# UIS Green Project Letter of Intent- Fall 2019

**Project Name: Native Bees for UIS**

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My project is to place native bee "hotels" around the UIS campus. Most people are familiar with honeybees and bumblebees but not our native bees. Our native bees are incredible pollinators, pollinating many of our food crops and native plants alike but they are in serious danger of going extinct (Pearson, 2018). To help our native bees many people have begun setting out wooden structures called bee hotels for the bees. Native bees are remarkably non-aggressive and will only sting if handled roughly (Honeybee Conservancy A, 2017). Stings are very mild even when they do occur (Pavlis, n.d). The bee "hotels" are small wooden structures filled with wood or bamboo tubes of varying sizes facing outward that native bees nest inside of. These hotels will be placed in miniature bee gardens in out of the way areas around campus. These bee gardens will include pansies, bee balm, chives, borage, and native flowers to support the bees throughout the year (Honeybee Conservancy B, 2017).

These bees will benefit the campus by pollinating our gardens around college grounds and enriching the environment outside of the campus. The bees will also provide learning opportunities for students and potential lab or lecture material for faculty. I believe three bee hotels around campus will be sufficient, though more would be optimal if possible. Each bee hotel should have a small educational sign telling passerby's that the bees are not dangerous and how the bees are good for the environment but are actually in danger of extinction.

I love native bees. They come in so many, shapes, sizes, and colors, that they are an incredible example of what diversity within a single scientific family (Apidae) can look like. Native bees are disappearing though. Native bees are more sensitive to pesticides and habitat loss than the more famous honeybee and even though the decline of the honeybee in North America has become a rallying cry for conservationists, native bees are far more important to our ecosystems and they are in much more danger. Native bees pollinate a wider variety of plants than honeybees do and different species are more specialized than the generalist honeybee allowing them to pollinate more flowers per bee by comparison. Native bees are critical to ecological sustainability because they help prevent ecological homogenization by pollinating native plants that honeybees cannot, helping preserve native plant populations (Pearson, 2018).

The majority of native bees do not sting unless handled directly but to avoid any potential discomfort to students and faculty the bee hotels will be located in low traffic areas. The areas I believe will work best are on the edge of the UIS woods, between the prairie restoration and the community garden, by the old Sangamon State columns, by the new gardens by lot C, and near the UIS sign at the intersection of 11th Street and Ernest Hemingway Drive. The hives can be placed nearly anywhere as long as they face southeast and have a small overhang to protect it from rain (Brokaw and Isaacs, 2017).

Having native bees on campus offers the opportunity for biology and ecology classes to examine a variety of native species and learn more about the diversity of the natural world around us. Environmental Studies classes can use the hives as props for outdoor lectures on the economic value of native pollinators as an ecosystem service. Botany classes can also use the hives as the centerpiece of lectures on how different species pollinate flowers that bloom at different times of the year and how essential that is to the ecosystem. As the hives need to have the larva removed for safe storage over the winter. Brood can be stored in any cool and dry place over the winter, even in a wooden shed outdoors. The biology greenhouse would be a suitable location as well if space is available. Official approval for storage in the biology greenhouse is currently pending. The Biology Club is currently considering taking care of the brood removal and storage and I have been informed that they are likely to agree. Brood removal is to protect the insects from predators, as they can survive the winter temperatures as long as they are not encased in ice (Honeybee Conservancy A. 2017). This exercise presents an opportunity for either a biology lab on measuring the amount of brood and diversity of bee species using the hives, or for student STARS projects on the same topic.

To establish the hotels in a timely manner, post holes will need to be dug in early spring or as soon as possible, posts for the hives must be erected in the same time period. Hives will be placed in late March or early April, just before the earliest bees become active (Brokaw and Isaacs, 2017). Early blooming plants such as pansies and snowdrops will need to be purchased and planted around the post to ensure the bees are fully supported in the first season (Honeybee Conservancy B, 2017). The document *Building and Managing Bee Hotels for Wild Bees* by the Michigan State University Extension shows how to set up and maintain the hives.

I have estimated the costs of the bee hotels however I could not determine the costs of labor and certain materials. Three hotels will cost a total of $65.85 at $21.95 apiece from Gardeners Supply Company (https://www.gardeners.com/buy/mason-bee-house/37-481.html?irecsclick). This is the best deal I found as many either greatly overcharge for what the hotel is worth or the hives are of inferior design, being either too large for sanitation or the materials were useless for the native bees. The website did not calculate shipping on incomplete orders so I was unable to determine the shipping cost, but the website does offer free shipping on orders over $100. I was also unable to certify the cost of the three sturdy four-foot wooden poles but in my own experience they are rarely expensive. I expect they will cost less than $40. Plant prices vary seasonally but a plant budget of $200 or less is likely to be sufficient. If reseeding plants such as borage or thistle are used then they will not need to be repurchased. The price calculator for thesignexpert.com estimates three 11”x14” signs with up to eight colors will cost $20.96 without shipping or installation costs (https://thesignexpert.com/sign-pricing-calculators/), though a different retailer may need to be located. Estimates from signs.com are comparable (https://www.signs.com/). I expect three small aluminum printed signs will cost $70 or less. Neither sign retailer website calculated shipping costs on incomplete orders. In total, I expect the full beehotel project to cost roughly $375. I expect these costs to be lower if we use in-house labor and ask for material donations from retailers. The cost of plants in particular is a generous estimate.

The success of the hotels can be qualitatively evaluated by the appearance and abundance of wild bee species on and around the campus grounds. We can also observe an increase in the health and abundance of campus flower gardens and an increase in yields in the community garden. We can quantitatively measure the success of the hotels by observing the number of reeds closed up with mud or leaves, as well as counting the brood when the hives are stored for the winter.

There are a few universities have bee related facilities on campus. Dickinson College in Carlisle Pennsylvania has honeybee hives on campus, and Lewis & Clark College in Portland Oregon has a beekeeping club (O'Reilly, 2018). The only college I could find advertising any kind of action for native bees however, is the University of North Carolina in Asheville that has a dedicated pollinator garden an a giant bee hotel. Unfortunately, their bee hotel is made for show and not for use as it hosts some useless materials and is too large for proper sanitation because the large size spreads parasites and disease too easily (Schipani, 2018). Our native bee hotels may be a novel effort.

A study evaluated the benefits of native pollinators and one measuring the effectiveness of bee native hotels provide information relevant to my proposal.
*Wild Pollinators Enhance Fruit Set of Crops Regardless of Honey Bee Abundance*

A global study found that native pollinators provide an enormous ecosystem service in to global agriculture, being positively associated with increased fruit yields in all 41 crop systems studied. Native insects were found to be more effective pollinators than honeybees in all but 14% of systems studied. By quantifying pollen deposition and average fruit size, the study found that population native insects can pollinate as effectively a honeybee population of twice the size. This was due to how most native pollinators fly further in between pollinations, making them more likely to visit unrelated plants and increase cross-pollination even though honeybees reliably deposited more pollen. These increases in fruit size by native insects and honeybees were found to be independent of each other, suggesting that honeybees supplement the work of native insects rather than replacing it as is commonly believed. The high diversity of species associated with native pollinators also makes them more resistant to the threat of a single disease wiping out the entire pollination base, unlike when honeybees are used exclusively. Native pollinators are typically more vulnerable to pesticide use however and its application is discouraged when native insects are utilized (Garibaldi et al, 2013).

*'Bee Hotels' as Tools for Native Pollinator Conservation: A Premature Verdict?*

A study based in Toronto, Canada found that bee hotels host introduced bees as much as native species and burrowing wasps as much as bees. 200 bee hotels were set up annually for three years and the brood from each was collected every fall and incubated until April when the mature insects were harvested and identified. Collections were taken to calculate the percent abundance of the insects using the hotels. Hotel abundances were not compared to local insect abundances. Native bees represented 27.7% of hotel users and native bees colonized fewer sites, but hotels located next to residential gardens had significantly more native bees. Bee hotels with thin material were more likely to be parasitized than those with denser materials, though that was not the original focus of the study. Tubes of varying sizes were found to increase parasitization rates but were still required for diversity. The study advised further research be undertaken on matching the natural preferences of local bee species and mimicking these in hive hotel design. The study also warning of retailers "bee-washing" unusable or harmful products as beneficial to native bees when they only damage the population. Care must be taken to ensure hotels are of proper design and use safe materials (Macivor and Packer, 2015).

I would like to conclude by saying that native bee hotels can take a variety of shapes and use numerous materials. Many hotels used bamboo as their tubes but the bamboo must be inspected for passage blockages because native bees cannot use the tube unless both ends are open (Brokaw and Isaacs, 2017). Teasel and honeysuckle stems also make excellent tube material and can be easily gathered for no cost (Honeybee Conservancy A, 2017). Paper fiber tubes can also be used but are more vulnerable to parasitization and can draw paper wasps (Macivor and Packer, 2015). Alternatively wooden blocks that have had 1-1.5 cm holes drilled all the way through can be used but are harder to remove brood from. Plastic tubing should never be used as it traps moisture and can cause the bees and brood to mold. A wire screen can be placed over the holes to protect the residents from birds but it must be course enough that the bees can still pass through (Honeybee Conservancy A, 2017). The most important aspect of any medium is maintenance, and any hotel should be replaced or thoroughly cleaned every two years (Brokaw and Isaacs, 2017).

Citations

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