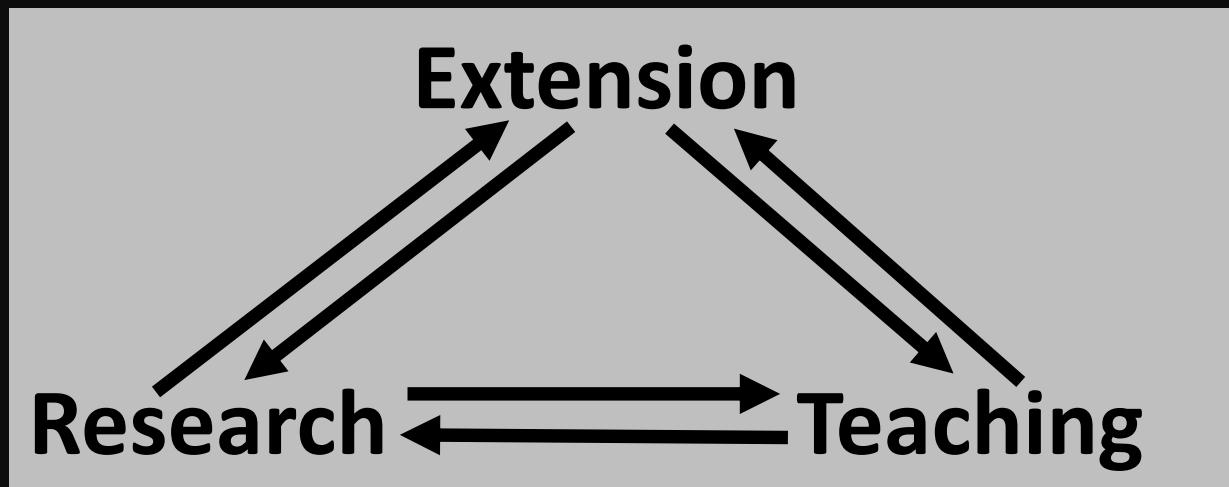
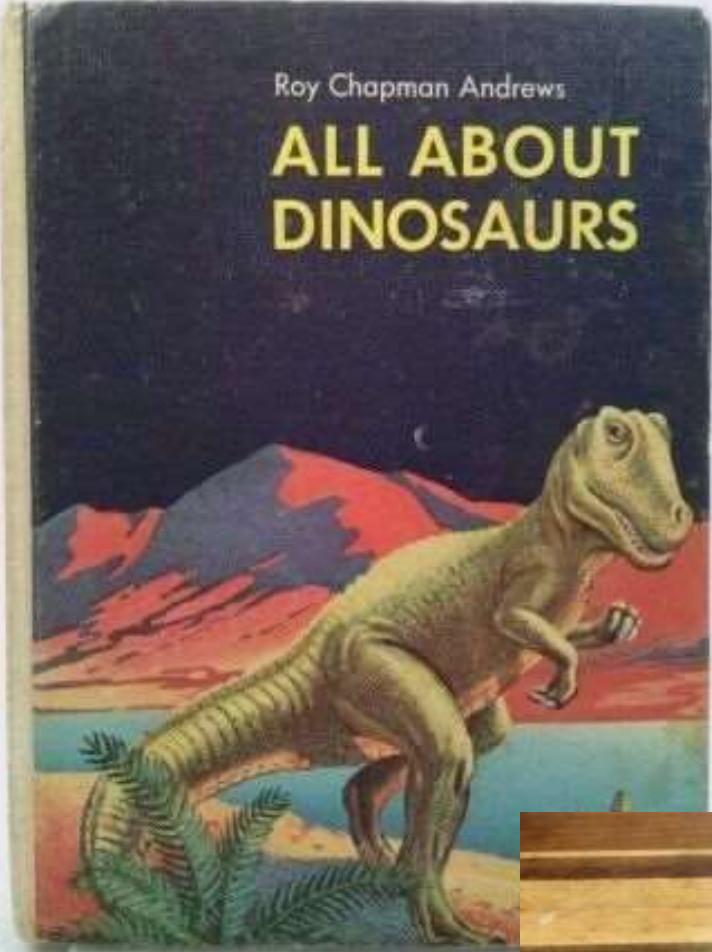


Synergies of a Split Appointment: Extending Entomological Literacy in Colorado

Whitney Cranshaw



Colorado Hairstreak
State Insect of Colorado



First there were
dinosaurs....





Virginia Herpetological Society



Maryland Biodiversity Project/Keith Eric Costley



CT Department of Energy and Environmental Protection

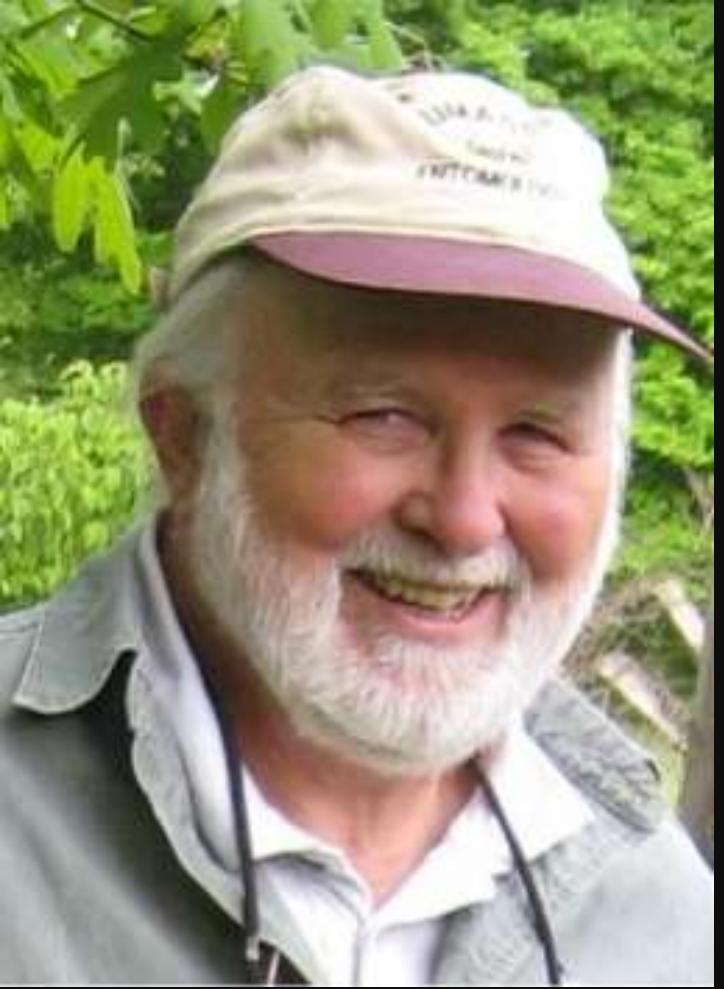
...then there
were herps...



Tuatara from New Zealand

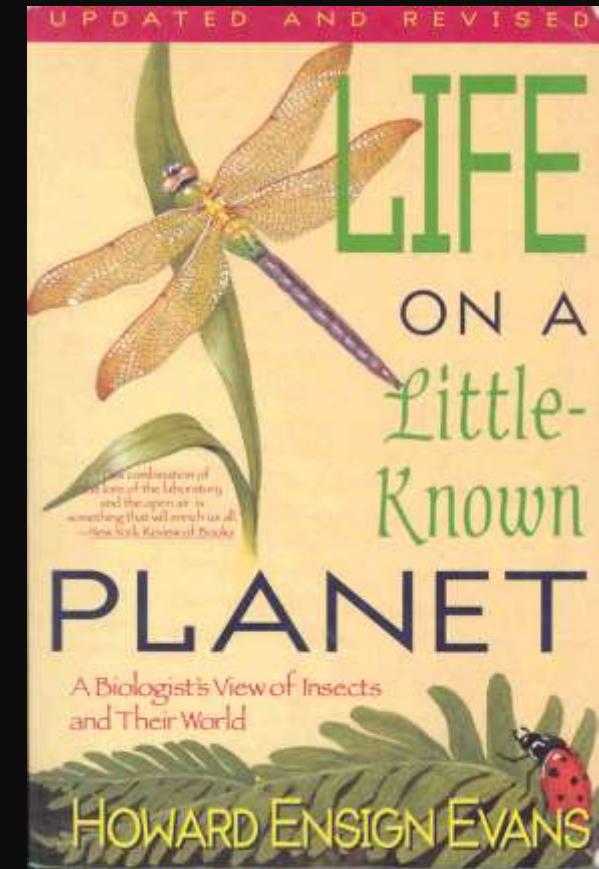
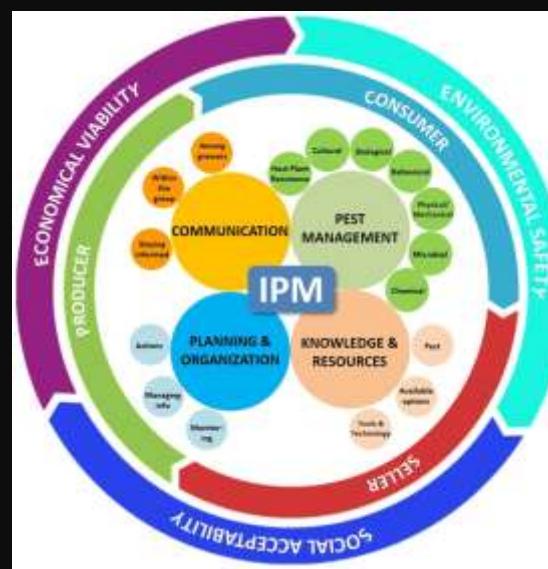
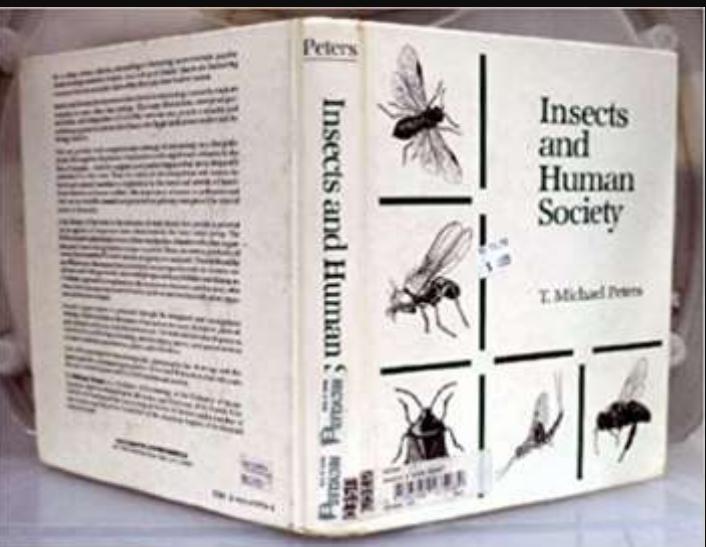


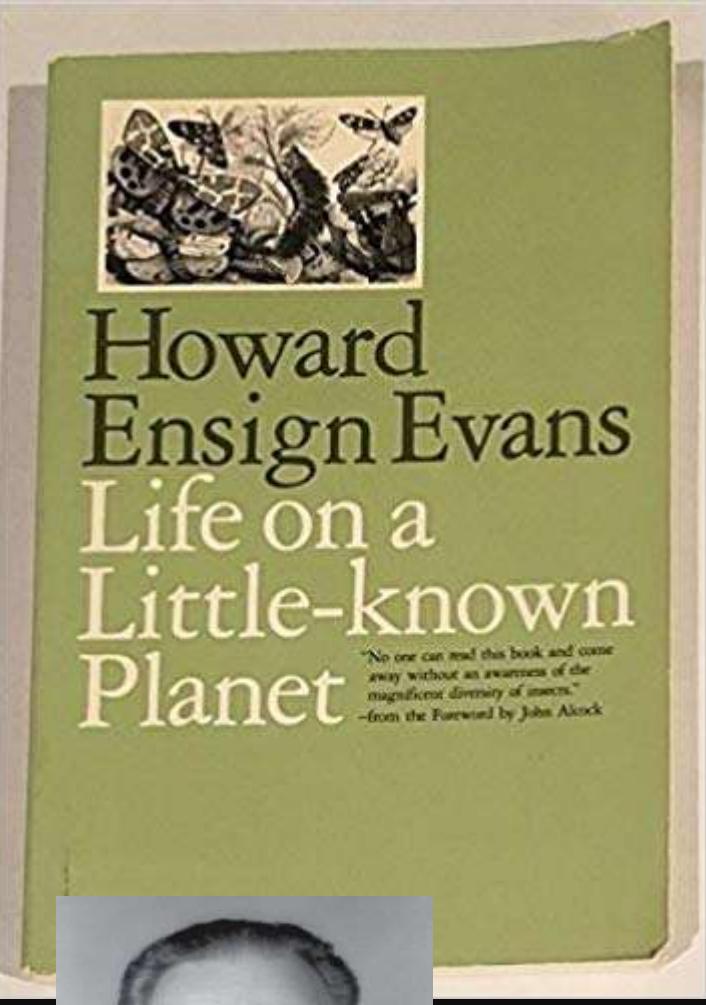
.....and then there
were insects!



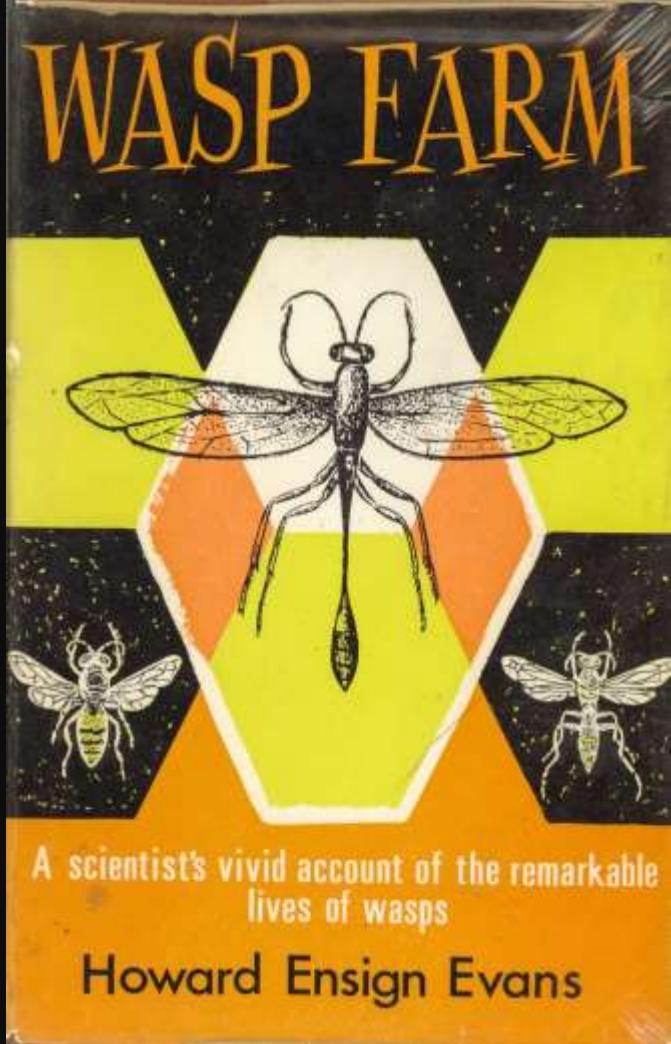
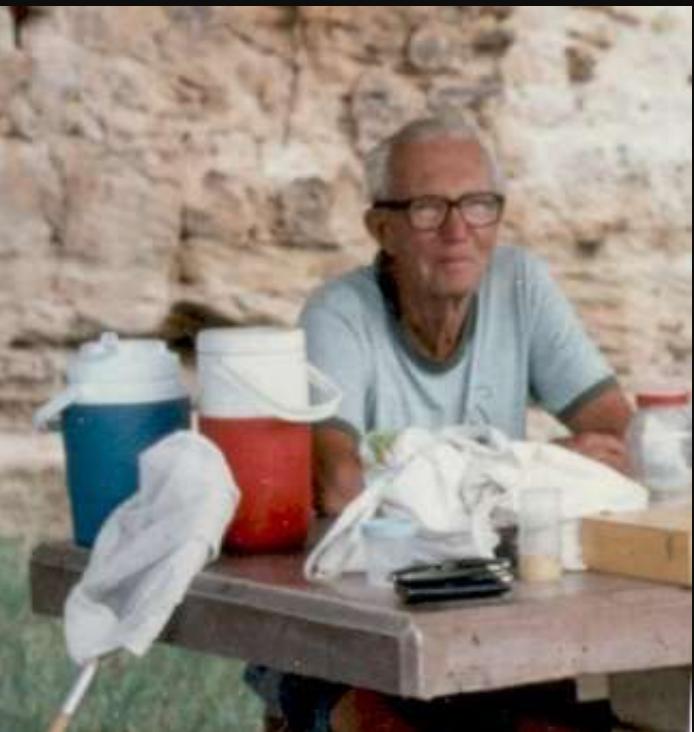
T. Michael Peters

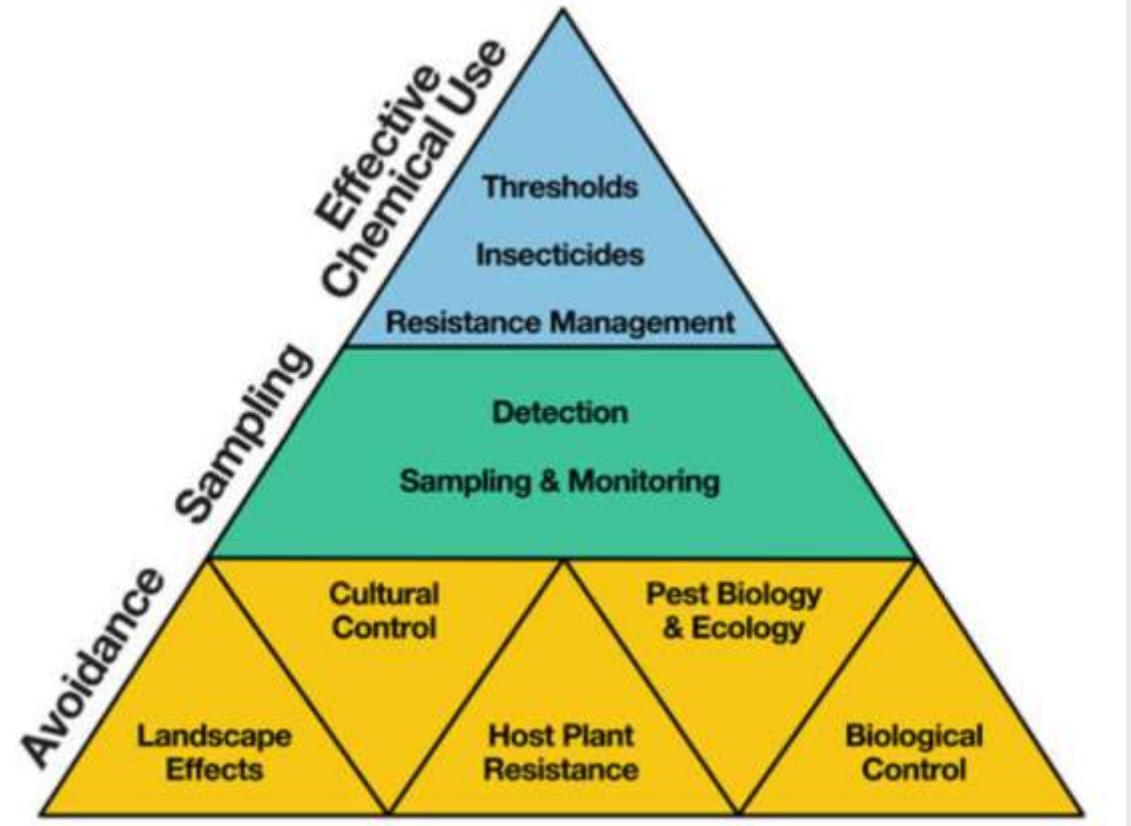
A great entomology course at UMass changed my course of study





A huge part of what helped reconnect me to my inner insect were the books of **Howard Ensign Evans**

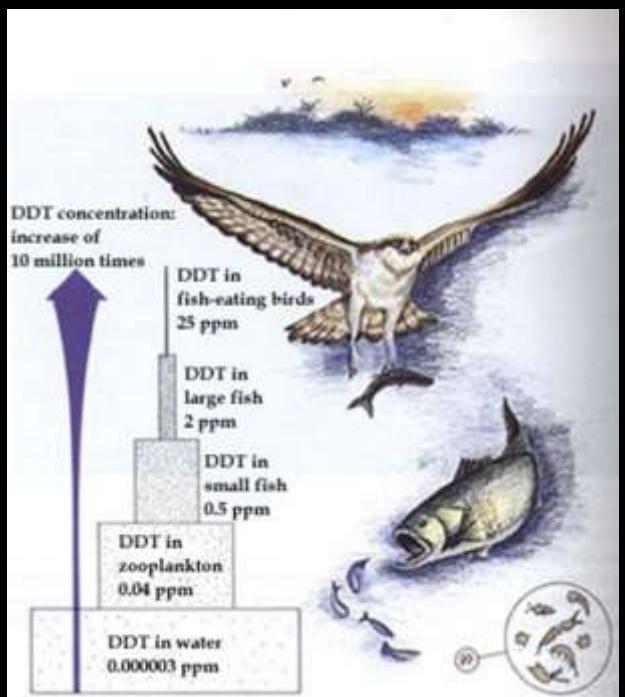
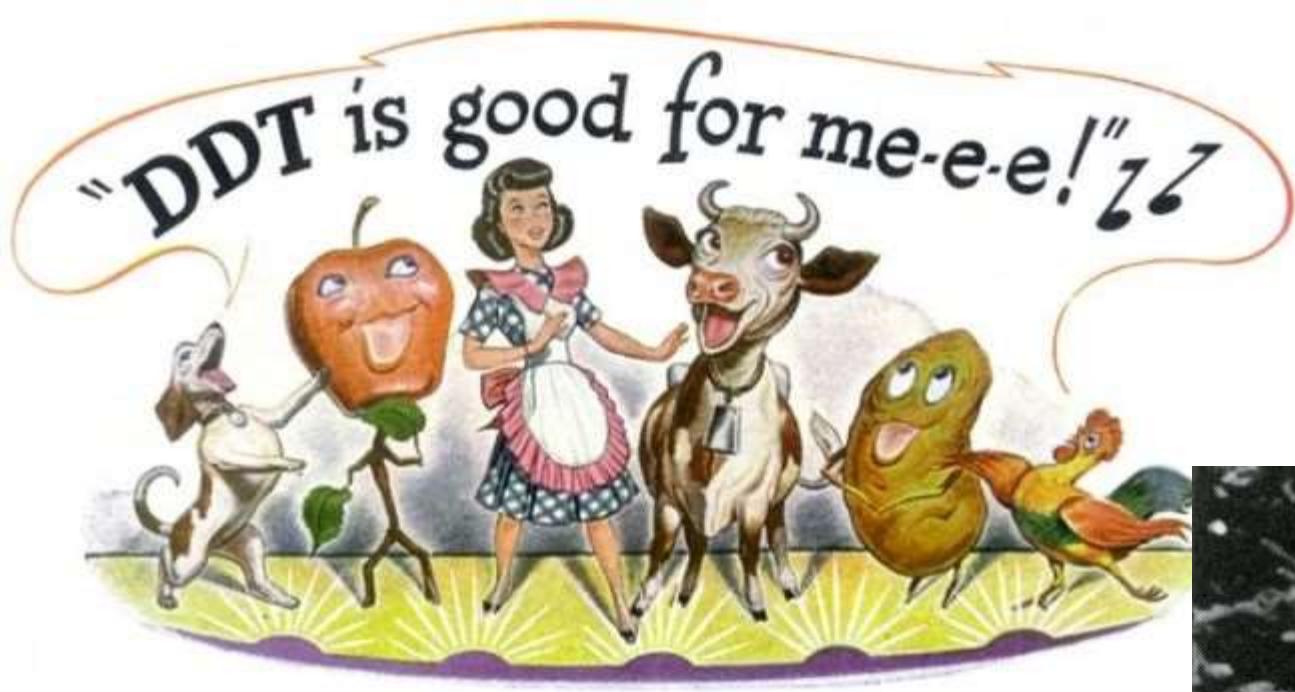




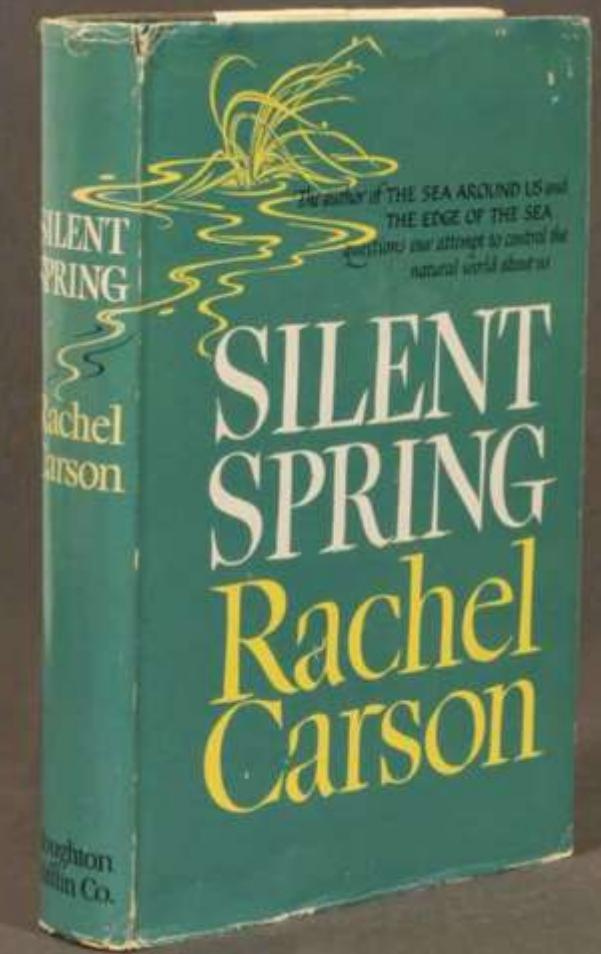
Classic IPM pyramid (From Steven Naranjo, USDA-ARS)

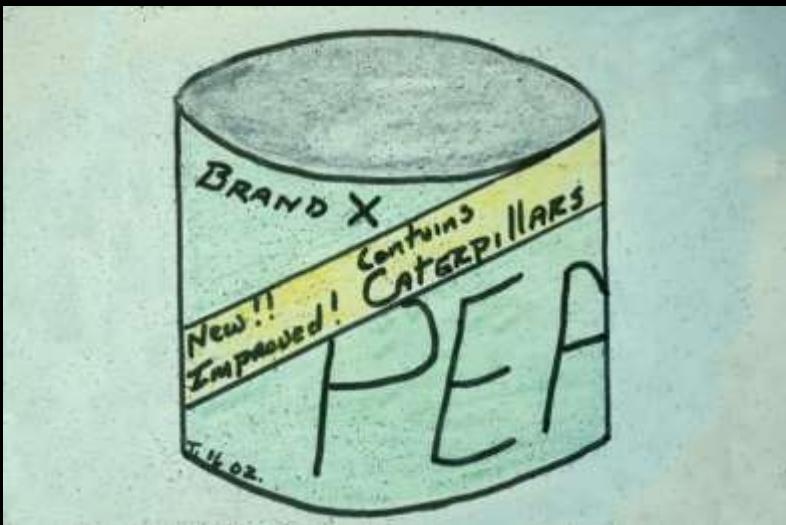
The philosophies of **Integrated Pest Management**, novel concepts at the time, were particularly compelling





One emerging issue of the time was perhaps we were not doing the best job of managing insect pest problems



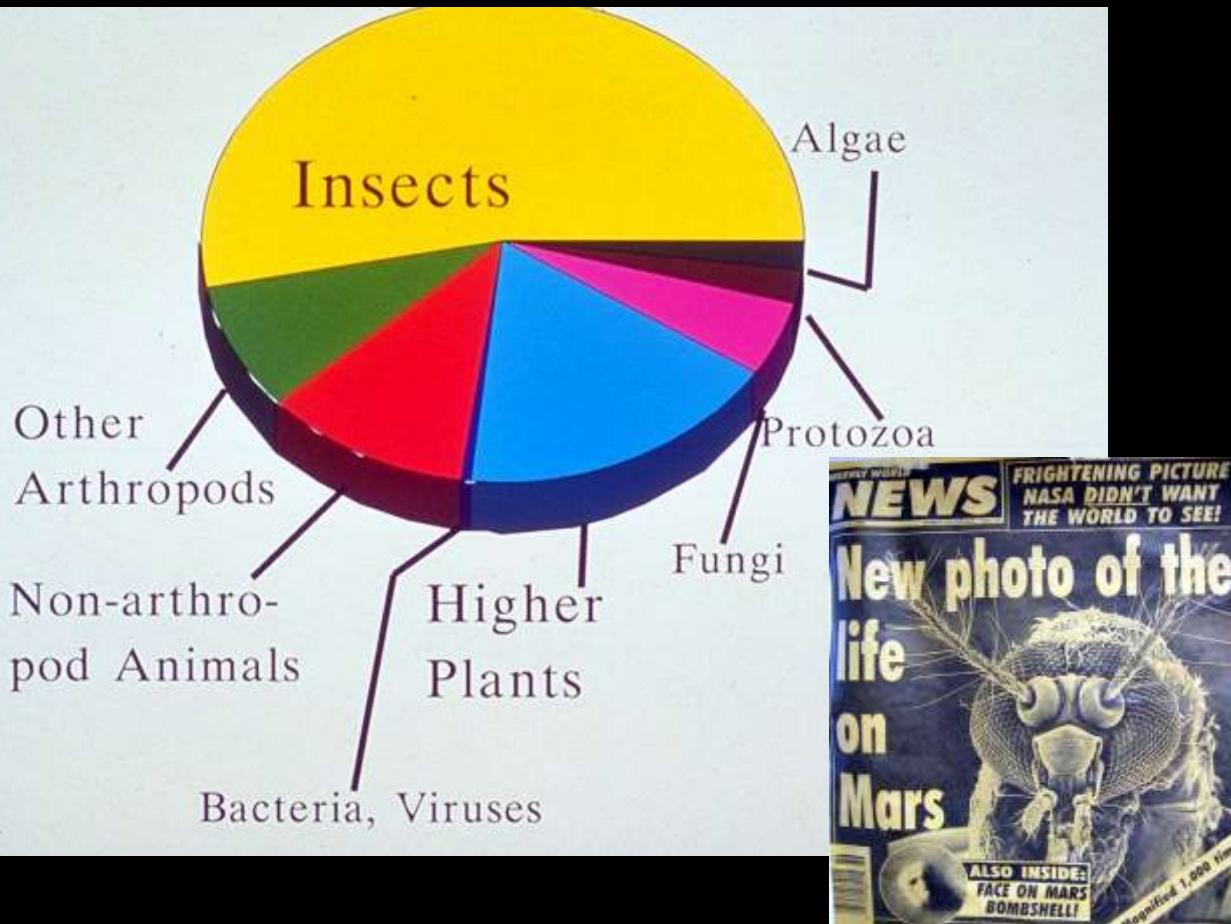


Dr. Ted Radcliffe,
my sainted advisor



“There is no such thing as a stupid question”
Dr. Alan Peterson

“There is no such thing as a stupid question”



A corollary? No one who works with insects should feel stupid if they don't know all – or even very many of - the answers.



Wm. M. Hantsbarger
1961-1983

William Hantsbarger
>The< Extension
Entomology Specialist for
Colorado State University

100% Extension Appointment

Affiliated with the **Department of Zoology &**
Entomology
College of Natural Sciences



Wm. M. Hantsbarger
1961-1983



Frank Peairs
Arrives August 1983



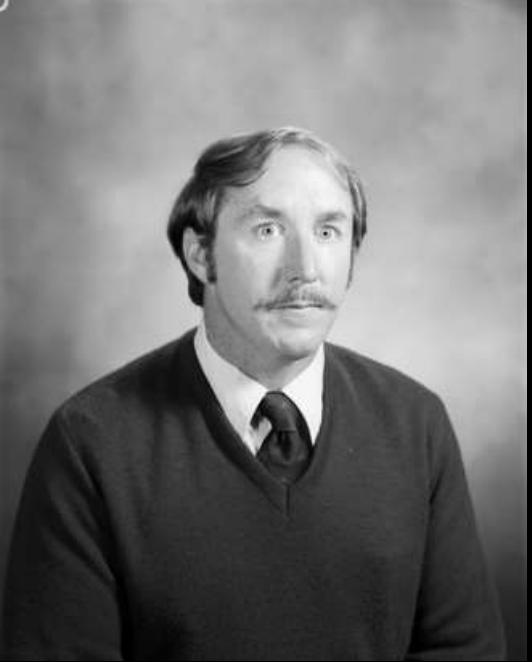
Wm. M. Hantsbarger
1961-1983



Frank Peairs
Arrives August 1983



Whitney Cranshaw
Arrives November 1983



Changes with the New Arrangement

- Appointments had split responsibilities
 - Extension (50%)
 - Research
 - Teaching
- Field Crops – Peairs
- Horticultural Crops – Cranshaw
- Everything Else – Who got touched first

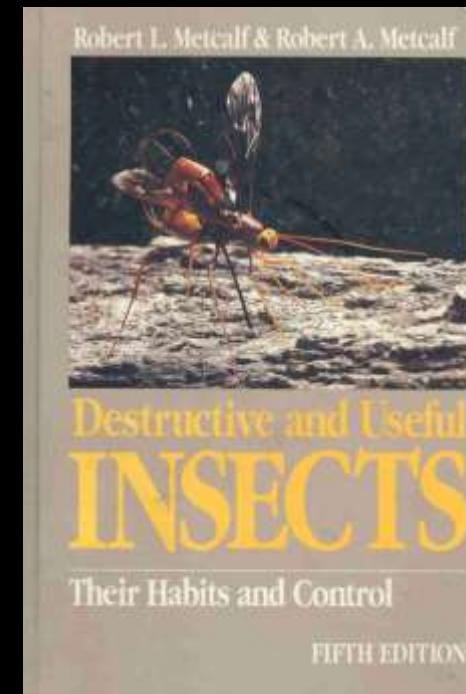
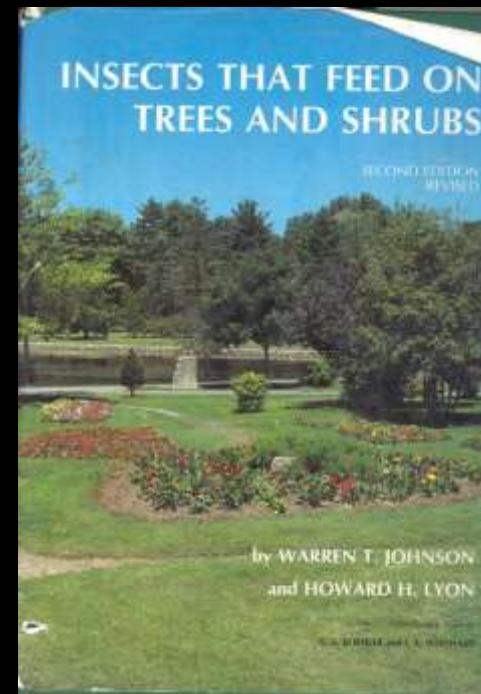
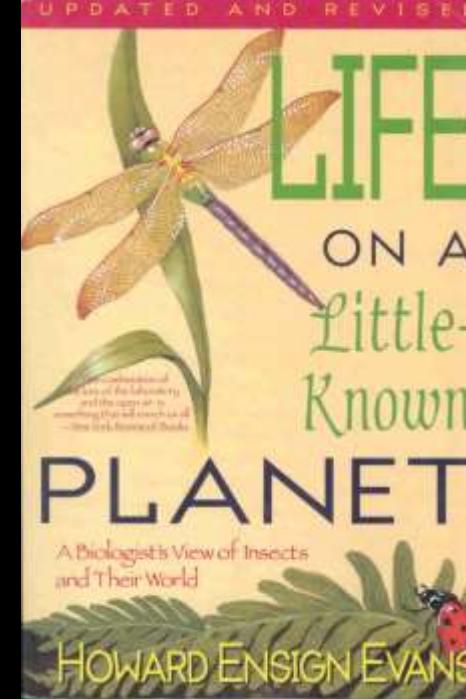
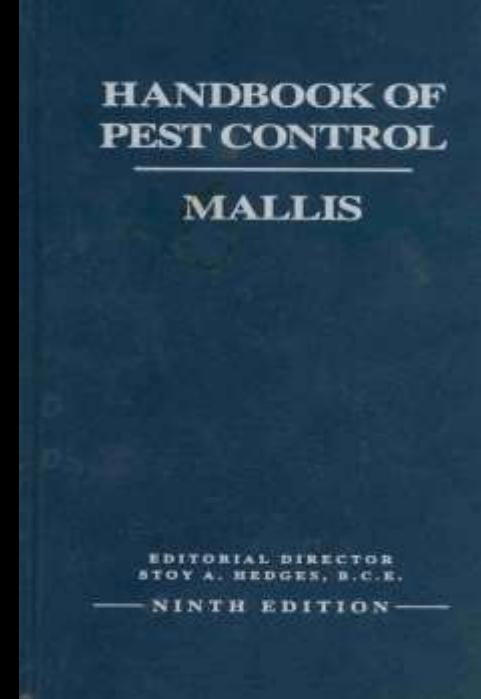
Concurrently Department was being divorced from Zoology and moved to the College of Agricultural Sciences

My Guiding Criteria for the New Job

- Must like bugs
 - Evangelical zeal helps
- Must be able to listen carefully and respectfully to questions
- Must be interested in solving problems for others

My Junior Extension Entomologist Kit

The books I used most heavily during the early years I was working at CSU



Start Writing

**SERVICE
IN ACTION**
COLORADO STATE UNIVERSITY COOPERATIVE EXTENSION

Quick Facts

With few exceptions, insects found in firewood will not infest household furnishings. The best way to avoid insects emerging in the home is to store wood outdoors until needed. Some bark beetles in firewood, such as the mountain pine beetle and elm bark beetle, can infest nearby healthy trees. Well-dried wood is not favorable to bark beetle survival.

Firewood and house log insects in Colorado

David A. Leatherman and Whitney S. Cranshaw¹

no. 5.563



Figure 1: Typical longhorned beetle (left) and metallic wood borer (right). Actual size may exceed 2 cm.

- Streamlines answering questions
- Focuses you to learn subject
- A memory aid

Colorado State University

Extension

Oystershell Scale

Fact Sheet No. 5.513

Insect Series | Trees and Shrubs

by W.S. Cranshaw*

The oystershell scale, *Lepidosaphes ulmi*, is the most damaging scale insect present in Colorado. It develops on the bark of trunks and limbs of a wide range of commonly grown deciduous trees and shrubs, including aspen, ash, cotoneaster, poplars, willow and lilac.

The most commonly observed form of the oystershell scale is the covering of the full-grown female scale attached to the bark (Figure 1). Mature scales are about 1/8-inch long, brown or gray, and the general shape of an oyster's shell. On many plants the scale insect blends in well with the underlying bark and it is not uncommon for extensive crusts of scales, and injury symptoms, to be present before they are observed (Figure 2).



Figure 2. During outbreaks oystershell scales can encrust branches, which typically kills the affected limb.

produced by Cytospora fungi. Bark cracking often occurs on areas of bark previously damaged by oystershell scale (Figure 3).



Quick Facts

- Oystershell scale develops on the bark of many common trees and shrubs and can cause serious injury during outbreaks.
- Oystershell eggs typically hatch in late May or early June and the active 'crawlers' that emerge move about to find new sites to feed.
- Sprays applied when the crawlers are present can be very effective in controlling them.

Colorado Arachnids of Interest

Colorado Tarantulas

Scientific Name: *Aphonopelma* spp.
(3-5 species)

Class: Arachnida (Arachnids)
Order: Araneae (Spiders)
Family: Theraphosidae (Tarantulas)



Figure 1. Male Oklahoma brown tarantula (*Aphonopelma hentzi*) crossing road.

Identification and Descriptive Features: Tarantulas (Figures 1, 2, 3 and 6) are large, hairy spiders and all species found in Colorado are generally dark brown to black. Longer hairs are usually present on the abdomen and these may be a lighter brown color. Some banding of colors may be present on the legs. The carapace (back of the section with legs and head/cephalothorax) of eastern Colorado species ranges from light gray-brown to dark reddish brown with some

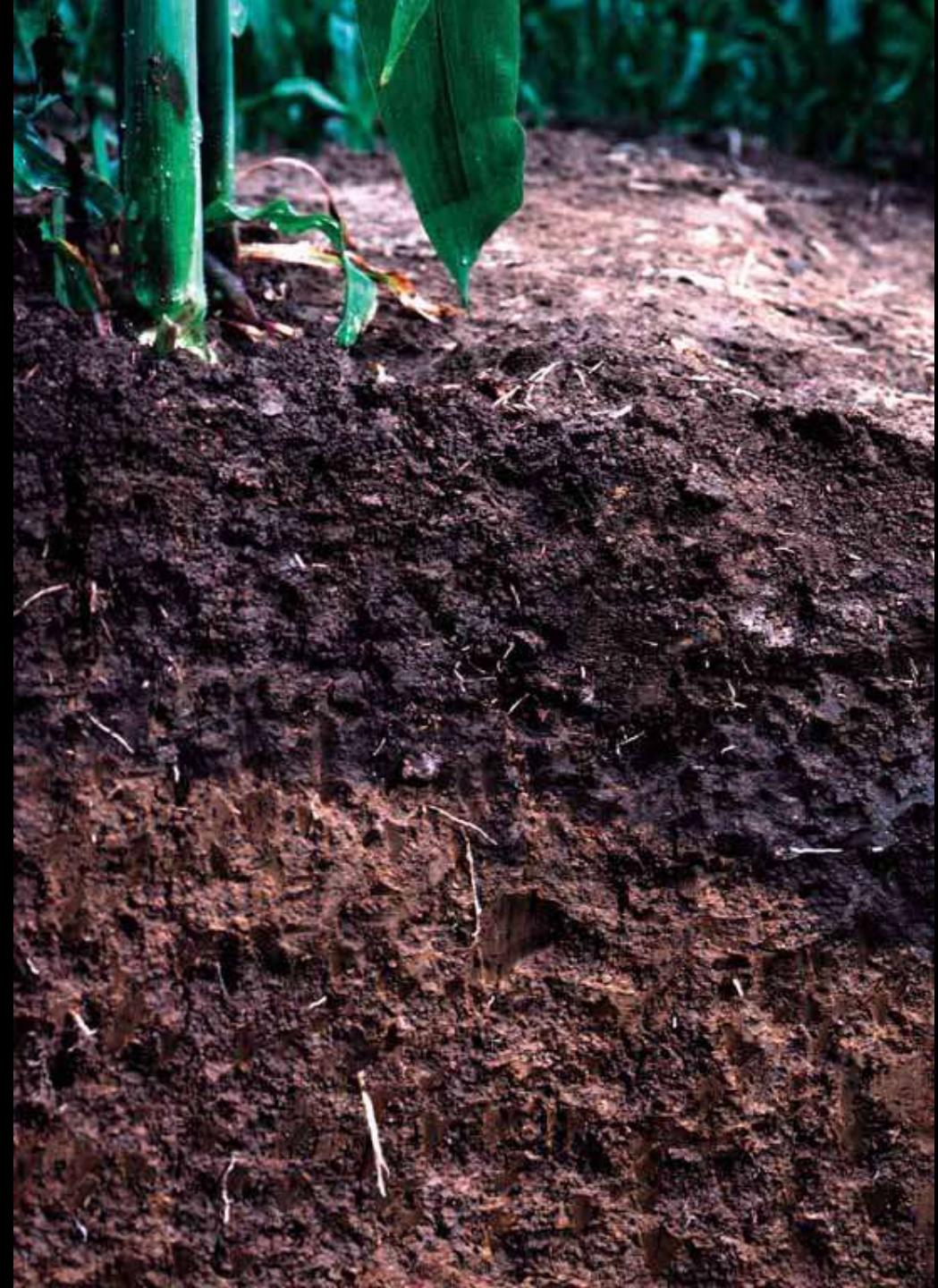
Take Photos!



Examples of some good looking plant diseases







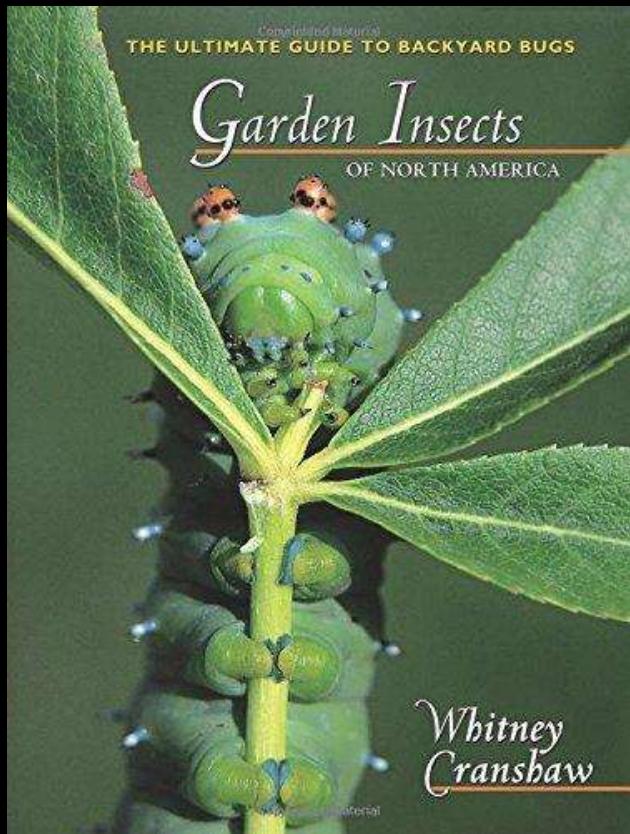
**Soil science seems (to me) have
a special limitation in the glamor
photo department**



To entomology educators and the Cooperative Extension system
that so well foster the spirit of shared learning.

2018 by Princeton University Press

Princeton University Press, 41 William Street, Princeton, New Jersey 08540



Among Extension colleagues I have always,, found willingness, ***without exception***, to freely share ideas, expertise, research, publications, photos.....

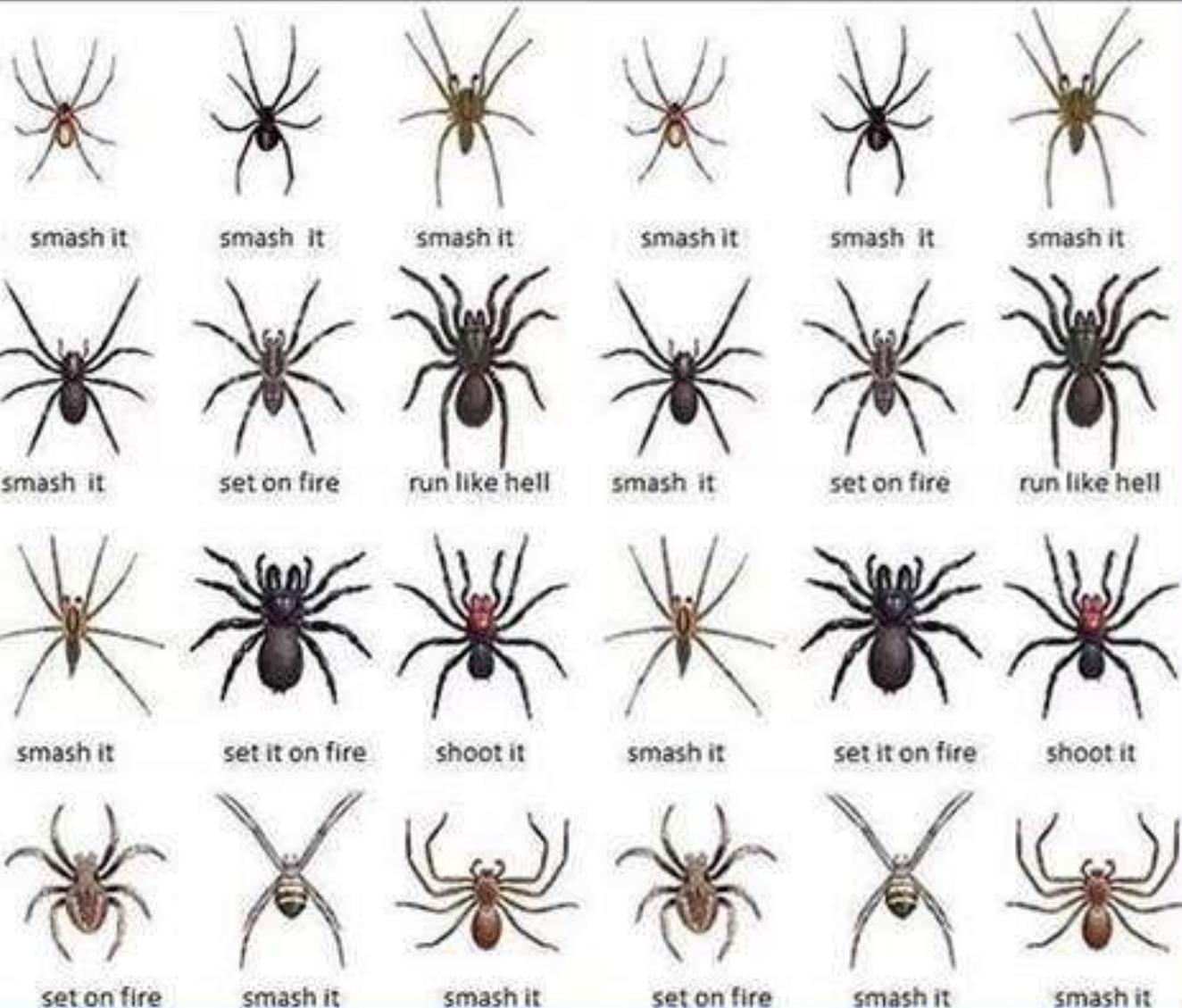




People tend to
fear what they
do not
understand



SPIDER IDENTIFICATION CHART



Attitudes and Concerns about Spiders Expressed in a Freshman Entomology Class FREE

Whitney Cranshaw

American Entomologist, Volume 52, Issue 4, Winter 2006, Pages 234–238,

<https://doi.org/10.1093/ae/52.4.234>

Published: 01 October 2006



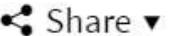
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Permissions

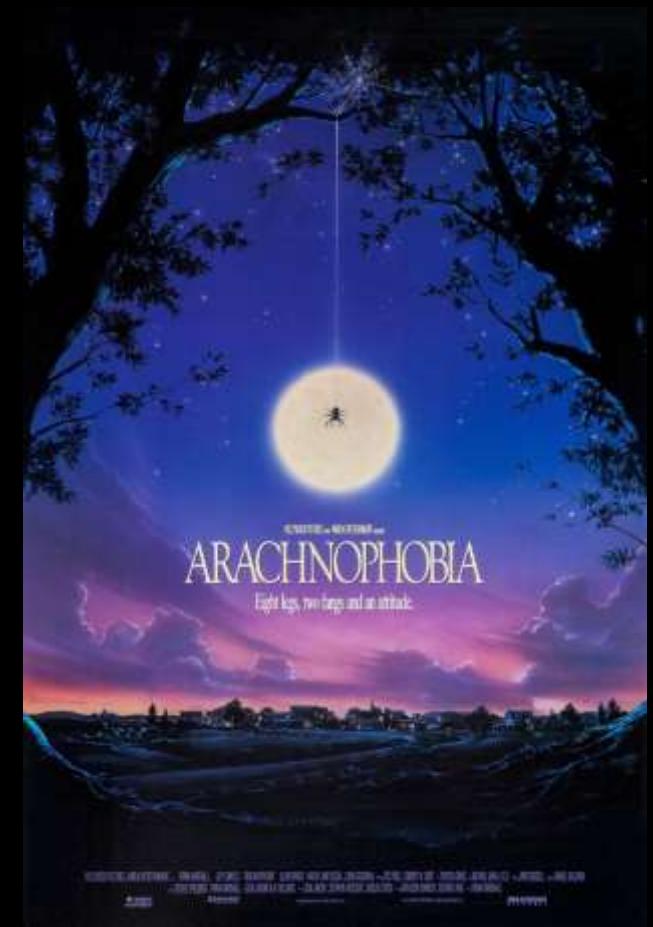


Share ▾

Abstract

An assessment of spider fears was made in a survey of Colorado State University students taking an introductory entomology course. Over two-thirds of the students expressed some measure of spider fear, ranging from being “a little apprehensive” to “cannot stand being in their presence.” One sixth of the students expressed highest-level fears, with females three times more likely to indicate high spider fear than males. Together, these figures indicate that

An example:
Americans – and
Coloradoans - have an
inordinate fear of
spiders



The most heavily accessed Colorado State University publication – by far

Colorado State University
Extension

Spiders in the Home

Fact Sheet No. 5.512

Insect Series | **Home and Garden**

by F.B. Peairs, W.S. Cranshaw and P.E. Cushing*

Spiders are beneficial arthropods, that survive by feeding on insects. Oftentimes they are the most important biological control of insect pests in gardens, fields, forests, and homes. However, their presence is a cause of concern to some people. Many people fear spiders because of stories or myths. Others object to spiders because of

Because spiders have a great ability to disperse, in addition to other factors that affect their survival, the number of spiders found in an area from one season to another naturally varies. Also, spiders are able to rapidly recolonize areas even if they have temporarily been eliminated.

Most spiders in Colorado have a life cycle



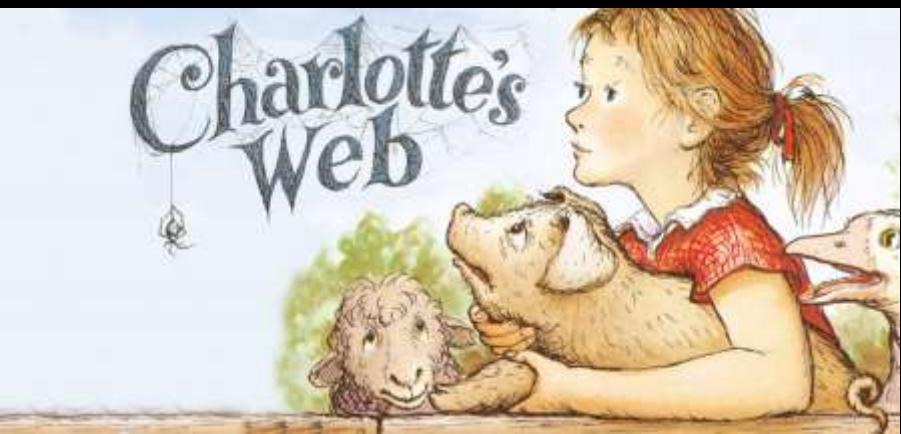
Quick Facts

- Spiders feed on insects and other arthropods. This makes them beneficial in helping manage pests.
- Some spiders wander indoors in the early fall when cooler

The “Cat-Faced” Spider

Araneus gemmoides

The western relative of
Araenus caviticus - Charlotte



11th Annual!!!!

How-Big-is-Your Cat-faced Spider Contest!



Contest Rules

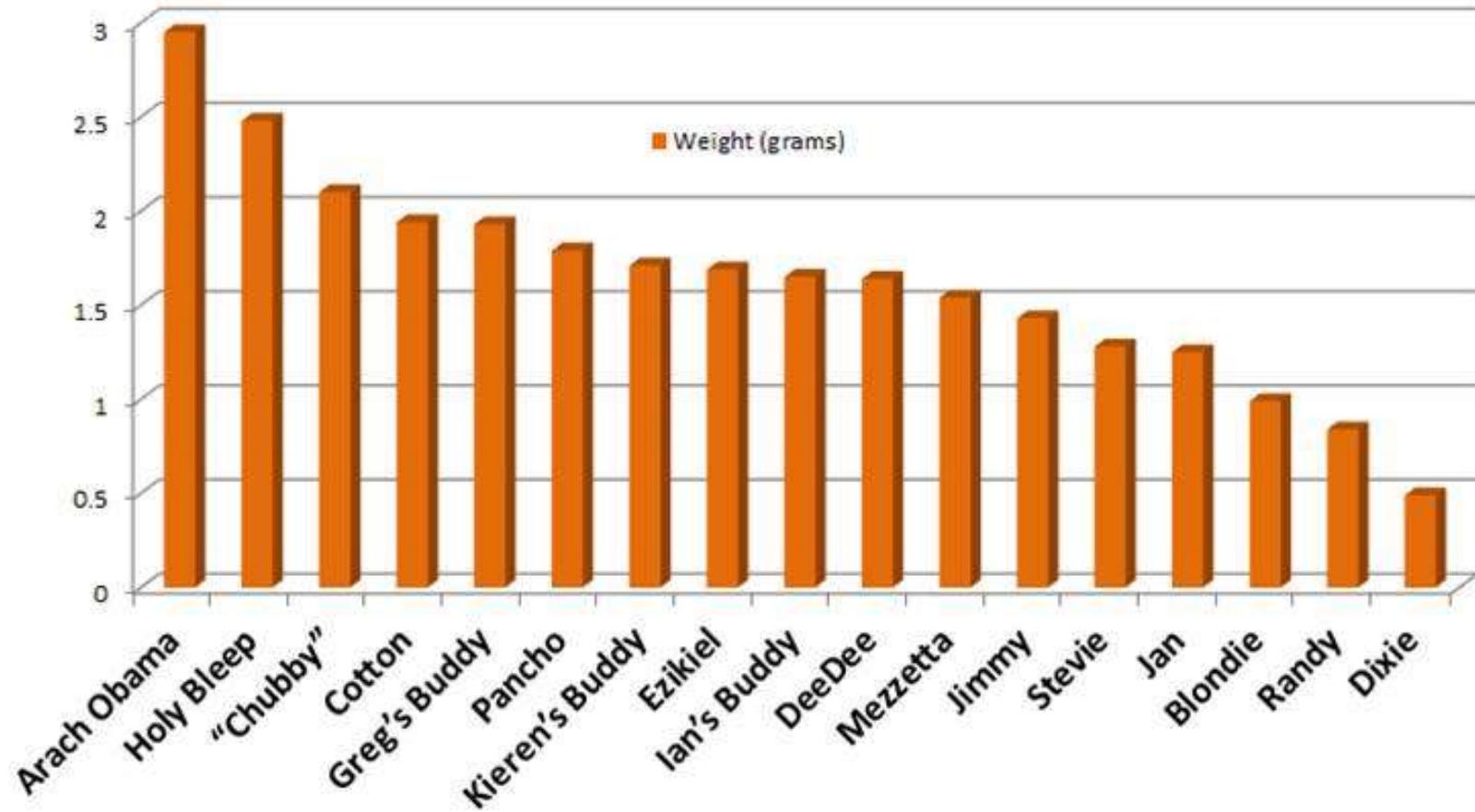
- The heaviest cat-faced spider received before contest deadline will win!
- Only the cat-faced spider (*Araneus gemmoides*) is eligible; no other spiders need apply
- No external decorations are allowed; spiders must be in the buff during weighing
- Spider weigh-ins should be arranged by contacting Whitney Cranshaw (Whitney.Cranshaw@ColoState.EDU, C201 Plant Sciences Building). After weighing the spider will be returned to its handler.
 - Spiders can be left outside this office and will be weighed ASAP
 - If you leave a spider for weighing please include: 1) your name; 2) the name of the spider; and email contact information.
- Spider keepers may return their spider for a repeat weigh-in through the contest deadline date (October 22); highest weight will be your score.

Contest deadline - October 22

Heaviest spider weighed will receive a trophy – *and a fabulous prize!*

How-Big-is-Your-Catface-Spider Contestants – 2014

Final Results!!



Arach Obama





Princess Raya

Winner 11th Annual How-Big-Is-Your-Catface-Spider Contest

3.75
grams!!!

...and All-Time Champion!!



Princess Raya



All Time
Champion

Handler/Trainer:
Raya Thompson,
4th Grade



Fact Sheets can also promote insects in a positive light. This was first produced in 1986.



Attracting Butterflies to the Garden

Fact Sheet No. 5.504

Insect Series | Home and Garden

by P.A. Opler and W.S. Cranshaw*

Dozens of butterfly species are commonly found along the Front Range and Eastern Colorado and are a welcome garden addition for many people. Butterflies often appear to be just passing through, occasionally stopping for a drink of nectar. You can prolong the stay of these colorful insects and draw in others by providing the food and shelter they need.

Providing the necessary food plants for the developing caterpillars also allows production of a “native” population that can be observed in all stages of development. Most species, however, fly away as adult butterflies.

Food for adult butterflies usually consists of sweet liquids, such as nectar from flowers,



Quick Facts

- Many kinds of butterflies can be found in Colorado. Encourage butterflies by planning a butterfly garden.
- Butterflies seek out areas with

Gardening *for* Insects *or not!*



This has been a very popular subject for the past 15 years



How Planting Selection Can Impact Insect Populations in Your Landscape



Synergies that Develop from an Extension Appointment

- **Research**
 - Helps identify new/emerging issues
 - Provides feedback loop to identify research gaps/refine research priorities
 - Facilitates development of off-campus cooperators
- **Teaching (RI)**
 - Helps provide relevant examples for teaching subjects
 - Refines teaching through exposure of concepts/approaches in different settings with different audiences

Discovery/Description of Thousand Cankers Disease of *Juglans*

Causal organisms jumped from resistant host (Arizona walnut) to susceptible host (black walnut)



Geosmithia morbida



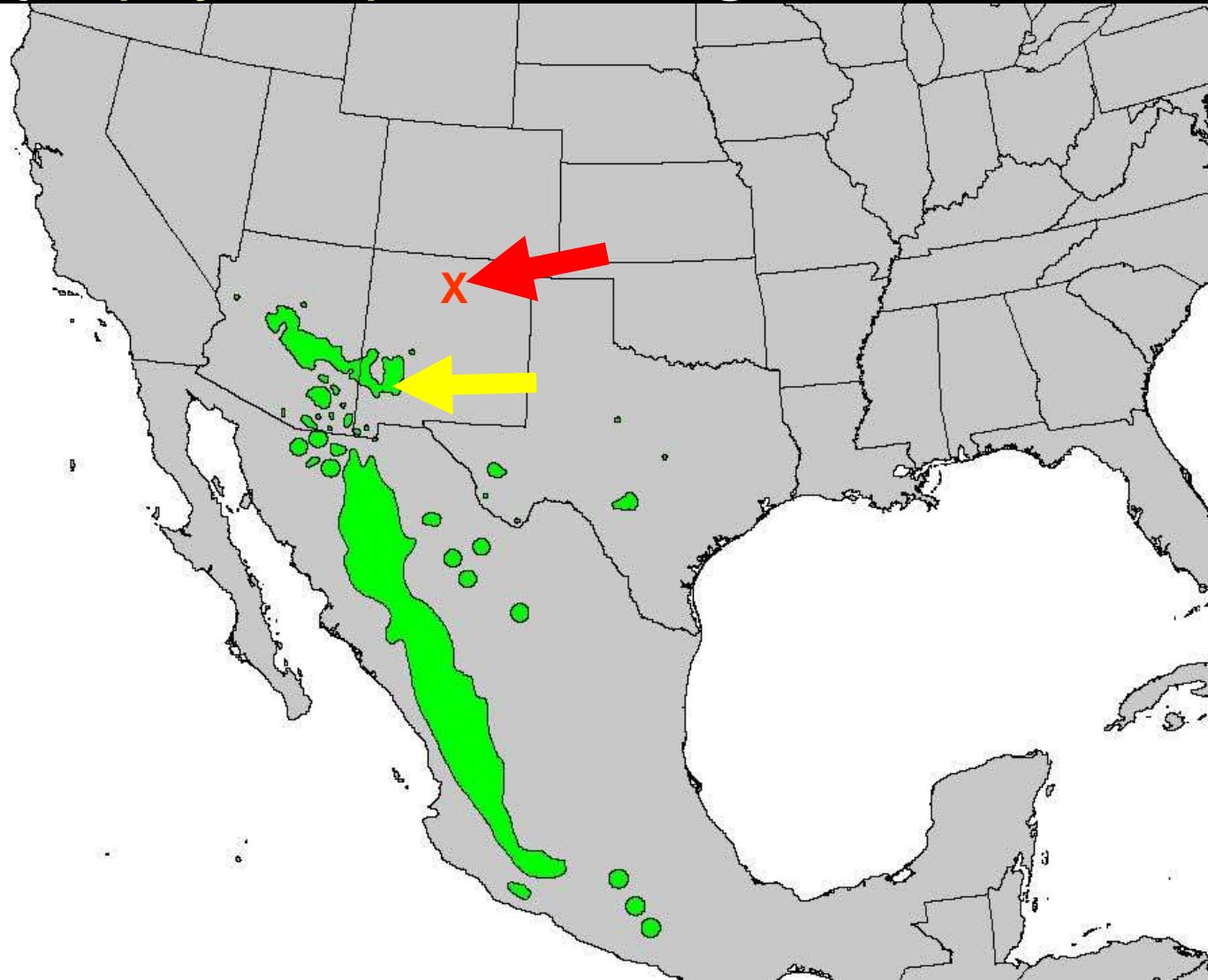
Walnut twig beetle

An example of a project that was derived from the Extension component

Beginning in 2001 the Colorado State Forest Service (Dave Leatherman) first investigated reports of dying black walnut in eastern Colorado



The first published association of walnut twig beetle with black walnut, *Juglans nigra*, in decline (2002) occurred in the Espanola Valley area of northern New Mexico (in red). This insect was originally described from Arizona walnut, *J. major* (in yellow). Walnut twig beetle was confirmed in Colorado in 2004.



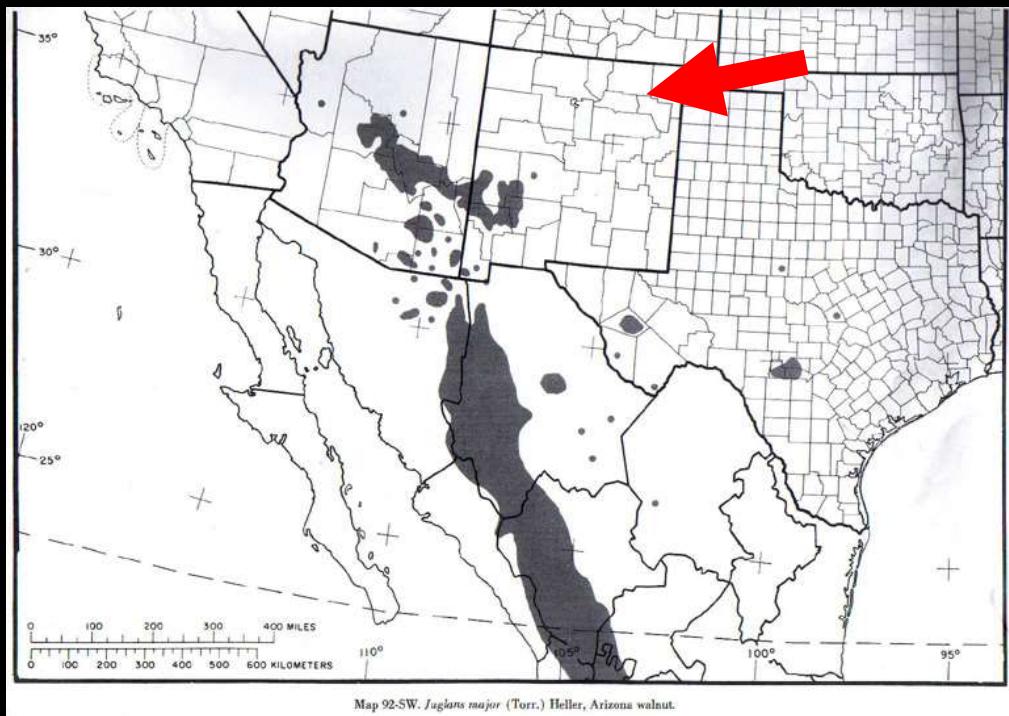
Walnut twig beetle



Jim LaBonte, Oregon Dept. of Agriculture



In New Mexico and Colorado
the decline of black walnut and
the involvement of walnut twig
beetle was *originally assumed*
to be associated with drought.



Map 92-SW. *Juglans major* (Tort.) Heller, Arizona walnut.



Extension programs suggestions mid-2000s

Provide additional irrigation to walnut trees – did not stop course of tree decline

Apply bark beetle insecticides preventively to trunks and branches – did not stop course of tree decline

**Black walnut
autopsy,
2006 –
organized by
Kathleen
Alexander,
Boulder City
Forester**





My personal epiphany:

***Idaho Hort Expo,
January 2008***

- #1 topic of audience concern involved black walnut die-offs
 - Idaho – 2004 record of walnut twig beetle; associated with die-off of black walnut in Boise-Meridian area

Soon learned that walnut twig beetle – and declines of black walnut – had been reported in Oregon and Utah

The Big Question:

How can a *very little* twig beetle be killing healthy trees???





Various fungi could be recovered from dying walnuts. Many thought to be “*Penicillium* spp.”

Ultimately one found growing around walnut twig beetle galleries was given a harder look.



The Key Step –

**Identification of *Geosmithia morbida* as a pathogen
involved in thousand cankers disease**



Thousand Cankers is produced by the combined effects of two species



Walnut twig beetle



Geosmithia morbida

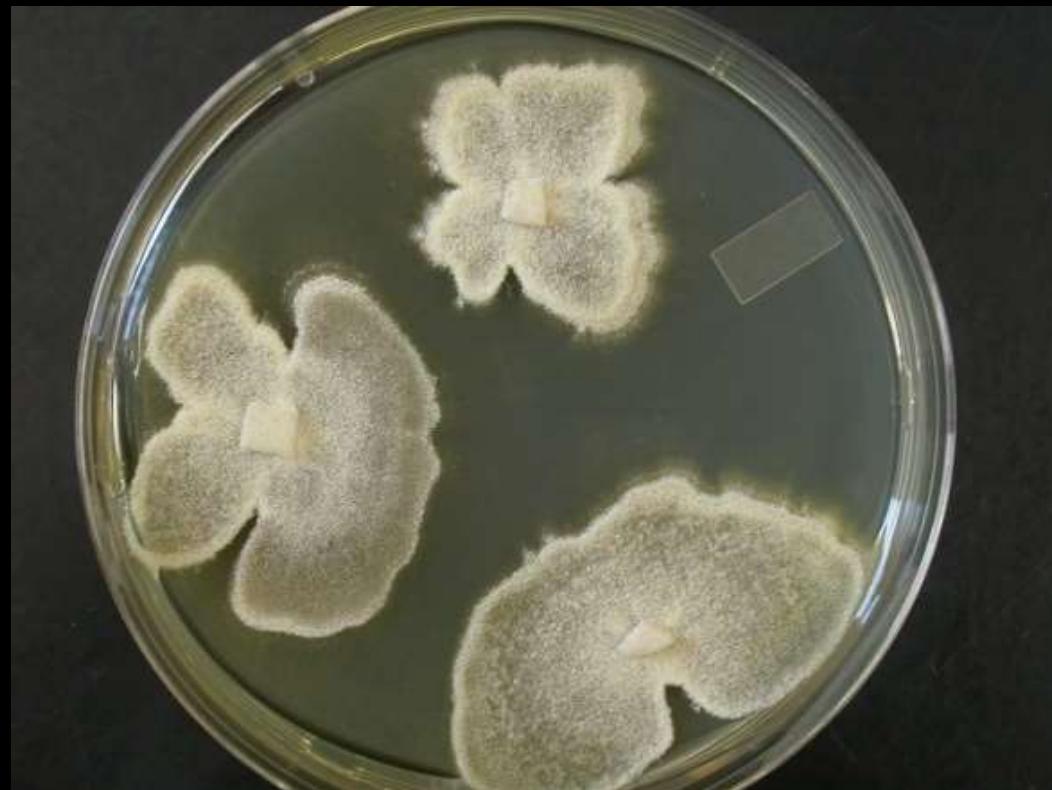


Beetle? (Walnut
twig beetle)

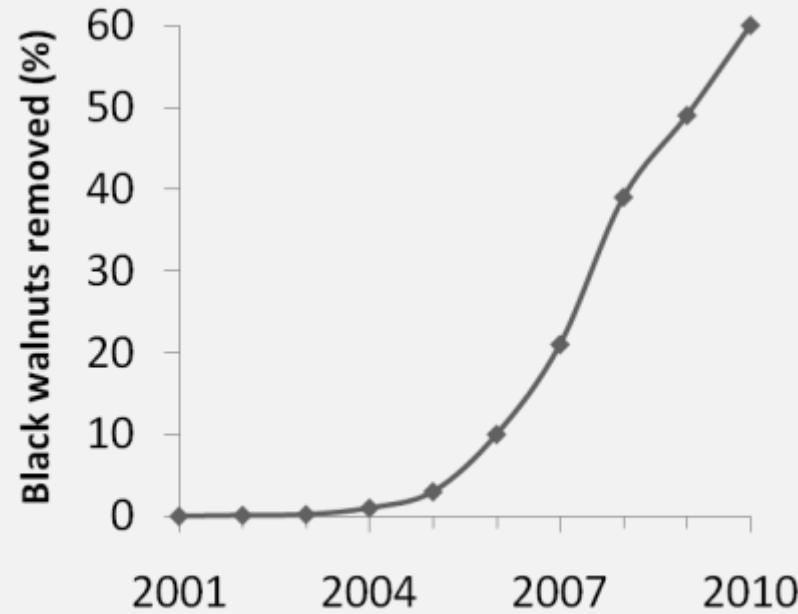
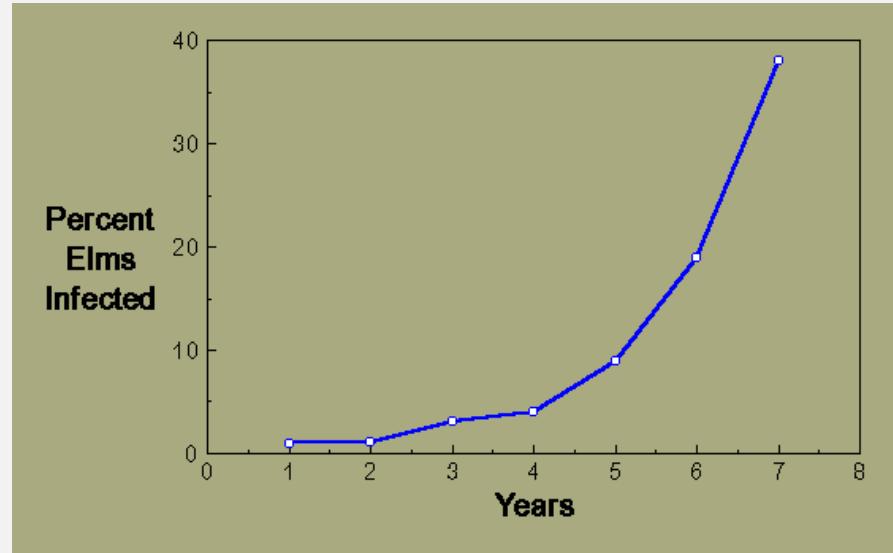
Who's
on first?

Both!

Fungus?
(*Geosmithia morbida*)



Comparison of Epidemics of Dutch Elm Disease (historical) and TCD in Boulder



In the most areas of Colorado, Utah, and Idaho where thousand cankers disease has been present losses of black walnut have approached 100%.

Thousand Cankers Disease in Colorado

- 1990s – Black walnut in western Colorado die out from unknown ailment
- 2001-2007 – Scattered complaints of dying black walnut along Front Range
- 2008 – Thousand cankers disease described
- 2008-2019 – Essentially all black walnut along Front Range corridor die

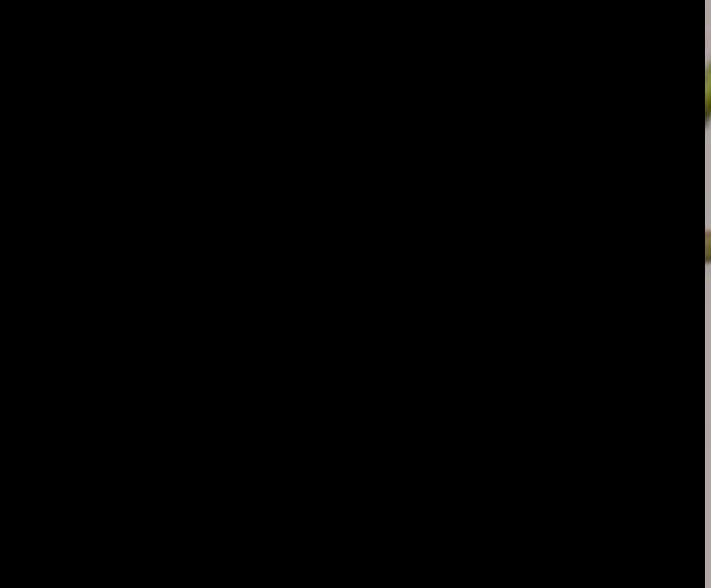
Newest CO range extension – Brush (2017)



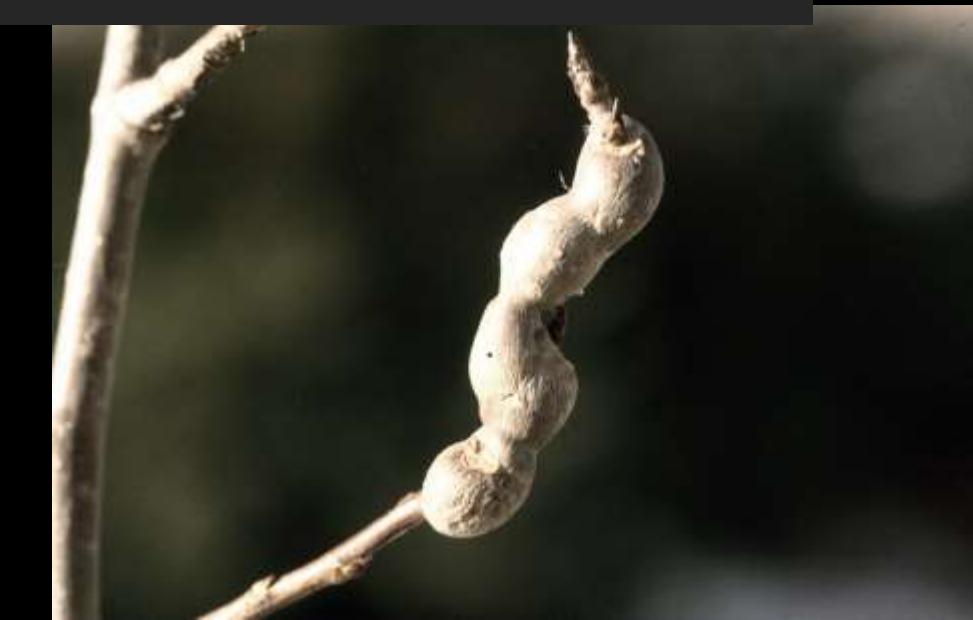
The last black walnut in Fort Collins



It was cut June 23



Change is the Norm for Insect Pests in the Western States



Banded elm bark beetle



New and unusual insect-related changes are regularly occurring all around us

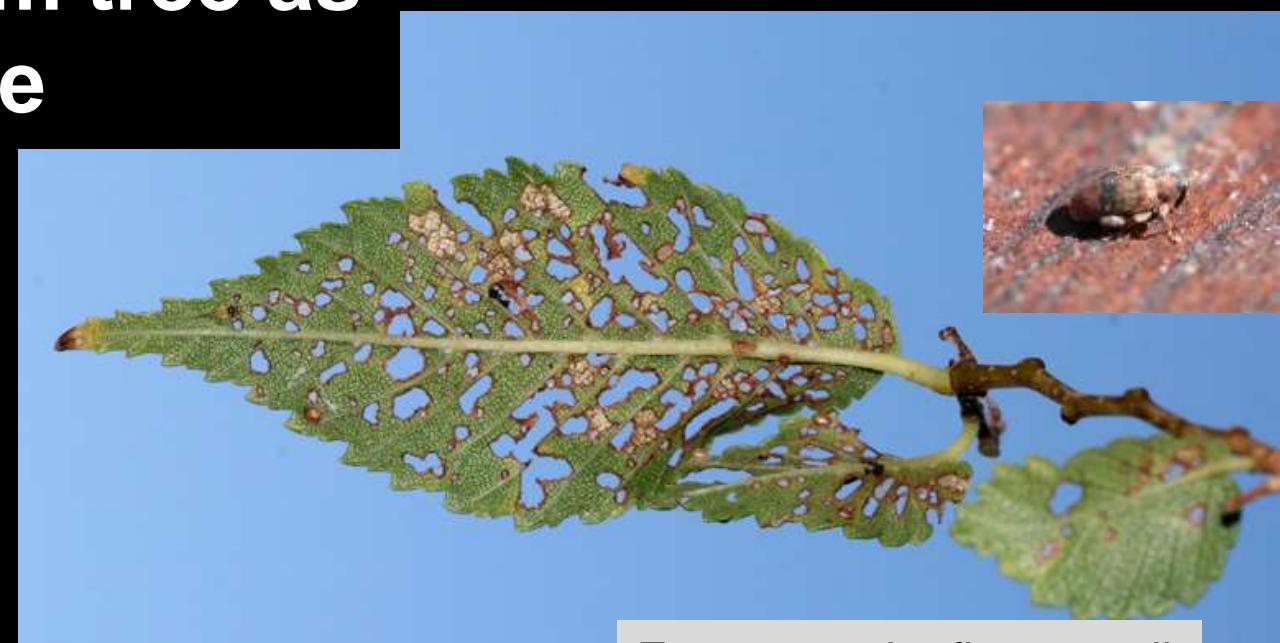
European elm scale



Take an elm tree as an example



Elm leaf beetle



European elm flea weevil



An insect that used to be much more important than it is at present

Elm Leaf Beetle

Xanthogaleruca luteola





Defoliation of elms (Siberian, rock) was a regular and widespread occurrence in most of the state – and through the Midwest in the 1980s and earlier.

Then they began to vanish.

What made this formerly extremely abundant insect largely disappear over a wide geographic range? TBD

Larval leafmines in elm



Shothole feeding wounds by adults

European Elm Flea Weevil

Orchestes (=alni) steppensis



European Elm Flea Weevil



This insect, unknown from the western US until 2006, quickly became the dominant elm insect defoliator in much of the region.



Question during Extension meetings in 2012 – are natural enemies finally catching up?





European Elm Flea Weevil – are natural enemies finally catching up? – Yes!



Yes they did. This insect is now difficult to find.



Elm leaf beetle



European elm flea beetle

- Newly recognized in state in 2006
- Populations peaked in most areas around 2011-2012
- Populations appear to have crashed over much of the state, due to natural enemies

- Most important chewing insect on trees prior to ca 1995
- Numbers declined sharply most everywhere in Colorado – and in the Midwest - about 25 years ago
- The reason for the dramatic ELB decline is a mystery



**Elm bark beetle
hand-off**





The “original” elm bark beetle

Smaller European elm bark beetle

Scolytus multistriatus

SEBB



The "new" (post-2003) elm bark beetle

Banded elm bark beetle

Scolytus schevyrewii

BEBB





Most behaviors and aspects of life history of the BEBB are similar to SEEBB



5382181



5382178

Banded elm bark beetle (BEBB) vs. Smaller European elm bark beetle (SEEBB)

- Both species occupy same ecological niche
- BEBB spring emergence is ahead of SEEBB
- BEBB summer generation is ahead of SEEBB
- *Banded elm bark beetle wins!*



Out

Elm bark beetle hand-off

Within ten years after its discovery, this new bark beetle of elm seems to have locally extirpated the old invasive bark beetle of elm through competitive displacement





European Elm Scale – and
*resistance to
neonicotinoid insecticides*



Prior to about 1995 European elm scale was controlled by spraying elm trees with insecticides in spring to kill overwintering stages on the twigs



European elm scale was one of the first shade tree insects against which the new insecticide imidacloprid was tested (ca 1993)

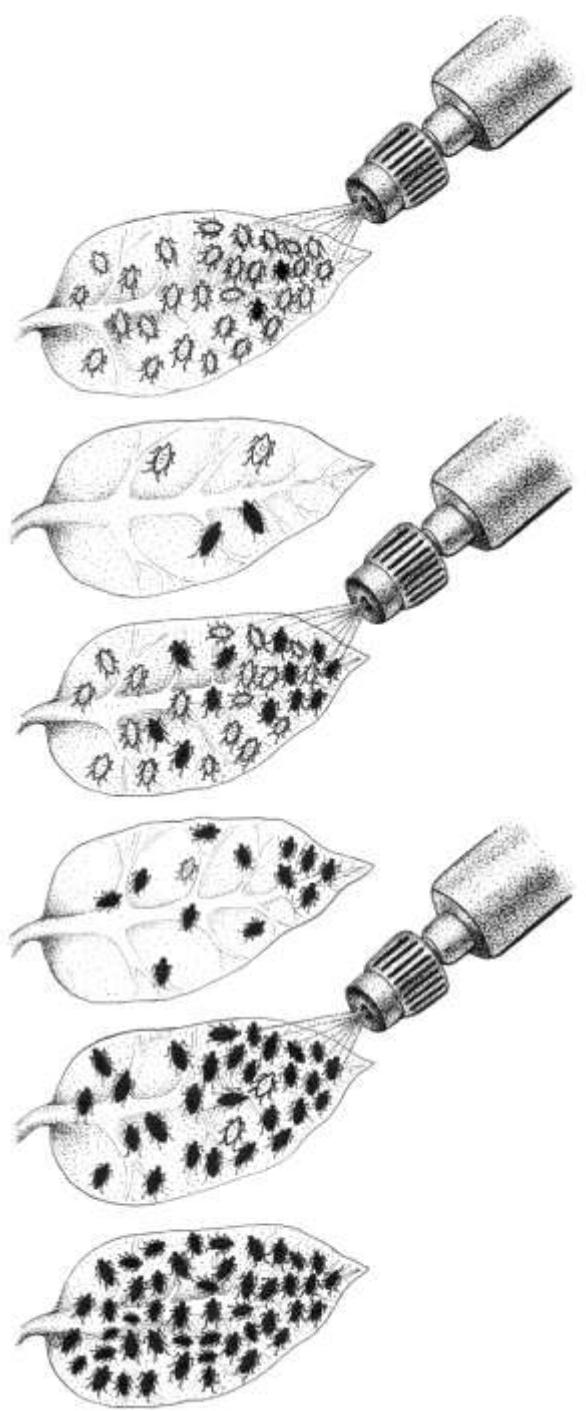
The results were fantastic

Soil injection of elm was embraced rapidly by the Colorado tree care community



Sustained applications of imidacloprid and other neonicotinoids were applied to almost every scale-infested elm throughout the state for almost 2 decades





Insecticide resistance develops by selecting individuals that have genetic traits that allow the insect to resist effects of the pesticide



European Elm Scale in
Colorado – *A poster child*
example of how to
develop insect resistance
in a shade tree pest



Some eastern Colorado vegetable insects creeping north the past 35 years



Southern corn
rootworm/ spotted



Squash bug



Harlequin bug



Southern cabbageworm



Striped cucumber beetle



Master Gardeners asked – “We heard beer works to trap slugs. Do you know what kind of beer to use?”

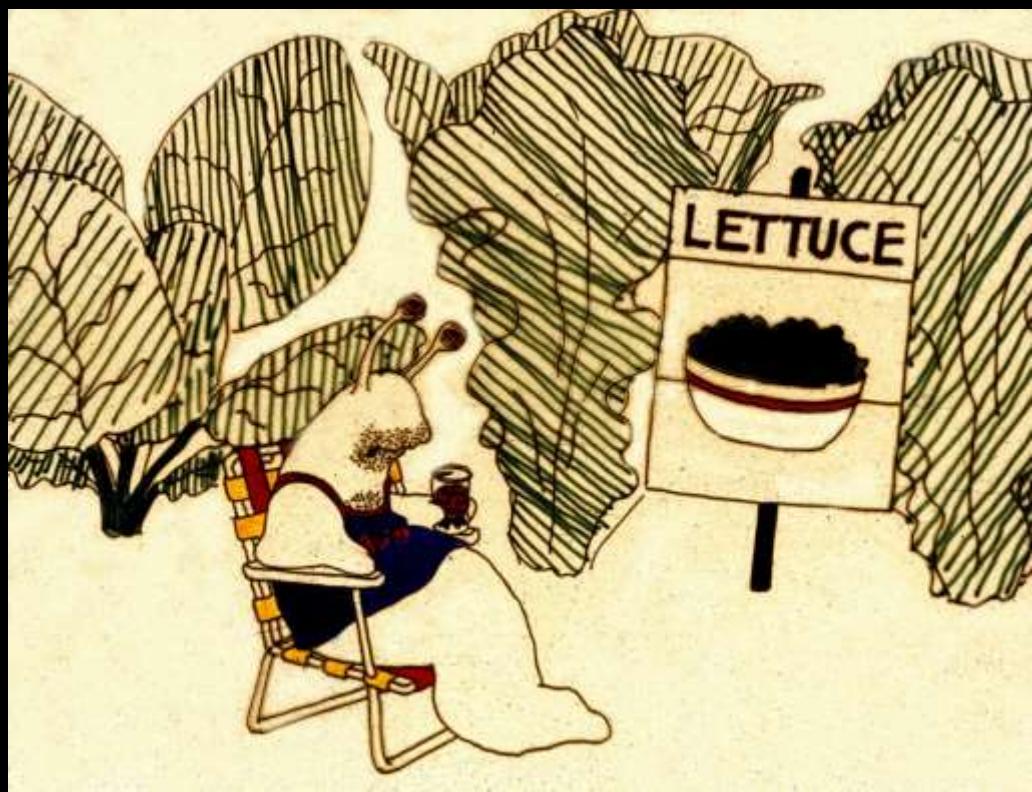


Table 1a. Rankings of beverages for attractiveness to slugs, Ft. Collins, CO 1987. (Summary of 5 trials).

Beverage	Attraction index*
Kingsbury Malt Beverage	1.14
Michelob	1.04
Budweiser	1.00
Bud Light	0.89
Old Milwaukee	0.81
Coors Light	0.79
Schaefer	0.69
Miller	0.68

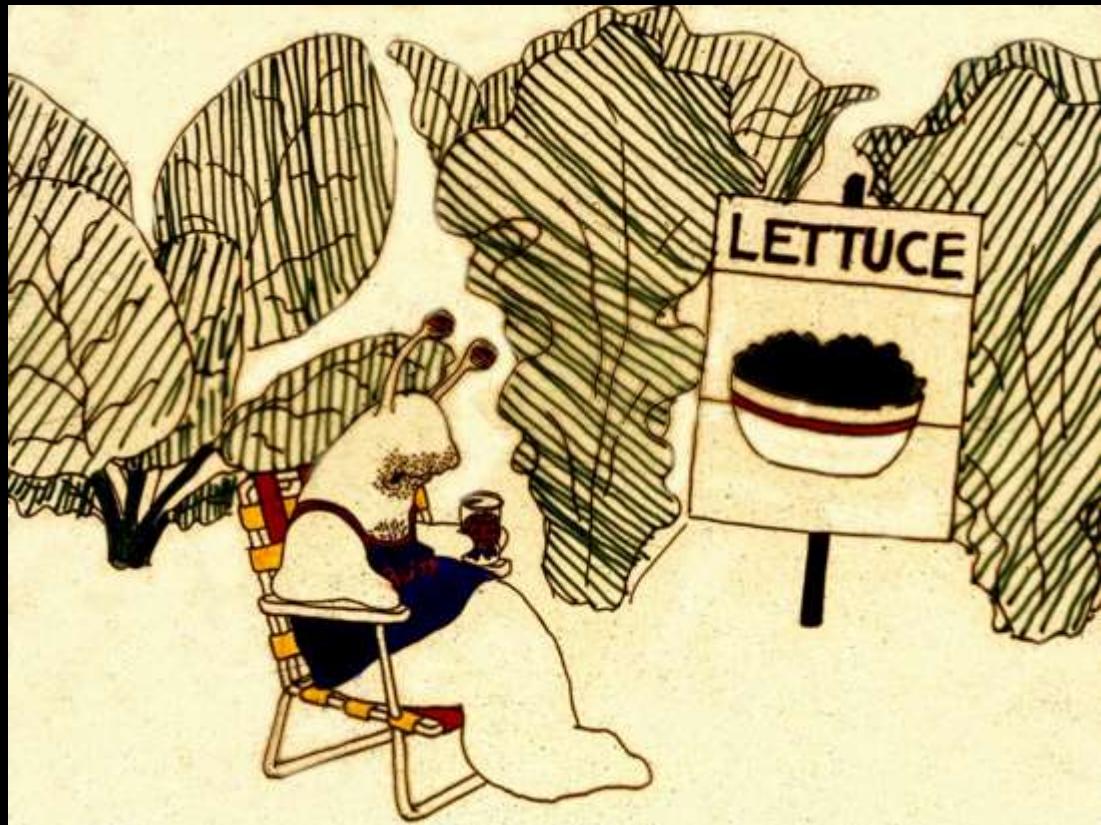
* Expressed as ratio of slug capture in comparison with Budweiser standard.

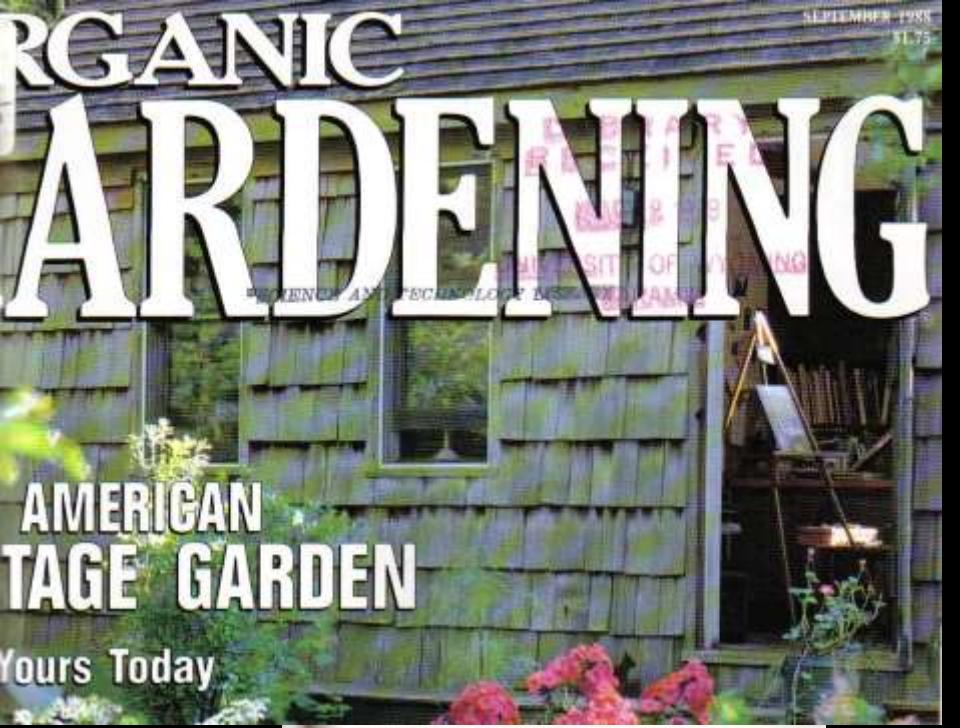


Table 1b. Rankings of beverages for attractiveness to slugs, Ft. Collins, CO 1987. (Summary of 5 trials).

Beverage	Attraction index*
Strohs Lite	0.67
Sugar water/yeast	0.57
Coors	0.56
Pabst Blue Ribbon	0.44
Rainier	0.36
Gallo Pink Chablis	0.09
Ft. Collins tap water	0.06

* Expressed as ratio of slug capture in comparison with Budweiser standard.





AMERICAN STAGE GARDEN

Yours Today

AN INSECT EINSTEIN

Whitey Cresswell's enthusiasm for insects is infectious. He has a Ph.D. entomologist who, in the same garage, maintains meetings, but when others and colleagues initialled him as the "Insect Einstein" creator of the "insect Einstein" name, he was modestly reticent. They have enough of the albatross—now he's dedicated, dynamic and willing to contribute with his expertise something that Whitney Cresswell is definitely one of a kind.

A scientist has an unusual avocation: writing books about insects. Another scientist doesn't even consider solutions for insect problems.

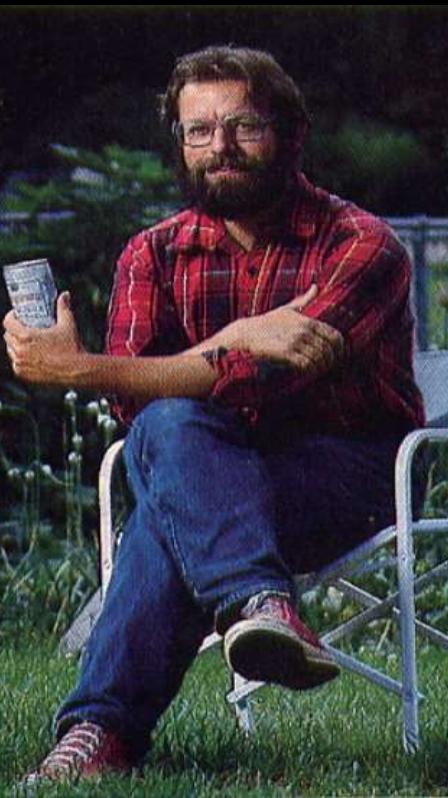
With scientific precision, they

BY KENT MARTIN

September 1988 \$1.75

The article spread features a portrait of Whitney Cresswell sitting in a chair, holding a glass. The text discusses his work as an entomologist and his passion for insects, including a quote about being asked why he writes books on insects.

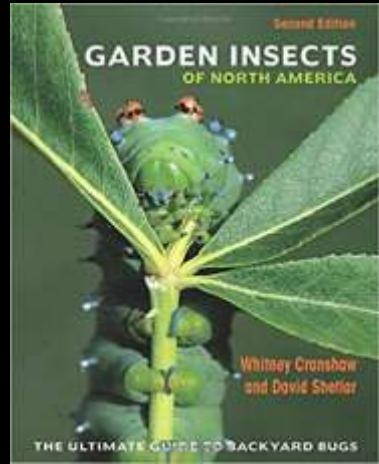
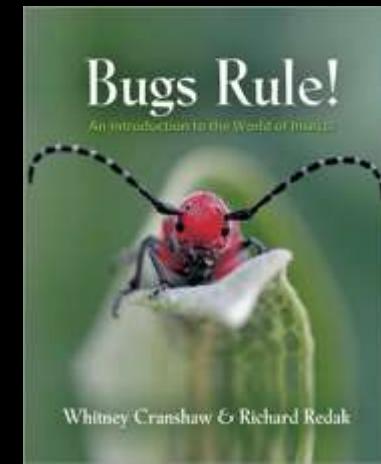
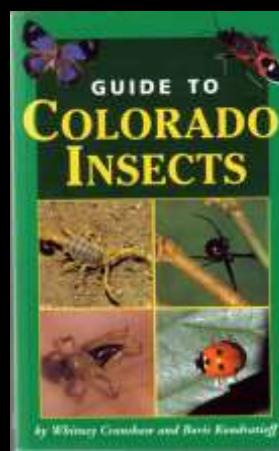
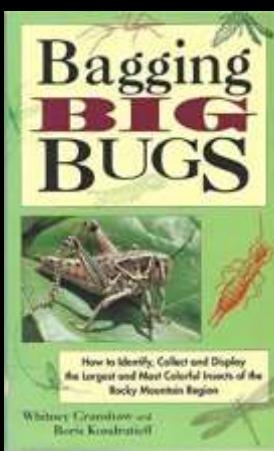
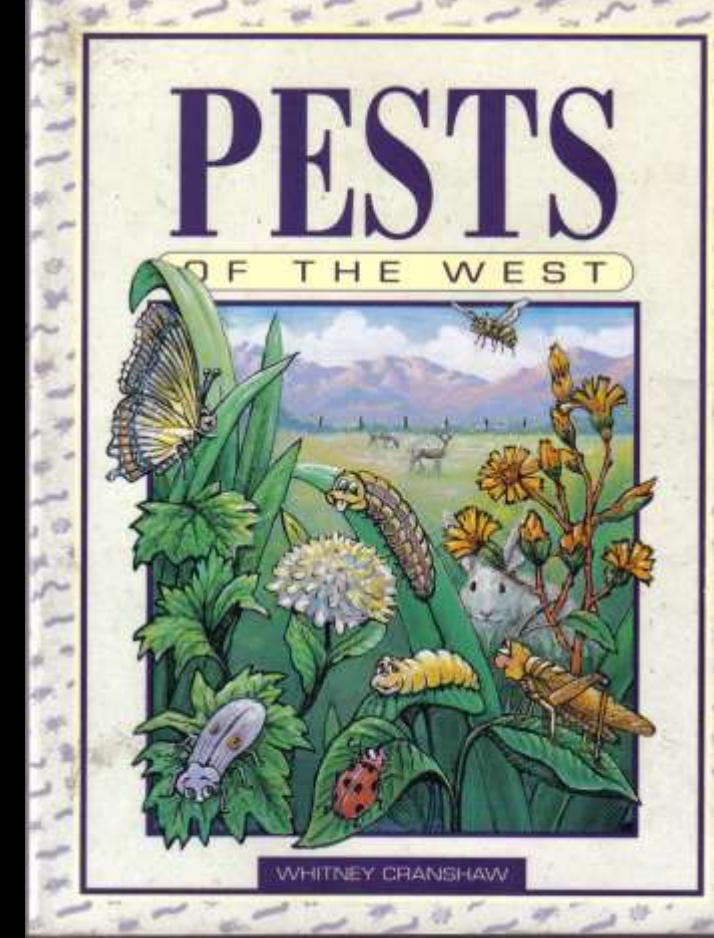
My entrée to book writing: The infamous *Organic Gardening* magazine article



Contributions to First Published Work (outside CSU)

Pests of the West

- Good luck – publicity that attracted publisher's attention
- Some track record of writing
- Demonstration of an audience
(Master Gardeners)

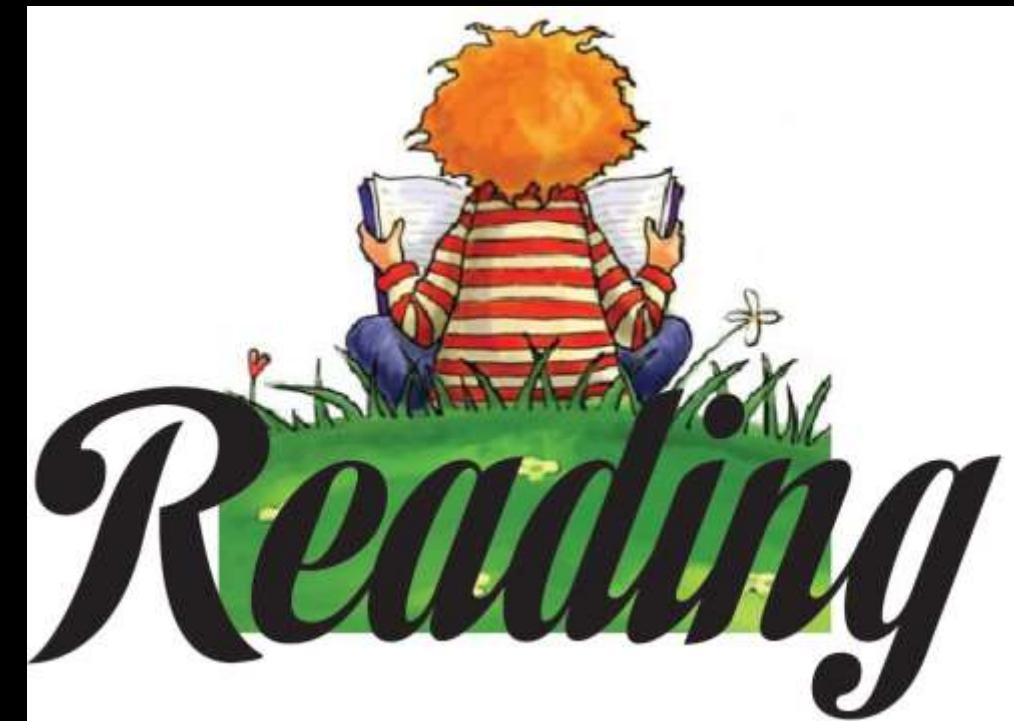


The 4 Rs

Reading

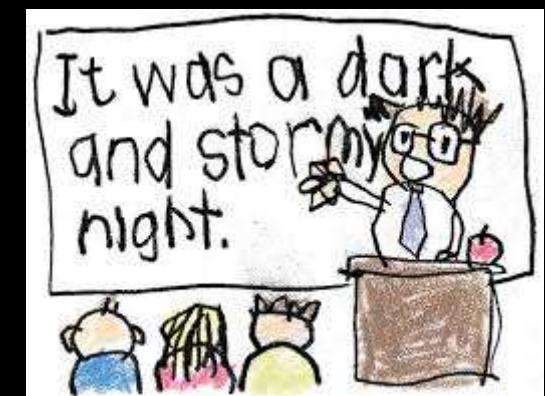
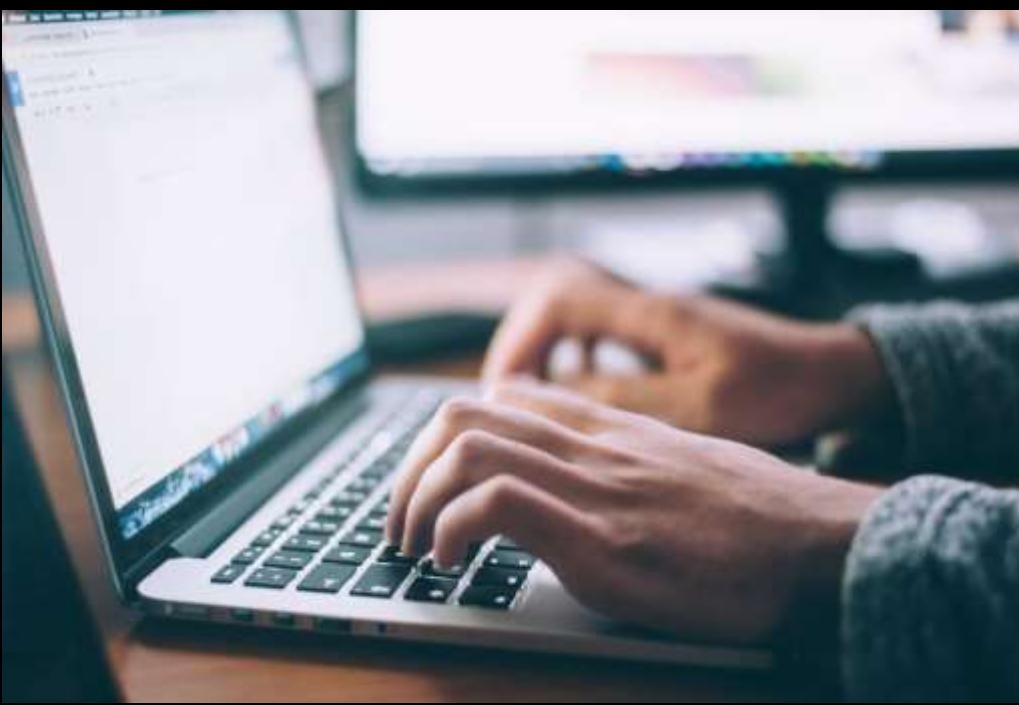


Clear Creek (TX) School District



The 4 Rs

Reading WRiting



The 4 Rs

Reading Writing ARithmetic

	£	s	d
	4	3	8
	5	17	7
	3	6	10
Answer	<u>13</u>	8	1

Column total	12	26	25
Carried forward	1	2	-
Unnormalised total	13	28	25
Normalisation	-	$28 \div 20$	$25 \div 12$

By Martinvl - Own work, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=18812163>

The 4 Rs

Reading
Writing
Arithmetic

Arthropods!



This presentation will be posted at the Insect Information Website

- Housed at Department of Bioagricultural Sciences and Pest Management
 - Search BSPM CSU
- Click on Entomology
- Insect Information
 - Extension presentations for 2019 posted at bottom of page

The screenshot shows the official website of the Colorado State University College of Agricultural Sciences. The header includes the university logo, the name 'COURT OF AGRICULTURAL SCIENCES', and a navigation bar with links for Department, People, Undergraduate, Graduate, Alumni & Friends, Seminars, Entomology, Plant Pathology, Future Students, and Commencement. Below the header, there's a sub-navigation menu with links for Department, People, Undergraduate, Graduate, Alumni & Friends, Seminars, Entomology, Plant Pathology, Future Students, and Commencement. The main content area features a section titled 'Insect Information' with a sub-section titled 'Arthropods of Colorado Fact Sheets'. It describes the availability of about 200 fact sheets related to insects and other 'bugs' found in Colorado. A prominent orange button labeled 'Fact Sheets' is visible. To the right, a sidebar titled 'Some Entomology Hot Links' lists several external resources.

COLORADO STATE UNIVERSITY COLLEGE OF AGRICULTURAL SCIENCES

Bioagricultural Sciences & Pest Ma

Department People Undergraduate Graduate Alumni & Friends Seminars Entomology Plant Pathology Future Students Commencement

Weed Science •

Insect Information

All materials provided in another accessible format can be made available upon request.

Arthropods of Colorado Fact Sheets

This is a listing of about 200 downloadable fact sheets related to insects and other "bugs" found in Colorado. It contains fact sheets that are written for the Colorado Arthropods of Interest series and the Extension fact sheets that are related to insects.

Fact Sheets

Some Entomology Hot Links:

- Colorado Hemp Insect Website
- Western Colorado Entomology Website
- IPM Images/Bugwood (Cranshaw)
- IPM Images/Bugwood (Pearls)
- Entomology Resources List
- Honey Bee Swarm Hotlines