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Beekeeping: Considerations for the Ecological Beekeeper

By Omar Rodriquez
NCAT Sustainable Agriculture Specialist

About this Presentation

- This presentation is designed for:
  - The novice/intermediate bee keeper
  - Beekeepers located in areas with regular pesticide use
  - Farmers who want to save on the cost of migratory pollination

Feeding bee. Photo: NCAT

New almond orchard. Photo: www.flickr.com/photos/usdagov/20591311786

About this Presentation

- We will cover:
  - Greatest challenges facing today's beekeeper
  - Avoiding the downward spiral that may lead to colony death
  - IPM and sustainable management
  - Requirements for good bee health

Beekeeping in an orchard. Photo: https://commons.wikimedia.org

Beekeeping in an orchard. Photo: https://commons.wikimedia.org

Current Trends

- 70% of the crops we consume are pollinated by the honey bee
- 30%-50% of hives die every winter
- 6 million hives nationally in 1947
- 2.4 million in 2008

Bee management. Photo: https://pixabay.com

Pesticide use. Photo: https://commons.wikimedia.org

Bee habitat. Photo: www.geograph.org.uk

Monocrops and Beekeeping

- Reduced habitat and food sources
- Many monocrops require the services of migratory beekeepers
- Bees are used to increase yields

Almond tree with fruit. Photo: https://pixabay.com/en/photos/almond%20trees

Almonds in California
1.7 million bee hives = 85% of commercially available hives

Apple tree with fruit.
Photo: www.publicdomainpictures.net

Apples in Washington

Sunflower Field.
Photo: www.publicdomainpictures.net

Sunflowers in South Dakota

Bees get stressed, too

Some management decisions and cultural practices can lead to greater challenges in the future.

- Transportation = Stress
- Increased disease transmission
- Increased treatment costs

Hives in close proximity to one another. Photo: www.flickr.com


Acaricide (Varroa mite treatment) Photo: https://en.wikipedia.org


Bee with deformed wing virus. Photo: www.flickr.com

Challenges of Agrochemicals

- Chemicals can drift (carried by the wind) for many miles
- Crop dusting agrochemicals with helicopters and airplanes will drift farther
- Pesticides are also embedded in seeds, and used in soils
- Agrochemicals can accumulate in inside of the hive
- As toxicity increases, bees may show no outward signs of stress until it is too late

Insecticide sprayed on field. Photo: https://pixabay.com

How can agrochemicals affect the colony?

- Herbicides (used to kill plants)
  - Interfere with ability to navigate
  - Destruction of habitat and food sources
- Neonicotinoids (used to kill insects)
  - Most closely linked to colony collapse
  - Include clothianidin, imdacloprid, and thiamethoxam
- Fungicides lead to:
  - Inhibited immune response
  - Decreased energy output
  - Increased chance of infection or infestation

Herbicide use. Photo: https://commons.wikimedia.org

Crop Pest (filbert weevil) Photo: http://maxpixel.freegreatpicture.com

Powdery Mildew. Photo: http://vegetablemdonline.ppath.cornell.edu

Acaricide/insecticide interaction

- Varroa is a high-priority pest because it can spread viruses
- Certain chemical treatments for varroa have direct effects on bees

Acaricide (Varroa mite treatment) Photo: https://en.wikipedia.org

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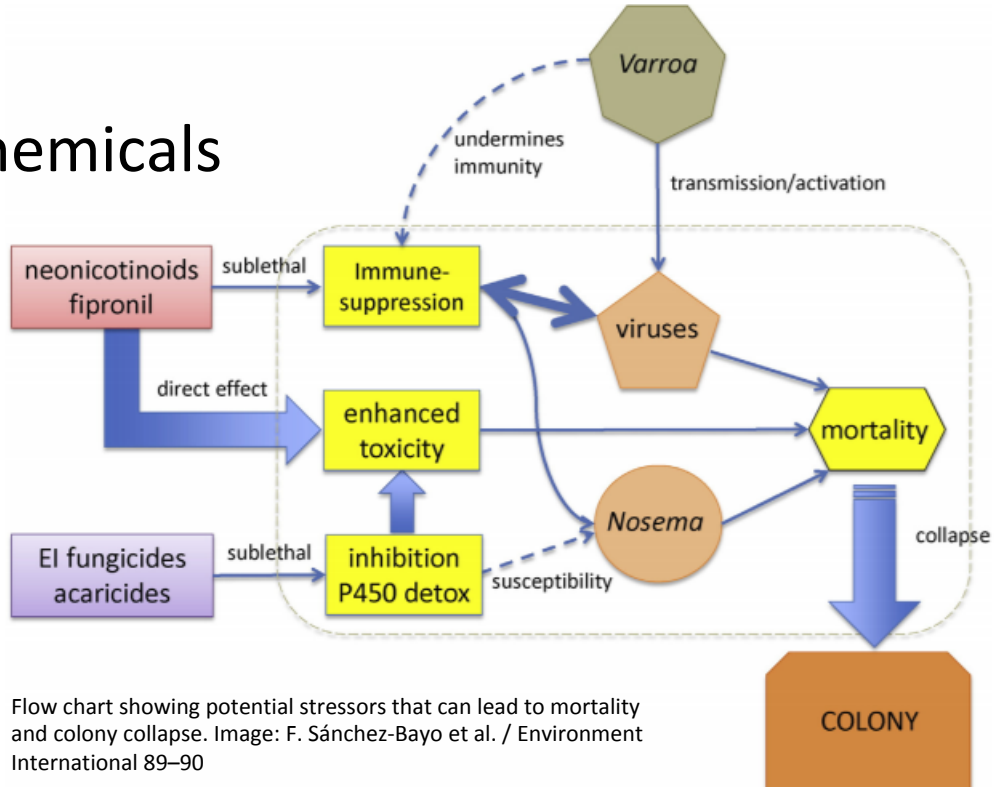
Insecticide sprayed on field. Photo: https://pixabay.com

= Synergism

Synergism

- Synergism can also occur with any combination of bee pests and chemicals used inside or outside the hive:
  - Agro chemicals like pesticides and fungicides
  - Acaricides and other chemicals used to treat bee hive pests
  - Mites
  - Viruses
  - Fungi

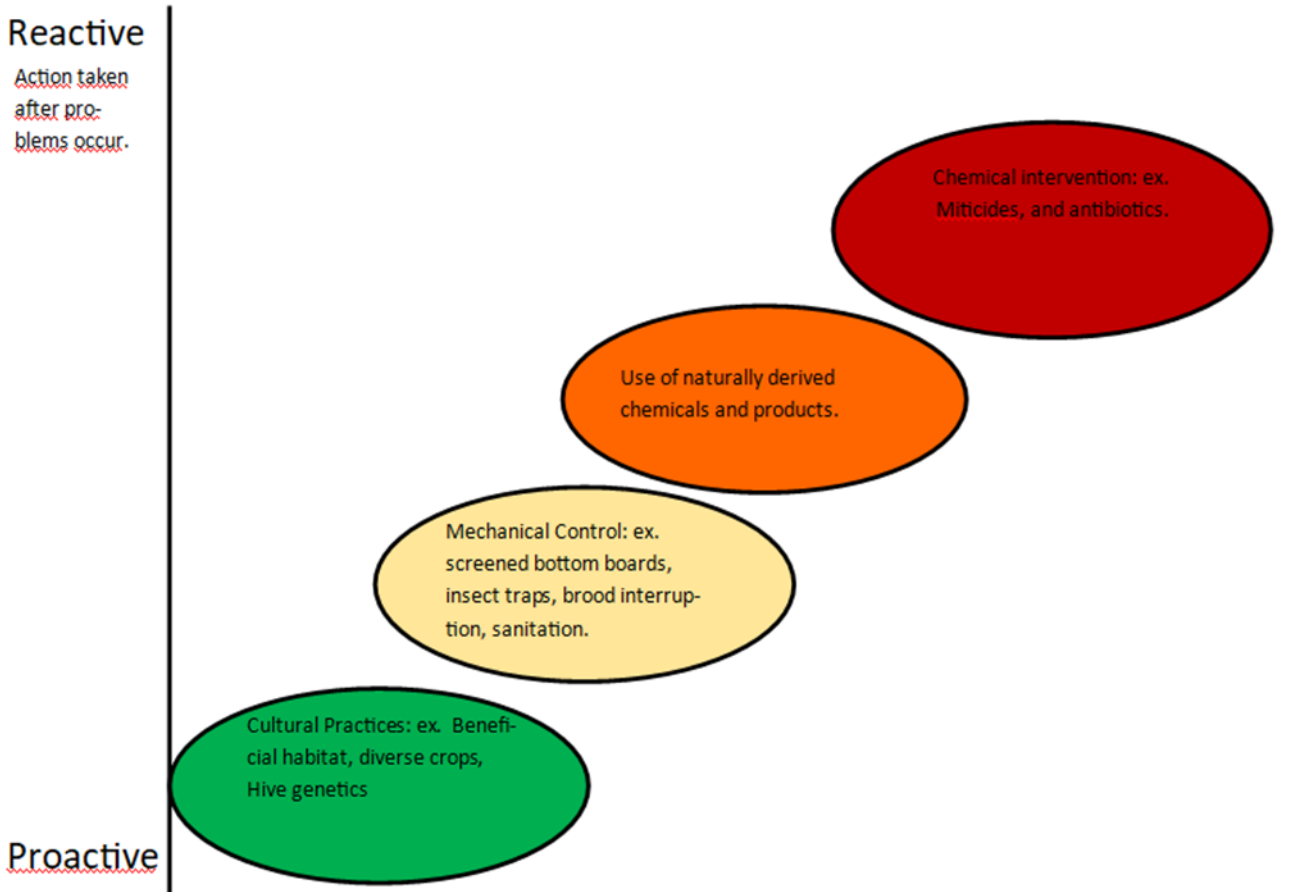


Flow chart showing potential stressors that can lead to mortality and colony collapse. Image: F. Sánchez-Bayo et al. / Environment International 89–90

Section 2: Introduction to IPM and Hive Management

- Minimize chemical treatments
  - Monitoring of bee and pests
  - Mechanical handling
  - Proper synchronization with the application of chemical treatments with the life cycle of the pest

IPM Graph



Biointensive

Development of natural systems that fortify hive health. (ex. Integrated pest management with a focus on biology

Conventional

Primary treatments are made using chemical intervention. (ex. Integrated pest management with a focus on chemicals.

Considerations Prior to Action

- Pest identification
- Understanding of the pest/bee lifecycle
  - Seasonality of pest species
  - Time of year/climate
    - Is it a wet/dry year? What effect will this have on pest populations?
- Focus your monitoring by using appropriate tools and timing inspections based on how your target pest are affected by the seasons

Cultural Practices and Bee Health

- Source locally whenever possible
  - Locally sourced bees will be better suited to the climate in your area
- Who are your local bee breeders?
- What are their breeding goals?
  - Immune resistance
  - Hygiene
  - Cold/heat hardiness
- Good breeding management leads to:
  - Greater resistance to pests
  - Adaptation to environment
  - Succession of beneficial traits

DNA double Helix Photo:
www.publicdomainpictures.net

Hygiene Habits

- Bees with better cleaning habits and sense of smell will better resist infestation of some pest species.

Keep your bee tools clean. Photo: https://commons.wikimedia.org

Carefully select breeders who breed healthy bees. Photo: https://pixabay.com

Get to know your local breeders. Photo: http://maxpixel.freegreatpicture.com

Selecting Habitat for Your Bees

High winds=pesticide drift. Photo: https://commons.wikimedia.orm

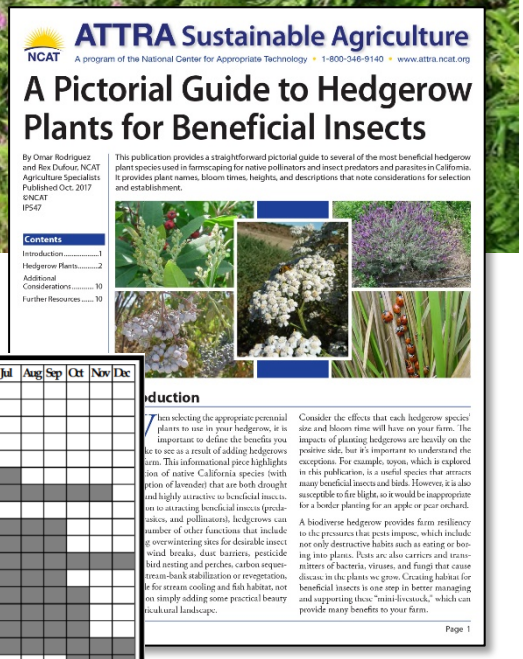
- Pesticide drift caused by wind can put bees in direct contact with pesticides
- Avoid spraying flowers directly when possible
- Spray in the evening
  - Bees tend to forage at temperatures above 55 degrees

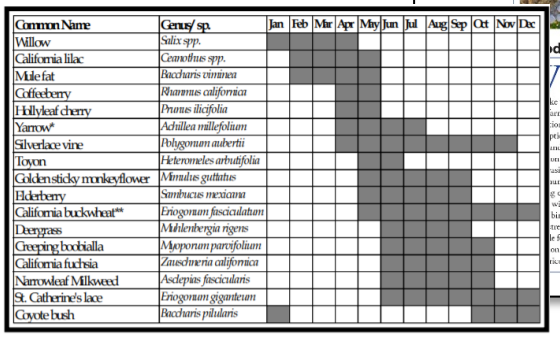
- Keep bees at a maximum possible distance from sources of pesticides
- Cover hives with breathable fabric if their area will be sprayed directly

Hives in close proximity to each other and agrochemical sprays: Photo: https://pixabay.com

Bee Habitat

- Hedgerows are a great way to increase bee habitat and food sources.
- Don’t forget: hives need good ventilation and access to sunlight.
- Flowering calendars help to visualize flowering schedules for specific plants throughout the year.



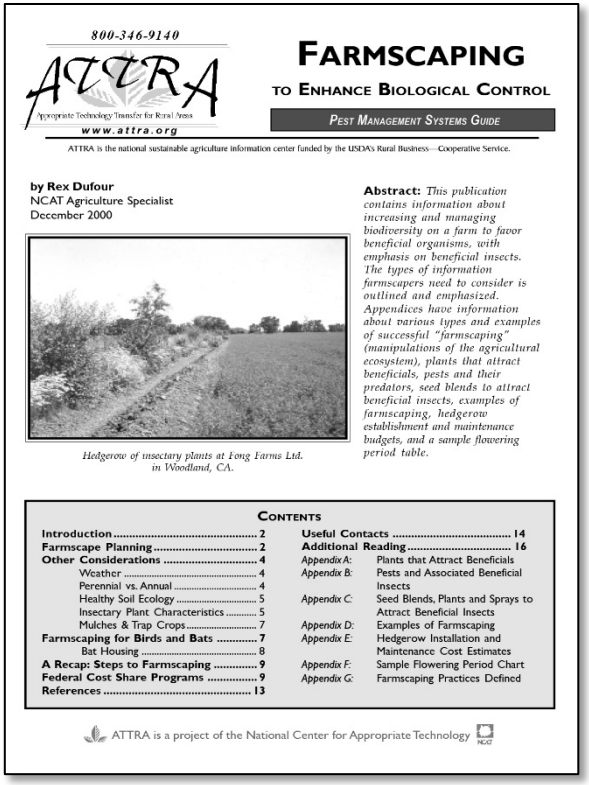


Common Name	Genus/ sp.	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Willow	*Salix spp.*												
California lilac	*Ceanothus spp.*												
Mule fat	*Baccharis viminea*												
Coffeeberry	*Rhamnus californica*												
Hollyleaf cherry	*Prunus ilicifolia*												
Yarrow*	*Achillea millefolium*												
Silverlace vine	*Polygonum aubertii*												
Toyon	*Heteromeles arbutifolia*												
Golden sticky monkeyflower	*Mimulus guttatus*												
Elderberry	*Sambucus mexicana*												
California buckwheat**	*Eriogonum fasciculatum*												
Deergrass	*Muhlenbergia rigens*												
Creeping boobialla	*Myoporum parvifolium*												
California fuchsia	*Zauschneria californica*												
Narrowleaf Milkweed	*Asclepias fascicularis*												
St. Catherine's lace	*Eriogonum giganteum*												
Coyote bush	*Baccharis pilularis*												

Top: Diverse hedgerow. Photo: https://commons.wikimedia.org
Center: ATTRA publication, courtesy of NCAT.
Bottom: Flowering calendar, courtesy of NCAT.

Thank you for listening

- Check out similar publications on our website:
  - attra.ncat.org



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Appropriate Technology Transfer for Rural Areas
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FARMSCAPING
TO ENHANCE BIOLOGICAL CONTROL

PEST MANAGEMENT SYSTEMS GUIDE

ATTRA is the national sustainable agriculture information center funded by the USDA's Rural Business—Cooperative Service.

by Rex Dufour
NCAT Agriculture Specialist
December 2000

Abstract: *This publication contains information about increasing and managing biodiversity on a farm to favor beneficial organisms, with emphasis on beneficial insects. The types of information farmscapers need to consider is outlined and emphasized. Appendices have information about various types and examples of successful "farmscaping" (manipulations of the agricultural ecosystem), plants that attract beneficials, pests and their predators, seed blends to attract beneficial insects, examples of farmscaping, hedgerow establishment and maintenance budgets, and a sample flowering period table.*

Hedgerow of insectary plants at Long Farms Ltd. in Woodland, CA.

CONTENTS

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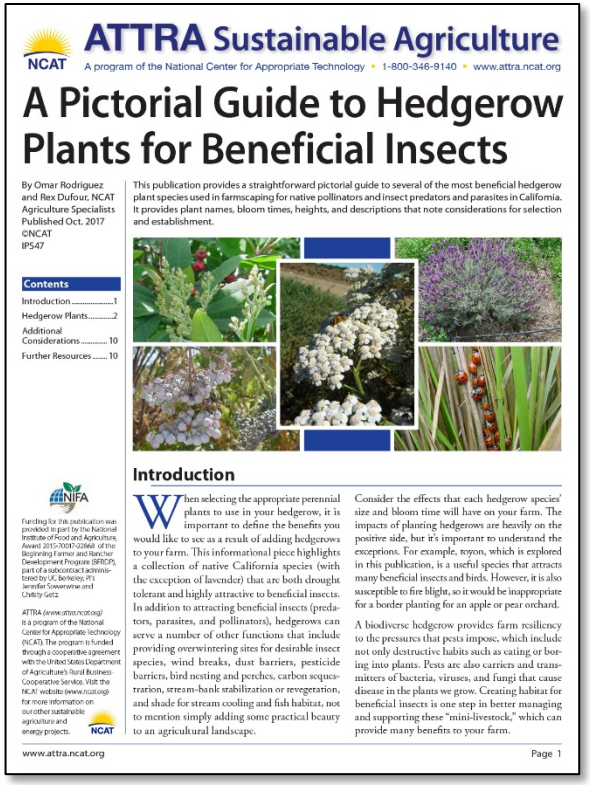

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A Pictorial Guide to Hedgerow Plants for Beneficial Insects

By Omar Rodriguez and Rex Dufour, NCAT Agriculture Specialists
Published Oct. 2017

IP547

This publication provides a straightforward pictorial guide to several of the most beneficial hedgerow plant species used in farmscaping for native pollinators and insect predators and parasites in California. It provides plant names, bloom times, heights, and descriptions that note considerations for selection and establishment.

Contents

Funding for this publication was provided in part by the National Institute of Food and Agriculture, Award 2015-70017-23868 of the Beginning Farmer and Rancher Development Program (BFRDP), part of a subcontract administered by UC Berkeley. PI's Jennifer Sowerwine and Christy Getz.

ATTRA (www.attra.ncat.org) is a program of the National Center for Appropriate Technology (NCAT). The program is funded through a cooperative agreement with the United States Department of Agriculture's Rural Business-Cooperative Service. Visit the NCAT website (www.ncat.org) for more information on our other sustainable agriculture and energy projects.

Introduction

When selecting the appropriate perennial plants to use in your hedgerow, it is important to define the benefits you would like to see as a result of adding hedgerows to your farm. This informational piece highlights a collection of native California species (with the exception of lavender) that are both drought tolerant and highly attractive to beneficial insects. In addition to attracting beneficial insects (predators, parasites, and pollinators), hedgerows can serve a number of other functions that include providing overwintering sites for desirable insect species, wind breaks, dust barriers, pesticide barriers, bird nesting and perches, carbon sequestration, stream-bank stabilization or revegetation, and shade for stream cooling and fish habitat, not to mention simply adding some practical beauty to an agricultural landscape.

Consider the effects that each hedgerow species' size and bloom time will have on your farm. The impacts of planting hedgerows are heavily on the positive side, but it's important to understand the exceptions. For example, toyon, which is explored in this publication, is a useful species that attracts many beneficial insects and birds. However, it is also susceptible to fire blight, so it would be inappropriate for a border planting for an apple or pear orchard.

A biodiverse hedgerow provides farm resiliency to the pressures that pests impose, which include not only destructive habits such as eating or boring into plants. Pests are also carriers and transmitters of bacteria, viruses, and fungi that cause disease in the plants we grow. Creating habitat for beneficial insects is one step in better managing and supporting these "mini-livestock," which can provide many benefits to your farm.

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