolly adelgid (*Adelges tsugae*) (HWA) is an introduced piercing, sucking insect that affects hemlocks (*Tsuga* spp.) by extracting carbohydrate from the xylem ray parenchyma cells. Left untreated, HWA will result in reduced shoot growth, branch dieback, and ultimately tree death. In this study, the insecticide DMA-jet (5% imidacloprid) was applied by trunk microinjection with the Arbogest Tree I.V. using the VIPER method. Sixteen randomly selected HWA-infested hemlocks were treated in 2002 and 2003 and eight trees were selected as untreated controls. Eight infested branch samples per tree were cut each year (2003, 2004, and 2005) and assessed. Four parameters were used to assess the efficacy and duration of treatments. These were percent HWA mortality, total and live HWA per linear centimeter shoot growth, and current-year shoot growth. The eastern hemlock (*T. canadensis*) in this study had high initial HWA pressure. In the 3 years of the study, winter low temperatures were insufficient to cause an appreciable or sustainable reduction in infestation levels. In the controls, HWA increased and hemlock growth decreased. Treatment with stem-injected imidacloprid did not provide a quick knockdown of the HWA; rather, it required time (i.e., at least 1 year). In the year after a second treatment, we observed sufficiently high HWA mortality for hemlock to resume growth. We have a high degree of confidence that a repeat treatment increased the levels of imidacloprid for the duration of efficacy observed. We recommend a 2x dosage (e.g., for trees in the 30 to 70 cm [12 to 27.6 in.] size class, increase from 0.08 L A.I. to 0.16 gm A.I./cm trunk diameter at breast height [DBH]) for an increased level of efficacy to extend the injection interval (to once every 2 years) and to limit the number of wounds a tree receives to centimeters DBH (0.1/2). The low rate recommendations are reflected on the DMA-jet label inserted in 2006. These results demonstrate that hemlock with high HWA pressure can be successfully treated using DMA-jet and the Arbogest Tree I.V. system.

**Key Words.** Adelgidae; hemlock; hemlock woolly adelgid; DMA-jet; imidacloprid; micro-injection; plant health; systemic injection; Tree I.V.; trunk injection; VIPER; wound response.

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## Preserving Endangered Species Hemlock Woolly Adelgid



Clemson University



Figure 13. A mature eastern hemlock in decline following its infestation from HWA (Photo: Bugwood.com)

In the 1990s, neonics were used by the National Park Service successfully to save over 200,000 trees. Neonics have been used since to protect other hemlocks in the Eastern US.

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## Preserving Ornamental Species Coral (Wiliwili) Tree in Hawaii

**PRESERVING NATIVE CORAL TREES IN HAWAII: EFFICACY OF SYSTEMIC INSECTICIDES AGAINST THE ERYTHRINA GALL WASP**

Shari L. Smith<sup>1</sup> and Brian L. Strout<sup>2</sup>

<sup>1</sup>U.S. Forest Service, Region 5, Forest Health Protection  
2550 Riverside Dr., San Jose, CA 95130

<sup>2</sup>U.S. Forest Service, Southern Research Station  
2200 Sheppard Highway, Pineville, LA 71360

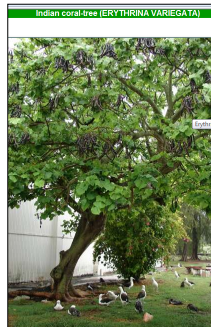
**ABSTRACT**

The erythrina gall wasp (*Erythrina gall wasp* (ECGW)) was described as a new species in 2004 from specimens collected in Singapore, Mauritius, and Réunion. Facilitated by a rapid life cycle (<20 days) and widespread movement by humans, ECGW is now widespread in Hong Kong, China, India, Thailand, American Samoa, Guam, Oklahoma, and the Hawaiian Islands. In October 2006, ECGW was detected on the continental U.S. in south Florida on *Erythrina variegata* L., a widely planted, ornamental and a favorite host for ECGW. *Erythrina* (and trees) are found in tropical, subtropical, and warm temperate regions of the world and are the only known hosts for ECGW.

The genus *Erythrina* includes 110 species worldwide, 25 of which are documented hosts of ECGW. Most other species have not been evaluated. In North America, 18 species of *Erythrina* are native to Mexico and 2 in the U.S. mainland. Seventy species are native to the neotropics, and additional coral trees exist in high-value ornamental plants such as San Diego and Los Angeles, CA. Many of these species are susceptible to ECGW. In Hawaii ECGW attacks the endemic *E. umbonata* (V. Duguet) (colletia) and two non-native species, *E. variegata* and *E. crista-qualis*. *E. crista-qualis* in Hawaii are facultatively deciduous depending on availability of water, and susceptibility differs among species, resulting in pronounced host mortality for the wasp. ECGW injury is so severe to wiliwili trees that their continued existence in Hawaii is in question.

Young tissues of *Erythrina*, especially leaves, shoots, and petioles, are preferred by ECGW for oviposition. Severe infestations cause aerial defoliation, physiological disruption, loss of seed production, and tree death. In April 2008, we began testing five chemicals (acifluorfen and imidacloprid) and three injection systems (Arborjet, Sidekick, and Widge) to evaluate their efficacy and effective duration for protecting native wiliwili trees from ECGW. Trees continue to be evaluated annually for changes in ECGW infestation levels. Results of this study should aid the survival of selected wiliwili trees in Hawaii and in the development of prevention, detection, and response strategies in the face of rapid ECGW range expansion in other areas of the world.

74 2007 USDA (Interagency) Research Forum - 07R-RES-F-20



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# Pesticides and Habitat Restoration

The screenshot shows the website for Friends of the Verde River. The navigation menu includes: SUSTAINING FLOWS, RESTORING HABITAT (highlighted), PROMOTING COMMUNITY, BECOMING INVOLVED, GETTING TO KNOW US, and DONATE NOW. Below the menu is a circular logo for the Verde Watershed Restoration Coalition. A list of links includes: Verde Watershed Restoration Coalition (WVRC) Home Page, About the WVRC, How to Participate, WVRC Partners, and WVRC in Action. A large photograph shows a person in a blue shirt and red hat working in a wooded area. Below the photo is the caption: "Conservation Crew Member with Trees of Heaven Growth." A text block below the photo states: "The Verde River is treasured for its wildlife habitat, water supply, recreational opportunities, and natural beauty. It

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The slide features the Friends of the Verde River logo at the top left. Below it is a circular portrait of Nancy Steele, Executive Director. To the right of the portrait are two side-by-side photographs of a hillside. The left photo is labeled "Before Tamarisk Removal" and shows a dense thicket of green trees. The right photo is labeled "After Tamarisk Removal" and shows the same hillside with significantly fewer trees and more open ground. Below the photos is the heading "INVASIVE PLANTS OF THE VERDE RIVER WATERSHED" and the text "WVRC's Big Four (considered to be the biggest threats to the natural functioning of the watershed): Tamarisk/Saltcedar - *Tamarix Ramosissima*".

**“Without the use of Roundup for our restoration program, we would have given up.”**

Dr. Nancy Steele, April 16, 2019, “Insights to the Outdoors, The Verde,” presentation given at the Highlands Center for Natural History.

30

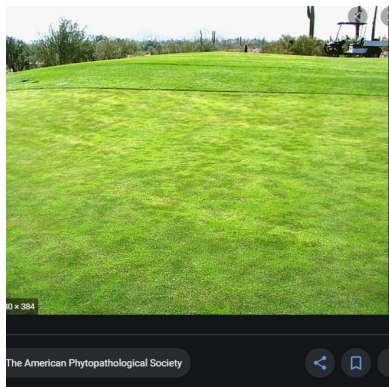
## Golf Courses and Rapid Blight fungus

- - **Affects** most golf courses (municipal and extremely private from Las Vegas to Phoenix to Southern CA).
- - *Labyrinthula* is a fungus (slime mold type) that has attacked marine plant seagrass and turf. Took out 95% of seagrass along the European and N.American coasts in 1930s.
- - The terrestrial species, *L. terrestris* (Rapid Blight) attacks turf as a saprophyte – discovered on turf in 1995 in CA.



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## Golf Courses, Rapid Blight, gray water, and fungicides



- *Labyrinthula* sp., Rapid Blight.
- Attacks turf compromised by high salinity – especially in the fall after over-seeding.

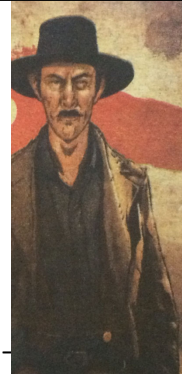
**Fungicides kill Rapid Blight which confer vigor, allows the turf to survive, and provides a use for poor-quality recycled water.**

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## THE BAD

- Human Toxicity
- History of Bioaccumulation
- Ozone Layer Destruction (Freon/MB)
- Waterway contamination from pyrethroids and heavy metals –  
(UC Berkeley Study, Elkhorn Slough)
- Pollinators (neonics, fungicides on pollen, Sivanto+fungicides)



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## Pesticides Where we've come from to where are today

### Insecticides

Arsenic – early 1900a  
 DDT and organochlorines – 1943-1950s  
 Methyl bromide – 1960s' present  
 Organo-phosphates and carbamates – 1950s-1980s  
 Pyrethroids – 1980s -present  
 Neonicotinoids 1990 - present  
 Spinosyns 2000  
 Insect growth regulators 2000New chemistry-??

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## Pesticides

### Where we've come from to where are today



Gypsy moth control  
in the late 1880s

35

## Pesticides

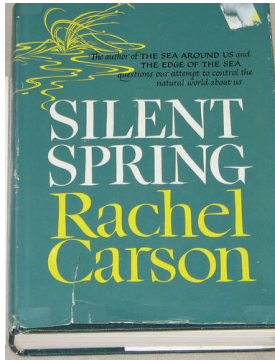
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 Neonicotinoids 1990 - present  
 Spinosyns 2000  
 Insect growth regulators  
 New chemistry-??

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## Pesticide Environmental Effects DDT



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## Pesticide Environmental Effects DDT

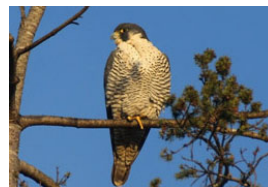


- Used in WW II to combat malaria (mosquitoes) and typhus (lice)
- Then used in agriculture
- 1950s - WHO launched a global malaria eradication program
- Initially highly successful – malaria eliminated in Taiwan, parts of the Caribbean, northern Africa, northern Australia, S.Pacific. etc.
- Millions of lives saved.
- Not applied in sub-Saharan Africa because of mosquito pressure and poor infrastructure.

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## DDT

- 1950s – 1960s – Resistance appeared (mosquitoes/malaria, agriculture)
- Environmental effects noted – thinning egg shells (peregrine falcons and other species)
- Carson noted human health effects studies, but this was dose related.
- 1972 – EPA banned ag use.
- But still used in vector control sparingly. (CA – bubonic plague program/fleas).
- Now pyrethroid-protective netting is being distributed, but Malaria is on the rise.(also resistance to drugs)
- New evidence of endocrine disruption



SUMMARY:  
THERE WERE BENEFITS AND DETRIMENTS  
REPLACED BY SAFER MATERIALS

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## Pesticide Environmental Effects Methyl Bromide

- Ozone Depleter
- “United Nation's Montreal Protocol on Substances That Deplete the Ozone Layer” – went into effect in 2005
- Eye and lung irritant
- Very toxic



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Methyl Bromide: No comparable alternatives in Agriculture, but usage has been significantly reduced with new resistant varieties (but pathogens develop resistance fast – spinach/strawberries)

- Telone and chloropicrin – toxic
- Biologics?
- Soil composting ?
- 

TABLE 2. Estimated statewide costs of 2001 DPR methyl bromide use restrictions to California strawberry growers

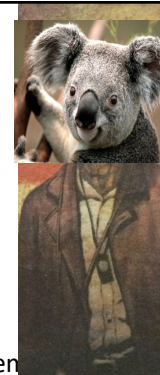
Cost	\$ (millions)
Applying buffer zones	3.2
Lost processing-strawberry sales	10.4
Additional fumigation time	10.0
Switch from bed to flat fumigation	2.4
Notification	0.125
<b>Total</b>	<b>26.125</b>



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## THE CUDDLY

### Organic pesticides



- “Organic agriculture is an ecological production management system that promotes and enhances biodiversity, biological cycles and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony” .....USDA National Organics Standards Board....1991

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## Organic Pesticides

- Because they have been Generally Regarded as Safe, fewer tests have been required in the past.
- This is changing.

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## Organic Pesticides Substances allowed

- Naturally derived products Generally Regarded as Safe
- Bacillus species
- Streptomyces derivatives
- Chenopodium derivatives (Regalia)
- Botanicals



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## Organic Pesticides Substances allowed

- Also synthetics:
- Sulfur
- Copper sulfate, hydroxide, oxide “provided that it is used in a manner that minimizes accumulation in the soil”
- Lime sulfur
- Oils, mineral and narrow range petroleum oils – dormant
- Tetracycline
- Recycled paper
- Petroleum based plastic mulches
- Alcohols, ethanol, isopropanol

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## Are Organics safer for the environment?



### ENVIRONMENTAL HAZARDS

This pesticide is extremely toxic to fish and aquatic invertebrates. Do not apply directly to water, to areas where surface water is present or to intertidal areas below the mean high water mark. Do not apply when weather conditions favor drift from treated areas. Drift and runoff from treated areas may be hazardous to aquatic organisms in neighboring areas. Do not contaminate water when disposing of equipment washwaters.

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## Are Organics safer for the environment?



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## Organic Pesticides The Challenges

- They require more frequent applications and then often don't perform as well.
- Yields are **lower**, but the growers receive a better price and this is passed down to the consumer.

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## Organic Pesticides

### Where do they work where yields are comparable?

- In growing regions where the pest and disease pressure is unusually low.
- EX: Verde Valley grapes: No powdery mildew, no botrytis rot, no spider mites, thrips (?), nematodes?, no phylloxera, no viral diseases.
- EX: Chino Valley vegetable growers: Little disease and insect pressure.
- THE GROWERS ARE VERY LUCKY!!..for now.
  
- Where pest/disease pressure is apparent, if it intensifies as the crop matures, then harvest the crop before the pests occur. EX: spinach. The vast majority of the retail product is pre-packaged "Spring Mix" or "Baby Spinach."
  
- In scenarios, organic and conventional products are used in an integrated program.

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## Pesticides and Pollinators – Miscellaneous reflections

- Homeowner label rates are higher than agriculture labeled use rates and are more toxic to pollinators.
- Neonics are less toxic to bees than many other over-the-counter products.
- Soil-applied pesticides generally result in less exposure to pollinators.
- Many organic materials that may be relatively harmless to pollinators don't work very well on the targeted pests.
- Organic materials that work on worms are toxic to butterfly pollinators.

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## Pesticides and Pollinators What to use?

- Read the label very carefully to see if the product is safe for bees and under what conditions (bloom, time of day, method of application) is the product safe?
- If you are concerned about Monarchs, then do not use any insecticides!

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## Misuse of Pesticides

- Spray drift – to another crop, body of water, non-ag property
- Spraying when it is windy or when there is an inversion layer
- Wrong rate
- Contaminated spray tanks going from one crop/ornamental where the product is registered to another where it is not.
- Spraying flowering plants while bees are foraging when the label prohibits it. Pest control companies and **Homeowners are guilty.**
- Blowing the dust of pesticide seed coatings when planting.

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## Misuse

“On June 17, 2013, the largest native bee kill ever recorded occurred in Wilsonville, Oregon. More than **50,000** bumble bees died when 55 blooming linden trees were sprayed with the pesticide dinotefuran (also known as **Safari**) in a Target parking lot. This loss represents potentially hundreds of wild bumble bee colonies.” Xerces Society  
**THIS WAS AN ILLEGAL APPLICATION AT VARIANCE WITH THE LABEL**



Trees outside the Target store in Wilsonville received a mesh covering after the bee deaths.



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Read and follow the label:

**Safari's Label:**

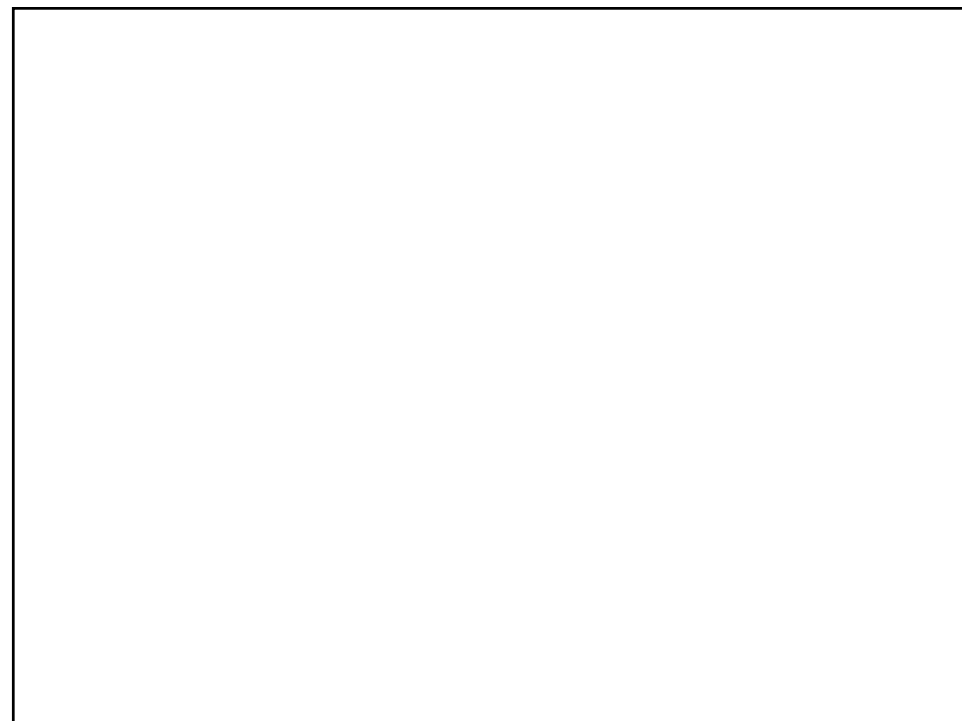
This product is toxic to bees exposed to treatment for more than 38 hours following treatment. Do not apply this product to blooming, pollen-shedding or nectar-producing parts of plants during this time period, unless the application is made in response to a public health emergency declared by appropriate state and federal authorities.

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## Ways to minimize the detrimental effects of pesticides

- Don't treat on windy days.
- Wear protective clothing
- Keep the sprays and granules off sidewalks, driveways
- Don't treat plants are/will be flowering unless the pesticide is known to be SAFE for pollinators
- Take unused pesticides to a county sanitation facility that accepts pesticides
  
- **Read and follow the label**

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