Pollinator Workshop Program

Sebastian Kopacz

Seeking $9,030 from the Foundation for the Preservation of Honey Bees for the Establishment of a Pollinator Workshop Program in Massachusetts

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Dear Ms. Schumacher,

I am writing this letter as part of my proposal to the Foundation for the Preservation of Honey Bees, to request funding for the establishment of a pollinator workshop program in Massachusetts. The decline of various bee populations is an issue prevalent in many parts of the world, and the United States of America is no exception. Should population declines persist, a decrease in pollination services can acutely impact wildlife ecosystems as well as food availability for humans. Entomological and apicultural communities are making significant efforts to mitigate the issue and learn more about it, resulting in a body of research and resources critical to pollinator maintenance. I propose establishing a program that works to disseminate these resources, and their accompanying pollinator maintenance guides, to the general populace of Massachusetts, in a manner that attempts to engage people in maintenance efforts.

This program is an ideal candidate for the Foundation's funding, because it relates to all four goals of the organization, as listed on its website. Not only would the program provide opportunities for education and the advancement of bee culture, it would also assist in the upkeep of pollination services and biodiversity. In the program's workshops, attendees will learn about the importance of pollinators, and the simple strategies they can employ to help mitigate bee decline. Moreover, the program can be readily expanded to reach a larger distribution of communities, with potential for an extensive scale of operation. Such a program is necessary, because it engages community residents in efforts to preserve the populations of various pollinators, and spreads awareness of the steps that can be taken to fight this issue. The future of bees is in the hands of the people, and this program will show them what they can do to make a difference.

Should you have any questions about the program or the proposal itself, I may be reached by the email or phone number listed above.

Sincerely,

Sebastian Kopacz

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1. Statement of the Problem

Bee Decline

Widely accepted among apicultural and entomological communities is the observation that many insect pollinators are facing a decline in population and, in some cases, are under threat of extinction. For instance, honey bee populations sharply declined in the latter half of the 20th century: from 1947 to 2005, the United States lost over 56% of its honey bee colonies, a decrease that has caused concern among scientists and laypeople alike (Nature Research Council 41). Honey bees are a managed species often used in agriculture for crops requiring pollination, and this decline presents a danger to the upkeep of yields for these dependent crops.

Bees that are managed by keepers are not the only pollinators facing a decline. Native bee populations, although difficult to definitively record, are also experiencing these same issues. Bumble bees that were considered at one point to be common in their native regions are becoming increasingly difficult or impossible to find. A species with one of the world's smallest geographical ranges among its genus, the Franklin bumble bee of the Pacific northwest was thought to be extinct over a decade ago, and is now classified as critically endangered by the International Union for Conservation of Nature (IUCN; Nature Research Council 43-44). Certainly, some bees are more at risk than others, but the trend of population decline is still a problem among pollinators more generally, and countless species need attention. The reasons for action stretch far beyond an altruistic desire for preservation, as bees profoundly impact both human life and nature.

The Value and Impact of Bees

The importance of pollinating insects is readily seen in agriculture, where they provide pollination services to most crops used for human consumption, somewhere between 50% and 75% (Gallai et al. 813; Potts et al. 347). The exact dependence on pollinators varies widely among the different crops. To a few, bees are totally essential and would see a catastrophic decrease in yield without the insects, though an absence of pollination services would be noticeable among all crops. Fruits and vegetables are the most valuable categories of crops that are highly dependent on pollination, and categories that are dependent tend to be more valuable than those that are not: on average, dependent groups have five times as much production value to the world economy than non-dependent groups of crops (Gallai et al. 813). The sum of all non-dependent categories still provides a majority of agriculture's economic value, but not enough to make the value of bees insignificant. In 2005, researchers found that crops dependent on pollination comprised 39% of the world's production value of food, a total of €625 billion (Gallai et al. 813). Another group that year, attempting to assess the value provided specifically by pollinators to these crops, estimated pollination services to be worth €153 billion (Potts et al. 347). Most farms employ some combination of honey bees and native varieties for their population services, and where one group is the dominant pollinator, the farmers will still depend on the other as a supplement for maximum yields (Kremen et al. 16814).

Outside of agriculture, pollinators help maintain their ecosystems by providing an abundance of diverse, flowering plants. 80% of wildflower species are dependent on insect pollination, and the continued decline of wild bee populations will have multifaceted implications for the

environment overall (Potts et al. 347). The effect of pollinator decrease can create a downward spiral for some bees, especially for specialist species that only visit specific flowers; with less pollination available to wildflowers, the quantity and diversity of these flowers will diminish, and amplify challenges of survival for many specialist species (347).

One Cause of Population Decline

There exist numerous factors that contribute to the decline of many pollinator populations, and they almost always work together in varying combinations. To place the blame of bee decline on one single factor would therefore be erroneous. However, in attempting to address strategies to counter this overall problem, focusing on one significant issue is ideal for assessing the effectiveness of the strategies. The factor generally believed to be the largest contributor towards the decline of pollinators is the loss or fragmentation of habitats (348). Habitat loss typically occurs as more land becomes utilized for agriculture and urbanization, reducing the amount of suitable land for most varieties of bees. Although the effect of habitat loss varies across different species (some groups such as cavity-nesters seem to strive in urban areas), the "bulk of evidence from quantitative synthesis supports the hypothesis that habitat loss reduces bee diversity and abundance" (349). Since habitat loss will always persist in tandem with population growth, widespread efforts will need to be made by both professionals and average citizens in order to mitigate the problem.

Strategies for Pollinator Maintenance

Reversing the effects of habitat loss, at least by means of regaining land used for agriculture and urban property, is not a feasible method of maintaining wild bees. Other strategies must be pursued in order to mitigate bee decline caused by this factor. In effect, loss of habitat is a loss of resources available to pollinators. The most useful contribution that an ordinary person can make is to provide some of these resources for bees near or on their property. This includes sources of water; nesting materials, substrates, and sites; and, of course, proper floral sources of pollen and nectar (National Research Council 171). The appropriate floral sources vary by pollinator, and the Pollinator Partnership (hereon referred to as P2) possesses region-specific planting guides, which offer recommendations for plants that best accommodate pollinators in specific sections of the United States and Canada.

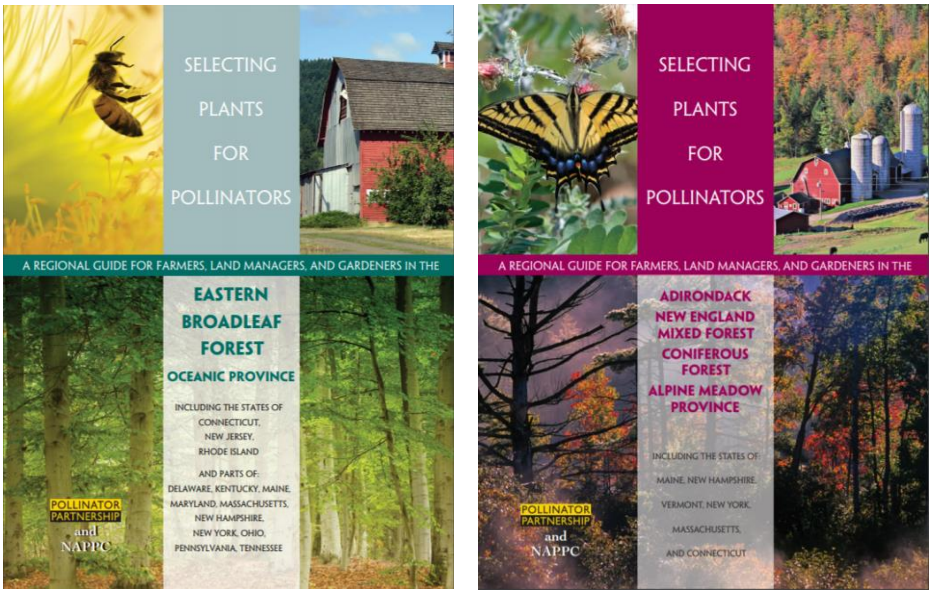


Figure 1: Covers of planting guides available on the Pollinator Partnership's website. The two guides shown are the predominant ecoregions of Massachusetts. Credit: Pollinator Partnership

Ideally, an assortment of flowers with “overlapping bloom periods” provide bees with constant pollen and nectar throughout their flight season, providing for some species that require nutrients for weeks or months at a time (173). Additionally, agricultural fields stand to benefit more from polycultures than monocultures, where a diversity of flowering plants works in favor of the diversity and abundance of pollinators in that area (179).

Nesting resources are also vital to pollinator maintenance. Many bee species nest in or on the ground, and thus providing adequate areas of soil suitable to a variety of species is especially beneficial. Nesting materials are desirable to numerous species; depending on the bee, this can include foliage, living plant materials, or dead wood, all serving a particular purpose for the pollinators that use the resources. For mason bees and leafcutter bees, which are used in agricultural settings to pollinate crops, plant materials and fresh mud are especially helpful (174). A portion of bees also nest in wood, including cavities in trees and wood structures that are often created by beetles. These species will also nest in wood with holes drilled to an appropriate size, both in blocks of wood and dead trees with drilled holes (174, 177). Even nest boxes, made from Styrofoam or wood, and filled with nesting materials, can be buried and then housed by cavity nesting bumble bees (178-79).

Figure 2: A particularly large, well-crafted “bee hotel” that provides a nesting site for numerous pollinators. Note the different nesting materials with cavities of varying size. Credit: The Old Farmer’s Almanac

These are only a few strategies of many that can be implemented by homeowners and farmers, efforts that would help to maintain pollinators across the United States despite habitat loss and fragmentation. The resources to guide this process are available, but there is still a challenge of distributing them to the population and engaging individuals with the process of pollinator maintenance. Thus, efforts must be made to disseminate information, in order to facilitate the implementation of pollinator resource provision.

2. Statement of Request

The purpose of this grant proposal is to request a grant of $9,030 from the Foundation for the Preservation of Honey Bees, which will fund a pollinator workshop program in Massachusetts aimed to educate attendees on the importance of pollinators, and on actions they could take to help their maintenance. Many people have a general awareness that bees are important to agriculture and the environment, and that some changes must be made to stop their decline. However, few have an appreciation for the extent of their importance, and do not personally engage in preservation efforts for lack of knowledge or encouragement. The workshops will provide local areas with a brief education of pollinator maintenance, and will allow them to practice maintenance techniques they could employ at their own homes. They will also work to reinforce the value of community in maintenance strategies, encouraging the further sharing of practices and resources learned during attendance.

The pollinator workshops will be held in four cities and towns in the Commonwealth of Massachusetts, and each location will hold a workshop three times throughout the year. One will be during spring, and the other two will be in the summer. Each consecutive workshop session will largely remain the same, as to provide members of a town multiple opportunities to attend, and to minimize the issue of timing and availability for prospective attendees. Although the core of the educational component will not change, some variations will be made to better suit the time of year. For instance, the spring workshop would emphasize gardening practices for the growing season, and the late summer session would focus on making shelters that bees can use for overwintering.

These workshops will provide educational opportunities to residents all over Massachusetts, allowing them to learn about pollinators and to receive hands on experience with preservation efforts. The program's twofold function, to educate and to encourage participation, makes it an asset to the mission of pollinator preservation. Such a program also benefits from its scalability. In the event of a successful series, the workshops can be held again in consecutive years and in a greater number of cities and towns. Expanding the program will allow for a larger distribution of communities to begin pollinator maintenance efforts and to help raise awareness of bee decline. The potential for expansion adds significant value to this program.

3. Description of Proposed Work

Upon acceptance of the grant, preparations for the establishment of the workshop program will be initiated by one of P2's program associates, Sebastian Kopacz. Given the small scale of the program, the associate will take on the program as if it were his own and play an involved role in every stage of the process. If the program were to expand, more administrative personnel could be hired for roles dedicated to the workshop series.

Initial Preparations

The objectives during this initial stage are only administrative and logistical, but they are the cornerstones for the creation of the workshop series. The first objective is to begin the hiring process for personnel to instruct the workshops. Advertisement of the job posting, the initial step of this process, will immediately begin in a variety of methods. The posting will be displayed on

internet job boards, such as Craigslist and Indeed, and paper flyers will be distributed in the four areas that will host the workshops. Universities and colleges may also prove a valuable resource in this search, because they possess thousands of potential candidates or connections to desirable personnel, and usually have their own job boards to streamline opportunities directly to the university. They will likely be one of the most valuable resources in the search for workshop instructors and can expedite the process significantly. A comprehensive description of personnel and their preferred qualifications is detailed below, in the section titled "Qualifications of Personnel."

The second objective is to secure the facilities where the workshops will take place. The program does not require any extensive amenities, and the most important requirements are simply spaces that can provide seating and a workspace for attendees. This simplifies the search for facilities, and means that finding more locations will not be a significant burden in the event of the program's expansion. Four cities or towns were selected across Massachusetts, each in their own distinct section of the Commonwealth. They are as follows: Lennox, Amherst, Worcester, and Lexington. Except for the workshops in Worcester, which will be held in Worcester Technical High School, community centers in each town offer ideal facilities. Each of these facilities have rooms large enough to host twenty to thirty attendees, and are readily provided with tables and chairs. The facilities will be contacted, and rentals will be arranged for dates in March, June, and August. Once these arrangements are set in stone, the process of preparation can enter its second stage.

The Hiring Process and Material Preparations

This stage is where the final preparations for the workshops will begin to take place. P2 associate Sebastian Kopacz will conduct interviews and filter through applicants until an appropriate amount of qualified personnel is secured for the program. Ideally, the workshops will operate at their best with two instructors per session, although one will suffice if necessary. For the educational component of the workshop, one instructor is all that is needed. For the hands-on section of the workshop, however, having multiple instructors will help ensure that all attendees receive the proper attention and guidance. A pair of personnel will also limit the chances of a workshop needing to be cancelled, in the case emergency circumstances prevent an instructor's attendance on a given day. Personnel must be available to teach at all three sessions for their assigned location, which will result in a maximum of eight instructors hired for the program. However, they are welcome to teach in multiple locations, if they wish to receive more wages or experience in teaching. This would not decrease the budget of the program in any significant way, although it would reduce time spent on the hiring process.

During or after the hiring process, Sebastian Kopacz will also begin the material preparations for the program. Accompanied by a P2 intern, he will purchase a variety of materials and tools needed for the workshops. This will include materials for building pollinator nests or walls, such as wood, Styrofoam, paper straws, sand, etc. Tools, such as cordless power drills, will also be necessary for the assembly of these structures. Additionally, floral resources will need to be purchased, such as seeds and seed trays, either online or from a garden center. All these materials will then be transported to a storage unit, where they will be stored until delivery to the workshops.

Educational Materials, Training, and Advertisement

Once the previous stage is officially complete, three objectives remain before the workshop series is ready to begin. The first step is to prepare educational materials. Sources that outline preservation strategies for pollinators will be accumulated, and copies will be made for distribution to the workshop attendees. These materials will vary in scope, from instructions for building nests, to planting guides dedicated to specific habitats. All sources will contain information tailored to benefit the bees common to each town's area, and a list to additional resources will also be provided.

The next step is the training of the workshop instructors. The instructors will be taught the lesson plan for each workshop and will practice their instruction, so they can achieve a sense of comfort with their material. They will also practice the techniques to be taught for the hands-on component of the workshops, such as planting seeds in trays and constructing pollinator shelters. Upon completion of training, the instructors are ready to lead the upcoming workshops, and are encouraged to review materials before the workshops begin, if they wish to become even more comfortable with the lesson plan.

The final step will be to advertise the program itself. Flyers must be printed up and distributed throughout the towns and cities hosting the workshop series, and posts will be made on various social media platforms. Due to the limited availability of resources and seating, prospective attendees will need to reserve a space if they wish to participate in the latter, more involved half

of the workshop. After the workshop series is advertised and seats are filled, the series is ready to begin.

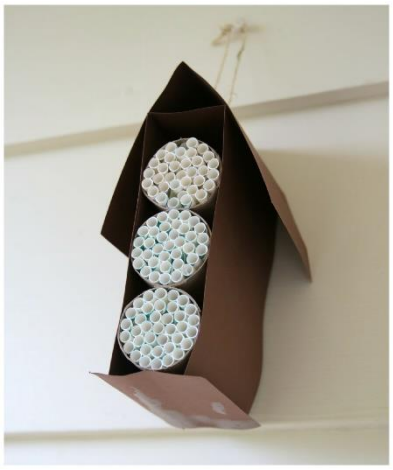
Pollinator Workshops

The workshops will begin with an introduction, where the instructors will introduce themselves to their audience and give a brief outline of the workshop. After introductions, they will move on to the first major part of the lesson plan, which is a discussion on the importance and impact of bees. Any printed educational materials will also be distributed at this point. The audience may be comprised of individuals who, for one reason or another, will soon grow bored in a lecture style environment, so instructors will have been asked to engage the crowd in as many ways as possible. For example, they may ask the audience about their level of involvement in beekeeping or apiculture, or ask about personal experiences that might be shared with the group. One way or another, the objective is to have elements of dialogue present in this portion of the course, in order to break up the audience's time spent sitting and listening to the instructors speak.

After the instructors detail the ways in which pollinators impact and shape the environment around people, they will move to discuss the actions that anyone can take to help maintain pollinator populations. The focus will specifically fall on methods to combat the effects of habitat loss and fragmentation, such as resources that one could provide to bees in their area. In effect, this will act as a transition into the "fun part" of the workshop, where the attendees will finally be able to engage more directly with maintenance strategies. The first workshop session, hosted in March, will split this time between planting seeds and making a relatively simplistic mason bee house. The seeds will consist of an assortment of flowers recommended in P2's

planting guides, and the house will be a bundle of paper straws that can be hung from any structure, such as a tree.

The latter two sessions will forego the floral component, as they will be held on dates past the ideal planting period for many of the flowers. Instead, attendees will be able to construct a more complex bee house. The structure of the house is essentially an assortment of materials (wood blocks, packed sand, Styrofoam, paper straws, etc.) held together by a wooden rectangular frame. The materials will have either drilled or poked holes, where bees will lay eggs and provide food for the future larvae. Some attendees may not be able to use the power drills to construct the homes or may not be comfortable doing so. For that reason, some pre-made frames and pre-drilled blocks of wood will be available. Nevertheless, the instructors will check on all attendees to help with any part of the process.



Figures 3 & 4: (Left) A bee habitat made of bundled straws, similar to those that will be crafted in the workshops. Credit: Heather Mann (Right) A bee habitat, similar in complexity to the bee houses that will be crafted in the last two workshop sessions. Credit: Marc Carlton

Once the second half of the workshop is finished, the instructors will wrap the course up and briefly summarize everything covered. They will also encourage attendees to share what they've learned with friends and, if later workshops still have openings, to consider recommending the workshop to others.

4. Description of Available Facilities

The pollinator workshops will be held in the rooms of three community centers and one technical high school. Each facility meets the relatively basic needs of the workshop, which is a capacity of at least twenty-five people and the availability of chairs and tables. The community centers all store chairs and tables that can be brought out for the workshop. The shop rooms of Worcester Technical High School, which are used for educating students learning a trade, also have an arrangement of stools and tables ideal for the purposes of the workshop. The facilities can all be rented by the hour and have an average cost of $30 per hour.

In between the program's preparations and the beginning of the workshop sessions, any materials will need to be stored in storage units, which are widely available throughout Massachusetts. One unit large enough to store all the materials will have a monthly rate of about $95. The storage companies also offer box truck rentals, and a truck will be used to transport materials from the store to the storage unit.

5. Qualifications of Personnel

Coordination and Administration

Sebastian Kopacz is a Program Associate at P2, whose role is to aid in the coordination of programs sponsored and run by the Pollinator Partnership. He plays administrative and organizational roles in the management of a variety of P2 programs, and occasionally assists in seeking funds for the establishment of new projects. As detailed in the Description of Proposed Work, Sebastian will manage essentially every part of the program, from start to finish. All other personnel involved in the program, excepting the use of a single P2 intern, will have been hired, trained, and managed by Sebastian.

Workshop Instruction

For the instruction of the workshops, P2 will rely on hiring a maximum of eight applicants, each working in pairs for three workshop sessions in the year. Due to the limited number of hours they will be able to work over a period of six months, the instructors are effectively volunteers with paid stipends, though they will be seasonal employees in technicality. The requirements for instruction are not very demanding, although certain qualities will be necessary for the success of the workshops. Instructors will not need any scientifically advanced knowledge on apiculture and entomology, although they should have enough related experience to be comfortable with teaching laypeople. Any experience in teaching or education will also be highly preferred.

The ideal candidate would be an experienced beekeeper or entomologist, who desires to educate individuals on the importance of bees and engage their community in preservation efforts. Though at the very least, instructors would need to be college students who can demonstrate a significant amount of experience with beekeeping, entomology, or other related fields. They would also need to prove their ability to competently teach a group of adults with little to no background on the material they are learning. One downside to the job is that the hours spent working are stretched between significant amounts of time, a factor that might discourage potential applicants. In order to make the position attractive to the most qualified individuals, instructors will receive a wage of $35 per hour. Between the time spent in training and instructing the workshops, an instructor can expect to make around $300.

6. Budget

Expense	Cost
Construction Materials	**$4,000**
Tools and Equipment	**$800**
Floral Materials	**$260**
Flyers and Printed Materials	**$100**
Facility Rentals	**$750**
Storage Unit and Box Truck Rental	**$720**
Wages for Workshop Instructors	**$2,400**
Total	**$9,030**

The pollinator workshop program would need approximately $9,030 to operate at its current scale. A significant majority of the funding will go towards the purchase of materials to be used in the workshop. The materials will be used by workshop attendees to construct bee houses of varying complexity, and for trays with flower seeds/bulbs that will benefit local pollinators. The other major component of the budget is the wages for workshop instructors. If the workshop program is successful, its expansion would lead to a mostly proportional increase in costs.

7. Summary

The Foundation for the Preservation of Honey Bees stands to benefit greatly from the funding of this workshop program. Listed on its webpage, the Foundation outlines four main goals for its work:

1. Providing Educational Opportunities
2. Advancing Bee Culture
3. Improving Pollination
4. Conserving Biodiversity

(Foundation for the Preservation of Honey Bees, Inc.)

The programs facilitate all of these goals. The workshop itself is an educational program that allows communities to learn about bees, their importance, and ways in which the average individual can work with their community to make an impact. The attendees of the workshop also engage in bee culture, some for the first time, and can potentially be inspired to play a more active role by trying out beekeeping. By teaching individuals about methods of pollinator maintenance, they can practice strategies in their own gardens and improve both the pollination

and biodiversity in their immediate area. The realistic effect of these practices is admittedly small, given the limited capacity of the workshops. A larger impact will depend on the attendees sharing their newly acquired resources with their friends and family, as well as the expansion of the program itself.

The pollinator workshop program has multiple strengths that make it stand out from similar programs. One strength is that the workshop performs multiple functions while still maintaining cohesiveness. Other workshops might typically focus on one objective, such as performing crafts like making a bee house. The workshop detailed in this proposal, on the other hand, involves craft work *and* an education on valuable information about pollinator maintenance. By encouraging a sense of community in the workshops, the program also attempts to engender an impact that reaches beyond the attendees.

Pollinator decline is an issue that can carry tremendous impacts on ecosystems and agriculture throughout the world. This would result in profound changes for the lives of people around the world, such as a drastic reduction in food availability. Research has demonstrated concerning declines in many bee populations, such as honey bees in North America, and many actions must be taken to preserve pollinators. This includes a need for communities to involve themselves more actively in preservation efforts.

Community involvement will be encouraged and facilitated through the workshop program. Attendees will leave the workshop with resources and education on pollinators. They will also leave with items they made in the workshop, which is a first step in their engagement with

pollinator maintenance, and motivation to do more. The workshop program also benefits from its scalability, meaning that significantly more people can learn about pollinators as the workshops expand to reach larger areas.

This program is an excellent opportunity to spur action among a collective of individuals who care about bees and their importance to everyday life. Resources on pollinator maintenance are widely available to the public, but action must be taken to encourage the public's direct involvement in the issue. This program can contribute to inspiring action among a wide distribution of communities, especially if it expands to meet its full potential.

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Figure 2: https://www.almanac.com/content/bee-houses-solitary-bees#

Figure 3: http://www.kixcereal.com/kix-cereal-bee-kind-to-bees-make-a-bee-condo/

Figure 4: http://www.foxleas.com/make-a-bee-hotel.asp