Threats to Beekeepers & Honey Bees

The Problems

- Varroa Mites
- Small Hive Beatle
- Under Feeding at intro
  - Carbs & Protein
- Starvation – Harvesting too much honey
- Poor nutrition areas
- Chemicals
- Southern stock
- Not reading – internet info
- Not attending bee meetings

The Solutions

- Genetics –Monitor Mites-IPM
- Strong colony-Traps
- Feed-Feed-Feed
  - Proper time as required
- 80 to 90 pounds for winter
  - Monitor colony weight
- Plan your location
- Plan your location
- Northern Stock
- Read-Read & Land Grant sites
- Please take time for meetings

Checking for % of Dropped Chewed Mites

Mites dropping through a #8 screen below the brood nest

- Ohio isolated colonies
  - Four years – colony replaced own queens 22%
  - Eight years-colony replaced own queens 47%
- Ohio Feral colony queen X Purdue 60%
- Purdue X mated in Purdue gene pool 73%
- Purdue X mated in Ohio gene pool 62%
- Caucasian X Purdue daughter mated in Ohio 41%
- 2015 swarm from isolated area in Ohio 20%
- Ohio isolated colony 30%

What Beekeepers/Clubs must do

- A Sustainable Beekeeping Operating Model
- Control Mites
- Rebuild Healthy Gene Pool areas
- Produce Local queens
- Produce Healthy drones
- Produce Nucs with local stock
- Develop Networks of like minded Beekeepers
- Field Days – Nuc creation, Queen rearing & Beekeeper training
- Connect, follow The Bee Informed Organization

Understanding Varroa Mites
***** About, What, Why, & How*****

- Biology, Anatomy and Behavior of mites
- Life Cycle of the Mite **vs.** The Honey Bee Life Cycle
- How Mites **kill** honey bees; How Bees ***Kill*** Mites
- How Mite **populations grow** in the colony
- What Beekeepers **need to know**
- How Beekeepers can ***successfully*** manage Varroa Mites

Know the Enemy well

Mite growth potential

- Mite numbers increase from 1 mite to 11 in 50 days
- One mite results in a population of 1456 mites in 150 days on worker brood
- The population would be 6000 mites in 150 days if they reproduced only in drone brood
- Two mites invading a colony per day can result in a growth of 1000 mites a month earlier.
- Invasion rates can be low in the spring, 1.6 to 13.7 mites per day in summer, 75 mites per day in the fall

Varroa Growth

- Varroa stay on adult bees between 5 to 11 days before entering an uncapped cell with larvae
- Mites can survive away from brood or bees for 2-3 days
- Mites are introduced to colonies by beekeepers exchanging equipment between hives, drifting of bees and bees robbing colonies weakened by varroa.
- Mites can only reproduce on honey bee brood
  - Enter cell with 5 day old larvae before cell is sealed

Varroa Growth

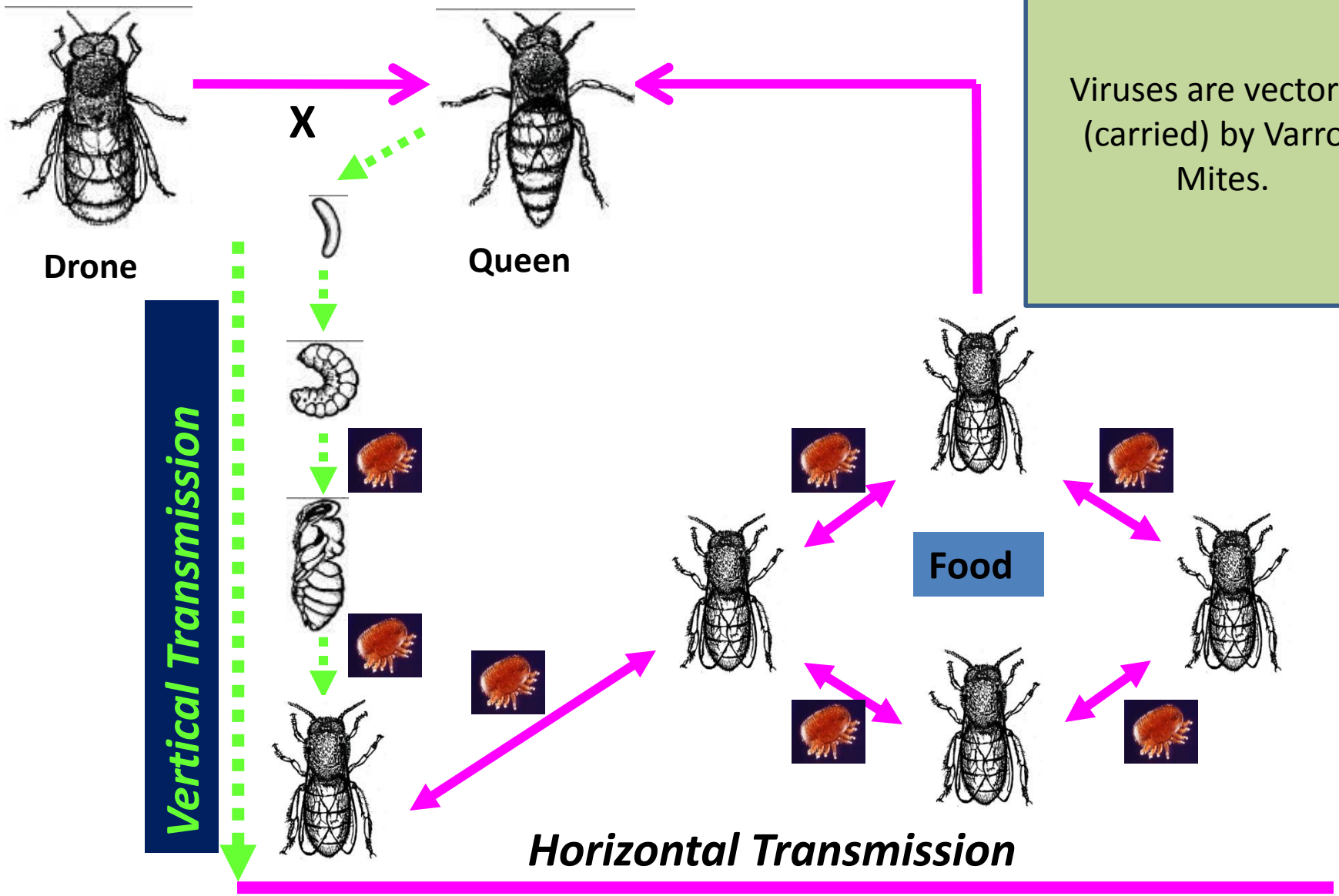
- Adult mites leave adult bees and invade worker brood cells 20 hours before they are capped or 40 hours in drone brood cells
- Drone cells are 6 to 12 times more likely to contain varroa than worker cells
- Usually 4-5 eggs are laid, 1st is a male, then 3-4 females
- The male mates with the females before the host bee emerges.
- Reproduction rate is ~1.3 in worker cells, 2.6 in drone cells

Phases of a Colonies Yearly Life Cycle

- Growth Phase
  - Brood nest established, linear growth if good nutrition
  - Overwintered colony or swarm
- Reproductive Phase
  - Swarming threshold is reached (hi bee population and food)
- Food Storage Phase
  - Main nectar flow, colony has plenty of honey and pollen
    Until nutrition becomes available again
- Conservation Mode – Ready for Fall
  - Bee population is reduced, egg laying is reduced
  - **HIGH MITE POPULATION – Viruses are growing on bees**

Effects of Varroa on the colony

- Mites feed directly on adult bees or the mother mite & her offspring feeding on bee larvae or capped pupa
- Effects of mites feeding on adult bees, larva & pupa
  - Reduces the bee's immune response, which in turn allow viruses to enter the bees body
  - Mites that bit bees with viruses will then retransmit viruses to other bees
  - Viruses are further spread by nurse bees to the larvae and the queen they feed
  - Viruses infections result in reduced survival of infected bees which causes the death of the colony



Transmission Pathways of Viruses in Honey Bees

Understanding Varroa Effects -Viruses-

- Effects on honey bee colonies
  - Results in a rapid reduction in number of adult bees in the colony
  - Low forager force (poor nutrition stores)
  - Abnormal brood (Parasitic Mite Syndrome)
  - Secondary infections - Nosema
  - Robbing of the colony
  - Infecting drones who then infect the queen while mating
  - Absconding of the bees (moving to other colonies)
- Local Feral colonies killed by mites

Effects on colony production

- Spring: Bees population will grow quicker than mite population and will produce a good honey crop
- Summer: Mite population rapidly grows, infecting larva and young bees (late summer bee population is decreasing).
- Fall: Infected bees and brood develop Parasitic Mite Syndrome, plus invasion of mites will prevent the colony to perform normal activities, the colony fails
- Winter: Colony is dead

Preventing field bee drifting

Preventing spread of diseases and viruses in bee yards

- Placement of hives within the Bee Yard
  - Different colors of hives
  - Hives several feet apart
  - Entrances different angles left or right

Why sample Colonies for Varroa

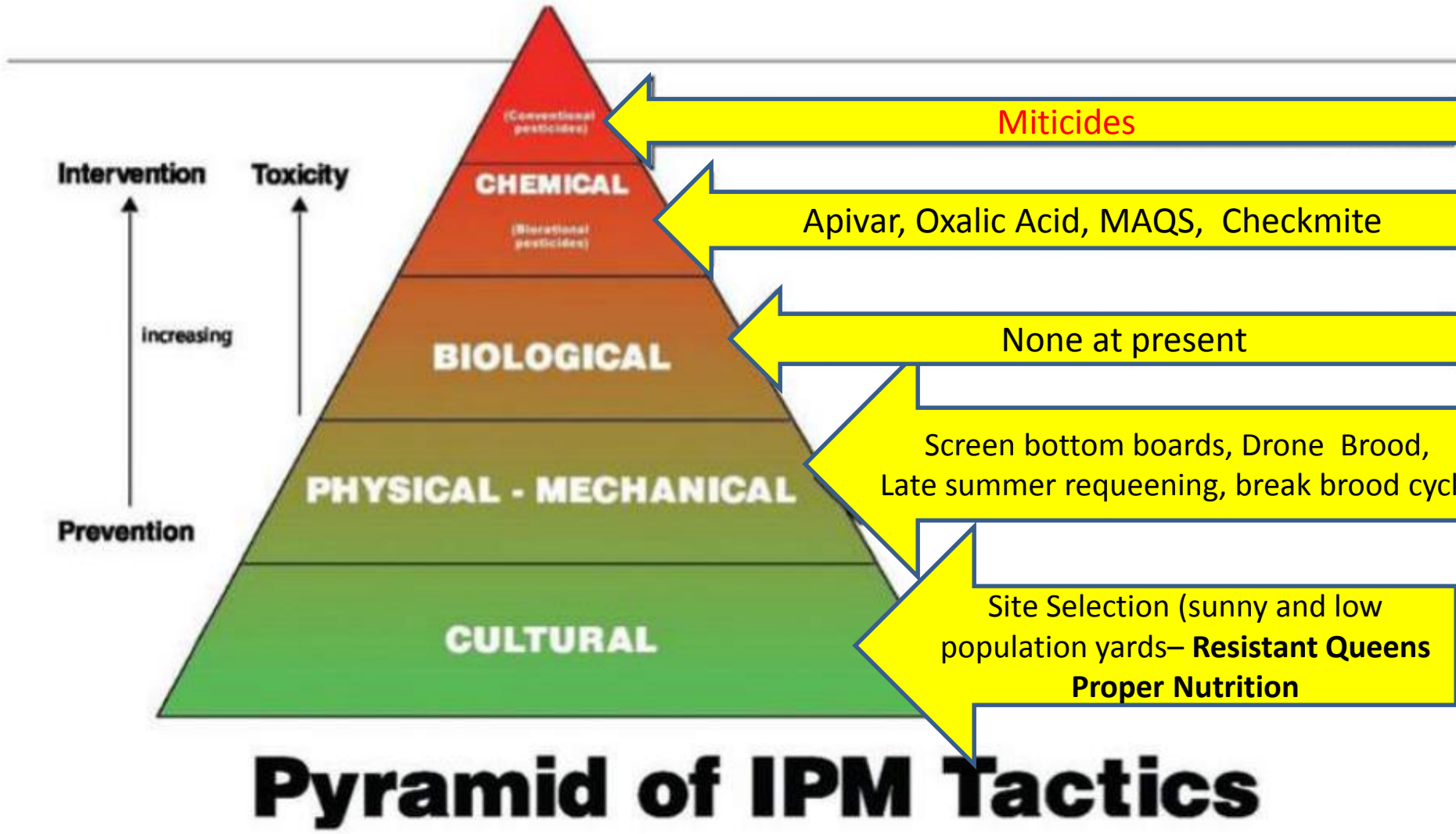
- Surveillance
  - April – July 1st-September 1st – Oct 15 to Nov 15
- When to treat for Varroa Mites (Thresholds)
- To determine the effectiveness of treatments
- To locate mite resistant strains of bees
  - Check mites for chewed legs with microscope
  - % of total mites on sticky board

INTEGRATED PEST MANAGEMENT (IPM)

- IPM systems have four components:
  - Beekeepers must be ***aware*** of potential diseases and pests and how to identify them
  - It is essential to ***monitor*** colony health and to record disease status
  - Determine the ***economic threshold***, the level at which a treatment is required to prevent the issue from reaching the economic injury level
  - Provide a ***solution*** once a problem is identified

Subject of another Presentation

Beekeeping
*I*ntegrated *P*est *M*anagement



Pyramid of IPM Tactics

Penn State University/M.A.R.E.C IPM pyramid for varroa control.

Virus Vector Management

- Use mite-resistant bee stock
- Begin the season with low mite counts <2 mites per hundred (2%)
- Regularly monitor mite levels
- Minimize drift
- Keep an eye on your neighbors bees.
  - Mite bombs?

Timing of Mite monitoring and treating

- April 1 Check level of mite population
- July 4 “
- August 15 “
- Sept 1 Treat if required
- Oct 1 Check level of mite population
- Nov 1 “
- Keep the mites down at a level of 1 to 2 per cent per hundred

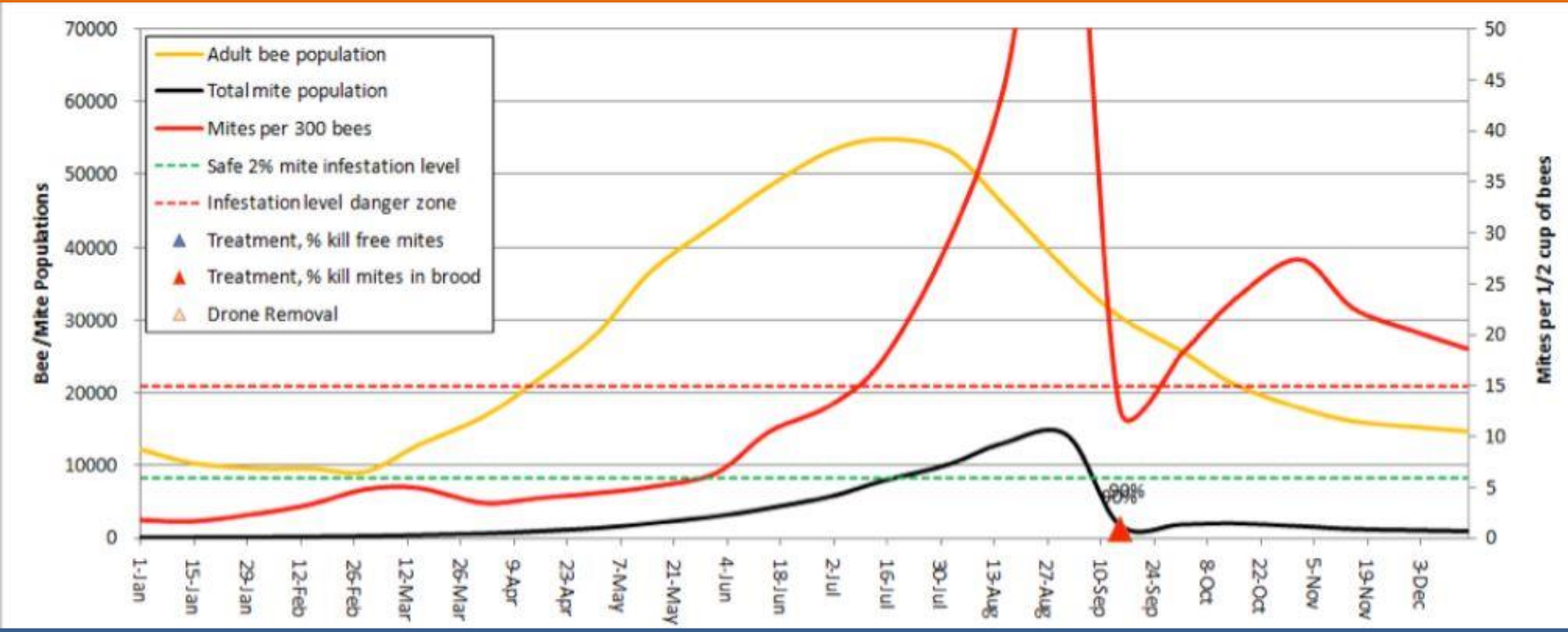
Projects To Do

- **Club Level**
  - Train and educate **EVERY Member about Mites**
  - Start monitoring and checking mites for chewing behavior
  - Honey Bee Community **Mite Bomb** Watch Program
  - Swarm Trap Project
  - Feral Colony Location Project
- Field Days for Nucs and Queens
  - Flip the gene pools to mite resistance stock

Projects To Do

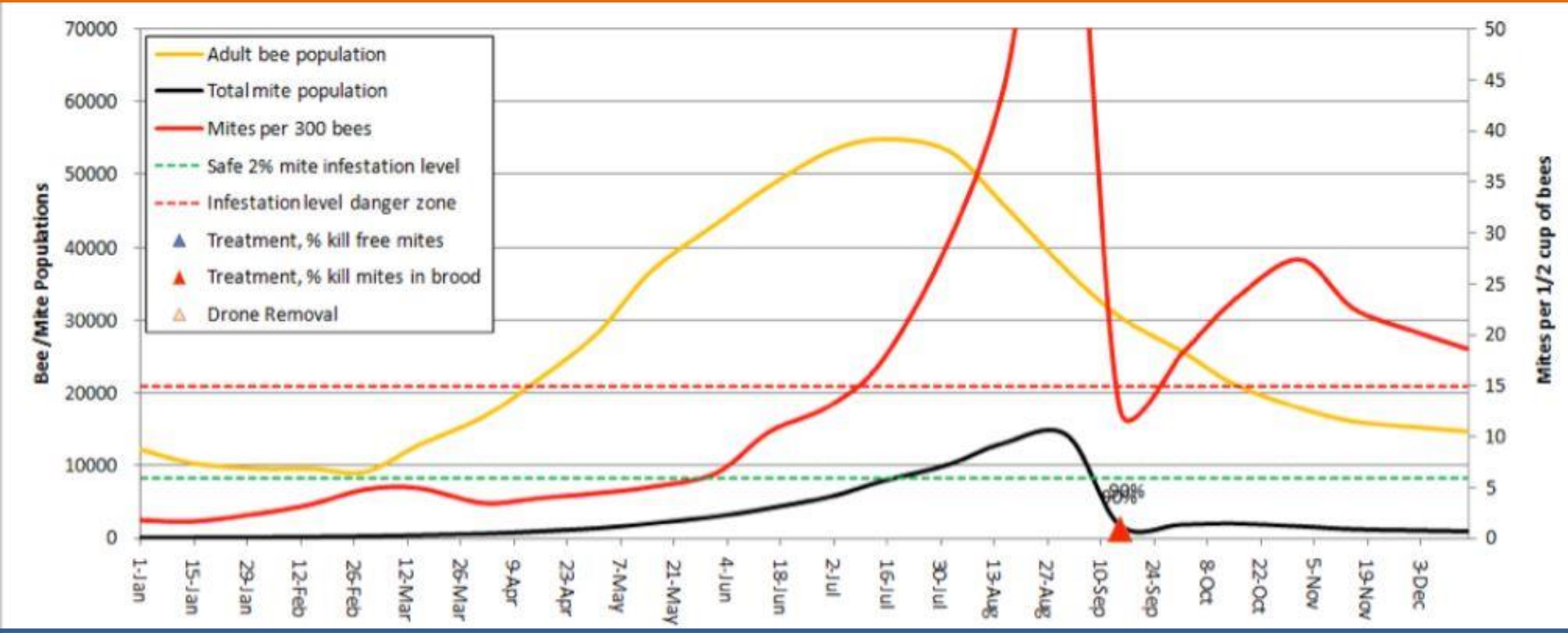
- **Beekeeper Level**
  - **Monitor** your colonies mites
  - Pollinator Nutrition
  - Locate your colonies is a safe area
  - Commit to read on subjects that will help save bees
  - Discover what is in your Honey Bee Gene Pool
    - Package bees southern or California – 2 mile radius
    - Feral colonies – swarm traps – swarms
    - Check for chewing behavior

Mite & Honey Bee Growth Graph – *ABJ Sept 2011 Randy Oliver*



1. May 21-Honey Bee population rapidly building, mite population starting to increase
2. June 18-Mites moving out of safe threshold, honey bee ~50,000 workers
3. July 2-Mites starting to cross danger threshold, honey bees at max population, flow over
4. July 30-Mites out of control, honey bee population starting to decrease, viruses invading, mite control required or colony doomed to die by Oct 1
5. Aug 20-Mite population has control of the honey bees, viruses out of control
6. Sept 15-Mite control applied
7. Sept 24-Mite population above danger threshold again due to migration of mites
8. Sept 25-Treat asap or lose colony, monitor mite population every 2 weeks & treat if required

Mite & Honey Bee Growth Graph – *ABJ Sept 2011 Randy Oliver*



When the colony becomes too weak to protect its self, the stronger colonies will rob the honey, at that time many mites will climb on the robbing workers and invade the strong colonies.

If the colony is strong enough and still has a laying queen, when the larvae are ~5 days old, 4 to 5 mites will invade each cell to try to reproduce, most will die in the cell.

At the same time the Yellow Jackets will remove all brood

The beekeeper will find a nearly empty colony the next time they inspect the colony