

Best Management Practices
(BMPs)
For
Beekeepers
Pollinating California's Agricultural Crops

Project Apis m.



Managed Pollinator CAP
Coordinated Agricultural Project

A National Research and Extension Initiative
to Reverse Pollinator Decline



Project Apis m. and the Managed Pollinator Coordinated Agricultural Project
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Best Management Practices for Nutrition

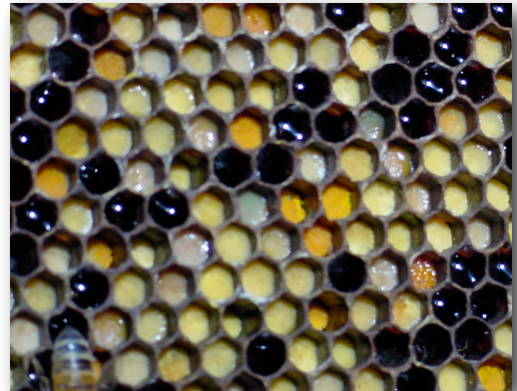
Honey bees require food as an energy source.

Why is nutrition important to Honey Bees?

Vigorous well-nourished colonies are able to withstand bee diseases and parasites better than poorly nourished colonies. Scientists have emphasized that malnutrition may be playing a key role in the decline of colonies due to Colony Collapse Disorder (CCD). Honey bees can suffer from a compromised immune system related to poor nutrition.

Natural Forage

- Healthy bees require a diversity of natural pollen.
- Placing bees on locations with abundant and diverse floral resources will help them stay healthy.
- Locations vary in their carrying capacity, and experience will suggest optimum densities.
- Placing too many bees in one location will result in inadequate floral resources, robbing, drifting and the spread of bee diseases and parasites.



Supplemental Feeding

- Forage can be limited in late summer and fall. When floral resources are inadequate, feeding bees sugar syrup and pollen substitutes can improve colony survival and performance.
- Supplemental feeding is critical to build bees for early almond pollination by Feb. 1st.
- Provide protein pollen patties.
- Pollen substitutes should have three (3) essential properties:
 - Consumable - honey bees should be readily able to eat and consume the supplemental feed;
 - Absorbable - honey bees should be able to digest and absorb the supplemental feed, and;
 - Nutritious - it should contain the necessary and vital ingredients for bee health.
- Place pollen patties between brood boxes or on top of hive frames.

- It is critical to provide supplemental feed when colonies arrive for almond pollination; dearth is a factor prior to and after bloom.

Water

- Provide plentiful and abundant water.
- Pesticides, fungicides and fertilizers may drift into water sources; locate colonies near accessible clean water.
- Drought causes honey bee stress. Work with your grower on identifying a potable water source for bees to avoid dehydration.



The Beekeeper's Goal

Provide bees a diversity of natural pollen.

When possible, locate natural forage for your bees.

Fall is a critical time to build bees for almond pollination.

Provide supplemental feed, especially protein, to build strong, 8-frame colonies by Feb. 1st.

Water is just as important as food; keep your bees well-hydrated with clean water.

Best Management Practices for Pest/Varroa Control

Controlling pests, particularly Varroa, is a critically important management practice.

Why is Varroa harmful to Honey Bees?

Varroa mites reduce individual bee and colony vigor by feeding on their haemolymph. In addition, they vector viruses and facilitate infection by other bee pathogens.

Manage for Varroa control

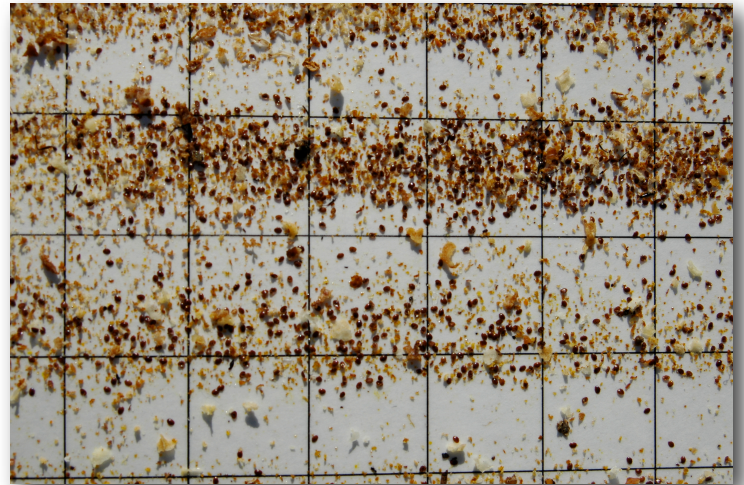
- Varroa control should be a primary activity in your beekeeping operation.
- Requeen with mite resistant stock. Using stock selected for resistance may aid in slowing down the growth of Varroa populations.

Do your colonies have Varroa mites?

- Monitoring is important, early detection is key.
- Check often, every 2-3 months.
- Conduct a random sampling of hives.
- Follow regional guidelines for action thresholds.

How to check for Varroa

- Sticky Boards for an accurate mite count
- Alcohol Wash
- Sugar/Ether Roll



How to treat for Varroa

- Use biotechnical methods to suppress mite populations if action is necessary when surplus honey is being produced.
- Drone brood removal
- Powdered sugar dusting
- Screened bottom boards

- If honey is not being produced, use thymol-based materials or organic acids.
- Exercise judicious treatment and soft chemicals.
- Follow the recommended label instructions.
- Rotate treatments to prevent resistance.
- Varroa mites have exhibited resistance to some varroacides in some regions. Check with your local cooperative extension office or apiary inspector to find out which varroacides are most effective in your area.
- Be aware that strong colonies in mid-summer can be highly infested with Varroa and even strong colonies can crash in population in late-summer and fall.

Are your treatments working?

- Recheck for efficacy; don't assume your treatments are working.
- Varroa is a community problem. Work with your beekeeper neighbors to be sure that all beekeepers are keeping Varroa at low levels.

Minimize toxin exposure

- Honey bees have a limited capacity to metabolize toxins, including beekeeper-applied varroacides, and some toxins can accumulate in beeswax combs.
- Be aware of crop pest control practices near your apiary; know the risks and have a plan for protecting colonies.
- Varroacides can tie up bees' detoxification capabilities and render them less able to deal with other varroacides and chemicals used on crops.
- Avoid treating bees with varroacides when they are likely to be exposed to crop pest control chemicals.
- Renew beeswax combs by replacing a few combs from each hive annually

The Beekeeper's Goal

A good management program pays close attention to mite levels.

Varroa can rebound quickly; watch your threshold levels closely.

Constant monitoring and timely treatment is critical for healthy hives.

Best Management Practices for Disease Control/*Nosema*

Evidence suggests that presence of Nosema is contributing to honey bee health problems.

Why is *Nosema* harmful to Honey Bees?

Scientists agree that *Nosema ceranae* is the most prevalent and economically damaging of the honey bee diseases. In serious cases of *Nosema*, the colony may eventually die.

Do your colonies have *Nosema*?

- It's important to monitor your bees for *Nosema* (*N. apis* and *N. ceranae*) - early detection is key - and treat to reduce levels if warranted.
- Monitor *Nosema* levels and colony condition.
- Check often, ideally monthly.
- Random sampling of hives

How to check for *Nosema*

- Collect live or fresh dead bees from the hive entrance or from top bars of the frames.
- On-site microscopic examination of honey bee gut for spore count.
- When levels exceed 1 million spores per bee, colonies can exhibit dwindling, but this will not always be the case.

How to treat for *Nosema*

- Chemical control with Fumagillin
 - Practice judicious treatment.
 - Follow proper preparation, storage and application.
- Hygiene
 - Clean comb
 - Clean or replace contaminated equipment.
- Nutrition
 - Good "Fall Flow" of natural or wild forage, proper nutrition eases stress.
 - Strong immune system = healthy bees.
- Treat based on your risk assessment and previous experience.

Are your treatments working?

- Recheck for efficacy
- Don't assume

The Beekeeper's Goal

Watch your *Nosema* levels; *Nosema* can appear quickly.

Be aware that *Nosema* in the presence of high mite levels can compromise colony health.

Constant monitoring and treatment are critical for healthy hives.

Best Management Practices for Hive Equipment

A well-maintained and hygienic apiary can translate into a successful beekeeping operation.

Why practice diligent hive maintenance?

Beekeepers agree that the most important piece of equipment in the apiary is the beehive, the home of the honey bee.

Hive Maintenance

- Proper maintenance extends the life of the hive.
 - Check apiary for hive condition.
 - Inspect for rotten, loose or broken boards and frames.
 - Reconstruct, tighten or replace frame parts.
 - Paint supers with light colors to beat summer heat.
 - Take advantage of the winter months to do maintenance and prepare for the new season.
- Check bee attire.
 - Repair clothes, veil, gloves and bodysuit.
- Inspect your essential two (2) pieces of equipment.
 - Smoker and the hive or "universal" tool
- Maintain yard equipment.
 - Inspect and repair trucks, trailers, loaders and forklifts.
 - Repair bunkhouses, if applicable.
 - Eliminate trash in the apiary.
 - Practice fire safety when the bee smoker is in use.

Hygiene

- Practice good hygiene with hands, gloves, and other equipment to reduce transmission of pathogens between colonies.
 - Replace comb with new foundation to minimize residual chemicals in old wax.
 - Develop a comb replacement schedule.
 - Purchase equipment only if it has a history of clean health.

Hive Security

- Be aware that the probability of hive theft has increased with the increased value of pollinating crops.
 - Keep equipment simple to identify.
 - ID hives with a brand or name.
 - Secure a signed contract when entering into a "wintering deal."
 - Practice discretion when showing where your yards are located.

The Beekeeper's Goal

Keep your equipment in good condition.

Good maintenance prolongs the life of hive parts, clothing, vehicles, and other equipment.

Good hygiene reduces the incidences of pests and diseases.

Hive security can minimize economic losses.

Best Management Practices for Colony Management

Successful beekeepers employ practices that are tested and proved to be profitable.

Exert you energy wisely

- Invest time, money and energy on your healthy colonies.

Practice judicious methods

- Maintain a reserve; don't commit all your colonies to contract.

Monitor colony strength

- Cull weak colonies.
- Use diagnostic services for objective colony assessment.
- Check frames of brood for intended strength to coincide with almond bloom.
- Be mindful of colony placement to minimize stress.
- Do not combine weak collapsing colonies with healthy colonies.



Managing Stock

- Maintain genetic quality to meet your objectives:
 - Maintain stocks that are productive and disease and pest resistant.
 - Encourage high drone densities to provide well-mated queens and genetically diverse colonies.
 - Discourage stocks that are excessively defensive.
 - Select stock by propagating colonies that prosper when other colonies exhibit symptoms of stress.
- Requeen colonies, at least annually.
- Package bees typically exhibit low Varroa and virus levels during the year following installation. Consider making colony increases by shaking package bees from your own colonies.

Water

- Consider water access when transporting colonies and when placing colonies in the orchard.

The Beekeeper's Goal

Work towards strong 8-frame colonies for almond pollination by Feb. 1st.

Invest your energy in the expectation of future returns and benefits.

Use discretion to avoid waste.

Employ genetics, diagnostic services and placement of hives to ensure healthy colonies.

Best Management Practices for Business Management

Beekeeping is an evolving profession.

Be professional in your beekeeper/grower interactions.

- Use a Contract (See a Sample Pollination Contract at <http://www.ProjectApism.org> under 'Downloads').
- Determine pollination fees that are realistic relative to your operation costs.
- Use well-maintained equipment.
- Be dependable with the timing of hive drops and pickups.
- Be visible to your growers.
- Develop contingency plans for the unexpected.

Be efficient

- Streamline your business to manage resources wisely.
- Keep good records to improve practices.

Keep learning

- Successful beekeeping is a rapidly changing art and science.
- Join local, state, regional and national organizations.
- Attend conferences.
- Access the internet, watch for reliable sources of information.
- Subscribe to bee journals.



- Regularly check the CAP project website for new information at <http://www.beeccdcap.uga.edu/index.html>.

Give back

- Beekeeping needs ideas and leadership to build a prosperous future.
- Mentor new and young beekeepers.
- Support and contribute to bee research to ensure a sustainable pollination industry.

Best Management Practices
(BMPs)
For
Almond Growers Renting Honey Bees

Best Management Practices for Almond Growers Renting Bees

Growers can help beekeepers in the pollination process of their crops.

Nutrition

- If possible, help your beekeeper locate flowering forage prior to and after almond bloom.
- Plant a cover crop on adjacent land:
 - At perimeter of orchard
 - Within younger orchards
 - On fallow land
- Good examples of alternative food resources are mustard, clover or vetch.

Water

- Water is important to prevent dehydration.
- Provide abundant and potable water, free from contamination.
- Landings and screens make water accessible and prevent bee drownings.

Access and Placement

- The distribution of colonies should be accessible and convenient at all times.
 - Beekeepers need to place, service and remove hives routinely.
- Orchard roads should be maintained and graded for easy access.
- Allow hive placement in areas not prone to flooding or shade.
- Eastern and southern exposures are better for sun and warmer temperatures and encourage bee flight for pollination.
- Let bees do their job, place hives as to limit human and honey bee interaction.

Agricultural Sprays

- Let your beekeeper know the agricultural products used for crop protection, including tank mixes.

Application and Timing

- Honey bees come in contact with agricultural sprays in different ways:

- Bees may fly through the spray.
 - Sprays may drift to hives via wind.
 - Bees may collect and bring into the hive pollen that contains chemical residue.
- Management practices to minimize contact are:
 - Spray when bees are not flying.
 - Spray when pollen is not being produced by the tree.
 - Time applications at night or when bees are not flying.

Communication

- Keep in contact with your beekeeper, especially prior to almond bloom.
- Inquire about supplemental feeding through the winter.
- Ask about colony collapses, Varroa infestations, honey crop, over-wintering.
- Location, transportation and other factors can positively or negatively affect the strength of the colonies.
- Negotiate rental fee, number of colonies per acre, frames of bees per colony, and payment schedule.
- Discuss timing of hive placement prior to bloom and pick up after bloom.

Pollination Contracts

- A signed contract protects both grower and beekeeper.
- Visit Downloads at <http://www.ProjectApism.org/> for a pollination contract template.
- Secure contracts early for the following season so beekeepers will make the investment in colony health and strength.
- When colonies arrive in the orchard, check colony strength; 8 to 10 frames is optimum.
- An objective third party inspection of colonies will confirm if contractual obligations have been met.
- Allow your beekeeper time and opportunity to provide additional colonies if needed.
- Walk your orchard during honey bee flight hours to make sure you see plenty of bee activity.