PMRF Establishing NEW HIVES to Protect Honey Bee Population & Minimize Interference with Base Activities

New Environmental Director's Entomology Skills Creating a Buzz

The new environmental director at the Pacific Missile Range Facility (PMRF) is building new hives to establish a healthy bee population on base, conduct associated diagnoses, and ultimately guard against the potentially adverse impacts of swarming events on base.

The Challenge

PMRF at Barking Sands, located on the western side of Kauai, Hawaii, is the world's leading multi-dimensional integrated test and training range. The installation simultaneously supports surface, subsurface, air and space operations. The installation is contained within a strip of land 7.5 miles long and one-half mile wide between the ocean and mountains.

Much of the land adjoining the installation is used for agriculture, which benefits from the area's generally warm and dry climate. This climate also contributes to numerous honey bee swarms. PMRF can see nine to 15 swarms during the year, with peak season occurring during the summer months.

Honey bee swarm hanging from a tree branch.

Hive damaged by small hive beetle larvae in the "slime" stage.
USDA

Deadly parasitic varroa mite on the back of a honey bee.
Scott Bauer

Bee swarms at PMRF, particularly near the air strip, typically have been managed as a pest concern for a number of reasons. First is bio-security. With aircraft coming in and out, there is potential for varroa mite (*Varroa destructor*) and other honey bee threats to be introduced. Varroa mite, a significant threat to all honey bee colonies, has not yet been detected on Kauai. Because PMRF is a small installation with limited staff, it does not support an animal and plant health inspection service.

Second, if swarms are not captured and put into hives, the bees can establish their colonies where they may pose problems for buildings and humans. If hives become established in buildings not only they can damage the structure but the bees could become defensive and sting people perceived as a threat to the colony.

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The first spring after John Nelson, PMRF's new environmental director, arrived he received a call about a swarm. While swarms were typically handled by PMRF's pest control officer, Nelson's entomology training fueled his interest in checking out the swarm. When a staff person from Hawaii's Department of Agriculture (HDOA) arrived to collect the swarm, he told Nelson that he would freeze the swarm to kill it and send samples to HDOA's Bee program to test for parasites.

The Purpose Behind This Effort

Nelson thought there might be another way to address the concerns while also protecting the beneficial and at-risk bee populations. He had been exposed to beekeeping as a child—his family had hives when he was growing up—and it felt like something he could do. He proposed

The Pacific Missile Range Facility.

establishing an apiary where swarms could be placed into hives, inspected for potential pests and protected, which is consistent with Federal guidance to protect honey bees and other pollinators.

Honey bees (*Apis mellifera*) contribute to an estimated $14.6 million in U.S. crop production, making them critical contributors to the country's food supply. Their populations are on the decline worldwide. A recent United Nations report estimated that 40 percent of invertebrate pollinators, including bees and butterflies, are facing extinction. (For a copy of the report, visit www.ipbes.net/article/press-release-pollinators-vital-our-food-supply-under-threat.) One of the more publicized honey bee concerns is colony collapse disorder (CCD) in which managed hives suffer from the rapid loss of adult worker bees. Although no single cause for CCD has been clearly identified, a number of issues have been suggested including susceptibility to threats from varroa mite, small hive beetle, bee brood diseases and pesticides, including neonicotinoids. Other important pollinators, such as bumblebees and butterflies, also are at risk.

Recognizing the seriousness of declining pollinator populations, President Barack Obama issued a Presidential Memorandum in 2014 to create a "Federal Strategy to Promote the Health of Honey Bees and Other Pollinators." The memorandum, noting the "breadth, severity, and persistence of pollinator losses," established the Federal Pollinator Health Task Force, co-chaired by the Secretary of Agriculture and the Administrator of the U.S. Environmental Protection Agency. The task force which included

Presidential Memorandum for a National Strategy on Honey Bee and Pollinator Health

President Barack Obama issued his Presidential Memorandum on 20 June 2014 to create the Federal Pollinator Health Task Force. He charged the Task Force with creating a "Federal Strategy to Promote the Health of Honey Bees and Other Pollinators." The Task Force is co-chaired by the Secretary of Agriculture and the Administrator of the U.S. Environmental Protection Agency. Selected documents associated with the President's Memorandum and resulting from the task force's work can be found at the following links:

Presidential Memorandum—Creating a Federal Strategy to Promote the Health of Honey Bees and Other Pollinators

- https://www.whitehouse.gov/the-press-office/2014/06/20/presidential-memorandum-creating-federal-strategy-promote-health-honey-b
- https://www.gpo.gov/fdsys/granule/FR-2014-06-24/2014-14946

National Strategy to Promote the Health of Honey Bees and Other Pollinators

- https://www.whitehouse.gov/sites/default/files/microsites/ostp/Pollinator%20Health%20Strategy%202015.pdf

The Department of Defense's Role in the National Strategy to Promote the Health of Honey Bees and Other Pollinators (2015)

- www.dodpollinators.org/Pollinator_Health_Strategy_2015_for_DoD.pdf

Pollinator Friendly Best Management Practices on Federal Lands

- www.fs.fed.us/wildflowers/pollinators/BMPs/documents/PollinatorFriendlyBMPsFederalLandsDRAFT05152015.pdf

LEFT: Swarm of bees on a swarm trap at PMRF.

ABOVE: Frame of recently transferred comb with honey, pollen, bee bread, open brood, and sealed brood present.

John Nelson

representatives of all Executive Branch departments, including Department of Defense, and other key federal government offices, was charged with crafting the federal strategy.

In addition to research into the causes of population declines and public education efforts to detail ways that citizens could support pollinators, the strategy specifies steps to be taken on federal facilities. It provides federal facility managers with needed information to "promote the overall lifecycle of pollinators at Federal facilities—improved foraging, reproduction, shelter, and hibernation." (See the addendum to *Sustainable Practices for Designed Landscape* guidance, 2014, page 6.)

What PMRF is Doing

Establishing hives requires equipment, including hive structures and beekeeping suits. Nelson saw two primary ways to get hives structures—buy them online and have them shipped (prohibitively expensive to Hawaii) or build them. Nelson reached out to the local community and found woodworkers, including the pest control contractor at PMRF, willing to help. Not only did the pest control contractor have beekeeping experience, but he also was a woodworker. The team started building and completed the first Langstroth hives in summer 2015. (See our "Langstroth Hives" sidebar for more information.)

Nelson has created two apiaries (placed hives) by capturing swarms before they established colonies. The apiaries are at two locations on the installation, one at the north end and the other at the south end. These locations have been carefully selected to avoid more populated and frequented areas of the base. In addition, he has placed several swarm traps around the base near buildings and other locations where swarms might try to establish a new colony. The traps are large, bucket-

Beekeeper (Randy Nakama, Manu Kai) observing the reminder of bees from a swarm trap make their way into a newly established hive.

John Nelson

The traps might help to prevent potential conflicts from a colony becoming established in buildings or near the air strip.

LEFT: Newly established PMRF bee hive (brood box) after transferring a swarm of feral bees.

ABOVE: Frame of recently transferred comb with honey, pollen, bee bread, open brood, and sealed brood present.

John Nelson

size containers that include a lure. When a swarm gets into a trap, Nelson and his team can move the swarm to one of the constructed hives. While there is no guarantee that the swarms will only go to these traps, they make it easier to capture the swarms. The traps might help to prevent potential conflicts from a colony becoming established in buildings, near more populated parts of the base or near the air strip. The team is prepared to establish ten hives during the 2016 season.

While established colonies sometimes can be moved, one of Nelson's early experiences demonstrated potential problems. A colony discovered underneath a temporary building was near the building entrance and needed to be removed. The team attempted to move the colony by transferring the layers of comb into Langstroth hive frames. While such a transfer can be done successfully under good conditions, this one did not proceed as hoped. As the ambient temperature rose, the wax of the brood and honey combs began to soften and the combs were falling apart. During the process some parts of the combs overlapped, making the colony vulnerable to small hive beetle attack. Ultimately, after the colony was moved into a hive, the hive beetles overwhelmed the hive and it failed.

Although that colony did not succeed, some of the collapsed combs from that relocation effort were full of kiawe honey—known to be light and flavorful. The honey filled several jars and provided a vehicle for generating added interest for the apiary effort.

To give the other new hive colonies a "leg up" Nelson provided sugar water during times that nectar was not readily available. In a fashion similar to hummingbird feeders, supplementing nectar sources with sugar water can help to establish and support healthy hives. Healthy hives are better able to withstand and control the inevitable

Langstroth Hives

John Nelson is using Langstroth hives for the PMRF apiary. Of the three types of hives currently popular with beekeepers, the Langstroth is probably the one most people recognize. Patented in 1852 and developed by Lorenzo Langstroth, the hive is composed of stackable boxes with frames. The larger brood box holds ten deeper frames where the queen starts laying her brood and worker bees draw comb (wax). The smaller boxes placed over the brood box are called "supers" or "honey supers" where worker bees store excess honey.

John Nelson

The first PMRF hive has a full brood box and the bees are starting to draw wax and store honey in the first super box. In the other successful hive, the bees are still building out the brood box.

LEFT: Queen bee surrounded by ring of attendant workers. This only happens when the queen is at rest.

ABOVE: Frame of brood comb with open and sealed brood present.

John Nelson

presence of some small hive beetles. During the spring, with the abundance of kiawe *(Prosopis pallida*, a type of mesquite) on PMRF, the hives have a significant nectar source during its flowering period.

The initial hives were inspected, sampled and approved by the state apiarist (beekeeper). PMRF will continue to work with the state, providing bee, pollen and wax samples that can be tested for possible parasites and pesticide loads, and bee tissue for genetic testing. These hives could become sentinel hives, providing timely valuable information about the colonies' health and potential threats to honey bee populations on Kauai, as well as provide insights into which strains of bees are present and succeeding. (For more on honey bee strains, see our "Honey Bee Basics" sidebar.) This cooperation might be able to contribute data to research on colony collapse disorder.

Public Outreach & Education

The PMRF bee project offers numerous education and outreach opportunities. Public education efforts, both on base and off, can help people to:

- Understand the critical role honey bees and other pollinators play.
- Learn more about the precipitous declines in honey bee and pollinator populations.
- Become more aware of ways to support pollinators.
- Recognize that honey bees are generally non-aggressive.
- Distinguish between honey bees and more worrisome wasps (also common at PMRF).

Understanding more about bee swarms—why swarms occur, what they look like and what people can do when they see a swarm—is a valuable first step. Swarms happen when a queen bee and about one-third to one-half of the workers leave to establish a new colony. In the existing hive a new queen will emerge. The departing worker bees surround the queen to protect her while other bees scout out a location to establish a new hive. Often swarms are seen on tree branches, on fences or under building eaves. When bee traps are set with lure, the bees might swarm on the trap.

Important things to keep in mind when finding a swarm:

- Swarming bees typically are not defensive and do not pose a threat.
- Do not disturb the swarm.
- Do not spray or try to kill the bees.
- Call a beekeeper. They are eager to capture swarms and know how to do it safely.

At PMRF, anyone sighting a swarm can contact the Environmental Division and Nelson and his team will capture the swarm.

In addition to working with HDOS's bee program, Nelson coordinates with other beekeepers, environmental groups and local schools on the island. He is an active member of the Kauai Beekeeper Association and the local community college's apiary

This is not rocket science. With a little research, anyone can take up beekeeping.

—John Nelson

program. Some of the goals of these connections include:

- Advancing honey bee awareness and advocacy on the island of Kauai.
- Improving collaboration on bee-related issues.
- Assisting, educating and sharing with fellow beekeepers.
- Promoting beekeeping by creating a positive image of honey bees, beekeeping, and bee products.

Nelson also believes making these efforts is consistent with PMRF's commitment to being a good neighbor on Kauai and to implementing the full spirit of Executive Order 13352, "Facilitation of Cooperative Conservation."

Looking forward, Nelson hopes to establish a demonstration "bee yard." This would provide a safe setting in which people could get close to the hives, learn more about the bees and beekeeping. It is exciting for people to hold a frame of bees, see the eggs and developing larvae, and see the queen. It helps to demystify the hive and makes the bees a little less scary. Eventually Nelson hopes to expand the project to provide more hands-on education on base and to support environmental education in nearby schools.

Nelson also would like to expand his efforts to providing direct support for other pollinators, particularly native pollinators. Hawaii's only native bee (*Hylaeus*), commonly known as the yellow-faced bee, also has been in decline due in part to habitat loss These are species of solitary bees (meaning they do not establish colonies like the honey bee) and important pollinators for native Hawaiian plants. Planting native species on base could support these and other native pollinators, including butterflies and birds.

Conclusions

With the increasing attention to the plight of honey bees and other pollinators, Navy environmental managers who haven't done so already can anticipate adding pollinator protection plans to their Integrated Natural Resources Management Plans. In locations that need to respond to honey bee swarms, establishing swarm traps and being prepared to capture and transfer swarms into hives is a win-win for the installation and for the honey bees. Managing honey bees this way provides a unique channel for public outreach. This is one more way the Navy can demonstrate its stewardship of the land and natural resources on installation.

While Nelson might be an entomologist, he is quick to note, "This is not rocket science. With a little research, anyone can take up beekeeping."

John Nelson with a smoker preparing to inspect a hive.
Randy Nakama

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The Basics About Honey Bees

There are over 20,000 types of bees world-wide. The most commonly known is the European or western honey bees are *Apis mellifera* (Apis: bee; mellifera: honey-bearing). They are social and establish colonies that include a queen, a limited number of male drones and female workers, each with specific responsibilities within the colony. The queen is the only bee within the colony that can lay eggs. She only leaves the hive to mate with drones or to establish a new colony. Workers forage for nectar and tend and build the hive.

Rob Flynn

Within the *Apis mellifera* species are various strains or subspecies with different characteristics beekeepers sometimes consider when establishing managed hives. There are German or "black" bees (*A. m. mellifera*), one of the first honey bees brought to the United States, are a more defensive strain; Italian honey bees (*A. m. ligustica*), are good honey producers and docile; Carniolan bee (*A. m. carnica*), are particularly docile but quick to swarm; Caucasian bees (*A. m. caucasica*) from the Ural mountain foothills are another more defensive strain.

The PMRF honey bees are from feral swarms and their genetics are not currently known.