

Native Bee Study Midway Update

Breann Kniffen

The original proposal for this project focused on studying the native bee population on SU campus, building nesting site structures, and importing my native bees into the area. Since the proposal however, the above ground bee nesting structure and the importing of native bees has been removed from the agenda. This decision was based on ethical ramifications, sustainability of the project, and the associated potential risks to bee populations. Several studies have suggested that importing bees can bring new diseases to the area negatively impacting established bee populations. Furthermore, while building above ground nesting structures for bees may be beneficial, several studies have shown they do not help native bees anymore than they do wasps or other insects. Additionally, the original design of the structure had the nesting sites clustered together which would allow for pests to eat more larvae over winter further hurting bee populations. These structures would additionally need to be cleaned out and maintained every sprint with new nesting materials which could become difficult to maintain.

The overall aim of the project now, is to examine ways to help large campuses in the PNW area, including SU, to establish native bee gardens. The overall goal is to provide native plant suggestions along with plant requirements and a bloom chart to ensure a plentiful food supply from March to September, educational signage for the garden, and housing for native bees. Overall, to create a guide for creating the optimal environment for bees and having it be an educational experience to promote awareness. The project will also lay out the ground works for accessing SU's campus bee abundance and diversity.

With the help of Shannon from Grounds and Landscaping, data was collected for the first time ever about SU's bees via student volunteers. The foundation for the monitoring was the CCUWBee Monitoring parameters which have been slightly modified to fit the needs of SU's campus.



SEATTLE UNIVERSITY

BEE MONITORING

2021 Data Collection Results

BEE GROUPS SIGHTED

On SU Campus

01

Bumbe Bees (BB)

02

Medium Dark Bee (MDB)

03

Tiny Dark Bee (TDB)

04

Striped Hairy Belly Bee (SHBB)

05

Metalic Hairy Belly Bee (MHBB)

06

Honey Bee (HB)

2021 BEE GROUP SIGHTINGS

Total number seen over a span of 9 monitoring days
in 5 months (April-August)

77

10

10

6

2

2

Bumble Bee
(BB)

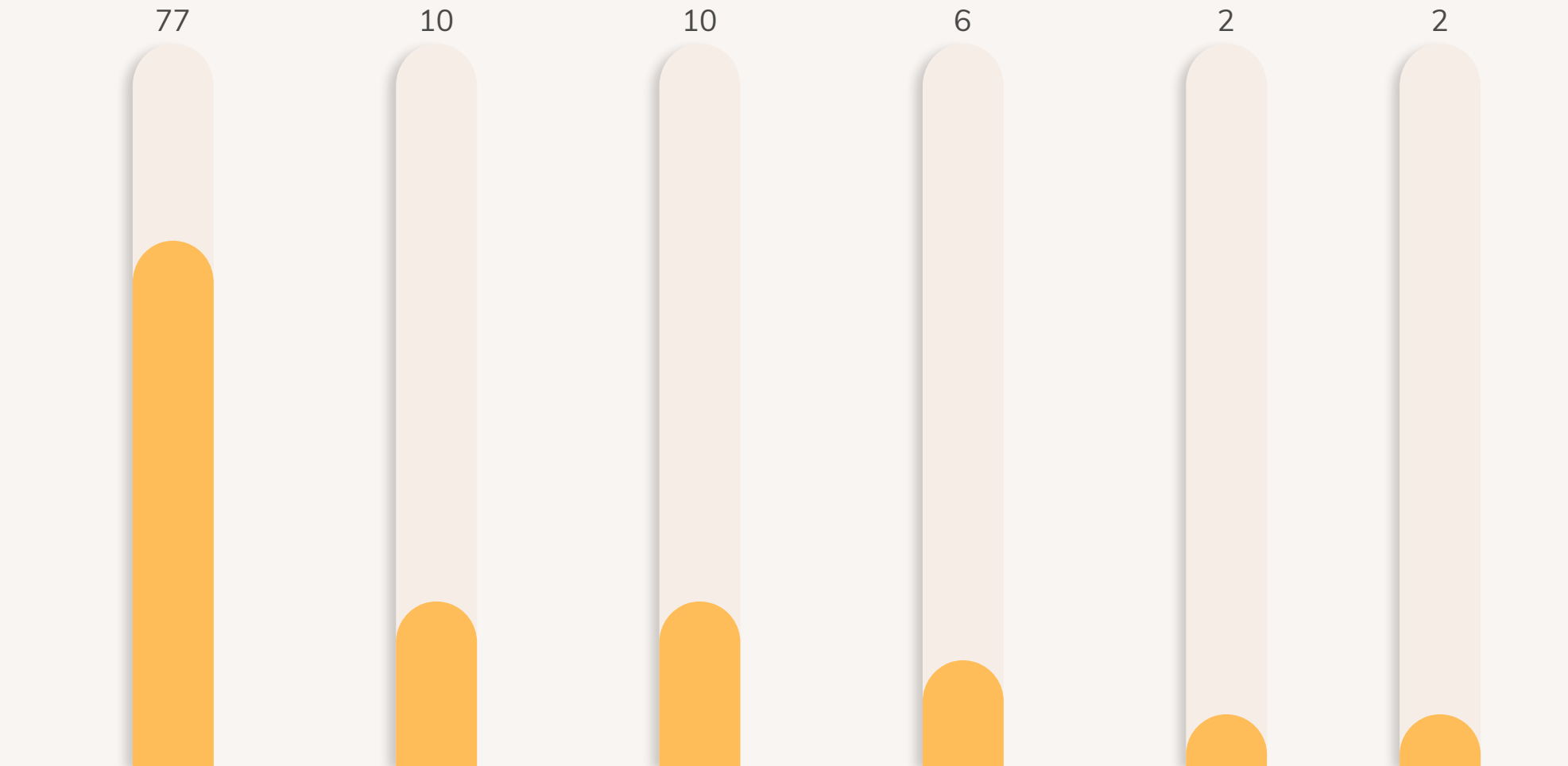
Medium Dark Bee
(MDB)

Tiny Dark Bee
(TBD)

Stripped Hairy
Belly Bee
(SHBB)

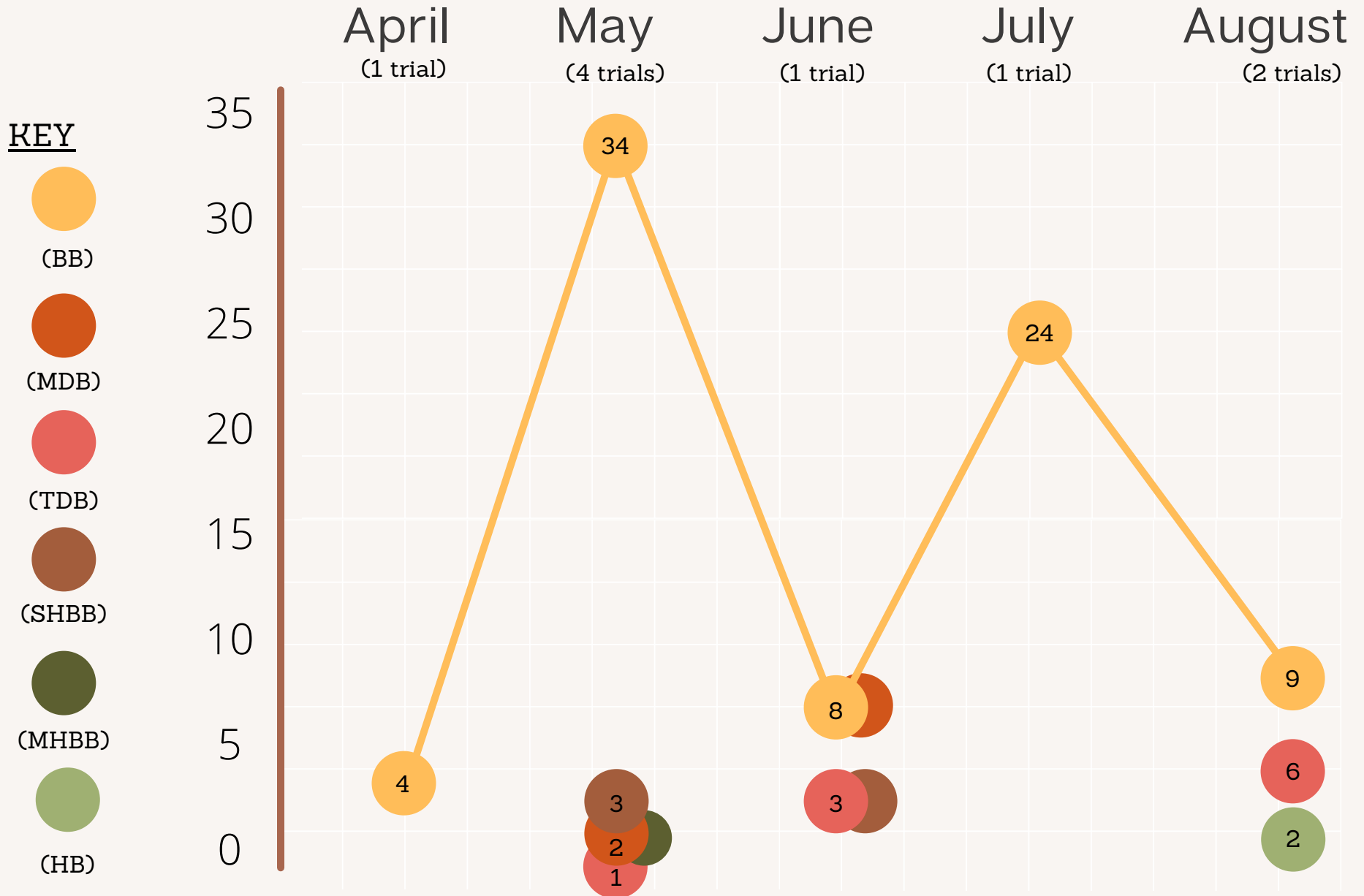
Metallic Hairy
Belly Bee
(MHBB)

Honey Bee
(HB)



BEE GROUP SIGHTINGS

BY MONTH



BEE GROUP SIGHTINGS

BY DATE

26-April 5-May 12-May 21-May 28-May 24-Jun 20-Jul 10-Aug 16-Aug

KEY



(BB)



(MDB)



(TDB)



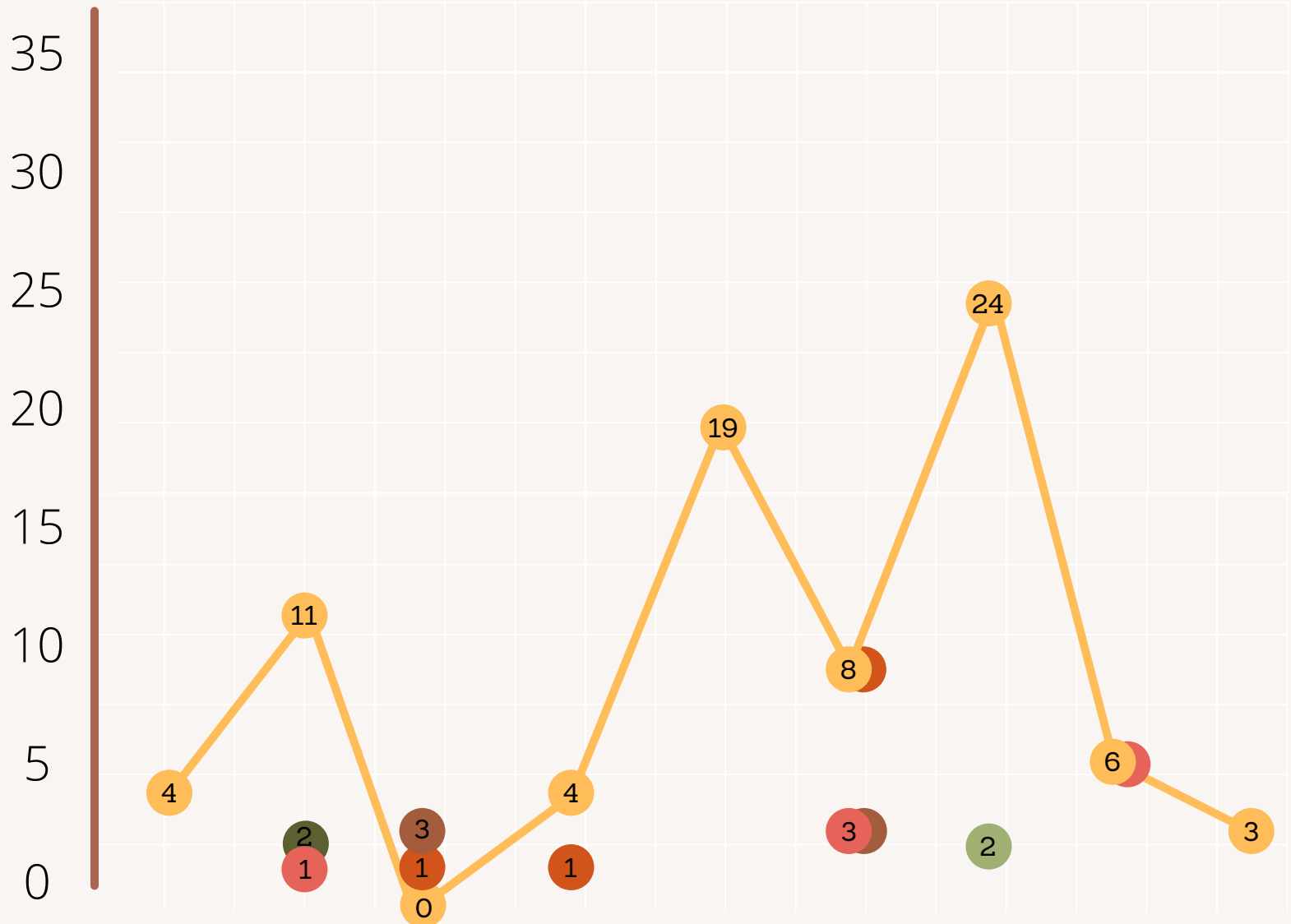
(SHBB)



(MHBB)



(HB)



CONCLUSION

PRELIMINARY PREDICTIONS

Regardless of species there is a close correlation between the number of bumble bee foragers observed and number of nesting sites (Geib, Strange, & Galen, 2015). Data collected thus far suggests SU's campus hosts several bumblebee nests. Additionally, bumble bee "population size is likely to correlate positively with average individual health" (Parreño et al., 2021), and for many bees, nesting resources are a primary limiting factor in population growth and diversity (Buckles & Harmon-Threatt, 2019). Thus continuously observing bumble bee species may suggest that SU's campus provides a diverse and plentiful floral diet as well as the necessities for nesting sites.

While other bee groups were not as common as the bumble bee (BB) group, six out of eight bee groups were sighted on SU campus (bee groups were established by the CCUWBee Monitoring project). It is also important to note that some native bee species can be as small as 2 mm, making it incredibly difficult to spot them all. Thus, further data is needed to accurately assess the diversity of bees on SU campus.

Future monitoring sessions should range from March to November and be as frequent as possible. It is also recommended that the method of observation be switched from using the transect method to a targeted sweep netting approach as it is significantly more accurate (Prendergast, Menz, Dixon, & Bateman, 2020).

Works Cited

- Buckles, B. J., & Harmon-Threatt, A. N. (2019). Bee diversity in tallgrass prairies affected by management and its effects on above- and below-ground resources. *Journal of Applied Ecology*, 56(11), 2443–2453. <https://doi.org/10.1111/1365-2664.13479>
- Geib, J. C., Strange, J. P., & Galen, C. (2015). Bumble bee nest abundance, foraging distance, and host-plant reproduction: implications for management and conservation. *Ecological Applications*, 25(3), 768–778. <https://doi.org/10.1890/14-01511>
- Parreño, M. A., Alaux, C., Brunet, J.-L., Buydens, L., Filipiak, M., Henry, M., Leonhardt, S. D. (2021). Critical links between biodiversity and health in wild bee conservation. *Trends in Ecology & Evolution*. <https://doi.org/10.1016/j.tree.2021.11.013>
- Prendergast, R. S., Menz, M. H. M., Dixon, R. W., & Bateman, P. W. (2020). The relative performance of sampling methods for native bees: an empirical test and review of the literature. *Ecosphere*, 11(5). <https://doi.org/10.1002/ecs2.3076>

For a conclusive idea of SU's campus native bee abundance and diversity at least four to five more years of data collection needs to be conducted from March to September. To aid in the bee monitoring process and accuracy, an insect display is being put together. The insect display will showcase various types of bees and the group they belong to under the bee monitoring guidelines. This display can then be used to train and teach new people wanting to partake in the bee monitoring program. Furthermore, the bees placed into the display will be barcoded which involves extracting and sequencing DNA. This will allow us to quantify some of the diversity on campus.

To inform the project of the best uses of signage information, a survey has been sent out to SU members. The results of the survey will inform what information would be the most useful and practical for native bee garden signage. The survey is currently open and set to close the first of March. If you'd like to take the survey you can find it [here](#), or by scanning the QR code below:



As for the native bee housing, the ground nesting structures are still underway. Recycled materials from the SU carpentry shop were donated to build these structures. There will be a total of six structures built and placed around campus. Due to nesting resources being a limiting factor to most native bees we are hoping to overcome this by providing the ideal nesting environment. These structures will be installed by the end of February and will be observed two-three times a week. We will be observing what, if any, species inhabit the structures as well as how many. If the structures become inhabited with native bee's further research will need to be conducted to examine the effectiveness of the structures. As a large portion of active bee season is outside of the normal academic year, I would recommend making bee monitoring an undergraduate research credit for students during the Spring and Summer quarters.

Native plants are nutritionally more valuable to native bees than are non-native plants. Thus, I have put together a bloom chart for the King County Native Plant Guide as a resource to avoid having plant gaps in gardens.

King County Native Plant Bloom Guide

(<https://green2.kingcounty.gov/gonative/Plant.aspx?Act=list>)

		Bloom Month											
Type	Common Name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Tree	bigleaf maple				■	■							
Tree	bitter cherry				■	■							
Tree	black cottonwood				■	■							
Tree	black hawthorn					■	■						
Tree	cascara				■	■							
Tree	Douglas' Maple				■	■							
Tree	Douglas-fir				■	■							
Tree	gand fir				■	■							
Tree	Hookers willow			■	■	■							
Tree	madrone; madrona			■	■	■							
Tree	Oregon ash				■	■							
Tree	Oregon white oak; Garry oak			■	■	■							
Tree	Pacific crabapple				■	■							
Tree	Pacific dogwood				■	■	■	■					
Tree	Pacific willow			■	■	■	■						
Tree	paper birch				■	■							
Tree	quacking aspen				■	■							
Tree	red alder			■	■	■							
Tree	shore pine				■	■							
Tree	Sitka spruce				■	■							
Tree	Sitka willow			■	■	■							
Tree	slide alder				■	■	■						
Tree	vine maple			■	■	■							
Tree	Western hemlock				■	■							
Tree	Western redcedar				■	■							
Tree	Western white pine				■	■							
Tree	yew				■	■	■	■					
Shrub	blad hip rose				■	■							
Shrub	beaked hazelnut	■	■	■									
Shrub	black cap raspberry				■	■	■						
Shrub	black gooseberry						■						
Shrub	blue elderberry			■	■	■	■	■	■				

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Shrub	bog laurel				█	█							
Shrub	bog rosemary						█	█					
Shrub	devil's club							█					
Shrub	evergreen huckleberry			█	█	█							
Shrub	hairy manzanita			█									
Shrub	highbush cranberry; mooseberry					█	█						
Shrub	hybrid manzanita		█	█	█								
Shrub	indian plum; osoberry			█									
Shrub	low Oregon grape				█	█	█						
Shrub	mock orange			█				█					
Shrub	nootka rose					█	█	█	█				
Shrub	oceanspray							█	█				
Shrub	Oregon box				█								
Shrub	Pacific ninebark							█					
Shrub	Pacific rhododendron				█	█	█	█					
Shrub	Pacific wax myrtle				█	█	█	█					
Shrub	red elderberry												
Shrub	red huckleberry												
Shrub	red stem ceanothus							█					
Shrub	red-flowering currant			█	█								
Shrub	red-osier dogwood					█	█						
Shrub	salal				█	█	█	█					
Shrub	salmonberry			█									
Shrub	serviceberry; juneberry				█	█	█						
Shrub	snowberry							█					
Shrub	snowbrush; sticky laurel				█	█	█	█	█				
Shrub	spiraea; hardhack								█	█			
Shrub	stink currant					█	█						
Shrub	subalpine spirea							█	█				
Shrub	swamp rose; clustered wild rose					█	█	█					
Shrub	sweet gale							█	█	█			
Shrub	tall Oregon grape			█	█	█							
Shrub	thimbleberry						█	█	█				
Shrub	twinberry			█	█				█				
Shrub	white spirea; shiny-leaved spirea							█					
Groundcover	beach strawberry				█	█	█						

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Groundcover bleeding heart			█	█	█	█	█	█	█			
Groundcover blue-eyed grass				█	█	█	█	█	█			
Groundcover bracken fern	█	█	█	█	█	█	█	█	█	█	█	█
Groundcover broad-leaved stonecrop					█	█	█	█				
Groundcover bunchberry					█	█	█	█				
Groundcover camas, common				█	█	█						
Groundcover camas, great				█	█	█						
Groundcover Cascade penstemon		█	█	█	█		█	█				
Groundcover chocolate lily		█	█	█	█							
Groundcover coastal gumweed								█	█			
Groundcover columbia lewisia					█	█	█	█				
Groundcover common harebell									█			
Groundcover Cooley's hedge nettle					█	█	█	█				
Groundcover cow-parsnip					█	█	█					
Groundcover deer fern	█	█	█	█	█	█	█	█	█	█	█	█
Groundcover Douglas aster						█	█	█	█		█	
Groundcover edible thistle					█	█	█	█	█			
Groundcover false lily-of-the-valley					█	█	█					
Groundcover false Solomon's-seal					█	█	█					
Groundcover farewell-to-spring						█	█	█				
Groundcover fireweed									█			
Groundcover foam flower					█	█	█	█				
Groundcover fringe-cup				█	█	█	█					
Groundcover goat's beard					█	█	█					
Groundcover golden eyed grass					█	█	█					
Groundcover goldenrod									█	█	█	
Groundcover graceful cinquefoil						█	█					
Groundcover Hendersons checker mallow						█	█	█	█			
Groundcover inside-out flower					█	█	█					
Groundcover kinnikinnik; bearberry			█	█	█	█	█					
Groundcover kneeling angelica						█	█					
Groundcover lady fern	█	█	█	█	█	█	█	█	█	█	█	█
Groundcover licorice fern	█	█	█	█	█	█	█	█	█	█	█	█
Groundcover maidenhair fern	█	█	█	█	█	█	█	█	█	█	█	█
Groundcover nettle						█	█	█	█			
Groundcover nodding onion						█	█	█				

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Groundcover	oak fern											
Groundcover	Oregon iris											
Groundcover	oxalis; wood sorrel											
Groundcover	Pacific waterleaf											
Groundcover	palmate coltsfoot											
Groundcover	pearly everlasting											
Groundcover	piggyback plant; youth-on-age											
Groundcover	rattlesnake plantain											
Groundcover	Scouler's corydalis											
Groundcover	sea-watch											
Groundcover	showy fleabane											
Groundcover	silverweed											
Groundcover	small flowered alumroot											
Groundcover	spreading stonecrop											
Groundcover	star-flowered false Solomon's-seal											
Groundcover	stream violet											
Groundcover	swamp lantern; skunk cabbage											
Groundcover	sword fern											
Groundcover	taper-tip onion; Hooker's onion											
Groundcover	thrift; sea pink											
Groundcover	trailing snowberry											
Groundcover	trillium											
Groundcover	twinfleur											
Groundcover	vanilla leaf											
Groundcover	wapato; arrowhead											
Groundcover	Western columbine											
Groundcover	Western starflower; Indian potato											
Groundcover	wild ginger											
Groundcover	wild strawberry											
Groundcover	woodland strawberry											
Groundcover	yarrow											
Groundcover	yellow monkey-flower											
Grass-like	cattail											
Grass-like	dagger-leaved rush											
Grass-like	Dewey's sedge											
Grass-like	dunegrass											

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Grass-like	hardstem bulrush												
Grass-like	Idaho fecue												
Grass-like	Lyngbye's sedge												
Grass-like	slough sedge												
Grass-like	small-fruited bulrush												
Grass-like	thick headed sedge												
Grass-like	tufted hairgrass												
Vine	blackberry, trailing												
Vine	hairy honeysuckle												
Vine	orange honeysuckle												

Bloom information was found using The University of Texas at Austin plant database the Lady Bird Johnson Wildflower Center
(https://www.wildflower.org/plants/combo.php?fromsearch=true&distribution=WA&habit=&duration=&moist_moist=1)

Additionally, I have put together a native plant suggestion list for SU's future Bannan roof garden. The plant suggestions thus far are plants that are beneficial to native bees and many of them also fit the edible campus project. Before finalizing plans to install the Bannan roof garden, more research about SU's campus bloom gap needs to be conducted. This way three objectives can be meant at once: having an educational native bee garden, incorporating the edible campus project, and closing the campus bloom gap. Zachary Smith has already done research on the soil quality of the Bannan building which will be extremely valuable in assessing what can be grown in the area. It will take a lot of future efforts from students to encompass all aspects of this garden.