



# Honey Bee Health And Supply





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**Moderator: Chris Heintz, ABC Bee Task  
Force Liaison**

**Presenters:**

**Dan Cummings, Cummings-Violich, Inc.)**

**Ned Euliss, U.S. Geological, Survey,  
Northern Prairie Wildlife Research Center**



# Honey Bee Health and Supply

Chris Heintz



# Today's Topics

## The ABC Pollination Research Program

*Chris Heintz*



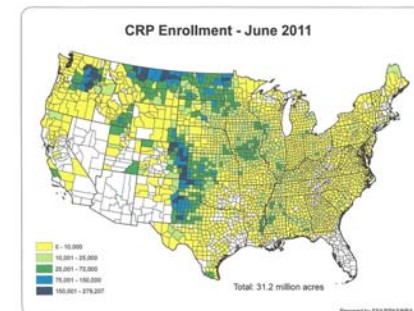
## Almond/Bee Dynamics for Bloom 2012

*Dan Cummings*



## Land Use in the Northern Great Plains and Almond Pollination

*Dr. Ned Euliss, USGS*





ABC pollination research: since 1976. \$1.88 M

# Pollination Funding History '07- '11



2007	\$185,678
2008	\$203,744
2009	\$123,427
2010	\$128,450
2011	\$102,909

# ABC Pollination Research - Current



Honey Bee Stock Improvement Program

Sue Cobey \$21,020

Germplasm for Honey Bee Breeding

Steve Sheppard \$20,629

Formation of a Tech Transfer Team - Genetics

Susan Donahue \$20,000

RNA interference for Varroa Control

Zach Huang \$17,960

On-line Learning for Colony Evaluation

Shannon Mueller \$ 3,300

Pesticides – New Opportunities

TBD \$20,000

## California State Beekeepers Association Survey

### Almond Pollination Average Rental Fee

2006	\$ 138
2007	\$ 142
2008	\$ 148
2009	\$ 157
2010	\$ 151





Specialty Crop Block Grants are Targeting Bee Management

Project Apis m. - Windows Internet Explorer

http://projectapism.org/content/view/12/26/

Google Search W + More >>

Project Apis m.

Downloads Contact

### Project Apis m. (PAm)

was established by beekeepers and orchardists in December, 2006, as a 'New Vision' to fund honey bee research on managed colonies. The organization's goal is to fund and direct research to improve the health and vitality of honey bee colonies while improving crop production. Emphasis is placed on research studies that have realistic and practical usefulness for beekeeping businesses.



PAm brings together representatives of the American Honey Producers Association (APHA), the American Beekeeping Federation (ABF), the National Honey Board (NHB), California State Beekeepers Association (CSBA), and California almond farmers. PAm includes representatives from both the pollination and crop production enterprises.

Whereas beekeepers are represented and well-served by the three national organizations and several regional and state organizations, they have lacked a means in which to assess themselves or their customers a minimal commitment to be used toward solutions for sustaining the industry in the long term. PAm fills this void. Beekeepers and representatives of pollination-dependent crops are ready and willing to invest in their future. PAm's Board is demonstrating action in coordinating a project-driven program to find realistic solutions to immediate beekeeping challenges.

Almond growers, under the Almond Board of California assessment, have traditionally funded a significant share of honey bee research. The CSBA has funded bee research for several years

### Latest News

Survey: Input costs for colonies placed into almond orchards

[Read more...](#)



### The Cummings Report

### Almond Status



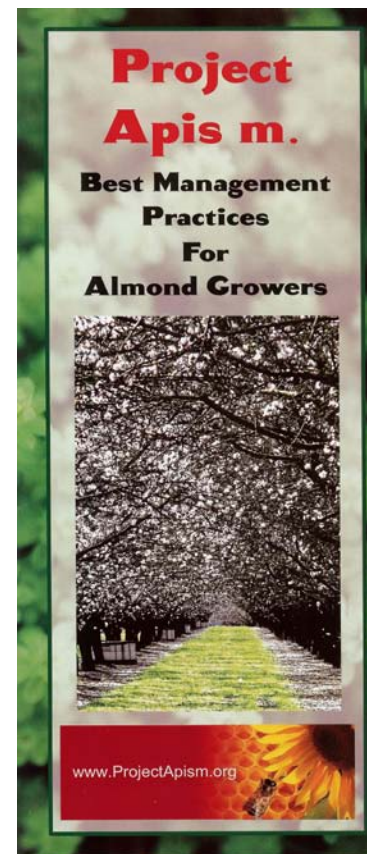
### Bee Status

Internet | Protected Mode: On 100%

# Keys to Healthy Bees in Almonds

Visit the PAm booth in the Pollination Pavilion

Pick up a copy of BMPs  
for Almond Growers  
renting bees





# Pollination Update

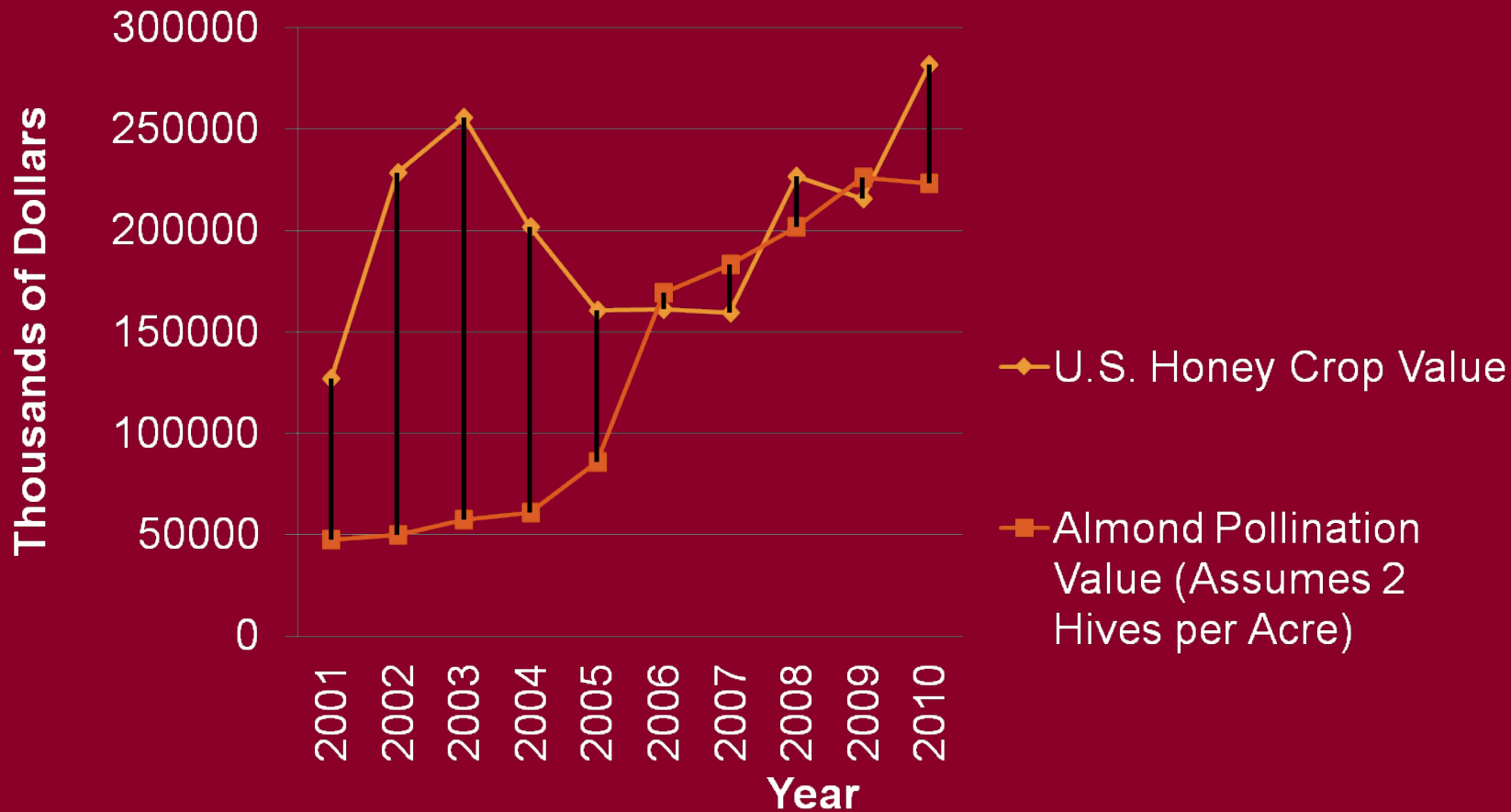


# Honey Bee Health and Supply

Dan Cummings

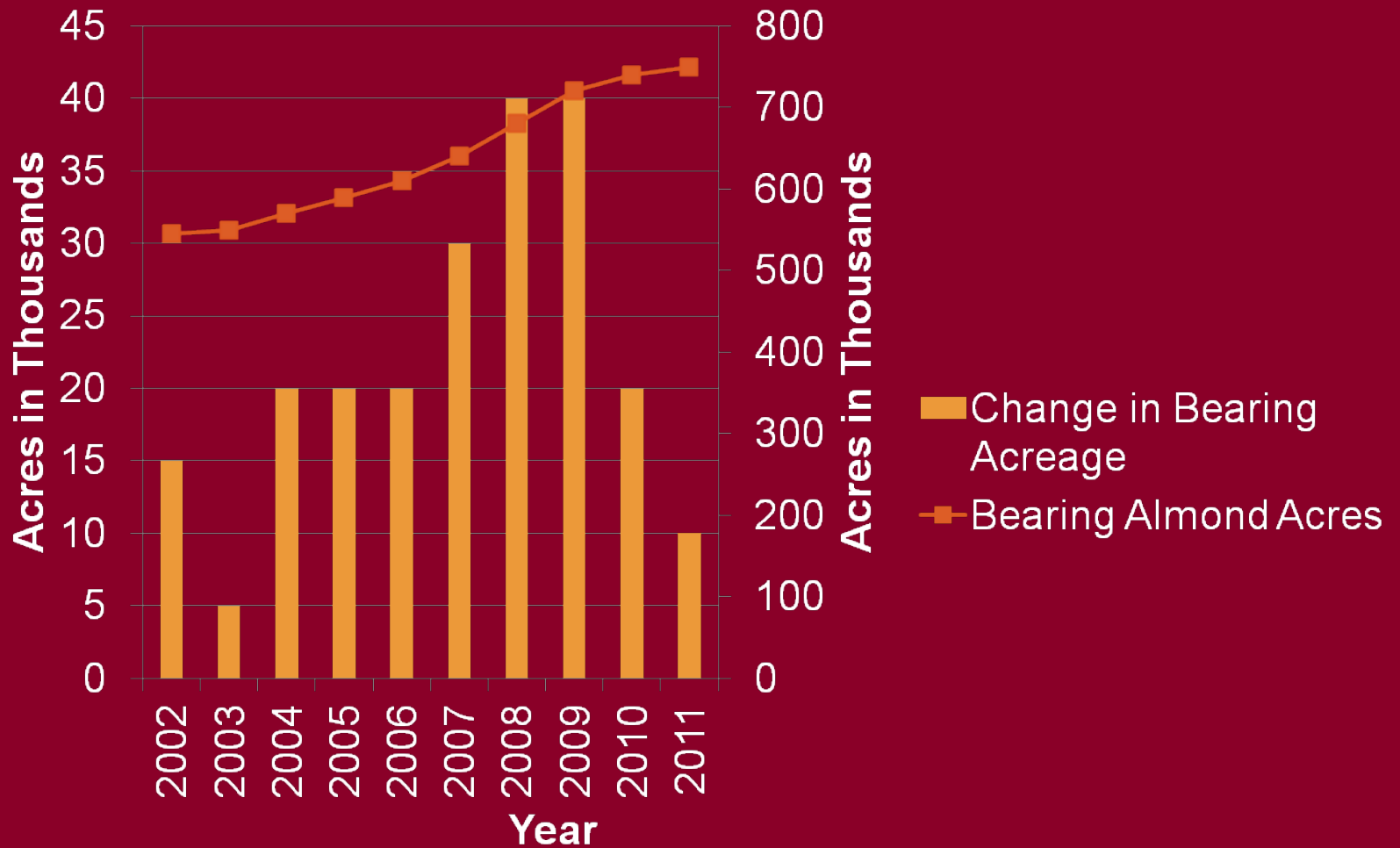


## Almond Pollination Value Relative to Honey Production Value



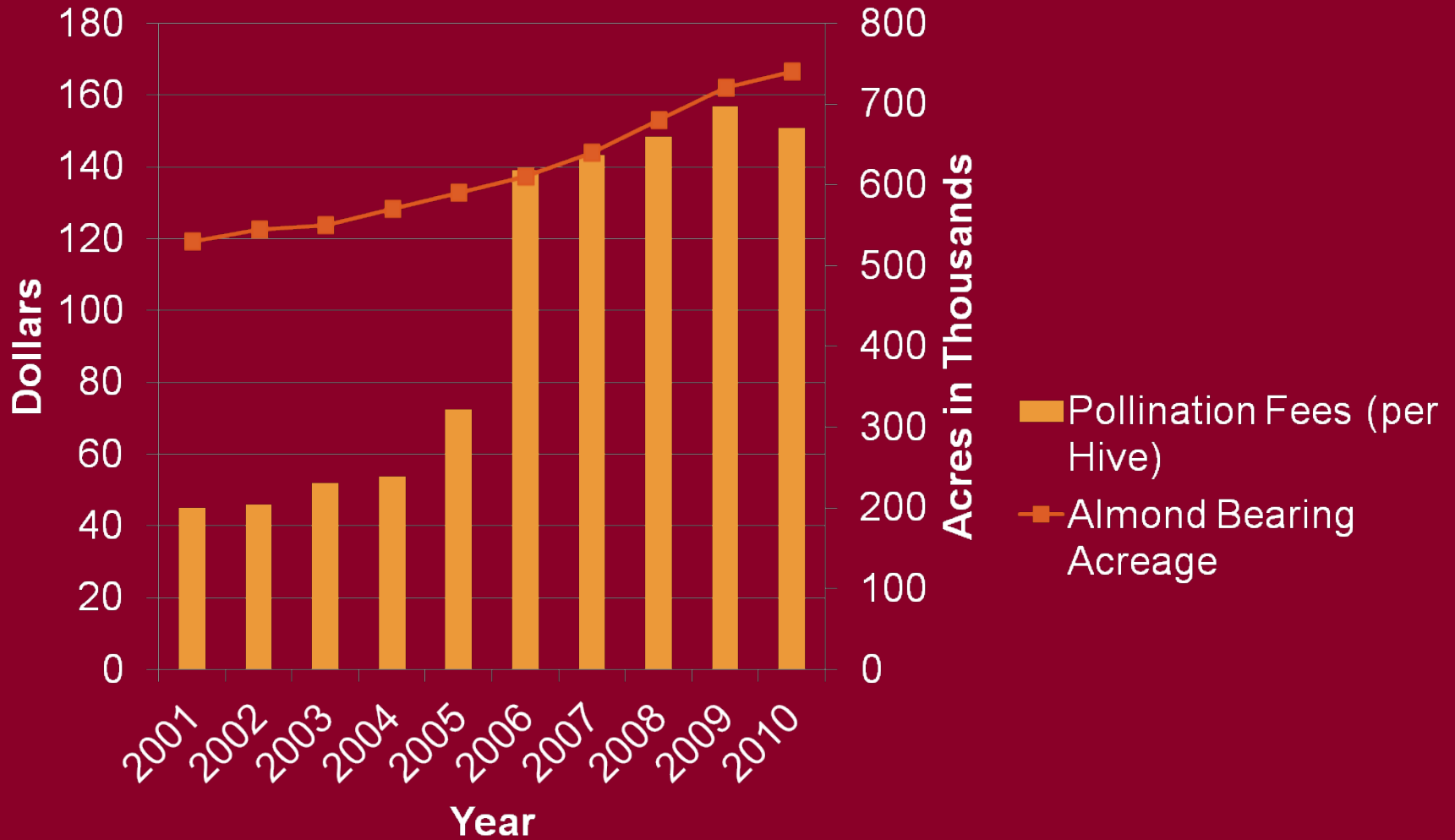
(Sources: NASS Honey Report  
Giannini Foundation of Agricultural Economics)

# Bearing Almond Acreage



(Source: NASS Almond Acreage Report)

# Bearing Acreage & Pollination Fees



(Sources: NASS Acreage Report  
Giannini Foundation of Agricultural Economics)



# Blue Orchard Bees



Alone and W/Honey Bees

Sensitive to Fungicides

Propagation

Regional Sources

Cost

# Self Fertile Almonds



California Variety

Pollen Transfer

Bee Stocking Rates

Competitive Yields

Single Pass Harvest

# Bee Research



ABC & PAm.

Varroa Mite

Nosema

Virus

Nutrition

# Almond Bloom 2011



1.95 Billion lbs.  
2,600 lbs. per Acre

# La Nina



# Influence of Agricultural Land Cover Trends in the Northern Great Plains on Almond Pollination

N.H. Euliss, Jr., J.S. Pettis, M. Spivak, A. Gallant, M. Smart, N. Rice, Z. Browning, and J. Miller

U.S. Department of the Interior  
U.S. Geological Survey



UNIVERSITY OF MINNESOTA  
Driven to Discover™



Miller Honey Farms



Browning's Honey Co. Inc.



United States Department Of Agriculture  
Agricultural Research Service

# Why the Northern Great Plains?

- **This region is the most important area in the nation for honey production, especially North Dakota**
- **Bees that spend the summer in the Northern Great Plains pollinate up to 80% of our nation's crops**
- **The Region provides essential nutrients for “winter” bees**
- **The nutrition derived from the landscapes in the Northern Great Plains, especially pollen, determines the overall health of honey bee colonies shipped throughout the country to pollinate crops**

# Interdisciplinary Team

**USGS**

**USDA-ARS**

**Univ. Minnesota**

**Industry**

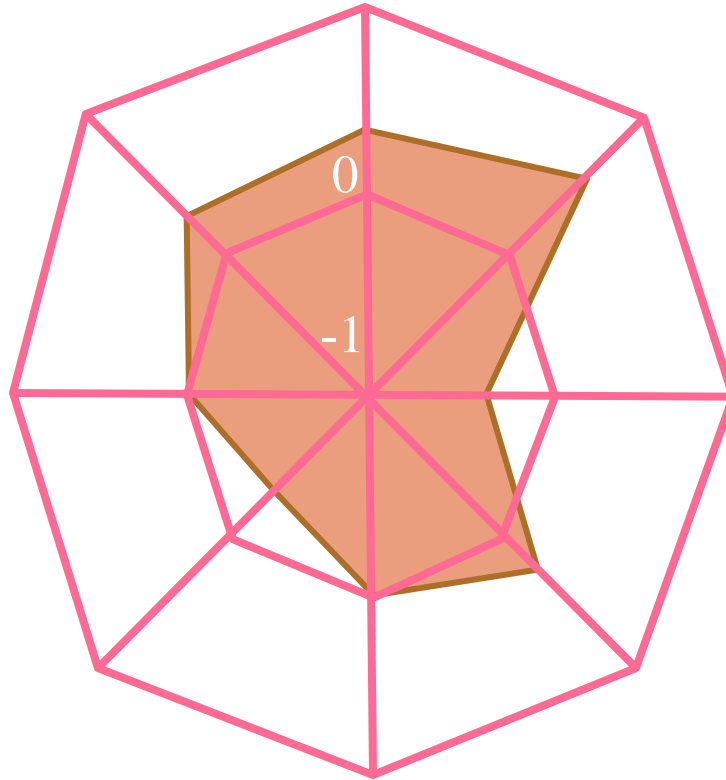
**Collaborators:**



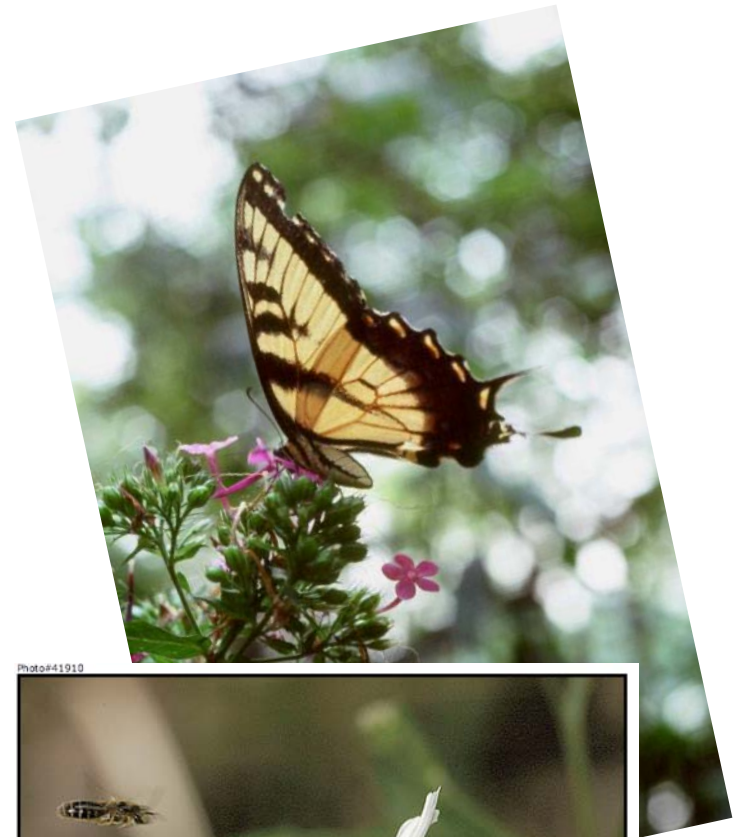
# Can we develop models useful for informing decisions on how alternate land use and climate will affect honey bees?

- **Within a context that simultaneously considers multiple ecosystem services to inform trade-off decisions**
- **Spatially explicit**
- **Scalable from plot to landscape to better inform decisions**

# Ecosystem Services



# A Habitat Based Monitoring and Modeling Approach is a Requisite for Success



Photo#41910



Copyright © 2005 Brian E. Womble


Halictidae



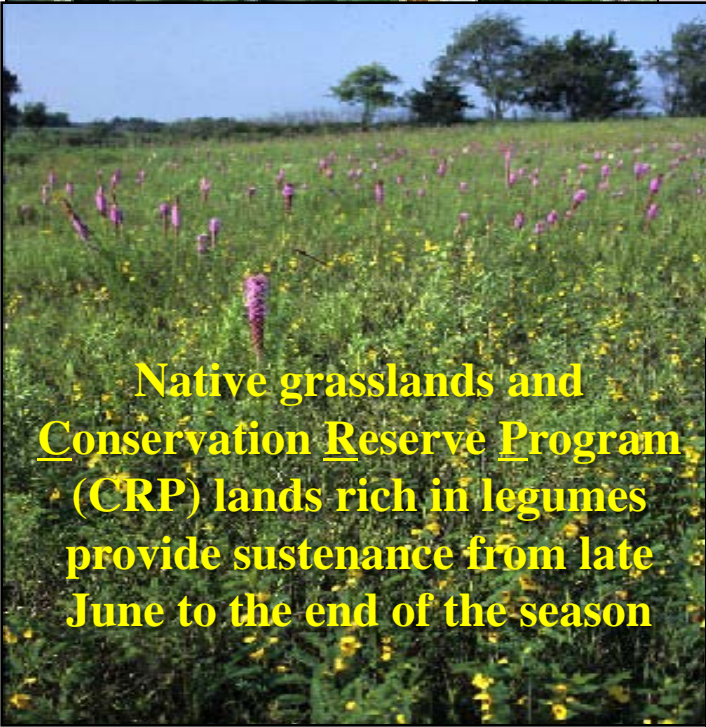
**Flowering trees and shrubs are early-season sources**



**Canola is a source by June**



**Second-crop alfalfa is available from mid-July through the end of the season**



**Native grasslands and Conservation Reserve Program (CRP) lands rich in legumes provide sustenance from late June to the end of the season**



**Oilseed sunflowers trail alfalfa by a week and help carry bees through the end of August.**

# Rapid prototype landscape model for honey bees

## An idealized bee neighborhood

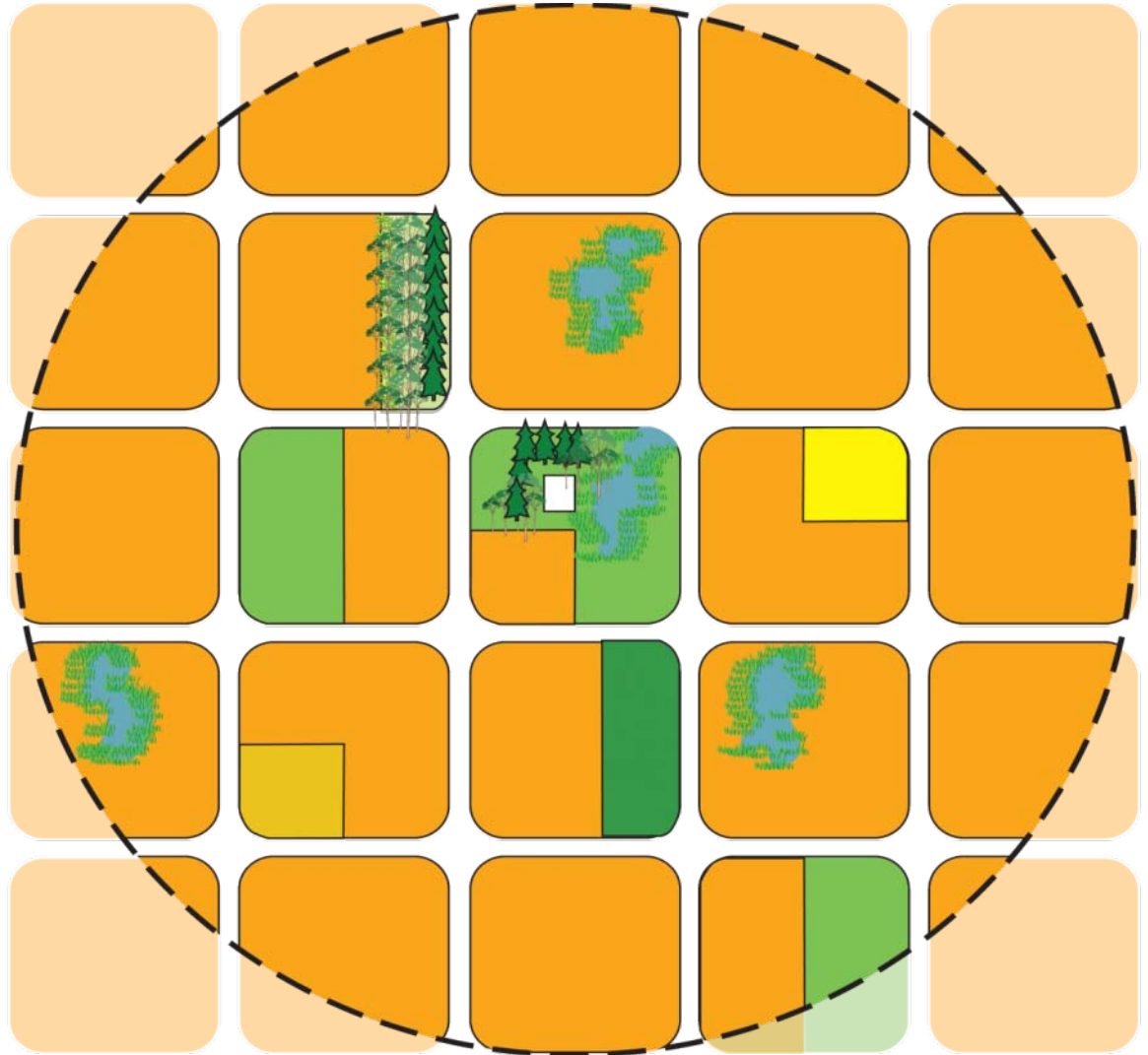
“Recipe” by Zac Browning,  
4<sup>th</sup>-generation beekeeper and Past  
President of the American Beekeeping Federation

# An idealized bee neighborhood in North Dakota

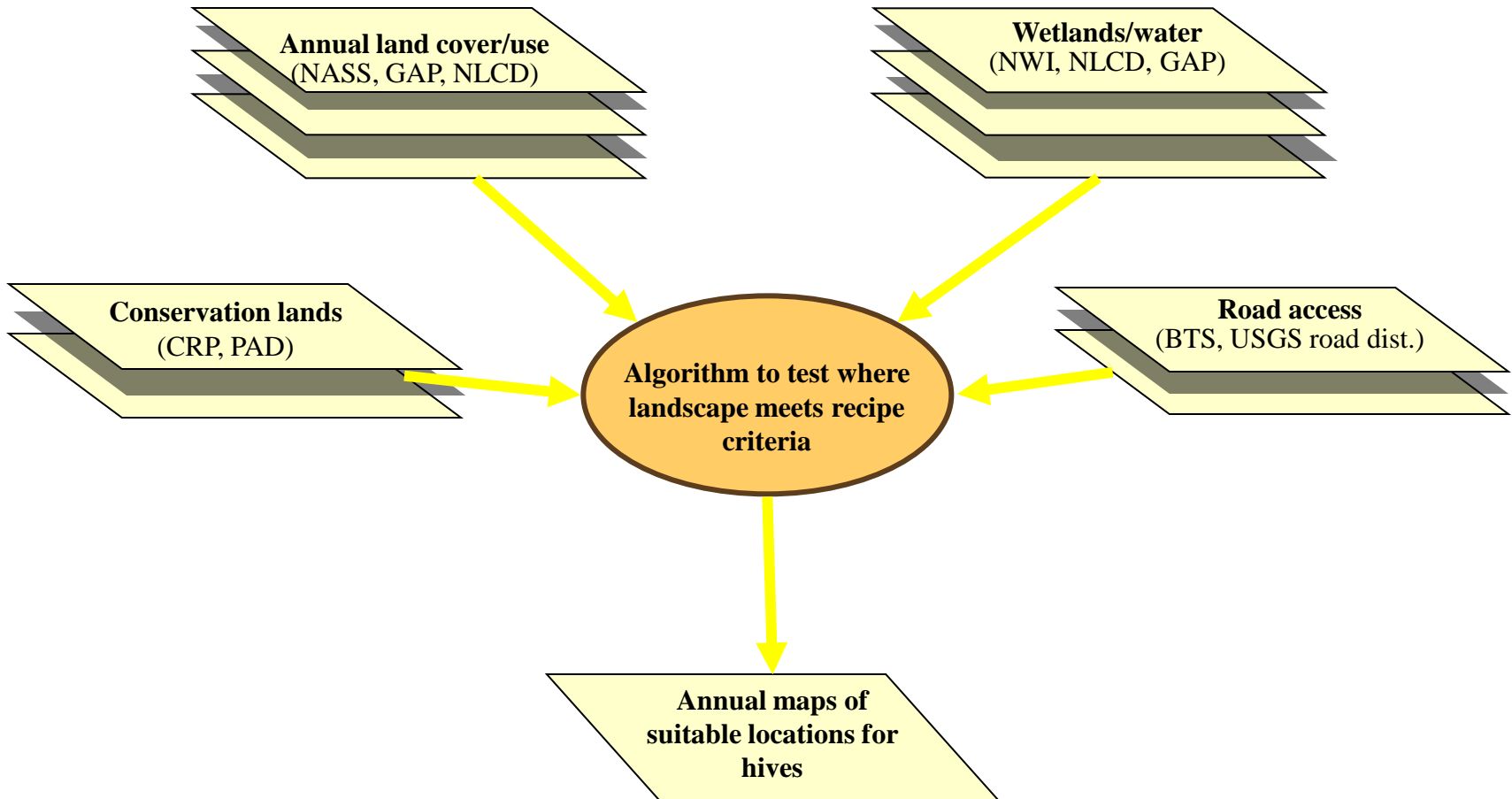
- 100 Beehives
- Wetlands
- Flowering Trees & Shrubs, Shelter
- Shelterbelt
- Legume-rich CRP Land
- Canola
- Oil Sunflowers
- Alfalfa Hayland
- Other crops



*Browning's Honey Co. Inc.*



# Rapid prototype model: Use available data



A topographic map of North Dakota, showing the state's outline and internal terrain features. The map is rendered in shades of brown and tan, with darker areas indicating higher elevations and lighter areas indicating lower elevations. The map is set against a solid brown background.

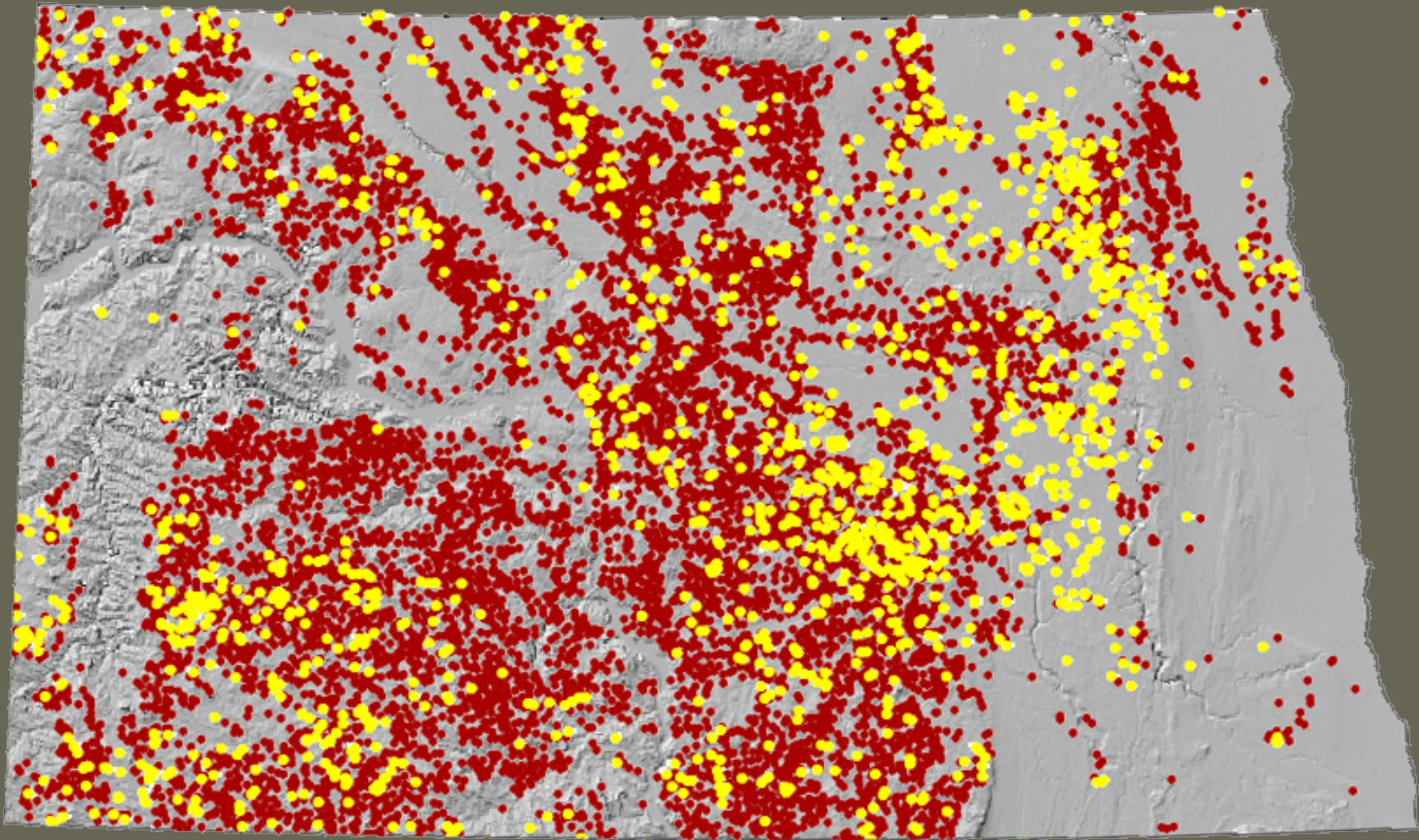
**Where are there good landscapes for  
bees in North Dakota?**



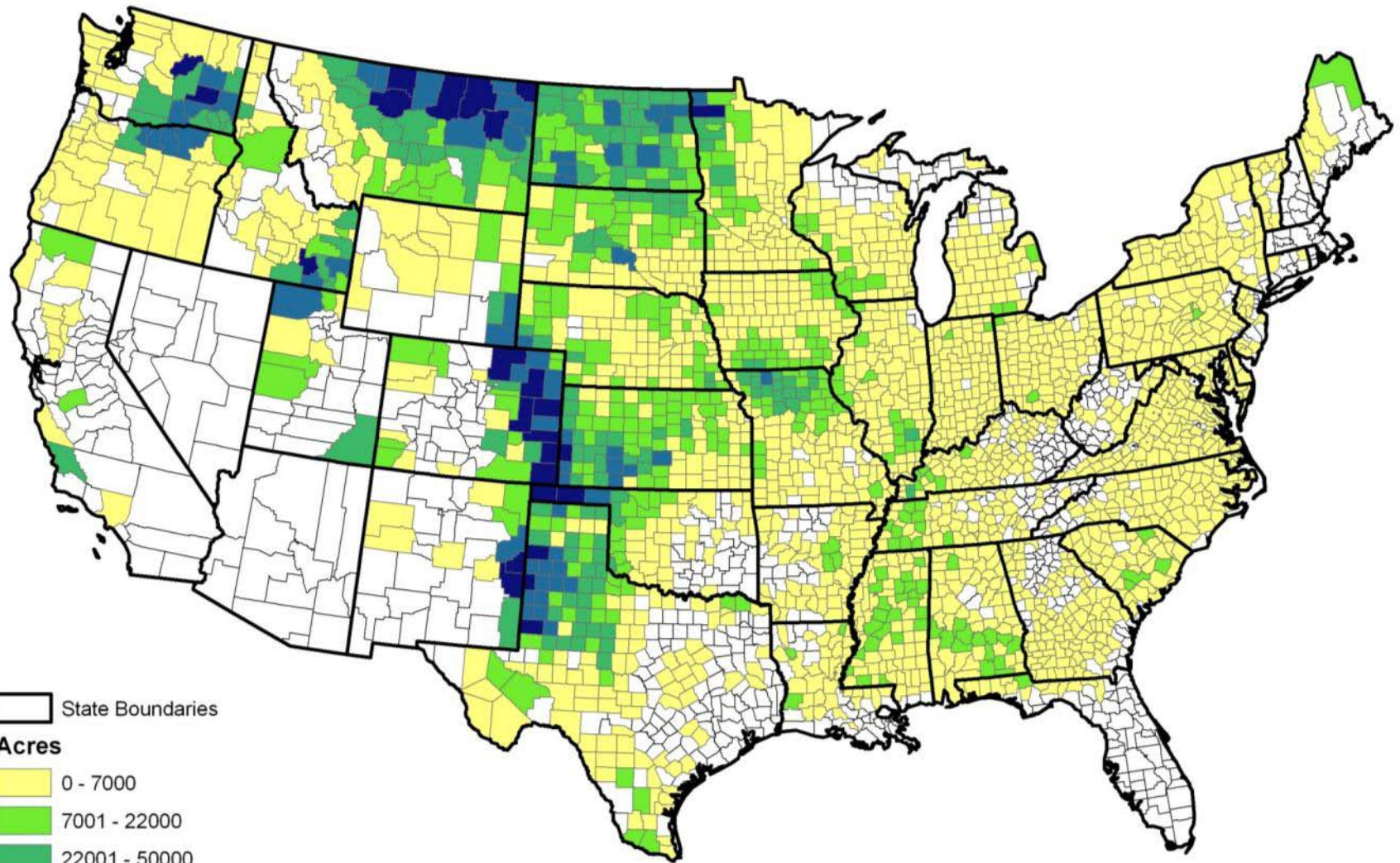
# Prototype Results

(examples provided for cropping patterns in 2002)

**Locations in North Dakota that could have supported hives in 2002 if the local grasslands were sufficiently rich in legumes and other flowering plants (yellow dots highlight contribution of CRP lands).**



# Expiring CRP Acres (2010-2013)



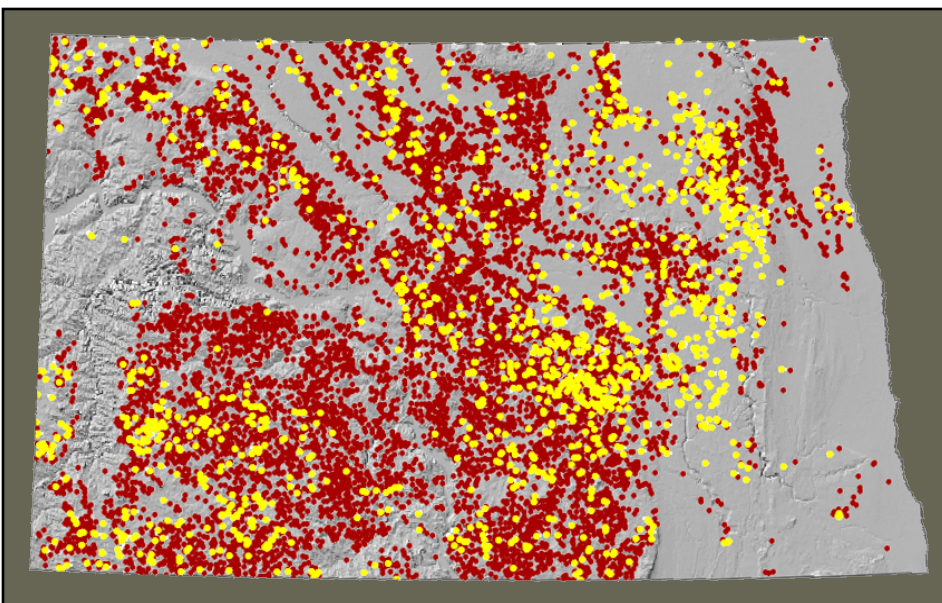
State Boundaries

## Acres

- 0 - 7000
- 7001 - 22000
- 22001 - 50000
- 50001 - 100000
- 100001 - 180000

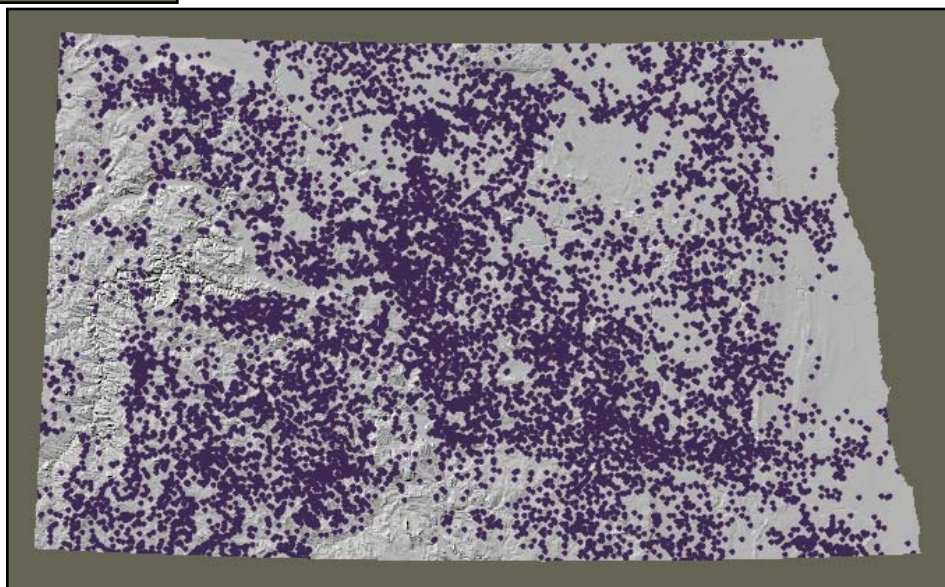
Total Expiring 2010-2013 acres: 18,786,861

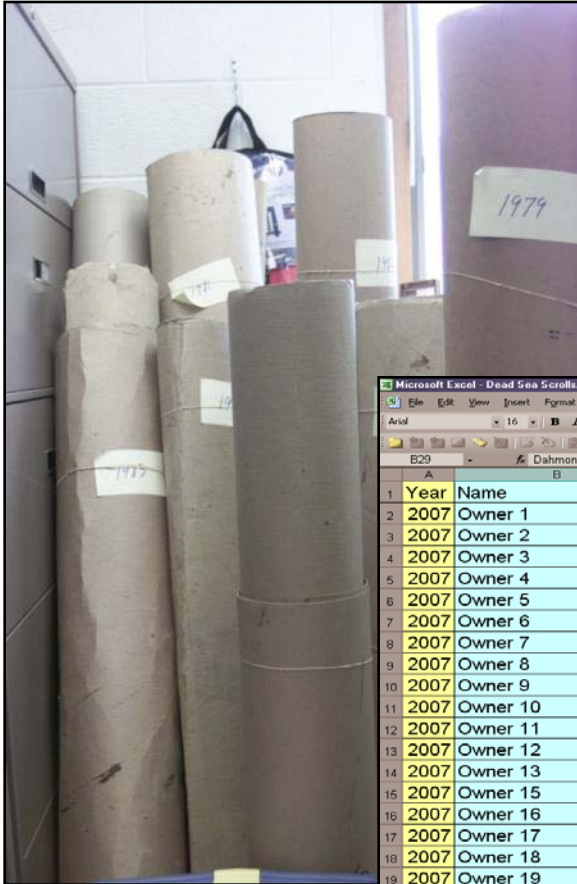
**But . . .**



**Locations estimated as  
suitable for 100 hives in  
2002**

**Registered bee yard  
locations in North  
Dakota in 2006**





Microsoft Excel - Dead Sea Scrolls.xls

File Edit View Insert Format Tools Data Window Help Adobe PDF

Arial 16 B I U L E S % 100%

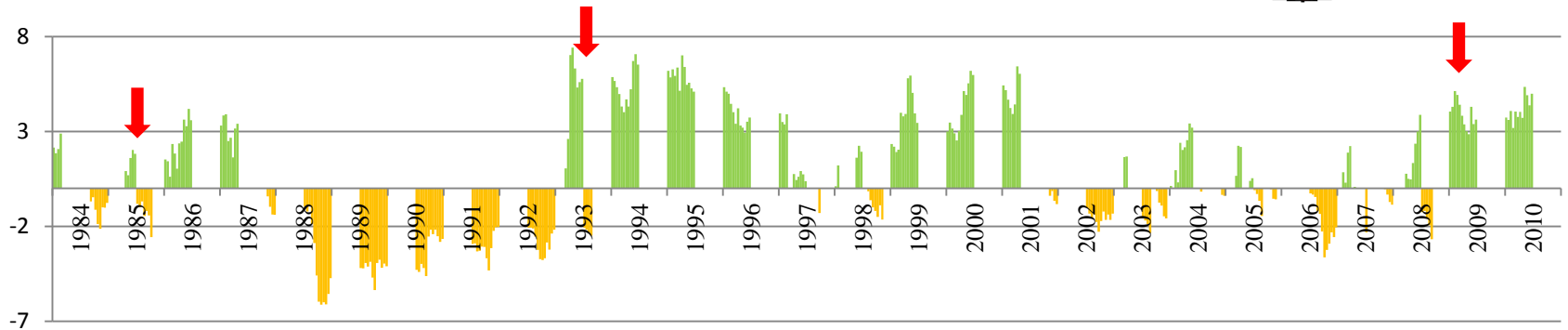
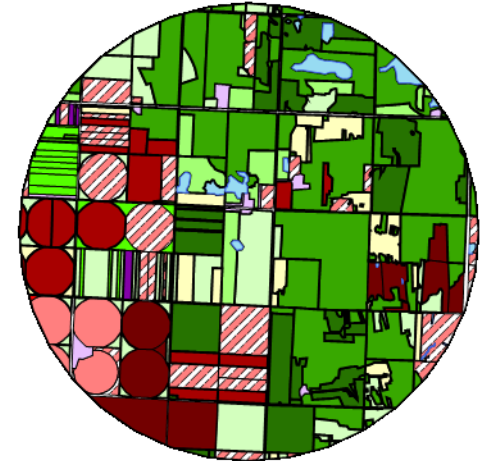
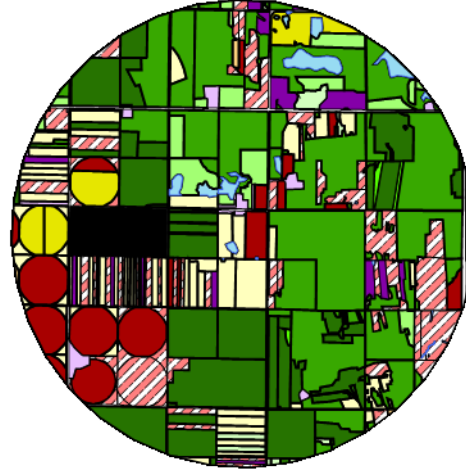
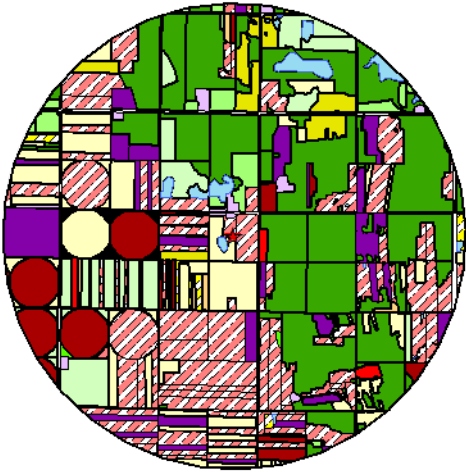
B29 Dahmon, J.

Year	Name	Yard Number	Date In	Count	1st Super Date	1st Super	2nd Super Date	2nd Super	3rd Super Date
2007	Owner 1	952	6/25	40	6/29	120	7/17	52	
2007	Owner 2	966	6/28	40	6/29	120	7/17	6	
2007	Owner 3	967	9/26	40	6/29	120	7/17	5	
2007	Owner 4	507	6/5	40	6/14	170	7/9	23	
2007	Owner 5	703	6/12	40	6/19	121	7/16	29	7/30
2007	Owner 6	701	6/12	48	6/19	160	7/16	19	7/30
2007	Owner 7	712	6/15	40	6/19	120	7/13	49	7/31
2007	Owner 8	615	6/20	40	6/23	120	7/11	3	7/20
2007	Owner 9	201	5/24	40	6/15	120	7/7	25	
2007	Owner 10	301	5/15	40	6/15	108	7/10	25	8/8
2007	Owner 11	408	6/26	40	6/27	120	7/12	39	8/7
2007	Owner 12	411	6/27	40	6/27	120	7/12	13	8/7
2007	Owner 13	805	6/23	40	6/23	100	7/17	100	7/31
2007	Owner 15	825	6/22	40	6/27	111			
2007	Owner 16	571	6/26	40	6/30	120	7/11	0	7/20
2007	Owner 17	905	9/22	40	6/27	120	7/18	0	
2007	Owner 18	351	5/25	40	6/16	114	7/7	16	
2007	Owner 19	210	5/24	40	6/20	120	7/6	0	
2007	Owner 20	607	6/29	40	6/30	105	7/13	27	7/27
2007	Owner 21	714	6/15	39	6/19	120	7/13	42	7/31
2007	Owner 22	556	6/20	40	6/30	120	7/10	0	7/20
2007	Owner 23	568	6/20	40	6/25	120	7/11	0	7/20
2007	Owner 24	559	6/27	40	6/28	117	7/11	0	7/23
2007	Owner 25	406	6/11	40	7/2	120	7/18	19	8/8
2007	Owner 26	962	6/25	40	6/29	120	7/17	57	
2007	Owner 27	752	6/6	39	6/15	120	7/9	0	7/27

A number of bee yards have been among those producing both the highest and the lowest annual yields of honey in different years.

FSA records of actual crop types grown in fields surrounding selected bee yards will allow us to test this hypothesis.

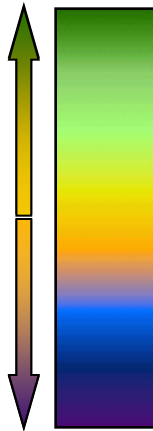




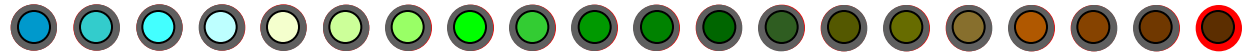
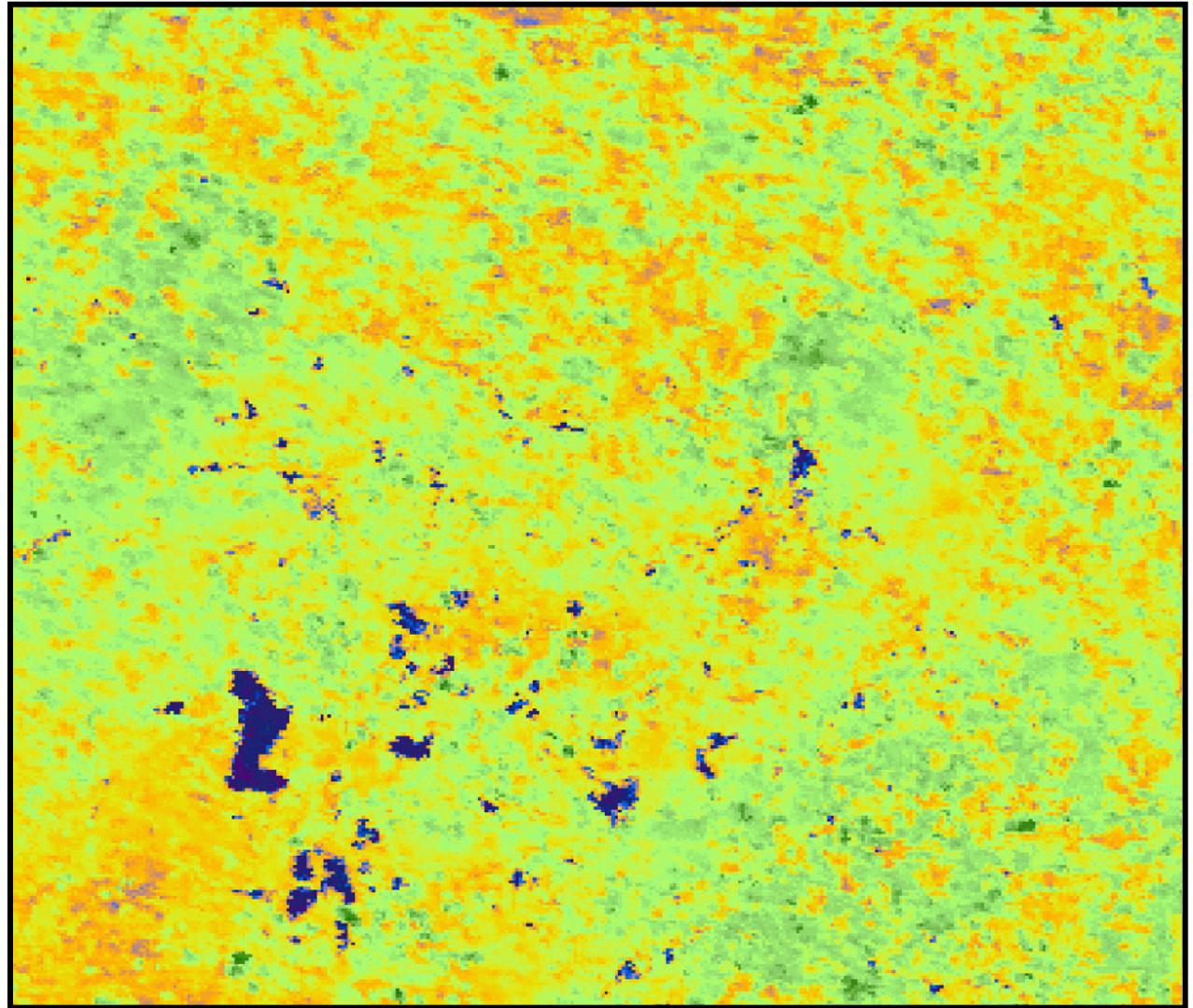


The image to the right was acquired over part of North Dakota in 2002.

Vigorous  
vegetation

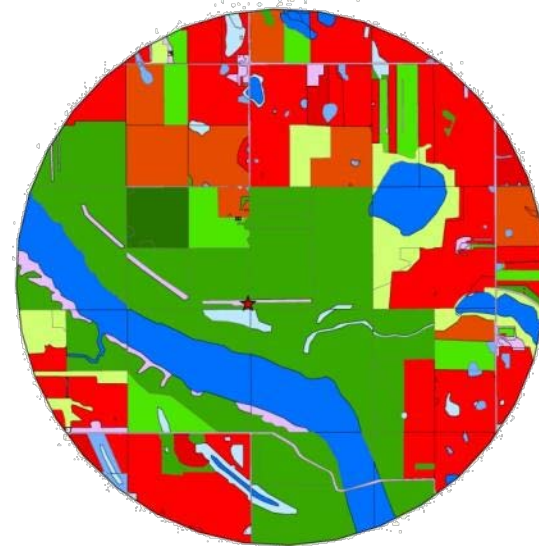


Dead or no  
vegetation

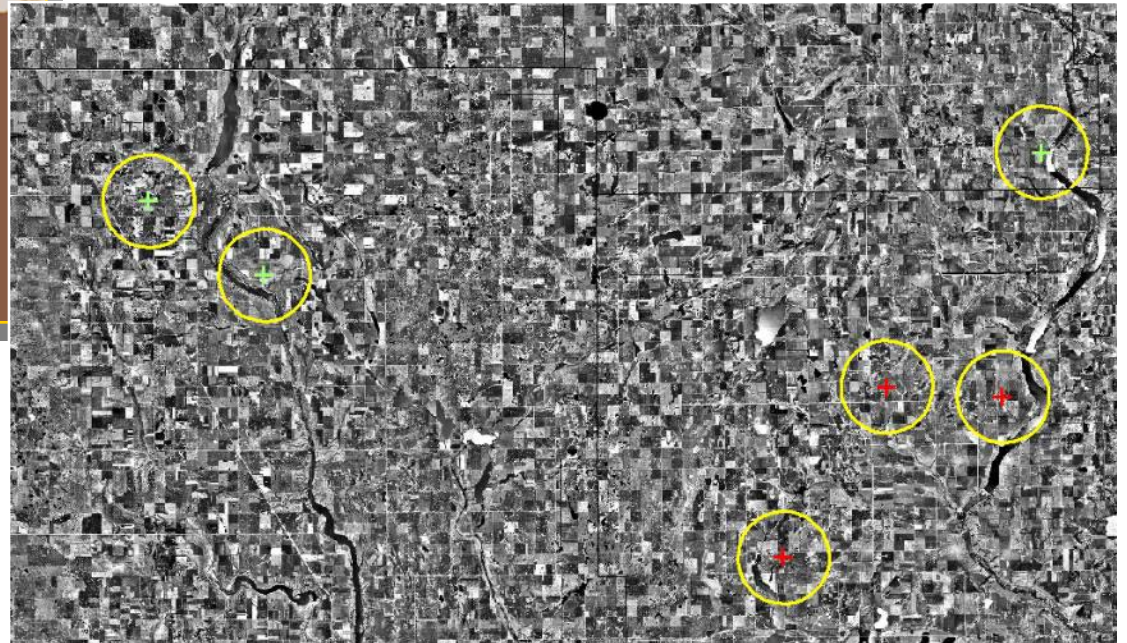
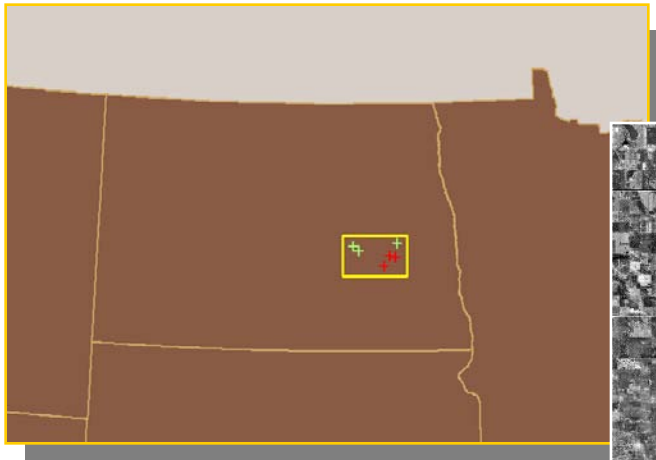


May —————> June —————> July —————> Aug —————> Sep —————>

- Windshield survey of surrounding crops.
- Analyze types of pollen collected, honey yield, and health status of honey bees, native bees, pollen collected, and health.



# Six locations established for study, Summer 2009



High Floral Diversity sites  
Low Floral Diversity sites  
48 hives per location;  
288 hives total

## Effects of summer / fall nutrition on colony survival in the Midwest

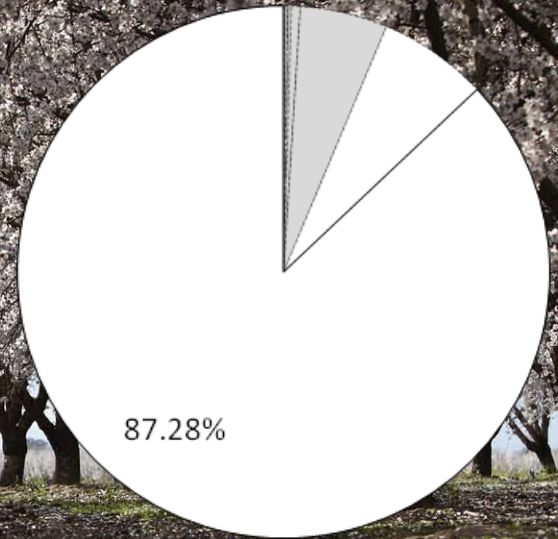
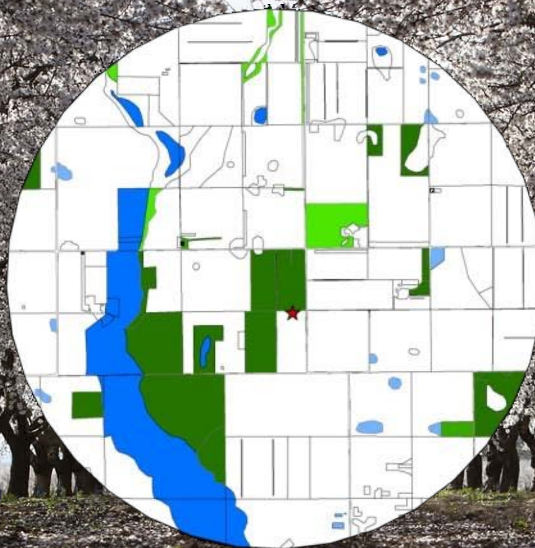


### Monitor pollen

- Quantity
- Protein content
- Pesticide load



Bee Yard 3  
Low Performing  
24.56 lbs of honey in 2009



Agriculture crops - no value to honeybees



Agriculture crops - valuable to honeybees



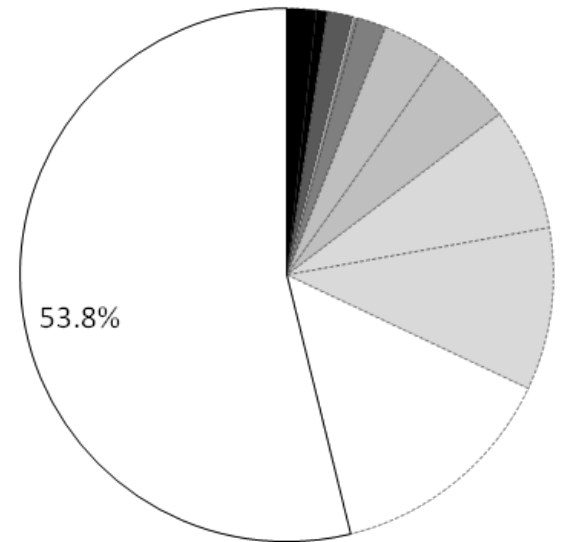
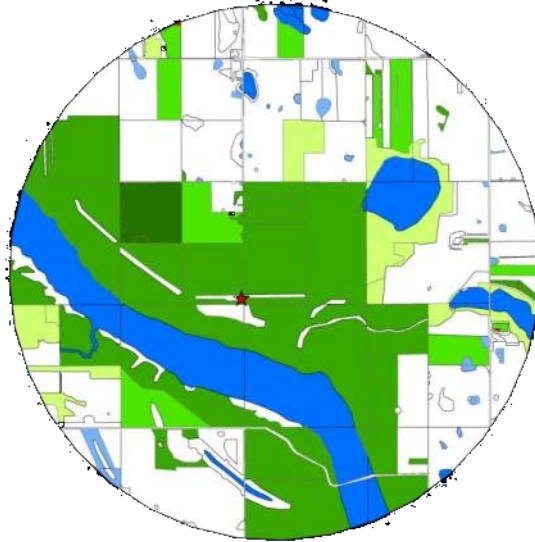
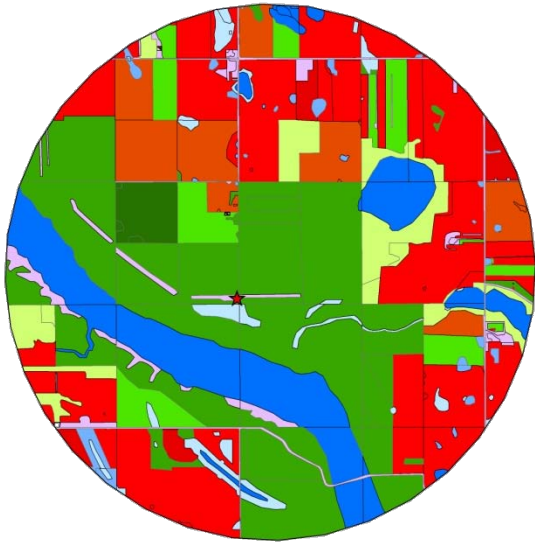
Grassland - value to honeybees varies



Wetland - value to honeybees varies



Honeybee yard



Agriculture crops - no value to honeybees



Agriculture crops - valuable to honeybees



Grassland - value to honeybees varies

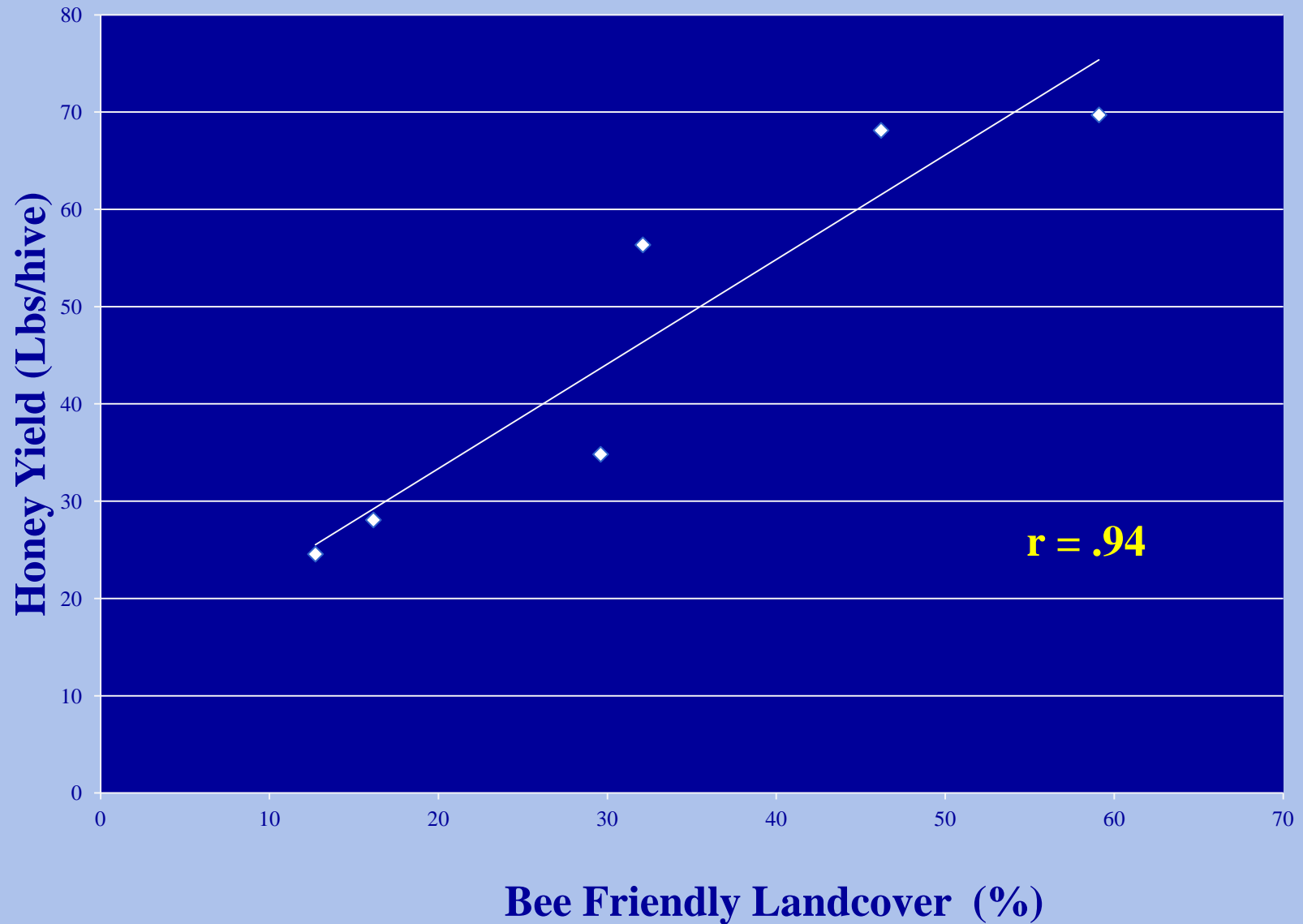


Wetland - value to honeybees varies

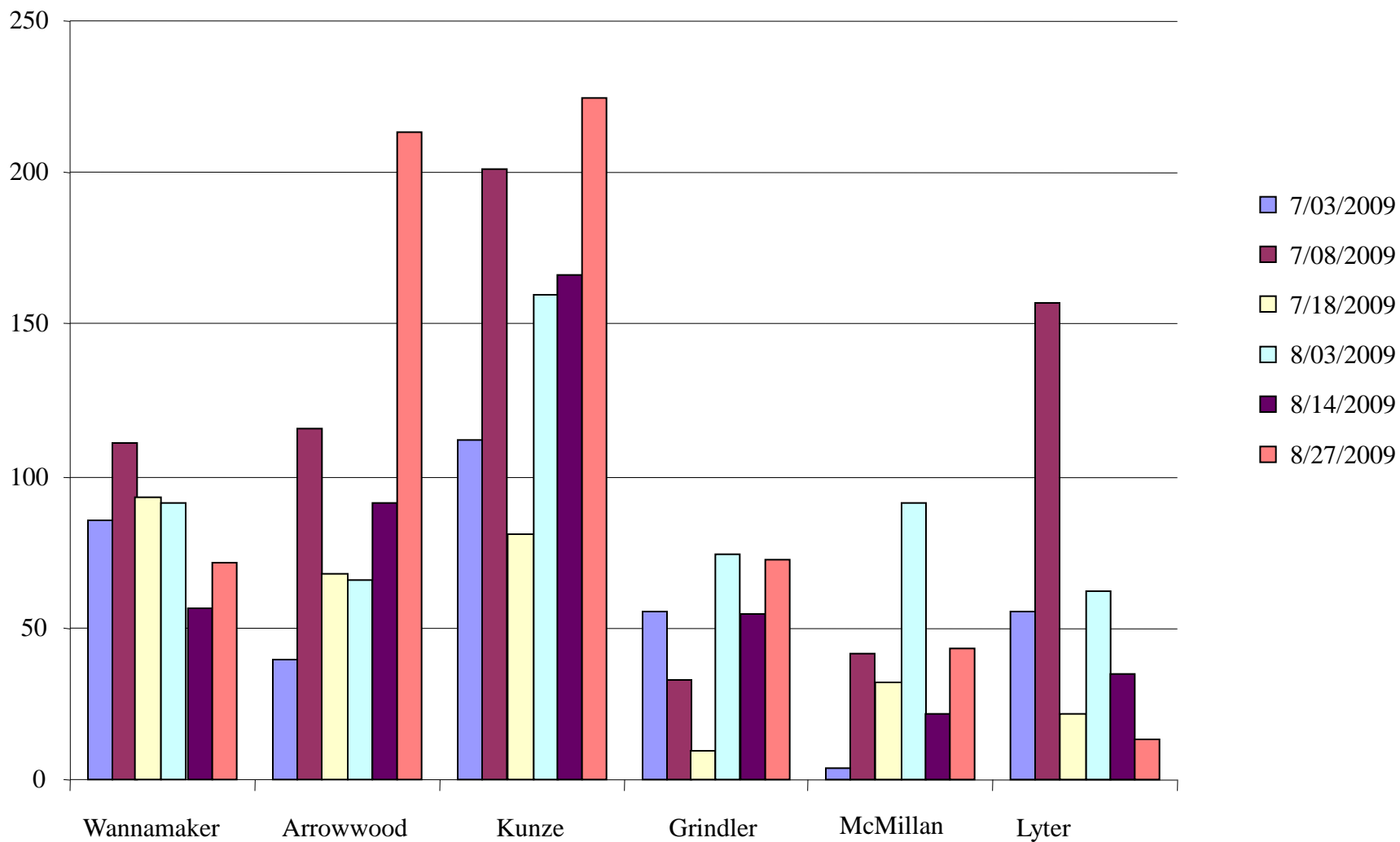


Honeybee yard

# Honey Bees Sample the Plant Community Very Efficiently!

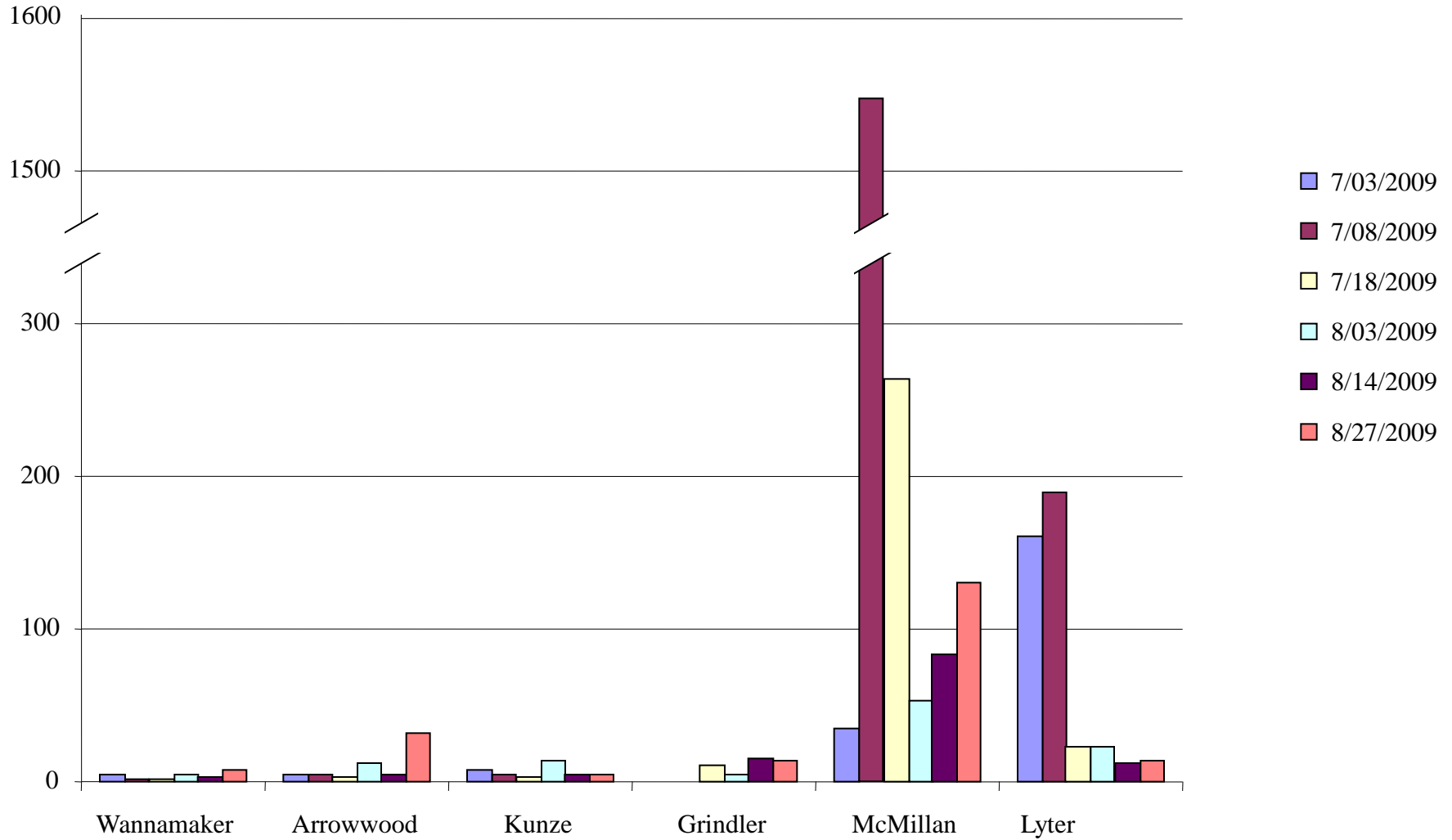


## Grams of Pollen



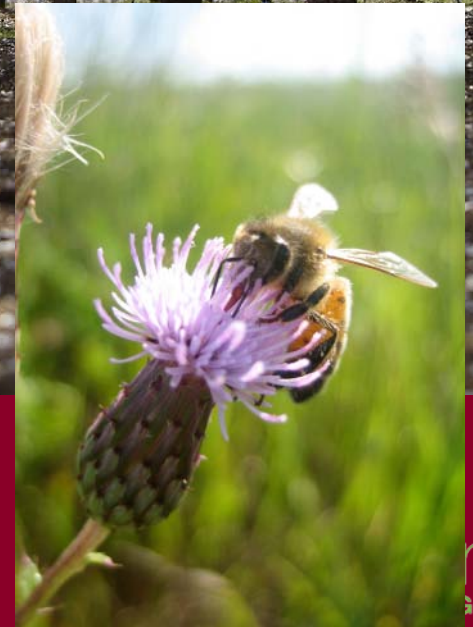


# Chlorpyrifos in Collected Pollen (ppb)



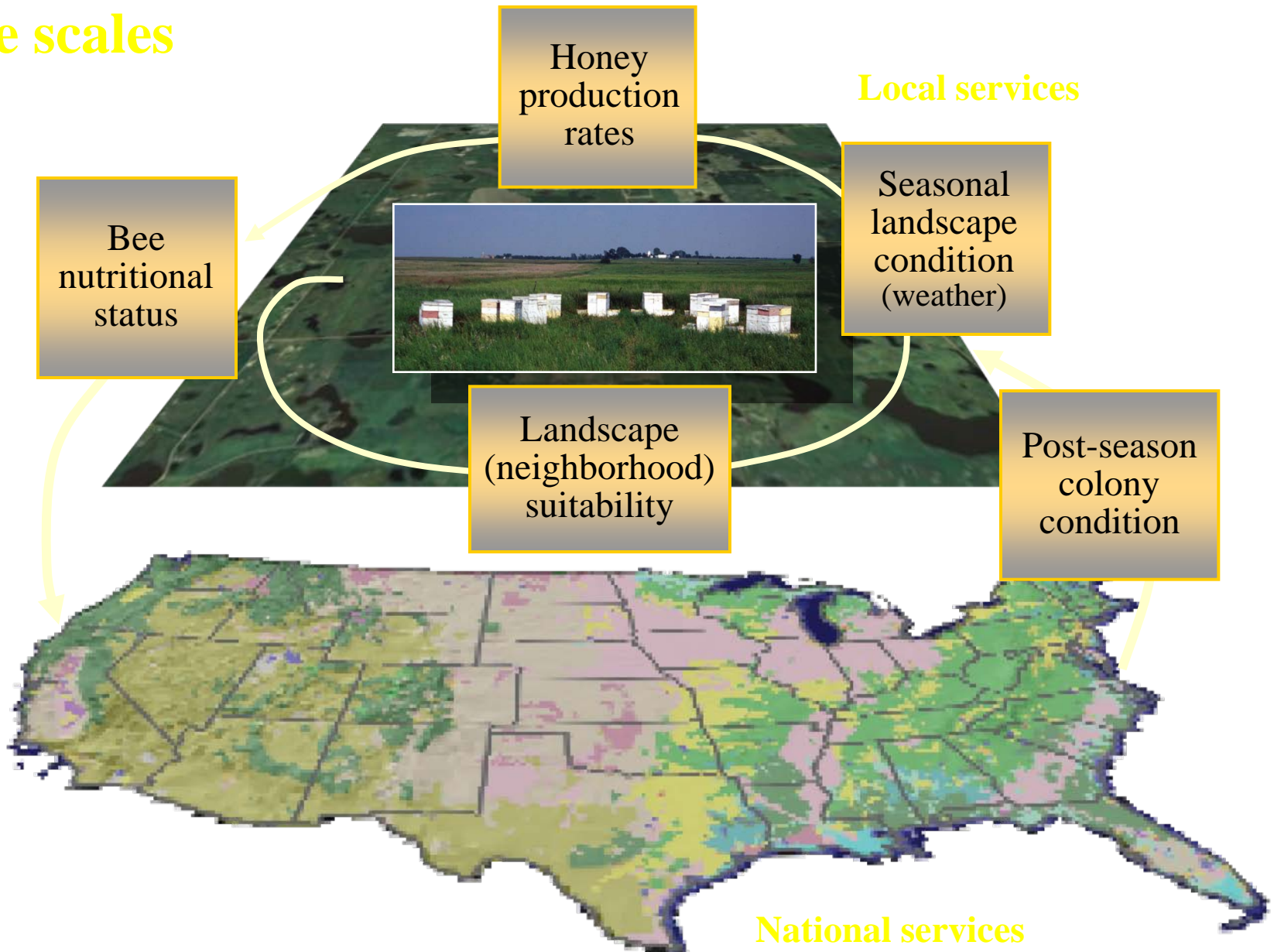
# Nutritional and immune status of honey bees in varying landscapes

Matthew Smart  
University of Minnesota



**So, how do land-use decisions in the Plains affect  
pollination of crops elsewhere in the U.S. ??**

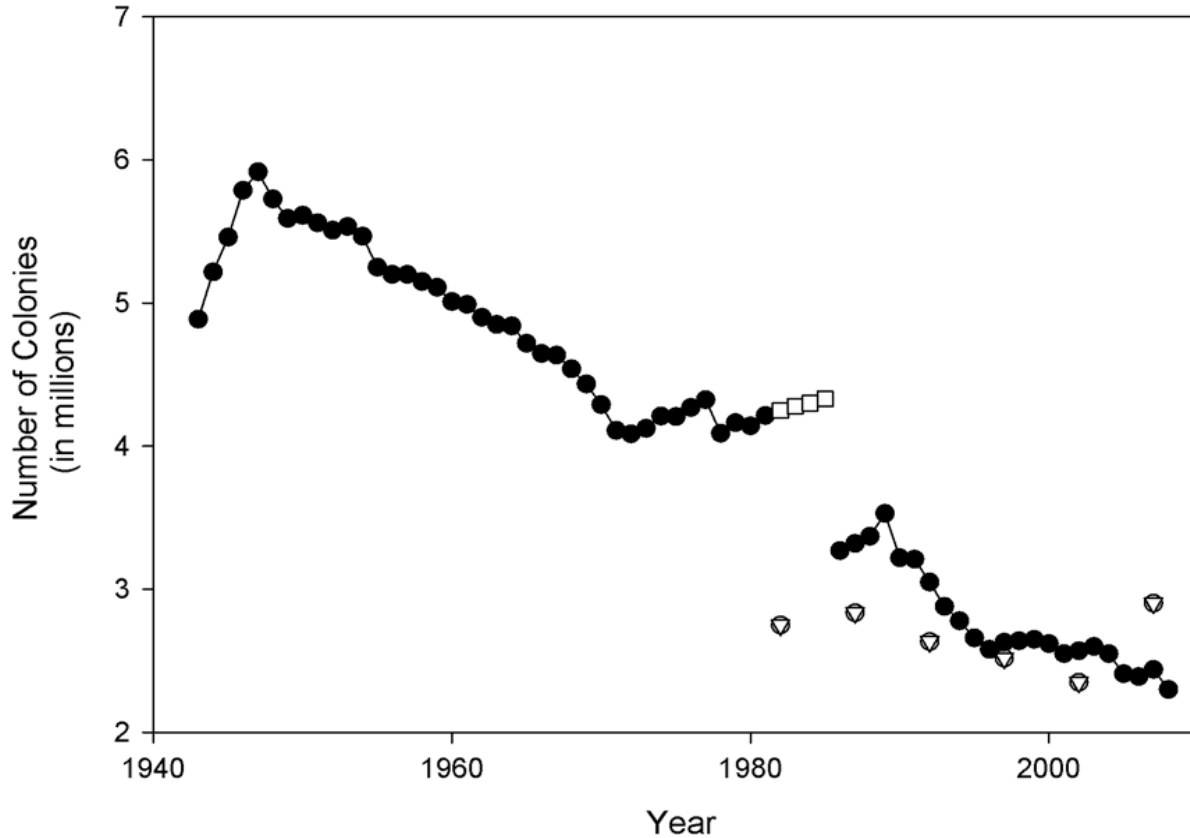
# Bee scales





**1.5 Million honey bee colonies needed just to support the almond industry**

# Honey bee colony decline



- Presently approximately 2.5 million managed honey bee colonies nationally

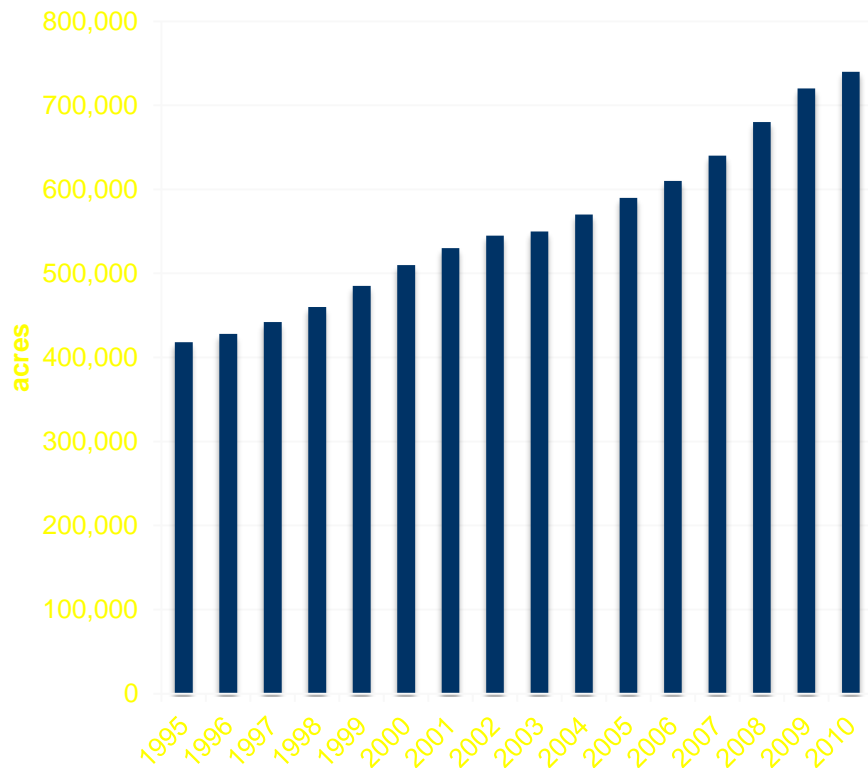
vanEngelsdorp and Meixner 2010

Year	% losses
2006-07	31.0
2007-08	36.0
2008-09	28.6
2009-10	34.4
2010-11	30.0

vanEngelsdorp et al. 2010, 2011

# Background: almond pollination

CA almond acreage 1995-2010



[www.nass.usda.gov/ca](http://www.nass.usda.gov/ca)

“No bees, no nuts” – M. Spivak

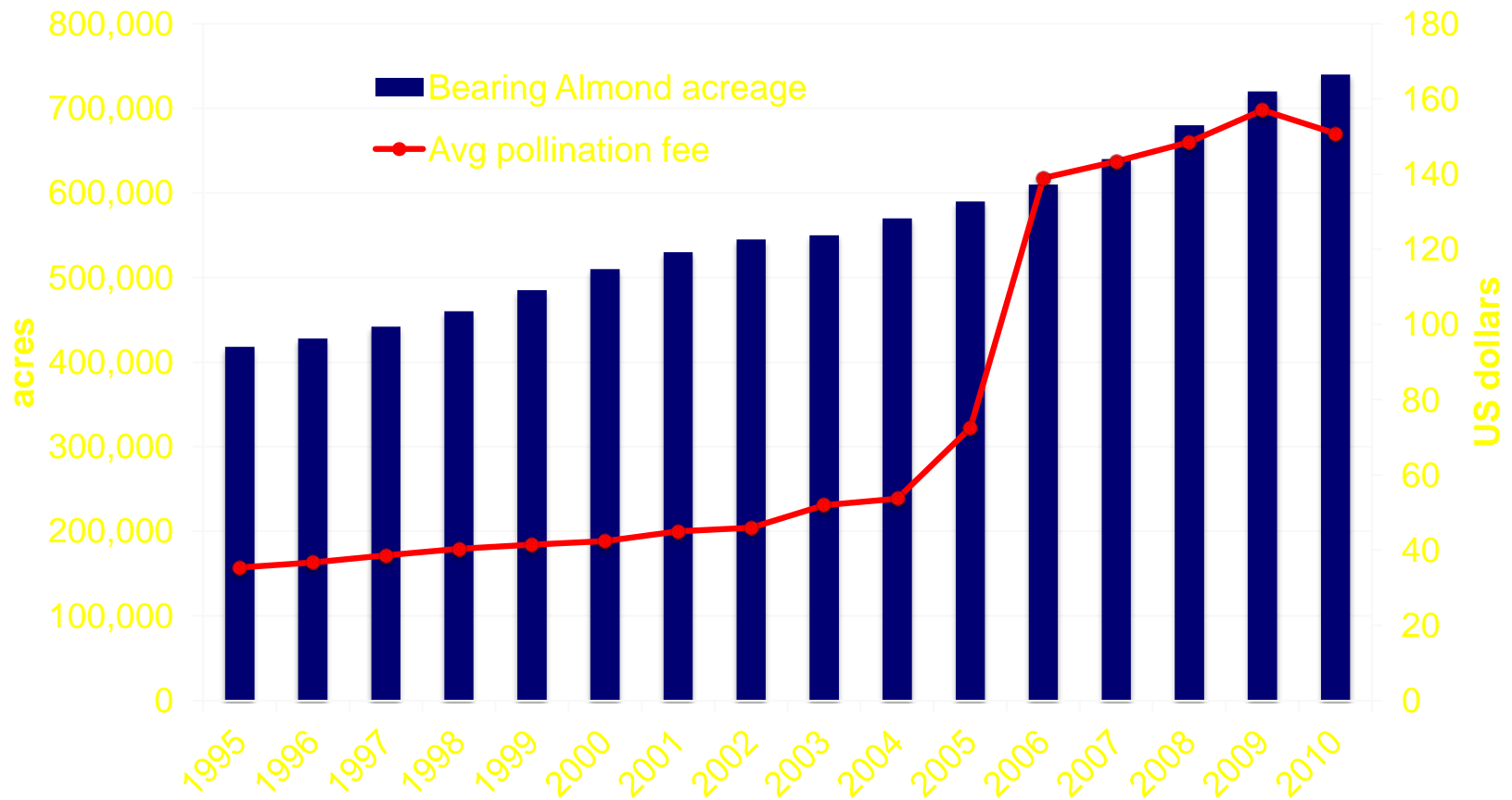
CA Almond Board predicts >800,000 bearing acres of almonds by 2012

- 2.5 colonies/acre = 2,



# Background: almond pollination

## CA Almond acreage and pollination fees 1995-2010

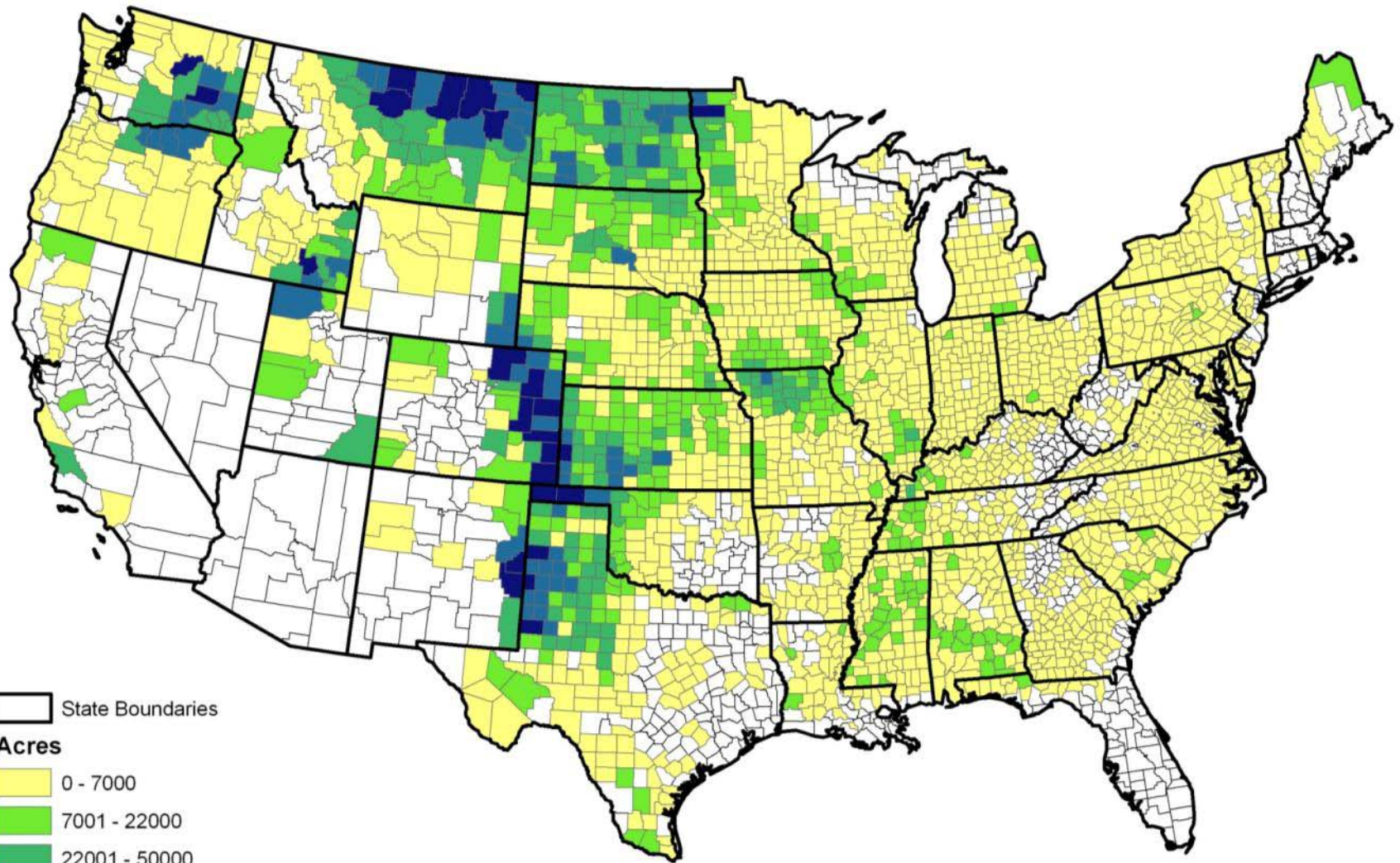


[www.nass.usda.gov/ca](http://www.nass.usda.gov/ca)

Average fee/colony ~ \$150 over recent years



# Expiring CRP Acres (2010-2013)



State Boundaries

## Acres

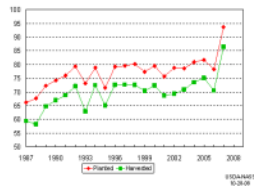
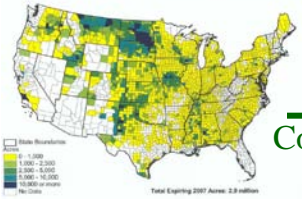
- 0 - 7000
- 7001 - 22000
- 22001 - 50000
- 50001 - 100000
- 100001 - 180000

Total Expiring 2010-2013 acres: 18,786,861

# GLOBAL DRIVER



# REGIONAL and NATIONAL SIGNALS of CHANGE

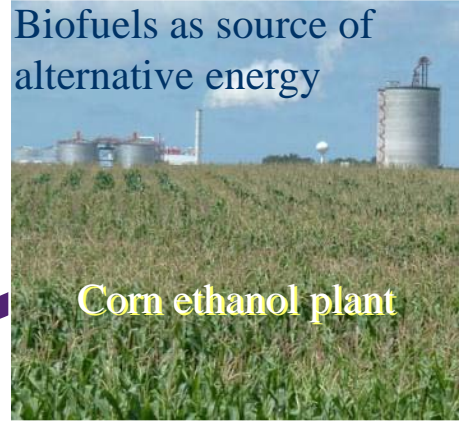


Conversion



Push for U.S. to gain energy independence

Energy independence as a driver of local habitat loss



- Commodity prices for biofuel crops ↑
- Price for traditional fuel at the pump ↑

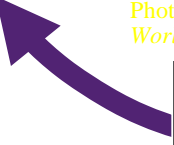


Photo: D. Hendee, Omaha World-Herald, July 27, 2008

# LOCAL RESPONSE



Photo: AGREM.com, accessed Nov. 26, 2008





**Changes in agricultural or conservation programs, policies, or other incentives**



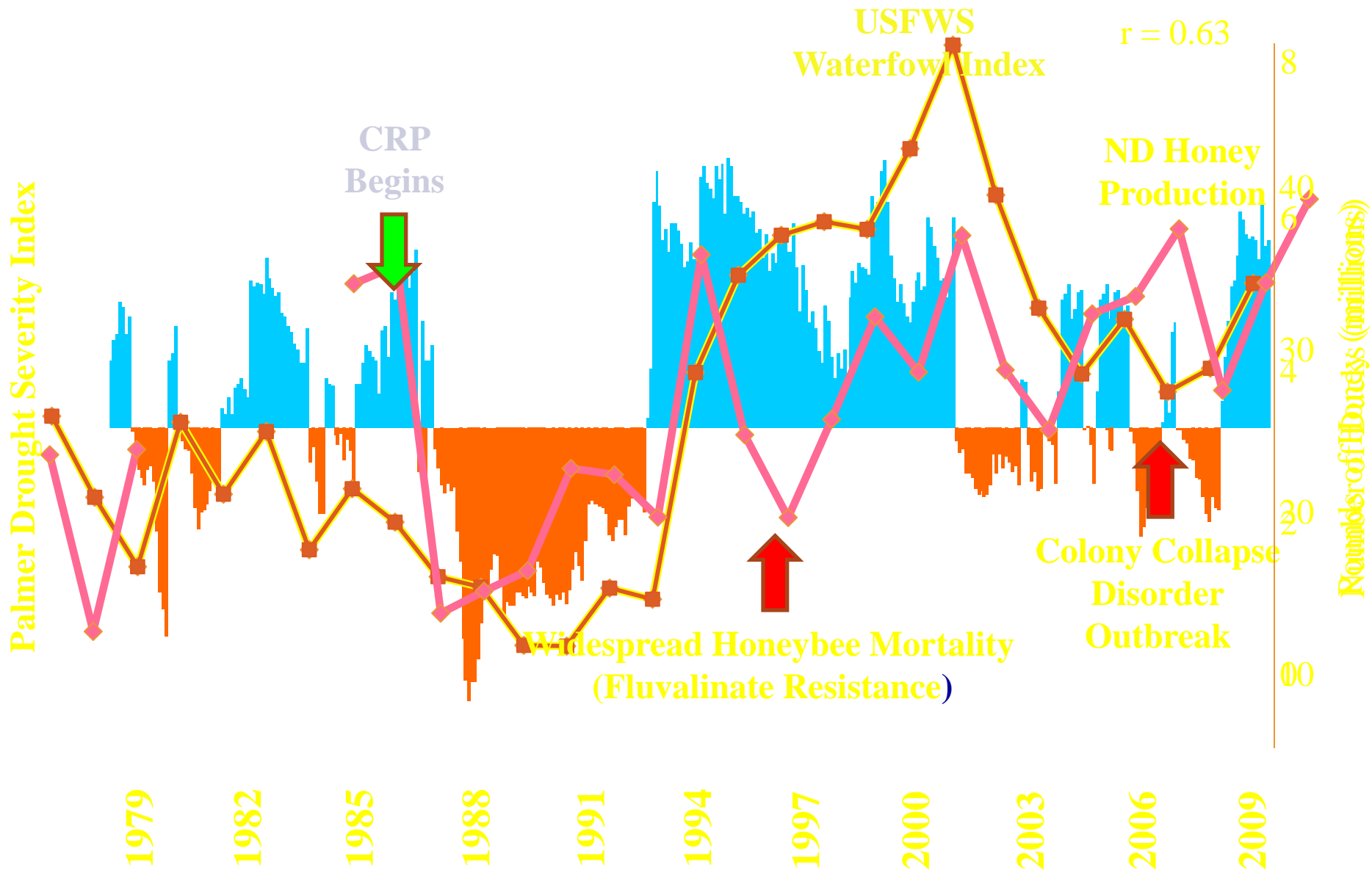
**Changes in land management practices**



**Climate or other global change**



**Loss of pollinators**





# Questions



# Alion: A New Pre-Emergence Herbicide for Tree Nuts





# Alion: A New Pre-Emergence Herbicide for Tree Nuts

**Moderator: Richard Waycott, ABC**

**Presenters:**

**Jerome Kovar, Bayer CropScience**

# Alion Product Overview



What is Alion?

How to use Alion?

When to use Alion?

Why use Alion?







Longer-lasting Alion™ herbicide provides a new solution for pre-emergence control of weeds.

- **Broad-spectrum** control of grass and broadleaf weeds
- **Longer lasting** – Over six months of weed control
- **New & Unique chemistry**
  - New mode of action, group 29
  - Controls glyphosate-resistant weeds
- **Excellent Crop safety**



# Alion - Mode of Action



## Cellulose-Biosynthesis Inhibitor (CBI)

Currently 2 other CBIs commercially available

- Isoxaben (Gallery/Trellis)
- Dichlobenil (Casoron)

CBIs are generally used preemergent

Generally little effect on developed leaves and tissues

No known resistance in North America

Indaziflam (Alion) is the most effective CBI discovered and different from other CBIs

- WSSA group 29, HRAC group L

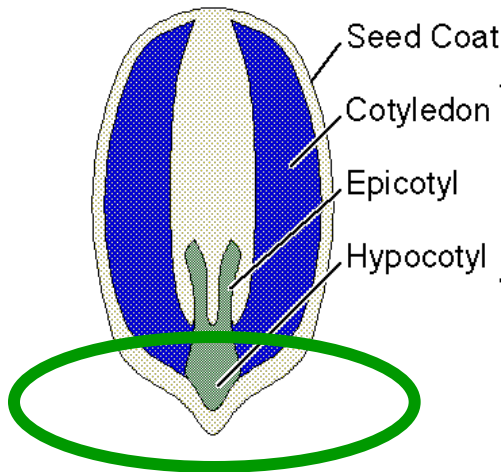
# How Does Alion Work?



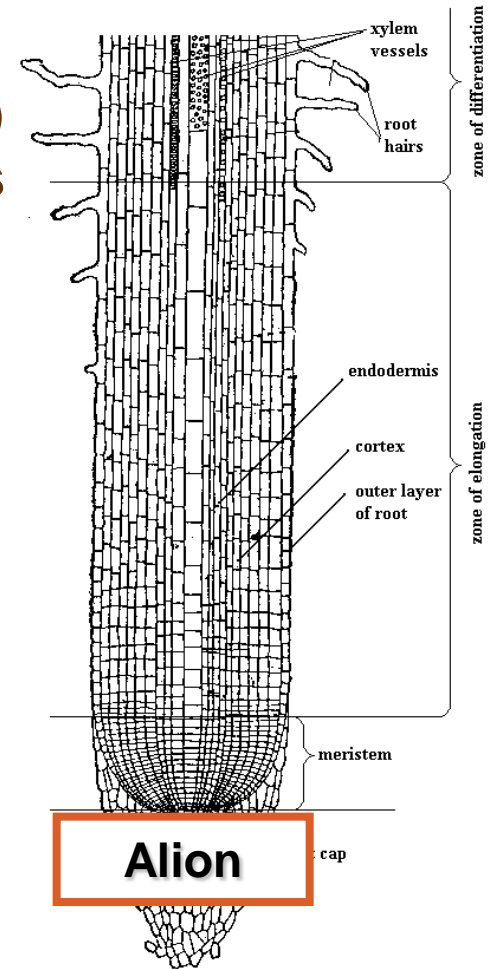
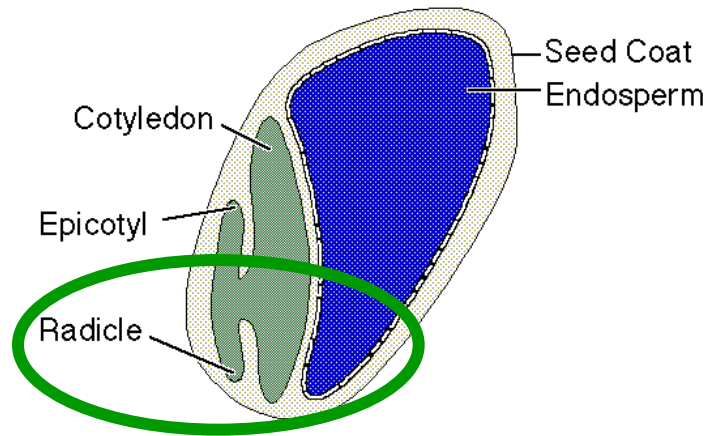
## Cellulose Biosynthesis Inhibitor (CBI)

Inhibits meristematic growth (generation of new cells) in developing roots once the hypocotyl/radicle begins to grow thus preventing root development from annual weed seeds

Dicot Seed Structure



Monocot Seed Structure



# Influence of Water/Soil Moisture

Wet conditions

Weeds planted 0.4 inches deep



Weeds planted 2.4 inches deep



Dry conditions



- Demonstrates the importance of incorporating water after an Alion application.

# Physical & Chemical Properties



## Low vapor pressure

-will not vaporize from the soil

## Low to medium soil sorption

-at the dividing point for low to medium mobility.

## Low water solubility

-norflurazon ~ 10X more soluble

*Low potential for contamination of groundwater*

# Excellent Environmental Profile



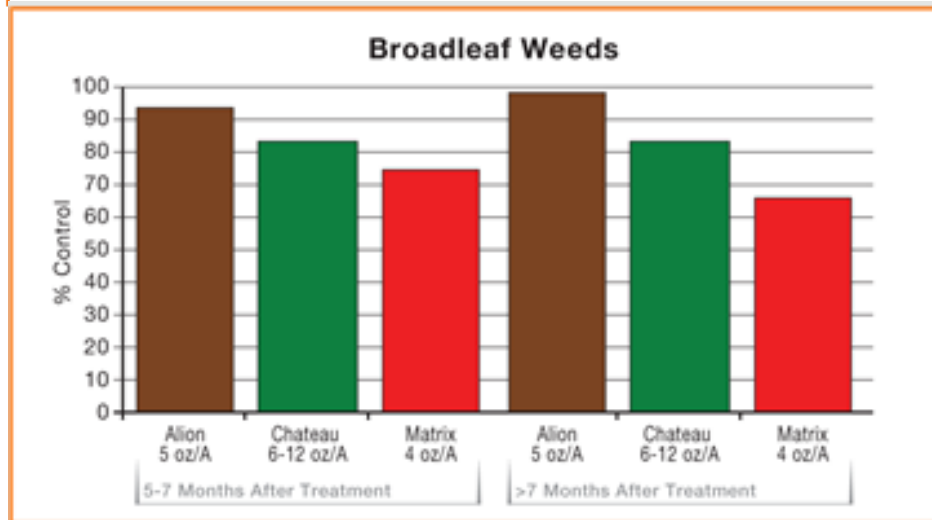
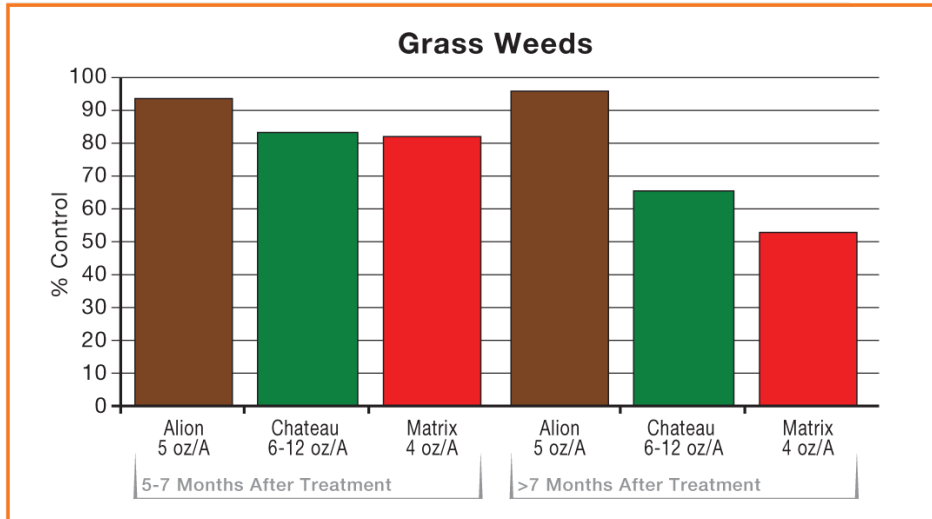
## Human Safety Assessment

- CAUTION signal word on label
- No evidence of toxicity / developmental effects
- No evidence of carcinogenicity

## Environmental Safety Assessment

- Low risk to mammals and aquatic invertebrates and fish
- Potential risk to aquatic weeds from surface water runoff
- Low risk for leaching into ground water = low potential for groundwater contamination

# Longer Lasting Control of Grass/Broadleaf Weeds



- Over 900 field trials that BCS has conducted over 8 years confirms longer lasting control with Alion vs leading competitive products



# Alion vs Competition – 6 MAT



Chateau + Prowl  
12 oz + 5 pt



Alion  
5 oz

Both Applied with Rely

# Weeds Controlled



## GRASS WEEDS CONTROLLED

28

- Barley, mouse
- Barnyardgrass, common
- Bluegrass, annual
- Brome, downy
- Brome, foxtail
- Brome, rigid
- Cheat

- Crabgrass, large
- Crabgrass, smooth
- Crowfootgrass
- Cupgrass, southwestern
- Foxtail, giant
- Foxtail, green
- Foxtail, yellow

- Goosegrass
- Guineagrass
- Junglerice
- Lovegrass, tufted
- Millet, wild proso
- Oat, wild
- Panicum, fall

- Panicum, Texas
- Ryegrass, annual
- Ryegrass, Italian
- Sandbur, southern
- Signalgrass, broadleaf
- Sprangletop, bearded
- Sprangletop, Mexican

<sup>1</sup>Denotes partial control of these weeds.

## BROADLEAF WEEDS CONTROLLED

67

- Amaranth, spiny
- Buckwheat, wild<sup>1</sup>
- Burclover, California<sup>1</sup>
- Buttercup, corn
- Carpetweed
- Catsear, spotted
- Celery, wild<sup>1</sup>
- Chickweed, common
- Chickweed, mouse-ear
- Clover, crimson<sup>1</sup>
- Clover, red<sup>1</sup>
- Clover, white<sup>1</sup>
- Cudweed, purple
- Dandelion, common (seedling)
- Eveningprimrose, cutleaf<sup>1</sup>
- Fiddleneck, coast
- Filaree, redstem

- Filaree, whitestem
- Fleabane, hairy
- Geranium, Carolina
- Groundsel, common
- Henbit<sup>1</sup>
- Horseweed (Marestail)
- Knotweed, prostrate<sup>1</sup>
- Kochia
- Lambsquarters, common<sup>1</sup>
- Lettuce, prickly<sup>1</sup>
- Mallow, common (Cheeseweed)
- Mallow, little (Cheeseweed)
- Melon, smell
- Morningglory, ivyleaf
- Morningglory, pitted<sup>1</sup>
- Mustard, black
- Mustard, wild

- Nettle, stinging
- Nightshade, American black
- Nightshade, black
- Nightshade, hairy
- Pigweed, prostrate
- Pigweed, redroot
- Pigweed, smooth
- Plantain, buckhorn
- Prickly sida (Teaweed)
- Purslane, common
- Purslane, horse
- Pusley, Florida
- Ragweed, common<sup>1</sup>
- Redmaids
- Rocket, London
- Sesbania, hemp
- Shepherdspurse

- Smartweed, Pennsylvania
- Sorrel, red
- Sowthistle, annual
- Sowthistle, spiny
- Spanishneedles
- Spurge, prostrate
- Spurge, spotted
- Spurry, corn
- Sunflower, common<sup>1</sup>
- Swinecress
- Thistle, Russian
- Velvetleaf
- Vetch, purple
- Willowweed, panicle
- Woodsorrel, common yellow<sup>1</sup>
- Woodsorrel, Florida yellow

# Crop Safety and MRL Position

Alion herbicide offers excellent crop safety for peace of mind.

- Approximately 400 U.S. trials conducted demonstrate Alion can be used effectively and safely when applied according to label directions.

## ■ Alion MRL Position

- No **measurable** residues in any food commodity
  - Except almond hulls (0.15 ppm)
- Therefore there are no current plans to establish import MRLs in export countries
- Since there has been no **measurable** residues, importation of treated commodities should not be a problem in any country.



# Application Rates for Tree Nuts and Pistachio



Soil Texture	Indaziflam 200SC Herbicide (fl oz product / broadcast acre)
Coarse soils (Sand, Loamy sand, and Sandy loam) Medium soils (Loam, Silt loam, Silt, and Sandy clay loam)	5.0 fl oz/A (0.065 lb ai/A)
Fine textured soils (Silty clay loam, Clay loam, Sandy clay, Silty clay, and Clay.)	5.0 to 6.5 fl oz/A (0.065 to 0.085 lb ai/A)

- Packaging:
  - 32 oz containers
  - 6.4 (bdcst) treated acres at 5 oz/ac



# Alion Use in Tree Nuts



Remove heavy weed or crop debris prior to application

Minimum spray volume: 10 gallon / Ac (25 gpa)

Avoid applications within 25 feet of ponds, lakes, rivers, streams, wetlands, and habitat containing aquatic and semi-aquatic plants

Avoid direct or indirect spray contact with crop foliage, green bark, roots or fruit as it may cause localized crop injury

14 day PHI

12 hour REI

## Tankmixing Flexibility:

- May be applied with other PRE or POST herbicides
- Tankmix with non-selective for control of emerged weeds



## Alion™ Herbicide Tank Mix Guidelines:

- Add dry compatibility agents (AMS, UAN)
- Add dry herbicide products
- Add Alion SC (ensure thoroughly mixed)
- Add EC products (Rely, glyphosate)
- Adjuvants (MSO, ESO, etc.)



# Why use Alion?



- Longer lasting control (4 to 6 months or sometimes longer)
- Broad Spectrum control of grass and broadleaf weeds
- New and Unique chemistry
- Low Dose Rate: 5.0 fl.oz/acre
- Safe to handle and for the environment
- Excellent crop safety on established trees
- Flexible in Application timing
- Tank-mix Flexibility



**Cleaner. Longer.**  
**ALION**

**Thank You**





Dedicated Trade Show