

BIRD PREFERENCE OF NATIVE VS INTRODUCED FOOD SOURCES AT PURCHASE COLLEGE

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ABSTRACT

As the effects of climate change and anthropogenic land usage increase, native plant species are being pushed out. In the place of these plants, invasive plants and anthropogenic food sources are left as the dominant providers for bird fall foraging. In this study, we examine bird preference for native vs introduced food choices on the Purchase College campus. The three foraging options we observed include one native fruit-bearing plant, the American pokeweed, one invasive fruit-bearing plant, the porcelain berry, and one introduced anthropogenic food source, a bird feeder containing safflower seeds. Results of this study show that birds preferred both non-natural food sources, the porcelain berries, and the safflower seeds, over the natural American pokeweed berries. However, birds preferred the safflower seeds in the bird feeder over all other options. Birds on the Purchase College campus show a strong preference for non-native food sources, encouraging us to conclude that the major source of food for fall foraging on campus is introduced, or non-native.

Keywords: Invasive species; Bird foraging; Bird feeder; Porcelain Berries; Pokeweed Berries.

INTRODUCTION

As humans continue to interact, trade, and globalize, we spread around different species of plants and animals that would not naturally live in these new environments. Specifically, an invasive plant species is not native to the ecosystem that they have been introduced to. These invasive species are invading completely new environments that are very different from their own native one. Since these invasive species have not evolved in this new environment, they often cause a disruption to the ecosystem's natural order, often even inducing environmental harm. Invasive plants are often able to spread and disperse at a much more efficient rate than the native species that have lived there. Therefore, invasive species are very effective at taking over the new environments they are introduced to (Laufer et al. 2006).

Seeds of native and invasive plants have many other ways of spreading that do not involve any interactions with humans. Birds have played a significant role in this dispersal of seeds (Murray 2012). One way birds help spread seeds is through seed consumption as they move either north or south during the change of seasons. There is still a lot unknown about birds and their relationships between invasive plants compared to their relationship with native plants, but the research has been growing in recent years (Gosper et al. 2005). A significant amount of invasive plants are high in carbohydrates, while natives are full of proteins and lipids, meaning they have a greater nutritional value. This means that birds are choosing food that may taste better, but is possibly a little less nutritious and healthy (Randall). Invasive species aren't all bad however, they tend to last longer into the early colder months and provide birds with food when food would generally be limited (Drummond 2005).

The relationship between birds and bird feeders is also something researchers still have a lot to learn about. Feeders provide an introduced source of food to birds that would not naturally occur without

human interference. Birds can easily rely on this supplied food source when the natural sources of food might be compromised or unavailable due to weather conditions. Feeders can improve health, increase antioxidant levels and decrease stress in an individual bird's health, but there has also been an increased occurrence in infectious diseases in birds that use bird feeders (Gosper et al. 2005).

There is a substantial population of invasive plants on the Purchase College campus that have done a significant job at taking over and interfering with the native plants. One of the most abundant invasive plant species that we have on campus is *Ampelopsis brevipedunculata*, otherwise known as the porcelain berry. The porcelain berry was originally brought to the United States around the 1870s but has quickly out-competed native plants and has been spreading rapidly (FWS 2006). One native plant species on the Purchase College campus is the American pokeweed, or *Phytolacca Americana*. The American pokeweed is a perennial plant, native to most parts of the U.S. and some parts of Canada (USDA.) This campus has an abundance of birds that rely on all of our invasive and native species, as well as our bird feeders. These food sources are an important supply of food for the birds as the weather gets colder. This study investigates the relationship between birds and invasive porcelain berries, native pokeweed berries, and introduced bird seeds in bird feeders during the change of seasons on the SUNY Purchase campus. We predict that the birds on campus will prefer the food in the bird feeders over all else, followed by the invasive porcelain berries and then the native pokeweed berries. We hope our findings in this study will further help us understand the relationship between birds and invasive plants and how these invasive species are affecting our ecosystems.

METHODS

Field Site. We selected three sites on the SUNY Purchase College Campus to observe for our study. All of these sites are located between the Dance Building and The Commons apartments. Each site accounts for one of our potential food sources. We chose our sites first by using iNaturalist to assist in finding one native and one invasive type of berry on the Purchase College campus. We located these two sites and used a tape measure and flagging ribbon to measure out our study sites and mark them. Our first site consisted of a $20.25m^2$ lot of porcelain berries, along the path that runs between the academic buildings and The Commons apartments. Our second site was a $20.25m^2$ lot of American pokeweed berries located on the road that runs in front of the common's apartments. Next, we added a third site, with an anthropogenic food source. Our third field site consisted of a platform bird feeder located in close proximity to the other sites that contained Wagner's brand safflower seeds. This site was located in a tree directly behind the dance building. We checked this bird feeder each day of our observations to make sure it contained enough seed. Each of these sites can be seen in Figure 1.

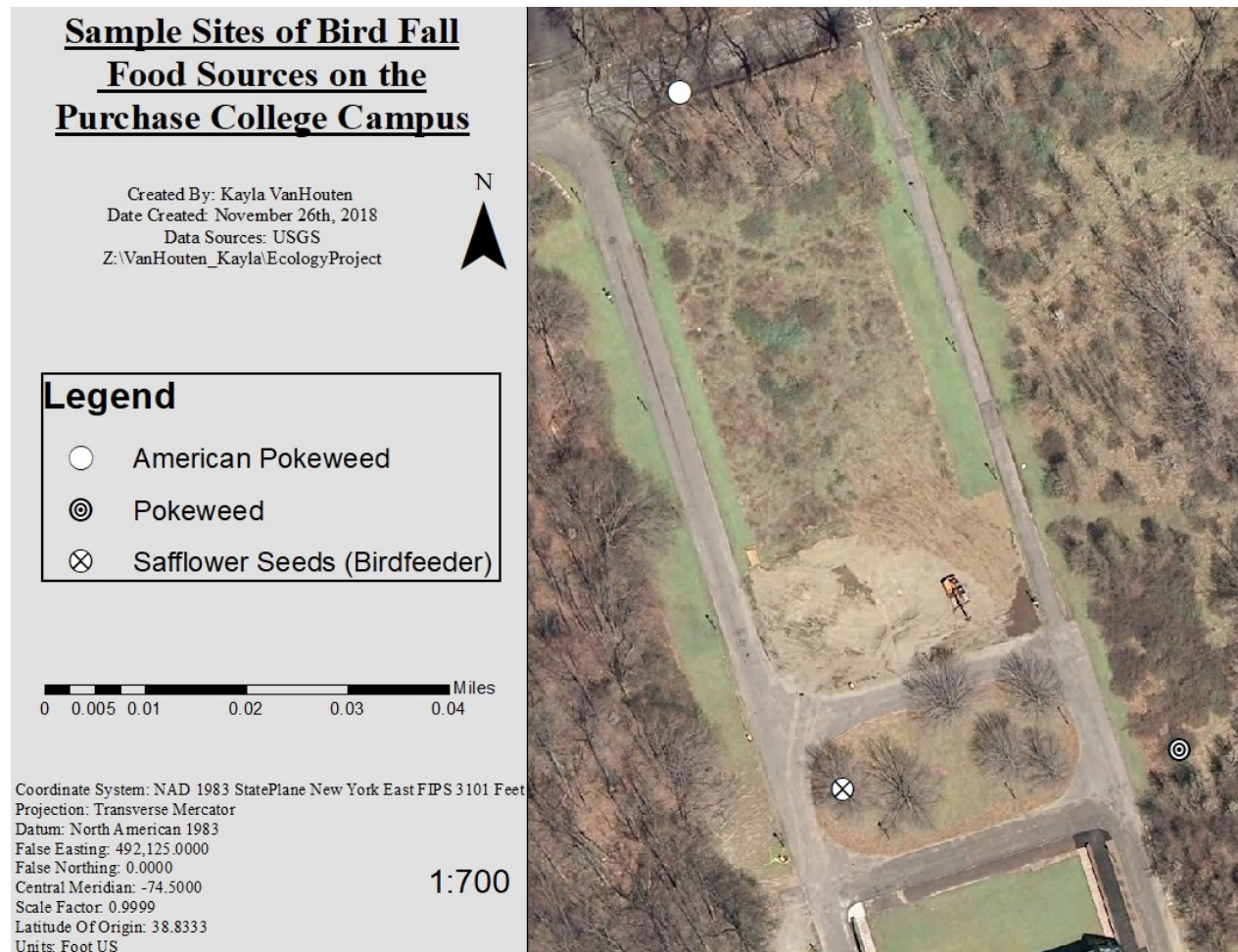


Figure 1. Our 3 study sites on the Purchase College Campus.

At each of our sites, we completed three separate hours of observation. All of the observations took place between October 24th, 2018 and November 1st, 2018 between the hours of 9:20 am and 12:10 pm. At each site, we sat a minimum distance of 20 ft from our study site so as not to disturb the birds and skew our findings. We observed the area with Eagle Optics brand binoculars and tallied the total number of birds at each site after each individual hour of observation.

RESULTS

At our first site, consisting of porcelain berries, we observed a total of four birds utilizing the berries over 3 hours of observation (Table 1) At our second site, consisting of American pokeweed berries, we observed a total of zero birds utilizing the berries over 3 hours of observation (Table 2.) At our third site, consisting of safflower seeds in a bird feeder, we observed a total of 40 birds over three hours of observation (Table 3). It is important to note that there were birds in the vicinity of all three sites during periods of observation. The variation in abundance of birds at each food source is presented in Figure 2. At the pokeweed berry site, we observed zero birds during all three days of observation. At the porcelain berry site, we observed one bird during the first hour of observation, two birds during the second hour, and one bird during the third. At the bird feeder site, we observed 14 birds eating the safflower seeds during the first hour of observation, 19 birds during the second hour, and 7 birds during the third hour. The sum of birds observed at each site over all hours of observation is shown in Figure 3.

Table 1. Porcelain Berries

Date	Time	Number of Birds Observed
10/24/18	10:20 am – 11:20 am	1
10/25/18	10:00 am – 11:00 am	2
10/30/18	9:30 am – 10:30 am	1

Table 2. American Pokeweed Berries

Date	Time	Number of Birds Observed
10/24/18	11:00 am – 12:00 pm	0
10/25/18	11:10 am – 12:10 pm	0
10/31/18	10:30 am – 11:30 am	0

Table 3. Bird Feeder- Safflower Seed

Date	Time	Number of Birds Observed
10/31/18	9:20 am – 10:20 am	14
10/31/18	10:30 am – 11:30 am	19
11/01/18	9:45 am – 10:45 am	7

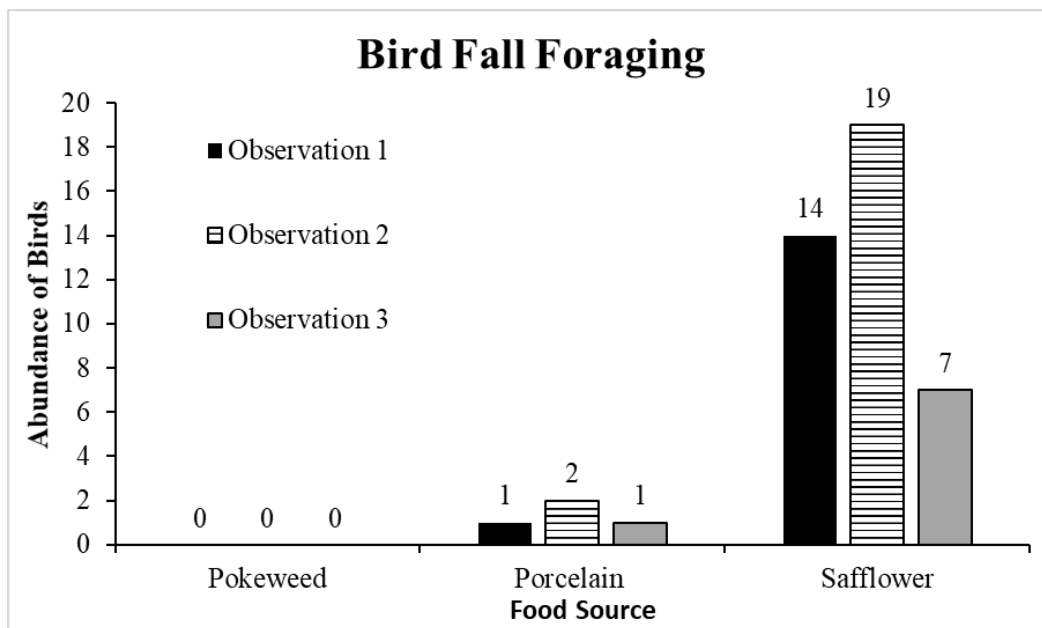


Figure 2. The abundance of birds at each food source separated into the three different periods of observation.

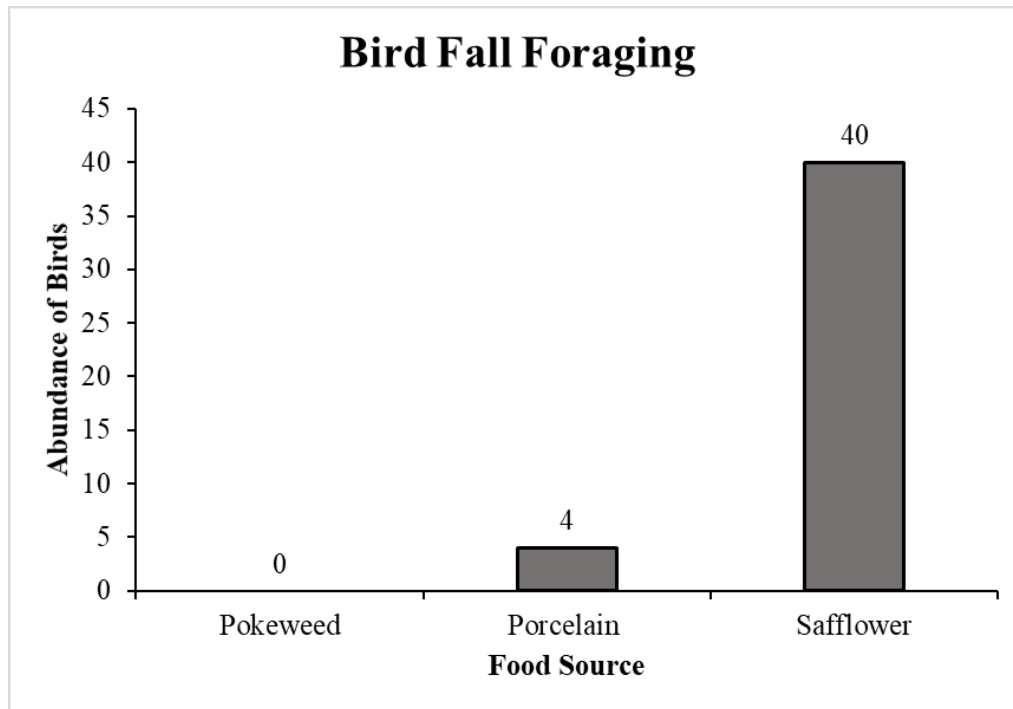


Figure 3. The total abundance of birds observed foraging overall at each one of the three food sources across all observation periods. Overall there were 40 birds observed at the bird feeder containing safflower seeds, four birds observed at the porcelain berry site, and no birds observed at the pokeweed berry site.

DISCUSSION

Our results showed that birds preferred both non-natural food sources, the porcelain berries, and the safflower seeds, over the natural American pokeweed berries, but preferred the safflower seeds in the bird feeder over all else. In several ecosystems, invasive species have become more dominant and now play key roles as providers in these ecosystems. These roles were originally taken on by native plant species but due to the effects of climate change and increased anthropogenic land use, these plants have experienced a decline (Davis 2011). This decline in native species means a decrease in foraging options for the birds. At such a critical foraging time birds are forced to turn to other options.

Regardless of the available berries, the birds favored the safflower seeds in the bird feeder over all other options. This could be due to the fact that the safflower seeds were easiest to obtain for the birds. We also considered that the results of our study may be linked to the possibility that the birds on Purchase College campus have already moved on from the berries as a winter food source. Migratory birds forage in a much different way than a wintering bird would. Migratory birds may experience inconsistent feeding conditions and are forced to adjust their diet and behavior in order to prepare for the possibility of varying prey throughout their migration (Martins et al. 2013). Migrating species require higher energy intake, in some cases, even attaining 65% higher energy intake rates than that of wintering birds. It is possible that if this study had been completed at a different time of the year, in early fall, we would find different results, possibly favoring the berries over the seeds.

We found that both the American pokeweed and the porcelain berries had a significant amount of fruit still left on the bushes but the safflower seeds were still easiest to forage. Knowing that hunger level is a determinant for feeding location is important to know in this study. When birds are satiated, they will prefer the uncertain feeding location, such as the berries, but when they were hungry, they will prefer the more consistent feeding location, such as the bird feeder (Talling et al. 2002). If the birds are foraging at the location with the greatest relative benefit, then it is clear that they will favor the bird feeders. The birds may also prefer the bird feeders because they had the greatest relative benefit in terms of nutritional

value and increased body condition. One study found that after a year of being present at bird feeder sites, the birds showed an increase in body condition, concluding that this non-native food source had a positive influence on the birds (Wilcoxon et al. 2015). Invasive berries may not be as highly preferred as the birdseed, but they are preferred over native berries. Invasive plants are often higher in carbohydrates and native plants are higher in proteins (Randall). Essentially, the invasive plants are more like a junk food. This is potentially a reason for why the birds would prefer the porcelain berries over the American pokeweed.

To find more conclusive results in the future we would modify this study in a few different ways. First, we might try to observe at different times of the year. This might allow us to make broader conclusions on the foraging preferences of birds on Purchase College Campus, not only in the fall, but during each separate season. Another change we would make would be to look at other types of invasive and native food sources, as well as increase the number of patches we completed our observations at. This change would allow us to determine if other native or invasive plants may be favored over the safflower seeds. The last change we would make would be to observe for longer periods of time, for example, observing for 10 hours at each site instead of three.

CONCLUSIONS

Higher bird foraging activity was observed at the bird feeders than at each berry location. However, there was still more birds utilizing the porcelain berries than the sweed berries, allowing us to conclude that the introduced food sources were favored, the native berries were the least favorable, and our hypothesis was supported by our findings. We believe that more studies on bird foraging behaviors on the Purchase College campus would be beneficial.

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