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BEFORE THE
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NATURAL RESOURCES COMMITTEE
SUBCOMMITTEE ON FISHERIES, WILDLIFE, AND OCEANS

OVERSIGHT HEARING—THE BIRDS AND THE BEES:
HOW POLLINATORS HELP MAINTAIN HEALTHY ECOSYSTEMS
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Madam Chairwoman, Ranking Member Brown, and Members of the Subcommittee, I am Kevin Hackett, National Program Leader for Bees and Pollination of the Agricultural Research Service (ARS). I am here today speaking as a representative of the United States Department of Agriculture (USDA) and, primarily, on behalf of research conducted by ARS and our sister agency, the Cooperative State Research, Education, and Extension Service (CSREES). ARS is the primary intramural science research agency of USDA, operating a network of over 100 research laboratories across the nation on all aspects of agricultural science. CSREES is the primary extramural research agency of USDA and the Federal partner for the Cooperative Extension System. CSREES maintains wide ranging partnerships with over 130 colleges of agriculture, 77 agricultural experiment stations, and 75 cooperative extension services. Other Departmental agencies have primary responsibility for conserving pollinators through public lands management.

Thank you for the opportunity to appear before the Subcommittee today to present testimony about the roles bees play in pollination and maintaining healthy ecosystems, and, specifically, USDA efforts to address the problem of colony collapse disorder, known as CCD. Please note that my comments will focus primarily on the causes of CCD in managed honey bees, and I understand that Dr. Mamie Parker, from the Department of the Interior, will focus her remarks on the decline of wild, native pollinator species. CCD and native bee declines likely have different causes.

VALUE OF POLLINATION

As a natural resource, pollinators are as essential to the reproduction of most wild and crop plants as soil is to the growth of those plants. Bees and other pollinators play a critical role in the pollination process for a variety of crops that reproduce sexually; when visiting plants in search of nectar or pollen to feed their colony, they carry pollen from flower to flower and thus allow the plants to reproduce.

As stated in the 2007 National Academy of Sciences report "Status of Pollinators in North America," pollinators are critical to almost three-quarters of the estimated quarter million species of flowering plants on the planet. In total, honey bee pollination alone is responsible for $15 billion in added crop value, particularly for specialty crops such as almonds and other nuts, fruits such as apples and pears, berries, and vitamin and mineral-rich vegetables. One of every three bites of food is dependent on pollinators. The California almond crop in itself requires 1.3 million colonies of bees, a need that is projected to grow significantly by 2010.

COLONY COLLAPSE DISORDER (CCD)

However, pollination and the many growers dependent on honey bees for pollination are facing a significant threat from the phenomenon known as CCD. First reported in October of 2006, CCD is characterized by the sudden disappearance of all but a few bees from a colony's population and has no recognizable underlying cause. Because wild, native bee populations have not been monitored to any significant extent, we do not know if there is any similar syndrome in native pollinators. Beekeepers have reported unexplained losses of 30 to 90 percent. Due to CCD, the bee industry is facing great difficulty meeting the demand of almond producers. If researchers are unable to solve the problem, and beekeepers are unable to meet demand for this and other crops, agriculture will be significantly impacted.

CCD Working Group Formation

In response, USDA, partnering with university and industry stakeholders, formed a CCD working group and steering committee which have been very active since the fall of 2006. They have been assessing the nature and extent of the problem and identifying possible causes. At a major workshop in April involving over 80 Federal and university scientists and bee industry and grower representatives, knowledge gaps and research priorities were identified. Accordingly, a comprehensive action plan to address the problem has been developed which is now undergoing agency clearance.

Plausible Causes/Theories of CCD

Surveys and analysis to date indicates that there are a few common factors shared by beekeepers experiencing CCD. Many of these beekeepers indicated that their colonies were under some sort of stress at least two months before the first incident. In support of this theory, the high numbers of infectious agents detected in adult CCD bees indicates that the immune systems of bees are becoming suppressed. At present, the top four suspected causes of stress on bees include the varroa mite, various pathogens, pesticides, and migratory stress.

The number one suspect is the varroa mite, which has been linked to serious colony decline for the past few years. It is possible that by directly feeding on bee brood and transmitting pathogenic bee viruses, varroa mites are playing a major role in CCD. Therefore, the mite is almost certainly contributing to increased stress on bees.

Another group of possible CCD-related stressors are various pathogens, such as new viruses, spiroplasmas (bacteria without cell walls that are often parasitic in plants and arthropods), fungi, and others, that may be either killing bees directly or compromising their immune systems. *Nosema ceranae*, a microsporidian that causes diarrhea in bees, is suspected as a cause of CCD in Spain, and is present in the U.S. Bee viruses can cause brain pathologies in bees. Organisms

that infect the bee brain might cause brain damage that would make it hard for the bees to communicate the location of food or water sources or to find their hive after foraging.

Migratory stress is another stressor that may contribute to CCD; migration has increased due to increased demands on beekeepers for colonies for almond pollination, resulting in bee crowding and lack of hygiene. It is common for 10 percent of colonies to die after transportation, with losses of 30 percent possible after the pollination of some crops.

Finally, many pesticides are toxic to bees. Based on findings from the bee genome, it has become apparent that bees have very weak detoxifying systems for breaking down pesticides. Applications of some miticides (*i.e.*, pesticides used for controlling mites such as varroa) can accumulate in hive wax, reducing worker longevity. And some insecticides have been shown to impair neurological function in bees and prevent them from finding their way back to the hive. In addition, even if not lethal to bees, some pesticides may increase the stress levels of bees, making colonies more susceptible to disease.

PLAN OF ACTION

The current strategy for addressing the CCD crisis involves four main components: 1) survey and data collection; 2) analysis of samples; 3) hypothesis-driven research; and, 4) mitigation and preventative action.

Survey and Data Collection

Despite the existence of several surveys for both honey production and bee health, these surveys are either limited in scope, fundamentally flawed, or otherwise unable to provide an accurate picture of bee numbers or products (honey and pollination services). New surveys are needed to determine the extent of CCD in the United States and the current status of honey bee colony production and health. Similar surveys are needed to determine the status of the 3,500 North American species of wild, native bees, and the ecosystem services that they provide.

Analysis of Samples

Researchers have collected and are analyzing bee samples collected. These and other analyses will help researchers determine the exposure of worker bees to various toxins and pests and pathogens and potentially to identify any new pathogens. Various Federal agencies, universities, and private institutions will continue to expand on this work, with the goal of identifying and characterizing pathogens, pests, and pesticides or environmental contaminants that may be associated with CCD.

Hypothesis-Driven Research

The largest component of this Plan is research. Scientists have identified four categories of candidate factors based on the most reliable information available concerning what impacts bee health and on recent analysis of affected bees: 1) new or re-emerging pathogens; 2) bee pests; 3) environmental and nutritional stresses; and 4) pesticides. Research will focus on determining whether these candidate factors, or specific stressors within these categories, are contributing causes of CCD, either individually, in combination, or synergistically.

Mitigative and Preventative Measures

Since little is known about the cause(s) of CCD, mitigation, at present, must be based on improving bee health and habitat and countering known mortality factors. Goals identified under this topic include: developing general best management practices for honey bees and non-*Apis* bees; developing strategies to maintain bees with resistance to parasites and pathogens; improving the regulatory framework for better protection against pathogens, pests, and parasites; developing an Areawide Program to improve honey bee colony health; and developing Web-based sites for the dissemination of science-based information on bee health and CCD.

OTHER POLLINATORS

Madam Chairwoman, I will end by pointing out that USDA also has a major program in developing other pollinators for use on crops. These pollinators include the alfalfa leafcutting bee and the native alkali bee for pollination of alfalfa, the native blue orchard bee for pollination of tree crops such as almond and cherry, and native bumble bees for pollination of greenhouse crops such as tomatoes.

Also, in support of ecosystem-level pollinator programs, ARS maintains the Bee Systematics Collection at Logan, Utah, the premier bee collection in the world.

Finally, USDA is dedicated to supporting efforts to restore wildlands. For example, USDA agencies are working with Department of the Interior agencies in developing native pollinators and honey bees to produce wildflower seed for use in restoring burn areas.

And, in the area of biodiversity, agencies are monitoring native bee populations in Yosemite National Park, Grand Staircase-Escalante National Monument, and Grand Canyon National Park, and in cooperation with counties such as Clark County around Las Vegas. During these surveys, scientists gather host plant and habitat information useful in developing restoration plans. This type of information is also being used to augment pollinator habitat at the margins of farmland. Of interest to both beekeepers and to those studying wild bee populations is whether introduced pathogens are causing decline of native pollinators.

Madam Chairwoman, the USDA, in collaboration with other Federal agencies and private institutions, conducts and funds much ongoing research that addresses pollinators. We will continue to work to improve bee health and prevent disorders such as colony collapse, to develop other pollinators for use on crops, and to monitor and protect native bee populations. These efforts will be critical to safeguarding agriculture and ecosystem resources. We thank you for the opportunity to share our research with you. Madam Chairwoman, this concludes my remarks. I would be pleased to answer any questions at this time.