2018

Pollinator Awareness Program

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POLLINATOR AWARENESS PROGRAM

ENS 401-01

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TABLE OF CONTENTS

PLAN OF ACTION

Action Plan *What Will Be Done?*	Responsibilities *Who Will Do It?*	Timeline *By When? (Day/Month)*	Resources *A. Resources Available* *B. Resources Needed (financial, human, political & other)*	Potential Barriers *A. What individuals or organizations might resist?* *B. How?*	Communications Plan *Who is involved?* *What methods?* *How often?*
Advertising	Designated project leader	September until June	A. SAP website, bulletin boards they already post on B. Expanding advertisement to different buildings, campus life night and transitions, whiteboards in classrooms	A. Bulletin post approver B. Might not have space, or decline advertisements	Involved: Pollinator Awareness Program coordinator(s) Methods: Websites, flyers, email, classrooms. How often: Prior to each event
Flower Crowns	Hsiao-Ping Chen Katalin Zaszlavik	September	A. Flowers from the SAP gardens B. Floral kit	A. N/A B. N/A	See step by step process
Pressed Flowers	Tim Evans	October	A. Flowers from the SAP gardens B. Glue, toothpicks, tweezers, laminator, paper	A. N/A B. N/A	See step by step process
Flower Candles	Beekeeping Club	November	A. Flowers from the SAP gardens, beeswax B. Candles, extra wax, glue	A. Maintenance, Event Planning Department B. Having to clean up mess from event, getting approval for a building	See step by step process
Bat Boxes	Amy Russell	December	A. Wood B. Wood, nails, power tools	A. Safety Regulations B. Use of power tools could be an endangerment	See step by step process
Gourd Bird Houses	Farm Club	February	A. Gourds B. Power tools, paint, wood sealer, steel wool, wire	A. Safety Regulations B. Use of power tools could be an endangerment	See step by step process
Flower Pots	SAP Team	March	A. Seeds from SAP B. Plastic pots, upcycled material	A. Potentially SAP team B. Requires time and resources	See step by step process
Planting Party	SAP Team	May	A. Potential produce from SAP B. Food, see budget	A. Potentially SAP team B. Requires time and resources	See step by step process
U-Pick	SAP Team	Throughout summer growing season	A. Flower patches B. Potential paying or donation box	A. N/A B. N/A	Involved: SAP team, volunteers. Methods: signs How often: duration of growing period

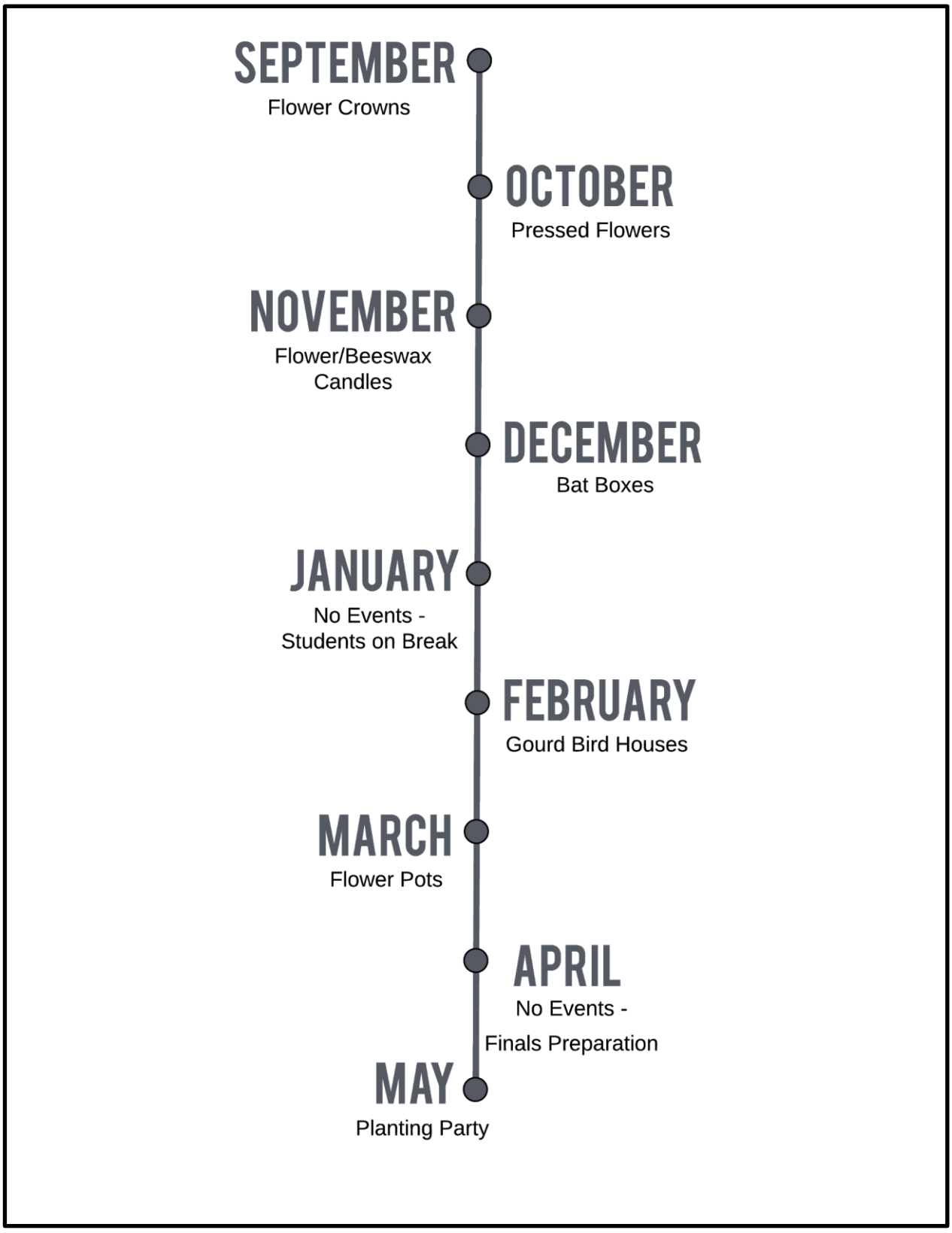
Each event will run similarly. It will kick off with a welcome and tour of the SAP (for events not held on campus). The event leader will briefly educate attendees on pollinators, specifically the target pollinator for the event, if there is one. The attendees will participate in pollinator garden maintenance (as needed). After the maintenance portion, the event leader would give instructions on the project and lead the group in constructing their make-and-take.

The event would finish with light refreshments and a time for community and questions. Events held on campus would include the education, construction, and community elements. At the conclusion of each event, students can enter their name into a raffle, entering each time they attend an event or volunteer time. At the end of the school year, names will be drawn for winners.

PROMOTIONAL DESCRIPTION

The Pollinator Awareness Program is an initiative evoked by the Sustainable Agriculture Project (SAP) of Grand Valley State University to increase student involvement through the lens of pollinator education and habitat creation. The program includes educational components that teach students about what pollinators exist, what they do for us as well as delicate ecosystems, and how we can contribute to their survival. Through this program, students and community members gain the opportunity to plant and maintain the pollinator gardens at the SAP as well as participate in make-and-take events that encourage them to improve pollinator habitats near their own homes.

TIMELINE


SEPTEMBER
Flower Crowns
OCTOBER
Pressed Flowers
NOVEMBER
Flower/Beeswax Candles
DECEMBER
Bat Boxes
JANUARY
No Events - Students on Break
FEBRUARY
Gourd Bird Houses
MARCH
Flower Pots
APRIL
No Events - Finals Preparation
MAY
Planting Party

CONSIDERATION OF SAP VALUES

The most important thing about this program is to implement the wants and needs of the stakeholders. Issues presented by stakeholders of the SAP inspired solutions that worked well with the organizational values of the SAP, as well as addressing the issue of student engagement. The SAP has four project purposes: seeding sustainable food practices, cultivating leadership and learning, creating a nurturing place, and growing community. Each of these are touched on in our program. The program is seeding sustainable food practices by increasing the overall pollinator population around the farm. Having more pollinators at the SAP increases the health of the farm as well as the output of the farm. The increased number of pollinators at the SAP increases fertilization of plants, including produce, which is beneficial for the output of the farm. The program cultivates leadership and learning by offering learning opportunities at every event. For example, the planting party includes educational stations on the passports that offer the participants a chance to be educated on local pollinators and the native plants that help support their existence. At the other events, such as the flower crowns, the program involves different departments that are not directly related to the SAP. The program creates a nurturing place by increasing the pollinator population and allowing the plants to grow and be fertilized naturally. This program also helps nurture place by adding native plants that are helpful for local pollinators to the SAP. Not only does this support the values and the pollinators, but it also helps native plant populations. Finally, the program grows community by offering opportunities for interdisciplinary departments, as previously mentioned, and through the participants. When participants come to events, they gain insight about local pollinators as well as the plants/habitats

they require and have the opportunity to take some of those habitats (bat boxes, gourd bird houses) home in order to expand the pollinator habitat.

BACKGROUND RESEARCH

Food production at the SAP would simply not exist without the role of pollinators. Hummingbirds, bats, bees and butterflies and others facilitate the fertilization process of all vegetables and terrestrial flowers. Without pollinators, plants would have to rely on wind pollination which is prehistoric and inefficient. The alternative is humans providing fertilization by hand pollination, which is labor intensive and also inefficient, especially the growing population and the demand for crop-plant species is considered. The eminent importance of pollination via pollinators may or may not ever be capable replication. If ever done, it will likely be costly. Many studies have agreed that the decline of pollinator populations is drastic. Instead of waiting for the worst to happen, conservation and restoration of our landscapes is the most affordable and tangible solution for negating the loss of the most important ecosystem service provided.

The role of a pollinator extends further than just the responsibility of the bee species. When discussing pollination, bees are the foremost pollinator that come to mind but, it is essential to extend credit to the butterflies, birds, beetles, moths, bats, flies and hummingbirds. Pollinator populations provide a vital ecosystem service that sustains both wild plant communities and agricultural productivity (Potts et al., 2010). In times when agricultural land-use is expanding to meet the needs of a growing population, landscapes are becoming more homogeneous and detrimental to pollinator populations. In 2005, wild and managed pollinator populations generated $215 billion dollars globally and accounted for 9.5% of global food production. Pollinators account for approximately 75% of crop-plant species yields globally (Vanbergen et al., 2013). Bees in particular are responsible for pollinating more than 66% of the

world's 1,500 crop species (Kremen et al., 2002). Pollinators facilitate biodiversity because of their ability to provide means of fertilization across wild and managed areas. Each pollinator species has preference for what they chose to feed upon. The decline of a pollinator species could threaten the decline of an important crop or wildflower that would then alter the ecological integrity of an ecosystem.

A declining pollinator population is a threat to global biodiversity. Vegetable plots and pollinator gardens provide refuge in an increasingly monotypic landscape. A meta-analysis conducted by Vanbergen and Insect Pollinator Initiative outlined interrelated environmental pressures that consequential to pollinator decline:

Land-use intensification

Habitat degradation from urbanization and agriculture deplete the floral and nesting resources of pollinators. Residential lawns and exposed soil inhibit pollinator travel from flower to flower. Natural landscapes are fragmented to suit the needs of a growing human population. Not all pollinator species are vulnerable to habitat change but specialized species which require unique food sources are likely to become endangered. Intensively managed landscapes are sprayed with large amounts of fertilizer to enhance productivity which deter valuable pollination services. Monotypic cropland may offer some value as a food source but are short lived food supply for pollinators and do not provide adequate nutrition. Pollinators that are active for longer time periods may find competition between the pollinators that may favor crop species. Although habitat fragmentation cannot be linked directly to pollinator declines due to lack of empirical evidence, low connectivity between habitats can facilitate the decrease in pollinator species richness. Decreased habitat coupled with the rise of colony collapse disorder may even subject generalist species to extinction.

Climate Change

Changes in plant phenology from the effects of climate change can alter the relationship between flowering and pollinator flight periods. Increasing mean temperatures over the past century have facilitated earlier flowering dates of plants as well as insect seasonal flight activity (Memmott et al, 2007). Each flower opens and closes at different times than what has been considered historical timing, the change may subsequently disrupt the general pollination of late season flowering plants. Although pollinators have evolved over time to exploit new pollinator-plant interactions, the diets of specialist species ,like bumblebees, may be most negatively affected. Generalist species may also be subjected to a reduced availability of dietary preference.

Pests, Pathogens, Pesticides

Populations of honeybee (*Apis mellifera)* hives in the United States have been declining since the 1980's, which is now known as colony collapse disorder. *Varroa destructor*, an infectious mite which serves as a primary disease vector, feeds on the hemolymph of the bee and inhibits the bee's immunity by increasing the virus load (Vanbergen et al, 2013). The dense populations of bee hives provide an ideal habitat for *V. destructor* to manifest. The gut parasite *Nosema ceranae*, threatens honeybees by increasing their metabolic demand for carbohydrates. How *N. ceranae* contributes to colony loss is not well known but previous research has demonstrated that *N. ceranae* degenerates the digestive tissue of the honeybee which reduces the lifespan by subjecting the honeybee malnourishment (Eiri et al, 2015). If the *N. ceranae* does cause an increase in dietary uptake and there is a lack of food sources, honeybee populations will suffer and a valuable pollinator may be at risk of extinction. Recent research into what may be facilitating colony collapse disorder has examined the interactions between sublethal doses of neonicotinoids, a pesticide commonly used across cropland, and *N. ceranae* infection. Results

indicated that the interaction reduces the enzyme that reinforces the worker bees to combat pathogen transmission and sterilize colony food stores (Alaux et al., 2010). Studies have found supporting evidence that sublethal doses of neonicotinoid results in higher infections of *N. cernae.* It is essential to maintain a clean self-built bee home which can reduce the chances of infection.

BEST PRACTICES

Below are other universities across the United States that have implemented pollinator gardens and best management practices.

University of California, Berkeley (UC Berkeley)

Since 1987, UC Berkeley has monitored and recorded the frequency and diversity of bee populations that pollinate wild California plants across several northern California locations. A new method of bee sampling resulted from that research and in the 1990's, UC Berkeley started the urban bee project. For several years, the urban bee project examined bee populations within residential areas and discovered that 90 species of bees were native to the San Francisco Bay Area. UC Berkeley's research identified bee preferences to different plant species and whether those bee groups are more likely to forage for pollen or nectar from varied plants. UC Berkeley recognized the frequencies at which bees were to visit certain plants and if the plant was native or exotic. Their data collection created the initiative to establish an experimental bee garden that contained plants that bees preferred most on the Berkeley campus. Once established, the experimental bee garden became an exemplary reference point for the community on how to plan their own urban pollinator friendly garden.

When establishing a pollinator garden, UC Berkeley encourages a holistic approach in deciding what plants to grow. They choose flowers which attract not only pollinators, but the other portion of the pollinator diet, such as insects that hummingbirds like to feed upon. They plant sunflowers which provide nectar and pollen for bees but also seeds for birds. They choose plants which bloom at different times to ensure that early and late season pollinators have food. UC Berkeley highlights the benefits of providing cover and areas where pollinators can raise

their young. Implementing banks of soil will provide refuge for ground nesting bees whereas bundles of sunflower stems that are hollow and dried out can be suitable for cavity nesting bees. Bird and bat houses provide protection when the pollinators need to nest or roost. In addition to building suitable habitat, providing a watering hole in the pollinator garden is a key resource for the well-being of pollinators. Establishing a bird bath or pond will aide in the hydration of bees, butterflies and birds.

In caring for pollinator gardens, UC Berkeley promotes sustainable, best management practices. They discourage the use of pesticides and encourage natural remedies to negate the effects of unwanted insects and animals. Ladybugs can be used to prey on aphids, wasps are capable of feeding on damaging flies, hornworms and caterpillars. UC Berkeley acknowledges the importance of composting to sustain nutrients within the gardens, capturing rainwater, applying organic fertilizers as well as planting an array of native plant species. UC Berkeley pollinator garden has been recognized by the National Wildlife Federation to be a certified wildlife habitat and provides an abundance of information on their webpage on best management practices so the public can incorporate their sustainable methodology into creating their own pollinator gardens.

Montana State University (MSU)

In 2013, MSU established a pollinator garden that serves as their Honey Bee Research Site and community outreach and engagement center. The objective of MSU's pollinator garden is to educate the community on the benefits of honeybees, the current demise of their populations and to increase awareness of bee friendly flowers. MSU's research examines the pathogen interactions that are responsible for the decline of honey bee populations and seek to better understand how pathogens are affecting the honey bee. The long-term goal of this research is to

mitigate colony losses manifested by pathogens and discover practices that will improve colony health in the long-term. The Principal Investigator, Michelle Flenniken, hosts community events that are centered on informing the public about why bees and other pollinators are important and what her research lab is studying.

Community outreach is essential for involving the public to understand why the decline in pollinators is important. Educating the public on the benefits of native vegetation and introducing the public to what pollinator gardens pertain to increases awareness. If the community does not understand what a pollinator garden is or how native plants facilitate habitat and food for pollinators, then there will be a lack of support to implement pollinator gardens in public spaces. In relation to the SAP, our primary goal is to educate students from different areas of study about why pollinators are important and what they can do to support pollinator habitat. Activities centered around flowers and pollinators encourages those involved to share their new knowledge which in return will build support to create an environment which is more habitable for all pollinators.

University of Colorado Boulder (UC Boulder)

UC Boulder implemented their first pollinator garden in 2014. Located next to a roadside entrance, plant species were selected to withstand the harsh roadside conditions and support pollinator populations. The previous landscape was turf grass and water intensive perennials, and through what is the equivalent to GVSU's Office of Sustainability, replaced and redesigned the landscape to be a pollinator sanctuary. UC Boulder renovated 10,000 square feet of landscape with plant species that will offer pollinators a consistent food source throughout the seasons. Along the gardens, UC Boulder installed educational posts about the importance of pollinators. The renovation has increased the aesthetic value of the campus and passively informs the

students and community about the crucial role pollinators and native plants have in our ecosystem.

Prior to installation, primary goals of the project were to reduce water and pesticide use. The strips of turf grass were deemed “unmanageable” because of the difficulty to maintain and its’ likeliness to support undesired plant species. Plant species chosen included a diverse set of plants which bloomed from early spring into late fall. Instead of being arranged by single species, plants were densely clumped to give pollinators an advantage to find the food source. Native species and plant species that are adapted to the Front Range climate were planted. There will be no pesticides applied to the landscape. Finally, to the best of their ability, plant species were sourced from distributors that did not apply neonicotinoids.

COMMUNITY SUPPORT & INCLUSION

Through make-and-take events, the Pollinator Awareness Program will intentionally start the spread of man-made pollinator habitats and safe havens throughout the surrounding community, including Allendale. We acknowledged the landscape around Grand Valley is mostly farmland that is not suitable for pollinators of the area. Our intention is to turn the SAP into a place that promotes and educates about local pollinators. Many people know very little about pollinators. Through the education people gain from volunteering at the SAP, they will be able to take what they learned and bring it home. This could be their apartments or dorms around campus, or their actual homes with their families. Bringing their make-and-take project (bat boxes, bird houses, gourds for birds, pots of flowers) home can expand the pollinator habitat beyond the SAP as well as add a possibility for increased interest in the SAP pollinator projects. Roommates and families may see these projects and become interested in pollinator habitats.

This program is inclusive to all genders. Flowers generally tend to attract more women, but there is also another aspect of maintenance and working on building pollinator habitats. This will appeal to men or those uninterested in flowers. In the marketing for these programs, there shouldn't be an assumption of which gender each project will specifically draw, so as not to discourage anyone from attending.

Historically, there has been negative connections between people of color and farming. This program, however, will be inclusive to people of color since it doesn't have anything to do with farming directly. The marketing can be intentional about reaching out to clubs for people of color to encourage their participation and lead to further SAP engagement.

Our program is also inclusive to low income students and staff. The goal is for events to be free to everyone. For high budget events, the goal is to fundraise and collect donated supplies. If for some reason, with the high budget activities, we would need additional funding, only a small fee would be charged.

This program is also inclusive to students that do not have transportation from campus to the SAP. Some of the events will be held on campus, which will eliminate the need for transportation. Through marketing, carpooling could also be encouraged for SAP specific projects.

EDUCATIONAL PLAN

The incorporation of educational aspects into the Pollinator Awareness Program is critical to making a tangible impact on participants and pollinators. One of the main purposes of the SAP is to implement agricultural practices that are ecologically durable, socially responsible, and economically viable while exploring various means of sustainable food production. We intend to explain the link between pollinator habitat and sustainable food systems to participants. Through the pollinator awareness program and the beautiful example that is the SAP, we intend to exemplify the critical role that pollinators play in our food systems. The Pollinator Habitat Awareness Program will excite participants and increase student involvement while simultaneously elevating the nurturing environment and growing community that is the SAP. Educational components are incorporated throughout the Pollinator Habitat Awareness Program with items such as verbal explanations, multi-use cards, and signs.

Exemplified in the timeline, the Pollinator Habitat Awareness Program involves a series of engaging and creative activities and events that span over several months. Events that are hosted through the Pollinator Habitat Awareness Program involve creating pollinator habitats, maintaining pollinator habitats at the SAP, using plants grown in the pollinator habitat for make-and-take crafts, as well as making take-home pollinator habitat projects. A verbal explanation of the link between pollinators, the craft or event that is taking place, and the relation to the SAP are all key components to educating those who participate in the Pollinator Habitat Awareness Program. Coordinators of the Pollinator Habitat Awareness will team up with Grand Valley students and faculty who are knowledgeable about the type of specific pollinator that each craft

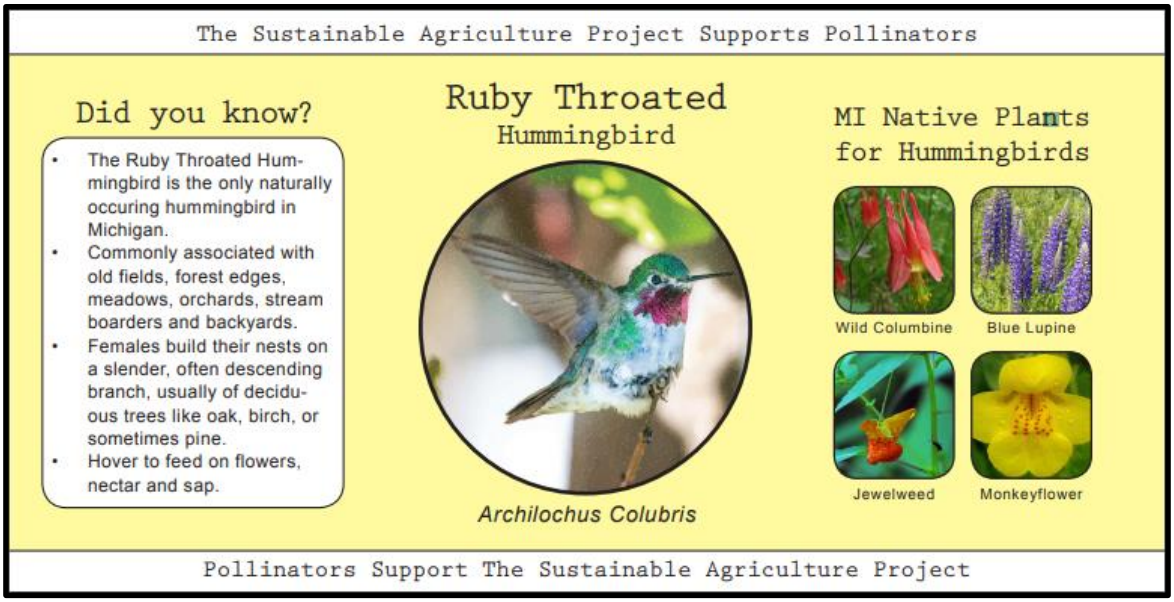
revolves around. These knowledgeable members of the Grand Valley community will be encouraged to lead introductory, educational speeches before each craft session commences.

For example, one of the make-and-take crafts hosted by the Pollinator Habitat Awareness Program involves assembling a bat-house. Before starting construction with participants, during the group greeting speech, the coordinator would explain the links. The speech would be similar to the following:

"Thank you all for coming out. It's great to this see such a wonderful turnout. We are hosting this bat-box making class to draw awareness to and combat the loss of pollinator habitat that is occurring across Michigan and the rest of the world. Bats play important roles in our ecosystems by controlling insect populations, spreading seeds, and of course, pollinating plants. These are important aspects to naturally maintaining healthy ecosystems and sustainable agriculture, things that are actively practiced here at the SAP." Knowledgeable Grand Valley community members will also be encouraged to interact with participants and answer questions about that type of pollinator. This addition will add to the excitement and understanding of each pollinator that the Pollinator Awareness Program sponsors.

Multiple use cards will be informational, eye-catching, laminated half-page papers filled with pollinator habitat facts and pictures. A variety of cards will be made and specific cards will be used depending on the day's events and the pollinators that the event pertains to. The intent of the cards is to better inform participants about the activity, give them conversation starters, and enlighten them about the importance of the work they get to be involved in. The purpose of the

lamination is to reduce waste. Rather than giving out flyers, the Pollinator Habitat Awareness Program Hosts will hold onto the cards and reuse them.



Signage throughout the pollinator habitat is an opportunity to educate participants and nonparticipants of the Pollinator Habitat Awareness Program. Signs will serve as an informational and interactive guide as well as draw attention to the importance of pollinator habitat at the SAP. Signs are a useful tool to spark the interest of Grand Valley community members about the SAP and pollinators whether or not there is a pollinator event going on. Grand Valley community members will be able to simply read the sign and understand the overall importance of the pollinator habitat. One large sign will be placed in front of the pollinator habitat, closest to the entrance, and a series of small signs will be placed throughout the habitat in easily accessible places identifying plants and the pollinators they attract. The large sign will explain the purpose of the pollinator habitat, how it serves the surrounding ecosystems as well as food production at the SAP with a vibrant, educational display


Pollinator Habitat
This area has been planted with pollinator friendly, native plants. Our pollinator habitat is protected from pesticides and provides a sustainable farming aid to the Sustainable Agriculture Project. Plants were selected to support pollinators such as bees, butterflies, birds and bats.
POLLINATORS SUPPORT THE SAP
THE SAP SUPPORTS POLLINATORS
GRAND VALLEY STATE UNIVERSITY

FOOD PRODUCTION

The increase of local pollinators in and around the SAP is beneficial to the plants, flowers, and produce grown there because pollinators increase the natural fertilization of plants. This natural fertilization increases the overall output of all the plants at the farm, including the plants that produce food. The increase of pollinators at the SAP will also draw in more community members to purchase produce from the SAP. Pollinators are responsible for helping plants reproduce in a natural and sustainable way, which is very important when looking to profit off of food production, or to even be successful in sustainable food production at all. A variety of herbs will be planted along with native flowers in the pollinator habitat, which will expand food production to the SAP. The herbs can be sold, used in meals at the SAP or other places around Grand Valley, or even used as a prize for the raffle that this program utilizes.

BUDGET

The budget below outlines each activity and the resources required to complete that activity, independent of the other activities. This budget outlines total cost without subtractions from grants, donations, or upcycling. You will notice that various tools are required for multiple activities. However, we chose to include them multiple times so that the SAP could effectively budget, should they choose not to implement all of the activities outlined in our program. Seeds are not included in this budget because of the variation in quantity and type that the SAP team could potentially choose from.

Each activity was quoted for roughly 15-20 attendees, with the exception of the planting party. The planting party was quoted for roughly 100 attendees. While we acknowledge that the food chosen for the planting party does not support sustainable farming, we elected to go this route for ease in preparation and the ability to obtain donations, as well as the marketing to a larger student population. To ensure that the cookout is inclusive, the SAP could include an option for attendees to bring a dish to pass. Futuristically, the SAP could transition the food for this event to highlight foods that can only be produced through the work of pollinators, maintaining the primary focus of the program. Unfortunately, this style of meal would require more preparation and could potentially be less appealing to those that do not engage with the SAP regularly.

ITEMS	COMPANY QUOTED	COST	QUANTITY	TOTAL NEEDED	TOTAL COST
PLANTING NEEDS					
Planting Needs					
Watering cans	Amazon	$10	1	5	$50

Trowels	Amazon	$5	1	5	$25
Cultivator	Amazon	$5	1	5	$25
MARKETING					
Design	Well Design	$100	1	1	$100
Welcome Sign	Well Design	$20	1	2	$40
Flyer Printing	Grandville Printing	$10	30	1	$10
Wayfinding Signage	Well Design	$40	multiple	multiple	$40
U-Pick Printing	Grandville Printing	$10	80	1	$10
Passport Printing	Grandville Printing	$20	80	1	$20
Literature for Pol Education/Native Plant Ed	Well Design	$50	200	1	$50
Podium	Custom Engraving	$250	1	1	$250
COOKOUT					
Grill Rental	A&B Rental Jenison	$125 day	16x64	1	$125
Tables Rental	A&B Rental Jenison	$8	1	multiple	
Chairs Rental	A&B Rental Jenison	$1.25	1	multiple	
Plates	World Centric Compostables	$4.20	50	2	$8.40
Bowls	World Centric Compostables	$2.99	50	2	$5.98
Forks	World Centric Compostables	$2.94	24	5	$14.70
Spoons	World Centric Compostables	$2.94	24	5	$14.70
Knives	World Centric Compostables	$2.94	24	5	$14.70
Napkins	World Centric Compostables	$3.92	100	1	$3.92
Cups	World Centric Compostables	$3.71	50	2	$7.42
Hot Dogs	Gordon Food Services	$22	100	1	$22
Hot Dog Buns	Gordon Food Services	$27	144	1	$27
Hamburgers	Gordon Food Services	$50	100	1	$50
Hamburger Buns	Gordon Food Services	$26	120	1	$26
Chips/Snacks	Gordon Food Services	$4	19oz	4	$16
Ice Cream	Gordon Food Services	$28	3 gal	1	$28
Fruit Salad	Gordon Food Services	$28	3 lb	1	$28
Drinks	Gordon Food Services	$2	1	12	$24
GOURD BIRD HOUSES					

Steel Wool	Amazon	$8	9	1	$8
Paint	Home Depot	$40	3	3	$40
Wood Sealer	Amazon	$32	1 gallon	1	$32
Wire	Amazon	$15	1 roll	1	$15
Hole Drill	Home Depot	$30	1	1	$30
Snack For Attendees	//	//////////////////	//////////////////////	//////////////////////////	$10
BAT BOXES					
Saw	Home Depot	$40	1	1	$40
Drill	Home Depot	$40	1	1	$40
Screws	Home Depot	$10	1	4	$40
Cedar Deck Boards	Home Depot	$25	1 (2"x6")	12	$300
Snack For Attendees	//	//////////////////	//////////////////////	//////////////////////////	$10
FLOWER CROWNS					
Floral Kit (floral wire, floral cutters, floral tape)	Amazon	$11	1	5	$55
Snack For Attendees	//	//////////////////	//////////////////////	//////////////////////////	$10
FLOWER POTS					
Plastic Pots	Amazon	$10	8 (4")	3	$30
Spray bottles	Amazon	$12	4	1	$12
Premade Labels with Care Directions					
Snack for Attendees	//	//////////////////	//////////////////////	//////////////////////////	$10
PRESSED FLOWERS					
Toothpicks	Amazon	$7	1000	1	$7
Tweezers	Amazon	$7	1	5	$35
Craft Glue	Amazon	$6	1	5	$30
Paper	Amazon	$10	100	1	$10
Laminator	Amazon	$30	1	1	$30
Laminating Paper	Amazon	$20	1	1	$20
Snacks for Attendees	//	//////////////////	//////////////////////	//////////////////////////	$10
FLOWER CANDLES					
Candles	Amazon	$23	Set of 6 (3"x3")	7	$161
Heating Mechanism	Amazon	$40	1	1	$40
Craft Glue	Amazon	$6	1	5	$30

Extra Wax	Amazon	$25	10 lb	1	$25
Snacks for Attendees	//	//////////////////	//////////////////////	//////////////////////////////	$10

OTHER INFORMATION

Contacts that Could Potentially Assist in Leading a Make-and-Take and Location Recommendations:

Flower Crowns

Location: campus

Art Education Department Co-Directors

Hsiao-Ping Chen: chenh@gvsu.edu

Katalin Zaszlavik: zaszlavk@gvsu.edu

Pressed Flowers

Location: campus

Professor of Botany

Tim Evans: evanstim@mail.gvsu.edu

Flower Candles

Location: SAP

Beekeeping Executive Board Member

Name: Joslyn Raether

Email: jivymae@gmail.com

Bat Boxes

Location: SAP

Professor of Genetics (with bat emphasis)

Amy Russell: russelam@gvsu.edu

Gourd Bird Houses

Location: SAP

Farm Club President

Ellen Audia: audiae@mail.gvsu.edu

Flower Pots

Location: campus

SAP Team to Lead

Potential Raffle Donations

1. Meijer
2. Celebration Cinema
3. Blandford Nature Center
4. Fredrick Meijer Gardens
5. Other clubs around campus (beekeeping club, rock climbing club, etc.)

Possible Grant Opportunities:

Natural Resource Conservation Service (NRCS)

Conservation Innovation Grant: public and private grantees develop the tools, technologies, and strategies to support next-generation conservation efforts on working lands and develop market-based solutions to resource challenges. Grantees leverage the federal investment by at least matching it.

Conservation Reserve Enhancement Program: "Annual payment plus cost-share of up to 50% of the eligible costs to install the practice. CREP contracts require a 10- to 15-year

commitment to keep lands out of agricultural production. CREP is administered by FSA. NRCS provides technical assistance. “

Regional Conservation Partnership Program: “ encourages partners to join in efforts with producers to increase the restoration and sustainable use of soil, water, wildlife and related natural resources on regional or watershed scales.”

Agricultural Conservation Easement Program: “ protect the long-term viability of the nation’s food supply by preventing conversion of productive working lands to non-agricultural uses. Land protected by agricultural land easements provides additional public benefits, including environmental quality, historic preservation, wildlife habitat and protection of open space.”

Grand Valley State University

Center for Scholarly and Creative Excellence: “Promotes a culture of active, engaged and ethical scholarship through supporting innovative faculty and student research and collaborative partnerships in the broader community.”

Office of Undergraduate Research and Scholarship: “A fund to support undergraduate student research, performance, and scholarship. The OURS Project Supplies Grant is designed to encourage collaborative scholarly research and creative work between undergraduate students and faculty.”

Potential Seed Sources:

Michigan Native Plant Producers Association

The Michigan Native Plant Producers Association comprises 5 independently owned nurseries located throughout the state of Michigan. Together, they sell over 400 species of Michigan native plants and seeds, including, trees, shrubs, wildflowers, grasses, and ferns

Cardno Native Plant Nursery

The Cardno Native Plant Nursery has more than 350 species of native plant and seed in stock, in addition to genotype-specific seed. Their full-service native plant nursery is located in Walkerton Indiana and can immediately provide naive plant and seed material as well as custom seed mix.

Earth Source Native Plant Nursery

Heartland Restoration Services has been producing native seed and plants since 1994 and continues to expand to meet the growing need for high quality native plant materials. Located in Northeast Indiana, Heartland specializes in producing local-genotype native grasses, sedges, and forbs of wetland, prairie, savanna, and woodland species,

Spence Nursery

Spence Restoration Nursery is a wholesale producer of midwest native herbaceous plugs and seeds of Ohio Valley and Great Lakes origins. They produce around 180 species of native plugs for wetland, prairie, and woodland understory situations. The seed nursery consists of 5 properties totaling around 200 acres and includes nearly 140 species. Plugs and seeds are source identified by the Indiana Crop Improvement Association through their Yellow Tag source identification program.

Step-by-Step Processes to Creating Each Make-and-Take Project:

Flower Crowns

Website: https://laurenconrad.com/blog/2014/10/diy-how-to-make-flower-crowns/

Supplies Needed: floral wire, floral tape, floral wire cutters, greenery, flowers

1. Take a piece of floral wire and form it into a circular shape. Rest it atop your head to see how long you need the wire to be to form a loose crown around your head. Cut off excessive wire, and form the rest into a circular shape. Tape the circle shut with floral tape. You'll want to wrap the tape around the wire several times.

2. Choose your greens and flowers. You'll want to start your crown with a layer of pretty greenery that covers the wire, which will act as the base of your crown. Once you have your greenery, you'll tape it to the crown with your floral tape.

3. Once you have greenery taped to the crown, it's time to add your flowers. To attach each flower to the crown, make sure the flower stems are at least 3 inches long (you can cut off excess stems with scissors or wire cutters), and, using floral tape, tape the stem to the crown (see photo below). Just like for the greenery, you'll want to wrap the tape around the stem about four to five times to make sure it stays.

4. Add flowers to as much or as little of the rest of the crown as you'd like. In the photo above, Lauren layered a few different types of flowers for a beautiful and textured look.

Pressed Flowers

Website: https://www.greetingsofgrace.com/pages/how-to-use-pressed-flowers-a-simple-5-step-guide

Supplies Needed: toothpicks, tweezers, wood glue, shallow dish to hold glue, paper

1. Arrange the pressed flowers on the paper, but *do not glue anything*. If your design has multiple layers of flowers, arrange the flowers one layer at a time, starting with the bottom layer. Arranging the flowers should **always** be the first step because no changes can be made once the flowers are glued.
2. Pour a small amount of glue into a shallow dish or container for easy access.

3. In this step, you will start gluing the flowers, starting with the flowers on the bottom layer of the arrangement. Dip one end of a clean toothpick into the glue, and use the toothpick to apply a small amount of glue on one side of the pressed flower. **It is very important to use as little glue as possible.** Simply place little "dots" of glue on various parts of the flower. Try to distribute the glue evenly to help ensure a firm hold and prevent any petals or fragments from coming loose later. Use tweezers when handling the flowers.

4. Turn the pressed flower over so that the glue is facing down and carefully place the flower on the paper. Avoid moving or adjusting the flower once it is already placed.

5. Apply a slight amount of pressure on the pressed flower and hold for a few seconds. Then go back to Step 3 and repeat the procedure until all of the flowers have been glued.

Flower Candles

Website: https://www.flowersfordreams.com/blog/15-unique-flower-crafts/

Supplies Needed: dried flowers, molded candles, craft adhesive, paraffin and beeswax

1. Arrange flowers in the way that you desire.
2. Secure dried flowers to a candle using craft adhesive.
3. Dip the entire candle into a pot of melted paraffin and beeswax for five seconds,
4. Remove and dip again for another five seconds.
5. Let your new flower candle dry for at least two hours

Bat Boxes

Website: https://www.diynetwork.com/how-to/outdoors/gardening/how-to-build-a-bat-house

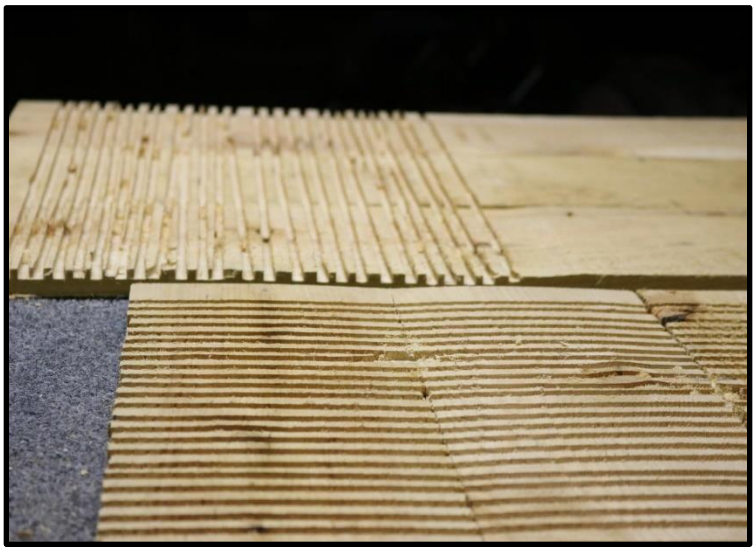
Supplies Needed: saw, drill, wood, screws (0.5 inch and 3.5 inch)

1. Trim wood to size. Natural cedar is ideal for a bat shelter. We used three 1x6 fence panels. Fence panels are typically less expensive than finished cedar boards that are typically used for interior woodwork. Use a pencil and a speed square to mark 26” from the end on one board then stack all three boards to be cut on the chop saw at the same

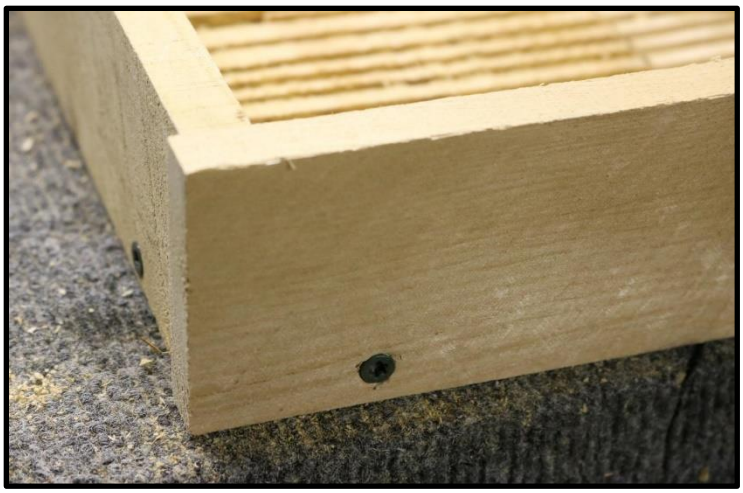
time. Measure 22” on the remaining length and then use the chop saw to cut all three boards down to size. These boards will compose the front and back of the bat house.

2. Attach board using simple joinery. Use a wood joiner to attach the two sets of three boards together. The biscuits and wood glue used here work together to create a very strong connection, though there are many joinery options to consider depending on your resources, including pocket screws. The three short boards will align to create the front of the bat house (22” long) and longer boards will form the back panel of the bat house (26” long). On the 22” boards, avoid placing joinery around 6” from the bottom of the boards. A ventilation channel will be routed at this mark and could damage the joint. Place joinery higher and lower on the boards.
3. Create grooves on the inside. There are a few different ways to create texture on the inside of the bat house. Rough texture is necessary, it makes it easy for bats to grab on and nest comfortably in their dwelling. One method is to staple plastic mesh on the inside of the panels. The alternative is to cut small 1/4” horizontal grooves in the wood, making

a ladder on which the bats can climb and cling. A palm router with a 1/4” straight bit is perfect for creating horizontal grooves. Use a piece of clamped wood as a straight edge and set the router depth to plunge 1/4” deep (the grooves will be 1/4” x 1/4”). Continue routing these lines from the top of each panel, towards the bottom. Adjust the router depth to 3/4” and use the tool to create a ventilation strip 6” from the bottom on the front panel. You may find it easiest to mark the location of the ventilation strip and then re-route the opening once the house is assembled so the straight bit can plunge through easily.



4. Cut and install side walls. Now that you’ve finished the front and back panels of the house, trim the remaining lengths of cedar to size. Use the circular saw to rip the boards in half lengthwise and the miter saw to cut them to size. Use these pieces as the side walls and the roof of the bat house. You will need two 22” pieces and one 18” length. Use a drill bit to pre-drill in the cedar and galvanized screws to assemble the walls. Lap the corners of the wood and screw through into the front and back panels.



5. Paint or apply stain. Dark colors like medium-brown, dark brown or black are recommended for bat houses, because they help generate and retain heat from sunlight. Use only latex paint or a natural stain. Bats prefer warmer temperatures, 85 to 100 degrees Fahrenheit. Choose and apply a stain or exterior paint for the bat house.

6. Find the right spot and prep. Location is a big factor to consider when it's time to install the bat box. The ideal mount is 15'-20' off the ground, mounted on a pole, stand-alone tree or on the side of a building. Position the box to get maximum sun exposure. If you're

installing on a building, be sure there is ground beneath for the droppings to collect (as opposed to allowing them to sit on the roof). Batconservation.org recommends placing a two-foot wide metal piece below the box, so raccoons and cats can't jump over it, but you also have to make sure to place it at least a few feet away from the bat house to allow the bats to drop and fly out of the house. Use appropriate mounting materials to attach the bat house. To mount it on a tree, a t-plate bracket is attached to the back panel and two additional holes were drilled for screws in the bottom of the house.

7. Install bat box. Use an extension ladder and exercise caution while you install the house. Use a level for accuracy, and a drill to attach the 3-½" galvanized screws into the tree.

Gourd Bird Houses

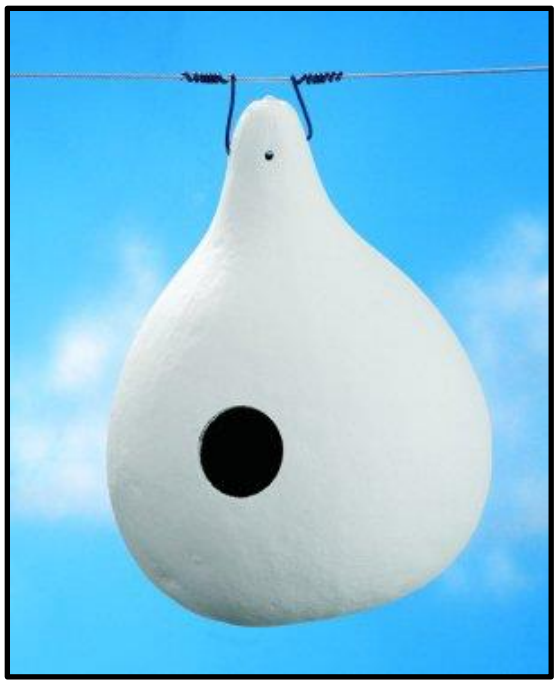
Website: http://www.birdsandblooms.com/backyard-projects/diy-birdhouse/make-purple-martin-gourd-birdhouse/

Supplies Needed: Hard-shell gourd, bleach (for disinfectant), fine steel wool, wood preservative, oil-based primer, oil-based enamel paint, plastic coated wire, drill, 2-1/8-inch hole saw or a keyhole saw

1. Soak the gourd for 15 minutes in hot soapy water, then scrape it with a dull knife to remove the outer skin and mold. Scrub the gourd in the water with fine steel wool. Rinse it well and allow it to thoroughly dry.
2. To locate the entrance hole, hold the gourd by its stem between your index finger and thumb and let it hang. Mark a center point along the outermost part of the curve so the hole faces straight out—not towards the sky or the ground. The hole should measure 2-1/8 inches and can be easily and quickly drilled with the proper-size hole saw. (Be sure to

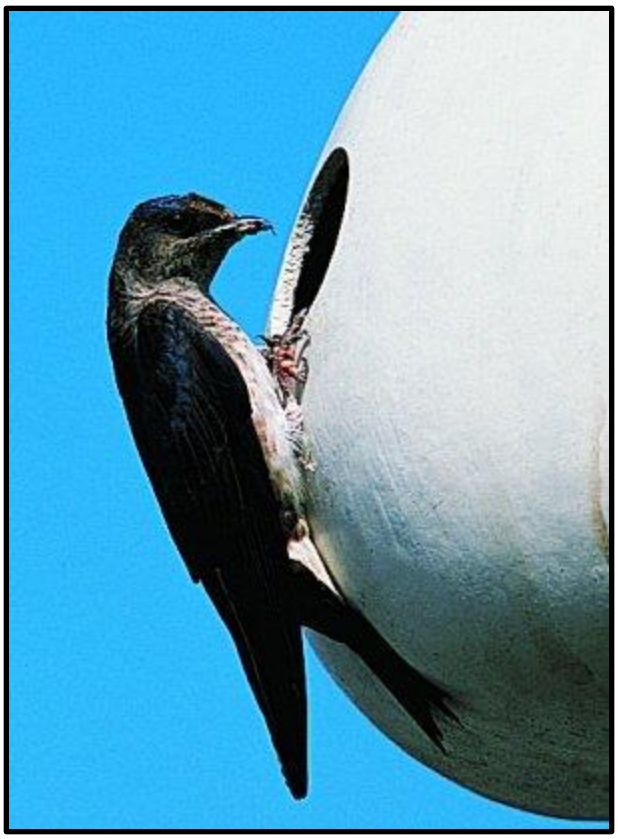
wear a face mask.) You can also use a keyhole saw to cut the entrance by hand. If you do, it's best to cut the hole immediately after washing the gourd, while it's still wet.

3. Make seven drainage holes in the bottom of the gourd about 2 inches apart using a 5/16-inch drill bit. With the same bit, drill two sets of holes about 2 inches from the top of the gourd's neck for hanging and ventilation. One set should be drilled perpendicular to the entrance hole and the other in line with it. (You'll only use one set of holes for hanging. Choose the pair that will allow the entrance hole to face the most open direction.)
4. Remove seeds and membrane through the entrance hole with a long-handled metal spoon, screwdriver or a wire coat hanger (wear a face mask). If this is difficult, soak the gourd in water for several hours. The inside does not have to be completely clean.
5. Dip the gourd in a wood preservative for 15 minutes, weighing it down with a brick. Then remove the gourd and hang it up to dry for several days. (For a cheaper alternative, dissolve 1 pound of copper sulfate (available at garden centers and farm-supply stores) in



5 gallons of warm water and dip the gourd as instructed above. Wear rubber gloves while handling it.)

6. Sand the gourd smooth and paint with an oil-based primer. Allow it to dry. Paint the gourd house with white exterior enamel paint with a nylon brush. (Do not use water-based latex paint because it will peel.) Apply two coats. Be careful not to clog drainage holes.
7. When dry, you can hang your gourd (you'll need at least 4 to 6 gourds to attract martins) from a 24-inch plastic-coated copper wire. Thread the wire through two of the holes directly across from each other and hang it from a support line, below a martin house or on a specially made gourd rack. Hang the gourd 10 to 15 feet high, with the entrance hole facing an open area. The gourd will swing, making it less attractive to nest competitors, such as starlings.



8. Gourd Birdhouse Maintenance: In late August or early September, after the martins depart for their winter homes in the tropics, take the gourd house down for cleaning. Break up nests with the handle of a wooden spoon and shake out the contents. Then store until early spring (the martins return as early as February in the deep South) in a spot inaccessible to rodents. Your gourd house will be ready to use again, but you might want to prepare a few more over winter, because the martins will probably bring along a few more friends!

Gourd Species Recommendations

Gourd recommendations include white flowered, bottle, and club gourds (Lagenaria siceraria), and sponge gourd (Luffa cylindria). These gourds are described as hard shelled when mature; hard, solid, angular grooved stem with moderate storage.

Plant Species Recommendations

Table 1. Of plant species recommendations is provided by Michigan State University

Table 2. Of plant species recommendations if provides by Xerces Society for Invertebrate Conservation

Hummingbird preferred native flowers

Squirrel corn *(Dicentra canadensis)*

Virginia bluebells *(Mertensia virginica),*

Marsh bellflower *(Campanula aparinoides)*

Spotted jewelweed *(Impatiens capensis)*

Butterfly preferred native flowers

Purple coneflower *(Echinacea purpurea)*

Butterfly weed *(Asclepias tuberosa)*

Button bush *(Cephalanthus occidentalis)*

Joe pye weed (*Eutrochium fistulosum)*

Meadow blazing star *(Liatris spicata)*

Common name	Scientific name	Natural enemies	Bees
1. wild strawberry	*Fragaria virginiana*	★★	★
2. golden Alexanders	*Zizia aurea*	★★★	★★
3. Canada anemone	*Anemone canadensis*	★★★	★
4. penstemon/hairy beardtongue	*Penstemon hirsutus*	★★	★★
5. angelica	*Angelica atropurpurea*	★★★	★
6. cow parsnip	*Heracleum maximum*	★★★	★
7. sand coreopsis/lanceleaf tickseed	*Coreopsis lanceolata*	★★★	★
8. shrubby cinquefoil	*Potentilla fruticosa*	★★★	★
9. Indian hemp	*Apocynum cannabinum*	★★★	★
10. late figwort	*Scrophularia marilandica*	★★	★★
11. swamp milkweed	*Asclepias incarnata*	★★	★★
12. Culver's root	*Veronicastrum virginicum*	★★	★★★
13. yellow coneflower	*Ratibida pinnata*	★★★	★★
14. nodding wild onion	*Allium cernuum*	★	★★
15. meadowsweet	*Spiraea alba*	★★★	★★
16. yellow giant hyssop	*Agastache nepetoides*	★★	★★★
17. horsemint/spotted beebalm	*Monarda punctata*	★★★	★★
18. Missouri ironweed	*Vernonia missurica*	★★	★★
19. cup plant	*Silphium perfoliatum*	★★★	★★★
20. pale Indian plantain	*Cacalia atriplicifolia*	★★	★★
21. boneset	*Eupatorium perfoliatum*	★★★	★★
22. blue lobelia	*Lobelia siphilitica*	★★★	★★★
23. pale-leaved sunflower	*Helianthus strumosus*	★★★	★★
24. Riddell's goldenrod	*Solidago riddellii*	★★★	★★★
25. New England aster	*Aster novae-angliae*	★★★	★★
26. smooth aster	*Aster laevis*	★★	★★

Native Flowering Plants that Attract Beneficial Insects

The bloom periods shown for the native perennials are for 2-year-old plants growing in full sun in 2005 in Ingham County, Michigan. Bloom times will vary between years and locations. All plants are native to the north central United States; many are native to the eastern United States. Check with local resources to determine if they are native to your area.

Key:

★ good
★★ better
★★★ best

Entire bloom period.
Yellow area shows peak bloom.

Project GREEEN
MICHIGAN AGRICULTURAL EXPERIMENT STATION
MICHIGAN STATE UNIVERSITY EXTENSION

www.ipm.msu.edu/plants/home.htm

This list of pollinator plants for the Great Lakes Region was produced by the Xerces® Society. For more information about pollinator conservation, please visit www.xerces.org

Bloom Period	Common Name	Scientific Name	Life Cycle*	Flower Color	Max. Height† (Feet)	Water Needs L: low, M: medium, H: high	Notes
	Forbs						*Life Cycle abbreviations: A: annual, P: perennial, B: biennial. †Max. Height is an average, individual plants may vary.
Early 1	Lanceleaf coreopsis	*Coreopsis lanceolata*	P	yellow	2	L	This early bloomer can hold its own among grasses and taller species; bees and syrphid flies are common visitors
Early 2	Smooth penstemon	*Penstemon digitalis*	P	white	2	M	Semi-evergreen; prolific nectar producer; visited by a huge diversity of butterflies, moths, and bees, including honey bees
Early 3	Wild lupine	*Lupinus perennis*	P	blue	2	L	Larval host plant for the endangered Karner blue butterfly (*Lycaeides melissa samuelis*, shown), and various other blue butterflies
Mid 4	Butterfly milkweed	*Asclepias tuberosa*	P	orange	3	L	Milkweeds (*Asclepias* spp.) are host plants for the monarch butterfly (*Danaus plexippus*), and nectar sources for many bees
Mid 5	Dotted mint	*Monarda punctata*	A, B, P	purple	3	M	Tolerates dry, sandy soils; blooms prolifically; highly attractive to beneficial wasps and bees, including honey bees
Mid 6	Great blue lobelia	*Lobelia siphilitica*	P	blue	3	H	Great blue lobelia is an exceptional bumble bee plant, and is excellent for rain gardens
Mid 7	Purple coneflower	*Echinacea purpurea*	P	purple	4	M	Visitors include bees in the genera *Bombus*, *Melissodes*, and *Svastra*, and the leafcutter bee (*Megachile pugnata*)
Mid 8	Purple prairie clover	*Dalea purpurea*	P	purple	2	L	Honey bees and bumble bees are voracious visitors, as well as several specialist polyester bees (*Colletes* spp.)
Mid 9	Virginia mountain mint	*Pycnanthemum virginianum*	P	white	3	M	This and related species have fragrant foliage, and are visited by blue and copper butterflies, honey bees, and more
Mid 10	Wild bergamot	*Monarda fistulosa*	P	purple	4	M	Hawk moths, hummingbirds, and long-tongued bumble bees (such as *Bombus pensylvanicus*) are common visitors
Mid-Late 11	Cup plant	*Silphium perfoliatum*	P	yellow	8	M	Attracts many bees and butterflies; thick hollow stems make excellent nests for leafcutter bees and small carpenter bees (*Ceratina* spp.)
Mid-Late 12	Prairie blazing star	*Liatris pycnostachya*	P	purple	5	M	Blazingstars (*Liatris* spp.) support a broad community of butterflies including monarchs, swallowtails, skippers, and sulfurs
Mid-Late 13	Purple giant hyssop	*Agastache scrophulariifolia*	P	purple	6	M	This and other wild hyssops (*Agastache* spp.) provide long-lasting, nectar-rich flowers and mint-like foliage
Mid-Late 14	Rattlesnake master	*Eryngium yuccifolium*	P	white	5	M	Attracts incredible insect diversity and is the host plant for the rattlesnake master borer moth (*Papaipema eryngii*)
Mid-Late 15	Joe Pye weed	*Eutrochium fistulosum*	P	pink	7	H	Primarily known as a butterfly plant, Joe Pye weed also attracts bees; tolerant of partial shade and wet soils
Mid-Late 16	Wingstem	*Verbesina alternifolia*	P	yellow	6	H	A major honey producer; great as a shade-tolerant rain garden or wetland edge plant; may be hard to find in nurseries
Late 17	Bottle gentian	*Gentiana andrewsii*	P	blue	2	M	Its flower petals never open; almost exclusively pollinated by bumble bees, which pry the petals apart to climb inside
Late 18	Calico aster	*Symphyotrichum lateriflorum*	P	white	3	M	Its shallow nectaries attract more insect diversity than some related species; is also tolerant of partial shade
Late 19	Field thistle	*Cirsium discolor*	B, P	purple	6	M	Not to be confused with non-native thistles; a now uncommon but important plant for butterflies and bumble bees
Late 20	New England aster	*Symphyotrichum novae-angliae*	P	purple	6	M	One of the latest fall-blooming plants; frequented by honey bees and pre-hibernation bumble bee queens
Late 21	Showy goldenrod	*Solidago speciosa*	P	yellow	5	M	Goldenrods (*Solidago* spp.) are frequented by beneficial solitary wasps, pollen-eating soldier beetles, honey bees, and much more
	Shrubs and Trees						
Early-Mid 22	Cockspur hawthorn	*Crataegus crus-galli*	P	white	35	L	Tough native tree that attracts bumble bees, honey bees, species of mining bees (*Andrena* spp.), as well as songbirds
Mid 23	Leadplant	*Amorpha canescens*	P	purple	3	L	Leadplant is generally tolerant of disturbed soils; readily visited by leafcutter bees, honey bees, and other beneficial insects
Mid 24	New Jersey tea	*Ceanothus americanus*	P	white	4	M	Pollinator magnet that attracts species of flies, wasps, bees, and butterflies; slow growing and prone to deer browsing

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