

# **SOLITARY LIFE AND TIMES OF THE BLUE ORCHARD BEE**



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# BLUE ORCHARD BEE

## *Osmia lignaria*

- Transcontinental
- One spring generation per year
- Non-social
- 138 other *Osmia* in U.S.



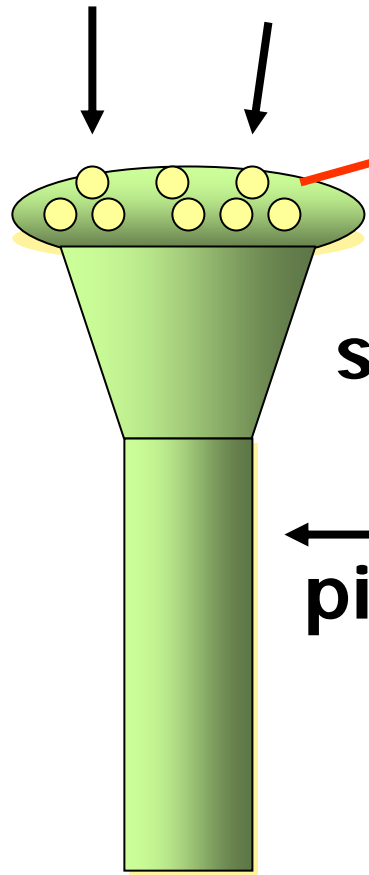


45 F



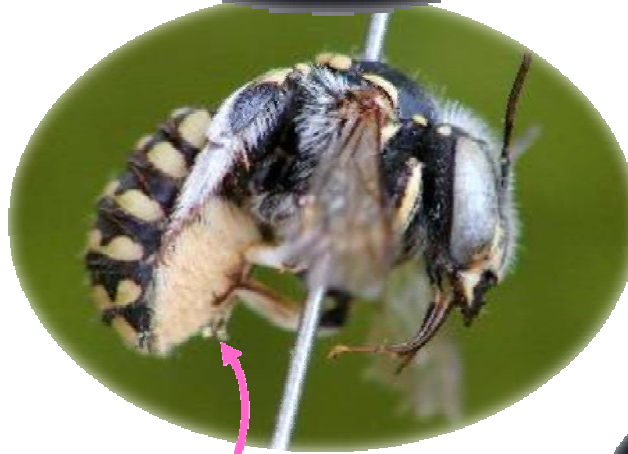
# POLLINATION

pollen load



stigma

pistil



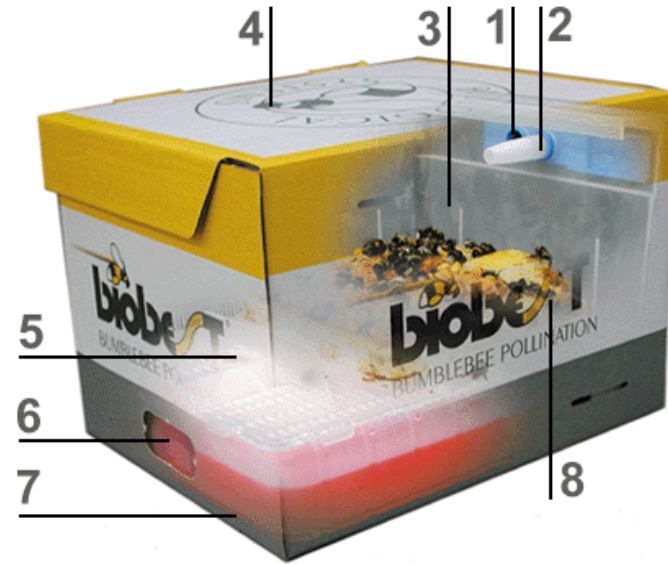
# PHILOSOPHY OF USING BLUE ORCHARD BEES FOR POLLINATION



# MANAGEMENT STRATEGIES



Rental



Disposable



Ownership  
(sustainable mngmt)

# MOBILITY



Migratory



Fixed in season



Immobile



# REPRODUCTIVE POTENTIAL



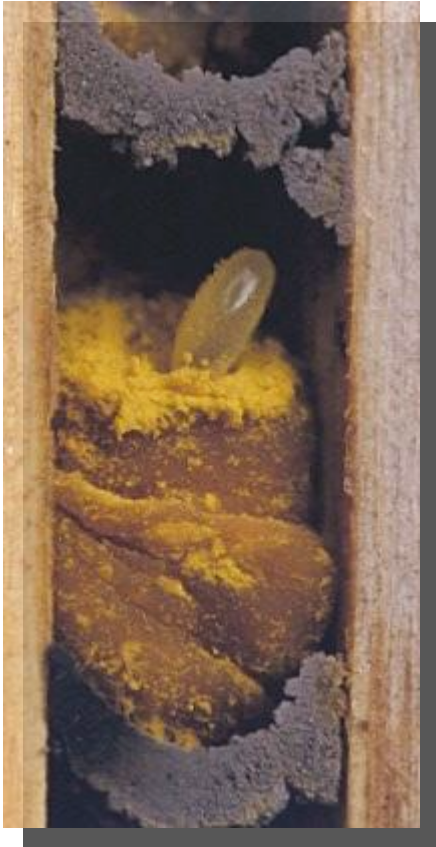
# BEE HUSBANDRY

- KNOW YOUR BEE
- OPTIMIZE SEASONAL TIMING
- PROVIDE FOR FORAGE
- MINIMIZE DISEASE AND PESTS



# LIFE CYCLE OF THE BLUE ORCHARD BEE

- **CREATION**
- **EGG stage**
  - 6-9 days
  - delicate
  - unfertilized boys



# LIFE CYCLE OF THE BLUE ORCHARD BEE

## FEEDING & GROWTH

- LARVA 9-21 days
- Immobile (keep on provision)
- Prone to pestilence



←  
sons

→  
daughters



# LIFE CYCLE OF THE BLUE ORCHARD BEE

## ○ TRANSITION

- PREPUPA (in cocoon)
- Stage most bees winter over
- Tough (OK to move)
- *Osmia* summering stage- 2-4+ weeks, CA diapause



Preserving  
fat



# LIFE CYCLE OF THE BLUE ORCHARD BEE

- **TRANSFORMATION**
- **PUPA- 3-7 weeks**
- **delicate**
  - **No bee overwinters at this stage**



# LIFE CYCLE OF THE BLUE ORCHARD BEE

## ○ ADULT BEE

- winters over for months
- ready to go in spring, active 2-3 weeks
- sexes disperse, mate
- female also prepares nest, forages, lays eggs and more

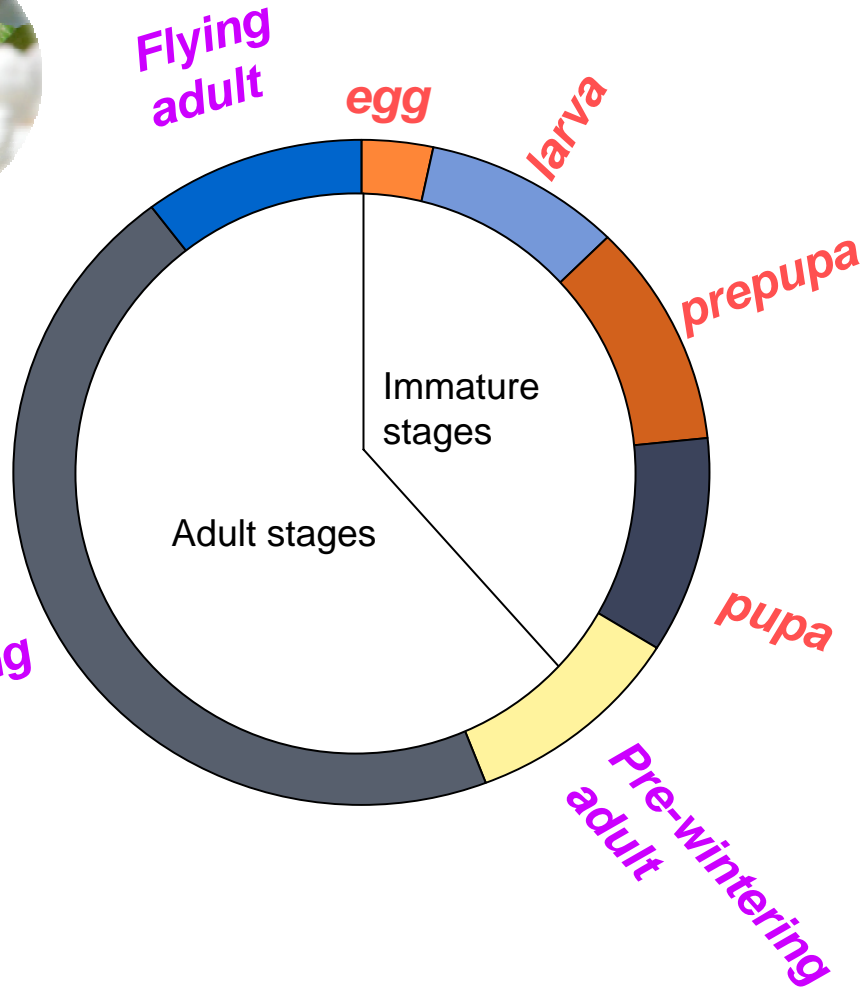


# LIFE CYCLE OF THE BLUE ORCHARD BEE SPRING



WINTER

Wintering  
adult



# FLORAL RELATIONS

## ○ Taxonomic Generalist- in nature...



willows



redbud



*Hydrophyllum*



*Collinsia*



# SUPPLEMENTAL FORAGE

- Duration of bloom < longevity of BOBs
- Excessive bad weather
- Unfortunate timing of release



# SUPPLEMENTAL FORAGE- EARLY

- Young females for egg development
- Emergence precedes orchard bloom



Almond

1 BOB = pollen produced  
by 40-60 flowers



Flowering quince

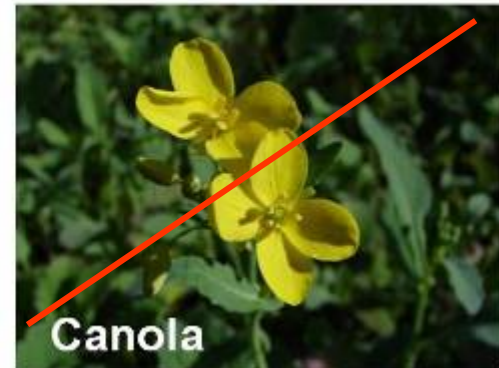
-10x nectar sugar  
- 2-3x the pollen



# SUPPLEMENTAL FORAGE- LATE

- Tardy or old females
- Extends nesting after orchard bloom
- Honey bees will mob these

Figure 2. Flowers evaluated for forage and nest provisioning



# CUES OF SEASONALITY

- Generation cues – one, or more?
- Developmental transition cues
- Day-length versus thermal cues
- Synchronization with host bloom



# FRUIT TREE & BEE DORMANCY



autumn

winter

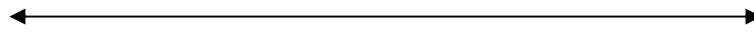
spring



cold  
acclimation

chill hour  
accumulation

growing  
degree  
days

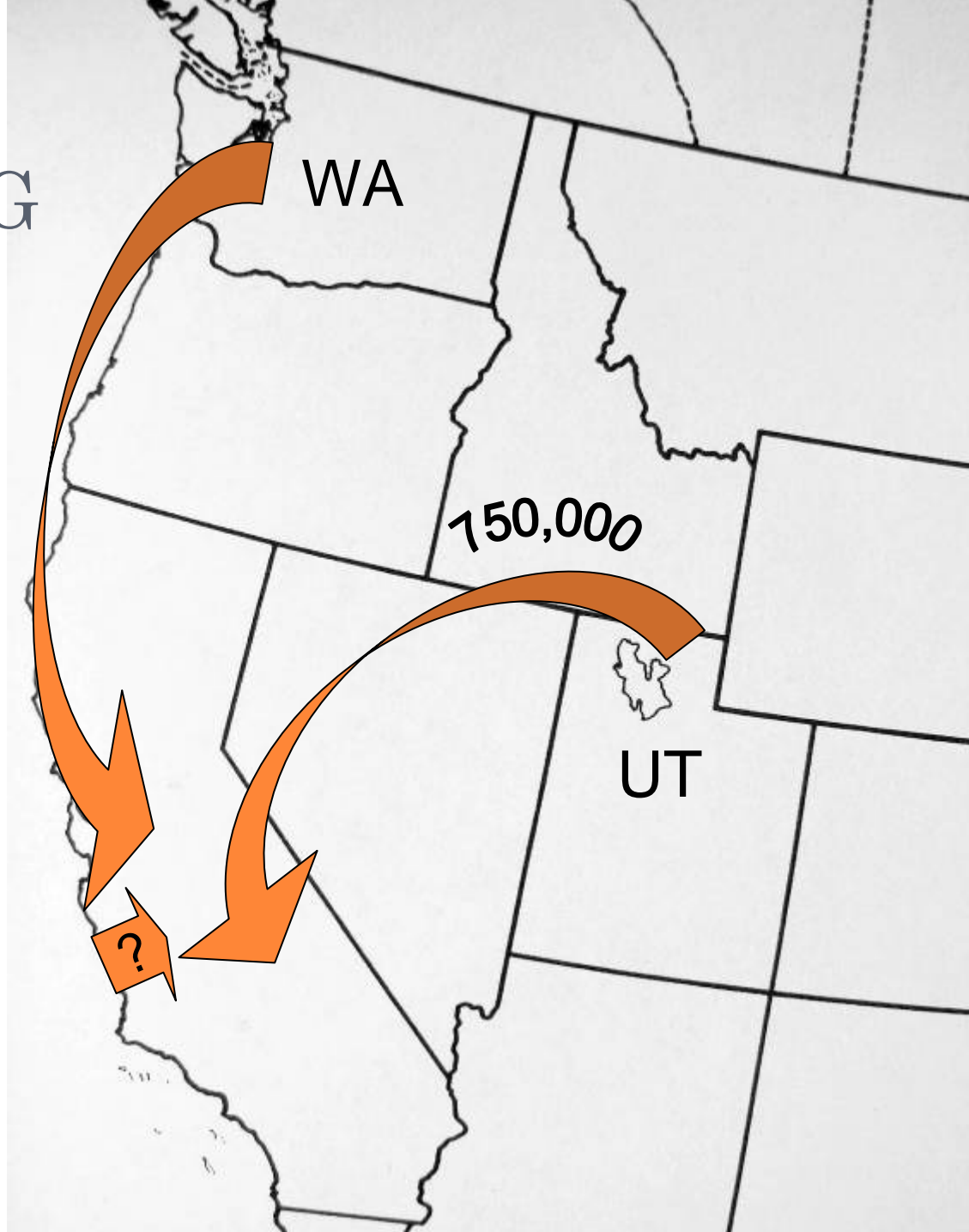


Dormancy



# TRAP-NESTING

- Northerly areas
  - Owner permit
- Import CA
  - CDFA permit
- No mix CA bees



# SUSTAINABLE MANAGEMENT

principal with interest

- Principal comes from wild trapping
- start with bees trap-nested from the wild
  - e.g. 750,000 BOBs from n UT, se ID this year
- Interest comes from good management
  - multiply bees in orchard / forage crop
  - surviving daughters > mothers released
  - 1.5 - 3x realistic most years after first



# PESTILENCE & MALADIES

- Provision, larva most vulnerable
- Insect cleptoparasites and predators, mites, fungi, bacteria, probably virus
- Share with honey bees, bumblebees?
- Insecticide (fungicide?) sensitivity
- Start with clean populations
  - Orchard advantages
- Program of hygienic nest management



# “Weight of Too Many Blue Orchard Bees Results in Limb Breakage”

-Sacramento Bee 30 February 2009





# CENTRAL PLACE FORAGER

- learns local visual landmarks around nest
- navigates by landmarks, sun
- optimal foraging and flight distance
- poor at later resetting nest orientation cues
- prospect for migratory beekeeping with BOB

