

# RESEARCH PROPOSAL

Gene DeBons

## **Rationale for conducting this research**

The population of known honey bees (“social bees”) have been declining in recent years. “In just the last ten years, over 40% of the bee colonies in the US have suffered Colony Collapse Disorder (CCD). Social bees have been the primary pollinators of approximately ninety-one varieties of vital agricultural products vital to the food chain such as fruits and vegetables and a primary source of honey to markets around the world” (retrieved from [www.honeylove.org/list-of-food](http://www.honeylove.org/list-of-food) on 1.24.2018). As stated by M. Dagterom (2016), “if you are a gardener you may have noticed a decline in your fruit production. In North America, during the late 1990’s and until recently, in many city and suburban gardens, fewer bees mean smaller fruit.” To mitigate the impact on product yield and quality, the introduction of Mason (genus *Osmia*) and Leafcutter (genera *Chalicodoma* and *Megachile*) bees have been introduced commercially to the pollination process. They are considered to be (“solitary bees”) and “gentle bees” as they are not aggressive and do not swarm or sting. The leafcutter bee is described as “this non-aggressive bee can do the work of 20 honey bees, for a 1:20 ratio”, according to the ARS Bee Biology and Systematics Laboratory (retrieved from [www.prweb.com](http://www.prweb.com) on 4.27.2017). While much research has been conducted with honey bees, there is minimal research on solitary bees, particularly with regard to the southwest states of America. The purpose of this proposal is to conduct a multi-season study of solitary bee habitats, diversity, and population in controlled Arizona state environments.

## **Who may benefit from the data and outcome of this study?**

- Farmers and growers in Arizona (Arizona is ranked 5<sup>th</sup> nationally in production of vegetables and melons)
- Researchers, and students of the Aprian field of study who may be unfamiliar with or who are currently studying southwest desert bee species
- Master gardener groups
- Businesses invested in increasing the population of solitary bees for sustainability and increase of crop production and quality

## **Where will the study be conducted and why these sites were specifically chosen?**

Two locations in the Sonoran Desert of Arizona:

- Riparian Preserve Park, Gilbert, Arizona ([www.gilbertaz.gov/riparian](http://www.gilbertaz.gov/riparian))
  - Based on the Gilbert Riparian Hiking Map (**Exhibit A**), and pictures of observation sites provided, five possible observation and data collection sites have been identified as

most likely to obtain best results from the study. Each site has the habitat and environmental components for the species to be sustained and studied, habitat locations, abundant water and flowering foliage. But more locations may be identified and recommended:

- “Bee Garden”
- Hummingbird Garden”
- “Honey Bee Point”
- “Dragonfly Ramada”
- Butterfly Breeze Way”
- Val Vista Lakes floral park (**Exhibit B**)
  - Extensive and well maintained rose garden

## Methodology

- Gene DeBons will conduct the study and data collection in collaboration with the Town of Gilbert staff.
- The primary study methodology will be visual observation of bee activity and habitat. Each species can share the same nesting habitat. To distinguish the diversity between the two species each has its own nesting identifiers. Mason bees use mud to construct and maintain each nest. Leafcutter bees use mutilated foliage.
- The rationale for location and timing of this study to begin in the spring:
  - Mason bees emerge and pollinate in early spring based on their life-cycle. They need a sustainable water source to gather mud
  - Leafcutter bees emerge and pollinate in the summer based on their life-cycle. They need a diverse and abundant plant source
- Three models of housing nests will be used (**Exhibit C**). Each nesting house has its own unique design and features supporting both Mason and Leafcutter bee habitat.
- For educational and awareness purpose--accompanying laminated posters describing each bee species (Mason and Leafcutter) known habitats, behavior and life cycles will be attached to each house for guests of the park to see and learn from (**Exhibit D**)

## What outcomes are expected?

- Verifiable data collection methods and analytics of Sonoran Desert native bee behavior, ideal habitats and population sustainability
- At the end of each season data will be shared with the Gilbert staff, and Orchard Bee Association (OBA) members, farmers and farm associations to assess:
  - Diversity of bee species in an extensive and diverse Sonoran Desert controlled habitat
  - Number and type of bee species in each collection house
  - Data on types of sustainability issues of the species (i.e. predators, disease, climate, etc.)
  - Future impact on crop yield and quality