




## 2018 INC MEETING

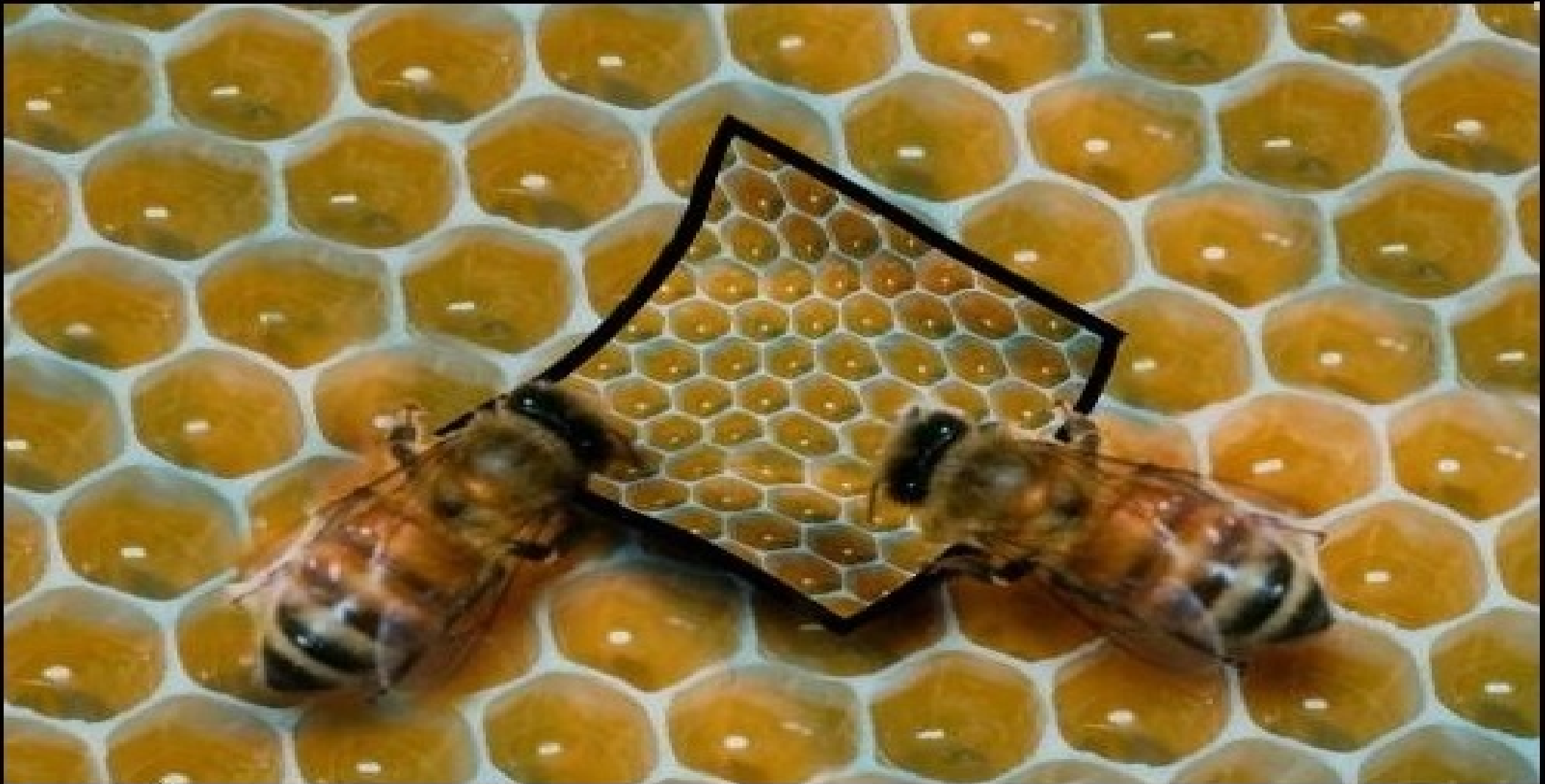
# Considering Native Bees

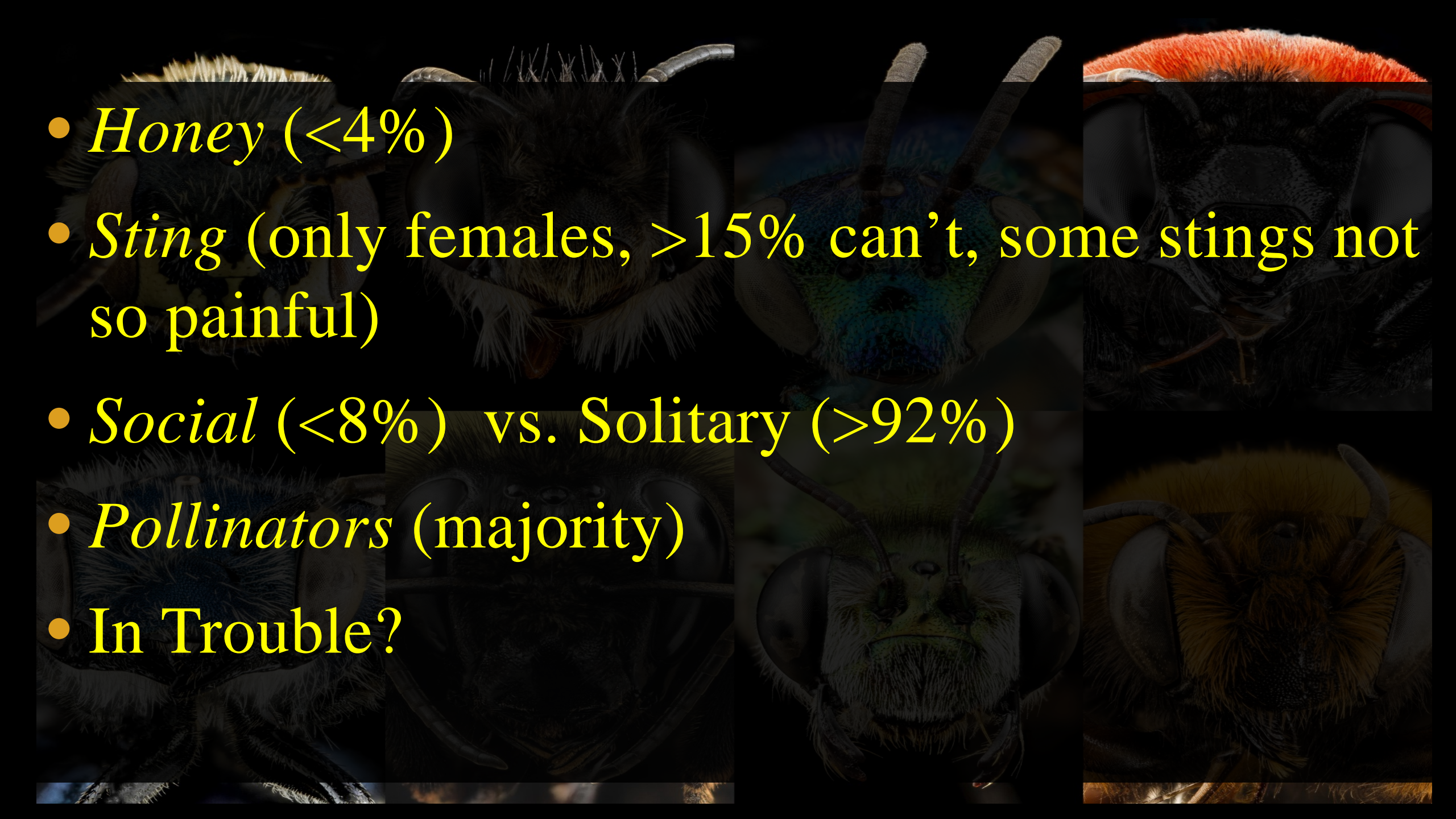
Brian Dykstra  
Native Bee Society



- 
- Honey
  - Sting
  - Social – Colonial, nest in hives
    - Beekeeping
    - Pollinators
    - *In Trouble ?*
  - *Colony Collapse Disorder (CCD)?*

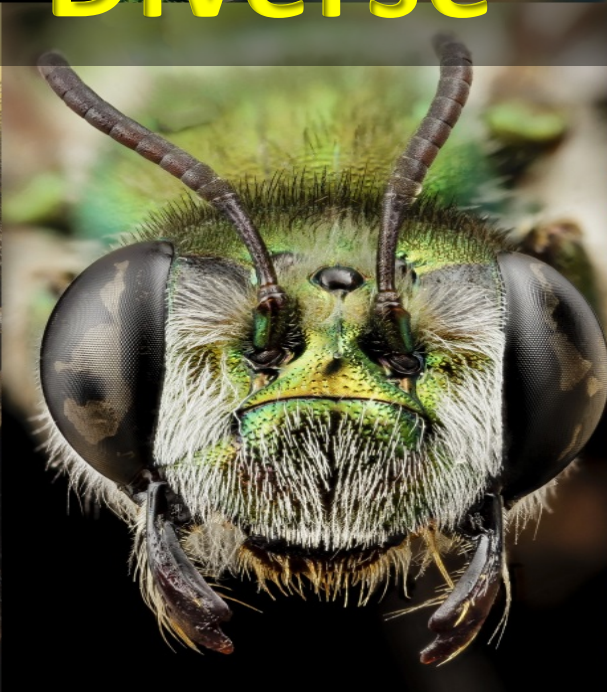
# The Map Is Not The Territory



- 
- *Honey* (<4%)
  - *Sting* (only females, >15% can't, some stings not so painful)
  - *Social* (<8%) vs. *Solitary* (>92%)
  - *Pollinators* (majority)
  - *In Trouble?*



**Bees are Diverse**

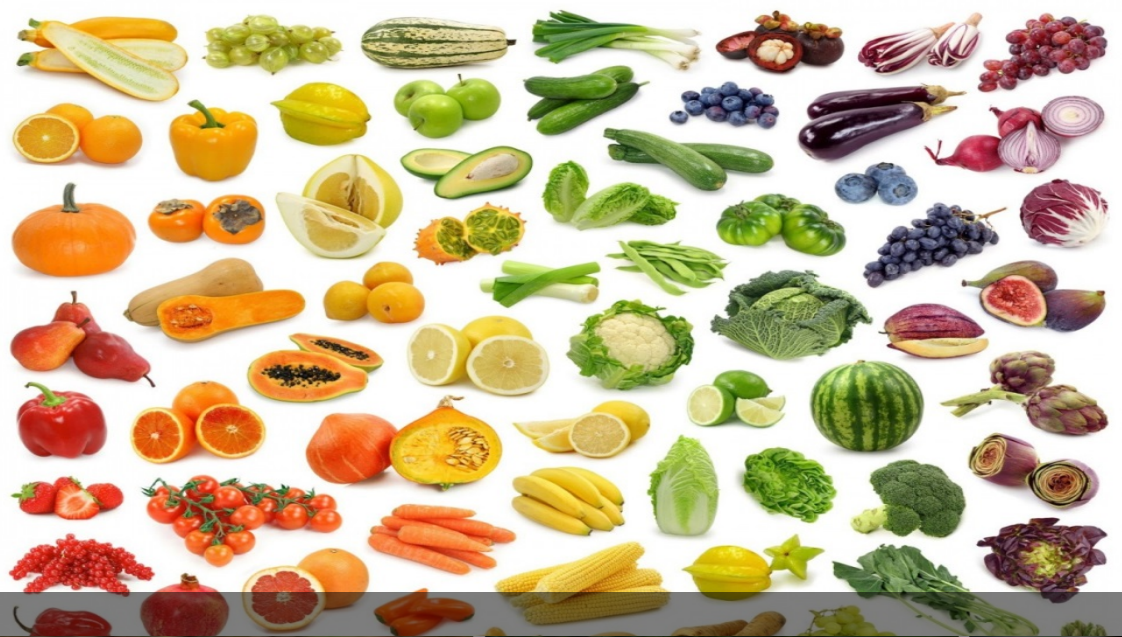




**diverse shapes, sizes, colors, sounds, phenology,  
nesting, floral preferences, tongue length, flight  
range, sociality, etc.**



**Bee Diversity Ensures**



# Food and Medicinal Plant Diversity







• Bees provide *ecosystem service*: **Pollination**

**Pollination** provides **fruits**, **nuts**, **berries**,  
continuous **plant populations**

“traditional taxonomic systems, as well as indigenous understanding of wild bee behavior and biology *parallels and often exceeds levels in western science*”

### View of experts on the way forward

- local management practices supporting pollination services and indigenous bee management should serve as the foundation of future recommendations for pro-pollinator management practices.
- in-situ management of plant genetic resources can benefit by greater consideration of the role of pollination in the conservation of plant genetic diversity.

## RAPID ASSESSMENT OF POLLINATORS' STATUS

FAO 2008

A CONTRIBUTION TO THE INTERNATIONAL  
INITIATIVE FOR THE CONSERVATION AND  
SUSTAINABLE USE OF POLLINATORS



RAPID ASSESSMENT OF POLLINATORS' STATUS

### CHAPTER FIVE: INDIGENOUS KNOWLEDGE OF POLLINATION

# Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES)



## Respecting indigenous knowledge of pollinators



The assessment report on  
**POLLINATORS,  
POLLINATION AND  
FOOD PRODUCTION**

United Nations



- Biocultural Heritage
- 2012, 2016

diverse  
sizes





Sweat bee: *Halictus*



Polyester bee: *Colletes*



Mason bee: *Osmia*



Fairy bee:  
*Perdita*



Digger bee: *Anthophorula*



European honey bee:  
*Apis mellifera*



Mining bee: *Andrena*



Sweat bee:  
*Lasioglossum (Dialictus)*



Green sweat bee:  
*Agapostemon*



Small carpenter bee:  
*Ceratina*



Leaf-cutter bee:  
*Ashmeadiella*



bees are *vegetarian*

food =  
*pollen and nectar*

bee larvae especially need *pollen* for  
protein to grow

adult bees especially need *nectar* for  
flying energy

tized



hair

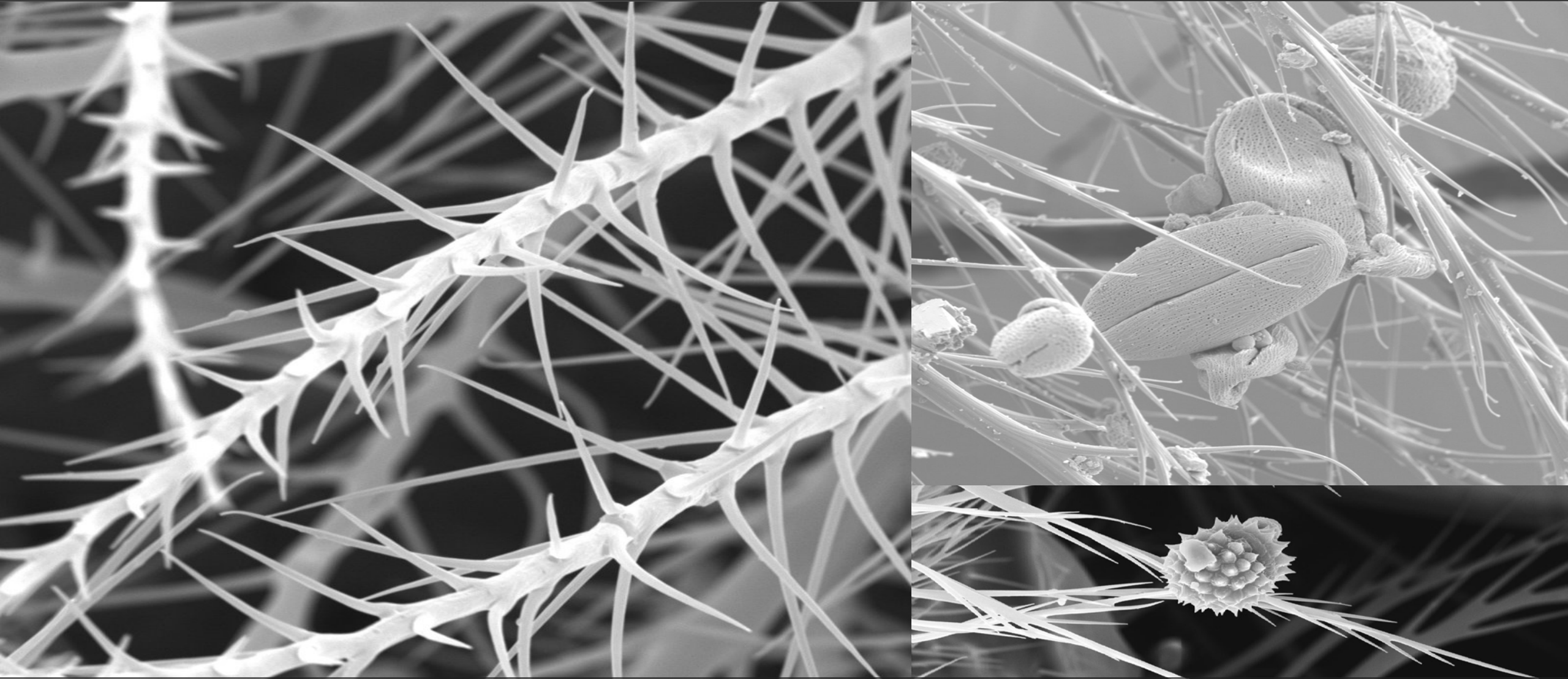
other animals



bee



every bee has some *branched* hairs



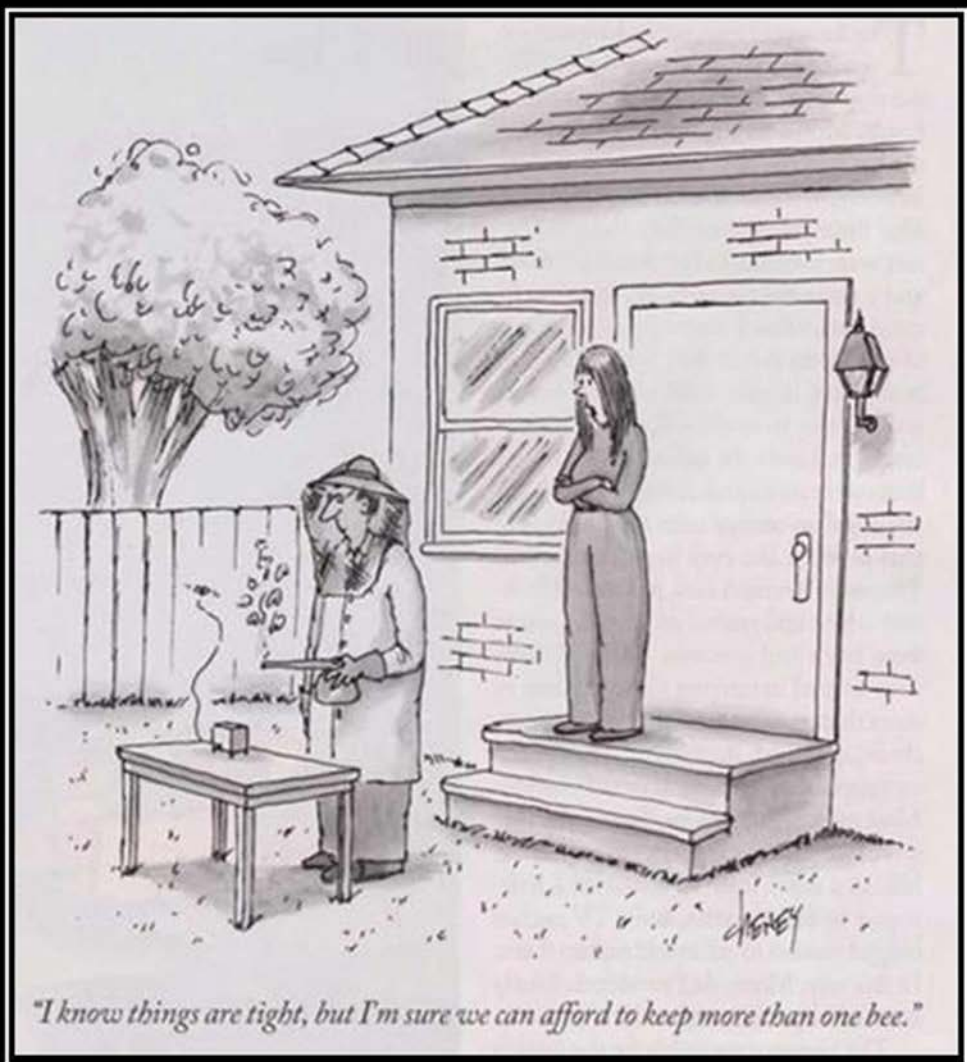
that catch pollen grains

most bee species have

*single hard-working mothers*



each mom bee builds her own nest and collects her children's food without help



*"I know things are tight, but I'm sure we can afford to keep more than one bee."*



# SOLITARY BEES

You're doing it wrong.

# life cycle of a solitary, ground nesting bee





Silver Dune Bee - *Habropoda miserabilis*

## Wool Carder Bees



- *Eriogonum latifolium* and *Anthidium palliventre*



*Solidago spathulata* and *Megachile wheeleri*  
leafcutter bee and dune goldenrod

Sandstone nesting  
*Anthophora pueblo*:

natural/cultural resource conservation









# Importance to Agriculture



# Importance to Agriculture



Squash Bee

Pollen Specialist







# Buzz Pollination











# Buzz Pollination





# Native Plants and Native Bees Importance to Agriculture



blueberry



manzanita

*Buzz pollination*

# Native Plants and Native Bees

## Importance to Agriculture



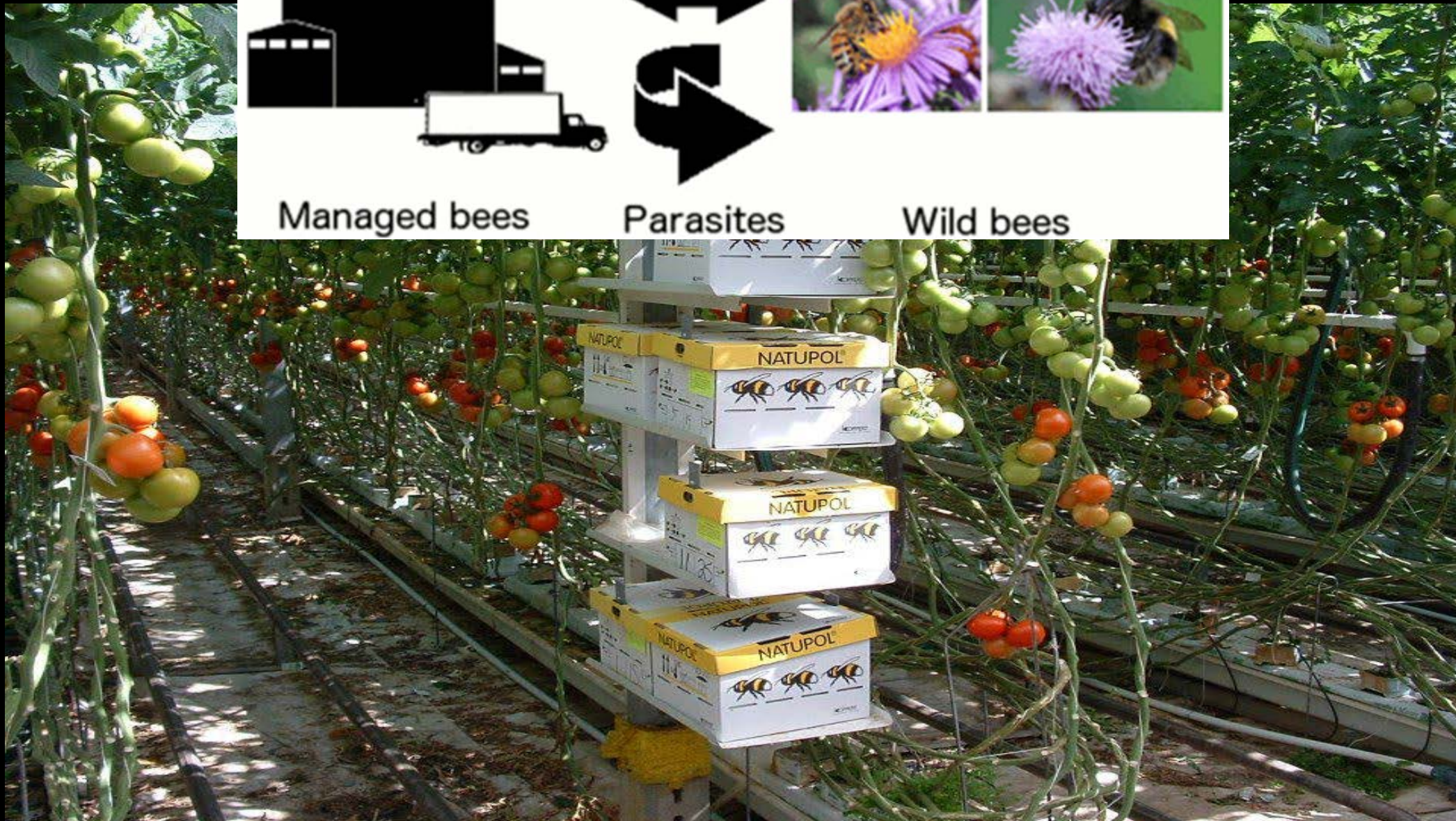
tomato



manzanita

*Buzz pollination*

# Effects on wild bee health due to managed bee proximity



## Western bumble bee (*Bombus occidentalis*)



- **Original Range: Southern California to Alaskan Tundra**
- **Abundance: Was the most Common BB throughout that range**
- **Mostly absent now from southern BC to central CA**
- **No longer commercially available**



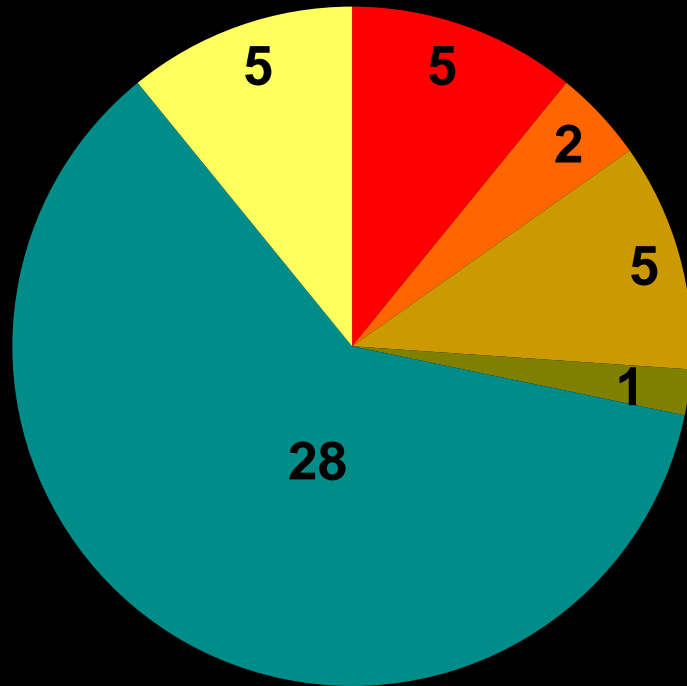
# Why the major decline?



- Spread of pests and diseases by the commercial bumblebee industry
- Habitat destruction or alteration that may degrade, destroy, alter, fragment, and reduce their food supply or nest sites
- Pesticides and insecticides (ground bumblebees are particularly susceptible)
- Invasive plant species that may directly compete with native nectar and pollen plants

# North American bumble bees are in decline

- **1-in-4 NA bumble bees at risk of extinction today**
- **Causes: Disease spread by commercial bees, habitat loss, pesticide use, global climate change**



- Critically Endangered
- Endangered
- Vulnerable
- Near Threatened
- Least Concern
- Data Deficient

Yellow banded bumble bee



Rusty patch bumble bee



# Fremontia

## NATIVE BEES, NATIVE PLANTS, AND CROP POLLINATION IN CALIFORNIA

by Claire Kremen, Robert L. Bugg, Nikki Nicola, Sarah A. Smith,  
Robbin W. Thorp, and Neal M. Williams

California is recognized globally as an area of exceptional plant diversity containing a host of plants found nowhere else in the world. It is also the most important agricultural area in North America, producing half of the US supply of fruits, nuts, and vegetables at an annual value of \$16.45 billion, and exporting \$6.5 billion of food and agricultural commodities abroad.

Insect pollinators are critically important both for the maintenance of California's diverse natural ecosystems and for its agricultural productivity. In 1997, honey bees alone

were credited with contributing \$4.2 billion to crop productivity in California (E. Mussen, pers. comm.). Here we focus on the under-appreciated role that native bees play in California's agricultural productivity, and how California's native plants support these native bee populations.

A large number of flowering plants (Angiosperms) rely on an animal for pollination, successful seed set, and fruit growth. Even self-fertile plants (e.g., tomatoes) or plants

*Osmia lignaria*, the blue orchard bee, on almond. Photograph by D.L. Briggs.



### California is:

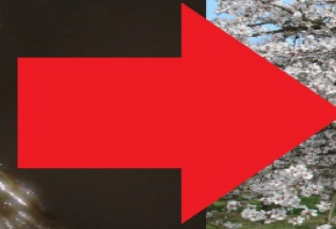
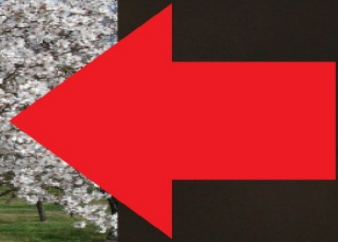
- Plant Diverse
- Bee Diverse
- Important Agriculturally

### In Central Valley of CA:

- Loss of native plants/habitat
- Decline in native bees
- Reduction in crop pollination

•• plant  
native hedgerows

# mason bee



*pollen-carrying and foraging behavior*

# honey bee



*pollen-carrying and foraging behavior*

# Native Plants and Native Bees

## Importance to Agriculture



apple



Oregon grape

*Phenology*

# raspberry bee



*phenology, pollen-carrying, foraging, and nest material*

# *Traditional Ecological Management Cared for Bees*

karrikinolide + butenolide → seed germination: Huron +

- Fire as tending the wild
- Enhance and maintain floral diversity and health





# *“disturbance” ecology non-commercial management*

- Nesting + Foraging opportunities
- Bee abundance + Bee diversity



# Non-natives



bumble bee



honey bee



Raising honeybees to save pollinators is like raising cows to help ungulates



yellow-faced bee



honey bee

Raising honeybees to save pollinators is like raising chickens to help birds

# Gauging the Effect of Honey Bee Pollen Collection on Native Bee Communities

## Competition

[James H. Cane](#)

USD

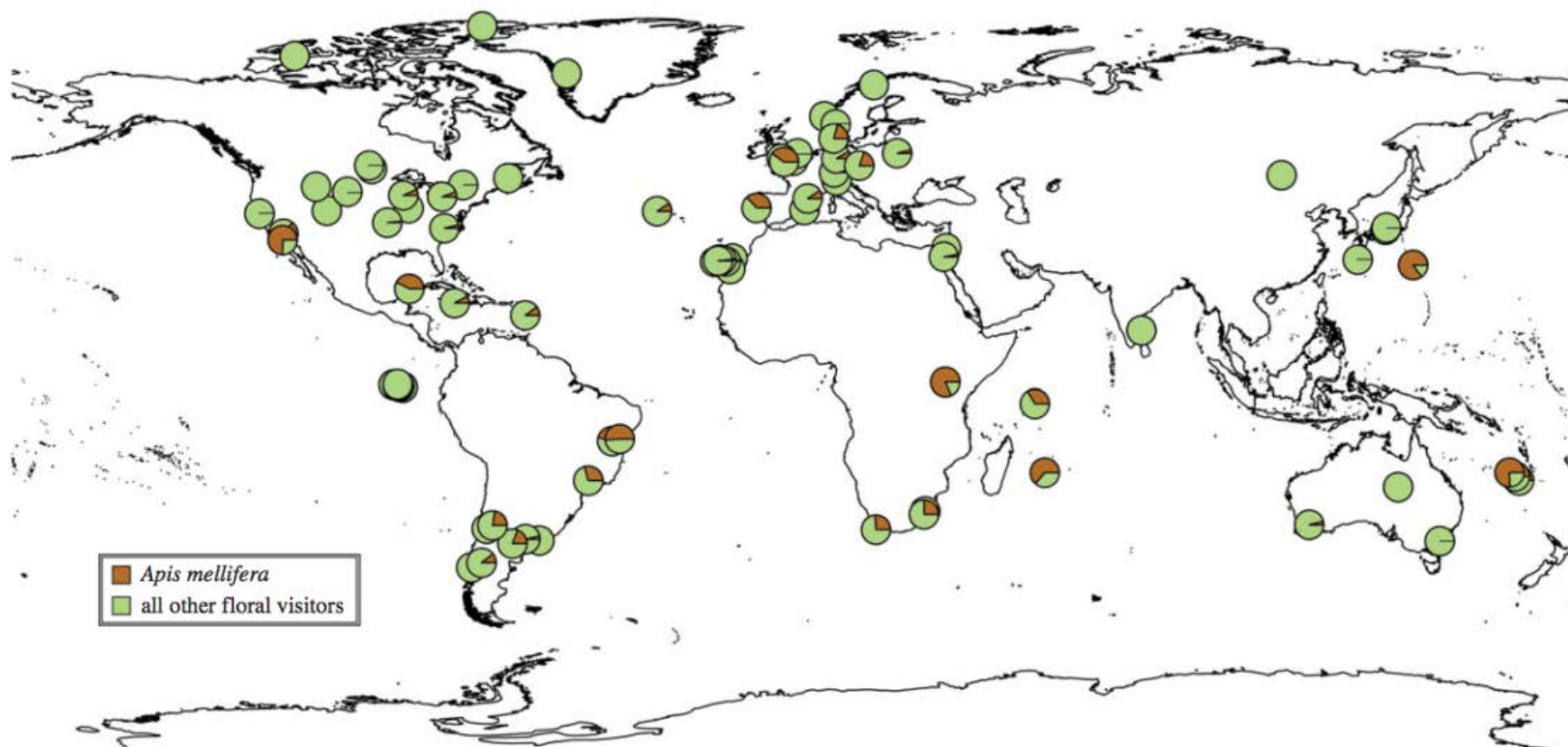
[Vinc](#)

Dep



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Open Access

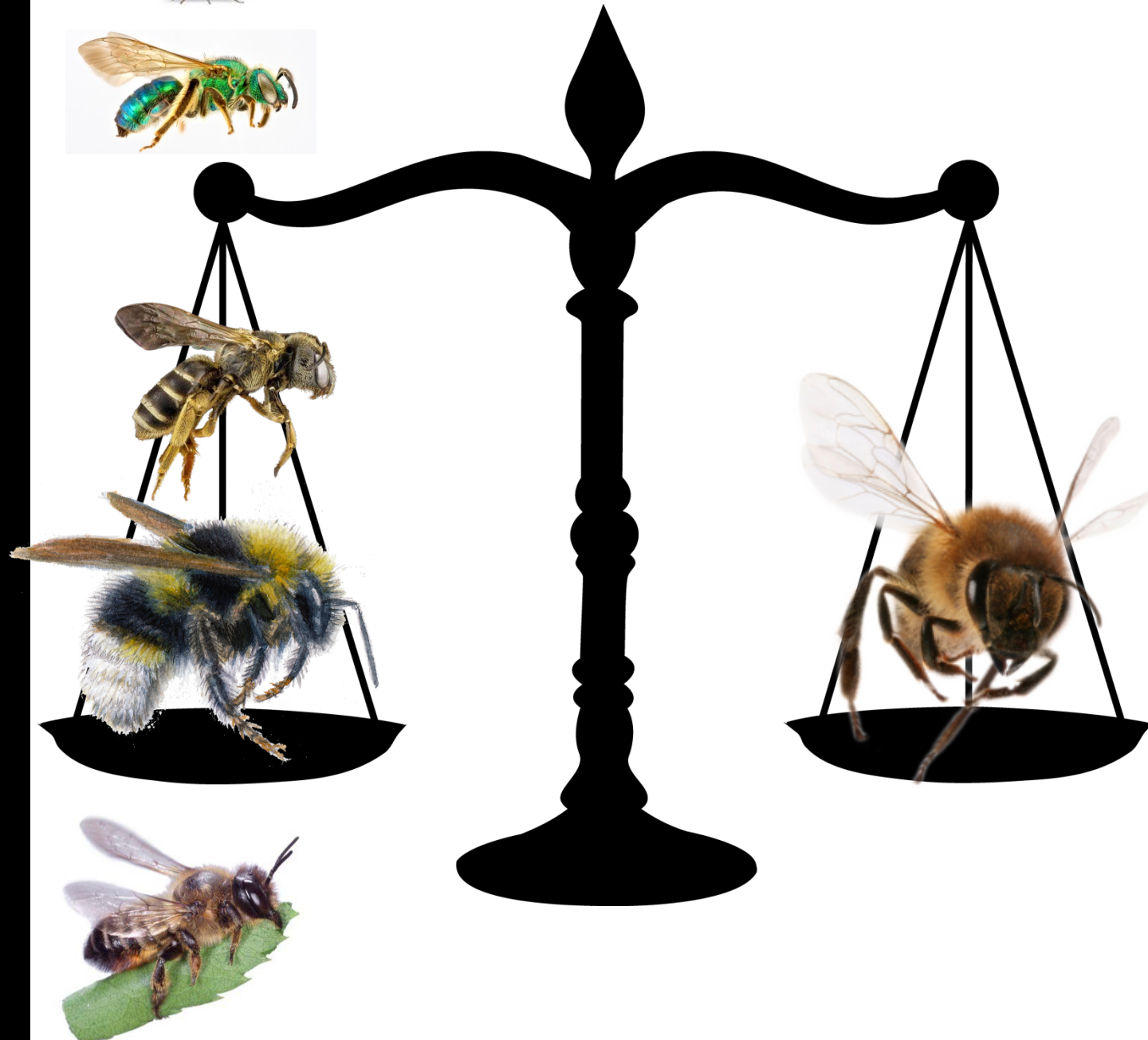
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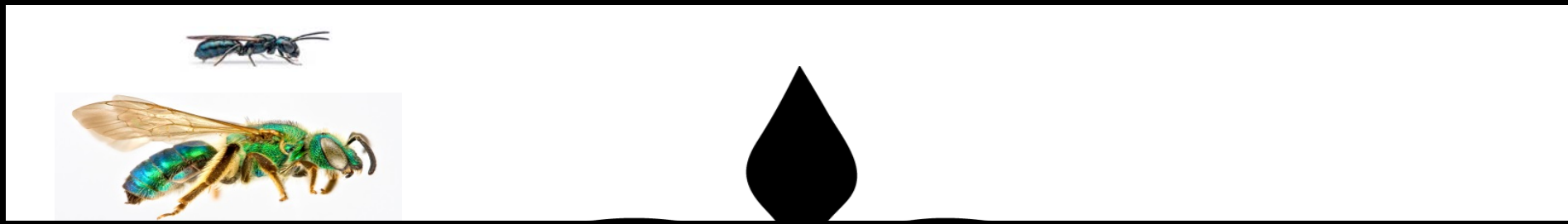


**Figure 1.** Proportion of all floral visits contributed by the western honey bee (*Apis mellifera*) in 80 plant–pollinator interaction networks in natural habitats worldwide. *Apis mellifera* is generally considered a native species in Europe, the Middle East, and Africa; and introduced elsewhere. (Online version in colour.)

- honey bee responsible for ~ 13% of flower visits.
- 5% of plant species exclusively visited by the honey bee.
- 49% of plant species honey bee never visited

EPA





“there is no means of assessing species diversity using only one surrogate species, the honeybee. It is also important to note that the honey bee is a domesticated organism that is not native to the Americas. Furthermore, a substantial amount of research indicates that the presence of honeybees can have a harmful impact on native species of bees ”

Guidance For Assessing Pesticide Risks To Bees (2014)  
Office Of Pesticide Programs (OPP) US EPA







- ✓ ...contact toxicity tests [non-systemic soil-applied pesticides] should be included in risk assessments ... Honey bees could not be used for these contact toxicity tests as surrogates.
- ✓ Regarding the measurement endpoint “colony strength”, the Agency should take note of the fact that 98% of native bee species are solitary, and thus a colony measurement endpoint does not include solitary bees
- ✓ adult mortality could have a greater impact on the native bee populations the next year than for honey bees
- ✓ The Panel recommends that EPA consider using at least one additional bee species other than *Apis mellifera* to address the goal of protecting diversity.

White Paper in Support of the Proposed Risk Assessment Process for Bees (2012)

**Scientific Advisory Panel (SAP) to EPA - FIFRA**



*An invitation  
to go hunting*

# Safari

INSECTICIDE

Super-systemic: fast uptake,  
increased concentration

Broad spectrum control, including  
Q- and B-biotype whiteflies

Unsurpassed residual control

**FLIT KILLS ROACHES, BEDBUGS, ANTS, FLIES and MOSQUITOES**

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# EPA AND BEES



- **1970? – 2011.** Qualitative pesticide risk assessment process (i.e., not quantitatively measured)
- **2011 – now.** *Qualitative* and *Quantitative* (measure exposures and relate them to effects at the individual level; sometimes colony level).
- **Acute** (immediate) and **chronic** (10 days) toxicity
- Sublethal, Additive, Synergistic, Long-term, Colony, Semi-field or field studies **NOT REQUIRED**

# Clothianidin – NipsIt, Belay, Poncho, Titan, etc.

AN INTERNAL EPA MEMO RELEASED WEDNESDAY CONFIRMS THAT THE VERY AGENCY CHARGED WITH PROTECTING THE ENVIRONMENT IS IGNORING THE WARNINGS OF ITS OWN SCIENTISTS ABOUT CLOTHIANIDIN, A PESTICIDE FROM WHICH BAYER RACKED UP 183 MILLION POUNDS OF SALES IN 2009.

40 crops

2003 Reg. Review 2011-ongoing

CLOTHIANIDIN HAS BEEN WIDELY USED ON CORN, THE LARGEST U.S. CROP, SINCE 2003. SUPPLIERS SELL SEEDS PRE-TREATED WITH IT. LIKE OTHER MEMBERS OF THE NEONICOTINOID FAMILY OF PESTICIDES, CLOTHIANIDIN IS "TAKEN UP BY A PLANT'S VASCULAR SYSTEM AND EXPRESSED THROUGHOUT THE PLANT, INCLUDING IN NECTAR," ACCORDING TO A PESTICIDE WORK OF NATURE (PANNAPANNA), WHICH LEAKED THE DOCUMENT ALONG WITH BEYOND PESTICIDES. THE PESTICIDE'S EFFECT MAKES IT HIGHLY TOXIC TO A CROP'S PESTS -- AND ALSO HARMFUL TO BEE-KEEPING HONEYBEES, WHICH HAVE EXPERIENCED MASSIVE DIE-OFFS (KNOWN AS "COLONY COLLAPSE DISORDER") IN THE U.S. STATES AT LEAST SINCE 2006.

THE EPA'S GOT MY BACK



ACCORDING TO PANNAPANNA, CROPS PRE-TREATED WITH CLOTHIANIDIN INCLUDE CANOLA, SOY, SUGAR BEETS, SUNFLOWERS, AND WHEAT -- ALL AMONG THE MOST WIDELY PLANTED U.S. CROPS. BAYER IS NOW PETITIONING THE EPA TO REGISTER IT FOR USE WITH COTTON AND MUSTARD SEED.

THE DOCUMENT REVEALS THAT EPA SCIENTISTS HAVE DECLARED ESSENTIALLY REJECTED THE FINDINGS OF A STUDY CONDUCTED ON BEHALF OF BAYER THAT THE AGENCY HAD USED TO JUSTIFY THE REGISTRATION OF CLOTHIANIDIN. AND THEY REITERATED CONCERNS THAT WIDESPREAD USE OF CLOTHIANIDIN IMPERILS THE HEALTH OF THE NATION'S HONEYBEES.

# Clothianidin: neonicitinoid



Half-life of 19 years in clay soil

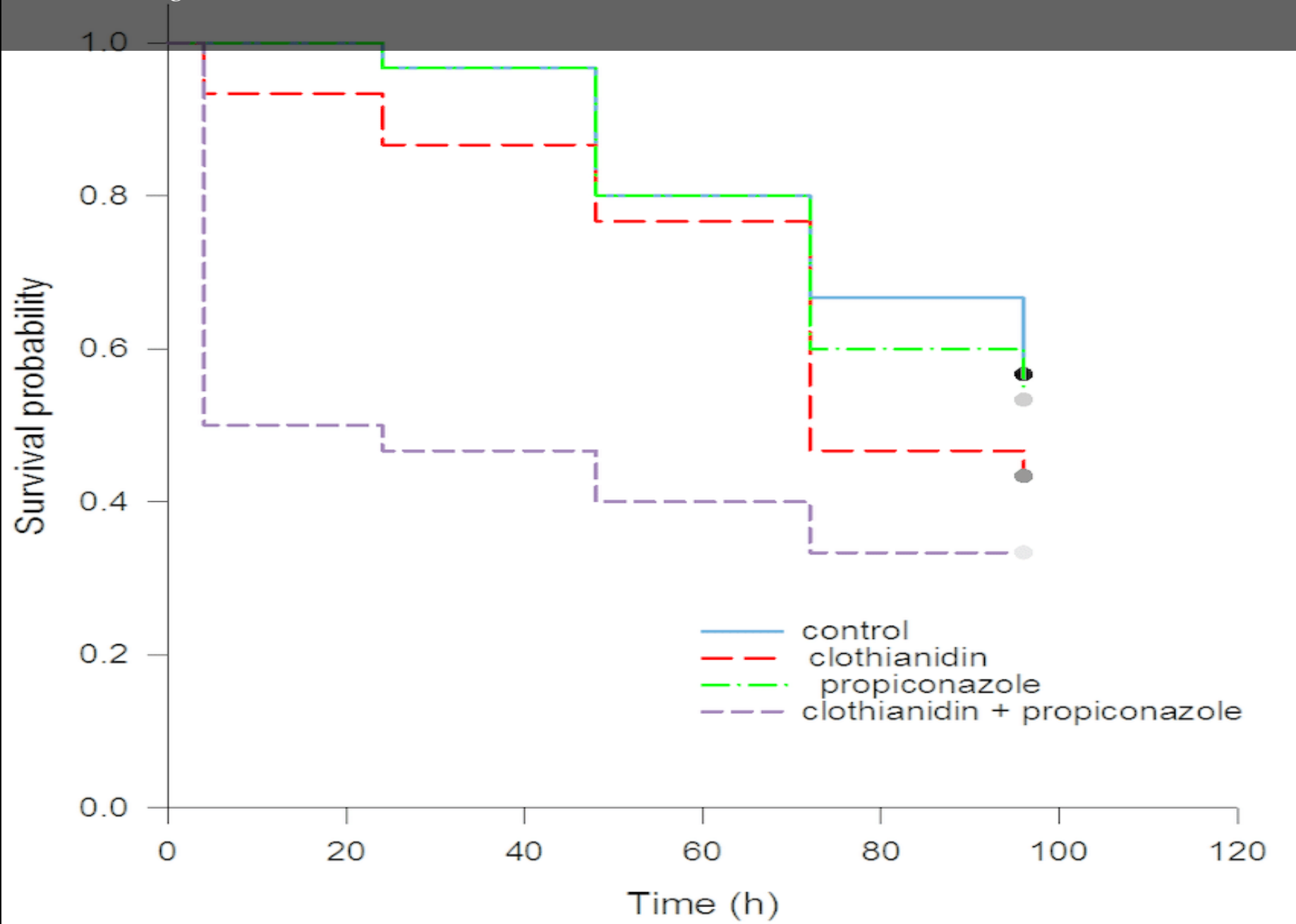
Neonicotinoid clothianidin adversely affects insect immunity and promotes replication of a viral pathogen in honey bees

PNAS 2013 110: 18466-18471.

Next Generation Effect



Synergistic mortality between a neonicotinoid insecticide [Clothianidin] and an ergosterol-biosynthesis-inhibiting fungicide in three bee species. *Pest Management Science* 2016



# ENVIRONMENTAL ENTOMOLOGY

## Routes of Pesticide Exposure in Solitary, Cavity-Nesting Bees

*Environmental Entomology*, Volume 47, Issue 3, 6 June 2018, Pages 499–510.

Andi M Kopit and Theresa L Pitts-Singer

USDA ARS Pollinating Insects Research Unit, Utah State University, Logan, UT

- Solitary vs. Social
- Ground nesting vs. Above ground
  - Unmanaged vs. Managed





# Dwelling: Paint Branch Creek: A Fusion of Science, Art and Sustainability





# 2018 INC MEETING



Thank You !

Brian Dykstra  
Native Bee Society



- Sunday April 10 1496  
thievery of honey  
and wax under fear  
of being shot by  
canon
- Indigenous Arawak  
People of Karukera  
(Guadeloupe) Island

scopa(e) = pollen broom(s)



corbicula(e) = pollen basket(s)



European honey bee  
Associated with spread of  
noxious weeds



Native Bees  
Capable of pollinating more plants than  
European honeybee

One of the most common bites



depend

bee.



**One of every three bites  
of food you eat**

*(and a good proportion of  
wildflower pollination)*



**depends on bee diversity**

Plant “normal” species/varieties, not double-blooms and hybrids



# Plant “normal” species/varieties, not double-blooms and hybrids

Peony-type (open)  
'Bishop of Oxford' Dahlia



Cactus-type  
'Tahiti' Dahlia



**10x > Bees**

# Plant a diversity of floral colors, shapes, and sizes

*tongue length and corolla depth matter*



Sunflower, Carrot families, etc.



Figwort, Gentian families etc.

# Plant a range of bloom times

Botanical Name	Common Name	March	April	May	June	July	August	September
<i>Fragaria vesca</i> var. <i>bracteata</i>	Woods Strawberry	○ ○ ○	○ ○ ○ ○	○ ○ ○ ○				
<i>Cynoglossum grande</i>	Pacific Houndstongue							
<i>Rubus sanguineum</i>	Red-flowering Currant							
<i>Berberis aquifolium</i>	Tall Oregongrape							
<i>Lomatium dissectum</i>	Fern-leaf Lomatium							
<i>Camassia quamash</i> var. <i>maxima</i>	Common Camas							
<i>Delphinium trolliifolium</i>	Tall Larkspur							
<i>Plectritis congesta</i>	Rosy Plectritis							
<i>Dicentra formosa</i>	Bleeding Heart							
<i>Fragaria virginiana</i> var. <i>platyphylla</i>	Broadpetal Strawberry							
<i>Rubus parviflorus</i>	Thimbleberry							
<i>Camassia leichtlinii</i> var. <i>suksdorfii</i>	Tall Camas							
<i>Aquilegia formosa</i>	Red & Yellow Columbine							
<i>Geranium oregonum</i>	Oregon Geranium							
<i>Lupinus rivularis</i>	Riverbank Lupine							
<i>Rosa nutkana</i> ssp. <i>nutkana</i>	Nootka Rose							
<i>Hydrophyllum tenuipes</i>	Pacific Waterleaf							
<i>Sidalcea malviflora</i> ssp. <i>virgata</i>	Rosy Checkermallow							
<i>Balsamorhiza deltoidea</i>	Deltoid Balsamroot							
<i>Wyethia angustifolia</i>	Mules' Ears							
<i>Drymocallis glandulosa</i> ssp. <i>glandulosa</i>	Sticky Cinquefoil							
<i>Lupinus polyphyllus</i>	Many-Leaved Lupine							
<i>Eriophyllum lanatum</i>	Oregon Sunshine							
<i>Ligusticum apiifolium</i>	Lovage							
<i>Potentilla gracilis</i> var. <i>gracilis</i>	Graceful Cinquefoil							
<i>Phacelia nemoralis</i>	Bristly Phacelia							
<i>Achillea millefolium</i>	Yarrow							
<i>Prunella vulgaris</i> var. <i>lanceolata</i>	Self-Heal							
<i>Asclepias speciosa</i>	Showy Milkweed							
<i>Madia elegans</i>	Showy Tarweed							
<i>Solidago canadensis</i>	Goldenrod							
<i>Symphotrichum subspicatum</i>	Douglas Aster							
<i>Grindelia integrifolia</i>	Willamette Valley Gumweed							

Blooming Timetable of Native Plants for Native Insect Pollinators in the Southern Willamette Valley, Oregon

Bruce Newhouse – Salix Associates <http://www.salixassociates.com/>

# The Missing God Telipinu, Hittite God of Agriculture



# Totonac origin story of vanilla & bee



Claude Levi Strauss:

"The Coast Salish see a kind of parallelism between wild berries and Hymenopterous insects, such as bees.."

# Folk-Tales of the Coast Salish

Collected and edited by Thelma Adamson

*New introduction by William R. Seaburg and Laurel Sercombe*



Blue-jay given basket of  
bees from his sister



Patience = bees turning  
into berries.



Kwakwala (Kwakiutl language):

hamdzalatsi = bumble bee

hamdzatlala = berries, travel to another village or  
island to pick

# Hopi (Oraibi) medicine for peaches and bee wings



# RAPID ASSESSMENT OF POLLINATORS' STATUS

A CONTRIBUTION TO THE INTERNATIONAL  
INITIATIVE FOR THE CONSERVATION AND  
SUSTAINABLE USE OF POLLINATORS



RAPID ASSESSMENT OF POLLINATORS' STATUS

## CHAPTER FIVE: INDIGENOUS KNOWLEDGE OF POLLINATION

# *Bees as a Natural and Cultural Resource*



# *Hoopa Valley Pollinators*

## Culturally significant plants

- Medicinal
- Technological
- Ceremonial
- Food
- Games
- Ecosystem Service



Bee design Hupa basket - 1930s



## Collaboration

Athena Steen – the Canelo Project

Sarah Peebles – Resonating Bodies

**a bee habitat wall**

Canelo, AZ





integrate Hoopa artists



Connecting people, culture and nature

## CONTACT

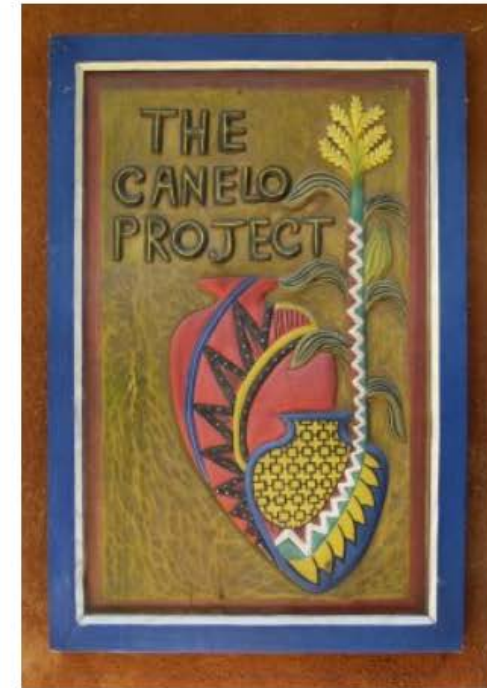
[on a map](#) | [directions](#)

The Canelo Project  
Bill & Athena Steen  
111 Membrillo Lane  
Elgin, AZ 85611

(520) 455-5548

[caneloproject@gmail.com](mailto:caneloproject@gmail.com)

As a non-profit organization we gladly accept donations of useful materials and tools, such as those on our [Wish List](#).



Connecting People, Culture and Nature.

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[www.caneloproject.com](http://www.caneloproject.com)

# Always Becoming (2007)

National Museum of the American Indian (NMAI)

- Athena and her Aunt, Tewa artist Nora Noranjo-Morse (Santa Clara Pueblo)
- first Native American woman to create an outdoor sculpture in Washington, D.C., titled *Always Becoming*.
- clay sculptures made of organic, nontoxic materials intended to reflect messages of growth, transformation, and Native peoples' relationship with the land.

# Sarah Peebles - Resonating Bodies

“integrated media installations, community outreach projects and educational initiatives focused on biodiversity of indigenous pollinators

[resonatingbodies.wordpress.com](http://resonatingbodies.wordpress.com)







### Benefits

- Cultural values
- Respect for the land
- Hands-on education
- Art
- Language immersion
- Food Sovereignty
- National leadership

*Food/Natural Resource* security is *Cultural* security

- Positive action for *Food/Natural Resource* security will support Cultural revitalization

*Helping Native Bees  
Helps Native Peoples*

# Additional Funding and Networking Opportunities

- Shakopee Mdewakanton Sioux Community  
(Minnesota)
- Native Bee Society
- KTRCD
- KTJUSD





# *Anthophora bomboides*

- chimney bee
- digger bee
- borer bee
- bumblebee-mimic digger bee





A Presentation to the  
Hoopa Valley Historical Alliance

by

Brian Dykstra  
Native Bee Society



Pollin

co



ower

es

*Calypso bulbosa* and Queen *Bombus*





*Calliopsis (Nomadopsis)* ♀ - *Horkelia daucifolia* (June)



*Chimaphila maculata*  
(Spotted Wintergreen)



*Vaccinium macrocarpon*  
Large cranberry



*Dodecatheon alpinum*  
Alpine Shooting Star



*Solanum sp.*  
Horse nettle







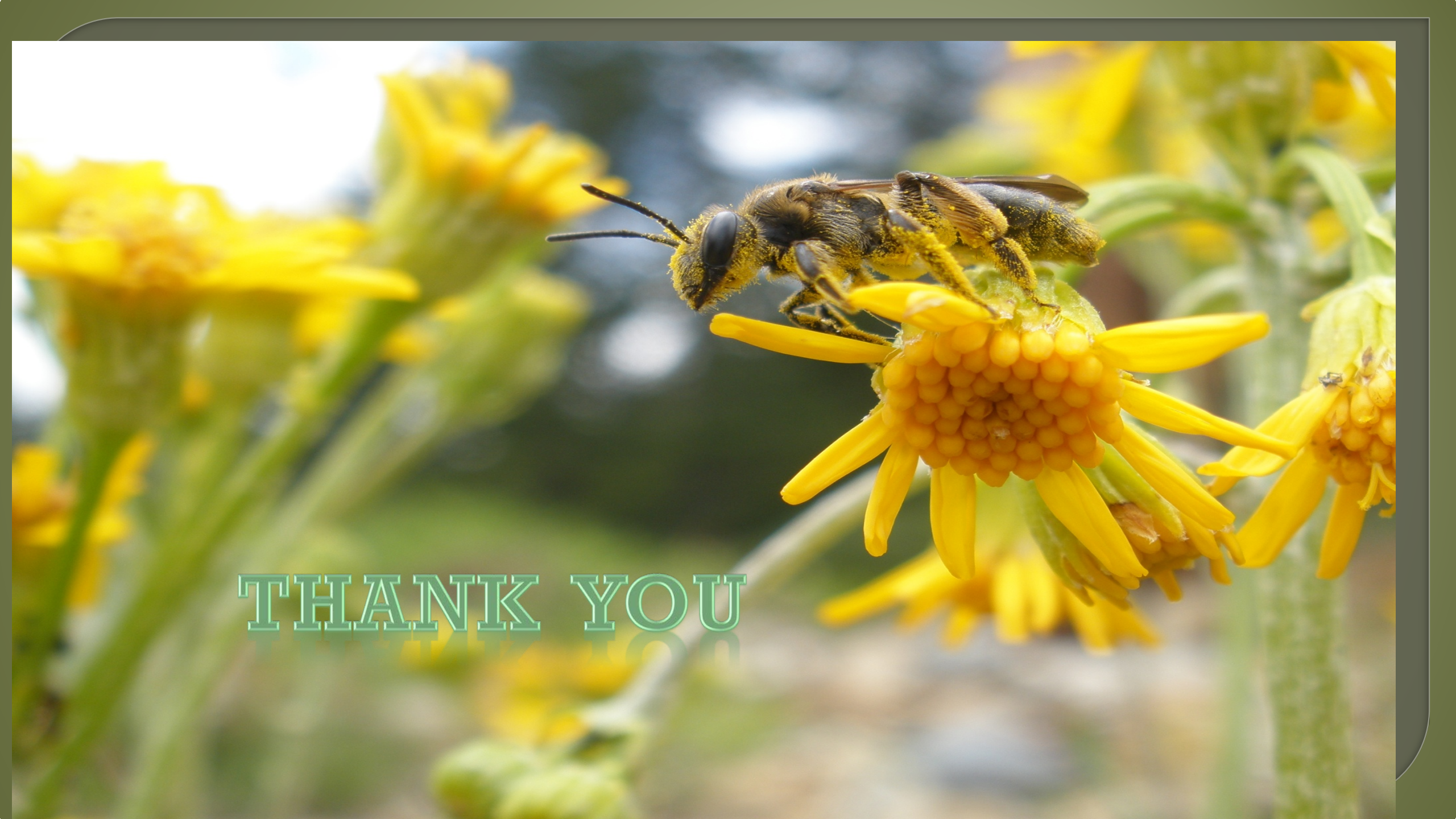




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THANK YOU







SEP/ 4/2014





AUG/19/2015



