Honeybee and Wild Bee Flower Preferences in the Pacific Northwest

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Introduction:

Animal pollination is very important in the production of food for humans. Many of the commercially grown crops humans produce for food rely on animals, particularly insects, for pollination [3]. In fact, about two thirds of the world's crops require animal pollination in order to be produced [3]. Agriculture in the Pacific Northwest is no different, where farmers rely on animal pollination in order to produce crops such as apples, berries, wine grapes, and nuts [6].

Agriculture is a very important part of the economies within the states of the Pacific Northwest region of the United States. Agriculture, within the states that compose the Pacific Northwest, makes up more than 13% of each state's economies [6]. Therefore, maintaining, if not increasing, crop yields is crucial to the livelihoods of many people within the Pacific Northwest. Pollinator declines, however, could threaten the agricultural component of the Pacific Northwest's economy by decreasing crop yields, or even causing complete crop failures [2]. There is a relationship between decreased bee abundance and increased pollination deficits [5]. Pollination deficits occur when fruits are not produced as a result of a plant's flowers not being pollinated. These pollination deficits are one of many causes of decreasing yields for farmers. As pollinator populations continue to decline, pollination deficits become even more significant to yields [5].

It has been found that increased bee abundance can result from increased floral availability [4]. Growing more flowers could increase bee abundance in farms within the Pacific Northwest, which in turn could lead to increased pollination, and increased yields, thus protecting the agricultural component of the Pacific Northwest's economy. Therefore, farmers within the Pacific Northwest would stand to gain from understanding the relationships that bees and non-agricultural flowering species have with one another. With this information they could include more flowers on their farms, to foster larger pollinator populations.

Knowledge Gaps:

What is unknown, however, is which specific flower species, if any, are preferred by bees in the Pacific Northwest [1]. Additionally, it also has not been confirmed if planting these preferred species could lead to even greater bee abundance, beyond the scope of abundance increasing simply due to increasing floral availability. Through our own analyses, the first knowledge gap of which flower species are preferred by bees,

can be answered. We will look at the quantity of visitation of different flowering species and those flowers with the greatest amount of visitation will be likely to be the preferred flowers of bees. The second knowledge gap, whether planting preferred species will increase bee abundance, will need to be confirmed through experimentation, but can be supported through our analyses as well.

Proposed Analysis:

In order to determine the preferred flower species of different bees, we will be using the data from Bloom et al. This data includes the number of honeybee as well as wild bee visitations of different species of flowers for the years: 2014, 2015, and 2016. It is not clear what analyses these researchers conducted using this data, if any, because they do not state what analyses were conducted. Though, we do know that Bloom et al. were looking to find which flowering plant species to use for bee conservation. We, however, are interested in bees and their relationship to agriculture. Although similar in the sense that we both want to determine which flowers are preferred by bees, our goals with the data are ultimately different. As a result we will be conducting our own analyses as opposed to recreating those completed by Bloom et al.

We will be finding if honeybees and wild bees prefer certain species of flowers over others. First the data for each year will be filtered to only include the number of visitations and the corresponding flower species. Next the rows of flower species names will need to be made consistent in formatting, between each year. Additionally, each year's data will need to be standardized in terms of the types of flower species. Those flower species that do not occur in the data for all three years will be removed. Histograms of each year will be created to display the quantity of visitation of both honeybees and wild bees for specific species of flowers. These histograms will make it easier to identify the preference of honey bees and wild bees for specific flower species. We will also calculate the mean number of visits across all years to determine which species of flower the honeybees or wild bees visited the most from 2014 to 2016. This will be represented once again by a histogram.

After the histograms are made, we will make a conclusion as to which species farmers located in the Pacific Northwest should plant to help increase their crop yield. Going further, we will also have to identify if the species are non-invasive or invasive species. Farmers would want to plant non-invasive species because invasive species would compete with crops, which could decrease their crop yield, or escape into surrounding ecosystems to compete with native species, damaging the environment. After this additional step of filtering, we will then work to find the most preferred flower for each season. We will find the most preferred flower for the spring, summer, and fall. This will ensure that farmers have a variety of flowers planted to foster bee populations throughout the year. Providing the bees with consistent food sources will help increase

their populations and to keep these populations near the crops that will need to be pollinated. The data will need to be separated into three categories. The first containing the flowers that bloom in the spring, the second containing the flowers that bloom in the summer, and the third containing the flowers that bloom in the fall. Another histogram will be made, for each season, displaying the most preferred species for each season.

After completing all analyses there will be two separate groups of histograms, one for honeybees and one for wild bees. Having this information separated will allow farmers to appropriately plant non-invasive species that will best suit their farms and attract the bees that the farmers desire.

References:

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