Tracking the dispersal of the endangered Eastern Prickly Pear Cactus (*Opuntia cespitosa*) by animal vectors in Canada

Mandy Huynh

A Thesis submitted to
the Faculty of Graduate Studies
in Partial Fulfillment of the Requirements
for the Degree of Master of Science

Graduate Program in Geography
York University
Toronto, Ontario

April 2023

© Mandy Huynh, 2023

Abstract

Opuntia cespitosa is an endangered cactus with only one substantive population in Point Pelee National Park (PPNP), Canada. Staff observations at the Park include that many cactus fingerlings (young *Opuntia* seedlings) appeared in sites frequented by the Eastern Wild Turkeys. This study aims to assess the effectiveness of seed dispersal by wild turkeys and other animals at PPNP, and to identify the primary seed dispersers. We used trail cameras, analyzed wild turkey scats, and examined fingerlings to determine potential seed dispersers from August to October 2020. Migrating birds were the most frequent visitors at cactus sites, followed by rabbits and wild turkeys. We conclude that while wild turkeys consume and disperse cactus seeds, the seeds are not necessarily preferred by them in their diet. This research has important implications for *O. cespitosa*'s reproduction and potential genetic variability and can be used to inform Park managers about conservation strategies for this species.

Acknowledgments

I would like to thank the Park's staff at Point Pelee National Park, especially Rachel Windsor and Tammy Dobbie for their assistance and quick responses to all my inquiries. Thank you to my supervisor, Dr. Taly Drezner, for her guidance, support, and quick feedback on my research. I would also like to thank Dr. Chris Lortie for providing his feedback and insights, Kasra Babashahiashtiani for his feedback and guidance on making maps, Patrick Mojdehi for providing field equipment, and Jenny Lau, Pham Do, Jacky Duong, and my sister, Cindy Huynh for their assistance in the field. Finally, I would like to thank Januja Jeyarajah, Jenny Tang, and Shruti Vellanki for being my writing buddies while I was writing this thesis. This study would not have happened or be done without everyone's assistance and encouragement despite the limitations that came with COVID-19. I appreciate all the support I have received and hope the findings in this thesis will provide some insights on the seed dispersal of the Eastern Prickly Pear Cactus. This research was conducted under Research and Collection permit PP-2020-36377. Funds for this project were provided, in part, by NSERC through the Canadian Graduate Scholarship – Master's (CGS-M) program, and the Province of Ontario and York University through the Ontario Graduate Scholarship (OGS) program.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction

1.1 Seed dispersal through endozoochory

Seed dispersal is an important process for plants to propagate and colonize new areas. In the Cactus family, the most common mode of dispersal is endozoochory, or seed dispersal through fruit consumption by animals, especially birds (Bregman 1988). Several animals are known to play a crucial role in ecosystem restoration by grazing and dispersing plants. For example, Giant Tortoises (*Geochelone nigra hoodensis*) were recently reintroduced on Española Island, Galápagos, which significantly aided the ecological restoration of the endangered arboreal cactus (*Opuntia megasperma* var. *megasperma*) by consuming their fallen fruits and facilitating long distance dispersal (Gibbs et al. 2008). In tortoise-occupied sites, there was a higher density of *O. megasperma* juveniles compared to sites without tortoises (Gibbs et al. 2008). Endozoochory can also potentially increase seed survival rates. For example, chilli pepper (*Capsicum chacoense*) seeds moving through a bird's gut removes fungal pathogens and predator attractants from the seeds, increasing their survival by 370% (Fricke et al. 2013).

1.2 Marginal plant populations

Marginal plant populations often have lower genetic diversity, are fragmented and prone to local extinctions (Kawecki 2008; Abeli et al. 2013). Trees and isolated plant populations at the edge of their range are a priority for conservation efforts to prevent further loss of genetic diversity (Charco et al. 2017). The conditions at range margins may affect performance, stagnancy, or regression of some plant populations (de Medeiros 2018). Furthermore, the dispersal capabilities of marginal populations will be the primary influence on the shift of species ranges as climate change shifts suitable habitat (Dytham 2009). In the Northern Hemisphere, the northern range of plant populations is usually limited by low temperatures and frost sensitivity (Heegaard and

Vandvik 2004; Boucher-Lalonde et al. 2012; Abeli et al. 2018). As global temperature continues to increase, marginal populations are usually the first to be affected and respond. In the northern edges of their range, plants such as *Opuntia cespitosa*, may benefit from increasing temperature, but potential competitors may also respond positively (Drezner 2017a).

1.3 Study species: *Opuntia cespitosa* (the Eastern Prickly Pear Cactus)

1.3.1 Species' range and conservation status

Opuntia cespitosa Raf. (Rafinesque 1820) (Eastern Prickly Pear Cactus, *O. humifusa* prior to taxonomic revision) is an endangered and native species in Ontario as recognized by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) since 1985 under the Species at Risk Act (COSEWIC 2010), and the Committee on the Status of Species at Risk in Ontario (COSSARO) since 1987 under the Endangered Species Act (Ministry of the Environment, Conservation and Parks 2018). In Canada, there are only two naturally occurring populations of *O. cespitosa*; a small (of perhaps only a few individuals), highly disturbed population on Pelee Island, and at Point Pelee National Park (PPNP or the Park hereafter) (COSEWIC 2010; Drezner 2017), as seen in Figure 1.1. The PPNP population represents the only substantial population in Canada. Both populations in Canada are at the northern edge of their range. There are 5 other known extant populations of *O. cespitosa* in Ontario, but they are not recognized for status assessment because the plants were transplanted by humans (COSEWIC 2010). The range of *O. cespitosa* is wide and includes large parts of the eastern United States, however, it is infrequent to rare throughout its range and populations are often very small (Majure et al. 2017). Although there has been some monitoring and research on this species (Chiarot 1992), many questions remain about its status, health, and viability (VanDerWal et al. 2007a).

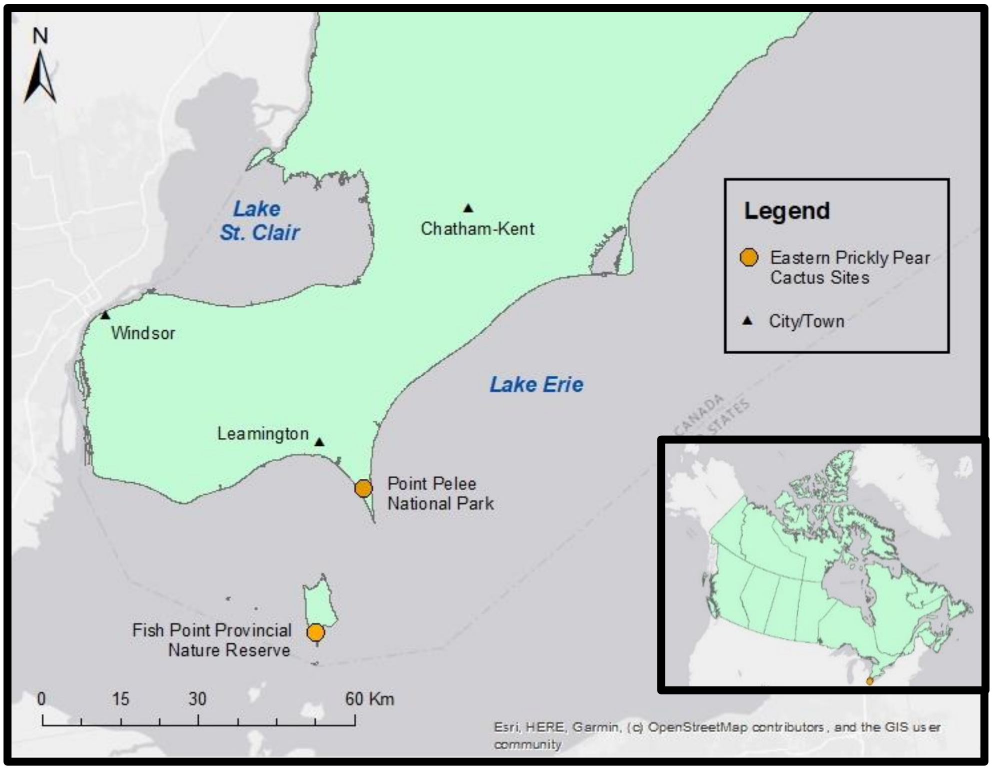

Figure 1.1. Modern Eastern Prickly Pear Cactus populations in Canada.

In PPNP, the range of *O. cespitosa* may shrink with future Lake Erie water levels. Climate change has increased the rate of erosion along both sides of the Park, especially on the eastern shorelines (Parks Canada 2020) (Figure 1.2). Between 2013 and 2020, the average annual water level of Lake Erie rose by 0.83 m (Gharib et al. 2021). Based on recent climate models, there will be a significant increase in flood inundation in the Great Lakes drainage basins (Mohanty and Simonovic 2021). Under various climate change scenarios (Figure 1.3), the majority of PPNP is projected to be permanently flooded within the next 80 years, except for a small section of the western shoreline. The barrier bar along the western shoreline is thicker and taller than the east, which could result in less impact from erosion (Figure 1.4). Although *O. cespitosa* may survive on the unflooded part of PPNP, the population would be isolated from the mainland and their seeds would have a lower chance of dispersing to new suitable habitats because of reduced plant-animal interactions (Tewksbury et al. 2002).

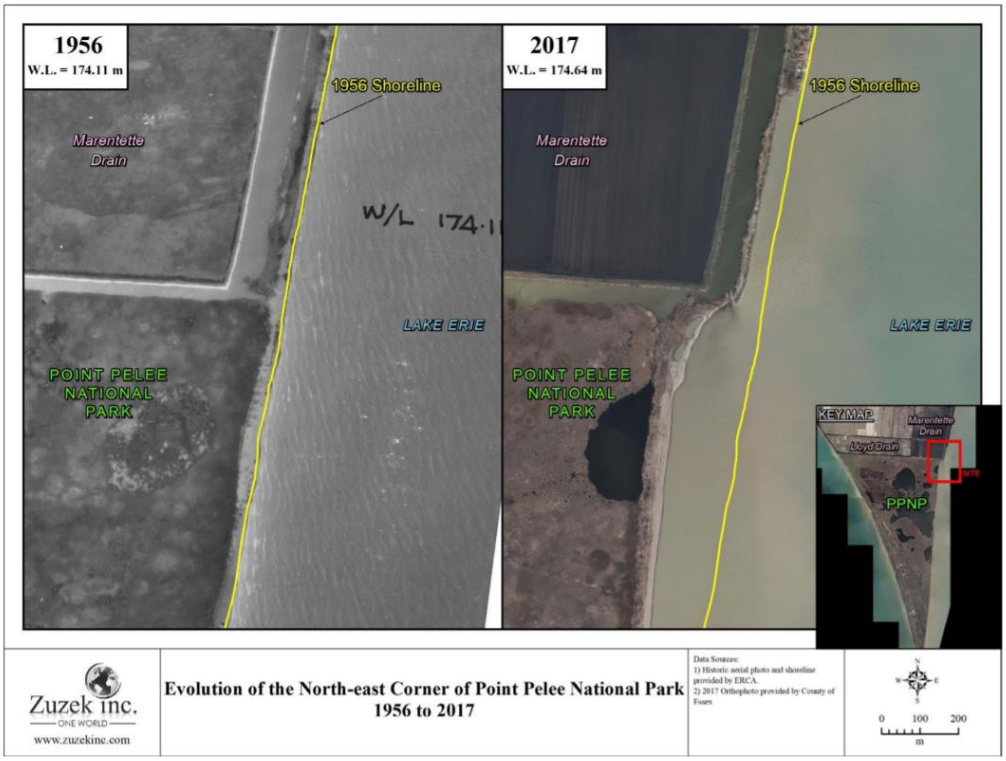

Figure 1.2. Comparison of the 1956 to 2017 North-east corner shoreline of Point Pelee National Park (Zuzek Inc. 2021).

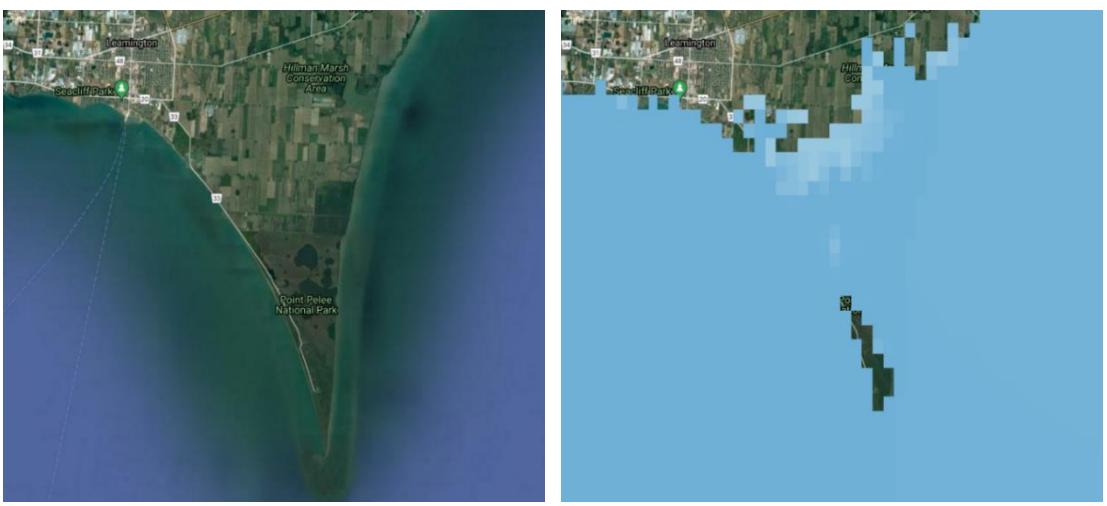

Figure 1.3. (a) Left: current flood map of Point Pelee National Park. (b) Right: future flood map (2020-2060) of Point Pelee National Park based on climate model CMIP6 ensemble SSP2 4.5. Different shades of light blue pixels represent a flood depth of 0 to 5.2 m. Google Imagery used for base map. Source: floodmapviewer.com.

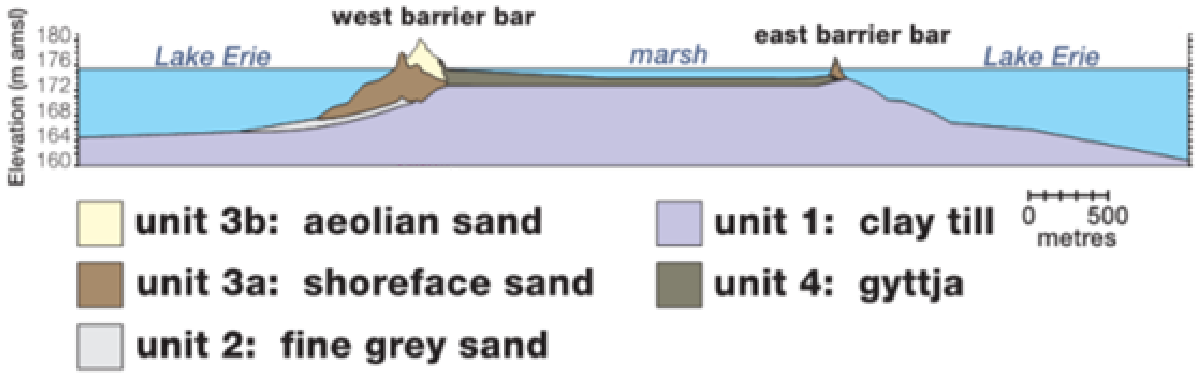

Figure 1.4. Cross-section of Point Pelee National Park through Northwest Beach. (Coakley et al. 1998, as cited in Zuzek Inc. 2021).

1.3.2 Species' reproduction strategies

Opuntia cespitosa can reproduce sexually or asexually through vegetative reproduction (Chiarot 1992). Asexual reproduction occurs when cladodes disarticulate (a flat stem or pad) and set root. However, there are no available data for the genetic make-up, seed dispersal, and dispersal vectors for the several hundred cacti at the Park. Whether the individuals at the Park reproduced primarily by vegetative reproduction or through sexual reproduction which contributes to genetic diversity, requires an assessment. If *O. cespitosa* is comprised mainly of clones at PPNP, it is at greater risk of being eradicated by stochastic events, as low genetic diversity can reduce the adaptability to changing environments (Lande 1988). Knowing the genetic diversity of *O. cespitosa* in Canada will provide more information about its population status and health.

Some fingerlings (*Opuntia* seedlings) have been casually observed at the Park, but their survival has not been tracked. A population of *Opuntia compressa*, which may be conspecific to *O. cespitosa* at PPNP (Leuenberger 1993), is known to have its seeds dispersed by a variety of animals, such as rabbits and wild turkeys (Baskin and Baskin 1977). Based on anecdotal observations by Park staff, many cactus fingerlings appeared in sites frequented by Eastern Wild Turkeys (*Meleagris gallopavo silvestris*; hereafter wild turkey) (T. Dobbie, Park Ecologist, personal communication). Wild turkeys were first spotted in the Park in 2006 (Dobbie 2021). Hence, the recent arrival of wild turkeys in the Park may have increased seedling recruitment. However, no research has been done to confirm this relationship. Understanding the effectiveness of seed dispersal by animal vectors will provide information about reproduction and the potential genetic variability of this endangered species.

1.4 Objectives

One of the limiting factors that could be affecting the population growth and genetic variability of *Opuntia cespitosa* is seed dispersal via animal vectors. The *O. cespitosa* population at PPNP is threatened by habitat loss due to succession and shoreline erosion (Kraus 1991; BaMasoud and Byrne 2011). It is important for *Opuntia* seeds to be dispersed into new suitable habitat for continued survival at the Park without human intervention (e.g., prescribed fire). Yet knowledge about *O. cespitosa* seed dispersal is limited. Several species such as rabbits, deer, and wild turkeys have been suggested as potential seed dispersers but most findings are inconclusive (Kevan et al. 2004; Toews 2013). The main objective of this study is to assess the effectiveness of cactus seed dispersal by wild turkeys at PPNP and to identify potential seed dispersers. In recent years, the Park has observed an increase in wild turkeys, which in some cases are seed predators (Chips et al. 2014). If wild turkeys are primary seed dispersers, I predict fingerlings would be found in areas they travel, as determined by the location of their scat. This research can be separated into two parts. First, I used trail cameras in cacti patches to collect digital data for potential dispersers. Second, I collected wild turkey scats and located fingerlings at sites that are suitable for the growth of *O. cespitosa*. The physical condition and abundance of fruits at each site were also analyzed to determine if these factors affect visitation and consumption frequency by animals.

Chapter 2: Literature Review

2.1 Genus: *Opuntia*

Opuntia is the most diverse and widely distributed genus (Reyes-Agüero et al. 2006) in the Cactus family (Cactaceae). Within the genus, the *O. humifusa* clade has been taxonomically revised several times (Majure and Ervin 2008; Majure et al. 2012a; Majure et al. 2017) and it is still not fully resolved. This is because the species exhibit extreme morphological plasticity (e.g., cladode size can be phenotypically variable), are able to hybridize, and produce polyploids (Majure and Ervin 2008; Majure et al. 2017). Despite work investigating the genetics of *Opuntia* species (e.g., Lovett-Doust et al. 2003; Majure et al. 2012a; Fehlberg et al. 2013), the genetic diversity of the *O. humifusa* clade remains unclear. For example, a preliminary study on the population at PPNP revealed that there might be some genetic uniqueness between patches (Lovett-Doust et al. 2003), but the study was unable to provide a definite number of genetically unique individuals. Thus, the genetic diversity of *Opuntia cespitosa* at PPNP remains unclear.

In Canada, there are 3 native species of *Opuntia*: *O. polyacantha*, *O. fragilis*, and *O. cespitosa*. *Opuntia polyacantha* and *O. fragilis* are mainly found in the Canadian prairies and are both ecologically important for their habitat. They provide food for at least 44 species of birds and mammals and reduce soil erosion during drought and heavy grazing by livestock (Maw and Molloy 1980). They can also reduce damage to seeds of other plants by slowing runoff (Maw and Molloy 1980). *Opuntia cespitosa* is found in southern Ontario, and recent research shows that the soil has a higher moisture level and an abundance of some nutrients where they are found (Drezner 2021), which may benefit neighboring plants.

2.1.1 Taxonomic revision of **Opuntia humifusa**

Until recently, *Opuntia cespitosa* at PPNP was known as *Opuntia humifusa*. Benson (1982) concluded that the population at PPNP was *O. humifusa* which was classified as a strictly yellow-flowered species (Figure 2.1a). However, the plant matches Majure and Ervin's (2008) description for *O. cespitosa*, which has yellow flowers with a bright red center (Figure 2.1b). There is also a significant difference between the cladode size and orientation of the population in PPNP when compared to a closely related population of the *O. humifusa* clade in Florida (Drezner 2017a). Unlike *O. cespitosa*, *O. humifusa* is nearly spineless, with different colored spines, pads, and glochids (Majure 2010). Furthermore, *O. cespitosa* is tetraploid (has 4 sets of chromosomes) (Majure et al. 2012b), which has been more successful at invading cooler environments with harsher winters than the more restricted, southern diploid in the *O. humifusa* clade (Majure et al. 2012b). After a recent taxonomic revision, several former *O. humifusa* populations are now known as *O. cespitosa*, including the Canadian population. *Opuntia cespitosa* at PPNP was also known as *O. compressa* prior to various taxonomic updates (Leuenberger 1993). Other scientific names used in the past include *O. rafinesquii* among others (Canadian Museum of Nature 2019). To avoid any confusion, *O. cespitosa* will be used when referring to the cactus at PPNP.

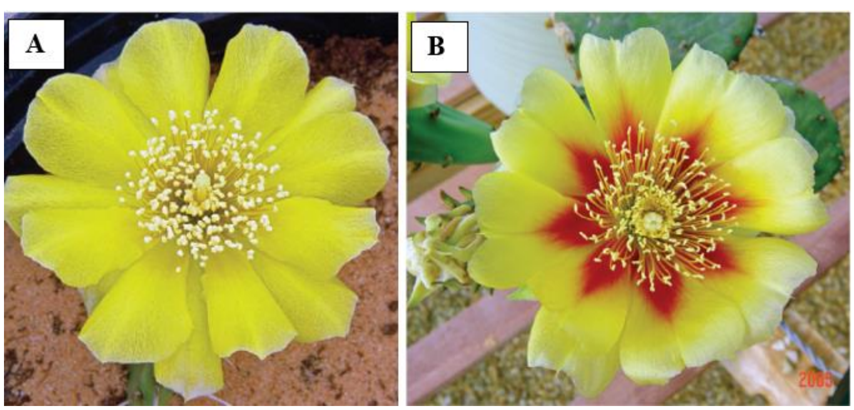

Figure 2.1. Flower of (a) *Opuntia humifusa* and (b) *Opuntia cespitosa* (Majure and Ervin 2008).

2.1.2 Studies on **Opuntia cespitosa**

Until recently, several unpublished status reports recorded population size and morphological traits of *O. cespitosa* at PPNP (e.g., Ross 1971; Kraus 1991; Chiarot 1992). However, population size and the terminology used to record individual plants were inconsistent across studies. For example, Ross (1971) reported a total of 24,000 "links" (connections between two cladodes), while Chiarot (1992) reported 3,716 "stems" (primary cladode). Later studies used number of cactus patches or microsites, which provided a more accurate representation of the population (e.g., Levi 1999 and 2001). However, population size was still under-represented until a full survey using a standardized method identifying microsites was conducted (VanDerWal et al. 2007b). A microsite that has been identified is permanently tagged and its Global Positioning System (GPS) location is recorded for future monitoring and conservation efforts (VanDerWal et al. 2007b). Geographic Information System (GIS) technology was used to model *Opuntia* distribution at PPNP. GIS has gained popularity in conservation activities (Draper et al. 2003) and incorporating this technology will facilitate long term monitoring and conservation goals.

Recent studies on *O. cespitosa* at PPNP have revealed more details about how environmental factors affect their physiology and vegetative associations. For example, *O. cespitosa* experiences more pad yellowing, a presumed sign of illness, when exposed to more sunlight (Drezner 2017b). *Opuntia cespitosa* also does not appear to engage in facilitative associations with native plants at the Park (Drezner 2021).

Outside of Canada, there are fewer published studies on *O. cespitosa* compared to *O. humifusa*. Furthermore, it is difficult to identify which studies are relevant to the current classification of *O. cespitosa* as they were considered conspecific to *O. humifusa* until the most recent taxonomic revision (Majure et al. 2017). Prior to the revision, many studies examined the physiology and ecology of *O. humifusa* (e.g., Koch and Kennedy 1980; Abella and Jaeger 2004). Koch and Kennedy (1980) found that *O. humifusa* in Iowa have the greatest Crassulacean Acid Metabolism (CAM) fluctuation during June, when flowering, new growth, and high tissue water content occurs. Abella and Jaegar (2004) suggest that disturbed sandy sites are suitable habitats for *O. humifusa* in Ohio. The location of Koch and Kennedy (1980) and Abella and Jaeger (2004) studies fall within the current range of *O. cespitosa*'s habitat as described by Majure et al. (2017). Therefore, their findings on *O. humifusa* may apply to *O. cespitosa*. There are also many studies that emphasize their importance in the medical field and food industry, such as *O. humifusa*'s potential for treating cancer (e.g., Choi et al. 2014; Hahm et al. 2015).

2.2 *Opuntia cespitosa* in Point Pelee National Park

Point Pelee National Park represents the northern limit of *O. cespitosa*'s geographical range (Majure et al. 2017). *Opuntia cespitosa* are typically found in disturbed or open successional areas such as the savannah at PPNP (VanDerWal et al. 2007a). Habitat loss caused by succession is the primary threat to their survival (Kraus 1991). In addition, changes to the shoreline and lake-level caused by future climate-change are expected to result in a loss of Park land (BaMasoud and Byrne 2011), which may affect the habitats *O. cespitosa* can colonize. This would be exacerbated by distribution limitation due to low seed dispersal (Santelmann 1991) or by low germination rates (Levi 2001).

The cactus was first collected and reported in Ontario, Canada by John Macoun in 1882-1883 (COSEWIC 2010; Canadian Museum of Nature 2019) and has been monitored for over 100 years (Kraus 1991). *Opuntia cespitosa* is classified as a native species in Canada, but it remains unknown when and how the plant arrived in the Park (COSEWIC 2010). The populations at PPNP and Pelee Island are isolated from the United States population by Lake Erie.

Although habitat loss has been identified as the primary threat faced by many species in PPNP, habitat protection does not guarantee species persistence (Browne and Hecnar 2007). Browne and Hecnar (2007) found that the size structure of Blanding's and snapping turtles at PPNP are shifting toward a larger and older class, which is an indication of limited juvenile recruitment. Despite habitat protection by the Park, turtle populations are likely declining due to stresses such as heavy predation on turtle nests by raccoons and road mortality (Browne and Hecnar 2007). It is important to understand aspects such as reproduction, recruitment, and other biological and ecological factors that may affect a species' population, as signs of stress may not always be apparent (Browne and Hecnar 2007).

2.3 Vegetative reproduction versus sexual reproduction

Vegetative reproduction is the process in which a fragment from the parent plant, such as rhizomes and branches, can asexually grow into a new plant that is genetically identical. *Opuntia* species can reproduce vegetatively by cladode separation or sexually. Both methods are important for cacti. Clonal propagation allows successful genotypes to persist and eventually colonize new areas without going through the germination process, whereas sexual reproduction creates new genetic combinations which may succeed in new environments such as through long distance dispersal (Mandujano et al. 1998). Vegetative reproduction in *Opuntia* species is usually more common in arid environment (Baskin and Baskin 1977; Reyes-Agüero et al. 2006) because of extreme environmental conditions and herbivory (Mandujano et al. 1998), including in northern limits (Benson 1982). Cladodes can stick onto the fur or skin of animals and are deposited at a new location where the cladode can set root and form clones of the parent plant (Majure et al. 2017). Depending on the interaction between herbivores, plants, and abiotic conditions, Mandujano et al. (1998) suggest that *O. rastrera* seedling survival is unlikely without the protection of a nurse plant, which may also be true for other *Opuntia* species. However, PPNP's *O. cespitosa* are not known to be protégé nor nurses for other native species (Drezner 2021).

Bobich and Nobel (2001) examined 4 *Opuntia* species and suggest that vegetative reproduction through detached joints can be distinguished from seedlings by comparing the stem's diameter and number of spines. Detached joints tend to have larger stem diameters and a greater number of spines (Bobich and Nobel 2001). Another characteristic of vegetative propagules is that the distance between the base and the parent plant is shorter than the height of the parent plant (Bobich and Nobel 2001). Another study suggests that *O. rastrera* seedlings are easily recognized by the hairs (trichomes) at their cylinder-shaped base, which persist for at least 6 years (Mandujano et al. 1998), whereas a clone would be relatively flat and smooth (Mandujano et al. 2001). Furthermore, two cotyledons (first leaves) can be observed when the seedling is relatively young (Kevan et al. 2004).

Bowers (1996) noted that in *Opuntia* species, each areolar meristem (specialized axillary bud) can produce either a cladode or flower once. If all areolar meristems were to be expended in flower production, no new cladodes could be produced, and further reproductive effort would cease. At PPNP, flower and fruit production of *O. cespitosa* have been observed but not consistently monitored (Chiarot 1992; Kraus 1991) to determine the cladode-to-flower ratio. If the population of *O. cespitosa* produces more flowers without the seeds being effectively dispersed or germinated, their genetic variability cannot increase, and production of flowers and fruits may eventually cease.

Some studies have suggested that the allocation of resources to vegetative growth or flower production may be influenced by weather. For example, Sauby et al. (2017) suggested that precipitation serves as a cue in determining the allocation of resources to growth or fruit production in *O. humifusa* in Florida. They found that rainfall was negatively associated with the relative growth rate of *O. humifusa* but was positively associated with sexual reproduction. Similarly, Mandujano et al. (2001) found that clonal propagation of *O. rastrera* decreases as precipitation increases, while sexual reproduction tends to increase with precipitation.

Opuntia cespitosa flowers bloom during the summer between mid-June to mid-August at PPNP (Chiarot 1992). The flowering season is variable across *Opuntia* species but seems to be related to the temperature regime as northern *Opuntia* species that experience cooler climates, flower and fruit later than those further south (Majure et al. 2017)**.**

2.4 Seed dispersal

Opuntia seed dispersal is not well understood. Several studies have suggested that animal vectors are the primary dispersers (Baskin and Baskin 1977; Mandujano et al. 1997; Kevan et al. 2004; Reyes-Agüero et al. 2006). Animals are known to eat the fleshy fruit of *Opuntia* species, and most seeds remain unharmed by the digestive processes (Baskin and Baskin 1977). However, there are uncertainties about the effectiveness of internal seed dispersal by animal vectors. A study on *Opuntia rastrera* seeds suggested that viability and germination rate are dependent on the disperser (Mandujano et al. 1997). For example, some species (e.g., woodrats) eat a high amount of *O. rastrera* seeds, but the lack of seeds in their scat indicates they may not be actively dispersing, whereas the scat of some species' (e.g., coyotes) contained many seeds but with reduced viability. Mule deer seem to be the best *O. rastrera* seed dispersers as they had the highest germination percentage (69%), but only about 19 seeds were found per scat, which was relatively fewer than other animals (i.e., coyote, woodrat, and northern raven) (Mandujano et al. 1997). Mandujano et al. (1997) suggest that low seedling recruitment may be due to the extinction of co-evolved dispersers, such as Pleistocene megafaunas (Janzen and Martin 1982; Janzen 1986). It has been noted in other studies that extinction or population reductions of vertebrates may affect active dispersal (Barlow 2001).

Opuntia cespitosa may have been primarily reproducing by vegetative propagation (Baskin and Baskin 1977) in PPNP because of the extirpation of a potentially important disperser, the eastern wild turkey. The wild turkey was native to southwestern Ontario (Wintemberg 1919) but disappeared in 1907 due to unregulated hunting and habitat loss (Alison 1976). In 1984, wild turkeys were reintroduced into Ontario from various U.S. jurisdictions (Weaver 1989; Nguyen et al. 2004), the year before *O. cespitosa* was officially designated as an endangered species by COSEWIC. Based on anecdotal observations of PPNP staff, the relatively recent arrival of wild turkeys in the Park may have increased seedling recruitment, but no research has been done to confirm this relationship.

Wild turkeys are generalists, and their food habits are dependent on the abundance and availability of plants and insects in their habitat (Bailey and Rinell 1967; Korchgen 1967; Lewis 1973; Wightman et al. 2018). In Missouri, approximately 75% of their diet consists of plant material and the remaining 25% consists of insects (Dalke et al. 1942). About 20-25% of wild turkey diets are grass blades and leaves between January and June (Dalke et al. 1942). They eagerly seek fleshy fruits when available, such as those of flowering dogwood (*Cornus florida*) as well as acorns during the winter (Dalke et al. 1942). In West Virginia, plant material made up over 98% of their diet, including corn as well as grasses (Glover and Bailey 1949). The wild turkeys at PPNP are likely to have different food habits and may include *O. cespitosa* fruits, which ripen by late summer (Klinkenberg and Klinkenberg 1984).

Kevan et al. (2004) studied potential *O. cespitosa* dispersers at PPNP. Rodents, rabbit, skunk, raccoon, red fox, and white-tailed deer were present based on the tracks observed around fruiting cacti and in study sites. However, Kevan et al. (2004) did not quantify these observations nor confirm whether all identified animals fed on the fruits of *O. cespitosa*. Their attempts to film fruit feeding activity during the evenings (4 pm – 8 am) of three consecutive nights by creating a pile of fruits to lure the animals were unsuccessful (Kevan et al. 2004). Cactus seeds were retrieved from white-tailed deer (Kevan et al. 2004) and rabbit faeces (Lovett Doust and Levi 2003) at PPNP. Wild turkey faeces were not collected in either study. Instead, Kevan et al. (2004) conducted an experiment where they obtained seeds from the faeces of hand-fed chickens to represent wild turkeys. The seeds were then used in a germination experiment but no seeds from any faecal extractions germinated. This may have been because the seeds were not cleaned properly to prevent mould from developing on the seeds (Lovett-Doust and Levi 2003). As a result, it remains unclear whether animal vectors are effective at facilitating the dispersal and germination of *O. cespitosa* seeds. Toews (2013) also used a wildlife camera to identify animals that visited the cactus patches. However, no digital evidence of fruit feeding activity was recorded as the camera was limited to still photography.

Plant densities could also be a factor in the effectiveness of seed dispersal by animals. Studies on other species of plants have found various relationships between plant densities and frugivore activities, such as how frugivore activity on the fleshy-fruited *Frangula alnus* increases with fruit abundance (Hampe 2008).

It has also been suggested that *Opuntia* species could be dispersed by natural meteorological events, such as hurricanes (Majure et al. 2007). However, it would be unlikely for *O. cespitosa* at

PPNP to be dispersed by such events as the seeds are relatively heavy (Lovett-Doust and Levi 2003) and hurricanes are rare in southwestern Ontario.

2.5 Viability and Germination

A few studies have evaluated the effect of endozoochory (seed dispersal via ingestion by vertebrate animals) on the viability and germination of seeds in the Cactus family. Often, the importance of animals as endozoochorous dispersers is overlooked due to limited research on seeds in their faeces (Blanco et al. 2016). For example, parrots were considered plant antagonists and neglected as seed dispersers until a study found that the faecal matter of 11 parrot species in South America contained a significant number of seeds from different plants which were largely comprised of cactus species, such as *Pilosocereus pachycladus* (Blanco et al. 2016). A large proportion of the seeds retrieved were viable after conducting tetrazolium tests (Moore 1985; Blanco et al. 2016). Another example is the *Tropidurus semitaeniatus* lizard which was recorded as the primary seed disperser of *Pilosocereus gounellei* (Gomes et al. 2016). The results from the germination experiments using viable *P. gounellei* seeds obtained from the lizards' faecal samples indicated that *T. semitaeniatus* is an effective seed disperser as the germinability and germination rate of the seeds were positively affected by the passage through the lizards' digestive tract (Gomes et al. 2016). The viability and germination of some cactus seeds may be dependent on animal species. Closely related plant species can have different germination patterns when ingested by the same species of frugivores (Traveset 1998; Mas and Traveset 1999).

There are even fewer studies that evaluated the effect of endozoochory on the viability and germination of *Opuntia* seeds. Kevan et al. (2004) found neither white-tailed deer nor chicken appeared to facilitate *O. cespitosa* germination. Lovett-Doust and Levi's (2003) more robust study of *O. cespitosa* found that seeds from small and seedy fruits are slowest to germinate. In many studies, the germination of large seeds is more likely to increase from endozoochory than small seeds (Traveset and Verdi 2001). The maturity of seeds is also a factor that can impact seed germination (Blanco et al. 2016). The maturity and size of seeds found in faeces by Kevan et al. (2004) were not considered during that study, which may have affected their observed germinability. Relative germinability of seeds is also dependent on the site of origin (Lovett-Doust and Levi 2003).

Another factor that may affect the viability and germination of *Opuntia* seeds is the effect of endozoochory on seed coat thickness and structure. Ingested seeds generally have a thinner coat due to scarification from passage through the gut, which can increase germinability (Nogales et al. 2005). However, seeds can also be damaged if the seed coat becomes too thin, which is dependent on the consumer (Nogales et al. 2005). Other studies suggest that changes to seed coat thickness impacts the rate of germination (Traveset et al. 2001; Padrón et al. 2011). For example, the germination rate of *O. dillenii* seeds improved after ingestion by lizards, which can be advantageous in arid environments where rain is unpredictable (Padrón et al. 2011). Another study suggests that enhanced germination rates may be a result of modified seed coat structure (e.g., more scars and crevices) rather than the thickness (Traveset et al. 2001). Overall, germination response can differ depending on both the animal consuming the seeds and the seeds of the plant being consumed (Padrón et al. 2011). More research on viability and germination of *O. cespitosa* endozoochory could contribute to our understanding of reproductive strategies and plant-animal interactions required to improve conservation strategies.

Microsite conditions where seeds are defecated are another determining factor of plant reproductive success (García-Cervigón et al. 2018). Propagules and seedlings often arrive in unsuitable habitats for germination (Maschinski et al. 2004; Ozinga et al. 2005). For example, the survival rate for *O. cespitosa* seedlings in a dry forest would be very low (VanDerWal et al. 2007a). *Opuntia cespitosa* grows best under partial shade (irradiance levels of 70%) along with high nutrients (VanDerWal et al. 2007a). Hence, it is crucial to determine where potential animal dispersers such as wild turkeys defecate, to determine if the seeds are dispersed to suitable habitats for germination and survival.

2.6 Camera traps

Camera traps have been used to identify potential dispersers by filming the feeding of cactus fruits (e.g., Kevan et al. 2004; Vázquez-Castillo et al. 2019). Although Kevan et al. (2004) were unsuccessful, they still recommended the use of filming in future studies to capture evidence of potential dispersers feeding on fruits. Vázquez-Castillo et al. (2019) used camera traps to observe frugivory in the columnar cactus *Pilosocereus leucocephalus*, and they successfully obtained over 14 hours (out of 2162 hours) of effective pulp removal footage. From still images and videos captured by the camera traps, they were able to identify both diurnal and nocturnal species that fed on the fruits. Motion-triggered camera traps are recommended in long-term or monitoring studies, as they allow consecutive days or weeks of data collection with minimal disturbances by the researchers (Evans et al. 2019; Harrison et al. 2019). Moreover, Evans et al. (2019) suggest having two or three cameras per site to increase detection success rate. Camera traps have also become more affordable because of technological advances (Harrison et al. 2019) and have been used to study the diets of raptors such as falcons (Booms and Fuller 2003; Robinson et al. 2015) and eagles (Dykstra et al. 2002; Harrison et al. 2019). Well-camouflaged camera traps can be a non-invasive method of obtaining visual evidence of potential primary dispersers.

Alternatively, some studies used Sherman traps and sticky traps to capture live animals feeding on the *Opuntia* seedlings (Mandujano et al. 1998). Sherman traps can vary in size and are box-style traps that operate on a door-and-treadle system to capture live animals (Anthony et al. 2005), while sticky traps are covered with glue and are commonly used to monitor pest population such as insects and rodents (Lu et al. 2012; Mandujano et al. 1998). However, the success rate of these two methods were very low (Mandujano et al. 1998) and would not be useful for capturing large animals such as wild turkeys and deer. Furthermore, it would be ideal if no animals are distressed during the study by using traps.

2.7 Scat collection and analysis

Scats (or faeces) have been used in various types of studies as a non-invasive method of collecting samples without harming the species of interest (e.g., Mandujano et al. 1997; Vynne et al. 2012; Blanco et al. 2016). DNA and hormone samples were obtained from wolf scats to noninvasively assess the physiological health of maned wolves (Vynne et al. 2012). Furthermore, animals such as wild turkeys, can be elusive or aggressive (Drake et al. 2013), making scats important lines of evidence indicating the presence of the species without having direct contact with them. Recently, internal seed dispersal has been assessed by searching for seeds in faeces (Blanco et al. 2016). Most faeces can be collected at communal roosts, foraging sites, and bird nests (Blanco et al. 2016). It is best to collect faeces right after the animal has left their homes or roosts to avoid having any direct contact with them.

2.7.1 Wild turkey scats

Wild turkeys are important agents of change in forest understories by direct consumption and by creating litter disturbances (Chip et al. 2014). The soil and litter disturbances are caused by wild turkey group foraging behaviours, which can have long-lasting effects on both woody and herbaceous plants (Chip et al. 2014). These disturbances are often accompanied by scat and feathers (Elbroch and Mark 2001; Chips et al. 2014), which can be identified based on tracks made by foot raking action. Scats can also be found near nesting sites (Blanco et al. 2016). However, it may be difficult to locate wild turkey nesting sites which occur in various habitats including hayfields, shrubs, and tree bases (Nguyen et al. 2004). A dense understory may be favoured by wild turkeys in Ontario for selecting nesting habitats (Nguyen et al. 2004). Detection dogs are very effective at locating scats quickly in the wild and have been used previously with species such as the blunt-nosed leopard lizard (*Gambelia sila*) (Filazzola et al. 2017). However, wild turkeys may feel threatened by the presence of unfamiliar animals, which could change their travelling behaviours (Drake et al. 2013).

Wild turkey scat identification is relatively straightforward due to their unique shape. Male and female wild turkeys have different shaped and sized droppings (Bailey 1956). Female wild turkeys (hens) produce droppings that are small in diameter (5-8 mm) and have a spiral or bulbous shape (Figure 2.2a). Male wild turkeys (gobblers) produce J-shaped droppings (Figure 2.2b) that are longer, straighter, and greater in diameter (10 – 15 mm) (Bailey 1956).

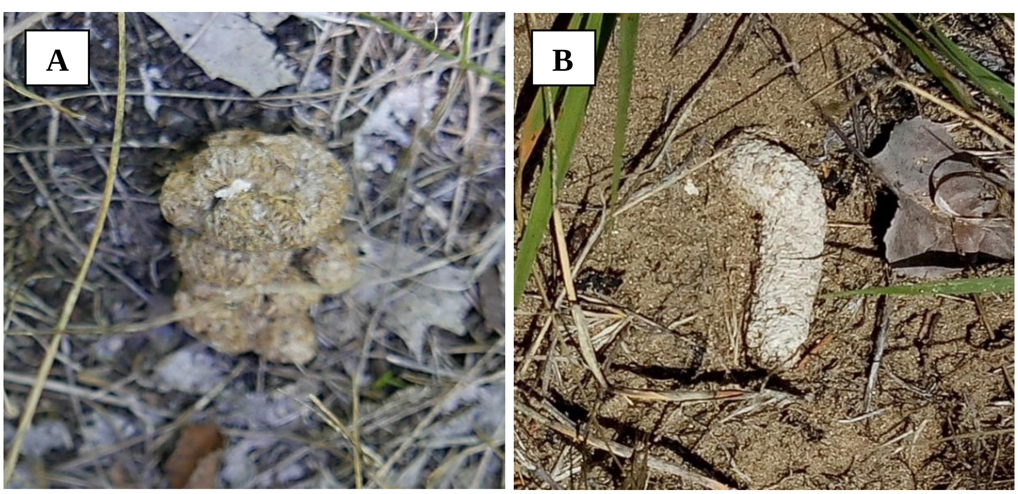

Figure 2.2. Dropping from (a) a female turkey and (b) male turkey. Photos taken at Point Pelee National Park in August 2020.

2.8 Acid scarification

Acid scarification can occur artificially in a lab or naturally by passing through an animal's digestive tract. Scarification is known to encourage germination because it can break the physical dormancy of seeds (Jaganathan et al. 2016). The results of acid scarification on the germination of *Opuntia* species have been inconsistent in past studies. Several studies have stated that acid scarification is required to promote seed germination (Potter et al. 1984; Lovett-Doust and Levi 2003) whereas others argue the opposite (Basin and Baskin 1977; Kevan et al. 2004). *Opuntia cespitosa* seed germination in PPNP was about four times higher when treated with acid in the lab (Lovett-Doust and Levi 2003). Germination experiments on other *Opuntia* species in Western Texas also demonstrated that acid treatment consistently increased germination (Potter et al. 1984). However, some studies argue that scarification is ineffective in promoting germination. For example, mechanical and acid scarification were ineffective in promoting the germination of *O. compressa* in Tennessee (Basin and Baskin 1977). Germination rates of acid-treated (artificially or naturally by animals) and untreated *O. cespitosa* seeds at PPNP were not significantly different (Kevan et al. 2004). Furthermore, the germination rate of untreated seeds was found to be higher than the acid-treated seeds (Kevan et al. 2004). More research is needed to better understand the effect of acid scarification on the germination of *Opuntia* seeds.

Chapter 3: Materials and Methods

3.1 Study species and site

Opuntia cespitosa are spreading succulent plants that rarely exceed 30 cm in height in PPNP (Drezner 2017a), which can be difficult to locate and identify if neighbouring plants are expansive or have a dense canopy. Individual plants can be difficult to distinguish as multiple small independently rooted plants can grow in close proximity and resemble one large plant (Drezner 2021). Until a method was standardized by VanDerWal et al. (2007b), individual cacti were classified differently across studies at PPNP. In this study, individual plants (microsites) were identified based on the criteria set by Levi (1999 and 2001) and VanDerWal et al. (2007b), by patches of cacti that are at least 1 m away from other patches.

This study was conducted at PPNP (41.957°N, 82.518°W, 173-177 m.a.s.l), where the only substantial population of *O. cespitosa* occurs in Canada (Figure 3.1). The Park was established in 1918 and is surrounded by Lake Erie on all sides except to the north where the peninsula meets the mainland. PPNP is the second smallest National Park and has an area of about 20 km^2, including the most southern point of mainland Canada, in the municipality of Leamington, Essex County. Although it is one of the smallest parks in Canada, it is the most ecologically diverse National Park. The Park is about 70% marsh and the remainder is made up of the dryland eastern deciduous forest (Carolinian forest), the swamp forest, the beach, and the Red Cedar Savannah (Trenhaile and Dumala 1978). The Park has more species at risk than any other National Park in Canada (Dobbie et al. 2007), including *O. cespitosa* (Kraus 1991). About 25% of PPNP's species at risk, including *O. cespitosa*, are found in Lake Erie Sandspit Savannah (LESSS), an extremely rare habitat in Canada (Dougan and Associates 2007). At the Park, LESSS consists of three types of habitats: Red Cedar Savannah, Shoreline Savannah, and Woodland. LESSS is dependent on periodic disturbances such as fire to prevent succession to dry forest (Parks Canada 2021a). Furthermore, the Park is internationally designated as an Important Bird Area, serving as a habitat for over 390 species of migrating birds every year (Parks Canada 2020). Meteorological data from 1981 to 2010 at the nearby Kingsville, ON station (Environment Canada, climate ID# 6134190) show a daily average temperature of -3.7°C in January and 22.5°C in July with an annual mean precipitation of 900.5 mm.

Within the Park, a majority of the *O. cespitosa* population is found naturally in two locations. One population is at West Beach (WB), along the western coast of the peninsula (Drezner 2017a; Drezner 2017b; Drezner 2021). The second population is located inland near the DeLaurier Homestead (DeL), which is characterized as a secondary successional savannah (VanDerWal et al. 2007a). There are also naturally occurring isolated populations of *O. cespitosa* in the Red Cedar Savannah habitat within the dryland forest.

A total of 38 sites were selected for this study. Eighteen sites were from DeL (Figure 3.2), 16 sites were from WB (Figure 3.3), and 4 sites were selected from isolated populations of cacti in the savannah located within the dryland forest of the Park (Figure 3.4). Six of the selected sites were controls and did not have a cactus patch. Most of the selected sites were from WB and DeL because there are significantly more cacti at these locations. In addition, seeds from DeL have been reported to have relatively higher germinability, which may mean that this location contains greater genetic diversity and may have more seedling recruits arising from seeds (Lovett-Doust and Levi 2003). WB is visited by many potential animal dispersers and contained several partially eaten fruits (Kevan et al. 2004).

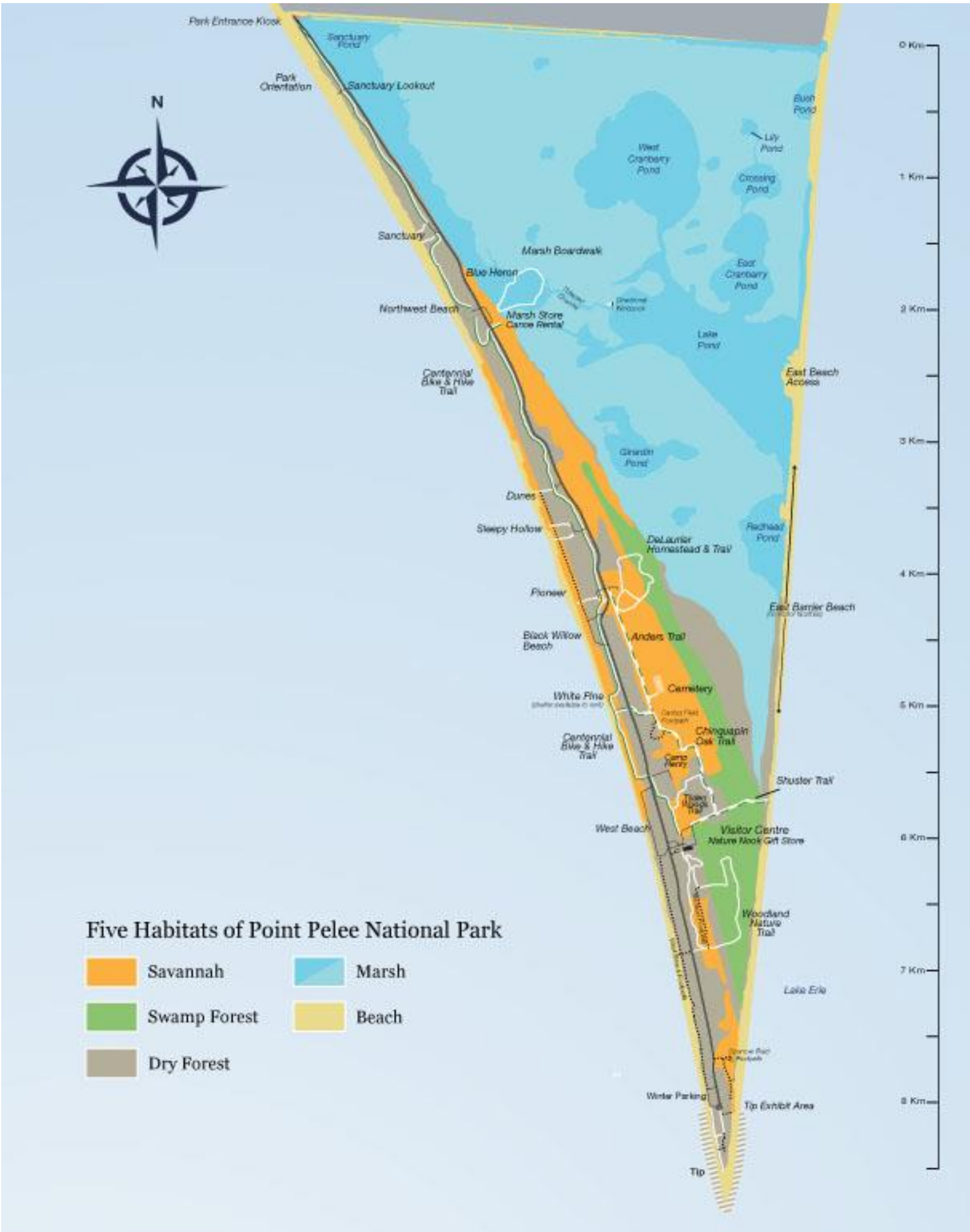

Figure 3.1. Map of Habitats at Point Pelee National Park, Ontario, Canada (Parks Canada 2021b).

Figure 3.2. One of the West Beach sites at Point Pelee National Park. Photo taken in October 2020.

Figure 3.3. One of the DeLaurier Homestead southern sites at Point Pelee National Park. Photo taken in October 2020.

Figure 3.4. One of the isolated sites near the cactus field foothpath at Point Pelee National Park. Photo taken by Mandy Huynh.

3.2 Fieldwork timeline

Fieldwork at PPNP was conducted under the Research and Collection Permit number PP-2020-36377. This permit allowed fieldwork to occur between August 4, 2020 and October 31, 2020. Fieldwork was originally scheduled to start during *O. cespitosa*'s flowering season in June 2020, but it was postponed to August because all National Parks, were closed to all visitors and researchers until June due to COVID-19 in Canada. The Park re-opened on June 29, 2020. To conduct research in the Park, a permit application and contingency plan were required to be submitted for health and safety precautions.

3.3 Pre-fieldwork assessments

A density map of known cacti microsites in PPNP was provided by the Park Ecologist (Rachel Windsor) to help determine potential sites (Parks Canada 2015). The density map contains confidential information and is not published nor included in this thesis to protect the endangered species from being harvested or destroyed by human activities.

Prior to the start of fieldwork, several pieces of equipment including trail cameras (Spypoint Force-Dark Ultra Compact Trail Cameras [Figure 3.5]) and a GPS unit (Garmin GPSMAP 64 [Figure 3.6]) were tested to ensure functionality and accuracy. All functions and features of the trail cameras were tested several weeks before fieldwork began. The functions and features that were tested included night photo/video capabilities, trigger speed, battery life, and detection distance. Although trail camera brands such as Bushnell and Reconyx were more popularly used for fieldwork (e.g., Toews 2013), Spypoint cameras were used because they are more attainable, affordable, and made to withstand Canadian climate. Spypoint Force-Dark trail cameras also have a very fast trigger speed of 0.07 second, which is crucial for taking photos and videos of moving targets.

Figure 3.5. Spypoint Force-Dark Ultra Compact Trail Cameras and 6-ft Masters Lock Python Adjustable Locking Cable.

Figure 3.6. Garmin GPSMAP 64 device used in the field to locate sites at the Park.

On the first day of fieldwork, August 5, 2020, the GPS was tested in the Park to determine the accuracy of recording the coordinates of a location. Testing was required because variables such as forest canopy can interfere with GPS signals and influence accuracy (Galán et al. 2011). Accuracy was determined by measuring the distance or surveying the ground and using the tracking function to check if the device will provide accurate directions and distance to each selected site. For example, the direction and distance from an identifiable reference such as a trail sign to a study site were measured using a compass (Figure 3.7) and 60-ft fibreglass tape measure (Figure 3.8). The measurements were then compared to the direction and distance provided by the GPS. All recorded GPS measurements were accurate to within 5 m.

Figure 3.7. Suunto MC-2 NH Mirror Compass.

Figure 3.8. 60-ft fibreglass tape measure.

3.4 Recording animal behaviour with camera traps

To determine whether wild turkeys and other animal vectors are potential primary seed dispersers, we set-up four trail cameras in the Park on August 5, 2020 for long-term monitoring. With the assistance of the Park Ecologist, Rachel Windsor, two study sites were selected at WB and two study sites were selected at DeL. Study sites at each habitat were spaced at least 100 m apart from each other. They were selected based on the presence of at least 1 cactus patch and whether there was a tree nearby to set-up the trail camera facing the cactus patches. Two trail cameras were used in each habitat to increase the detection rate of species in motion by at least 22% (Evans et al. 2019).

Trail cameras were used to photograph and video record motion when detected at the study sites. Each trail camera was placed about 1-2 m above the ground with the lens angled toward the cactus patch(es) (Figure 3.9). The trail cameras were set to take a photo followed by a 10-second video when triggered by motion. Trail cameras were set to delay motion detection by 1 minute before taking the next photo and video to reduce the amount of false positive data caused by strong wind and insects. Secure Digital High Capacity (SDHC) cards with the maximum storage capacity of 32 GB were used for the trail cameras. After each trail camera was set-up, a 6-ft Masters Lock Python Adjustable Locking Cable was used to secure it to a tree and prevent it from being removed by curious animals or humans (Figure 3.9). A Parks Canada sign was also attached to each tree with a trail camera, alerting passersbys not to disturb the site.

Figure 3.9. Photo of trail camera set-up at one of the West Beach study sites.

In addition to setting up the trail cameras, the size and density of cactus patches within the view of the trail cameras were measured to determine whether they affected the frequency of feeding activity by wild turkeys and other species. The number of cladodes and number of fruits were counted to calculate their respective densities. Fruits were recounted during each visit to calculate the change in density through the summer and fall season. The fruits were further classified based on their color which represents ripeness.

We made periodic visits (3-4 times per month) to the Park between August and October to retrieve data from the trail cameras and to conduct maintenance checks. During each visit, the number of flowers and fruits at each site were recounted to determine if there was any correlation between changes to flower or fruit counts and animal visits. Any evidence of fruit consumption was also recorded during each visit. On October 12 to October 18, 2020, all trail cameras were set to take photos and videos with no delay because the digital data were retrieved every other day. On October 18, we removed the trail cameras from the study sites.

Photos and videos were examined to determine the species that fed on cactus fruits. Those that showed animal visitation were logged onto an Excel spreadsheet for analysis including location, animal species, and animal behaviour.

3.5 Scat collection and fingerlings

Opuntia cespitosa fruit(s) were provided by Dr. Taly Drezner and dissected to retrieve the seeds for reference. The reference seeds were used to determine if seeds retrieved from wild turkey scats originated from *O. cespitosa* or another plant. Reference seeds were air-dried for at least 48 hours before being weighed with a digital scale (g), and measured with a digital caliper for their thickness, largest and smallest diameter (mm). The seeds were also classified as either mature or immature based on the visual distinctions made by Lovett and Levi (2003) (Figure 3.10).

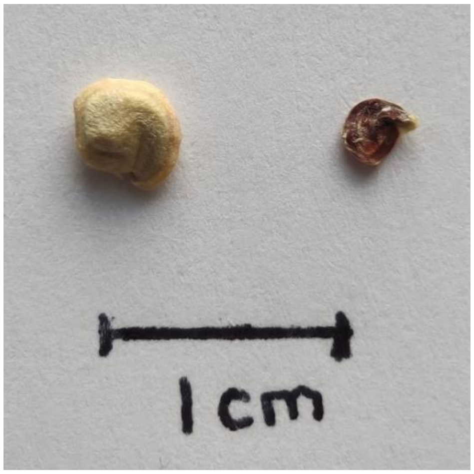

Figure 3.10. Mature seed (left) vs immature seed (right).

We searched for wild turkey scats and fingerlings in *O. cespitosa* habitats as evidence towards determining if wild turkeys could be effectively dispersing cactus seeds. The fieldwork was conducted in two different time periods. The first data collection period occurred at the end of the flowering season, on August 5-6, 2020. The purpose of the first data collection period was to collect at least 25 samples of scats for preliminary testing, which may have contained seeds from the previous year. We searched for fingerlings and turkey scats at the 4 sites with trail cameras. The second data collection period occurred during the end of the fruiting season, on October 12-18, 2020. We searched for fingerlings and turkey scats at 38 sites, including the ones with trail cameras. These sites were selected based on the density map provided by the Park (Parks Canada 2015). The goal was to collect at least another 50-100 samples of scats, which hopefully contained more seeds from ripe fruits. Each site was sampled only once during August and once during October due to time and resource limitations.

We visually searched for fingerlings and turkey scats in each site within a 2.5 m radius starting from the centre of the largest cactus patch, if present. At least 30 minutes were used to carefully walk around and within each site to search for scats and fingerlings as seedling growth in the field is very slow (Baskin and Baskin 1977) and the seedlings may be short and hidden under neighbouring vegetation. It was also important to carefully sample each site to distinguish fingerlings from young cladodes that grew from dislodged pads (Figure 3.11). The GPS coordinates of each site's centre were recorded using the Garmin GPSMAP 64 and stake flags were used to mark the boundary of each site (Figure 3.12). If a fingerling or turkey scat was identified, the habitat and sample conditions were recorded, such as presence of shade, proximity to a cactus patch, and fingerling height using a digital caliper (Figure 3.13). Plastic tags were temporarily placed at the bases of identified fingerlings to prevent double counting (Figure 3.14).

We collected turkey scats immediately after sample conditions were recorded, and removed all tags and stake flags after we completed sampling at each site.

Figure 3.11. (a) Photo of 2 fingerlings, which are cylindrical in shape and contains more trichomes. (b) Photo of a clone growing from a fallen piece of cladode; usually flatter compared to fingerlings.

Figure 3.12. Photo of a northern site at the DeLaurier Homestead. The site's boundary was marked by pink stake flags. One flag was used to represent the centre of the site.

Figure 3.13. FineSource electronic Digital Caliper.

Figure 3.14. Plastic tag by fingerling to prevent double counting. Photo taken at a West Beach site.

The use of a fixed radius sampling area around the initial scat or fingerling was recommended to increase sample size (Keiter et al. 2016). Keiter et al. (2016) found that the use of a 15 m or 20 m radial search protocol increased the number of scats detected for wild pigs. We adapted their method using a 2.5 m radial search protocol at each site during the second data collection period to ensure enough scats were collected for testing and analysis.

Each turkey scat was stored in a labelled paper bag (8.9 x 5.1 x 17.1 cm), to allow the moisture in the scats to escape and prevent fungal growth (Blanco et al. 2016). The samples were air-dried at room temperature for at least 2 weeks before being manually broken down in the lab.

After 2 weeks, the scats were disaggregated at the lab, and intact seeds from *O. cespitosa* and other plants were separated and placed on petri dishes labelled with the scat collection date and sample number. The seeds were then washed immediately with deionized water, dried with lab blotting paper, and stored in labelled mini plastic bags at room temperature. In the lab, the thickness, largest and smallest diameter (mm) of each *O. cespitosa* seed were measured with a digital caliper. *Opuntia cespitosa* seeds were classified as either mature or immature based on the visual distinctions made by Lovett and Levi (2003). Only mature seeds were used for analysis because the immature group does not contain viable embryos (Lovett and Levi 2003).

3.6 Statistical analysis

3.6.1 Datasets

We have 6 datasets: long_fruit, fall_site, fingerling, camera, scat, and seed datasets. We used the long_fruit dataset primarily to document long-term changes regarding the consumption and physical appearance of *O. cespitosa* at the sites that included a trail camera. This dataset has 11 columns and 44 rows. Each row represents the observations we made during our visits to the sites that contained a trail camera between August and October 2020. Each column represents the data recorded which include *Date*, *CAM #* (Camera), *Location*, *# Flowers*, *# Red Fruits*, *Total Fruits*, *% Red Fruits*, *# Partial Eaten*, *# Fully Eaten*, *Total Eaten*, and *# Fingerlings*. *CAM #* is used to identify the site that contained a trail camera. *% Red Fruits* represents the percentage of fruits that are red compared to the total number of fruits. This dataset also includes data from one-time observations related to patch density at each site, which are *Total Pads* and *Patch Area (m^2)*.

The fall_site dataset was used to document the consumption and physical appearance of *O. cespitosa* as well as the number of wild turkey scats and fingerlings at the sites during a single visit to them between October 13 to 17, 2020. This dataset has 12 columns and 38 rows. Each row represents the sites and each column represents the data recorded at each site which include *Site #*, *Location*, *Patch Area (m^2)*, *# Red Fruits*, *Total Fruits*, *% Red Fruits*, *Total Fruit Density (fruit/m^2)*, *Red Fruit Density (fruit/m^2)*, *# Partial Eaten*, *# Fully Eaten*, *Total Eaten*, *# Fingerlings*, and *# Turkey Scats*. *Site #* is used as an ID number for each site and *Location* represents the area in the Park where the sites are located. We calculated *Total Fruit Density* by using *Total Fruits* and *Patch Area (m^2)*, and *Red Fruit Density* by using *# Red Fruits* and *Patch Area (m^2)*.

The fingerling dataset documents the information on fingerlings found in the sites visited between October 13 to 17, 2020. This dataset has 7 columns and 111 rows. Each row represents a fingerling identified at the Park. Each column represents the data recorded for each individual fingerling which include *Fingerling*, *Date*, *Site*, *Inside/Outside Cactus Patch*, *Distance from Closest Patch (cm)*, *Height (mm)*, and *Diameter (mm)*. *Fingerling* is used as an ID number for each identified fingerling.

The camera dataset was used to document detailed information of photos and their corresponding videos containing at least one animal taken by a trail camera between August and October 2020. This dataset has 7 columns and 860 rows. Each row represents a photo and its corresponding video. Each column represents the descriptive data of the digital images which include *Rep*, *Date*, *Location*, *Animal*, *Animal Counts*, *Location Relative to Cactus Patch(es)*, and *Behaviour*. *Rep* is used as an ID for each digital image. We used *Behaviour* to log the type of activities exhibited by the animal(s) in the video, such as foraging or travelling.

We used the scat dataset to document the information on wild turkey scats collected in the sites visited between August 5 to 6 and October 13 to 18, 2020. This dataset has 11 columns and 158 rows. Each row represents a wild turkey scat we collected. Each column represents the data recorded for a wild turkey scat which include *Scat ID #, Season, Date, Inside/Outside Cactus Patch, Scat Sex*, *Length (cm)*, *Width (cm)*, *Weight (g)*, *Seed/Foreign Object Presence*, *# of Cactus Seeds*, *# of Seed from Other Plants*, *# of Foreign Materials*, and *Primary Element*. *# of Foreign Materials* includes the count of everything that won't be classified as a seed, such as pebbles and minerals. *Seed/Foreign Object Presence* is used to record whether there were any seeds or foreign objects in the scat. *Primary Element* is used to record the main elements of the scats, such as grass or grain.

We used the seed dataset to document the descriptive information of *O. cespitosa* seeds obtained from Dr. Taly Drezner or dissected from a wild turkey scat collected in the field. This dataset has 10 columns and 68 rows. Each row represents an *O. cespitosa* seed. Each column represents the descriptive information of the seeds which include *Seed ID, Source, Season, Largest Diameter (mm), Smallest Diameter (mm)*, *Average Diameter (mm)*, *Thickness (mm)*, *Shape*, *Color*, and *Texture*. We calculated *Average Diameter (mm)* using *Largest Diameter (mm)* and *Smallest Diameter (mm)*.

3.6.2 Analysis

The Shapiro-Wilk test was first used to determine if continuous variables were normally distributed. The threshold for statistical difference, or α value is 0.05. If the data deviated significantly from a normal distribution ($p < 0.05$), then we attempted to transform the data. Non-parametric tests were used for data that we could not normalize.

We first examined the relationship between frequency of foraging activities and total fruit density at each site with a trail camera. To calculate the frequency of foraging activities for each site, we applied filters to the camera dataset to only include data where *Behaviour* is Foraging and *Location Relative to Cactus Patch(es)* is either In or Edge from August 12 to October 18, 2020. To calculate the total fruit density at each site, we averaged *Total Fruits* for each *CAM #* in the long_fruit dataset from August 12 to October 18, 2020, and then divided it by *Patch Area (m^2)*. We took the average of *Total Fruits* because the difference between each observation is minimal. We did not run a statistical test to assess the relationship between frequency of feeding activities and fruit density due to a low sample size ($n = 4$). We then examined the relationship between frequency of foraging activities and pad density at each site with a trail camera. To calculate the pad density, we divided *Total Pads* by *Patch Area (m^2)* from the long_fruit dataset for each site. A statistical test was not run to assess the relationship between frequency of feeding activities and pad density due to low sample size ($n = 4$).

We then examined the relationship between frequency of foraging activities and red fruit density at each site with a trail camera from August 12 to October 18, 2020. For frequency of foraging activities, we applied the same filters to the camera dataset, but we grouped the counts by date intervals of 10 days. To calculate the red fruit density, we averaged *# Red Fruits* in the long_fruit dataset that are within the same date interval at each site, and then divided it by *Patch Area (m^2)*. The data distribution for both frequency of foraging activities (Shapiro-Wilk, W = 0.864, n = 28, p= 0.002) and red fruit density (Shapiro-Wilk, W = 0.681, n = 28, p < 0.001) deviated significantly from a normal distribution. We transformed (square root) frequency of foraging activities (Shapiro-Wilk, W = 0.934, n = 28, p = 0.078). We were unable to normalize the data for red fruit density. A Spearman rank correlation test was used to assess the relationship between the non-transformed data of frequency of foraging activities and red fruit density.

The next relationship we examined was between the number of scats and number of fingerlings at each site from October 13 to 17, 2020. In the fall_site dataset, we used *# Turkey Scats* (Shapiro-Wilk, W = 0.625, n = 38, p < 0.001) and *# Fingerlings* (Shapiro-Wilk, W = 0.761, n = 38, p < 0.001) which are not normally distributed. Neither variable could be normalized. A Spearman rank correlation was used to assess the relationship between number of scats and number of fingerlings.

The sites we explored from October 13 to 17, 2020, were assigned one of three labels describing their location in the Park: West Beach (WB), Delaurier Homestead (DeL), or Forest (FoT). We compared the mean number of scats between each type of habitat to determine if there was a significant difference. In the fall_site dataset, we used *# Turkey Scats* and *Location* for type of habitats. The number of turkey scats at WB (Shapiro-Wilk, W = 0.884, n = 16, p = 0.044), DeL (Shapiro-Wilk, W = 0.691, n = 18, p < 0.001), and FoT (Shapiro-Wilk, W = 0.714, n = 4, p = 0.017) are not normally distributed. We transformed (square root) our data for number of scats at DeL (Shapiro-Wilk, W = 0.915, n = 18, p = 0.105), and at FoT (Shapiro-Wilk, W =

0.892, $n = 4$, $p = 0.392$). Number of scats at WB could not be normalized. The Kruskal-Wallis *H* test was used to compare the mean number of scats between the types of habitat.

We also compared the mean number of fingerlings between each type of habitat to determine if they are significantly different. We used *# Fingerlings* and *Location* for type of habitats from the fall_site dataset. The number of fingerlings at WB (Shapiro-Wilk, $W = 0.835$, $n = 16$, $p = 0.008$) and DeL (Shapiro-Wilk, $W = 0.778$, $n = 18$, $p < 0.001$) are not normally distributed. The number of fingerlings at FoT is normally distributed (Shapiro-Wilk, $W = 0.884$, $n = 4$, $p = 0.369$). We normalized number of fingerlings at DeL with square root (Shapiro-Wilk, $W = 0.938$, $n = 18$, $p = 0.266$), but could not transform number of fingerlings at WB. The Kruskal-Wallis *H* test was used to compare the mean number of fingerlings across habitats.

Using the data we gathered on fingerlings from October 13 to 17, 2020, we examined the relationship between the height and diameter of fingerlings, and their distance from a cactus patch. In this analysis, we only used data on fingerlings found outside of a cactus patch by applying a filter to the fingerling dataset where *Inside/Outside Cactus Patch* is Outside. We used *Height (mm)*, *Diameter (mm)*, and *Distance from Closest Patch (cm)* from the fingerling dataset. *Height (mm)* for fingerlings outside of a cactus patch (Shapiro-Wilk, $W = 0.880$, $n = 30$, $p = 0.003$), and *Distance from Closest Patch (cm)* (Shapiro-Wilk, $W = 0.677$, $n = 30$, $p < 0.001$) are not normally distributed. *Diameter (mm)* for fingerlings outside of a cactus patch is normally distributed (Shapiro-Wilk, $W = 0.956$, $n = 30$, $p = 0.241$). We normalized *Height (mm)* for fingerlings outside of a cactus patch (Shapiro-Wilk, $W = 0.980$, $n = 30$, $p = 0.838$), and *Distance from Closest Patch (cm)* (Shapiro-Wilk, $W = 0.963$, $n = 30$, $p = 0.366$) using logs. A Pearson correlation assessed the relationship between the height and diameter of fingerlings, and their distance away from a cactus patch.

From the fingerling dataset, we also compared the mean height and diameter of fingerlings inside a cactus patch to those outside of a cactus patch. We used *Height (mm)*, *Diameter (mm)*, and *Inside/Outside Cactus Patch* for the relative location of a fingerling to a cactus patch. The height of fingerlings (Shapiro-Wilk, $W = 0.877$, $n = 81$, $p < 0.001$) and diameter of fingerlings (Shapiro-Wilk, $W = 0.917$, $n = 81$, $p < 0.001$) inside a cactus are not normally distributed. We transformed *Height (mm)* with a log for fingerlings inside (Shapiro-Wilk, $W = 0.980$, $n = 81$, $p = 0.231$) and outside (Shapiro-Wilk, $W = 0.980$, $n = 30$, $p = 0.838$) a cactus patch. We also used log transformation on *Diameter (mm)* for fingerlings inside (Shapiro-Wilk, $W = 0.988$, $n = 81$, $p = 0.640$) and outside (Shapiro-Wilk, $W = 0.983$, $n = 30$, $p = 0.894$) a cactus patch. Independent samples *t*-tests were run to compare the mean height and diameter of fingerlings within and outside a cactus patch.

With the wild turkey scats we collected, we analyzed the different components found in the scats to determine if there was a difference between the summer and fall samples. The three variables we analyzed were *# of Cactus Seeds*, *# of Seeds from Other Plants*, and *# of Foreign Materials* from the scat dataset. *Season* was used to categorize the data as either summer or fall samples. The number of cactus seeds found in the fall scats were not normally distributed (Shapiro-Wilk, $W = 0.062$, $n = 130$, $p < 0.001$). The distribution for seeds from other plants for both the summer (Shapiro-Wilk, $W = 0.470$, $n = 28$, $p < 0.001$) and fall (Shapiro-Wilk, $W = 0.648$, $n = 130$, $p < 0.001$) were not normally distributed. Lastly, the distribution for foreign objects for both the summer (Shapiro-Wilk, $W = 0.761$, $n = 28$, $p < 0.001$) and fall (Shapiro-Wilk, $W = 0.572$, $n = 130$, $p < 0.001$) were also not normally distributed. The Mann-Whitney *U*-test was used for all three variables that could not be transformed.

We also categorized the scats by the sex of the wild turkey to determine if it affects scat weight. We used *Weight (g)* to represent the dry weight of wild turkey scats, and *Scat Sex* (male, female, or broken [sex could not be determined]) to represent the sex of the wild turkey that produced it. Female (Shapiro-Wilk, $W = 0.851$, $n = 61$, $p < 0.001$), male (Shapiro-Wilk, $W = 0.854$, $n = 82$, $p < 0.001$) and broken (Shapiro-Wilk, $W = 0.621$, $n = 15$, $p < 0.001$) wild turkey scats were not normally distributed and could not be transformed. The Kruskal-Wallis H test was used to compare the mean weight of wild turkey scats between different sexes. To determine if the influence of sex on scat weight was associated with the presence of seeds or foreign objects, we ran a Chi-square test of independence between *Scat Sex* and *Seed/Foreign Object Presence*. Cramer's V test was used to determine the strength of the association. Only male and female wild turkey scats were included in this test to determine if sex played a role.

From the fall_site dataset, we examined the relationship between the number of scats (*# Turkey Scats*) and number of fruits consumed (*Total Eaten*) at each site with a cactus patch. We also examined fruit distribution variables that could influence the number of scats and number of fruits consumed. The environmental variables we analyzed were *# Red Fruits*, *Total Fruits*, *Red Fruit Density (fruit/m^2)*, and *Total Fruit Density (fruit/m^2)* from the fall_site dataset. Number of scats (Shapiro-Wilk, $W = 0.643$, $n = 32$, $p < 0.001$), number of fruits consumed (Shapiro-Wilk, $W = 0.528$, $n = 32$, $p < 0.001$), number of red fruits (Shapiro-Wilk, $W = 0.879$, $n = 32$, $p = 0.002$), total number of fruits (Shapiro-Wilk, $W = 0.885$, $n = 32$, $p = 0.003$), red fruit density (Shapiro-Wilk, $W = 0.830$, $n = 32$, $p < 0.001$), and total fruit density (Shapiro-Wilk, $W = 0.831$, $n = 32$, $p < 0.001$) are not normally distributed. We used the square root transformation on all the fruit distribution variables. The number of red fruits (Shapiro-Wilk, $W = 0.976$, $n = 32$, $p = 0.676$), total number of fruits (Shapiro-Wilk, $W = 0.981$, $n = 32$, $p = 0.839$), red fruit density (Shapiro-

Wilk, $W = 0.977$, $n = 32$, $p = 0.696$), and total fruit density (Shapiro-Wilk, $W = 0.970$, $n = 32$, $p = 0.491$) do not deviate significantly from a normal distribution after transformation. Number of turkey scats was normally distributed with a log transformation (Shapiro-Wilk, $W = 0.936$, $n = 32$, $p = 0.059$). A Pearson correlation test was run to assess the relationship between the fruit distribution variables and the number of scats. We were unable to transform the number of fruits consumed to have a normal distribution, so we used a Spearman rank correlation to assess its relationship with the non-transformed data of number of scats and the fruit distribution variables.

Statistical tests were run with Statistical Package for the Social Sciences (SPSS) (2020) version 27.

3.7 Mapping the sites and data

ArcMap, a geospatial processing application developed by the Environmental Systems Research Institute (ESRI), was used to create a map with the recorded GPS coordinates of all the study sites within the Park. The application was also used to show the hotspots for fingerlings and turkey scats. A fishnet of rectangular cells was used to create a map representing abundance of fingerlings and another to represent abundance of turkey scats, where green represents low counts and red high counts. Each cell or is 100 m^2 and falls within a 5 m radius of a site. The value of each cell is based on the average of the sites that fall within the 5 m radius. In addition, a map was created to show and compare the abundance of fingerlings and turkey scats to each other using buffers, which are rings placed around a site. The buffer size increases or decreases based on the abundance of the samples at each site. The abundance is represented by the radius (m) of the buffer. In total, four maps were created: *Study Sites used to Track the Dispersal of Eastern Prickly Pear Cactus by Animal Vectors at Point Pelee National Park*, *Hotspots for Wild Turkey Scats at Point Pelee National Park*, *Hotspots for Eastern Prickly Pear Cactus*

Fingerlings at Point Pelee National Park, and *Correlation between Wild Turkey Scats and Eastern Prickly Pear Cactus Fingerlings at Point Pelee National Park*. The maps are not included in this thesis to preserve the integrity of *O. cespitosa* at its last known Canadian location.

Chapter 4: Results

4.1 Evidence from camera traps

From August 5 to October 18, the four trail cameras collectively recorded 41,674 photos and videos. Only 2.6% (860 photos and videos) of the digital images contained at least one bird or mammal species at the site. From August 12 to October 18, most images were recorded by cameras #2 and #3 at DeL. However, the number of photos and videos that show foraging activities near or within the cactus patches were about the same for both locations (Figure 4.1). Foraging activities include the act of searching for food, feeding on surrounding plants, and feeding on cactus parts. The frequency of foraging activities by wild turkey between the sites at DeL and WB also had similar numbers (Figure 4.1). Camera #4 at WB recorded the most foraging activities (Table 4.1). This site also had the highest fruit density (Table 4.1). Camera #1 at WB recorded the least foraging activities, and this site had the highest pad density (Table 4.1). Out of the 4 sites, those with higher total fruit density (camera # 3 and 4) had more frequent foraging activities (Table 4.1). Between frequency of foraging activities and red fruit density, the relationship was significantly positive (Spearman's, $r_s = 0.432$, $n = 28$, $p = 0.022$).

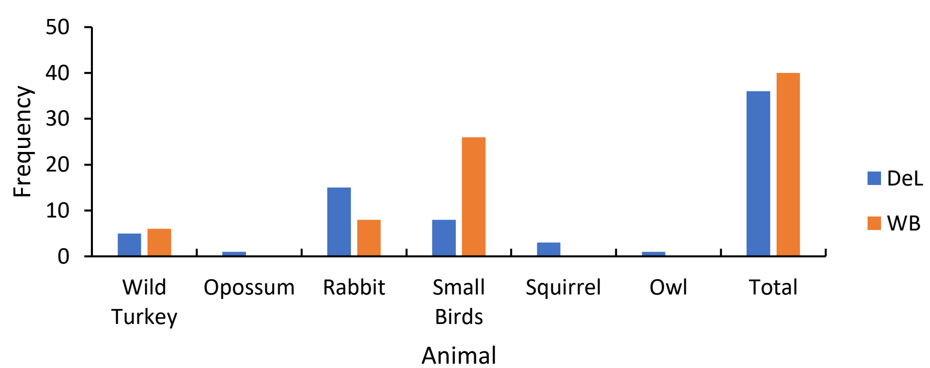

Figure 4.1. Foraging activities frequency of various mammals and birds near or within cactus patches at the two main habitat of *O. cespitosa* from August to October 2020. WB represents West Beach and DeL represents DeLaurier Homestead.

Table 4.1. Summary of cactus density variables and frequency of foraging activities from all species near or within the patches of *O. cespitosa* at each camera site from August 12 to October 18, 2020.

Cam #	Habitat	Pad #	Total Area (m^2)	Pad Density (pad/m^2)	Average Fruit Count	Fruit Density (fruit/m^2)	Frequency of Foraging Activities
1	WB	764	6.54	116.78	172.64	26.39	11
2	DeL	688	8.48	81.11	99.09	11.68	12
3	DeL	156	1.95	80.09	151.82	77.94	24
4	WB	250	2.83	88.42	294.64	104.21	29

All species that were recorded near or inside a cactus patch are given in Figure 4.2. Small birds appeared the most at all study sites, followed by the Eastern Cottontail Rabbit (*Sylvilagus floridanus*) and the wild turkey (Figure 4.2). Small birds included the Blue Jay (*Cyanocitta cristata*), Northern Flicker (*Colaptes auratus*), Mourning Dove (*Zenaida macroura*), vireos (Vireonidae), sparrows (Passeridae), warblers (Parulidae), and other songbirds. Out of all the photos and videos that show animals being near or inside a cactus patch (219 photos and videos), about half (126 photos and videos) exhibited foraging activities. Most photos were of small birds foraging, followed by rabbits, and the wild turkey (Figure 4.3). Small birds, rabbits, wild turkeys, and the occasional deer, minks, and opossum were the only species that were recorded inside a cactus patch.

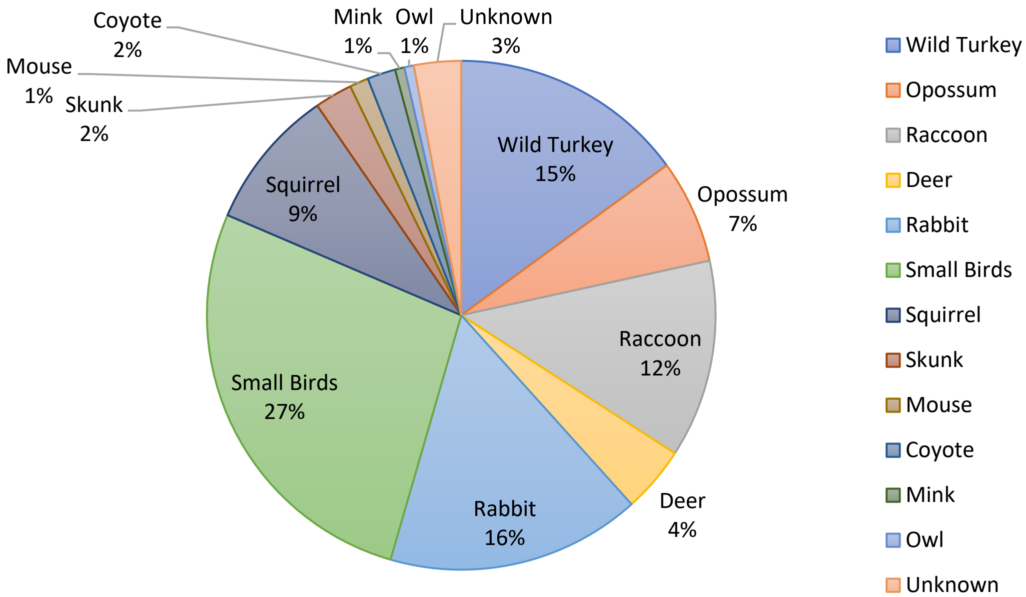

Figure 4.2. Relative frequencies of animal visits recorded by trail camera near or within an *O. cespitosa* patch at Point Pelee National Park between August to October 2020. Relative frequencies of animal visits near or within an *O. cespitosa* patch are based on a total of 167 photos and videos. Relative frequencies are rounded to the nearest whole percentage.

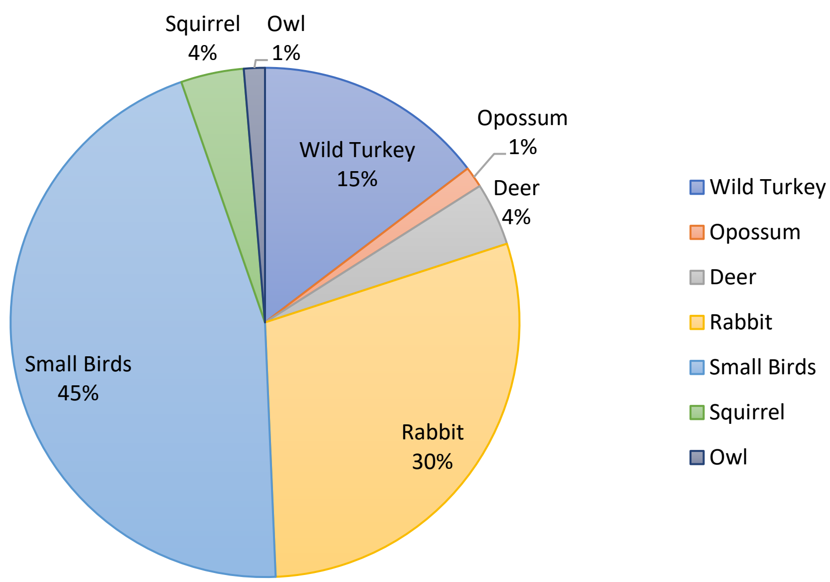

Figure 4.3. Relative frequencies of animals foraging at the edge or within an *O. cespitosa* patch at Point Pelee National Park between August to October 2020. Relative frequencies of animals foraging near or within an *O. cespitosa* patch are based on a total of 76 photos and videos.

Foraging turkeys were often seen in groups of up to 8 individuals, mainly poults (young turkeys) and at least one adult (Figure 4.4). On average, wild turkeys were in the largest groups per visit, followed by small birds and deer (Table 4.2).

Figure 4.4. Hen and poults resting in an open area along the West Beach trail. Photo taken on August 2020.

Table 4.2. Average count of animals per visit that exhibited foraging behaviours near or within the cactus patches at Point Pelee National Park in 2020.

Species	Total Count	Total Visit	Average Count per Visit
Wild Turkey	44	11	4.00
Opossum	1	1	1.00
Deer	4	3	1.33
Rabbit	24	24	1.00
Small Birds	72	34	2.12
Squirrel	3	3	1.00
Owl	1	1	1.00

The trail cameras captured foraging activities on the fruits of *O. cespitosa* by wild turkeys, rabbits, and small birds. Recordings included a video of two young wild turkeys pecking on the fruits inside a cactus patch while their feet were crushing fruits and pads as they walked through the patch (Figure 4.5). Rabbits had also been recorded feeding on cactus pads and flowers on a few occasions (Figure 4.6). Foraging activities increased after August, especially by small birds (Figure 4.7). Foraging activities also increased as temperature decreased (Figure 4.7).

Figure 4.5. Photo taken of wild turkeys foraging within and around the *Opuntia cespitosa* patch at a DeLaurier Homestead site at Point Pelee National Park.

Figure 4.6. Photo taken of an Eastern Cottontail Rabbit foraging within and around the *Opuntia cespitosa* patch at a DeLaurier Homestead site at Point Pelee National Park.

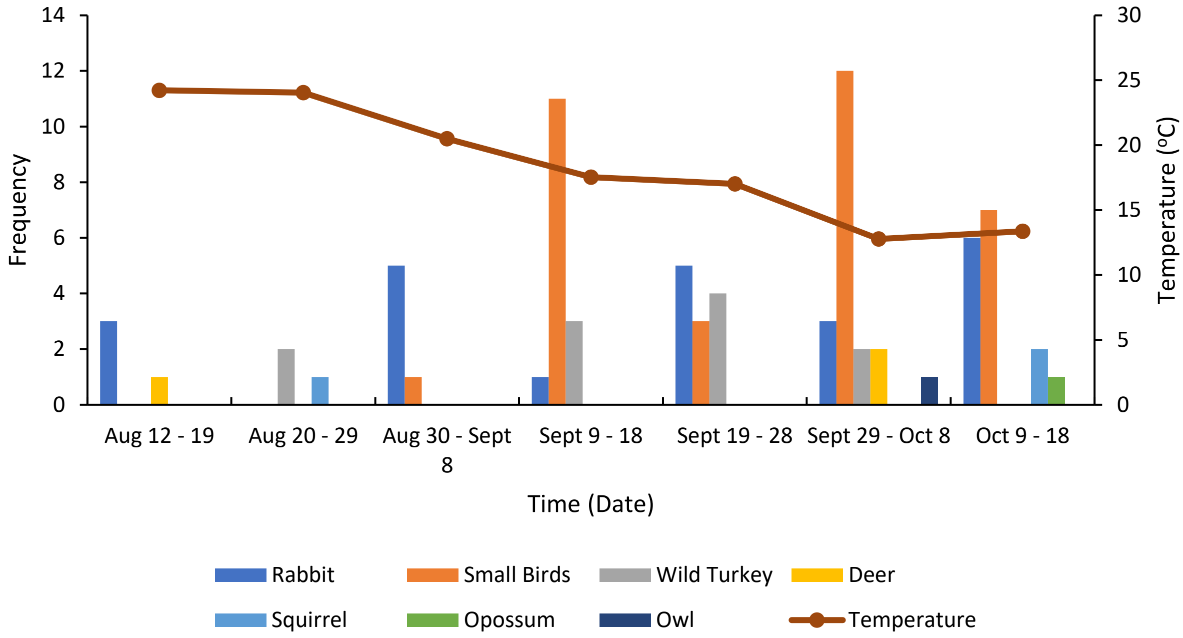

Figure 4.7. Frequency of foraging activity near or within the cactus patches over time at Point Pelee National Park in 2020. Temperature data retrieved from Environment Canada, climate ID# 6134190.

Other species such as squirrels, opossum, and raccoons, mostly travelled past the cactus patches. About 70% of the squirrel photos and videos show the animals with an eastern black walnut fruit in its mouth as it runs through the study sites (Figure 4.8). On a few occasions in the fall, squirrels were recorded by the trail cameras digging at the edge of the cactus patches (Table 4.3). Other animal behaviours that occurred at the study sites include resting and observing (Table 4.3). Observing is a behaviour where an animal stays in one place and looks around the area.

Figure 4.8. Photo taken of a squirrel with an eastern black walnut fruit in its mouth running through a West Beach site at Point Pelee National Park.

Table 4.3. Summary of all photos and videos taken by the 4 trail cameras from August 12 to October 18, 2020. Photos and videos that recorded animal(s) at the edge or within a cactus patch and their exhibited behaviours are summarized. Data in highlighted column are important for assessing impact on *Opuntia cespitosa*.

		Relative location is inside or at the edge of cactus patch					
Species	**All**	**Total In/Edge**	**Foraging**	**Travelling**	**Resting**	**Digging**	**Observing**
Total	782	167	76	74	7	3	7
Wild Turkey	61	25	11	10	3	0	1
Opossum	52	11	1	10	0	0	0
Raccoon	102	21	0	20	0	0	1
Deer	30	7	3	4	0	0	0
Rabbit	161	27	23	4	0	0	0
Small Birds	152	45	34	6	4	0	1
Squirrel	168	15	3	7	0	3	2
Skunk	12	4	0	3	0	0	1
Ermine	4	0	0	0	0	0	0
Mouse	14	2	0	2	0	0	0
Coyote	5	3	0	2	0	0	1
Mink	1	1	0	1	0	0	0
Owl	3	1	1	0	0	0	0
Unknown	17	5	0	5	0	0	0

4.2 Assessing the relationship between the location of wild turkeys and fingerlings

We found a total of 149 wild turkey scats and 128 fingerlings in 38 sites in October 2020. Based on the comparison map, there appears to be an association between the presence of wild turkey scats and fingerlings. There was a weak and positive relationship between the number of fingerlings and scats, but it was not statistically significantly (Spearman's, $r_s = 0.268$, $n = 38$, $p = 0.103$).

On average, fewer scats were found in WB compared to DeL and isolated sites in the forest (FoT) (Table 4.4). However, most scats found at FoT were located at one site (Table 4.4). DeL had the site with the largest number of scats which also had the highest ratio of consumed fruits to total fruits (12.3%) (Table 4.4). The average number of fingerlings found in DeL was higher compared to the other habitats (Table 4.4). Interestingly, the site with the most fingerlings at DeL had the biggest patch area (11.01 m^2) and was the only shaded site. There was no statistical difference in the number of scats between the different types of habitats (Kruskal-Wallis, $H(2) = 2.879$, $p = 0.237$), and no statistical difference in the number of fingerlings between the habitats (Kruskal-Wallis, $H(2) = 1.031$, $p = 0.597$).

Table 4.4. Summary of wild turkey scats and fingerlings found at 3 types of habitat during October 2020.

Habitat	Number of Sites	Total Scats	Max # Scat at a Site	Average # Scat per Site	Total Fingerlings	Max # Fingerlings at a Site	Average # Fingerling per Site
DeL	18	95	29	5.28	77	20	4.28
WB	16	32	4	2.00	42	6	2.63
FoT	4	22	19	5.50	9	6	2.25

4.3 Analysis of fingerling data

Out of 128 fingerlings found, only 111 were accessible and could be measured safely without harming or damaging them. Most of the fingerlings were located inside cactus patches (Table

4.5). The average height (mm) of fingerlings found within cactus patches was slightly taller than those found outside of cactus patches (Table 4.5). However, after transformation (log), the height of fingerlings within cactus patches (*M* = 25.02 mm; *SD* = 1.66 mm) was not significantly different from those outside of cactus patches (*M* = 21.30 mm; *SD* = 1.67 mm) (*t*-test, $t = 1.480$, $n = 111$, $p = 0.142$).

Table 4.5. Summary of fingerlings found inside and outside of cactus patches at 38 sites during October 2020. Distance variables represent how far the nearest cactus patch is from a fingerling.

Relative Location	Count	Average Height (mm)	Average Diameter (mm)	Minimum Distance (cm)	Average Distance (cm)	Maximum Distance (cm)
Inside	81	28.39	6.06	0	0	0
Outside	30	24.26	5.99	1	51.94	300

The average diameter (mm) of fingerlings within cactus patches was similar to those found outside of cactus patches (Table 4.5). After transformation (log), the diameter of fingerlings within cactus patches (*M* = 5.62 mm; *SD* = 1.48 mm) was not significantly different from those outside of cactus patches (*M* = 5.76 mm; *SD* = 1.33 mm) (*t*-test, $t = -0.297$, $n = 111$, $p = 0.767$).

Table 4.6 shows the correlation between fingerling measures. Height (mm) and distance (cm) to the nearest cactus patch were not significantly related (Pearson, $r = 0.298$, $n = 30$, $p = 0.110$), nor were fingerling diameter (mm) and distance (cm) to the nearest cactus patch (Pearson, $r = 0.193$, $n = 30$, $p = 0.308$).

Table 4.6. Pearson correlation coefficients (*r*) between log-transformed variables from the fingerling dataset. Only fingerlings found outside of a cactus patch were included in the analysis ($n = 30$).

Variables	Height	Diameter
Diameter	0.497**	
Distance	0.298	0.193

*: $p < 0.05$, **: $p < 0.001$

4.4 Wild turkey scats in lab

A total of 158 wild turkey scats were sampled at PPNP. Twenty-eight scats were sampled from 4 sites on August 5-6, 2020, and 130 scats were sampled from 38 sites on October 12-18, 2020. All wild turkey scats were found outside of a cactus patch. Grass/grain was the primary component found in most wild turkey scats collected during the summer and fall (Figure 4.9).

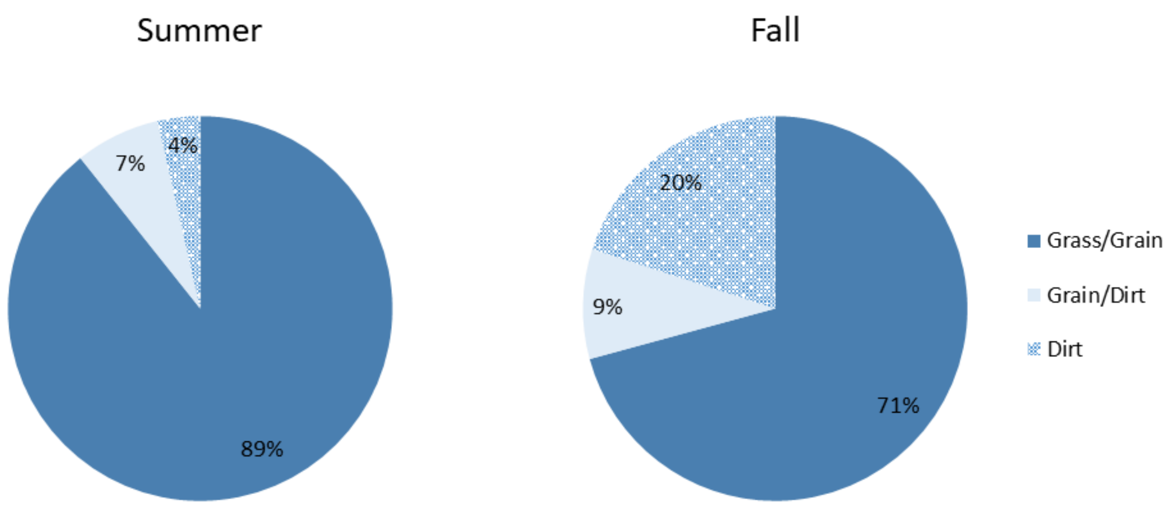

Figure 4.9. Primary components of wild turkey scats collected on August 5-6 and October 12-18, 2020.

The dried wild turkey scats weighed between 0.08 to 4.64 g. Eighty-two of the wild turkey scats were from males, 61 of them were from females, and 15 of the scats were broken pieces. Female wild turkey scats (1.33 ± 0.11 g) were heavier than the male (0.66 ± 0.06 g) and broken group (0.44 ± 0.12 g) on average. There was a statistically significant difference in the weight of the wild turkey scats between the different sexes (Kruskal-Wallis, $H(2) = 43.208$, $p < 0.001$), with a mean rank weight of 108.34 for female, 65.21 for male, and 40.37 for broken. Pairwise comparisons using Dunn's test indicated that the weight of female scats were significantly different from male scats ($p < 0.001$) and broken scats ($p < 0.001$).

The presence of seeds or foreign objects is 83.6% of the sampled pieces in female wild turkey scats and 61.0% in the male group. There was a statistically significant association between sexes and the presence of seeds or foreign objects in wild turkey scats (Pearson's Chi-Square, $\chi^2(1, n = 143) = 8.636$, $p = 0.003$). However, the strength of the association was weak (Cramer's *V*, $V = 0.246$, $n = 143$, $p = 0.003$). Specifically, female wild turkeys consumed more seeds and foreign objects compared to males.

Very few to no cactus seeds were found in both the summer and fall samples (Table 4.7). Only one female wild turkey scat in the fall contained cactus seeds, which was the third heaviest scat with a weight of 3.19 g. Given that only 2 cactus seeds were found, there is not enough evidence to assess whether the summer and fall samples are significantly different. The average number of seeds from other plants consumed by wild turkeys during the fall was significantly higher than the summer (Mann-Whitney, $U = 1366$, $n_1 = 28$, $n_2 = 130$, $p = 0.024$). Lastly, foreign objects consumed by wild turkeys during the fall was significantly lower than the summer (Mann-Whitney, $U = 1375$, $n_1 = 28$, $n_2 = 130$, $p = 0.029$). Foreign objects (anything that is not a seed) consumed by wild turkeys included pebbles, minerals, insect wings, animal scales, and small bones.

Table 4.7. Summary of seeds and other materials found in 158 wild turkey scats in August and October 2020.

Season	Sample Size	# of Scats with Cactus Seed(s)	Total # of Cactus Seed(s)	Average # of Seeds from Other Plants per Scat	Average # of Foreign Object(s) per Scat
Summer	28	0	0	2.04	2.79
Fall	130	1	2	4.53	1.98

4.5 Analysis on cactus fruit and pattern of consumption

We tracked the number of cactus fruits that turned red, and were consumed (Figure 4.10), from August to October 2020 at the 4 sites that had trail cameras. There were very few ripe red fruits in August (Figure 4.11). The proportion of fruits that ripened increased very quickly at two of the trail camera sites (CAM #1 and CAM #4), both located at WB during September and October (Figure 4.11). The proportion of red fruits in DeL did not substantially increase until October (Figure 4.11). No fruits were consumed at any of the sites until October, where 4, 0, 19, and 3 fruits were consumed at CAM #1 to CAM #4, respectively. Most of the fruit feeding evidence in October was observed when the proportion of red cactus fruits was higher than 65%.

Figure 4.10. Photo of consumed cactus fruit with seeds still exposed. Photo taken during October 2020.

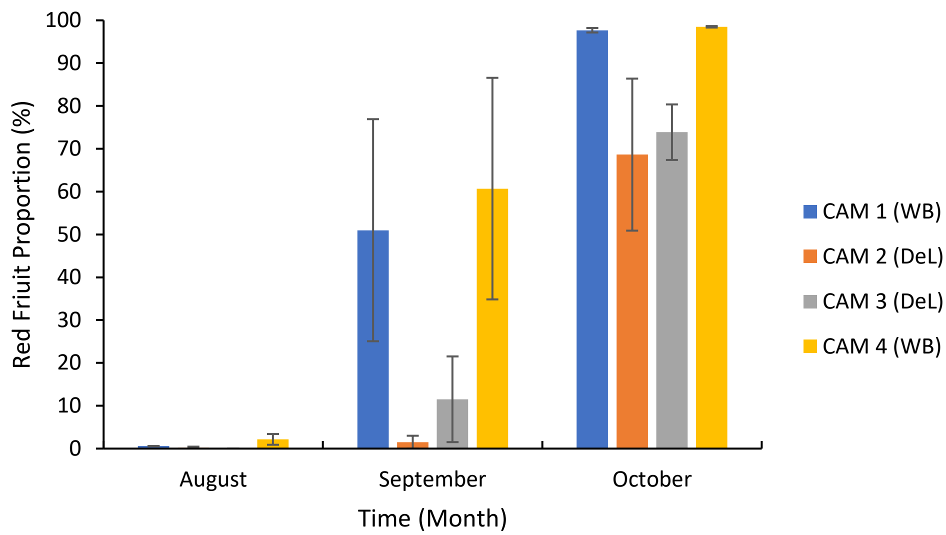

Figure 4.11. Average percentage of red cactus fruits ± SE per site with a trail camera from August to October 2020.

Table 4.8 shows the results from the Pearson correlation between the number of turkey scats and the fruit distribution variables. The number of turkey scats was not statistically related to any fruit distribution variables (Table 4.8). There was a significant correlation between the number of red fruits and total fruit count (Pearson, r = 0.996, n =32, p < 0.001), and between the red fruit density and total fruit density (Pearson, r = 0.997, n = 32, p < 0.001).

Table 4.8. Pearson correlation coefficients (r) between square root and log-transformed variables from the fall_site dataset. Scat count was the only variable transformed with log. Only sites that contained at least one cactus patch were included (n = 32).

Variables	# Red Fruits	Total Fruits	Red Fruit Density	Total Fruit Density
Total Fruits	0.996**			
Red Fruit Density	0.586**	0.558**		
Total Fruit Density	0.573**	0.551**	0.997**	
# Turkey Scats	0.148	0.164	0.123	0.145

*: p < 0.05, **: $p \leq$ 0.001

Table 4.9 shows the results from the Spearman's rank correlation test. There were positive correlations between the number of fruits consumed and all fruit distribution variables (Table 4.9), but there was no significant relationship between the number of fruits consumed and the number of wild turkey scats (Spearman's, $r_s = 0.122$, $n = 32$, $p = 0.506$).

Table 4.9. Spearman's rank correlation between number of scats, number of fruits consumed and environmental variables from the fall_site dataset. Only sites that contained at least one cactus patch were included ($n = 32$).

Variables	# Red Fruits	Total Fruits	Red Fruit Density	Total Fruit Density	# Turkey Scats
Total Fruits	0.996**				
Red Fruit Density	0.557**	0.534*			
Total Fruit Density	0.553**	0.530*	0.995**		
# Turkey Scats	0.146	0.149	0.063	0.092	
Total Eaten	0.486*	0.485*	0.492*	0.485*	0.122

*: $p < 0.05$, **: $p \leq 0.001$

The total number of consumed fruits counted during each visit were compared with the digital photos taken between the visits to determine the potential consumers of *O. cespitosa* fruits (Table 4.10). Several passerines such as the Blue Jay fed at the edge or within the cactus patches (Table 4.10). Rabbits were the second most frequent animal displaying feeding behaviour at the edge of the cactus patches (Table 4.10). Other animals such as deer and squirrels were also recorded near the cactus patches during the periods when fruits were consumed, but they appeared to be foraging for other food or just passing by the site instead (Table 4.10). It is noteworthy that no wild turkeys were recorded near the cactus patches during the periods when fruits were consumed.

Table 4.10. Potential consumers of *O. cespitosa* fruits based on the number of fruits consumed and digital evidence collected at each site that had a trail camera in 2020. The column "Additional Fruit Eaten" represents the count of additional fruits eaten since the previous trail camera site visit.

Recording Time Period	Cam #	Additional Fruit Eaten	Potential Consumer(s)	Observation Notes
Sept 23 - Oct 4, 2020	1	4	Wren or White-Crowned Sparrows	Oct 3 - Up to 5 sparrows/wrens foraged around the edge including the left patch where consumed fruits were counted. 1 of them went right in between the middle and right patch to forage.
Oct 3 - 12, 2020	3	9	Sparrow or Warbler	Oct 3 - Had black stripes on its head. 2 of the 9 birds were foraging at the edge of the cactus patch.
			Vireo or Warbler	Oct 8 - Foraging at the edge of cactus patch; hard to determine species on video.
			Rabbit	Oct 8 - Foraging at the edge of cactus patch.
			Deer	Oct 8 - Foraging at edge of cactus patch but on other plant species.
	4	1	Northern Flicker	Oct 4 - At edge of cactus patch; could be feeding on grass/other plants/bugs/cactus fruits/pads.
			Blue Jay	Oct 5 - Was in the cactus patch foraging for 1 second before flying away. No visible fruits missing according to digital evidence.
			Rabbit	Oct 8 - Feeding on grass/other plants/cactus fruit/pad at the edge before hopping away.
			Sparrow	Oct 12 - Most likely a sparrow but not 100% certain. 1 of the 2 birds pecked into the edge of the cactus patch.
Oct 12 - 14, 2020	3	10	Squirrel	Oct 13 - Sniffing the area near the cactus patch; may be looking for food or a spot to dig.
			Blue Jay	Oct 13 - Foraging in area but not near the cactus patch.
			Rabbit	Oct 14 - May have fed on cactus fruits at the edge of the cactus patch.
Oct 14 - 18, 2020	4	2		No foraging activities recorded. However, there was a meadow jumping mouse travelling near the cactus patch and a squirrel digging near the cactus patch.

4.6 Physical status of cactus seeds consumed by Wild Turkey

We found a total of two *O. cespitosa* seeds in the wild turkey scat samples (Table 4.7). The wild turkey scat containing the seeds was found in a savannah habitat at DeL, where most wild turkey scats were collected. The seeds consumed by wild turkeys were mature but visibly smaller than seeds retrieved from the fruits (Figure 4.12).

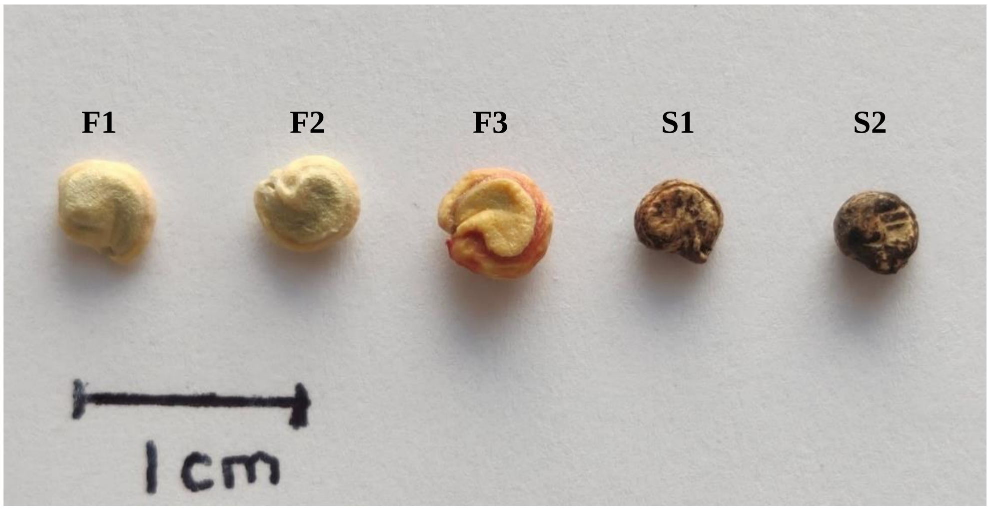

Figure 4.12. *Opuntia cespitosa* seeds. The three seeds on the left were directly retrieved from the fruits provided by Dr. Taly Drezner in August (F1 and F2) and October (F3) 2020. The two seeds on the right (S1 and S2) were retrieved from a wild turkey scat collected at Point Pelee National Park in October 2020.

Table 4.11 details the differences among the seeds from fruits harvested in the summer, fall, and found in wild turkey scats. There were 27 and 29 seeds in the two summer fruits and 10 seeds in the fall fruit obtained from Dr. Taly Drezner. On average, the seeds from the fall fruit had the largest measurements, both in terms of diameter (mm) and thickness (mm). Both consumed seeds were significantly smaller in diameter (mm) compared to the average diameters of summer and fall fruit seeds. The thickness (mm) of summer fruits' seeds and those found in the wild turkey scats were similar, with a small difference ranging from 0.03 to 0.17 mm (Table 4.11). However, the thicknesses of consumed seeds were not as evenly distributed as the seeds from the fruits based on visual observation.

Table 4.11. Physical features of cactus seeds from fruits provided by Dr. Taly Drezner and wild turkey scats collected from the Park. "F" represents fruit and "S" represents scat.

ID#	Source	Season	Total Seeds	Average Largest Diameter (mm)	Average Smallest Diameter (mm)	Average Diameter (mm)	Thickness (mm)	Shape	Color	Texture
F1	Fruit	Summer	27	4.37	3.89	4.13	2.23	Comma	Ivory and Translucent	Smooth
F2	Fruit	Summer	29	4.54	4.05	4.29	2.28	Comma	Ivory and Translucent	Smooth
F3	Fruit	Fall	10	5.22	4.84	5.03	2.69	Comma	Light Tan with Red-Pink Edges and Translucent	Smooth
S1	Scat	Fall	1	3.90	3.50	3.70	2.20	Comma	Light Tan with Dark Brown Spots and Opaque	Scarified; contains crevices and scars
S2	Scat	Fall	1	3.80	3.50	3.65	2.40	Comma	Light Tan with Dark Brown Spots and Opaque	Scarified; contains crevices and scars

Consumed seeds also have a different coloration and rougher surface comprising a thinner edge, more crevices, and scars (Figure 4.12). There was a distinct variation in the color of the seeds based on the sample origin. The seeds from the summer fruits had an ivory color and were translucent (Table 4.11). While the fall fruit's seeds were also translucent, they had a light tan color with red-pink edges (Table 4.11). The base color of the seeds found in the scat was light tan, similar to those found in the fall fruit; however, they were stained with dark brown spots and were opaque (Table 4.11).

One similarity between all the seeds was their shape. Despite being consumed, the seeds found in the wild turkey scat maintained the same comma shape as the fruit seeds (Figure 4.12).

Chapter 5: Discussion

5.1 Relationship between Wild Turkey and the Eastern Prickly Pear Cactus

5.1.1 Foraging behaviour and scat composition

Based on the evidence from the trail cameras and the wild turkey scat samples, the wild turkey does not appear to be feeding regularly on the fruits of *Opuntia cespitosa*. Although wild turkey is the third most likely animal to be found in the vicinity of a cactus patch and foraging in the area, there were few photos and videos that explicitly recorded the wild turkeys feeding on cactus fruit(s). Furthermore, none of the wild turkey scats from the summer sample contained seeds of *O. cespitosa* and only one scat from the fall sample contained mature seeds of *O. cespitosa* out of a total of 158 scats. The wild turkeys may not be actively feeding on cactus fruits during the summer and fall because there is an abundance of other plants and resources available, as is evidenced by the traces of plant and insect materials found in their scat. In Oregon and Washington, wild turkeys consumed significantly more fruits during the fall and winter, and more leaves and flowers during the spring (Evans-Peters 2013). About 70% of the samples at PPNP were primarily made up of vegetable matter such as grass, which were mixed with seeds from a variety of plants, a few insect wings, small bones, minerals, and pebbles. In West Virginia, wild turkey diets are primarily grass, beechnut, and dogwood during the fall; however, their diet changes throughout the year (Glover and Bailey 1949). In Missouri, wild turkeys prefer acorns from oak trees during the fall and winter season (Dalke et al. 1942). At PPNP, we found that there was a significant increase in seeds from a variety of plants in wild turkey scats while the number of foreign objects decreased during the fall compared to the summer, based on the Mann-Whitney *U* test results. Foreign objects such as pebbles are consumed by birds to aid grinding in the gizzard, an organ in their digestive tract that mechanically breaks down food (Svihus 2011). Cactus seeds consumed in the fall may also aid grinding in the gizzard, which could result in a mutualistic relationship if the dispersal or germination of the seeds were enhanced by the wild turkey. Peres and van Roosmalen (1996) found that hard-coated seeds of *Ormosia lignivalvis* (Amazonian legume tree) consumed by large-bodied terrestrial birds could aid in the mechanical breakdown of softer seeds, while benefiting from the abrasive gut treatment that enhances their germination. The diet of wild turkeys appears to be very dependent on seasonal availability of food and their geographic location. Analyzing wild turkey scats during the winter and early spring when food is more scarce at PPNP, would provide more insight into their role as cactus seed dispersers.

One factor that may have influenced the number of cactus seeds found is scat collection timing. Most of the sites we visited in October did not have evidence of fruit consumption unless an average of at least 65% of the fruits were red. At the sites with cameras, most fruits did not start ripening until late September and evidence of fruit consumption did not appear until October. We also found that the number of turkey scats collected, which indicate the presence of wild turkeys, was not significantly related to the number of ripe fruits or fruit density in October. Wild turkeys have a flexible gastrointestinal tract size that can change to adapt to the quantity and quality of food they consume (Klasing 2005; Svihus 2011). Their gizzard is smallest during the summer, and biggest and most muscular during the winter when their diet contains more woody and hard material that require more grinding activities (Korschgen 1967; Svihus 2011). As a result, the consumption of cactus fruits might not have been widespread among wild turkeys at the time of scat collection.

There is a significant association between sex and presence of seeds or foreign objects based on the Pearson’s Chi-Square test. However, the strength of their association was weak according to the Cramer's *V* test. Based on the Kruskal-Wallis test, female scats were significantly heavier than male scats and the only cactus seeds we found were from a hen. The difference in physiology and metabolism between hens and gobblers may influence their dietary preferences. For example, male ring doves suffer a greater decrease in metabolism with a 10°C increase of air temperature than females (Riddle et al. 1930).

It is possible that the wild turkeys at PPNP lack the experience to include cactus fruits in their diet (Stoddard 1941; Glover and Bailey 1949). Wild turkeys have been observed ignoring food they can eat but did not recognize, even when starving (Glover and Bailey 1949). If wild turkeys were important dispersers of *O. cespitosa* before they were extirpated in 1907 (Alison 1976), the population of wild turkeys that was re-introduced to Southern Ontario in 1984 (Nguyen et al. 2004; Weaver 1989) may not have the ability to recognize the cactus fruit as food.

5.1.2 Scarification effects

Viability of the cactus seeds retrieved from wild turkey scats was not assessed due to a low sample size. The physical appearance of the few seeds retrieved from the wild turkey scat were very different from those that were directly retrieved from *O. cespitosa* fruits, which may have an impact on seed viability and germination response. Besides the shape of the seeds, there were differences in colour, diameter (mm), thickness (mm) and texture between those retrieved from fruits and those from scats. The change in texture of consumed seeds is likely due to scarification (Nogales et al. 2005) and may be an indication of enhanced germination rate. Traveset et al. (2001) found that bird-consumed seeds of *Osyris* spp. and *Asparagus* spp. with more modified coat structures germinated faster and had a higher germination success rate. However, the opposite effect occurred for 3 other species (*Rubus*, *Rubia*, and *Phillyrea*) in their study, where passage through a bird's digestive system reduced the germination rate (Traveset et al. 2001).

Evans-Peters (2013) found that 41% of the 22 seed taxa they retrieved from wild turkey scats were viable, with the pea family (Fabaceae) having the highest viability (70%), followed by poison oak-ivy (*Toxicodendron* sp., 24.5%). However, this only represented 14.5% of their dietary seed taxa. Although we are uncertain how the germination rate and germinability of *O. cespitosa* seeds are impacted after digestion by wild turkeys, meta-analysis results suggest that the overall germination response of bird-digested seeds is positive (Traveset and Verdú 2001).

Although seed coat thickness was not measured, we visually observed that consumed seeds had thinner coats than their unconsumed counterparts. Changes to the seed coat thickness and texture were most likely from mechanical digestion in wild turkey gizzards (Klasing 2005). Scarification can impact the germination response, positively or negatively. Thinner seed coats contribute to faster germination rates for two fleshy-fruited plants, *Phillyrea angustifolia* and *Myrtus communis*, after ingestion by Eurasian Blackbirds, *Turdus merula* (Traveset et al. 2008). The germination rate of *Opuntia dilleni* increased after ingestion by lizards, possibly due to greater scarification (Valido and Nogales 2003; Padrón et al. 2011). However, both the germination response and seed coat thickness of *O. dilleni* and other *Opuntia* species varied greatly depending on the animal whose digestive system they passed through (Padrón et al. 2011). For example, *O. maxima* seeds ingested by tortoises and pine martens had thinner seed coats compared to control seeds, but this resulted in reduced seed viability rather than enhanced germination (Padrón et al. 2011). A bigger sample of *O. cespitosa* seeds ingested by wild turkeys at PPNP will be required to assess if changes to its coat thickness would result in a positive or negative germination response.

5.1.3 Distribution of scats and fingerlings

The hypothesis that there is a relationship between location of scats and fingerlings is rejected based on the Spearman's rank correlation test. The positive association was not statistically significant. There was also no difference in the number of turkey scats between the different habitats based on the Kruskal-Wallis test, which indicated wild turkeys did not favor any of the habitats over the others during the fall. However, this result was affected by the forest habitat only having 4 sites while Del and WB contained 18 and 16 sites respectively. Collectively, 95 scats were located at Del whereas only 32 scats were found in WB. These results could have been affected by whether wild turkeys were brooding. Early successional plant communities such as savannahs are often preferred by brooding turkeys to protect their poult from predation (Blackburn et al. 1975; Porter 1980). Open field habitats also provide more insects and plants preferred by young poults (Blackburn et al. 1975; Hurst and Stringer 1975). Alternatively, wild turkeys that are not brooding prefer forested habitats over open fields (Wright et al. 1996). Additionally, each site was only sampled once during October, with only 4 of the 38 sites having been sampled in August as well. Sampling should be repeated monthly at each site for a longer period to determine if there is a relationship between the number of fingerlings and the presence of wild turkeys as indicated by the scats. Regardless, wild turkeys may be effective seed dispersers given that many of their scats were found in suitable *O. cespitosa* habitats, some of which contained numerous fingerlings.

Fingerling survival does not appear to be affected by the type of habitat. According to the Kruskal-Wallis test, there was no difference in the number of fingerlings between the different habitats. Similarly, this result was affected by the number of sites at each type of habitat. The height and diameter of fingerlings were also not significantly affected by their relative location from the nearest cactus patch. Although most fingerlings were found inside cactus patches, and all wild turkey scats were found outside of cactus patches, the turkeys could have still contributed to the number of fingerlings inside the patches as they are one of the few species that can trek through them based on the video footage we captured.

Although wild turkeys were not actively dispersing cactus seeds, they may still have an important role in the survival of *O. cespitosa*, based on video recordings from the trail cameras. In several videos, groups or individual wild turkeys caused disturbances in areas suitable for *O. cespitosa* growth. Wild turkeys are known for causing disturbance via foraging behaviours while travelling as a group (Chips et al. 2014). By disturbing the area, wild turkeys could be removing *O. cespitosa* competitors, allowing them to adapt and thrive. *Opuntia cespitosa* are also early successional plants that tend to colonize disturbed sandy areas (Abella and Jaeger 2004). Furthermore, they are more likely to adapt to substrate disturbances rather than to anthropogenic solutions such as prescribed fire (VanDerWal et al. 2007a).

5.2 Relationship between other species and the Eastern Prickly Pear Cactus

The Eastern Cottontail Rabbit and many small to medium-sized bird species were recorded near or within cactus patches. Videos of rabbits foraging at the edge of patches coincided in time with the detection of consumed cactus fruits. The Eastern Cottontail Rabbit may be an effective seed disperser for *O. cespitosa* given that studies show the germination success of seeds retrieved from their pellets is high (Evans et al. 2005). However, the trail camera footage at the Park shows that they preferred feeding on cactus pads, the wilted flowers of the cactus, and the surrounding plants (e.g., grass), rather than fruits.

Small and medium-sized birds observed near the cactus patches such as Blue Jays, Northern Flickers, Mourning Doves, and other songbirds appear to be dispersing the seeds of *O. cespitosa* more frequently than other animal groups. In the videos, birds were more likely to stay for a longer period (> 1 minute) foraging for food at the edge of and within cactus patches compared to most other species. In addition, birds and wild turkeys may have been drawn to cactus patches because the spines can provide protection from predators (Hernandez et al. 2003).

Some bird species may have consumed cactus fruits at the sites during the monitoring period. For example, Blue Jays (Corvidae) foraged around the sites during some time periods when cactus fruits were consumed. Corvidae birds have been identified as important dispersers for the congeneric *Opuntia ficus-indica* (Dean and Milton 2000). In South African Karoo, *O. ficus-indica* were far more abundant below man-made structures, such as transmission poles and wired fences where crows commonly perched, roosted, and nested (Dean and Milton 2000). Given the frequent presence of Blue Jays around *O. cespitosa* sites in PPNP during the fall, they may have an active role in the seed dispersal of the cactus. Other passerines were also present at the sites, such as sparrows, warblers, wrens, and vireos. Future collection of scats from more species would be useful for establishing their role in *O. cespitosa* dispersal.

In addition, the consumption of cactus fruits did not start until October, when many migrating birds fly south for the winter through PPNP. All birds observed around *O. cespitosa* sites in October were migratory species which included Blue Jays, Northern Flickers, vireos, warblers, wrens, and sparrows. If migrating bird species are important seed dispersers of *O. cespitosa*, it could explain why its range is large in the United States, but its populations are small and infrequent despite suitable habitats existing between populations (Majure et al. 2017).

Carnivorous apex predators such as coyotes and owls may also be *O. cespitosa* seed dispersers. Both coyotes and owls were recorded near or within cactus patches. Carnivores, despite not feeding on cactus fruits, can contribute to seed dispersal. Felid carnivores such as cougars can potentially ingest and disseminate large number of seeds initially consumed by their prey (Sarasola et al. 2016). Sarasola et al. (2016) found an average of over 250 seeds per cougar scat and their germination potential was not significantly different than their prey. In addition to limiting herbivore populations and subsequent trophic cascades, apex predators such as coyotes and owls may play a role in large-scale ecosystem processes such as the colonization of new and unoccupied habitats by plants via seed dispersal (Nathan et al. 2008; Sarasola et al. 2016).

A casual observation of slugs feeding on the flesh of cactus fruits was made near the PPNP Visitor Centre but it is unclear whether they have a role in seed dispersal or seed viability. Slugs that consume seeds can have a positive effect on the germination speed of small-seeded plant species (Calvino-Cancela and Rubido-Bará 2012). However, the seed size of *O. cespitosa* are likely too large to be ingested by slugs but they can still cause chewing damage to the seed surface (Calvino-Cancela and Rubido-Bará 2012).

The number of Blue Jays and other small bird species visits increased during the fall, when wild turkey visits were fewer. Territorial behaviour could influence the frequency of visitation by wild turkeys or other species. Terrestrial birds that display territorial behaviour can play a role in limiting bird densities, especially during the spring and summer (Newton 1992). Interspecific territoriality can also account for differences in foraging behaviour (Murray Jr. 1971). Future studies could examine how animal-animal interactions may affect *O. cespitosa* dispersal.

5.3 Influence on cactus fruit consumption

Number of fruits, cactus pad density and other factors were analysed to determine if they influence the frequency of fruit consumption. Most factors, including pad density, did not have a statistically significant effect on the frequency of fruit consumption, except ripeness of cactus fruits at each site. There was a significant positive relationship between the frequency of fruit consumption and red fruit abundance. Fruits were only consumed when the majority were red and ripe, apparent either through a visual cue or through the reduction of glochids on the fruits (Barbera et al. 1995). We also observed glochids reducing as cactus fruits ripened at PPNP. Other *Opuntia* species exhibit rapid accumulation of sugar during the later stages of the ripening process (Lakshminarayana et al. 1979; Barbera et al. 1992; Kuti 1992; Barbera et al. 1995). If *O. cespitosa* fruits develop similarly, it would encourage animal consumption of their fruits later in the fall at PPNP.

Based on the Spearman’s correlation test, red fruit density was positively correlated to the number of fruits consumed at the sites in October 2020. At the trail camera sites, there was also a significant positive correlation between frequency of foraging activities and red fruit density based on the Spearman’s correlation test. Furthermore, the trail camera footage shows that sites with lower fruit density had fewer feeding activities. Other studies also indicate that the fruits of fleshy-fruited plants like *O. cespitosa* are more likely to be removed by frugivores as crop size or fruit abundance increases (e.g., Hampe 2008; Muñoz et al. 2017). For example, fruit removal by frugivores for 22 fleshy-fruited plant species in the Andes was positively associated with plant crop size (Muñoz et al. 2017). Coincidentally, our trail cameras observed an increase in migratory birds displaying foraging behaviours in October, such as Blue Jays and Northern Flickers. Migratory birds are especially dependent on fruit availability, as it can influence their migration success, pattern, and timing (Tattoni et al. 2019). In the northeast region of Italy, the peak capture of berry-eating birds coincides with the highest fruit availability during September and October (Tattoni et al. 2019). Migratory avian frugivores tend to select autumn stopover habitats that are fruit abundant during their migration journey (Sapir et al. 2004; Smith et al. 2015). For example, the presence of three species of *Sylvia* warblers and three Turdidae chats are positively correlated with fruit densities at the habitat scale (Sapir et al. 2004). However, the selection of stopover sites at the microhabitat scale may be influenced by other factors such as predation risk (Sapir et al. 2004). The findings from our research contributes to the strong body of literature that have demonstrated migratory avian frugivore dependency on high ripe fruit density.

It is uncertain whether wild turkeys were responsible for the number of consumed fruits because the recorded feeding activities at both DeL and WB were relatively low. Moreover, between September 23 and October 18, none of the foraging wild turkey footages coincided with the times when fruits were consumed at the trail camera sites. There was also no significant relationship between fruit density and the number of turkey scats found at the 38 sites. We can confirm that wild turkeys contributed to the total number of consumed fruits during the fall, but more long-term data are needed to determine the factors that influence their consumption of *O. cespitosa*.

5.4 Study limitations

One of the main limitations of this study was a lack of summer data due to COVID-19 restrictions on research in the Park. Originally, we wanted to start our fieldwork in mid-June when *O. cespitosa* begins to flower (Chiarot 1992), to collect more data on animal behaviour at cactus patches in the summer and the impact it may have on *O. cespitosa* seed dispersal.

We were limited by difficulty in locating scats resulting in a smaller sample size than we hoped for in the summer and fall. Searching for animal scats visually was especially difficult in areas that were heavily vegetated. The number of sites selected for scat collection was also limited due to insufficient knowledge about wild turkey foraging and nesting areas, as well as restricted access to certain areas of the Park.

Limited data storage space and detection capabilities of the Spypoint Force-Dark Ultra Compact Trail Camera was problematic as its memory would fill up quickly due to false detections caused by strong winds, physical movements of the camera, and insects.

We were also limited by the selection of trees where we could mount the trail cameras as trees were few in *O. cespitosa* habitats. Most trees that were close enough to the cactus patches and could provide a good view of the area for the trail cameras were relatively young. Three of our four trail cameras were secured to young trees (< 15 cm in diameter). Strong wind would sway the entire tree, resulting in false detection by the trail cameras. We also lost data when one of the trail camera's lenses was obstructed by a hanging branch with leaves after a strong windy night.

5.5 General conclusions

The findings in this study are essential for understanding the population dynamics of *O. cespitosa* and in elucidating its seed dispersal ecology. This study also contributes to knowledge gaps on *O. cespitosa* conservation. We conclude that wild turkeys do consume and disperse cactus fruits at PPNP, but the seeds are not a primary choice for the wild turkeys in their diet during the summer and fall. In addition, fruit consumption does not appear to start until fall, when a large proportion (> 65%) of fruits in a cactus patch have ripened and turned red. This also coincides with the time when many migrating birds stop at the Park during their southerly migration and other food sources such as herbaceous plants start to decline. This suggests that migrating birds could be important seed dispersers of *O. cespitosa*. Further studies are required to confirm whether wild turkeys may have other roles in facilitating the growth and seed dispersal of *O. cespitosa*, such as creating suitable substrates for the seeds via soil disturbances.

Studies on migrating birds and their winter ranges may also provide insights on *O. cespitosa* seed dispersal.

Several fingerlings were found inside and outside of cactus patches. It is unclear if the fingerlings will survive until their reproduction stage and influence the genetic variability of the *O. cespitosa* population, as no prior data exist on fingerlings that grow naturally in the Park. Research on fingerlings should be prioritized to determine survival and how they affect the genetic variability of the population.

This study on the relationship of wild turkey and other animals with *O. cespitosa* and its surrounding habitat can have important implications on the strategies used to manage and conserve this endangered species and other species that may contribute to its survival. More studies on the scats of other animals that occupy the same space as *O. cespitosa* can further contribute to our understanding of this endangered species and its relationships with dispersers.

References

Abeli T, Gentili R, Mondoni A, Orsenigo S, Rossi G. 2013. Effects of marginality on plant population performance. J Biogeogr. 41(2):239-249.

Abeli T, Vamosi JC, Orsenigo S. 2018. The importance of marginal population hotspots of cold-adapted species for research on climate change and conservation. J Biogeogr. 45(5):977-985.

Abella SR, Jaegar JF. 2004. Ecology of Eastern prickly pear cactus (*Opuntia humifusa*) in Oak Openings Preserve, northwestern Ohio. Mich Bot. 43:1-11.

Alison RM. 1976. The history of the wild turkey in Ontario. Can Field-Nat. 90:481-485.

Anthony NM, Ribic CA, Bautz R, Garland T. 2005. Comparative effectiveness of Longworth and Sherman live traps. Wildl Soc Bull. 33(3):1018-1026.

Bailey RW. 1956. Sex determination of adult wild turkeys by means of dropping configuration. J Wildl Manag. 20(2):220.

Bailey RW, Rinell KT. 1967. Management of the eastern wild turkey in the northern hardwoods. In: Hewitt OH, editor. The wild turkey and its management. Washington (DC): The Wildlife Society. p. 261-302.

BaMasoud A, Byrne ML. 2011. Analysis of shoreline changes (1959-2004) in Point Pelee National Park, Canada. J Coast Res. 27(5):839-846.

Barbera G, Carimi F, Inglese P, Panno M. 1992. Physical, morphological and chemical changes during fruit development and ripening in three culticars of prickly pear, *Opuntia ficus-indica* (L.) Miller. J Hortic Sci. 67(3):307-312.

Barbera M, Inglese P, Pimienta-Barrios E, editors. 1995. Agro-ecology, cultivation and uses of cactus pear. Rome (Italy): Food and Agriculture Organization of the United Nations.

Barlow C. 2001. Ghost stories from the ice age: some plants are haunted by large mammals from another era. Nat Hist. 110(7):62-67.

Baskin JM. and Baskin CC. Seed and seedling ecology of *Opuntia compressa* in Tennessee cedar glades. 1977. J Tenn Acad Sci. 52(4):118-122.

Benson L. 1982. The cacti of the United States and Canada. Stanford (CA): Stanford University Press.

Blackburn WE, Kirk JP, Kennamer JE. 1975. Availability and utilization of summer foods by eastern wild turkey broods in Lee County, Alabama. Proc Natl Wild Turk Symp. 3:86-89.

Blanco G, Bravo C, Pacifico EC, Chamaorro D, Speziale KL, Lambertucci SA, Hiraldo F, Tella JL. 2016. Internal seed dispersal by parrots: an overview of a neglected mutualism. PeerJ. 4:e1688.

Bobich EG, Nobel PS. 2001. Vegetative reproduction as related to biomechanics, morphology and anatomy of four cholla cactus species in the Sonaran Desert. Ann Bot. 87(4):485-493.

Booms TL, Fuller MR. 2003. Gyrfalcon diet in central west Greenland during the nesting period. Condor. 105(3):528–537.

Boucher-Lalonde V, Morin A, Currie DJ. 2012. How are tree species distributed in climatic space? A simple and general pattern. Global Ecol Biogeogr. 21(12):1157-1166.

Bowers J. 1996. More flowers or new cladodes? Environmental correlates and biological consequences of sexual reproduction in a Sonoran Desert prickly pear cactus, *Opuntia engelmannii*. Torrey Bot Soc. 123(1):34-40.

Bregman R. 1988. Forms of seed dispersal in Cactaceae. Acta Bot Neerl. 37(3):395-402.

Browne CL, Hecnar SJ. 2007. Species loss and shifting population structure of freshwater turtles despite habitat protection. Biol Conserv. 138:421-429.

Calvino-Cancela M, Rubido-Bará M. 2012. Effects of seed passage through slugs on germination. Plant Ecol. 213:663-673.

Canadian Museum of Nature. 2019. Specimen data provided by the Canadian Museum of Nature. Ottawa (ON): Canadian Museum of Nature; [accessed 2019 Dec 12]. http://nature.ca/collections-online.

Charco J, Venturas M, Gil L, Nanos N. 2017. Effective seed dispersal and decundity variation in a small and marginal population of *Pinus pinaster* Ait. growing in a harsh environment: implication of forest genetic resources. Forests. 8(9):312.

Chiarot R. 1992. Eastern Prickly Pear Cactus monitoring report 1992 at Point Pelee National Park. Located at Point Pelee National Park, Leamington, ON, Canada. p. 42.

Chip MJ, Magliocca MR, Hasson B, Carson WP. 2014. Quantifying deer and turkey leaf litter disturbances in the eastern deciduous forest: have nontrophic effects of consumers been overlooked? Can J For Res. 44:1128-1132.

Choi SB, Bae GS, Park KC, Jo IJ, Seo SH, Song K, Lee DS, Oh H, Kim YC, Kim JJ, et al. 2014. *Opuntia humifusa* ameliorated cerulein-induced acute pancreatitis. Pancreas. 43(1):118-127.

Coakley JP, Crowe AS, Huddart PA. 1998. Subsurface sediment profiles below Point Pelee: indicators of postglacial evolution in western Lake Erie. Can J Earth Sci. 35:88-99.

[COSEWIC] Committee on the Status of Endangered Wildlife in Canada. 2010. COSEWIC assessment and status report on the Eastern Prickly Pear Cactus *Opuntia humifusa* in

Canada. Ottawa (ON): Committee on the Status of Endangered Wildlife in Canada. p. x + 30. www.sararegistry.gc.ca/status/status_e.cfm.

Dalke PD, Clark WK, Korschgen LJ. 1942. Food habit trends of the wild turkey in Missouri as determined by dropping analysis. J Wildl Manag. 6(3):237-243.

Dean WRJ, Milton SJ. 2000. Directed dispersal of *Opuntia* species in the Karoo, South Africa: are crows the responsible agents? J Arid Environ. 45(4):305-314.

De Medeiros CM, Hernández-Lambraño RE, Ribeiro KAF, Agudo JAS. Living on the edge: do central and marginal populations of plants differ in habitat suitability? Plant Ecol. 219:1029-1043.

Dobbie T, McFadyen T, Zorn P, Keitel J, Carlson M. 2007. Point Pelee National Park of Canada: state of the park report 2006. Located at Point Pelee National Park, Leamington, ON, Canada. p. 51.

Dobbie T. 2021. Wild turkey observations and counts [unpublished document]. Located at Point Pelee National Park, Leamington, ON, Canada.

Dougan and Associates. 2007. Point Pelee National Park ecological land classification and plant species at risk mapping and status. Leamington (ON): Parks Canada. p. 109 + Appendices A–H + Maps.

Drake D, Bublitz C, Preisler M, Suckow J, Koele B. 2013. Wild turkey ecology and damage management. Madison (WI): University of Wisconsin-Extension Publication. Report No.: G3997-010.

Draper D, Rossello-Graell A, Garcia C, Tauleigne-Gomes C, Sergio C. 2003. Application of GIS in plant conservation programmes in Portugal. Biol Conserv. 113:337-349.

Drezner TD. 2017a. North and South: morphological variability in the endangered *Opuntia cespitosa* in Canada and variation with environmental conditions. Castanea. 82(1):8-23.

Drezner TD. 2017b. Shade, reproductive effort and growth of the endangered native cactus, *Opuntia humifusa* Raf. in Point Pelee National Park, Canada. Journey Torrey Bot Soc. 144(2):179-190.

Drezner TD. 2021. Vegetation associations of the endangered *Opuntia cespitosa* (Prickly Pear, Cactaceae) and microsite variation in Point Pelee National Park, Ontario, Canada. Phys Geogr. 42(2):126-142.

Dykstra CR, Meyer MW, Warnke DK. 2002. Bald Eagle reproductive performance following video camera placement. J Raptor Res. 36:136–139.

Dytham C. 2009. Evolved dispersal strategies at range margins. Proc R Soc B. 276:1407-1413.

Elbroch M, Marks E. 2001. Bird tracks and sign: a guide to North American species. Mechanicsburg (PA): Stackpole Books.

Evans BE, Mosby CE, Mortelliti A. 2019. Assessing arrays of multiple trail cameras to detect North American mammals. PLoS ONE. 14(6):e0217543.

Evans N, VanDerWal JJ, Lovett-Doust L. 2005. Population viability analysis of *Opuntia humifusa* at Point Pelee National Park. Located at Point Pelee National Park, Leamington, ON, Canada.

Evans-Peters ST. 2013. The ecology of wild turkey (*Meleagris gallopavo*) foraging in Pacific Northwest ecosystems [master's thesis]. Corvallis (OR): Oregon State University.

Fehlberg SD, Allen JM, Church K. 2013. A novel method of genomic DNA extraction for Cactaceae. Appl Plant Sci. 1(3):1200013.

Filazzola A, Westphal M, Powers M, Liczner AR, Woollett DA, Johnson B, Lortie CJ. 2017. Non-trophic interactions in deserts: facilitation, interference, and an endangered lizard species. Basic Appl Ecol. 20:51-61.

Fricke EC, Simon MJ, Reagan KM, Levey DJ, Riffell JA, Carlo TA, Tewksbury JJ. 2013. When condition trumps location: seed consumption by fruit-eating birds removes pathogens and predator attractants. Ecol Lett. 16:1031-1036.

Galán CO, Rodríquez-Pérez JR, Martínez Torres J, and García Nieto PJ. 2011. Analysis of the influence of forest environments on the accuracy of GPS measurements by using genetic algorithms. Math Comput Model. 54:1829-1834.

García-Cervigón AI, Żywiec M, Delibes M, Suárez-Esteban A, Perea R, Fedriani JM. 2018. Microsites of seed arrival: spatio-temporal variations in complex seed-disperser networks. Oikos. 127:1001-1013.

Gharib J, Smith A, Houser C. 2021. Barrier beaches and breaches: historical changes on the Point Pelee foreland. J Gt Lakes Res. 47(6):1554-1564.

Gibbs JP, Marquez C, Sterling EJ. 2008. The role of endangered species reintroduction in ecosystem restoration: tortoise-cactus interactions on Española Island, Galápagos. Restor Ecol. 16:88-93.

Glover FA, Bailey RW. 1949. Wild turkey foods in West Virginia. J Wildl Manag. 13(3):255-265.

Gomes VGN, Meiado MV, Quirino ZGM, Machado IC. 2016. Seed removal by lizards and effects of gut passage on germination in a columnar cactus of the Caatinga, a tropical dry forest in Brazil. J Arid Environ. 135:85-89.

Hampe A. 2008. Fruit tracking, frugivore satiation, and their consequences for seed dispersal. Oecologia. 156:137-145.

Hahm SW, Park J, Oh SY, Lee CW, Park KY, Kim H, Son YS. 2015. Anticancer properties of extracts from *Opuntia humifusa* against human cervical carcinoma cells. J Med Food. 18(1):31-44.

Harrison JT, Kochert MN, Pauli BP, Heath JA. 2019. Using motion-activated trail cameras to study diet and productivity of cliff-nesting Golden Eagles. J Raptor Res. 53(1):26-37.

Heegaard E, Vandvik V. 2004. Climate change affects the outcome of competitive interactions—an application of principal response curves. Oecologia. 139:459-466.

Hernandez F, Henke SE, Silvy NJ, Rollins D. 2003. The use of prickly pear cactus as nesting cover by northern bobwhites. J Wildl Manag. 67(2):417-423.

Hurst GA, Stringer BD Jr. 1975. Food habits of wild turkey poults in Mississippi. Proc Natl Wild Turk Symp. 3:76-85.

IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk (NY): IBM Corp.

Jaganathan GK, Yule K, Liu B. 2016. On the evolutionary and ecological value of breaking physical dormancy by endozoochory. Perspect Plant Ecol Evol Syst. 22:11-22.

Janzen D. 1986. Chihuahuan Desert nopaleras: defaunated big mammal vegetation. Annu Rev Ecol Syst. 17:595–636.

Janzen D, Martin PS. 1982. Neotropical anachronisms: the fruits the gomphoters ate. Science. 215:19–27.

Kawecki TJ. 2008. Adaptation to marginal habitats. Annu Rev Ecol Evol Syst. 39:321-342.

Keiter DA, Cunningham FL, Rhodes OE Jr, Irwin BJ, Beasley JC. 2016. Optimization of scat detection methods for a social ungulate, the wild pig, and experimental evaluation of factors affecting detection of scat. PLoS ONE. 11(5):e0155615.

Kevan PG, Boone JW, Aiello R, Taki H. 2004. Field and seed dispersal biology of Eastern Prickly Pear Cactus, *Opuntia humifusa*, in Point Pelee National Park: report for field seasons 2001, 2002 & 2003. Located at Point Pelee National Park, Leamington, ON, Canada.

Klasing KC. 2005. Poultry nutrition: A comparative approach. J Appl Poult Res. 14:426-436.

Klinkenberg B, Klinkenberg R. 1984. Status report on prickly pear cactus *Opuntia humifusa* (Raf.) Raf. a threatened species in Canada. Ottawa (ON): Committee on the Status of Endangered Wildlife in Canada. p. 37 + p. 6.

Koch KE, Kennedy RA. 1980. Effects of seasonal changes in the Midwest on Crassulacean Acid Metabolism (CAM) in *Opuntia humifusa* Raf. Oecologia. 45:390-395.

Korchgen LJ. 1967. Feeding habits and food. In: Hewitt OH, editor. The wild turkey and its management. Washington (DC): The Wildlife Society. p. 123-198.

Kraus D. 1991. Eastern prickly pear cactus management plan. Located at Point Pelee National Park, Leamington, ON, Canada.

Kuti JO. 1992. Growth and compositional changes during the development of prickly pear fruit. J Hortic Sci. 67:861-868.

Lakshminarayana S, Alvarado y Sosa L, Barrientos-Pérez F. 1979. The development and postharvest physiology of the fruit of prickly pear (*Opuntia amyclaea* Tenore). In: Inglett GE, Charalambous G, editors. Tropical foods: chemistry and nutrition. New York: Academic Press. p. 69-93.

Lande R. 1988. Genetics and Demography in Biological Conservation. Science. 241(4872):1455-1460.

Leuenberger BE. 1993. Interpretation and typification of *Cactus opuntia* L., *Opuntia vilgaris* Mill., and *O. humifusa* (Rafin.) Rafin. (Cactaceae). Taxon. 42:419-429.

Levi A. 1999. Population parameters and factors limiting reproduction for endangered *Opuntia humifusa* at Point Pelee National Park [BSc honours thesis]. Windsor (ON): University of Windsor.

Levi, A. 2001. Population biology of *Opuntia humifusa* [master's thesis]. Windsor (ON): University of Windsor.

Lewis JC. 1973. The world of the wild turkey. Philadelphia (PA): Lippincott.

Lovett-Doust L, Levi A. 2003. Seed germination, seedling survival and preliminary survey of the seed bank of *Opuntia humifusa*, eastern prickly pear at Point Pelee National Park. Located at Point Pelee National Park, Leamington, ON, Canada.

Lovett-Doust L, VanDerWal J, Golenberg E, Skipper J. 2003. A preliminary genetic study of the prickly pear cactus, *Opuntia humifusa* at Point Pelee National Park. Located at Point Pelee National Park, Leamington, ON, Canada.

Lu Y, Bei Y, Zhang J. 2012. Are yellow sticky traps an effective method for control of sweetpotato whitefly, *Bemisia tabaci*, in the greenhouse or field?. J Insect Sci. 12:113.

Majure LC. 2010. Towards an evolutionary understanding of the *Opuntia humifusa* complex of North America. Cactus Succul J. 82(4):156-163.

Majure LC, Ervin G. 2008. The *Opuntias* of Mississippi. Haseltonia. 14:111-126.

Majure LC, Fitzpatrick P, Ervin GN. 2007. Storm-driven maritime dispersal of prickly pear cacti (*Opuntia* species). International *Cactoblastis cactorum* Conference; 2007 May 7-10; Phoenix, AZ. Phoenix (AZ): USADA, Animal and Plant Health Inspection Service.

Majure LC, Puente R, Griffith MP, Judd WS, Soltis P, Soltis DE. 2012a. Phylogeny of *Opuntia* s.s. (Cactaceae): clade delineation, geographic origins, and reticulate evolution. Am J Bot. 99:847-864.

Majure LC, Soltis DE, Soltis PS, Judd WS. 2012b. Cytogeography of the Humifusa clade of *Opuntia* s.s. (Cactaceae: Opuntioideae): correlations with geographic distributions and morphological differentiation of a polyploid complex. Comp Cytogenet. 6:53-77.

Majure LC, Judd WS, Soltis PS, Soltis E. 2017. Taxanomic revision of the *Opuntia humifusa* complex (Opuntieae: Cactaceae) of the eastern United States. Phylotaxa. 290(1):1-65.

Mandujano MC, Golubov J, Montaña C. 1997. Dormancy and endozoochorous dispersal of *Opuntia rastrera* seeds in the southern Chihuahuan Desert. J Arid Environ. 36:259-266.

Mandujano MC, Montaña C, Méndez I, Golubov J. 1998. The relative contribution of sexual reproduction and clonal propagation in *Opuntia rastrera* from two habitats in the Chihuahuan Desert. J Ecol. 86:911-921.

Mandujano MC, Montaña C, Franco M, Golubov J, Flores-Martínez A. 2001. Integration of demographic annual variability in a clonal desert cactus. Ecology. 82(2):344-359.

Mas RE, Traveset A. 1999. Efectes de la ingestió per ocells sobre la germinació i la dispersió de dues espécies pròximes de *Solanum*. Butll Soc Hist Nat Balears. 42:69-77.

Maschinski J, Baggs JE, Sacchi CF. 2004. Seedling recruitment and survival of an endangered limestone endemic in its natural habitat and experimental reintroduction sites. Am J Bot. 91:689-698.

Maw MW, Molloy MM. 1980. Prickly-pear cactus on the Canadian Prairies. Blue Jay. 38(4).

Ministry of the Environment, Conservation and Parks. 2018. Five-year review of progress towards the protection and recovery of Ontario's species at risk. Government of Ontario; [updated 2020 Aug 24; accessed 2020 Nov 19]. p. 68. https://www.ontario.ca/document/2018-five-year-review-progress-towards-protection-and-recovery-ontarios-species-risk.

Mohanty MP, Simonovic SP. 2021. Changes in floodplain regimes over Canada due to climate change impacts: Observations from CMIP6 models. Sci Total Environ. 792:148323.

Moore RP. 1962. Tetrazolium as a universally acceptable quality test of viable seed. Proc Assoc Off Seed Anal. 51:127-130.

Moore RP. 1985. Handbook on tetrazolium testing. Zurich (Switzerland): The International Seed Testing Association.

Muñoz MC, Schaerfer HM, Böhnig-Gaese K, Schleuning M. 2017. Positive relationship between fruit removal by animals and seedling recruitment in a tropical forest. Basic Appl Ecol. 20:31-39.

Nathan R, Schurr FM, Spiegel O, Steinitz O, Trakhtenbrot A, Tsoar A. 2008. Mechanism of long-distance seed dispersal. Trends Ecol Evol. 23(11):638-647.

Nogales M, Nieves C, Illera JC, Padilla DP, Traveset A. 2005. Effect of native and alien vertebrate frugivores on seed viability and germination patterns of *Rubia fruticose* (Rubiaceae) in the eastern Canary Islands. Funct Ecol. 19:429-436.

Nguyen LP, Hamr J, Parker GH. 2004. Nest site characteristics of Eastern Wild Turkeys in Central Ontario. Northeast Nat. 11(3):255-260.

Ozinga WA, Schaminee JHJ, Bekker RM, Bonn S, Poschlod P, Tackenberg O, Bakker J, van Groenendael JM. 2005. Predictability of plant species composition from environmental conditions is constrained by dispersal limitation. Oikos. 108:555-561.

Padrón B, Nogales M, Traveset A, Vilà M, Marínez-Abraín A, Padilla DP, Marrero P. 2011. Integration of invasive *Opuntia* spp. by native and alien seed dispersers in the Mediterranean area and the Canary Islands. Biol Invasions. 13:831-844.

Parks Canada. 2015. PPNP Eastern Prickly Pear Cactus map 2015 [map]. Located at Point Pelee National Park, Leamington, Ontario, Canada.

Parks Canada. 2020. Point Pelee National Park Draft Management Plan 2020. Leamington (ON): Parks Canada; [modified 2020 Nov 5; accessed 2021 Mar 3]. p. 23. https://www.pc.gc.ca/en/pn-np/on/pelee/info/plan/gestion-management.

Parks Canada. 2021a. Conserving and restoring ecosystems. Leamington (ON): Parks Canada; [modified 2021 Jan 8; accessed 2021 Mar 4]. https://www.pc.gc.ca/en/pn-np/on/pelee/nature/conservation/ecosystemes-ecosystems.

Parks Canada. 2021b. Five Habitats of Point Pelee National Park [map]. Ecosystems and habitats – Point Pelee National Park. Leamington (ON): Parks Canada; [modified 2021 Jan 6; accessed 2021 Oct 20]. https://www.pc.gc.ca/en/pn-np/on/pelee/nature/enviro/habitats.

Peres CA, van Roosmalen MGM. 1996. Avian dispersal of “mimetic seeds” of *Ormosia lignivalvis* by terrestrial granivores: deception or mutualism? Oikos. 75:249-258.

Porter WF. 1980. An evaluation of wild turkey brood habitat in southeastern Minnesota. Proc Natl Wild Turk Symp. 4:203-212.

Potter LR, Petersen JL, Ueckert DN. 1984. Germination responses of *Opuntia* spp. to temperature, scarification, and other seed treatments. Weed Sci. 32:106-110.

Rafinesque CS. 1820. Annals of nature, or, annual synopsis of new genera and species of animals, plants, &etc. discovered in North America. Lexington (KY): Smith T.

Riddle O, Christman G, Benedict FG. 1930. Differential response of the male and female ring doves to metabolism measurements at higher and lower temperatures. Am J Physiol. 95(1):111-120.

Robinson BG, Franke A, Derocher AE. 2015. Estimating nestling diet with cameras: quantifying uncertainty from unidentified food items. Wildl Biol. 21:277–282.

Ross D. 1971. Cactus report: Point Pelee National Park. Located at Point Pelee National Park, Leamington, ON, Canada.

Reyes-Agüero JA, Aguierre JR, Valiente-Banuet A. 2006. Reproductive biology of *Opuntia*: a review. J Arid Environ. 64:549-585.

Santelmann MV. 1991. Influences on the distribution of *Carex exilis*: an experimental approach. Ecology. 72:2025-2037.

Sapir N, Abramsky Z, Shochat E, Izhaki I. 2004. Scale-dependent habitat selection in migratory frugivorous passerines. *Naturwissenschaften*. 91(11):544–547.

Sarasola JH, Zanón-Martínez JI, Costá AS, Ripple WJ. 2016. Hypercarnivorous apex predator could provide ecosystem services by dispersing seeds. Sci Rep. 6:19647.

Sauby KE, Kilmer J, Christman MC, Holt RD, Marsico TD. 2017. The influence of herbivory and weather on the vital rates of two closely related cactus species. Ecol Evol. 7:6996-7009.

Smith SB, Miller AC, Merchant CR, Sankoh AF. 2015. Local site variation in stopover physiology of migrating songbirds near the south shore of Lake Ontario is linked to fruit availability and quality. Conserv physiol. 3(1):cov036.

Stoddard H. 1941. The bob-white quail: its habits, preservation and increase. New York: Charles Scribner's Sons.

Tattoni C, Soardi E, Prosser F, Odasso M, Zatelli P, Ciolli M. 2019. Fruit availability for migratory birds: a GIS approach. PeerJ. 7:e6394.

Tewksbury JJ, Levey DJ, Haddad NM, Sargent S, Orrock JL, Weldon A, Danielson BJ, Brinkerhoff J, Damschen EI, Townsend P. 2002. Corridors affect plants, animals, and their interactions in fragmented landscapes. Proc Natl Acad Sci USA. 99(22):12923-12926.

Toews S. 2013. Monitoring of herbivory and light levels affecting the Eastern Prickly Pear Cactus (*Opuntia humifusa*) at Point Pelee National Park [undergraduate thesis]. Windsor (ON): University of Windsor.

Traveset A. 1998. Effect of seed passage through vertebrate frugivores' guts on germination: a review. Perspect Plant Ecol Evol Syst. 1:151-190.

Traveset A, Verdú M. 2001. A meta-analysis of gut treatment on seed germination. In: Levey DJ, Silva WR, Galetti M, editors. Frugivores and seed dispersal: ecological, evolutionary and conservation issues. Wallingford (UK): CAB International. p. 339–350.

Traveset A, Riera N, Mas RE. 2001. Passage through bird guts causes interspecific differences in seed germination characteristics. Funct Ecol. 15:669-675.

Traveset A, Rodríguez-Pérez J, Pías B. 2008. Seed trait changes in dispersers' guts and consequences for germination and seedling growth. Ecology. 89(1):95-106.

Trenhaile AS, Dumala R. 1978. The geomorphology and origin of Point Pelee, southwestern Ontario. Can J Earth Sci. 15:963–970.

Valido A, Nogales M. 2003. Digestive ecology of two omnivorous Canarian lizard species (*Gallotia*, Lacertidae). Amphib-Reptil. 24:331–344

VanDerWal J, Moeen MS, Lovett-Doust L, Stewart CL. 2007a. Defining habitat requirements of *Opuntia humifusa* as determined by field and lab studies. Located at: Point Pelee National Park, Leamington, ON, Canada. p. 142.

VanDerWal J, Evans N, Wozniczka I, Lovett-Doust L. 2007b. Demography of *Opuntia humifusa* located within Point Pelee National Park. Located at: Point Pelee National Park, Leamington, ON, Canada. p. 53.

Vázquez-Castillo S, Miranda-Jácome A, Inzunza ER. 2019. Patterns of frugivory in the columnar cactus *Pilosocereus leucocephalus*. Ecol Evol. 9:1268-1277.

Vynne C, Baker MR, Breuer ZK, Wasser SK. 2012. Factors influencing degradation of DNA and hormones in maned wolf scat. Anim Conserv. 15:184-194.

Weaver JE. 1989. On the ecology of wild turkeys reintroduced in southern Ontario [master's thesis]. London (ON): University of Western Ontario.

Wightman PH, Cantrell JR, Ruth CR, Byrne ME, Chamberlain MJ, Collier BA. 2018. Impact of supplemental feeding for northern bobwhite on movement ecology of eastern wild turkeys in South Carolina. J Southeast Assoc Fish Wildl Agencies. 5:114-124.

Wintemberg WJ. 1919. Prehistoric range of the wild turkey. Can Field-Nat. 33:68-70.

Wright RG, Paisley RN, Kubisiak JF. 1996. Survival of wild turkey hens in southwestern Wisconsin. J Wildl Manag. 60:313-320.

Zuzek Inc. 2021. Southeast Leamington graduate risk floodplain mapping project. Report prepared for the Municipality of Leamington. p. 114.

Appendices

Appendix A – Digital Evidence from Trail Cameras

A copy of all photos and videos from the trail cameras and their associated metadata are available upon request from the author.

Appendix B – Maps

A copy of these four maps is available upon request from the author: *Study Sites used to Track the Dispersal of Eastern Prickly Pear Cactus by Animal Vectors at Point Pelee National Park*, *Hotspots for Wild Turkey Scats at Point Pelee National Park*, *Hotspots for Eastern Prickly Pear Cactus Fingerlings at Point Pelee National Park*, and *Correlation between Wild Turkey Scats and Eastern Prickly Pear Cactus Fingerlings at Point Pelee National Park*.

Appendix C – Raw Data

Table C1. Long term data of flower, fruit, fruit eaten, and fingerling count of *Opuntia cespitosa* at 4 sites containing trail cameras in Point Pelee National Park. Two sites are located at West Beach (WB) and two sites are located at DeLaurier Homestead (DeL). Data recorded from August 6 to October 18, 2020.

Date	CAM #	Location	N or S	Start Time	End Time	# of flowers	# yellow fruits	# red fruits	# dead fruits	total fruits	%red fruit	# partial eaten	# fully eaten	total eaten	# fingerlings	Notes
06-Aug-20	1	WB	S	9:30 AM	10:05 AM	0	0	1	0	170	0.59	0	0	0	0	lock #389; 3 patches - 2 are small
06-Aug-20	2	DeL	S	11:35 AM	12:45 PM	0	0	0	0	102	0.00	0	0	0	0	lock #484
06-Aug-20	3	DeL	N	10:13 AM	11:15 AM	3	0	0	0	139	0.00	0	0	0	0	lock # 484
06-Aug-20	4	WB	N	8:45 AM	9:20 AM	0	0	0	0	342	0.00	0	0	0	0	lock # 389
12-Aug-20	1	WB	S	12:06 PM	12:45 PM	0	0	1	0	179	0.56	0	0	0	0	
12-Aug-20	2	DeL	S	2:34 PM	2:55 PM	0	0	0	0	100	0.00	0	0	0	0	
12-Aug-20	3	DeL	N	1:40 PM	2:15 PM	6	0	0	0	170	0.00	0	0	0	0	flowers: 1 fully bloomed + 5 ready to bloom
12-Aug-20	4	WB	N	11:20 AM	11:50 AM	0	0	**0**	**0**	**302**	0.00	0	0	0	0	several red fruits (numbers were not counted separately here yet). A lot of dried/yellow fruits too
19-Aug-20	1	WB	S	11:30 AM	11:50 AM	0	0	1	0	171	0.58	0	0	0	3	1 fingerling in LP + 2 in MP
19-Aug-20	2	DeL	S	12:50 PM	1:10 PM	0	2	1	0	111	0.90	0	0	0	2	
19-Aug-20	3	DeL	N	12:15 PM	12:35 PM	1	11	0	**0**	**158**	0.00	0	0	0	0	several dead fruits (numbers were not counted separately here yet).
19-Aug-20	4	WB	N	10:45 AM	11:10 AM	0	47	15	**0**	**313**	4.79	0	0	0	3	several dried up fruits fallen off pads
26-Aug-20	1	WB	S	11:05 AM	11:20 AM	0	0	1	0	173	0.58	0	0	0	0	
26-Aug-20	2	DeL	S	12:13 PM	12:21 PM	0	5	0	2	113	0.00	0	0	0	0	
26-Aug-20	3	DeL	N	11:45 AM	12:00 PM	0	2	0	27	181	0.00	0	0	0	0	dead fruits are still on cactus
26-Aug-20	4	WB	N	10:40 AM	11:00 AM	0	53	11	**0**	291	3.78	0	0	0	1	
05-Sep-20	1	WB	S	10:18 AM	10:30 AM	0	1	1	1	172	0.58	0	0	0	1	LP - 1 fell off, 7 starting to become red; MP - 4 starting to become red, lots of dead cactus pads that are white
05-Sep-20	2	DeL	S	11:35 AM	11:50 AM	0	0	0	4	105	0.00	0	0	0	2	Photo of cladode taken, lots of dead white cactus pads
05-Sep-20	3	DeL	N	11:10 AM	11:20 AM	0	7	0	13	162	0.00	0	0	0	0	A few dead white cactus pads
05-Sep-20	4	WB	N	9:45 AM	10:04 AM	0	32	32	8	299	10.70	0	0	0	2	
14-Sep-20	1	WB	S	11:40 AM	12:00 PM	0	0	113	1	172	65.70	0	0	0	3	Fruits are fatter than the ones at WB-N. LP - 1 is super red (dark), 1 fell off; MP - Most (40%) are red while 40% in process of turning red
14-Sep-20	2	DeL	S	1:10 PM	1:35 PM	0	1	0	3	100	0.00	0	0	0	4	2 fingerlings = unsure; fruits are mainly green and skinny
14-Sep-20	3	DeL	N	12:40 PM	12:50 PM	0	9	5	10	161	3.11	0	0	0	0	A few are starting to turn red, several dead fruits on ground
14-Sep-20	4	WB	N	11:10 AM	11:30 AM	0	3	210	5	283	74.20	0	0	0	0	Most fruits are red or starting to turn. Most yellow or dead fruits from before have fallen from the pad or were eaten?
23-Sep-20	1	WB	S	11:55 AM	12:20 PM	0	0	150	0	173	86.71	0	0	0	2	LP - 1 is starting to turn red, 1 is super red; MP - 1 super red fruit may be eaten? Fruits are more bulb like than CAM 4; pads starting to flatten and wrinkle; fruits appear to be less spikey when red?
23-Sep-20	2	DeL	S	1:35 PM	2:00 PM	0	0	4	1	89	4.49	0	0	0	4	Visually, it looks like a lot of fruits are gone; fruits mainly green; pads mainly still standing tall
23-Sep-20	3	DeL	N	1:00 PM	1:15 PM	0	9	50	21	159	31.45	0	0	0	0	pads are flattening but not wrinkly yet; many "dead" fruits still on pads
23-Sep-20	4	WB	N	11:00 AM	11:30 AM	0	0	279	3	287	97.21	0	0	0	3	Fruits are mainly pink color; most are skinny, some fruits are partially white; lots of ants in patch
03-Oct-20	1	WB	S	10:50 AM	11:15 AM	0	0	167	1	173	96.53	3	1	4	3	LP - 3 fruits eaten, 1 fruit broke off; MP - 2 shiny red fruits, 1 fruits completely eaten?
03-Oct-20	2	DeL	S	12:35 PM	1:00 PM	0	0	15	0	92	16.30	0	0	0	5	1 fingerling uncertain
03-Oct-20	3	DeL	N	11:45 AM	12:05 PM	0	4	86	14	158	54.43	0	0	0	0	Some fruits are fully bulb-like and some are wrinkly and tiny and not fully fed
03-Oct-20	4	WB	N	10:10 AM	10:39 AM	0	0	280	1	283	98.94	0	0	0	2	2 super red fruits; no red fruit dropped from the pad; 1 turkey scat outside of cactus patch
12-Oct-20	1	WB	S	12:37 PM	12:55 PM	0	0	168	2	173	97.11	3	1	4	4	2 of the fingerlings are dying?
12-Oct-20	2	DeL	S	2:26 PM	2:50 PM	0	0	73	1	95	76.84	0	0	0	3	fruits are purple in colour but will be considered as red; land is moist silty soil
12-Oct-20	3	DeL	N	1:55 PM	2:13 PM	0	2	114	19	142	80.28	5	4	9	0	there are ants in the fruits that are eaten
12-Oct-20	4	WB	N	12:05 PM	12:30 PM	0	1	280	4	285	98.25	1	0	1	2	some of the red fruits are partially dead/dying; slightly sandy around the patch
14-Oct-20	1	WB	S	8:45 AM	9:30 AM	0	0	169	0	172	98.26	3	1	4	4	
14-Oct-20	2	DeL	S	2:15 PM	2:50 PM	0	0	82	1	91	90.11	0	0	0	4	
14-Oct-20	3	DeL	N	11:00 AM	12:00 PM	0	0	100	15	124	80.65	10	9	19	0	
14-Oct-20	4	WB	N	8:10 AM	8:35 AM	0	0	270	5	275	98.18	1	0	1	3	
18-Oct-20	1	WB	S	10:25 AM	10:37 AM	0	0	169	0	171	98.83	3	1	4	4	
18-Oct-20	2	DeL	S	12:09 PM	12:26 PM	0	0	84	1	92	91.30	0	0	0	4	Most that are red are actually more purple
18-Oct-20	3	DeL	N	11:35 AM	11:43 AM	0	0	93	15	116	80.17	10	9	19	0	
18-Oct-20	4	WB	N	9:50 AM	10:03 AM	0	0	277	4	281	98.58	3	0	3	3	fruits here are small; 1 small partially eaten fruit have ants in it

Table C2. Fall data of flower, fruit, fruit eaten, fingerling, and wild turkey scat counts at 38 *Opuntia cespitosa* sites in Point Pelee National Park. Data recorded from October 13 to 17, 2020.

Date	Julian Date	Start Time	End Time	Site #	GPS Code	Location	Section	Habitat	Shaded?	# of patches	# of flowers	# green fruits	# yellow fruits	# red fruits	# dead fruits	total fruits	# partial eaten	# fully eaten	# fingerlings	# turkey scats	Notes
13-Oct-20	287	14:30	15:00	1	A1	DeL	C	Savannah	N	1	0	1	0	49	0	50	0	0	1	0	A lot of tall grass around patch; lots of fallen leaves
13-Oct-20	287	15:10	15:55	2	A2	DeL	C	Savannah	P	2	0	0	0	43	0	43	0	0	3	8	A lot of dead cactus pads; a lot of goldenrods in the area
13-Oct-20	287	16:00	16:35	3	A3	DeL	C	Savannah	N	2	0	0	0	20	0	20	0	0	6	5	A lot of goldenrods in the area
13-Oct-20	287	16:35	17:05	4	A4	DeL	C	Savannah	N	1	0	1	0	159	0	160	4	9	1	2	A lot of goldenrods in the area; a few fallen ripe fruits
13-Oct-20	287	17:10	17:45	5	A5	DeL	C	Savannah	N	5	0	9	0	347	3	359	2	5	7	4	
13-Oct-20	287	18:25	18:45	6	A6	DeL	C	Savannah	N	0	0	0	0	0	0	0	0	0	0	4	Very open area with some shade; contains more grass and goldenrod than other similar sites
13-Oct-20	287	17:50	18:20	7	A7	DeL	C	Savannah	N	1	0	0	0	66	0	66	3	2	2	5	
14-Oct-20	288	10:00	11:40	8	A8	DeL	C	Savannah	N	2	0	9	1	173	20	203	12	13	12	29	Site near Cam 3; most fruits eaten from the edge; few in the middle.
13-Oct-20	287	18:30	18:50	9	A9C	DeL	C	Savannah	Y	0	0	0	0	0	0	0	0	0	0	0	Area is surrounded by coniferous and decidious trees and short grass; Soil was darker and still wet from rain
14-Oct-20	288	12:15	12:50	10	A10	DeL	C	Savannah	P	2	0	8	0	21	1	30	0	0	8	15	Shaded by 1 tree; more tall grass around and west side of patch is more open
14-Oct-20	288	12:55	13:40	11	A11	DeL	C	Savannah	P	1	0	1	0	0	1	2	0	0	3	3	Very scattered patch; short decidious trees; soil is still wet; fewer scats from all animals in general
14-Oct-20	288	13:45	14:25	12	A12	DeL	C	Savannah	P	1	0	2	2	82	0	86	0	0	4	2	Tall trees around the area; very short grass in area; no open sandy area
14-Oct-20	288	14:30	15:00	13	A13	DeL	D	Savannah-Forest	P	2	0	8	0	84	1	93	0	0	4	5	A lot of fallen leaves in the area
14-Oct-20	288	15:05	15:45	14	A14	DeL	D	Savannah-Forest	Y	2	0	9	0	168	5	182	0	0	20	1	A lot of fallen coniferous needles in the area; pads are still standing straight up; a lot of goldenrods in the area.
15-Oct-20	289	9:45	10:30	15	A15	DeL	D	Savannah-Forest	P	2	0	8	0	6	0	14	0	0	3	0	Fruits that are counted as red are more purple in color (looks unhealthy); there was a snail on a fruit; medium height grass; conifer needles on and around patch
15-Oct-20	289	10:35	11:20	16	A16	DeL	D	Savannah-Forest	P	1	0	6	0	115	2	123	0	0	0	8	Patches more spread apart; more spaces in between cactus pads. Same habitat as site 15.
15-Oct-20	289	14:15	15:20	17	A17	DeL	D	Savannah-Forest	N	2	0	6	0	130	0	136	1	0	3	4	Habitat similar to site 15 and 16; lots of coniferous needles and more open space. Contains random patches of sand (nest?) nearby, might belong to wild turkey. One red fruit have some black spots on it. There are some tall plants surrounding patch and within the patch. A few patches are still standing straight up. Patches are spread out with a lot of space in between. Some fruit have black spots while some are very big. 1 fingerling inside the middle of a patch on bare soil is bent over.
15-Oct-20	289	15:25	16:00	18	A18C	DeL	D	Savannah-Forest	P	0	0	0	0	0	0	0	0	0	0	0	Control.
16-Oct-20	290	10:40	11:40	19	A19	WB	I	Beach	P	2	0	0	0	110	0	110	0	0	6	4	Area is open with a few trees and shrubs around; medium-height grass
16-Oct-20	290	12:00	12:45	20	A20	WB	I	Beach	N	1	0	0	0	94	0	94	4	3	6	0	
14-Oct-20	288	8:15	9:00	21	A21	WB	I	Beach	N	2	0	0	0	279	5	284	1	0	6	2	Originally 3 scats but 1 was actually from a raccoon. Area is relatively open.
16-Oct-20	290	14:15	14:45	22	A22	WB	I	Beach	N	3	0	0	0	152	0	152	0	0	3	2	contains 1 dead fingerling; lots of white dead cactus pads
16-Oct-20	290	14:50	15:20	23	A23	WB	I	Beach-Forest	P	1	0	2	0	76	0	78	1	0	0	1	Mushroom in the area
16-Oct-20	290	15:25	15:55	24	A24	WB	I	Beach-Forest	P	2	0	2	0	69	2	73	0	0	2	2	Lots of dried fallen leaves covering 1 of the patches
16-Oct-20	290	16:00	16:25	25	A25C	WB	I	Beach	N	0	0	0	0	0	0	0	0	0	2	2	Close to the shore, surrounded by tall shrubs. Some scats are mineralized; unsure if its turkey
16-Oct-20	290	16:30	17:00	26	A26	WB	I	Beach-Forest	P	3	0	0	0	130	1	131	0	3	0	3	Contains some moss. 3 scats found but not collected because they were mineralized. Patch #3 had wild turkey feathers and lots of bunny scats.
14-Oct-20	288	9:05	9:50	27	A27	WB	I	Beach	N	4	0	3	0	169	0	172	3	1	5	0	Open with some herbaceous plants with lots of moss
16-Oct-20	290	17:00	17:30	28	A28	WB	I	Beach	P	1	0	0	0	20	0	20	0	0	2	2	Very close to the shore; less than 20 m away. 1 dead cactus pad.
16-Oct-20	290	17:30	18:00	29	A29	WB	I	Beach-Forest	P	2	0	0	2	112	0	114	0	0	1	3	A lot of leaves covered the area.
16-Oct-20	290	13:00	14:00	30	A30C	WB	I	Beach-Forest	P	0	0	0	0	0	0	0	0	0	0	4	4 scats found but only collected 3. Site is beside the forest with some moss on the ground and groups of tall grass.
17-Oct-20	291	9:00	10:15	31	A31	WB	G	Beach	N	1	0	0	0	60	3	63	3	1	2	3	Bunny scats found within cactus patch. Patches of tall grass with open space and some moss.
17-Oct-20	291	11:05	11:30	32	A32	WB	G	Beach-Forest	N	3	0	2	0	93	0	95	2	0	6	4	Very grassy area. Patch #1 are spread apart with lots of space in between; patch #2 is beside a tree. Lots of fingerling-like cactus, but are coming from broken or dead parts of cactus.
17-Oct-20	291	10:20	11:00	33	A33	WB	G	Beach-Forest	Y	2	0	0	0	7	0	7	0	0	1	0	Lots of fallen leaves and coniferous needles and bamboo-like plants around
17-Oct-20	291	11:10	12:00	34	A34C	WB	G	Beach-Forest	Y	0	0	0	0	0	0	0	0	0	0	0	Lots of leaves and small shrubs on the ground. Lots of acorn.
17-Oct-20	291	13:10	14:00	35	A35	FoT	K	Forest	N	2	0	1	0	0	0	1	0	0	2	1	Very sunny and open area inside forest. Most patches are still standing up an are narrow in shape. It was 20 degree C in the area; looks like a different species. Not very windy; area covered by leaves and soil is dark. 1 scat collected - unsure if it's from wild turkey.
17-Oct-20	291	14:15	15:30	36	A36	FoT	H	Savannah-Forest	N	2	0	8	0	19	1	28	1	0	6	2	Cactus patch is in very grassy area. Red fruits look more purple; there are turkey feathers; savannah sandy soil
17-Oct-20	291	15:45	16:15	37	A37	FoT	F	Savannah	N	4	0	1	0	7	0	8	0	0	0	0	Lots of tall goldenrods and grass in area. All cactus patches are shaded by the surrounding plants.
17-Oct-20	291	16:20	17:10	38	A38	FoT	F	Savannah	P	2	0	0	0	19	0	19	1	0	1	19	There are dead cactus pads around the area. Most pads are hugging the ground. Very open sandy area (cactus field) within the forest.

Table C3. Descriptive data of each *Opuntia cespitosa* patch located at the 38 sites described in Table F2. Data recorded from October 13 to 17, 2020.

Patch #	Date	Julian Date	Site #	GPS Code	Location	Section	Habitat	Shaded ?	Patch Long Diameter (m)	Patch Short Diameter (m)	Patch Area (m^2)	# of flowers	# green fruits	# yellow fruits	# red fruits	# dead fruits	total fruits	# partial eaten	# fully eaten	# fingerlings	Notes
1	13-Oct-20	287	1	A1	DeL	C	Savannah	N	1.10	1.40	1.21	0	1	0	49	0	50	0	0	1	
2	13-Oct-20	287	2	A2	DeL	C	Savannah	P	1.50	1.10	1.30	0	0	0	16	0	16	0	0	2	1 fingerling is outside of the patch; not included here but is counted for the site.
3	13-Oct-20	287	2	A2	DeL	C	Savannah	P	1.10	0.90	0.78	0	0	0	27	0	27	0	0	0	
4	13-Oct-20	287	3	A3	DeL	C	Savannah	N	0.80	0.55	0.35	0	0	0	20	0	20	0	0	0	
5	13-Oct-20	287	3	A3	DeL	C	Savannah	N	0.90	0.50	0.35	0	0	0	0	0	0	0	0	6	
6	13-Oct-20	287	4	A4	DeL	C	Savannah	N	1.70	1.00	1.34	0	1	0	159	0	160	4	9	0	1 fingerling is outside of the patch; not included here but is counted for the site.
7	13-Oct-20	287	5	A5	DeL	C	Savannah	N	0.45	0.25	0.09	0	0	0	13	0	13	0	0	0	
8	13-Oct-20	287	5	A5	DeL	C	Savannah	N	0.30	0.10	0.02	0	0	0	2	0	2	0	0	0	
9	13-Oct-20	287	5	A5	DeL	C	Savannah	N	0.50	0.40	0.16	0	0	0	4	0	4	0	0	1	
10	13-Oct-20	287	5	A5	DeL	C	Savannah	N	1.70	1.40	1.87	0	6	0	137	0	143	0	0	1	
11	13-Oct-20	287	5	A5	DeL	C	Savannah	N	4.00	1.40	4.40	0	3	0	191	3	197	2	5	4	1 fingerling is outside of the patch; not included here but is counted for the site.
12	13-Oct-20	287	6	A6C	DeL	C	Savannah	N	0.00	0.00	0.00	0	0	0	0	0	0	0	0	0	
13	13-Oct-20	287	7	A7	DeL	C	Savannah	N	1.10	0.90	0.78	0	0	0	66	0	66	3	2	2	
14	14-Oct-20	288	8	A8	DeL	C	Savannah	N	1.55	0.80	0.97	0	9	0	100	15	124	10	9	0	
15	14-Oct-20	288	8	A8	DeL	C	Savannah	N	1.10	0.90	0.78	0	0	1	73	5	79	2	4	12	
16	13-Oct-20	287	9	A9C	DeL	C	Savannah	Y	0.00	0.00	0.00	0	0	0	0	0	0	0	0	0	
17	14-Oct-20	288	10	A10	DeL	C	Savannah	P	1.20	0.90	0.85	0	8	0	20	1	29	0	0	5	3 fingerlings are outside of the patch; not included here but are counted for the site.
18	14-Oct-20	288	10	A10	DeL	C	Savannah	P	1.30	0.40	0.41	0	0	0	1	0	1	0	0	0	Cladodes are more scattered/dispersed.
19	14-Oct-20	288	11	A11	DeL	C	Savannah	P	2.00	1.80	2.83	0	1	0	0	1	2	0	0	1	2 fingerlings are outside of the patch; not included here but are counted for the site.
20	14-Oct-20	288	12	A12	DeL	C	Savannah	P	1.50	1.20	1.41	0	2	2	82	0	86	0	0	4	
21	14-Oct-20	288	13	A13	DeL	D	Savannah-Forest	P	2.70	2.00	4.24	0	8	0	82	1	91	0	0	3	1 fingerling is outside of the patch; not included here but is counted for the site.
22	14-Oct-20	288	13	A13	DeL	D	Savannah-Forest	P	1.10	0.60	0.52	0	0	0	2	0	2	0	0	0	
23	14-Oct-20	288	14	A14	DeL	D	Savannah-Forest	Y	3.00	1.90	4.48	0	0	0	15	0	15	0	0	2	
24	14-Oct-20	288	14	A14	DeL	D	Savannah-Forest	Y	3.20	2.60	6.53	0	9	0	153	5	167	0	0	17	1 fingerling is outside of the patch; not included here but is counted for the site.
25	15-Oct-20	289	15	A15	DeL	D	Savannah-Forest	P	1.60	1.30	1.63	0	4	0	5	0	9	0	0	0	
26	15-Oct-20	289	15	A15	DeL	D	Savannah-Forest	P	2.60	2.00	4.08	0	4	0	1	0	5	0	0	3	
27	15-Oct-20	289	16	A16	DeL	D	Savannah-Forest	P	2.20	1.70	2.94	0	6	0	115	2	123	0	0	0	
28	15-Oct-20	289	17	A17	DeL	D	Savannah-Forest	N	0.70	0.70	0.38	0	4	0	8	0	12	0	0	0	
29	15-Oct-20	289	17	A17	DeL	D	Savannah-Forest	N	2.90	2.50	5.69	0	2	0	122	0	124	1	0	3	
30	15-Oct-20	289	18	A18C	DeL	D	Savannah-Forest	P	0.00	0.00	0.00	0	0	0	0	0	0	0	0	0	
31	16-Oct-20	290	19	A19	WB	I	Beach	P	0.60	0.40	0.19	0	0	0	8	0	8	0	0	0	
32	16-Oct-20	290	19	A19	WB	I	Beach	N	1.80	1.50	2.12	0	0	0	102	0	102	0	0	2	4 fingerlings are outside of the patch; not included here but are counted for the site.
33	16-Oct-20	290	20	A20	WB	I	Beach	N	1.60	1.35	1.70	0	0	0	94	0	94	4	3	3	3 fingerlings are outside of the patch; not included here but are counted for the site.
34	14-Oct-20	288	21	A21	WB	I	Beach	N	1.50	1.20	1.41	0	0	0	270	5	275	1	0	3	3 fingerlings are outside of the patch; not included here but are counted for the site.
35	14-Oct-20	288	21	A21	WB	I	Beach	N	0.60	0.25	0.12	0	0	0	9	0	9	0	0	0	
36	16-Oct-20	290	22	A22	WB	I	Beach	N	0.50	0.40	0.16	0	0	0	3	0	3	0	0	0	
37	16-Oct-20	290	22	A22	WB	I	Beach	N	0.40	0.20	0.06	0	0	0	6	0	6	0	0	0	
38	16-Oct-20	290	22	A22	WB	I	Beach	N	3.40	2.60	6.94	0	0	0	143	0	143	0	0	2	1 fingerling is outside of the patch; not included here but is counted for the site.
39	16-Oct-20	290	23	A23	WB	I	Beach-Forest	P	1.50	1.10	1.30	0	2	0	76	0	78	1	0	0	
40	16-Oct-20	290	24	A24	WB	I	Beach-Forest	P	0.40	0.21	0.07	0	1	0	27	1	29	0	0	0	
41	16-Oct-20	290	24	A24	WB	I	Beach-Forest	P	1.20	0.96	0.90	0	1	0	42	1	44	0	0	1	1 fingerling is outside of the patch; not included here but is counted for the site.
42	16-Oct-20	290	25	A25C	WB	I	Beach	N	0.00	0.00	0.00	0	0	0	0	0	0	0	0	0	No cactus patch but there were 2 fingerlings; counted for the site.
43	16-Oct-20	290	26	A26	WB	I	Beach-Forest	P	1.35	0.98	1.04	0	0	0	45	0	45	0	0	0	
44	16-Oct-20	290	26	A26	WB	I	Beach-Forest	P	1.35	1.20	1.27	0	0	0	36	0	36	0	3	0	
45	16-Oct-20	290	26	A26	WB	I	Beach-Forest	P	1.60	1.20	1.51	0	0	0	49	1	50	0	0	0	
46	14-Oct-20	288	27	A27	WB	I	Beach	N	0.90	0.90	0.64	0	0	0	44	0	44	3	1	0	
47	14-Oct-20	288	27	A27	WB	I	Beach	N	1.97	1.50	2.32	0	2	0	123	0	125	0	0	4	1 fingerling is outside of the patch; not included here but is counted for the site.
48	14-Oct-20	288	27	A27	WB	I	Beach	N	0.80	0.50	0.31	0	1	0	2	0	3	0	0	0	
49	14-Oct-20	288	27	A27	WB	I	Beach	N	0.30	0.20	0.05	0	0	0	0	0	0	0	0	0	
50	16-Oct-20	290	28	A28	WB	I	Beach	P	0.45	0.30	0.11	0	0	0	20	0	20	0	0	0	2 fingerlings are outside of the patch; not included here but are counted for the site.
51	16-Oct-20	290	29	A29	WB	I	Beach-Forest	P	1.30	1.10	1.12	0	0	0	58	0	58	0	0	0	1 fingerling is outside of the patch; not included here but is counted for the site.
52	16-Oct-20	290	29	A29	WB	I	Beach-Forest	P	1.70	0.85	1.13	0	0	2	54	0	56	0	0	0	
53	16-Oct-20	290	30	A30C	WB	I	Beach-Forest	P	0.00	0.00	0.00	0	0	0	0	0	0	0	0	0	
54	17-Oct-20	291	31	A31	WB	G	Beach	N	1.00	0.70	0.55	0	0	0	60	3	63	3	1	2	Fingerlings are at the edge of the patch so both are included here.
55	17-Oct-20	291	32	A32	WB	G	Beach-Forest	N	2.10	1.30	2.14	0	2	0	10	0	12	1	0	4	
56	17-Oct-20	291	32	A32	WB	G	Beach-Forest	N	1.20	0.80	0.75	0	0	0	73	0	73	1	0	0	
57	17-Oct-20	291	32	A32	WB	G	Beach-Forest	N	0.95	0.40	0.30	0	0	0	10	0	10	0	0	0	2 fingerlings are outside of the patch; not included here but are counted for the site.
58	17-Oct-20	291	33	A33	WB	G	Beach-Forest	Y	0.25	0.25	0.05	0	0	0	0	0	0	0	0	0	
59	17-Oct-20	291	33	A33	WB	G	Beach-Forest	P	2.00	1.61	2.53	0	0	0	7	0	7	0	0	1	
60	17-Oct-20	291	34	A34C	WB	G	Beach-Forest	Y	0.00	0.00	0.00	0	0	0	0	0	0	0	0	0	
61	17-Oct-20	291	35	A35	FoT	K	Forest	N	0.45	0.20	0.07	0	0	0	0	0	0	0	0	0	
62	17-Oct-20	291	35	A35	FoT	K	Forest	N	3.40	1.50	4.01	0	1	0	0	0	1	0	0	2	
63	17-Oct-20	291	36	A36	FoT	H	Savannah-Forest	N	0.50	0.40	0.16	0	0	0	0	0	0	0	0	1	
64	17-Oct-20	291	36	A36	FoT	H	Savannah-Forest	N	2.35	1.90	3.51	0	8	0	19	1	28	1	0	4	1 fingerling is outside of the patch; not included here but is counted for the site.
65	17-Oct-20	291	37	A37	FoT	F	Savannah	N	0.30	0.15	0.04	0	0	0	0	0	0	0	0	0	
66	17-Oct-20	291	37	A37	FoT	F	Savannah	N	0.50	0.15	0.06	0	0	0	0	0	0	0	0	0	
67	17-Oct-20	291	37	A37	FoT	F	Savannah	N	1.20	0.50	0.47	0	1	0	1	0	2	0	0	0	
68	17-Oct-20	291	37	A37	FoT	F	Savannah	N	0.50	0.37	0.15	0	0	0	6	0	6	0	0	0	
69	17-Oct-20	291	38	A38	FoT	F	Savannah	P	0.60	0.60	0.28	0	0	0	1	0	1	0	0	1	
70	17-Oct-20	291	38	A38	FoT	F	Savannah	P	1.50	0.95	1.12	0	0	0	10	0	10	0	0	0	
71	17-Oct-20	291	38	A38	FoT	F	Savannah	P	0.80	0.40	0.25	0	0	0	3	0	3	0	0	0	
72	17-Oct-20	291	38	A38	FoT	F	Savannah	P	1.10	0.80	0.69	0	0	0	5	0	5	1	0	0	

Table C4. Descriptive data of fingerlings found at the 38 sites described in Table F2. Data recorded from October 13 to 17, 2020.

Fingerling ID	Date	Julian Date	Time	Site #	Inside/Outside Cactus Patch	Distance from closest patch (cm)	Height (mm)	Diameter (mm)	Unsure?	Notes
1	13-Oct-20	287	14:32	1	Inside	0	45.8	9.8	No	Averaged; slightly flat
2	13-Oct-20	287	15:38	2	Inside	0	24.3	12.7	No	
3	13-Oct-20	287	15:52	2	Outside	5	44.2	10.1	No	Bent over/parallel to the ground
4	13-Oct-20	287	15:53	2	Inside	0	11.6	4.4	No	
5	13-Oct-20	287	16:07	3	Inside	0	8.0	2.4	No	Not shaded/covered by cactus pads
6	13-Oct-20	287	16:07	3	Inside	0	8.0	2.4	No	Not shaded/covered by cactus pads
7	13-Oct-20	287	16:08	3	Inside	0	15.0	3.0	No	Not shaded/covered by cactus pads
8	13-Oct-20	287	16:08	3	Inside	0	15.0	3.0	No	Not shaded/covered by cactus pads
9	13-Oct-20	287	16:08	3	Inside	0	15.0	3.0	No	Not shaded/covered by cactus pads
10	13-Oct-20	287	16:08	3	Inside	0	16.0	6.8	No	Not shaded/covered by cactus pads
11	13-Oct-20	287	17:02	4	Outside	30	18.8	8.6	No	A little bent over
12	13-Oct-20	287	17:21	5	Outside	2	21.6	8.3	Yes	Averaged
13	13-Oct-20	287	17:19	5	Inside	0	39.3	14.7	No	Bent over and has 3 segments
14	13-Oct-20	287	17:30	5	Inside	0	20.5	8.7	No	
15	13-Oct-20	287	17:31	5	Inside	0	25.1	6.8	No	Tip is a little purple
16	13-Oct-20	287	17:37	5	Inside	0	41.6	3.0	Yes	
17	13-Oct-20	287	17:39	5	Inside	0	27.5	6.8	No	Bent over
18	13-Oct-20	287	17:40	5	Inside	0	33.6	12.4	No	Bent over; Red-purple tip and bottom is dried out
19	13-Oct-20	287	18:08	7	Inside	0	36.2	6.0	No	
20	13-Oct-20	287	18:08	7	Inside	0	18.9	5.3	No	
21	14-Oct-20	288	8:26	21	Inside	0	21.7	3.4	No	Averaged; slightly flat
22	14-Oct-20	288	8:26	21	Inside	0	18.5	6.0	No	
23	14-Oct-20	288	8:26	21	Inside	0	15.7	5.5	No	
24	14-Oct-20	288	8:30	21	Outside	50	18.9	6.0	No	Bent over. Rabbit scats and leaves near fingerling.
25	14-Oct-20	288	8:32	21	Outside	50	10.8	4.3	No	Right beside fingerling #24. Bent over. Rabbit scats and leaves near fingerling.
26	14-Oct-20	288	8:33	21	Outside	30	17.0	4.9	No	Rabbit scats and leaves near fingerling.
27	14-Oct-20	288	9:06	27	Inside	0	6.1	3.5	No	
28	14-Oct-20	288	9:16	27	Inside	0	24.4	8.5	No	Averaged. Flat-ish.
29	14-Oct-20	288	9:16	27	Inside	0	18.0	7.3	No	Averaged. Very red in color.
30	14-Oct-20	288	9:18	27	Inside	0	36.5	9.3	Yes	Averaged. Flat. Tip is red.
31	14-Oct-20	288	9:23	27	Outside	100	15.7	5.9	No	Sheltered by tall grass.
32	14-Oct-20	288	11:27	8	Inside	0	11.0	6.1	Yes	Growing out from a pad.
33	14-Oct-20	288	11:30	8	Inside	0	21.2	3.6	No	
34	14-Oct-20	288	11:32	8	Inside	0	25.0	6.4	No	
35	14-Oct-20	288	11:33	8	Inside	0	26.4	6.4	No	
36	14-Oct-20	288	11:33	8	Inside	0	14.0	4.5	No	
37	14-Oct-20	288	11:33	8	Inside	0	17.7	4.6	No	
38	14-Oct-20	288	11:33	8	Inside	0	20.9	9.9	No	
39	14-Oct-20	288	11:34	8	Inside	0	19.8	5.3	No	
40	14-Oct-20	288	11:34	8	Inside	0	16.1	4.4	No	
41	14-Oct-20	288	11:34	8	Inside	0	16.1	4.4	No	
42	14-Oct-20	288	11:35	8	Inside	0	28.1	7.5	No	
43	14-Oct-20	288	11:36	8	Inside	0	20.5	6.6	No	Very straight.
44	14-Oct-20	288	12:39	10	Outside	10	40.6	5.6	No	
45	14-Oct-20	288	12:41	10	Inside	0	47.7	6.4	Yes	Averaged.
46	14-Oct-20	288	12:42	10	Inside	0	26.6	7.9	No	
47	14-Oct-20	288	12:43	10	Inside	0	20.8	8.3	Yes	Averaged. Growing out from a pad.
48	14-Oct-20	288	12:45	10	Inside	0	41.8	7.8	No	Averaged.
49	14-Oct-20	288	12:46	10	Outside	30	24.4	7.2	No	
50	14-Oct-20	288	12:47	10	Outside	30	23.4	6.6	No	Averaged.
51	14-Oct-20	288	12:50	10	Inside	0	16.6	6.5	No	
52	14-Oct-20	288	12:59	11	Outside	5	48.0	7.6	No	Averaged. Surrounded by leaves.
53	14-Oct-20	288	13:01	11	Inside	0	16.6	4.8	No	
54	14-Oct-20	288	13:09	11	Outside	10	27.9	8.4	No	Parallel to ground and slightly damaged.
55	14-Oct-20	288	13:50	12	Inside	0	48.2	6.8	No	Bent over; has 2 segments.
56	14-Oct-20	288	13:53	12	Inside	0	27.5	5.6	Yes	Averaged.
57	14-Oct-20	288	13:55	12	Inside	0	30.0	9.3	Yes	Averaged. Very flat.
58	14-Oct-20	288	13:56	12	Inside	0	25.5	9.3	Yes	Averaged. Very flat.
59	14-Oct-20	288	14:34	13	Outside	2	21.4	7.9	Yes	Averaged. At edge of cactus patch; flat and growing out from pad.
60	14-Oct-20	288	14:36	13	Inside	0	88.4	10.8	No	Averaged. Have 4 segments.
61	14-Oct-20	288	14:36	13	Inside	0	36.9	5.4	No	
62	14-Oct-20	288	14:37	13	Inside	0	49.6	6.8	No	Standing straight up.
63	14-Oct-20	288	15:05	14	Inside	0	27.8	8.0	Yes	Averaged.
64	14-Oct-20	288	15:06	14	Inside	0	39.7	6.2	No	
65	14-Oct-20	288	15:09	14	Inside	0	22.2	3.8	No	
66	14-Oct-20	288	15:10	14	Inside	0	29.9	11.2	No	Averaged. A little flat.
67	14-Oct-20	288	15:11	14	Outside	10	19.0	5.9	Yes	Averaged. Growing out from pad.
68	14-Oct-20	288	15:16	14	Inside	0	43.2	6.4	No	
69	14-Oct-20	288	15:17	14	Inside	0	38.8	5.7	No	
70	14-Oct-20	288	15:19	14	Inside	0	17.7	7.5	No	

Table C4. Continued.

Fingerling ID	Date	Julian Date	Time	Site #	Inside/Outside Cactus Patch	Distance from closest patch (cm)	Height (mm)	Diameter (mm)	Unsure?	Notes
71	14-Oct-20	288	15:20	14	Inside	0	14.5	4.6	No	
72	14-Oct-20	288	15:21	14	Inside	0	37.1	6.0	Yes	Averaged.
73	14-Oct-20	288	15:22	14	Inside	0	37.1	6.6	Yes	Averaged.
74	14-Oct-20	288	15:23	14	Inside	0	22.6	6.8	No	Averaged.
75	14-Oct-20	288	15:24	14	Inside	0	27.0	11.8	No	
76	14-Oct-20	288	15:24	14	Inside	0	21.2	7.5	No	
77	14-Oct-20	288	15:24	14	Inside	0	18.3	2.1	No	
78	14-Oct-20	288	15:25	14	Inside	0	33.0	4.2	No	
79	14-Oct-20	288	15:26	14	Inside	0	18.5	4.5	No	
80	14-Oct-20	288	15:28	14	Inside	0	29.5	6.0	No	
81	14-Oct-20	288	15:29	14	Inside	0	51.3	7.0	No	
82	14-Oct-20	288	15:32	14	Inside	0	42.6	8.6	No	
83	15-Oct-20	289	10:15	15	Inside	0	46.7	7.0	No	
84	15-Oct-20	289	10:17	15	Inside	0	42.8	4.0	No	
85	15-Oct-20	289	10:20	15	Inside	0	52.9	5.9	Yes	
86	15-Oct-20	289	14:30	17	Inside	0	59.2	5.5	No	
87	15-Oct-20	289	14:35	17	Inside	0	36.9	6.9	No	
88	15-Oct-20	289	14:36	17	Inside	0	41.0	6.0	No	Inside of patch (middle) on bare soil. Bent over.
89	16-Oct-20	290	10:59	19	Outside	20	19.2	4.0	No	Bent over. May not survive; not shaded/sheltered by anything.
90	16-Oct-20	290	11:01	19	Inside	0	32.4	5.2	Yes	Standing straight up. Not as many spines (fuzziness) than the typical fingerlings.
91	16-Oct-20	290	11:03	19	Inside	0	22.1	5.9	No	Averaged. Slightly flat.
92	16-Oct-20	290	11:11	19	Outside	100	20.4	5.3	No	Not shaded at all.
93	16-Oct-20	290	11:20	19	Outside	200	66.7	7.7	No	Have 4 segments. Not shaded. Diameter measured at the bottom.
94	16-Oct-20	290	11:37	19	Outside	50	15.3	5.0	No	Just outside of site #19.
95	16-Oct-20	290	12:06	20	Inside	0	11.4	4.3	No	
96	16-Oct-20	290	12:07	20	Outside	10	8.4	4.0	No	
97	16-Oct-20	290	12:09	20	Outside	15	17.0	4.0	No	
98	16-Oct-20	290	12:10	20	Outside	5	11.7	4.8	No	
99	16-Oct-20	290	12:11	20	Inside	0	41.3	5.5	No	
100	16-Oct-20	290	12:13	20	Inside	0	19.9	5.1	No	
101	16-Oct-20	290	14:37	22	Inside	0	27.7	6.2	No	
102	16-Oct-20	290	14:40	22	Inside	0	22.7	6.8	No	
103	16-Oct-20	290	14:43	22	Outside	20	38.6	5.5	No	Dead fingerling.
104	16-Oct-20	290	15:25	24	Inside	0	44.9	4.3	No	Bent over under a cactus patch.
105	16-Oct-20	290	15:27	24	Outside	5	17.6	5.5	No	
106	16-Oct-20	290	16:03	25	Outside	300	31.1	4.4	No	The soil underneath is dark and more forest-like; It is also shaded by a tree.
107	16-Oct-20	290	16:03	25	Outside	300	31.1	5.2	No	
108	16-Oct-20	290	17:04	28	Outside	150	23.0	9.7	No	Right beside another fingerling (111). Not covered by plants and both fingerlings bent over.
109	16-Oct-20	290	17:04	28	Outside	150	29.4	7.2	No	Right beside another fingerling (110). Not covered by plants and both fingerlings bent over.
110	16-Oct-20	290	17:33	29	Outside	5	17.4	5.8	No	Covered by leaves.
111	17-Oct-20	291	9:18	31	Outside	1	12.4	3.5	No	At the edge.
112	17-Oct-20	291	9:19	31	Outside	1	8.4	3.4	No	At the edge.
113	17-Oct-20	291	10:30	33	Inside	0	82.2	6.9	No	Measured at the bottom.
114	17-Oct-20	291	11:08	32	Inside	0	18.4	5.2	No	No patch covering fingerling. Surrounded by needles.
115	17-Oct-20	291	11:09	32	Inside	0	24.5	4.7	No	All four sites in site #32 are surrounded by needles.
116	17-Oct-20	291	11:11	32	Inside	0	37.3	4.9	No	
117	17-Oct-20	291	11:12	32	Inside	0	20.5	4.6	No	
118	17-Oct-20	291	11:21	32	Outside	4	19.4	6.2	No	Near patch 3.
119	17-Oct-20	291	11:22	32	Outside	4	12.6	7.0	No	Near patch 3.
120	17-Oct-20	291	13:39	35	Inside	0	47.3	5.6	No	
121	17-Oct-20	291	13:39	35	Inside	0	38.9	4.1	No	
122	17-Oct-20	291	13:55	35	Outside	60	52.1	5.9	Yes	Could be growing from a cladode. It is shaded by a cactus pad.
123	17-Oct-20	291	14:38	36	Inside	0	16.6	3.0	No	
124	17-Oct-20	291	14:53	36	Outside	2	38.5	6.4	No	Averaged.
125	17-Oct-20	291	14:53	36	Inside	0	39.9	5.6	No	
126	17-Oct-20	291	14:54	36	Inside	0	57.9	6.6	Yes	Averaged.
127	17-Oct-20	291	14:57	36	Inside	0	41.1	3.6	No	
128	17-Oct-20	291	14:57	36	Inside	0	18.3	3.6	No	
129	17-Oct-20	291	16:24	38	Inside	0	13.2	4.9	No	

Table C5. Descriptive data of digital evidence recorded by trail cameras at 4 sites in Point Pelee National Park. Two sites are located at West Beach (WB) and two sites are located at DeLaurier Homestead (DeL). Data recorded from August 6 to October 18, 2020.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
1	05-Aug-20	218	13:15	A	1	22	WB	Wild Turkey	1	Out	Resting	Day	Resting in open area east of a cactus patch
2	05-Aug-20	218	13:16	A	1	23	WB	Wild Turkey	1	Out	Travelling	Day	Walked into forest
3	05-Aug-20	218	22:48	N	4	627	WB	Opossum	1	Out	Climbing	Night	Camera moved/angled down by animal
4	05-Aug-20	218	22:48	N	4	628	WB	Opossum	1	Out	Climbing	Night	Camera moved/angled down by animal
5	06-Aug-20	219	1:22	N	4	630	WB	Opossum	1	Out	Travelling	Night	In picture not video
6	06-Aug-20	219	0:34	N	3	806	DeL	Raccoon	1	Out	Travelling	Night	
7	06-Aug-20	219	3:21	N	3	807	DeL	Deer	1	Edge	Travelling	Night	Walked by; Might have fed on grass close to cactus patch
8	06-Aug-20	219	7:57	M	3	808	DeL	Rabbit	1	Out	Foraging	Day	Feeds on grass/plants - did not go to near cactus patch
9	06-Aug-20	219	7:57	M	3	809	DeL	Rabbit	1	Out	Travelling	Day	
10	06-Aug-20	219	8:00	M	3	810	DeL	Rabbit	1	Out	Travelling	Day	
11	06-Aug-20	219	8:02	M	3	811	DeL	Rabbit	1	Out	Travelling	Day	
12	06-Aug-20	219	8:17	M	3	812	DeL	Rabbit	1	Out	Foraging	Day	Feeds on grass/plants - did not go to near cactus patch
13	06-Aug-20	219	8:18	M	3	813	DeL	Rabbit	1	Out	Foraging	Day	Feeds on grass/plants - did not go to near cactus patch
14	06-Aug-20	219	7:37	M	2	232	DeL	Bird	1	Edge	Foraging	Day	Species unknown; behind a tree
15	06-Aug-20	219	7:39	M	2	233	DeL	Bird	1	In	Foraging	Day	Fed/gathered dried grass within cactus patch; primarily brown colored and has a stripe on the head
16	06-Aug-20	219	7:50	M	2	234	DeL	Bird	2	In	Foraging	Day	Fed/gathered dried grass within cactus patch; primarily brown colored and has a stripe on the head
17	06-Aug-20	219	7:50	M	2	235	DeL	Bird	1	In	Foraging	Day	Fed/gathered dried grass within cactus patch; primarily brown colored and has a stripe on the head
18	06-Aug-20	219	7:50	M	2	235	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
19	06-Aug-20	219	7:51	M	2	236	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
20	06-Aug-20	219	7:51	M	2	237	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
21	06-Aug-20	219	7:51	M	2	238	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
22	06-Aug-20	219	7:58	M	2	239	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
23	06-Aug-20	219	8:02	M	2	240	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
24	06-Aug-20	219	8:02	M	2	241	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
25	06-Aug-20	219	8:02	M	2	242	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
26	06-Aug-20	219	8:03	M	2	243	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
27	06-Aug-20	219	8:03	M	2	244	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
28	06-Aug-20	219	8:04	M	2	245	DeL	Rabbit	1	Edge	Foraging	Day	**Fed on grass and cactus pad at the edge of the cactus**
29	06-Aug-20	219	8:04	M	2	246	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
30	06-Aug-20	219	8:05	M	2	247	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
31	06-Aug-20	219	8:06	M	2	248	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
32	06-Aug-20	219	8:10	M	2	249	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
33	06-Aug-20	219	8:12	M	2	250	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
34	06-Aug-20	219	8:13	M	2	251	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
35	06-Aug-20	219	8:14	M	2	252	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
36	06-Aug-20	219	8:15	M	2	253	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
37	06-Aug-20	219	8:17	M	2	254	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
38	06-Aug-20	219	8:22	M	2	255	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
39	06-Aug-20	219	8:23	M	2	256	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
40	06-Aug-20	219	8:25	M	2	257	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
41	06-Aug-20	219	8:25	M	2	258	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
42	06-Aug-20	219	8:27	M	2	259	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch and then
43	06-Aug-20	219	8:27	M	2	260	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass at the edge of the cactus patch; also fed on something under a cactus pad
44	06-Aug-20	219	8:39	M	2	261	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
45	06-Aug-20	219	8:44	M	2	262	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
46	06-Aug-20	219	8:45	M	2	263	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
47	06-Aug-20	219	8:46	M	2	264	DeL	Rabbit	1	In	Foraging	Day	**Fed on wilted(dead) flower on cactus fruit**
48	06-Aug-20	219	8:46	M	2	265	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
49	06-Aug-20	219	8:47	M	2	266	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
50	06-Aug-20	219	8:47	M	2	267	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
51	06-Aug-20	219	8:48	M	2	268	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
52	06-Aug-20	219	8:48	M	2	269	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plants within the cactus patch
53	06-Aug-20	219	8:50	M	2	270	DeL	Rabbit	1	In	Foraging	Day	Fed on grass/plant within the cactus patch then hopped
54	06-Aug-20	219	9:00	M	2	271	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
55	06-Aug-20	219	9:02	M	2	272	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
56	06-Aug-20	219	9:04	M	2	273	DeL	Rabbit	1	Edge	Foraging	Day	**Fed on wilted(dead) flower on cactus fruit**
57	06-Aug-20	219	9:04	M	2	274	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
58	06-Aug-20	219	9:10	M	2	275	DeL	Rabbit	1	Edge	Foraging	Day	**Fed on cactus pad at the edge**
59	06-Aug-20	219	9:11	M	2	276	DeL	Rabbit	1	Edge	Foraging	Day	**Fed on cactus pad at the edge**
60	06-Aug-20	219	9:14	M	2	277	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
61	06-Aug-20	219	9:14	M	2	278	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
62	06-Aug-20	219	9:20	M	2	279	DeL	Rabbit	1	Edge	Foraging	Day	Fed on grass/plants at the edge of the cactus patch
63	09-Aug-20	222	6:14	M	1	1926	WB	Deer	1	Out	Observing	Windy	Behind tall grass near cactus patch
64	09-Aug-20	222	6:19	M	1	1927	WB	Deer	1	Out	Travelling	Windy	Behind tall grass near cactus patch
65	09-Aug-20	222	16:21	A	1	2780	WB	Unknown	1	Out	Travelling	Day	**Pic/Vid 2780 - 2788 shows a small bug/frog/animal crawling up a tall grass in front of the cactus patch**
66	09-Aug-20	222	16:22	A	1	2782	WB	Unknown	1	Out	Travelling	Day	Pic/Vid 2780 - 2788 shows a small bug/frog/animal crawling up a tall grass in front of the cactus patch
67	09-Aug-20	222	16:22	A	1	2784	WB	Unknown	1	Out	Travelling	Day	Pic/Vid 2780 - 2788 shows a small bug/frog/animal crawling up a tall grass in front of the cactus patch
68	09-Aug-20	222	16:22	A	1	2786	WB	Unknown	1	Out	Travelling	Day	Pic/Vid 2780 - 2788 shows a small bug/frog/animal crawling up a tall grass in front of the cactus patch
69	09-Aug-20	222	16:23	A	1	2788	WB	Unknown	1	Out	Travelling	Day	Pic/Vid 2780 - 2788 shows a small bug/frog/animal crawling up a tall grass in front of the cactus patch
70	11-Aug-20	224	22:42	N	1	5674	WB	Rabbit	1	Edge	Foraging	Night	Fed on grass/plants at the edge of the cactus patch

Table C5. Continued.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
71	11-Aug-20	224	22:42	N	1	5676	WB	Rabbit	1	Edge	Travelling	Night	
72	11-Aug-20	224	22:43	N	1	5678	WB	Rabbit	1	Out	Travelling	Night	Hopped away into the bushes
73	11-Aug-20	224	23:10	N	1	5680	WB	Rabbit	1	Out	Travelling	Night	
74	12-Aug-20	225	2:20	N	1	5682	WB	Rabbit	1	Out	Travelling	Night	Another animal that passed over camera lens - spider?
75	12-Aug-20	225	2:32	N	1	5684	WB	Rabbit	1	Edge	Travelling	Night	
76	12-Aug-20	225	2:32	N	1	5686	WB	Rabbit	1	Out	Foraging	Night	Fed on grass/plants near cactus patch
77	12-Aug-20	225	4:20	N	1	5688	WB	Rabbit	1	Out	Travelling	Night	
78	12-Aug-20	225	4:20	N	1	5690	WB	Rabbit	1	Edge	Foraging	Night	Fed on grass/plants at the edge of the cactus patch
79	12-Aug-20	225	4:20	N	1	5692	WB	Rabbit	1	Out	Travelling	Night	
80	12-Aug-20	225	4:24	N	1	5694	WB	Rabbit	1	Out	Travelling	Night	
81	12-Aug-20	225	4:25	N	1	5696	WB	Rabbit	1	Out	Travelling	Night	
82	12-Aug-20	225	4:28	N	1	5698	WB	Rabbit	1	Out	Foraging	Night	Fed on grass/plants near cactus patch
83	12-Aug-20	225	4:28	N	1	5700	WB	Rabbit	1	Out	Travelling	Night	
84	12-Aug-20	225	4:31	N	1	5702	WB	Rabbit	1	Out	Travelling	Night	
85	12-Aug-20	225	4:44	N	1	5704	WB	Rabbit	1	Out	Travelling	Night	
86	09-Aug-20	222	16:50	A	3	3857	DeL	Bird	1	Out	Resting	Day	Hopped/flew on plants close to cactus patch
87	09-Aug-20	222	16:50	A	3	3859	DeL	Bird	1	Out	Resting	Day	Hopped/flew into stalk of a plant at the edge of cactus
88	10-Aug-20	223	12:05	A	3	4398	DeL	Bird	1	Out	Resting	Day	On coniferous tree beside cactus patch
89	10-Aug-20	223	21:28	N	3	5725	DeL	Raccoon	1	Out	Travelling	Night	
90	11-Aug-20	224	18:37	N	3	7118	DeL	Rabbit	1	Out	Foraging	Day	Ate some grass and then hopped away
91	12-Aug-20	225	1:35	N	3	7120	DeL	Raccoon	1	Out	Travelling	Night	
92	12-Aug-20	225	3:36	N	3	7122	DeL	Raccoon	1	Out	Travelling	Night	
93	12-Aug-20	225	7:00	M	3	7124	DeL	Rabbit	1	Out	Foraging	Foggy	
94	12-Aug-20	225	7:01	M	3	7126	DeL	Rabbit	1	Out	Travelling	Foggy	
95	12-Aug-20	225	9:32	M	3	7127	DeL	Wild Turkey	2	Out	Travelling	Day	Walked pass cactus patch
96	12-Aug-20	225	9:33	M	3	7129	DeL	Wild Turkey	1	Out	Travelling	Day	
97	12-Aug-20	225	12:38	A	3	7495	DeL	Wild Turkey	1	Out	Travelling	Day	
98	12-Aug-20	225	3:16	N	4	8624	WB	Opossum	1	Edge	Travelling	Night	**Seemed curious about cactus patch/grass inside patch then ran away; may have stepped on a cactus pad**
99	13-Aug-20	226	7:12	M	1	130	WB	Rabbit	1	Out	Travelling	Day	
100	14-Aug-20	227	2:06	N	1	414	WB	Raccoon	1	Out	Travelling	Night	Walked pass cactus patch
101	15-Aug-20	228	0:50	N	1	658	WB	Opossum	1	Out	Travelling	Night	
102	15-Aug-20	228	9:55	M	1	659	WB	Squirrel	1	Out	Travelling	Day	
103	15-Aug-20	228	22:00	N	1	888	WB	Raccoon	1	Out	Travelling	Night	
104	16-Aug-20	229	0:28	N	1	889	WB	Raccoon	1	Out	Travelling	Night	
105	17-Aug-20	230	0:35	N	1	973	WB	Rabbit	1	Out	Travelling	Night	
106	17-Aug-20	230	1:22	N	1	974	WB	Rabbit	1	Edge	Foraging	Night	Fed on grass/plants at the edge of the cactus patch
107	17-Aug-20	230	1:25	N	1	975	WB	Rabbit	1	Out	Travelling	Night	
108	17-Aug-20	230	20:31	N	1	1129	WB	Squirrel	1	Out	Travelling	Day	Sun is out
109	17-Aug-20	230	21:01	N	1	1130	WB	Rabbit	1	Out	Travelling	Night	
110	17-Aug-20	230	21:17	N	1	1131	WB	Rabbit	1	Edge	Foraging	Night	Fed on grass/plants at the edge of the cactus patch
111	17-Aug-20	230	21:32	N	1	1132	WB	Rabbit	1	Out	Travelling	Night	Hopped around the site very fast; chased?
112	18-Aug-20	231	0:10	N	1	1133	WB	Raccoon	1	Out	Travelling	Night	
113	18-Aug-20	231	0:39	N	1	1134	WB	Raccoon	1	Out	Travelling	Night	
114	18-Aug-20	231	3:56	N	1	1135	WB	Skunk	1	Out	Travelling	Night	
115	18-Aug-20	231	3:58	N	1	1136	WB	Raccoon	1	Out	Travelling	Night	
116	18-Aug-20	231	4:00	N	1	1137	WB	Raccoon	1	Out	Travelling	Night	
117	18-Aug-20	231	5:16	N	1	1138	WB	Skunk	1	Out	Travelling	Night	
118	18-Aug-20	231	20:48	N	1	1356	WB	Raccoon	1	Out	Travelling	Night	
119	19-Aug-20	232	7:25	M	1	1358	WB	Rabbit	1	Out	Travelling	Night	
120	19-Aug-20	232	7:38	M	1	1359	WB	Rabbit	1	Out	Travelling	Night	
121	12-Aug-20	225	19:37	N	3	125	DeL	Squirrel	1	Out	Travelling	Day	Appears to avoid cactus patch after taking a look at it
122	12-Aug-20	225	22:26	N	3	126	DeL	Rabbit	1	Out	Travelling	Night	
123	13-Aug-20	226	1:17	N	3	127	DeL	Raccoon	1	Out	Travelling	Night	
124	13-Aug-20	226	6:26	M	3	128	DeL	Rabbit	1	Out	Foraging	Foggy	
125	13-Aug-20	226	6:27	M	3	129	DeL	Rabbit	1	Out	Travelling	Foggy	
126	13-Aug-20	226	23:59	N	3	433	DeL	Raccoon	1	Out	Travelling	Night	
127	14-Aug-20	227	9:36	M	3	436	DeL	Wild Turkey	1	Out	Travelling	Day	
128	15-Aug-20	228	20:03	N	3	974	DeL	Rabbit	1	Out	Foraging	Day	
129	16-Aug-20	229	1:16	N	3	975	DeL	Raccoon	1	Out	Travelling	Night	
130	16-Aug-20	229	8:21	M	3	976	DeL	Wild Turkey	1	Out	Travelling	Day	
131	16-Aug-20	229	8:33	M	3	977	DeL	Wild Turkey	1	Out	Travelling	Day	
132	16-Aug-20	229	11:51	M	3	979	DeL	Wild Turkey	2	Out	Foraging	Day	Feeding on grass/plants outside of cactus patch
133	16-Aug-20	229	18:59	N	3	1091	DeL	Rabbit	1	Out	Travelling	Day	
134	16-Aug-20	229	19:18	N	3	1092	DeL	Rabbit	1	Out	Travelling	Day	
135	16-Aug-20	229	19:27	N	3	1093	DeL	Rabbit	1	Out	Travelling	Day	
136	17-Aug-20	230	8:15	M	3	1094	DeL	Squirrel	1	Out	Travelling	Day	
137	17-Aug-20	230	23:16	N	3	1276	DeL	Raccoon	1	Out	Travelling	Night	
138	19-Aug-20	232	2:23	N	3	1536	DeL	Raccoon	1	Out	Travelling	Night	
139	19-Aug-20	232	4:50	N	3	1537	DeL	Deer	1	Edge	Foraging	Night	Feeding on grass/plants beside cactus patch
140	19-Aug-20	232	4:51	N	3	1538	DeL	Deer	1	Out	Travelling	Night	
141	19-Aug-20	232	21:58	N	1	195	WB	Raccoon	1	Out	Travelling	Night	
142	19-Aug-20	232	23:11	N	1	196	WB	Rabbit	1	Out	Observing	Night	
143	20-Aug-20	233	7:10	M	1	197	WB	Squirrel	1	Out	Travelling	Day	
144	21-Aug-20	234	8:33	M	1	449	WB	Deer	1	Out	Foraging	Day	Feeding on grass/plants outside of cactus patch
145	21-Aug-20	234	21:03	N	1	678	WB	Deer	1	Out	Travelling	Night	Walked around
146	21-Aug-20	234	21:04	N	1	679	WB	Deer	1	Out	Travelling	Night	Ran; Hopped over cactus patch - may be chased?
147	23-Aug-20	236	5:48	N	1	842	WB	Unknown	1	Out	Travelling	Night	Hopped off screen very fast; most likely a rabbit
148	23-Aug-20	236	8:19	M	1	843	WB	Deer	2	Edge	Travelling	Day	One may have been feeding on cactus (RP) according to the photo; the same deer was filmed running/jumping
149	23-Aug-20	236	21:48	N	1	1074	WB	Unknown	1	Out	Travelling	Night	Can only see behind - small mammal; looks most similar
150	25-Aug-20	238	2:16	N	1	1270	WB	Skunk	1	Out	Digging	Night	Dug a hole near a cactus patch (LP); searching for food?

Table C5. Continued.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
151	25-Aug-20	238	4:21	N	1	1271	WB	Skunk	1	Edge	Travelling	Night	Ignored cactus patch and kept walking
152	25-Aug-20	238	4:25	N	1	1272	WB	Skunk	1	Out	Observing	Night	Hiding behind tall grasses until raccoon starts to approach
153	25-Aug-20	238	4:25	N	1	1272	WB	Raccoon	1	Out	Travelling	Night	Walks around cactus patch and approaches skunk
154	26-Aug-20	239	1:50	N	1	1372	WB	Raccoon	1	Out	Travelling	Night	
155	26-Aug-20	239	2:13	N	1	1373	WB	Opossum	1	In	Travelling	Night	Walked through a cactus patch (RP) - video work only
156	20-Aug-20	233	20:16	N	2	184	DeL	Raccoon	3	Edge	Travelling	Day	2 baby raccoons followed the adult
157	20-Aug-20	233	21:15	N	2	185	DeL	Raccoon	1	Edge	Travelling	Night	walked by cactus patch
158	21-Aug-20	234	10:32	M	2	187	DeL	Wild Turkey	9	Edge	Travelling	Sunny	1 adult + 9 babies approaching cactus patch and open
159	21-Aug-20	234	10:34	M	2	188	DeL	Wild Turkey	3	In	Foraging	Sunny	**Feeding on grass/plants inside cactus patch (3 babies)**
160	21-Aug-20	234	10:35	M	2	189	DeL	Wild Turkey	1	Out	Resting	Sunny	Sitting in open area for the first few seconds before
161	21-Aug-20	234	10:37	M	2	190	DeL	Wild Turkey	3	Edge	Resting	Sunny	3 babies sitting/standing to rest or groom themselves
162	21-Aug-20	234	10:37	M	2	190	DeL	Wild Turkey	1	In	Observing	Sunny	Adult walked into patch and observed surrounding
163	21-Aug-20	234	10:39	M	2	191	DeL	Wild Turkey	4	Edge	Resting	Sunny	3 babies sitting to rest or groom themselves; adult walks
164	21-Aug-20	234	10:40	M	2	192	DeL	Wild Turkey	3	Edge	Resting	Sunny	2 babies sitting to rest/nap + 1 baby walked by
165	21-Aug-20	234	10:48	M	2	193	DeL	Wild Turkey	1	In	Travelling	Sunny	Adult walks straight through cactus patch toward forest
166	21-Aug-20	234	19:29	N	2	347	DeL	Raccoon	2	Edge	Travelling	Day	2 babies walked by cactus patch
167	22-Aug-20	235	0:55	N	2	348	DeL	Raccoon	1	Edge	Travelling	Night	
168	22-Aug-20	235	6:42	M	2	349	DeL	Raccoon	1	Edge	Travelling	Night	
169	22-Aug-20	235	20:08	N	2	553	DeL	Raccoon	1	Edge	Travelling	Day	
170	23-Aug-20	236	17:28	A	2	761	DeL	Wild Turkey	1	Edge	Travelling	Day	Derpy looking Male adult; ran away
171	24-Aug-20	237	9:23	M	2	766	DeL	Squirrel	1	Out	Travelling	Day	
172	25-Aug-20	238	1:08	N	2	908	DeL	Raccoon	1	Edge	Travelling	Night	
173	20-Aug-20	233	7:03	M	3	127	DeL	Rabbit	1	Out	Travelling	Day	Hopped very fast
174	20-Aug-20	233	0:49	N	3	225	DeL	Bird	1	Edge	Resting	Day	Hopped on a plant at the edge of the cactus patch
175	21-Aug-20	234	12:08	A	3	402	DeL	Ermine	1	Out	Travelling	Night	Short-tailed weasel; can be distinguished from mink because of the black-tipped tail
176	21-Aug-20	234	6:24	M	3	403	DeL	Rabbit	1	Out	Foraging	Day	Feeding on grass
177	21-Aug-20	234	6:55	M	3	404	DeL	Rabbit	1	Out	Travelling	Day	
178	21-Aug-20	234	7:34	M	3	405	DeL	Squirrel	1	Out	Travelling	Day	
179	22-Aug-20	235	7:25	M	3	663	DeL	Bird	1	Out	Travelling	Day	Northern Flicker
180	22-Aug-20	235	7:27	M	3	664	DeL	Bird	1	Out	Travelling	Day	Northern Flicker - runs away followed by rabbit
181	22-Aug-20	235	7:27	M	3	664	DeL	Rabbit	1	Out	Travelling	Day	Followed Northern Flicker
182	22-Aug-20	235	7:41	M	3	666	DeL	Rabbit	1	Out	Travelling	Day	
183	22-Aug-20	235	7:47	M	3	667	DeL	Rabbit	1	Out	Travelling	Day	
184	22-Aug-20	235	7:50	M	3	668	DeL	Rabbit	1	Out	Travelling	Day	
185	22-Aug-20	235	8:53	M	3	669	DeL	Squirrel	1	Edge	Foraging	Day	Eats leaves from a plant at the edge of cactus patch
186	22-Aug-20	235	9:23	M	3	670	DeL	Rabbit	1	Out	Foraging	Day	Feeding on grass/plants outside of cactus patch
187	23-Aug-20	236	9:37	M	3	907	DeL	Squirrel	1	Out	Travelling	Day	
188	24-Aug-20	237	11:07	M	3	1189	DeL	Wild Turkey	1	Out	Travelling	Day	In the background; behind goldenrods
189	24-Aug-20	237	11:12	M	3	1191	DeL	Wild Turkey	1	Out	Travelling	Day	In the background; behind goldenrods; may be feeding
190	24-Aug-20	237	11:13	M	3	1192	DeL	Wild Turkey	3	Out	Travelling	Day	In the background; behind goldenrods; may be feeding
191	24-Aug-20	237	12:27	A	3	1241	DeL	Wild Turkey	1	Out	Travelling	Day	In the background; behind goldenrods
192	24-Aug-20	237	12:28	A	3	1242	DeL	Wild Turkey	1	Out	Travelling	Day	In the background; behind goldenrods
193	25-Aug-20	238	9:09	M	3	1420	DeL	Wild Turkey	1	Out	Observing	Day	
194	25-Aug-20	238	22:47	N	3	1580	DeL	Raccoon	1	Out	Travelling	Night	
195	27-Aug-20	240	3:08	N	1	52	WB	Unknown	1	Out	Travelling	Windy	Small mammal behind a bush; most likely a rabbit
196	27-Aug-20	240	5:25	N	1	53	WB	Rabbit	1	Out	Travelling	Windy	
197	28-Aug-20	241	2:08	N	1	173	WB	Opossum	1	Edge	Travelling	Night	Walked around the cactus patches; actively avoiding
198	29-Aug-20	242	22:23	N	1	290	WB	Rabbit	1	Out	Travelling	Night	
199	30-Aug-20	243	1:35	N	1	291	WB	Rabbit	1	Out	Travelling	Night	
200	30-Aug-20	243	1:37	N	1	292	WB	Rabbit	1	Out	Travelling	Night	
201	30-Aug-20	243	6:24	M	1	293	WB	Rabbit	1	Out	Travelling	Night	
202	31-Aug-20	244	1:58	N	1	378	WB	Rabbit	1	Out	Foraging	Night	Feeding on grass/plants outside of cactus patch
203	01-Sep-20	245	3:40	N	1	459	WB	Opossum	1	Edge	Travelling	Night	
204	04-Sep-20	248	3:55	N	1	874	WB	Rabbit	1	Out	Foraging	Night	Feeding on grass/plants outside of cactus patch
205	05-Sep-20	249	2:15	N	1	1032	WB	Opossum	1	Out	Travelling	Night	A tall animal (or human?) sihouette moving behind the
206	05-Sep-20	249	2:49	N	1	1033	WB	Opossum	1	Out	Travelling	Night	
207	05-Sep-20	249	5:44	N	1	1034	WB	Rabbit	1	Out	Resting	Windy	
208	26-Aug-20	239	13:40	A	2	8	DeL	Bird	1	Edge	Observing	Day	Brown bird was on the ground at the edge of the cactus patch and flew onto branch of a plant within cactus patch
209	26-Aug-20	239	17:22	A	2	79	DeL	Wild Turkey	1	Edge	Travelling	Day	Camera partially covered by a large bug
210	26-Aug-20	239	17:24	A	2	80	DeL	Wild Turkey	2	Edge	Travelling	Day	1 baby and 1 adult; Camera partially covered by a large
211	27-Aug-20	240	5:24	N	2	84	DeL	Ermine	1	Out	Travelling	Night	
212	29-Aug-20	242	0:28	N	2	221	DeL	Bird	1	In	Resting	Windy	Small bird resting on a cactus pad in the back
213	29-Aug-20	242	0:29	N	2	222	DeL	Bird	1	In	Resting	Windy	Bird hops off the cactus
214	30-Aug-20	243	8:27	M	2	348	DeL	Squirrel	1	Out	Travelling	Day	
215	30-Aug-20	243	11:15	M	2	352	DeL	Rabbit	1	Out	Travelling	Day	Also resembles a squirrel a little (head is small)
216	05-Sep-20	249	7:11	M	2	994	DeL	Squirrel	1	Out	Travelling	Day	
217	05-Sep-20	249	7:51	M	2	995	DeL	Squirrel	1	Out	Travelling	Day	
218	05-Sep-20	249	9:07	M	2	996	DeL	Wild Turkey	3	Edge	Travelling	Day	1 adult followed by 2 small ones
219	27-Aug-20	240	9:07	M	3	90	DeL	Wild Turkey	5	Edge	Foraging	Day	**5 babies; 1 stepped into cactus patch from the edge; feeding on grass/plants around and within cactus patch**
220	27-Aug-20	240	9:08	M	3	91	DeL	Wild Turkey	1	Out	Travelling	Day	Adult
221	27-Aug-20	240	9:18	M	3	92	DeL	Wild Turkey	4	Out	Foraging	Day	4 babies; searching for food around cactus patch
222	27-Aug-20	240	9:19	M	3	93	DeL	Wild Turkey	5	Out	Travelling	Day	3 babies and 2 adults
223	27-Aug-20	240	9:48	M	3	94	DeL	Wild Turkey	6	Out	Travelling	Day	All adults; appears to be all male
224	28-Aug-20	241	0:41	N	3	320	DeL	Raccoon	1	Out	Travelling	Night	
225	28-Aug-20	241	16:31	A	3	339	DeL	Wild Turkey	1	Out	Travelling	Wet	
226	29-Aug-20	242	6:28	M	3	340	DeL	Rabbit	1	Out	Travelling	Night	
227	29-Aug-20	242	8:21	M	3	341	DeL	Bird	1	Out	Observing	Wet	Robin
228	29-Aug-20	242	8:27	M	3	343	DeL	Bird	2	Out	Foraging	Wet	Robins; feeding on grass/plants/bugs outside of cactus
229	29-Aug-20	242	8:42	M	3	344	DeL	Bird	1	Out	Observing	Wet	Northern Flicker
230	29-Aug-20	242	8:53	M	3	345	DeL	Wild Turkey	4	Out	Travelling	Wet	All adults; appears to be all male

Table C5. Continued.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
231	29-Aug-20	242	8:56	M	3	346	DeL	Wild Turkey	3	Out	Travelling	Wet	All adults; appears to be all male
232	29-Aug-20	242	9:06	M	3	347	DeL	Bird	1	Out	Observing	Wet	Robin
233	29-Aug-20	242	9:07	M	3	348	DeL	Bird	1	Out	Foraging	Wet	Robin; pecked at ground for food
234	29-Aug-20	242	9:09	M	3	349	DeL	Bird	3	Out	Observing	Wet	Robin
235	29-Aug-20	242	9:11	M	3	350	DeL	Bird	4	Out	Foraging	Wet	Robin; 2 of them were flying/chasing each other while the other two were pecking the ground
236	30-Aug-20	243	4:48	N	3	514	DeL	Skunk	1	Edge	Travelling	Night	Appears to be searching for something at the edge of the
237	30-Aug-20	243	21:27	N	3	691	DeL	Rabbit	1	Out	Travelling	Night	
238	31-Aug-20	244	3:55	N	3	692	DeL	Unknown	1	Out	Observing	Foggy	Can only see eyes - small mammal (ermine or rabbit)
239	31-Aug-20	244	7:14	M	3	693	DeL	Unknown	1	Out	Travelling	Foggy	Small mammal outline; most likely a squirrel or rabbit
240	31-Aug-20	244	21:48	N	3	921	DeL	Rabbit	1	Out	Travelling	Night	
241	01-Sep-20	245	0:38	N	3	922	DeL	Raccoon	1	Out	Travelling	Night	
242	01-Sep-20	245	7:25	M	3	923	DeL	Rabbit	1	Out	Resting	Day	
243	02-Sep-20	246	21:23	N	3	1260	DeL	Opossum	1	Out	Travelling	Night	
244	03-Sep-20	247	6:15	M	3	1262	DeL	Rabbit	1	Out	Foraging	Night	Feeding on grass/plants just outside of cactus patch
245	03-Sep-20	247	6:17	M	3	1263	DeL	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants at the edge of cactus patch
246	03-Sep-20	247	7:24	M	3	1265	DeL	Squirrel	1	Out	Travelling	Foggy	
247	03-Sep-20	247	23:12	N	3	1540	DeL	Raccoon	1	Out	Travelling	Night	
248	04-Sep-20	248	5:58	N	3	1541	DeL	Deer	1	Out	Foraging	Night	
249	04-Sep-20	248	6:40	M	3	1542	DeL	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants at the edge of cactus patch
250	04-Sep-20	248	6:42	M	3	1543	DeL	Rabbit	1	Edge	Foraging	Day	Feeding on grass/plants at the edge of cactus patch
251	04-Sep-20	248	6:43	M	3	1544	DeL	Rabbit	1	Out	Foraging	Day	Feeding on grass/plants just outside of cactus patch
252	04-Sep-20	248	6:44	M	3	1545	DeL	Rabbit	1	Edge	Foraging	Day	Feeding on grass/plants at the edge of cactus patch
253	04-Sep-20	248	6:45	M	3	1546	DeL	Rabbit	1	Out	Foraging	Day	Feeding on grass/plants just outside of cactus patch
254	04-Sep-20	248	7:38	M	3	1547	DeL	Rabbit	1	Out	Foraging	Day	Feeding on grass/plants just outside of cactus patch; stood on hindlegs to feed
255	04-Sep-20	248	7:40	M	3	1548	DeL	Rabbit	1	Out	Travelling	Day	
256	04-Sep-20	248	7:41	M	3	1549	DeL	Rabbit	1	Out	Travelling	Day	
257	05-Sep-20	249	2:30	N	3	1836	DeL	Skunk	1	Out	Travelling	Night	
258	30-Aug-20	243	5:14	N	4	392	WB	Rabbit	1	Edge	Travelling	Night	
259	31-Aug-20	244	5:01	N	4	591	WB	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants at the edge of cactus patch
260	02-Sep-20	246	7:10	M	4	1035	WB	Raccoon	1	Out	Travelling	Wet	
261	05-Sep-20	249	21:30	N	1	23	WB	Opossum	1	Out	Travelling	Night	
262	05-Sep-20	249	21:41	N	1	24	WB	Opossum	1	Out	Foraging	Night	Feeding on grass/plants outside of cactus patch
263	05-Sep-20	249	21:43	N	1	25	WB	Opossum	1	Out	Travelling	Night	
264	06-Sep-20	250	3:15	N	1	27	WB	Rabbit	1	Out	Observing	Foggy	
265	06-Sep-20	250	22:13	N	1	32	WB	Opossum	1	Out	Travelling	Night	
266	09-Sep-20	253	1:41	N	1	86	WB	Raccoon	1	Out	Travelling	Night	
267	10-Sep-20	254	6:38	M	1	88	WB	Rabbit	1	Out	Travelling	Night	
268	10-Sep-20	254	7:54	M	1	89	WB	Squirrel	1	Out	Travelling	Day	
269	10-Sep-20	254	14:03	A	1	97	WB	Bird	1	Out	Resting	Day	Songbird - based on wing pattern and tail it should be a
270	10-Sep-20	254	15:11	A	1	98	WB	Wild Turkey	7	Edge	Foraging	Day	**1 adult, the rest are young ones; 2 young ones were feeding at the edge of a cactus patch (pecking at plants/insects/cactus) while the rest were searching for**
271	11-Sep-20	255	7:03	M	1	99	WB	Bird	1	Out	Travelling	Day	Video in black and white
272	11-Sep-20	255	20:46	N	1	252	WB	Rabbit	1	Out	Travelling	Night	
273	12-Sep-20	256	4:09	N	1	253	WB	Rabbit	1	Out	Travelling	Night	
274	12-Sep-20	256	6:54	M	1	254	WB	Bird	1	Edge	Foraging	Night	Songbird is at the edge of left cactus patch and appears to be pecking around before hopping away.
275	12-Sep-20	256	22:57	N	1	315	WB	Rabbit	1	Out	Travelling	Night	
276	13-Sep-20	257	8:25	M	1	317	WB	Squirrel	1	Out	Travelling	Day	
277	14-Sep-20	258	6:55	M	1	402	WB	Bird	1	Out	Resting	Night	Songbird - could be a flycatcher or vireo; video in black
278	05-Sep-20	249	18:07	N	2	93	DeL	Raccoon	1	Out	Travelling	Day	
279	06-Sep-20	250	10:02	M	2	95	DeL	Squirrel	1	Out	Travelling	Wet	Appears to be searching for something
280	07-Sep-20	251	15:49	A	2	527	DeL	Bird	1	Edge	Foraging	Day	Northern Flicker; pecking at ground of the cactus patch's
281	08-Sep-20	252	12:36	A	2	586	DeL	Raccoon	1	Edge	Travelling	Day	
282	08-Sep-20	252	17:25	A	2	652	DeL	Squirrel	1	Edge	Digging	Day	**Has eastern black walnut fruit in its mouth while digging around the edge of the cactus patch**
283	13-Sep-20	257	17:05	A	2	1042	DeL	Squirrel	1	Out	Travelling	Day	
284	14-Sep-20	258	3:44	N	2	1043	DeL	Raccoon	1	Edge	Travelling	Night	
285	05-Sep-20	249	12:15	A	3	9	DeL	Wild Turkey	1	Out	Travelling	Day	
286	05-Sep-20	249	12:24	A	3	13	DeL	Wild Turkey	1	Out	Travelling	Day	
287	06-Sep-20	250	1:59	N	3	109	DeL	Raccoon	1	Out	Travelling	Night	
288	06-Sep-20	250	2:06	N	3	110	DeL	Raccoon	1	Out	Travelling	Night	No video
289	06-Sep-20	250	7:21	M	3	111	DeL	Rabbit	1	Out	Travelling	Foggy	No video
290	06-Sep-20	250	8:46	M	3	112	DeL	Squirrel	1	Out	Travelling	Day	
291	05-Sep-20	249	21:13	N	4	71	WB	Deer	1	Out	Travelling	Night	
292	05-Sep-20	249	23:17	N	4	72	WB	Opossum	1	Out	Travelling	Night	
293	06-Sep-20	250	8:08	M	4	73	WB	Ermine	1	Out	Travelling	Foggy	Although it is foggy, the silhouette of the animal resembles the short-tailed weasel
294	09-Sep-20	253	20:18	N	4	353	WB	Rabbit	1	Out	Travelling	Night	
295	10-Sep-20	254	6:53	M	4	354	WB	Bird	2	Out	Foraging	Night	Mourning Doves, pecking at the ground just outside of
296	10-Sep-20	254	6:54	M	4	355	WB	Bird	2	Out	Foraging	Night	Mourning Doves, pecking at the ground just outside of
297	10-Sep-20	254	6:56	M	4	356	WB	Bird	2	Edge	Foraging	Day	Mourning Doves, 1 is pecking at the edge of the cactus patch (ground); the other appears to be feeding on
298	10-Sep-20	254	7:04	M	4	357	WB	Bird	2	Out	Foraging	Day	Mourning Doves, 1 is grooming while the other is pecking
299	10-Sep-20	254	7:06	M	4	358	WB	Bird	2	Edge	Foraging	Day	Mourning Doves, 1 is pecking at the edge of the cactus patch (ground); the other appears to be feeding on
300	10-Sep-20	254	7:09	M	4	359	WB	Bird	2	Edge	Foraging	Day	Both Mourning Doves are feeding at the edge of the
301	10-Sep-20	254	7:14	M	4	360	WB	Bird	2	Edge	Foraging	Day	Both Mourning Doves are feeding at the edge of the
302	10-Sep-20	254	8:00	M	4	361	WB	Bird	2	Edge	Foraging	Day	Both Mourning Doves are feeding at the edge of the
303	10-Sep-20	254	8:04	M	4	362	WB	Bird	2	Out	Foraging	Day	Mourning Doves, pecking at the ground just outside of
304	10-Sep-20	254	19:55	N	4	379	WB	Bird	1	Out	Observing	Day	Mourning Dove
305	10-Sep-20	254	19:57	N	4	380	WB	Bird	2	Edge	Foraging	Day	Mourning Doves
306	10-Sep-20	254	19:59	N	4	381	WB	Bird	2	Edge	Foraging	Night	Mourning Doves
307	10-Sep-20	254	20:00	N	4	382	WB	Bird	2	Edge	Foraging	Night	Mourning Doves; feeding as they walk around the cactus
308	10-Sep-20	254	20:03	N	4	383	WB	Bird	2	Edge	Foraging	Night	Mourning Doves; feeding as they walk around the cactus
309	10-Sep-20	254	21:53	N	4	384	WB	Opossum	1	Out	Travelling	Night	
310	11-Sep-20	255	3:21	N	4	385	WB	Deer	1	Out	Foraging	Night	Feeding on grass/shrubs/plants surrounding cactus patch

Table C5. Continued.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
311	11-Sep-20	255	3:23	N	4	386	WB	Deer	1	Out	Foraging	Night	Feeding on surrounding plants
312	11-Sep-20	255	3:40	N	4	387	WB	Deer	1	Out	Foraging	Night	Feeding on surrounding plants
313	13-Sep-20	257	5:08	N	4	931	WB	Rabbit	1	Out	Travelling	Night	
314	13-Sep-20	257	8:08	M	4	932	WB	Squirrel	1	Out	Travelling	Windy	Has eastern black walnut fruit in its mouth
315	13-Sep-20	257	8:36	M	4	933	WB	Squirrel	1	Edge	Travelling	Windy	Same squirrel carrying an eastern black walnut fruit in its
316	14-Sep-20	258	2:13	N	4	1133	WB	Deer	1	Out	Travelling	Night	
317	14-Sep-20	258	5:19	N	4	1134	WB	Rabbit	1	Out	Travelling	Night	
318	14-Sep-20	258	8:20	M	4	1135	WB	Squirrel	1	Out	Travelling	Day	Has eastern black walnut fruit in its mouth
319	14-Sep-20	258	10:36	M	4	1138	WB	Squirrel	1	Out	Travelling	Day	Has eastern black walnut fruit in its mouth
320	14-Sep-20	258	21:18	N	1	28	WB	Rabbit	1	Out	Travelling	Night	Hopped very fast
321	15-Sep-20	259	2:22	N	1	31	WB	Rabbit	1	Out	Travelling	Night	
322	15-Sep-20	259	7:43	M	1	32	WB	Squirrel	1	Out	Travelling	Foggy	
323	15-Sep-20	259	7:50	M	1	33	WB	Squirrel	1	Out	Travelling	Foggy	Has eastern black walnut fruit in its mouth
324	15-Sep-20	259	8:11	M	1	34	WB	Squirrel	1	Out	Travelling	Foggy	
325	17-Sep-20	261	8:52	M	1	238	WB	Squirrel	1	Out	Travelling	Day	
326	18-Sep-20	262	7:41	M	1	366	WB	Squirrel	1	Out	Travelling	Day	Has eastern black walnut fruit in its mouth
327	18-Sep-20	262	20:01	N	1	546	WB	Rabbit	1	Out	Travelling	Night	
328	19-Sep-20	263	7:00	M	1	550	WB	Bird	1	Out	Foraging	Night	Video in black and white
329	19-Sep-20	263	8:11	M	1	551	WB	Squirrel	1	Out	Travelling	Day	
330	21-Sep-20	265	0:14	N	1	743	WB	Deer	1	Out	Travelling	Night	
331	21-Sep-20	265	1:39	N	1	744	WB	Mouse	1	Out	Travelling	Night	Most likely the Meadow Jumping Mouse; hops like a rabbit but is the size of a mouse
332	21-Sep-20	265	5:43	N	1	745	WB	Rabbit	1	Out	Travelling	Night	
333	21-Sep-20	265	6:11	M	1	746	WB	Mouse	1	Out	Travelling	Night	Video did not capture movement; most likely still
334	21-Sep-20	265	10:09	M	1	747	WB	Squirrel	1	Out	Travelling	Day	Has eastern black walnut fruit (without the green husk) in
335	21-Sep-20	265	16:59	A	1	792	WB	Squirrel	1	Out	Travelling	Day	
336	21-Sep-20	265	22:42	N	1	797	WB	Rabbit	1	Out	Travelling	Night	
337	22-Sep-20	266	1:08	N	1	799	WB	Mouse	1	Out	Travelling	Night	Video did not capture movement; most likely still
338	22-Sep-20	266	5:11	N	1	800	WB	Raccoon	1	Out	Travelling	Night	
339	23-Sep-20	267	5:42	N	1	819	WB	Rabbit	1	Out	Travelling	Night	
340	15-Sep-20	259	6:41	M	2	5	DeL	Rabbit	1	Out	Travelling	Night	
341	15-Sep-20	259	6:47	M	2	6	DeL	Raccoon	2	Out	Travelling	Night	
342	15-Sep-20	259	10:02	M	2	7	DeL	Squirrel	1	Out	Travelling	Day	
343	15-Sep-20	259	20:04	N	2	88	DeL	Rabbit	1	Out	Travelling	Night	
344	15-Sep-20	259	23:12	N	2	89	DeL	Skunk	1	Out	Travelling	Night	
345	16-Sep-20	260	5:49	N	2	95	DeL	Raccoon	1	Out	Travelling	Night	
346	16-Sep-20	260	6:21	M	2	96	DeL	Skunk	1	Edge	Travelling	Night	
347	16-Sep-20	260	8:26	M	2	104	DeL	Squirrel	1	Edge	Observing	Day	Has eastern black walnut fruit (without the green husk) in its mouth; appears to be searching for something
348	16-Sep-20	260	10:02	M	2	105	DeL	Wild Turkey	6	Out	Foraging	Day	2 adult, 4 young ones. Feeding on grass/plants outside of
349	16-Sep-20	260	10:03	M	2	106	DeL	Wild Turkey	7	In	Foraging	Day	**1 adult, 6 youngs. 2 young wild turkeys pecking for food inside cactus patch while their feet may also crush fruits/pads as they walk through the patch. Wild turkeys**
350	16-Sep-20	260	10:05	M	2	107	DeL	Wild Turkey	3	Edge	Travelling	Day	1 adult and 2 youngs
351	16-Sep-20	260	20:58	N	2	175	DeL	Raccoon	1	Out	Travelling	Night	
352	16-Sep-20	260	22:45	N	2	176	DeL	Deer	1	In	Travelling	Night	Walked right through cactus patch with no issues.
353	16-Sep-20	260	22:46	N	2	177	DeL	Deer	1	Out	Travelling	Night	
354	17-Sep-20	261	8:32	M	2	178	DeL	Squirrel	1	Out	Travelling	Day	
355	17-Sep-20	261	16:00	A	2	188	DeL	Squirrel	1	Out	Travelling	Day	
356	17-Sep-20	261	19:37	N	2	190	DeL	Squirrel	1	Out	Travelling	Day	
357	17-Sep-20	261	22:28	N	2	191	DeL	Raccoon	1	Edge	Travelling	Night	
358	18-Sep-20	262	1:46	N	2	192	DeL	Opossum	1	Edge	Travelling	Night	
359	18-Sep-20	262	3:54	N	2	193	DeL	Coyote	1	Edge	Travelling	Night	Tail has black tip
360	18-Sep-20	262	10:10	M	2	194	DeL	Squirrel	1	Out	Travelling	Day	
361	18-Sep-20	262	19:42	N	2	302	DeL	Rabbit	1	Out	Travelling	Day	
362	18-Sep-20	262	22:56	N	2	303	DeL	Deer	1	Edge	Travelling	Night	
363	19-Sep-20	263	7:11	M	2	304	DeL	Rabbit	1	Out	Travelling	Day	
364	19-Sep-20	263	19:44	N	2	367	DeL	Rabbit	1	Out	Observing	Day	
365	19-Sep-20	263	19:48	N	2	368	DeL	Rabbit	1	Edge	Foraging	Day	Feeding on grass/plants at the edge of cactus patch
366	20-Sep-20	264	1:14	N	2	369	DeL	Raccoon	1	Out	Foraging	Night	Finding plants/bugs in the ground to eat
367	20-Sep-20	264	3:10	N	2	370	DeL	Coyote	1	Edge	Travelling	Night	Circles back in front of camera
368	21-Sep-20	265	2:41	N	2	515	DeL	Mink	1	In	Travelling	Night	American mink - 1 color, longer and thicker tail than ermine; travelled through cactus patch
369	21-Sep-20	265	4:35	N	2	516	DeL	Raccoon	1	Out	Travelling	Night	
370	21-Sep-20	265	4:38	N	2	517	DeL	Raccoon	1	Edge	Observing	Night	Searching at the edge of the cactus patch; appears to be
371	21-Sep-20	265	6:49	M	2	519	DeL	Raccoon	1	Out	Travelling	Night	
372	21-Sep-20	265	8:51	M	2	527	DeL	Squirrel	1	Out	Travelling	Day	
373	21-Sep-20	265	18:55	N	2	635	DeL	Squirrel	1	Out	Travelling	Day	
374	21-Sep-20	265	18:59	N	2	636	DeL	Squirrel	1	Out	Travelling	Day	
375	21-Sep-20	265	19:05	N	2	637	DeL	Squirrel	1	Edge	Observing	Day	Sniffing the plants around the cactus patch
376	21-Sep-20	265	19:06	N	2	638	DeL	Squirrel	1	Out	Travelling	Day	
377	21-Sep-20	265	19:07	N	2	639	DeL	Squirrel	1	Out	Travelling	Day	
378	21-Sep-20	265	19:14	N	2	640	DeL	Squirrel	1	Out	Travelling	Day	
379	21-Sep-20	265	19:55	N	2	641	DeL	Unknown	1	Out	Travelling	Night	Could only see the top of the silhouette. Might be an
380	21-Sep-20	265	20:55	N	2	642	DeL	Skunk	1	Edge	Observing	Night	Sniffing around the cactus patch; may dig
381	22-Sep-20	266	8:12	M	2	643	DeL	Squirrel	1	Out	Travelling	Day	
382	22-Sep-20	266	18:53	N	2	703	DeL	Squirrel	1	Out	Travelling	Day	
383	14-Sep-20	258	19:53	N	3	56	DeL	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants at the edge of cactus patch
384	14-Sep-20	258	20:26	N	3	57	DeL	Opossum	1	Out	Travelling	Night	
385	15-Sep-20	259	0:38	N	3	58	DeL	Rabbit	1	Out	Travelling	Night	
386	15-Sep-20	259	5:45	N	3	59	DeL	Rabbit	1	Out	Foraging	Foggy	Feeding on grass/plants outside of cactus patch
387	15-Sep-20	259	5:47	N	3	60	DeL	Rabbit	1	Out	Travelling	Foggy	
388	15-Sep-20	259	6:04	M	3	61	DeL	Rabbit	1	Out	Foraging	Foggy	Feeding on grass/plants outside of cactus patch
389	15-Sep-20	259	6:06	M	3	62	DeL	Rabbit	1	Out	Foraging	Foggy	Feeding on grass/plants outside of cactus patch
390	15-Sep-20	259	6:12	M	3	63	DeL	Rabbit	1	Out	Travelling	Foggy	

Table C5. Continued.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
391	15-Sep-20	259	6:22	M	3	64	DeL	Rabbit	1	Out	Travelling	Foggy	
392	15-Sep-20	259	7:47	M	3	65	DeL	Rabbit	1	Out	Foraging	Foggy	Feeding on grass/plants outside of cactus patch
393	15-Sep-20	259	18:36	N	3	239	DeL	Rabbit	1	Out	Travelling	Day	
394	15-Sep-20	259	20:12	N	3	240	DeL	Opossum	1	Out	Travelling	Night	
395	16-Sep-20	260	9:44	M	3	242	DeL	Squirrel	1	Out	Travelling	Day	Has eastern black walnut fruit in its mouth
396	16-Sep-20	260	18:48	N	3	462	DeL	Squirrel	1	Out	Travelling	Day	
397	17-Sep-20	261	8:03	M	3	465	DeL	Squirrel	1	Out	Travelling	Day	
398	17-Sep-20	261	23:01	N	3	613	DeL	Deer	1	Out	Travelling	Night	
399	17-Sep-20	261	23:19	N	3	614	DeL	Deer	1	Out	Travelling	Night	
400	18-Sep-20	262	0:43	N	3	615	DeL	Raccoon	1	Out	Travelling	Night	
401	18-Sep-20	262	4:39	N	3	616	DeL	Raccoon	1	Out	Travelling	Night	
402	18-Sep-20	262	7:59	M	3	617	DeL	Squirrel	1	Out	Travelling	Day	
403	18-Sep-20	262	19:36	N	3	911	DeL	Squirrel	1	Out	Travelling	Day	
404	18-Sep-20	262	20:33	N	3	912	DeL	Skunk	1	Out	Travelling	Night	
405	19-Sep-20	263	8:43	M	3	914	DeL	Squirrel	1	Out	Travelling	Day	
406	19-Sep-20	263	20:40	N	3	1142	DeL	Rabbit	1	Out	Travelling	Night	
407	19-Sep-20	263	20:54	N	3	1143	DeL	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants at the edge of cactus patch
408	19-Sep-20	263	21:34	N	3	1144	DeL	Rabbit	1	Out	Travelling	Night	
409	19-Sep-20	263	23:19	N	3	1146	DeL	Rabbit	1	Out	Travelling	Night	
410	20-Sep-20	264	4:59	N	3	1147	DeL	Opossum	1	In	Travelling	Night	Walked through cactus patch very quickly
411	20-Sep-20	264	5:23	N	3	1148	DeL	Rabbit	1	Out	Travelling	Night	
412	20-Sep-20	264	6:28	M	3	1149	DeL	Rabbit	1	Out	Travelling	Night	
413	20-Sep-20	264	6:30	M	3	1150	DeL	Rabbit	1	Out	Travelling	Night	
414	20-Sep-20	264	7:03	M	3	1151	DeL	Deer	1	Out	Observing	Day	
415	20-Sep-20	264	7:04	M	3	1152	DeL	Deer	2	Out	Travelling	Day	
416	20-Sep-20	264	8:48	M	3	1153	DeL	Bird	1	Out	Foraging	Day	Blue Jay; pecking at ground for food
417	20-Sep-20	264	8:50	M	3	1154	DeL	Bird	2	Out	Foraging	Day	Blue Jay; pecking at ground for food
418	21-Sep-20	265	0:52	N	3	1456	DeL	Coyote	1	Edge	Observing	Night	Walked up to the edge of cactus patch and looked around the area before turning away
419	21-Sep-20	265	5:21	N	3	1457	DeL	Rabbit	1	Out	Travelling	Night	
420	21-Sep-20	265	9:02	M	3	1461	DeL	Squirrel	1	Out	Travelling	Windy	
421	21-Sep-20	265	18:43	N	3	1704	DeL	Squirrel	1	Out	Travelling	Day	
422	21-Sep-20	265	21:00	N	3	1705	DeL	Skunk	1	Out	Travelling	Night	
423	21-Sep-20	265	22:44	N	3	1706	DeL	Rabbit	1	Out	Travelling	Night	
424	21-Sep-20	265	23:51	N	3	1707	DeL	Deer	1	Out	Foraging	Night	Feeding on grass/plants outside of cactus patch
425	22-Sep-20	266	3:12	N	3	1708	DeL	Raccoon	1	Out	Travelling	Night	
426	22-Sep-20	266	5:49	N	3	1710	DeL	Raccoon	1	Out	Travelling	Night	
427	22-Sep-20	266	5:51	N	3	1711	DeL	Raccoon	1	Out	Travelling	Night	
428	22-Sep-20	266	8:08	M	3	1714	DeL	Squirrel	1	Out	Travelling	Day	
429	22-Sep-20	266	8:46	M	3	1715	DeL	Rabbit	1	Out	Travelling	Day	
430	22-Sep-20	266	8:54	M	3	1716	DeL	Squirrel	1	Out	Travelling	Day	
431	22-Sep-20	266	8:59	M	3	1717	DeL	Bird	1	Out	Foraging	Day	Blue Jay; pecking at ground for food
432	22-Sep-20	266	9:00	M	3	1718	DeL	Bird	1	Out	Foraging	Day	Blue Jay; pecking at ground for food
433	22-Sep-20	266	9:25	M	3	1720	DeL	Bird	7	Out	Foraging	Day	Blue Jay; pecking at ground for food outside of cactus
434	22-Sep-20	266	9:41	M	3	1721	DeL	Squirrel	1	Out	Travelling	Day	Has eastern black walnut fruit in its mouth
435	22-Sep-20	266	9:49	M	3	1722	DeL	Squirrel	1	Out	Travelling	Day	Has eastern black walnut fruit without the green husk in
436	22-Sep-20	266	17:08	A	3	1903	DeL	Bird	1	Out	Foraging	Day	Northern Flicker; pecking at ground outside of cactus
437	22-Sep-20	266	19:00	N	3	1904	DeL	Squirrel	1	Out	Travelling	Day	A blue jay flew by
438	22-Sep-20	266	19:20	N	3	1905	DeL	Bird	1	Out	Foraging	Day	Blue Jay
439	22-Sep-20	266	19:22	N	3	1906	DeL	Bird	1	Out	Observing	Day	Blue Jay
440	23-Sep-20	267	5:41	N	3	1909	DeL	Opossum	1	Out	Travelling	Night	
441	23-Sep-20	267	7:07	M	3	1910	DeL	Bird	2	Out	Foraging	Day	Blue Jay
442	23-Sep-20	267	7:08	M	3	1911	DeL	Bird	3	Out	Foraging	Day	2 Blue Jay and 1 unknown (looked similar to a Northern
443	23-Sep-20	267	7:09	M	3	1912	DeL	Bird	1	Out	Observing	Day	Blue Jay
444	23-Sep-20	267	7:12	M	3	1913	DeL	Bird	1	Out	Foraging	Day	Blue Jay
445	23-Sep-20	267	8:41	M	3	1914	DeL	Squirrel	1	Out	Travelling	Day	
446	14-Sep-20	258	11:49	M	4	8	WB	Wild Turkey	8	Edge	Foraging	Day	1 adult + 7 youngs. 1 of them started to step into cactus patch before video ended
447	14-Sep-20	258	17:25	A	4	110	WB	Wild Turkey	2	Out	Foraging	Day	1 adult + 1 young in the distant
448	14-Sep-20	258	22:20	N	4	111	WB	Raccoon	1	Out	Travelling	Night	
449	14-Sep-20	258	23:14	N	4	112	WB	Bird	1	Edge	Travelling	Night	Has a long beak and chunky body; most likely an American Woodcock but Virginia Rail, Snipe, Dunlin, and a
450	15-Sep-20	259	1:15	N	4	113	WB	Raccoon	1	Out	Travelling	Night	Behind shrub
451	15-Sep-20	259	9:41	M	4	115	WB	Bird	1	Out	Foraging	Foggy	Northern Flicker
452	16-Sep-20	260	4:04	N	4	264	WB	Opossum	1	Out	Travelling	Night	
453	16-Sep-20	260	20:34	N	4	428	WB	Raccoon	1	Out	Travelling	Night	Behind shrub
454	16-Sep-20	260	21:15	N	4	429	WB	Rabbit	1	Out	Foraging	Night	Feeding on grass/plants behind shrub
455	17-Sep-20	261	5:11	N	4	431	WB	Opossum	1	Edge	Travelling	Night	Walked around the cactus patches
456	17-Sep-20	261	5:13	N	4	432	WB	Opossum	1	Out	Foraging	Night	
457	17-Sep-20	261	16:19	A	4	592	WB	Squirrel	1	Out	Travelling	Day	
458	17-Sep-20	261	20:23	N	4	613	WB	Unknown	1	Out	Travelling	Night	Small; can be a mouse or bird - hopped into shrubs in the
459	18-Sep-20	262	7:07	M	4	614	WB	Bird	1	Edge	Foraging	Day	Small songbird - has yellow belly with brown feather at the top. Most likely Bell's vireo (or another species of vireo). May also be a orange-crowned warbler
460	24-Sep-20	268	1:49	N	1	34	WB	Opossum	1	Out	Travelling	Night	
461	24-Sep-20	268	8:02	M	1	35	WB	Squirrel	1	Out	Travelling	Windy	
462	24-Sep-20	268	9:06	M	1	36	WB	Squirrel	1	Out	Travelling	Windy	Have a eastern black walnut fruit without green husk in
463	25-Sep-20	269	10:41	M	1	109	WB	Squirrel	1	Out	Travelling	Day	Ran past left cactus patch, ignored mature red cactus
464	26-Sep-20	270	22:51	N	1	208	WB	Opossum	1	Out	Travelling	Night	
465	28-Sep-20	272	7:38	M	1	342	WB	Squirrel	1	Out	Foraging	Windy	Eating something behind a bush
466	28-Sep-20	272	11:38	M	1	367	WB	Squirrel	1	Out	Travelling	Windy	
467	29-Sep-20	273	16:22	A	1	395	WB	Squirrel	1	Out	Observing	Day	Have a eastern black walnut fruit without green husk in
468	29-Sep-20	273	17:23	A	1	396	WB	Squirrel	1	Out	Travelling	Windy	
469	30-Sep-20	274	21:36	N	1	651	WB	Rabbit	1	Out	Travelling	Windy	Hopped away quickly
470	01-Oct-20	275	10:16	M	1	663	WB	Squirrel	1	Out	Travelling	Windy	Covered camera lens while climbing up tree

Table C5. Continued.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
471	01-Oct-20	275	11:52	M	1	664	WB	Bird	1	Out	Foraging	Windy	**Blue Jay; Has a small green sphere-like fruit (berry?) in its beak - possible cactus fruit?**
472	02-Oct-20	276	7:11	M	1	691	WB	Bird	1	Out	Foraging	Night	Black and white video; songbird - species unknown
473	02-Oct-20	276	8:02	M	1	692	WB	Squirrel	1	Out	Travelling	Day	
474	02-Oct-20	276	9:14	M	1	693	WB	Squirrel	1	Out	Travelling	Day	Have a eastern black walnut fruit without green husk in
475	02-Oct-20	276	18:11	N	1	730	WB	Squirrel	1	Out	Travelling	Day	
476	02-Oct-20	276	21:31	N	1	733	WB	Raccoon	1	Out	Travelling	Night	
477	03-Oct-20	277	7:17	M	1	735	WB	Bird	1	Edge	Foraging	Night	**Black and white video; most likely a wren due to size and lifted tail. Could also be a sparrow. Went right in between middle and right cactus patch to forage.**
478	03-Oct-20	277	7:18	M	1	736	WB	Bird	5	Edge	Foraging	Night	**Black and white video; most likely a sparrow due to size, tail, beak, and pattern around its eye.Most liekly white-crowned sparrow. Could also be a wren. Foraged around the edge of cactus patches including the left patch where**
479	03-Oct-20	277	7:19	M	1	737	WB	Bird	1	Out	Foraging	Night	Black and white video; bird hidden behind tall grass
480	24-Sep-20	268	0:17	N	2	11	DeL	Raccoon	1	Out	Travelling	Night	
481	24-Sep-20	268	0:41	N	2	12	DeL	Opossum	1	Edge	Travelling	Night	
482	27-Sep-20	271	5:59	N	2	202	DeL	Raccoon	1	Out	Travelling	Night	
483	28-Sep-20	272	10:13	M	2	285	DeL	Squirrel	1	Out	Travelling	Day	
484	28-Sep-20	272	10:29	M	2	286	DeL	Bird	1	Out	Travelling	Day	Blue Jay
485	28-Sep-20	272	11:03	M	2	290	DeL	Bird	1	In	Foraging	Day	Blue Jay; was in the centre of cactus patch in photo but went to the edge in the video
486	29-Sep-20	273	19:49	N	2	319	DeL	Raccoon	1	Out	Digging	Night	Digged just outside of cactus patch
487	30-Sep-20	274	2:28	N	2	320	DeL	Deer	2	Edge	Foraging	Night	Feeding on tall grass/plants at the edge and just outside
488	01-Oct-20	275	5:55	N	2	519	DeL	Raccoon	1	Out	Travelling	Night	
489	01-Oct-20	275	9:14	M	2	554	DeL	Squirrel	1	Out	Travelling	Windy	
490	03-Oct-20	277	9:24	M	2	1032	DeL	Bird	1	In	Resting	Day	Sitting in cactus patch; no direct evidence that it is feeding on fruits. Looks similar to a gray-cheeked thrush or swainson's thrush (based on size, belly and feather color)
491	03-Oct-20	277	9:26	M	2	1033	DeL	Bird	1	In	Foraging	Day	Inside cactus patch - came in from the edge. Looks most like a white-crowned sparrow (striped head, brown
492	03-Oct-20	277	9:38	M	2	1035	DeL	Wild Turkey	6	Out	Foraging	Day	All adults; feeding on grass/plants just outside of cactus
493	03-Oct-20	277	9:40	M	2	1036	DeL	Wild Turkey	3	Edge	Foraging	Day	All adults (may not be fully mature yet though); 2 of them are just walking while 1 was feeding on plants at the edge
494	03-Oct-20	277	9:41	M	2	1037	DeL	Wild Turkey	4	Edge	Foraging	Day	All adults (may not be fully mature yet though); 1 of them was pecking at the edge of the cactus patch
495	03-Oct-20	277	10:42	M	2	1054	DeL	Wild Turkey	1	Edge	Travelling	Day	
496	23-Sep-20	267	18:46	N	3	96	DeL	Bird	1	Out	Observing	Day	Blue Jay
497	23-Sep-20	267	19:35	N	3	97	DeL	Bird	1	Out	Observing	Day	Reddish-brown feathers with striped belly; could be a brown thrasher a waterthrush
498	24-Sep-20	268	7:37	M	3	98	DeL	Squirrel	1	Out	Travelling	Foggy	
499	24-Sep-20	268	10:01	M	3	99	DeL	Wild Turkey	1	Out	Travelling	Day	
500	24-Sep-20	268	17:00	A	3	274	DeL	Squirrel	1	Out	Travelling	Day	
501	24-Sep-20	268	20:36	N	3	275	DeL	Rabbit	1	Out	Travelling	Night	
502	25-Sep-20	269	0:34	N	3	277	DeL	Opossum	1	Out	Travelling	Foggy	
503	25-Sep-20	269	2:52	N	3	278	DeL	Coyote	1	Out	Travelling	Foggy	
504	25-Sep-20	269	5:20	N	3	280	DeL	Rabbit	1	Out	Travelling	Foggy	
505	25-Sep-20	269	6:52	M	3	281	DeL	Rabbit	1	Out	Foraging	Foggy	
506	25-Sep-20	269	6:53	M	3	282	DeL	Rabbit	1	Edge	Foraging	Foggy	
507	25-Sep-20	269	6:54	M	3	283	DeL	Rabbit	1	Edge	Foraging	Foggy	
508	25-Sep-20	269	6:56	M	3	284	DeL	Rabbit	1	Out	Travelling	Foggy	
509	25-Sep-20	269	9:40	M	3	285	DeL	Squirrel	1	Out	Travelling	Day	
510	25-Sep-20	269	10:35	M	3	287	DeL	Bird	1	Out	Foraging	Day	May have been at the edge of the cactus patch in picture;
511	25-Sep-20	269	16:18	A	3	444	DeL	Squirrel	1	Out	Travelling	Day	
512	26-Sep-20	270	8:21	M	3	446	DeL	Bird	1	Out	Travelling	Day	Blue Jay
513	26-Sep-20	270	8:25	M	3	447	DeL	Squirrel	1	Out	Travelling	Day	
514	26-Sep-20	270	10:00	M	3	449	DeL	Wild Turkey	1	Out	Foraging	Day	Feeding on plants outside of cactus patch
515	26-Sep-20	270	17:28	A	3	665	DeL	Squirrel	1	Out	Travelling	Day	Has an eastern black walnut fruit without the green husk
516	26-Sep-20	270	22:21	N	3	666	DeL	Raccoon	1	Out	Travelling	Night	
517	28-Sep-20	272	8:11	M	3	852	DeL	Squirrel	1	Out	Travelling	Day	Has an eastern black walnut fruit without the green husk in its mouth; a blue jay flew by
518	28-Sep-20	272	11:34	M	3	888	DeL	Bird	1	Out	Travelling	Day	Blue Jay
519	28-Sep-20	272	11:37	M	3	890	DeL	Bird	1	Out	Travelling	Day	Blue Jay
520	28-Sep-20	272	15:15	A	3	911	DeL	Bird	2	Edge	Foraging	Day	**Northern Flickers; 1 of them was pecking at the cactus patch at the edge - could be feeding on cactus fruit**
521	28-Sep-20	272	15:27	A	3	912	DeL	Rabbit	1	Out	Foraging	Day	
522	28-Sep-20	272	15:37	A	3	913	DeL	Bird	3	Edge	Foraging	Day	Northern Flickers; 1 of them was pecking around the edge of the cactus patch while the other two were pecking at the ground outside of the patch. 1 Blue Jay flew by
523	28-Sep-20	272	16:26	A	3	916	DeL	Bird	1	Out	Travelling	Day	Northern Flicker
524	28-Sep-20	272	17:27	A	3	917	DeL	Wild Turkey	1	Out	Travelling	Day	
525	29-Sep-20	273	4:14	N	3	918	DeL	Raccoon	1	Out	Travelling	Night	
526	29-Sep-20	273	5:58	N	3	919	DeL	Deer	1	Out	Foraging	Windy	Feeding on grass/plants just outside of the cactus patch
527	29-Sep-20	273	7:30	M	3	920	DeL	Squirrel	1	Out	Travelling	Day	
528	29-Sep-20	273	8:56	M	3	922	DeL	Squirrel	1	Out	Travelling	Day	
529	29-Sep-20	273	9:09	M	3	923	DeL	Wild Turkey	3	Out	Travelling	Day	
530	29-Sep-20	273	9:48	M	3	925	DeL	Bird	1	Out	Foraging	Day	Blue Jay
531	29-Sep-20	273	9:51	M	3	926	DeL	Bird	4	Out	Travelling	Day	Blue Jays
532	29-Sep-20	273	9:53	M	3	927	DeL	Bird	1	Out	Travelling	Windy	Blue Jay
533	29-Sep-20	273	18:17	N	3	1013	DeL	Squirrel	1	Out	Travelling	Day	
534	30-Sep-20	274	1:36	N	3	1015	DeL	Rabbit	1	Out	Travelling	Night	
535	30-Sep-20	274	17:24	A	3	1105	DeL	Squirrel	1	Out	Travelling	Day	Has an eastern black walnut fruit without the green husk
536	30-Sep-20	274	18:52	N	3	1106	DeL	Squirrel	1	Out	Travelling	Wet	
537	30-Sep-20	274	18:58	N	3	1107	DeL	Squirrel	1	Out	Travelling	Windy	
538	30-Sep-20	274	22:05	N	3	1110	DeL	Opossum	1	Out	Travelling	Windy	
539	01-Oct-20	275	5:51	N	3	1113	DeL	Opossum	1	Out	Travelling	Night	
540	01-Oct-20	275	7:36	M	3	1114	DeL	Squirrel	1	Out	Travelling	Day	Has an eastern black walnut fruit without the green husk
541	01-Oct-20	275	9:11	M	3	1115	DeL	Unknown	1	Out	Travelling	Day	Most likely a squirrel, but not sure because only a part of the tail is seen in photo
542	01-Oct-20	275	17:08	A	3	1276	DeL	Squirrel	1	Edge	Digging	Day	**Digged at the edge of the cactus patch; may be storing the walnut fruit in its mouth (without green husk) away.**
543	01-Oct-20	275	17:10	A	3	1277	DeL	Squirrel	1	Out	Travelling	Day	**Same squirrel no longer has walnut fruit in its mouth**
544	01-Oct-20	275	17:39	A	3	1278	DeL	Squirrel	1	Out	Travelling	Day	Has an eastern black walnut fruit without the green husk
545	02-Oct-20	276	7:42	M	3	1279	DeL	Squirrel	1	Out	Travelling	Day	
546	02-Oct-20	276	8:33	M	3	1280	DeL	Bird	1	Out	Travelling	Windy	Blue Jay
547	02-Oct-20	276	23:17	N	3	1487	DeL	Rabbit	1	Out	Foraging	Night	
548	02-Oct-20	276	23:19	N	3	1488	DeL	Rabbit	1	Out	Foraging	Night	
549	02-Oct-20	276	23:21	N	3	1489	DeL	Rabbit	1	Out	Foraging	Night	
550	02-Oct-20	276	23:22	N	3	1490	DeL	Rabbit	1	Out	Foraging	Night	

Table C5. Continued.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
551	03-Oct-20	277	0:07	N	3	1491	DeL	Rabbit	1	Out	Foraging	Night	
552	03-Oct-20	277	5:04	N	3	1492	DeL	Rabbit	1	Out	Travelling	Night	
553	03-Oct-20	277	7:14	M	3	1493	DeL	Bird	1	Out	Foraging	Night	Most likely a sparrow or warbler; has black stripes on its head (similar to a white-throated sparrow or black-and-
554	03-Oct-20	277	7:16	M	3	1494	DeL	Bird	8	Out	Foraging	Night	Most likely a sparrow or warbler; has black stripes on its head (similar to a white-throated sparrow or black-and-
555	03-Oct-20	277	7:17	M	3	1495	DeL	Bird	9	Edge	Foraging	Night	**2 of the birds were feeding at the edge of the cactus patch; most likely a sparrow or warbler - has black**
556	03-Oct-20	277	8:33	M	3	1496	DeL	Squirrel	1	Out	Travelling	Day	
557	03-Oct-20	277	8:35	M	3	1497	DeL	Bird	1	Out	Observing	Day	Blue Jay
558	03-Oct-20	277	8:55	M	3	1498	DeL	Squirrel	1	Out	Travelling	Day	Has an eastern black walnut fruit withouth the green husk
559	23-Sep-20	267	20:23	N	4	175	WB	Unknown	1	Out	Travelling	Night	Small mammal; most likely an oppossum due to its size
560	24-Sep-20	268	4:46	N	4	176	WB	Opossum	1	Out	Travelling	Night	
561	24-Sep-20	268	9:42	M	4	178	WB	Wild Turkey	1	Edge	Travelling	Day	
562	24-Sep-20	268	11:24	M	4	180	WB	Wild Turkey	5	Out	Foraging	Day	1 of the wild turkeys is relatively closer to the edge of the cactus patch while foraging
563	25-Sep-20	269	7:58	M	4	342	WB	Squirrel	1	Edge	Travelling	Foggy	
564	26-Sep-20	270	6:27	M	4	519	WB	Coyote	1	Out	Travelling	Night	
565	26-Sep-20	270	15:54	A	4	686	WB	Bird	1	Out	Resting	Day	Small bird resting on a branch of a tree just outside of the
566	27-Sep-20	271	2:59	N	4	704	WB	Rabbit	1	Edge	Foraging	Night	
567	27-Sep-20	271	6:49	M	4	706	WB	Unknown	1	Out	Travelling	Night	Too dark to see small mammal behind the tall grass
568	28-Sep-20	272	15:08	A	4	927	WB	Squirrel	1	Out	Travelling	Day	
569	28-Sep-20	272	15:48	A	4	928	WB	Wild Turkey	4	Edge	Travelling	Day	One of them is walking right by the edge of the cactus
570	28-Sep-20	272	15:55	A	4	929	WB	Wild Turkey	1	Edge	Foraging	Windy	Foraging at the front of the cactus patch
571	28-Sep-20	272	15:58	A	4	930	WB	Wild Turkey	1	Edge	Foraging	Windy	Foraging at the front of the cactus patch
572	28-Sep-20	272	16:00	A	4	931	WB	Wild Turkey	2	Edge	Foraging	Windy	Foraging at the front of the cactus patch
573	28-Sep-20	272	16:10	A	4	932	WB	Wild Turkey	3	Edge	Foraging	Windy	
574	29-Sep-20	273	13:41	A	4	971	WB	Bird	1	Out	Resting	Day	Sat on a branch in front of camera; blue jay
575	29-Sep-20	273	15:05	A	4	972	WB	Squirrel	1	Out	Travelling	Day	
576	29-Sep-20	273	17:49	A	4	974	WB	Bird	1	Edge	Foraging	Day	Blue Jay; pecking at ground
577	30-Sep-20	274	0:34	N	4	975	WB	Opossum	1	Out	Travelling	Night	
578	30-Sep-20	274	10:21	M	4	978	WB	Bird	2	Out	Foraging	Day	Blue Jays; pecking for food or materials under log
579	30-Sep-20	274	10:30	M	4	979	WB	Bird	1	Out	Foraging	Day	Blue Jays; pecking for food or materials under log
580	30-Sep-20	274	10:31	M	4	980	WB	Bird	2	Out	Foraging	Day	Blue Jays; pecking for food or materials under log
581	30-Sep-20	274	11:17	M	4	981	WB	Bird	2	Out	Foraging	Day	Blue Jays; pecking for food or materials under log
582	30-Sep-20	274	11:19	M	4	982	WB	Bird	2	Out	Foraging	Day	Blue Jays; pecking for food or materials under log
583	30-Sep-20	274	12:48	A	4	985	WB	Bird	1	Out	Travelling	Day	Blue Jay
584	01-Oct-20	275	5:33	N	4	1044	WB	Opossum	1	Out	Travelling	Night	Video missing
585	01-Oct-20	275	7:49	M	4	1045	WB	Squirrel	1	Out	Travelling	Windy	
586	01-Oct-20	275	8:00	M	4	1046	WB	Squirrel	1	Out	Travelling	Day	
587	01-Oct-20	275	8:59	M	4	1047	WB	Squirrel	1	Out	Travelling	Day	
588	01-Oct-20	275	12:42	A	4	1086	WB	Bird	1	In	Foraging	Day	Blue Jay; may be feeding on cactus pad/fruit or
589	01-Oct-20	275	14:12	A	4	1141	WB	Bird	1	Out	Travelling	Day	Blue Jay
590	01-Oct-20	275	18:03	N	4	1192	WB	Squirrel	1	Out	Travelling	Day	
591	02-Oct-20	276	14:05	A	4	1340	WB	Bird	1	Out	Travelling	Windy	Blue Jay
592	03-Oct-20	277	7:09	M	4	1428	WB	Bird	1	Out	Resting	Night	Could be a sparrows or warbler; black and white video
593	03-Oct-20	277	7:10	M	4	1429	WB	Bird	3	Edge	Foraging	Night	Could be sparrows or warblers; black and white video
594	03-Oct-20	277	7:41	M	4	1430	WB	Squirrel	1	Out	Travelling	Day	
595	03-Oct-20	277	7:51	M	4	1431	WB	Bird	3	Out	Foraging	Day	Most likely a white-throated or white-crowned sparrow; brown feathers with black stripes on head. Could also be
596	03-Oct-20	277	17:40	A	1	42	WB	Rabbit	1	Out	Travelling	Day	
597	03-Oct-20	277	18:04	N	1	43	WB	Squirrel	1	Out	Travelling	Day	
598	04-Oct-20	278	2:21	N	1	46	WB	Opossum	1	Out	Travelling	Night	
599	04-Oct-20	278	4:52	N	1	47	WB	Rabbit	1	Out	Travelling	Night	
600	04-Oct-20	278	18:36	N	1	49	WB	Squirrel	1	Out	Travelling	Day	
601	05-Oct-20	279	7:55	M	1	50	WB	Squirrel	1	Out	Travelling	Day	
602	05-Oct-20	279	8:01	M	1	51	WB	Squirrel	1	Out	Travelling	Day	
603	05-Oct-20	279	17:43	A	1	107	WB	Squirrel	1	Out	Travelling	Day	
604	05-Oct-20	279	18:10	N	1	108	WB	Squirrel	1	Out	Travelling	Day	
605	05-Oct-20	279	19:37	N	1	109	WB	Rabbit	1	Out	Foraging	Night	
606	06-Oct-20	280	15:35	A	1	188	WB	Bird	1	Out	Travelling	Windy	Blue Jay
607	07-Oct-20	281	18:29	N	1	313	WB	Squirrel	1	Out	Travelling	Day	
608	07-Oct-20	281	23:29	N	1	314	WB	Deer	1	Out	Foraging	Night	Deer has antlers - young male? Feeding on tall
609	08-Oct-20	282	7:26	M	1	316	WB	Bird	2	Out	Foraging	Night	Most likely a sparrow or warbler; has black stripes on
610	08-Oct-20	282	7:30	M	1	317	WB	Bird	1	Out	Foraging	Day	Behind tall grass; species unknown
611	08-Oct-20	282	19:26	N	1	404	WB	Bird	1	Edge	Foraging	Night	Black and white video; songbird - species unknown
612	08-Oct-20	282	23:25	N	1	406	WB	Opossum	1	Edge	Travelling	Night	
613	09-Oct-20	283	10:26	M	1	407	WB	Squirrel	1	Out	Travelling	Foggy	
614	09-Oct-20	283	13:47	A	1	408	WB	Bird	1	Edge	Foraging	Day	Blue Jay; may be feeding on cactus pad/fruit or grass/plants at the edge of the middle patch
615	10-Oct-20	284	22:49	N	1	555	WB	Deer	1	Out	Foraging	Night	Deer has antlers - young male? Feeding on tall
616	11-Oct-20	285	7:34	M	1	556	WB	Bird	4	Edge	Foraging	Night	**Black and white video; songbird - species unknown; 1 of the birds was foraging on cactus parts/grass/plants within or at the edge of the middle patch**
617	11-Oct-20	285	8:07	M	1	557	WB	Bird	1	Out	Foraging	Day	Songbird - feather is gray/brown and has a light colored belly - could be a flycatcher, vireo, titmouse, or
618	11-Oct-20	285	8:44	M	1	558	WB	Squirrel	1	Out	Digging	Day	
619	11-Oct-20	285	10:50	M	1	559	WB	Bird	4	Edge	Foraging	Day	Songbird - feather is gray/brown and has a light colored belly - could be a flycatcher, vireo, titmouse, or gnatcatcher; 1 of the birds were at the edge of the middle
620	11-Oct-20	285	21:16	N	1	722	WB	Rabbit	1	Out	Travelling	Night	
621	11-Oct-20	285	22:06	N	1	723	WB	Opossum	1	Out	Resting	Night	Grooming itself
622	12-Oct-20	286	8:28	M	1	724	WB	Squirrel	1	Out	Foraging	Day	Sniffing the ground; may be looking for food or a spot to
623	03-Oct-20	277	18:44	N	2	26	DeL	Squirrel	1	Out	Travelling	Day	
624	03-Oct-20	277	19:19	N	2	27	DeL	Raccoon	1	Edge	Travelling	Night	
625	03-Oct-20	277	19:46	N	2	28	DeL	Rabbit	1	Out	Travelling	Night	
626	03-Oct-20	277	20:43	N	2	29	DeL	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants at the edge of cactus patch
627	03-Oct-20	277	20:45	N	2	30	DeL	Rabbit	1	Out	Travelling	Night	
628	04-Oct-20	278	16:33	A	2	32	DeL	Squirrel	1	Out	Foraging	Wet	
629	04-Oct-20	278	18:12	N	2	33	DeL	Raccoon	1	Edge	Travelling	Wet	
630	04-Oct-20	278	18:34	N	2	34	DeL	Rabbit	1	Out	Foraging	Wet	

Table C5. Continued.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
631	04-Oct-20	278	18:43	N	2	35	DeL	Rabbit	1	Out	Foraging	Wet	
632	05-Oct-20	279	12:09	A	2	36	DeL	Squirrel	1	Out	Travelling	Day	
633	05-Oct-20	279	12:11	A	2	37	DeL	Squirrel	1	Out	Travelling	Day	
634	05-Oct-20	279	18:11	N	2	44	DeL	Raccoon	1	Out	Travelling	Day	
635	05-Oct-20	279	19:45	N	2	45	DeL	Rabbit	1	Out	Travelling	Night	
636	05-Oct-20	279	22:23	N	2	46	DeL	Raccoon	1	Out	Travelling	Night	
637	06-Oct-20	280	10:19	M	2	47	DeL	Squirrel	1	Edge	Travelling	Day	
638	06-Oct-20	280	17:43	A	2	104	DeL	Raccoon	1	Edge	Travelling	Day	
639	06-Oct-20	280	20:20	N	2	105	DeL	Raccoon	1	Edge	Travelling	Night	
640	07-Oct-20	281	6:44	M	2	106	DeL	Owl	1	Edge	Foraging	Night	Seems most similar to an Eastern Screech Owl or Burrowing Owl; sat at the edge of cactus patch before
641	07-Oct-20	281	20:57	N	2	128	DeL	Raccoon	1	Edge	Travelling	Night	
642	08-Oct-20	282	5:38	N	2	131	DeL	Rabbit	1	Edge	Travelling	Night	
643	08-Oct-20	282	9:32	M	2	134	DeL	Bird	1	Out	Foraging	Day	Songbird - species unknown - brown feathers
644	08-Oct-20	282	9:34	M	2	135	DeL	Bird	2	In	Travelling	Day	**1 of the songbirds stood right on top of a cactus patch. But did not feed on anything. Songbird feather is gray/brown and has a light colored belly - could be a**
645	08-Oct-20	282	9:42	M	2	136	DeL	Squirrel	1	Out	Travelling	Day	
646	08-Oct-20	282	19:25	N	2	166	DeL	Raccoon	1	Edge	Travelling	Night	
647	09-Oct-20	283	0:36	N	2	167	DeL	Opossum	1	Edge	Travelling	Night	
648	09-Oct-20	283	4:48	N	2	168	DeL	Rabbit	1	Out	Travelling	Night	
649	09-Oct-20	283	10:23	M	2	169	DeL	Squirrel	1	Edge	Travelling	Day	
650	09-Oct-20	283	16:28	A	2	186	DeL	Squirrel	1	Out	Travelling	Day	
651	09-Oct-20	283	18:38	N	2	187	DeL	Raccoon	1	Edge	Travelling	Day	
652	10-Oct-20	284	10:25	M	2	190	DeL	Bird	1	Edge	Foraging	Day	Blue Jay
653	10-Oct-20	284	18:34	N	2	195	DeL	Raccoon	1	Out	Travelling	Night	Only the shilouette can be seen
654	11-Oct-20	285	20:37	N	2	203	DeL	Raccoon	1	Edge	Travelling	Night	
655	12-Oct-20	286	5:45	N	2	204	DeL	Deer	1	Edge	Travelling	Night	
656	06-Oct-20	280	18:00	A	3	1090	DeL	Squirrel	1	Out	Travelling	Day	
657	06-Oct-20	280	19:08	N	3	1091	DeL	Squirrel	1	Out	Digging	Day	Have something orange in its mouth
658	06-Oct-20	280	21:00	N	3	1096	DeL	Ermine	1	Out	Travelling	Night	Tail has black tip
659	06-Oct-20	280	21:58	N	3	1098	DeL	Deer	1	Out	Travelling	Night	
660	07-Oct-20	281	5:55	N	3	1297	DeL	Deer	1	Out	Travelling	Night	
661	07-Oct-20	281	7:32	M	3	1349	DeL	Squirrel	1	Out	Travelling	Windy	
662	07-Oct-20	281	17:21	A	3	1629	DeL	Squirrel	1	Out	Travelling	Day	
663	07-Oct-20	281	17:38	A	3	1631	DeL	Bird	1	Out	Foraging	Windy	Northern Flicker
664	07-Oct-20	281	17:40	A	3	1632	DeL	Bird	1	Out	Foraging	Day	Northern Flicker
665	07-Oct-20	281	17:45	A	3	1633	DeL	Bird	1	Out	Foraging	Day	Northern Flicker
666	07-Oct-20	281	17:48	A	3	1634	DeL	Bird	1	Out	Foraging	Day	Blue Jay
667	07-Oct-20	281	22:28	N	3	1643	DeL	Rabbit	1	Out	Travelling	Night	
668	07-Oct-20	281	23:10	N	3	1644	DeL	Unknown	1	Out	Travelling	Night	Small mammal in the corner
669	08-Oct-20	282	0:24	N	3	1645	DeL	Rabbit	1	Out	Foraging	Night	
670	08-Oct-20	282	0:26	N	3	1646	DeL	Rabbit	1	Out	Foraging	Night	
671	08-Oct-20	282	0:27	N	3	1647	DeL	Rabbit	1	Out	Foraging	Night	
672	08-Oct-20	282	0:28	N	3	1648	DeL	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants at the edge of cactus patch
673	08-Oct-20	282	8:11	M	3	1651	DeL	Bird	3	Out	Foraging	Foggy	Blue Jays
674	08-Oct-20	282	8:28	M	3	1652	DeL	Bird	1	Out	Foraging	Foggy	Northern Flicker
675	08-Oct-20	282	8:30	M	3	1653	DeL	Bird	1	Out	Foraging	Foggy	Northern Flicker
676	08-Oct-20	282	10:00	M	3	1654	DeL	Bird	1	Out	Foraging	Day	Most likely a vireo or warbler; has a yellow breast/belly
677	08-Oct-20	282	10:05	M	3	1655	DeL	Bird	1	Edge	Foraging	Day	Too far to determine species, may also be a vireo or
678	08-Oct-20	282	16:07	A	3	1856	DeL	Bird	1	Out	Foraging	Day	Northern Flicker
679	08-Oct-20	282	16:11	A	3	1857	DeL	Bird	1	Out	Foraging	Day	Northern Flicker
680	08-Oct-20	282	16:54	A	3	1865	DeL	Bird	1	Out	Foraging	Day	Northern Flicker
681	08-Oct-20	282	19:05	N	3	1868	DeL	Squirrel	1	Out	Travelling	Day	
682	08-Oct-20	282	19:48	N	3	1870	DeL	Deer	1	Edge	Foraging	Night	Ate plants at the edge of the cactus patch
683	09-Oct-20	283	1:08	N	3	1873	DeL	Rabbit	1	Out	Travelling	Night	
684	09-Oct-20	283	9:25	M	3	1874	DeL	Bird	1	Out	Foraging	Day	Brown feathers, look like a sparrow
685	10-Oct-20	284	7:15	M	3	2409	DeL	Bird	1	Out	Observing	Windy	Species unknown; black and white video; bird is all black
686	10-Oct-20	284	8:32	M	3	2469	DeL	Squirrel	1	Out	Travelling	Windy	Have an eastern black walnut fruit without green husk in
687	10-Oct-20	284	17:18	A	3	2979	DeL	Squirrel	1	Out	Travelling	Day	
688	10-Oct-20	284	17:58	A	3	2983	DeL	Squirrel	1	Out	Travelling	Day	
689	10-Oct-20	284	18:18	N	3	2985	DeL	Squirrel	1	Out	Travelling	Day	
690	10-Oct-20	284	18:32	N	3	2987	DeL	Squirrel	1	Out	Travelling	Day	
691	11-Oct-20	285	14:38	A	3	3469	DeL	Bird	1	Out	Foraging	Day	Most likely a sparrow; have brown patterned feathers
692	11-Oct-20	285	15:24	A	3	3533	DeL	Bird	1	Out	Observing	Windy	Robin
693	11-Oct-20	285	14:26	A	3	3535	DeL	Bird	1	Out	Foraging	Windy	Robin
694	11-Oct-20	285	14:27	A	3	3537	DeL	Bird	1	Out	Observing	Windy	Robin
695	11-Oct-20	285	15:33	A	3	3545	DeL	Bird	1	Out	Foraging	Windy	Northern Flicker
696	11-Oct-20	285	15:36	A	3	3549	DeL	Bird	1	Out	Foraging	Windy	Most likely a White-throated sparrow (but missing yellow breast feathers); could also be a Western Meadowlark
697	11-Oct-20	285	15:38	A	3	3551	DeL	Bird	1	Out	Foraging	Windy	Most likely a White-throated sparrow (but missing yellow breast feathers); could also be a Western Meadowlark
698	12-Oct-20	286	4:10	N	3	3789	DeL	Rabbit	1	Edge	Foraging	Night	
699	12-Oct-20	286	7:16	M	3	3791	DeL	Bird	2	Out	Foraging	Night	Black and white video; most likely a sparrow or warbler due to black stripes on head
700	12-Oct-20	286	8:48	M	3	3795	DeL	Squirrel	1	Out	Travelling	Day	
701	12-Oct-20	286	10:26	M	3	3821	DeL	Squirrel	1	Out	Travelling	Day	Have an eastern black walnut fruit without green husk in
702	12-Oct-20	286	12:28	A	3	3999	DeL	Bird	1	Out	Travelling	Day	Blue Jay
703	03-Oct-20	277	23:11	N	4	189	WB	Mouse	1	Out	Travelling	Night	Species unsure; black and white video
704	04-Oct-20	278	3:42	N	4	191	WB	Mouse	1	Out	Travelling	Windy	Species unsure; black and white video
705	04-Oct-20	278	10:10	M	4	193	WB	Bird	1	Out	Foraging	Day	Northern Flicker
706	04-Oct-20	278	10:12	M	4	194	WB	Bird	1	Edge	Foraging	Day	**Northern Flicker; eating grass/plants/bugs/cactus**
707	04-Oct-20	278	10:26	M	4	195	WB	Bird	1	Edge	Travelling	Day	Northern Flicker
708	04-Oct-20	278	18:07	N	4	196	WB	Squirrel	1	Out	Travelling	Day	
709	04-Oct-20	278	20:09	N	4	197	WB	Unknown	1	Out	Travelling	Night	Could be a mouse/bird
710	04-Oct-20	278	21:27	N	4	198	WB	Unknown	1	Edge	Travelling	Night	Could be a mouse/bird

Table C5. Continued.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
711	04-Oct-20	278	22:12	N	4	199	WB	Mouse	1	Out	Travelling	Night	Could be a meadow jumping mouse
712	04-Oct-20	278	22:59	N	4	200	WB	Mouse	1	Out	Foraging	Night	
713	05-Oct-20	279	7:10	M	4	202	WB	Bird	2	Edge	Foraging	Foggy	Too foggy to determine what birds were at the site. There could be more than 2 birds.
714	05-Oct-20	279	16:30	A	4	329	WB	Bird	1	In	Foraging	Day	Blue Jay; stayed in patch for 1 second; no visible fruits
715	05-Oct-20	279	17:18	A	4	332	WB	Squirrel	1	Out	Travelling	Day	
716	05-Oct-20	279	17:19	A	4	333	WB	Squirrel	1	Out	Travelling	Day	
717	05-Oct-20	279	20:06	N	4	335	WB	Mouse	1	Out	Travelling	Night	Behind the log
718	06-Oct-20	280	22:11	N	4	517	WB	Mouse	1	Out	Travelling	Night	Could be a meadow jumping mouse
719	07-Oct-20	281	4:48	N	4	518	WB	Mouse	1	Out	Travelling	Night	There appears to be an additional black object in the
720	07-Oct-20	281	4:55	N	4	519	WB	Opossum	1	Out	Travelling	Night	
721	07-Oct-20	281	16:02	A	4	734	WB	Bird	1	Out	Foraging	Windy	Blue Jay
722	08-Oct-20	282	5:44	N	4	773	WB	Raccoon	1	Edge	Travelling	Foggy	
723	08-Oct-20	282	17:09	A	4	974	WB	Bird	1	In	Travelling	Day	Unknown species; too sunny. Was on cactus pad in photo but behind the shrubs in video.
724	08-Oct-20	282	18:18	N	4	975	WB	Bird	1	In	Travelling	Day	Could be a sparrow, warbler, or flycatcher
725	08-Oct-20	282	19:54	N	4	976	WB	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants/cactus fruit/pad at the edge of cactus patch before hopping away
726	08-Oct-20	282	20:48	N	4	977	WB	Mouse	1	Out	Travelling	Night	Meadow jumping mouse
727	10-Oct-20	284	7:19	M	4	1162	WB	Bird	2	Out	Travelling	Night	Black and white video; unknown species
728	10-Oct-20	284	7:56	M	4	1164	WB	Bird	1	Out	Travelling	Windy	Blue Jay
729	11-Oct-20	285	1:31	N	4	1354	WB	Mouse	1	Edge	Travelling	Windy	May have fed at the edge of cactus patch
730	11-Oct-20	285	6:20	M	4	1355	WB	Mouse	1	Out	Travelling	Windy	
731	11-Oct-20	285	7:25	M	4	1356	WB	Bird	1	Out	Foraging	Windy	Black and white video; chubby songbird
732	11-Oct-20	285	7:32	M	4	1357	WB	Bird	5	Edge	Foraging	Windy	Black and white video; songbird; only 1 bird was at the
733	11-Oct-20	285	7:51	M	4	1359	WB	Squirrel	1	Out	Travelling	Windy	
734	11-Oct-20	285	8:28	M	4	1360	WB	Bird	3	Out	Foraging	Windy	Could be a sparrow or warbler; has black stripes on head
735	11-Oct-20	285	8:29	M	4	1361	WB	Bird	4	Out	Foraging	Windy	Could be a sparrow or warbler; has black stripes on head
736	11-Oct-20	285	8:31	M	4	1362	WB	Squirrel	1	Out	Travelling	Day	
737	11-Oct-20	285	8:31	M	4	1362	WB	Bird	3	Out	Foraging	Day	Songbird; unsure species
738	11-Oct-20	285	8:45	M	4	1363	WB	Squirrel	1	Out	Travelling	Day	
739	11-Oct-20	285	8:45	M	4	1363	WB	Bird	1	Out	Travelling	Day	Songbird; unsure species
740	11-Oct-20	285	9:00	M	4	1364	WB	Squirrel	1	Out	Travelling	Windy	
741	12-Oct-20	286	4:47	N	4	1551	WB	Opossum	1	Out	Travelling	Night	
742	12-Oct-20	286	7:26	M	4	1552	WB	Bird	2	Edge	Travelling	Night	Black and white video; unknown songbird. Birds were staring at each other (courting?).
743	12-Oct-20	286	7:27	M	4	1553	WB	Bird	2	Edge	Foraging	Night	Black and white video; could be a sparrow. 1 of the birds pecked into the edge of the cactus patch.
744	12-Oct-20	286	7:32	M	4	1554	WB	Bird	1	Edge	Foraging	Day	Have stripes on its head and brown feathers. Most likely a sparrow or warbler.
745	12-Oct-20	286	19:09	N	1	16	WB	Rabbit	1	Out	Foraging	Night	
746	13-Oct-20	287	0:28	N	1	18	WB	Rabbit	1	Out	Travelling	Windy	
747	13-Oct-20	287	1:26	N	1	19	WB	Deer	1	Out	Resting	Night	
748	13-Oct-20	287	6:43	M	1	20	WB	Raccoon	1	Out	Travelling	Night	
749	13-Oct-20	287	17:19	A	1	30	WB	Squirrel	1	Out	Foraging	Day	Sniffing the ground; may be looking for food or a spot to
750	13-Oct-20	287	11:51	M	2	6	DeL	Squirrel	1	Edge	Travelling	Day	
751	14-Oct-20	288	11:49	M	2	38	DeL	Squirrel	1	Edge	Travelling	Day	
752	14-Oct-20	288	11:50	M	2	39	DeL	Squirrel	1	Edge	Travelling	Day	
753	12-Oct-20	286	17:53	A	3	115	DeL	Squirrel	1	Out	Travelling	Day	
754	12-Oct-20	286	22:37	N	3	124	DeL	Opossum	1	Out	Foraging	Night	Chasing a bug to eat
755	12-Oct-20	286	23:38	N	3	130	DeL	Opossum	1	Out	Foraging	Windy	
756	13-Oct-20	287	2:26	N	3	132	DeL	Rabbit	1	Out	Travelling	Night	
757	13-Oct-20	287	3:18	N	3	134	DeL	Opossum	1	Out	Travelling	Night	
758	13-Oct-20	287	4:01	N	3	135	DeL	Rabbit	1	Out	Foraging	Night	
759	13-Oct-20	287	7:33	M	3	137	DeL	Bird	1	Out	Foraging	Day	
760	13-Oct-20	287	8:25	M	3	138	DeL	Bird	2	Out	Foraging	Day	
761	13-Oct-20	287	8:26	M	3	139	DeL	Bird	1	Out	Foraging	Day	
762	13-Oct-20	287	8:27	M	3	140	DeL	Bird	1	Out	Foraging	Day	
763	13-Oct-20	287	9:08	M	3	141	DeL	Squirrel	1	Out	Travelling	Day	
764	13-Oct-20	287	16:25	A	3	438	DeL	Squirrel	1	Out	Travelling	Day	
765	13-Oct-20	287	17:38	A	3	439	DeL	Squirrel	1	Edge	Foraging	Day	Sniffing the ground; may be looking for food or a spot to
766	14-Oct-20	288	0:14	N	3	486	DeL	Owl	1	Out	Foraging	Night	Most likely an eastern screech owl
767	14-Oct-20	288	0:15	N	3	487	DeL	Owl	1	Out	Observing	Night	Most likely an eastern screech owl
768	14-Oct-20	288	6:36	M	3	522	DeL	Rabbit	1	Out	Travelling	Night	
769	14-Oct-20	288	6:55	M	3	523	DeL	Rabbit	1	Out	Foraging	Night	
770	14-Oct-20	288	6:55	M	3	524	DeL	Rabbit	1	Out	Foraging	Night	
771	14-Oct-20	288	7:07	M	3	525	DeL	Rabbit	1	Edge	Foraging	Night	**May have fed on cactus fruits at the edge of the cactus**
772	14-Oct-20	288	7:11	M	3	526	DeL	Rabbit	1	Out	Foraging	Night	
773	14-Oct-20	288	7:16	M	3	528	DeL	Rabbit	1	Out	Foraging	Night	
774	14-Oct-20	288	7:17	M	3	529	DeL	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants near the edge of the cactus patch
775	14-Oct-20	288	7:20	M	3	530	DeL	Rabbit	1	Out	Travelling	Night	
776	14-Oct-20	288	7:20	M	3	531	DeL	Rabbit	1	Out	Foraging	Night	
777	14-Oct-20	288	7:20	M	3	532	DeL	Rabbit	1	Out	Foraging	Night	
778	12-Oct-20	286	13:13	A	4	93	WB	Unknown	1	In	Travelling	Day	Very small; squirms like a snake and moves fast; white
779	12-Oct-20	286	13:13	A	4	94	WB	Unknown	1	In	Travelling	Day	Very small; squirms like a snake and moves fast; white
780	12-Oct-20	286	13:13	A	4	95	WB	Unknown	1	In	Travelling	Day	Very small; squirms like a snake and moves fast; white
781	12-Oct-20	286	13:14	A	4	96	WB	Unknown	1	In	Travelling	Windy	Very small; squirms like a snake and moves fast; white
782	13-Oct-20	287	6:10	M	4	263	WB	Opossum	1	Out	Travelling	Windy	
783	13-Oct-20	287	6:14	M	4	264	WB	Opossum	1	Out	Travelling	Windy	
784	13-Oct-20	287	6:16	M	4	265	WB	Opossum	1	Out	Travelling	Windy	
785	13-Oct-20	287	6:37	M	4	267	WB	Opossum	1	Out	Travelling	Windy	
786	13-Oct-20	287	6:38	M	4	268	WB	Opossum	1	Out	Travelling	Windy	
787	13-Oct-20	287	7:20	M	4	270	WB	Bird	1	Out	Observing	Windy	Black and white video; songbird - unknown species
788	13-Oct-20	287	7:20	M	4	271	WB	Bird	1	Out	Foraging	Windy	Black and white video; songbird - unknown species
789	13-Oct-20	287	7:34	M	4	272	WB	Raccoon	1	Out	Travelling	Windy	
790	13-Oct-20	287	9:00	M	4	273	WB	Squirrel	1	Out	Travelling	Day	

Table C5. Continued.

Rep	Date	Julian Date	Time	Time of Day (M/A/N)	Cam #	Photo ID	Location	Animal	Animal Counts	Location relative to Cactus	Behaviour	Weather/Site Condition	Extra Notes
791	13-Oct-20	287	19:36	N	4	560	WB	Raccoon	1	Out	Travelling	Night	
792	13-Oct-20	287	21:37	N	4	561	WB	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants near the edge of the cactus patch
793	13-Oct-20	287	21:37	N	4	562	WB	Rabbit	1	Edge	Foraging	Night	Feeding on grass/plants/cactus fruit/pad at the edge of
794	13-Oct-20	287	21:38	N	4	563	WB	Rabbit	1	Out	Travelling	Night	
795	13-Oct-20	287	22:17	N	4	564	WB	Raccoon	1	Out	Travelling	Night	
796	14-Oct-20	288	2:15	N	4	565	WB	Raccoon	1	Out	Travelling	Windy	
797	14-Oct-20	288	2:53	N	4	566	WB	Raccoon	1	Out	Travelling	Windy	
798	14-Oct-20	288	7:17	M	4	567	WB	Bird	1	Out	Observing	Night	Black and white video; songbird - unknown species
799	14-Oct-20	288	7:18	M	4	568	WB	Bird	1	Out	Travelling	Night	Black and white video; songbird - unknown species
800	14-Oct-20	288	7:57	M	4	569	WB	Squirrel	1	Out	Travelling	Day	
801	14-Oct-20	288	7:58	M	4	570	WB	Squirrel	1	Out	Travelling	Day	
802	14-Oct-20	288	8:01	M	4	571	WB	Squirrel	1	Edge	Digging	Day	Digged under a cactus pad at the edge and retrieved something similar to an eastern black walnut fruit
803	16-Oct-20	290	7:31	M	1	9	WB	Raccoon	1	Out	Travelling	Night	
804	16-Oct-20	290	7:44	M	1	10	WB	Raccoon	1	Out	Travelling	Day	
805	14-Oct-20	288	18:18	N	2	9	DeL	Squirrel	1	Out	Travelling	Windy	
806	14-Oct-20	288	21:19	N	2	33	DeL	Opossum	1	Out	Travelling	Night	
807	15-Oct-20	289	18:57	N	2	240	DeL	Raccoon	1	Edge	Travelling	Day	
808	16-Oct-20	290	7:39	M	2	241	DeL	Rabbit	1	Edge	Travelling	Night	
809	14-Oct-20	288	18:57	N	3	4	DeL	Squirrel	1	Out	Travelling	Day	
810	15-Oct-20	289	1:53	N	3	42	DeL	Opossum	1	Edge	Foraging	Windy	May be feeding on cactus fruit or bugs on fruits
811	15-Oct-20	289	6:34	M	3	59	DeL	Rabbit	1	Edge	Foraging	Windy	May be feed on grass/plants/cactus fruit at the edge
812	15-Oct-20	289	10:35	M	3	60	DeL	Wild Turkey	1	Out	Observing	Windy	
813	15-Oct-20	289	10:36	M	3	61	DeL	Wild Turkey	1	Out	Travelling	Windy	
814	15-Oct-20	289	10:36	M	3	62	DeL	Wild Turkey	3	Out	Foraging	Windy	
815	15-Oct-20	289	10:36	M	3	63	DeL	Wild Turkey	5	Out	Travelling	Windy	
816	15-Oct-20	289	10:37	M	3	64	DeL	Wild Turkey	1	Out	Travelling	Windy	
817	15-Oct-20	289	17:18	A	3	65	DeL	Squirrel	1	Out	Foraging	Day	Sniffing the ground; may be looking for food or a spot to
818	15-Oct-20	289	18:27	N	3	66	DeL	Squirrel	1	Out	Travelling	Day	
819	16-Oct-20	290	8:39	M	3	67	DeL	Bird	1	Out	Travelling	Wet	Northern Flicker
820	16-Oct-20	290	8:40	M	3	68	DeL	Squirrel	1	Out	Travelling	Wet	Has an eastern black walnut fruit without green husk in
821	14-Oct-20	288	9:53	M	4	1	WB	Squirrel	1	Out	Travelling	Day	
822	16-Oct-20	290	0:57	N	4	3	WB	Raccoon	1	Out	Travelling	Windy	
823	16-Oct-20	290	18:54	N	1	388	WB	Squirrel	1	Out	Travelling	Windy	
824	16-Oct-20	290	19:42	N	1	389	WB	Raccoon	1	Out	Travelling	Windy	
825	16-Oct-20	290	21:05	N	1	399	WB	Raccoon	2	Out	Travelling	Windy	
826	16-Oct-20	290	21:06	N	1	400	WB	Raccoon	1	Out	Travelling	Windy	
827	16-Oct-20	290	21:09	N	1	401	WB	Raccoon	1	Out	Travelling	Windy	
828	16-Oct-20	290	22:47	N	1	410	WB	Raccoon	1	Out	Travelling	Windy	
829	16-Oct-20	290	22:48	N	1	411	WB	Raccoon	1	Out	Travelling	Windy	
830	16-Oct-20	290	22:54	N	1	412	WB	Raccoon	1	Out	Travelling	Windy	
831	16-Oct-20	290	23:11	N	1	413	WB	Raccoon	1	Out	Travelling	Windy	
832	16-Oct-20	290	23:19	N	1	414	WB	Raccoon	1	Out	Travelling	Windy	
833	16-Oct-20	290	23:19	N	1	415	WB	Raccoon	1	Out	Travelling	Windy	
834	16-Oct-20	290	23:38	N	1	416	WB	Opossum	1	Out	Travelling	Windy	
835	16-Oct-20	290	23:50	N	1	420	WB	Raccoon	1	Out	Travelling	Windy	
836	17-Oct-20	291	1:50	N	1	431	WB	Opossum	1	Out	Travelling	Windy	
837	17-Oct-20	291	2:14	N	1	442	WB	Opossum	1	Out	Travelling	Windy	
838	17-Oct-20	291	3:28	N	1	455	WB	Raccoon	1	Out	Travelling	Windy	
839	17-Oct-20	291	4:59	N	1	497	WB	Raccoon	1	Out	Travelling	Windy	
840	17-Oct-20	291	5:12	N	1	501	WB	Raccoon	1	Out	Travelling	Windy	
841	17-Oct-20	291	5:12	N	1	502	WB	Raccoon	1	Out	Travelling	Windy	
842	17-Oct-20	291	5:44	N	1	509	WB	Raccoon	1	Out	Travelling	Windy	
843	17-Oct-20	291	8:22	M	1	519	WB	Squirrel	1	Out	Travelling	Windy	
844	17-Oct-20	291	20:07	N	1	832	WB	Opossum	1	Out	Travelling	Night	
845	17-Oct-20	291	21:26	N	1	833	WB	Opossum	1	Out	Travelling	Night	
846	18-Oct-20	292	6:44	M	1	839	WB	Raccoon	1	Out	Travelling	Night	
847	18-Oct-20	292	7:36	M	1	840	WB	Bird	1	Out	Foraging	Night	Black and white video; songbird - species unknown. Most likely a sparrow or warbler.
848	18-Oct-20	292	8:03	M	1	841	WB	Squirrel	1	Out	Travelling	Day	
849	17-Oct-20	291	22:10	N	2	142	DeL	Raccoon	1	Out	Travelling	Night	
850	16-Oct-20	290	17:19	A	3	414	DeL	Squirrel	1	Out	Travelling	Windy	
851	17-Oct-20	291	16:18	A	3	819	DeL	Squirrel	1	Out	Travelling	Day	
852	17-Oct-20	291	17:13	A	3	820	DeL	Squirrel	1	Out	Travelling	Day	
853	17-Oct-20	291	18:28	N	3	822	DeL	Squirrel	1	Edge	Foraging	Day	Sniffed the ground at the edge of the cactus patch (2
854	16-Oct-20	290	10:38	M	4	7	WB	Squirrel	1	Out	Travelling	Day	
855	17-Oct-20	291	0:06	N	4	478	WB	Raccoon	1	Out	Travelling	Night	
856	17-Oct-20	291	2:57	N	4	479	WB	Raccoon	1	Out	Travelling	Night	
857	17-Oct-20	291	16:43	A	4	985	WB	Squirrel	1	Out	Travelling	Day	
858	17-Oct-20	291	20:41	N	4	986	WB	Mouse	1	Edge	Travelling	Night	Most likely a meadow jumping mouse; a small rodent
859	18-Oct-20	292	8:34	M	4	988	WB	Squirrel	1	Out	Travelling	Day	Has an eastern black walnut fruit (without green husk) in
860	18-Oct-20	292	8:36	M	4	989	WB	Squirrel	1	Out	Travelling	Day	

Table C6. Descriptive data of wild turkey scats found at the 38 sites described in Table F2. Samples collected from August 5 to 6, 2020 and October 13 to 17, 2020.

Scat ID #	Season	Date	Julian Date	Time	Site #	Inside/ Outside Cactus Patch	Scat Sex	Age (Dry/Wet; Soft/Hard)	Colour	Length (cm)	Width (cm)	Shaded ?	Weight with tin (g)	Weight w/out tin (g)	# of cactus seeds	# of seeds of other plants	# of pebbles/ minerals	Primary Element	Unsure?	Notes
S1	Summer	05-Aug-20	218	14:25	8	Outside	F	DH	Brown-yellow	3.00	2.00	No	2.23	1.29	0	2	3	Grass/Grain	No	White on the outside.
S2	Summer	05-Aug-20	218	14:32	8	Outside	M	DH	Light yellow	5.50	1.50	Yes	2.86	1.92	0	0	2	Grass/Grain	No	A bit of white on the outside. Slight hint of green. Soft inside.
S3	Summer	05-Aug-20	218	14:38	8	Outside	F	DH	Yellow	2.50	2.00	No	2.11	1.17	0	0	1	Grass/Grain	No	Black and white on the outside. Soft inside.
S4	Summer	05-Aug-20	218	14:46	8	Outside	M	DH	Brown-yellow	3.00	0.50	No	1.30	0.36	0	0	0	Grass/Grain	No	Small. Black and white on the outside. Compact.
S5	Summer	05-Aug-20	218	14:46	8	Outside	M	DH	Brown-yellow	2.50	2.00	No	1.45	0.51	0	0	0	Grass/Grain	No	Small. Black and white on the outside. Compact.
S6	Summer	05-Aug-20	218	14:46	8	Outside	M	DH	Brown-yellow	1.50	2.00	No	1.34	0.40	0	0	0	Grass/Grain	No	Soft inside. Small. Black and white on the outside. Compact.
S7	Summer	05-Aug-20	218	14:50	8	Outside	F	DH	Brown-yellow	3.00	3.00	No	2.66	1.72	0	0	5	Grass/Grain	No	A lot of white on the outside. Soft inside. 2 minerals + 3 pebbles.
S8	Summer	05-Aug-20	218	14:54	8	Outside	F	DH	Brown-yellow	3.00	2.00	Yes	2.30	1.36	0	0	4	Grass/Grain	No	A lot of white on the outside. Soft inside. Lots of salt-like minerals.
S9	Summer	05-Aug-20	218	14:52	8	Outside	M	DH	Light yellow	3.50	1.00	Yes	1.60	0.66	0	1	1	Grass/Grain	No	A lot of white on the outside. Soft inside.
S10	Summer	05-Aug-20	218	14:59	8	Outside	F	DH	Brown-yellow	3.50	3.00	No	3.10	2.16	0	0	7	Grass/Grain	No	A bit of white on the outside. Dark colored on the outside. Less dry, soft inside.
S11	Summer	05-Aug-20	218	15:00	8	Outside	F	DH	Light yellow	3.50	1.00	No	2.15	1.21	0	0	1	Grass/Grain	No	A lot of white on the outside. Soft inside.
S12	Summer	05-Aug-20	218	15:06	8	Outside	F	DH	Brown-yellow	3.00	1.50	No	2.26	1.32	0	8	2	Grass/Grain	No	A lot of white on the outside. Soft inside.
S13	Summer	05-Aug-20	218	15:31	13	Outside	M	DH	Yellow	5.00	1.50	Yes	3.02	2.08	0	0	3	Grass/Grain	No	
S14	Summer	05-Aug-20	218	15:33	13	Outside	M	DH	Yellow	6.00	1.00	Yes	2.34	1.40	0	11	5	Grass/Grain	No	Soft inside. Some white spots on the outside.
S15	Summer	05-Aug-20	218	15:34	13	Outside	F	DH	Yellow	3.00	1.50	Yes	2.55	1.61	0	0	16	Grass/Grain	No	Lots of pebbles and minerals.
S16	Summer	05-Aug-20	218	15:38	13	Outside	M	DH	Yellow	4.00	1.00	Yes	2.18	1.24	0	24	0	Grass/Grain	No	
S17	Summer	05-Aug-20	218	15:40	13	Outside	F	WH	Brown-yellow	4.00	2.00	Yes	3.87	2.93	0	5	7	Grass/Grain	No	Small.
S18	Summer	05-Aug-20	218	15:43	13	Outside	M	DH	Light brown	3.50	0.50	Yes	2.13	1.19	0	0	5	Grass/Grain	No	Some white spots on the outside. Hint of green inside. Soft inside. Originally thought pebbles were seeds.
S19	Summer	05-Aug-20	218	17:08	27	Outside	M	DH	Dark brown	4.50	0.50	No	2.46	1.52	0	6	0	Dirt	No	Size of seeds are similar to cactus seed but shape is different. Seeds same as F119.
S20	Summer	05-Aug-20	218	17:10	27	Outside	M	DH	Dark brown	6.00	1.00	No	3.43	2.49	0	0	30	Dirt	Yes	Lots of minerals (possibly more than 30). Very small. Broken piece.
S21	Summer	06-Aug-20	219	10:39	8	Outside	M	DH	Light yellow	4.00	1.00	Yes	2.51	1.57	0	0	7	Grass/Grain	No	
S22	Summer	06-Aug-20	219	10:40	8	Outside	M	DH	Light yellow	4.50	1.00	Yes	1.78	0.84	0	0	1	Grass/Grain	No	Half piece.
S23	Summer	06-Aug-20	219	10:43	8	Outside	F	DH	Brown-yellow	3.00	1.50	No	2.24	1.30	0	0	2	Grass/Grain	Yes	Soft inside.
S24	Summer	06-Aug-20	219	10:50	8	Outside	F	DH	Yellow	2.00	2.00	No	1.77	0.83	0	0	0	Grass/Grain	No	Hard and dark outside like wood.
S25	Summer	06-Aug-20	219	10:52	8	Outside	M	DH	Yellow	2.50	0.50	No	1.35	0.41	0	0	0	Grass/Grain	No	
S26	Summer	06-Aug-20	219	10:55	8	Outside	F	DH	Light yellow	2.50	2.00	No	2.20	1.26	0	0	0	Grass/Grain	No	
S27	Summer	06-Aug-20	219	10:59	8	Outside	M	DH	Brown-yellow	3.00	1.50	No	2.48	1.54	0	0	0	Grass/Grain	No	
S28	Summer	06-Aug-20	219	11:03	8	Outside	F	DH	Brown	2.50	2.00	No	2.87	1.93	0	0	3	Grain/Dirt	No	
S29	Summer	06-Aug-20	219	11:56	13	Outside	F	DH	Brown	2.00	1.50	No	1.74	0.80	0	0	1	Grain/Dirt	No	
S30	Summer	06-Aug-20	219	11:59	13	Outside	F	DH	Light yellow	1.50	1.00	No	1.63	0.69	0	0	4	Grass/Grain	No	Broken. 1 large pebble. Hint of green.
F1	Fall	13-Oct-20	287	14:44	1	Outside	F	WS	Green			No							Yes	Not scat. Appears to be a leave/fruit/seed pod of some plant.
F2	Fall	13-Oct-20	287	14:44	1	Outside	F	WS	Green			No							Yes	Not scat. Appears to be a leave/fruit/seed pod of some plant.
F3	Fall	13-Oct-20	287	15:46	2	Outside	M	DS	Yellow	1.62	1.00	No	1.21	0.27	0	0	1	Grass/Grain	No	Dark brown with some white spot on the outside. Broken.
F4	Fall	13-Oct-20	287	15:46	2	Outside	M	DH	Yellow	1.66	1.08	No	1.24	0.30	0	0	0	Grass/Grain	No	Dark, black and white on the outside. Broken.
F5	Fall	13-Oct-20	287	15:48	2	Outside	M	DH	Black	3.26	0.89	No	2.23	1.29	0	5	0	Dirt	No	Has a hint of green. Dark, black and white on the outside. Very hard.
F6	Fall	13-Oct-20	287	16:17	3	Outside	F	DH	Black	2.52	1.47	No	2.06	1.12	0	0	0	Dirt	No	Dark, black and white in the centre. Very hard. Contains some grass. Small scat.
F7	Fall	13-Oct-20	287	16:18	3	Outside	F	DH	Dark brown	2.58	1.57	No	2.25	1.31	0	5	0	Dirt	Yes	Dark, brown with some white on the outside. Size of seeds are similar to cactus seed but shape is different. ~ 2 m away from patch.
F8	Fall	13-Oct-20	287	16:19	3	Outside	F	DH	Dark brown	3.29	2.68	No	4.13	3.19	2	5	0	Dirt	No	**Dark, brown with some white on the outside. 2 cactus seeds identified based on shape and size. Only took half of scat. ~ 2m away from patch.**
F9	Fall	13-Oct-20	287	16:23	3	Outside	U	DH	Dark brown	1.26	0.89	No	1.29	0.35	0	1	0	Dirt	No	Dark, brown with some white on the outside. Small seed. Broken. ~ 2 m away from patch.
F10	Fall	13-Oct-20	287	16:32	3	Outside	M	DH	Gray	7.58	0.93	No	5.43	4.49	0	0	3	Sand/Fur	Yes	Belongs to coyote, not turkey. Contained fur/long grass. White outside.
F11	Fall	13-Oct-20	287	16:35	4	Outside	M	DH	Brown-yellow	3.24	1.12	No	1.54	0.60	0	0	0	Grass/Grain	No	Dark brown yellow with some white outside. Soft inside.
F12	Fall	13-Oct-20	287	16:35	4	Outside	M	DH	Brown-yellow	3.43	0.94	No	1.42	0.48	0	0	0	Grass/Grain	No	Dark brown/black outside.
F13	Fall	13-Oct-20	287	17:46	5	Outside	M	DH	Light brown	3.81	0.93	No	1.58	0.64	0	2	0	Grass/Grain	No	Light brown/yellow with some white outside. Soft inside.
F14	Fall	13-Oct-20	287	17:46	5	Outside	F	DS	Light brown	3.53	0.98	No	1.93	0.99	0	0	5	Grass/Grain	No	Brown with some white spots.
F15	Fall	13-Oct-20	287	17:49	5	Outside	M	DH	Brown	4.50	1.13	No	2.94	2.00	0	30	0	Grass/Grain	No	There are at least 30 small seeds. Hint of green in scat. Brown with some white outside. May contain scales (flake-like skin). Small sample taken. ~ 5 m away from patch.
F16	Fall	13-Oct-20	287	17:56	5	Outside	F	DH	Black	2.49	1.35	No	2.89	1.95	0	0	2	Dirt	No	Black, dark brown and white ends outside. Very hard. Was buried.
F17	Fall	13-Oct-20	287	18:10	7	Outside	F	DH	Brown	2.19	1.92	No	3.17	2.23	0	3	14	Grain/Dirt	No	10 of the "pebbles" are similar to small bones or teeth. White outside with some brown. Soft inside.
F18	Fall	13-Oct-20	287	18:15	7	Outside	U	DH	Yellow	1.24	0.96	No	1.23	0.29	0	2	1	Grass/Grain	No	Small seeds. Brown-yellow with some white outside. Soft inside. Broken. ~ 5m away from patch.
F19	Fall	13-Oct-20	287	18:16	7	Outside	M	DH	Brown-yellow	3.20	1.18	No	2.72	1.78	0	15	12	Grass/Grain	No	Light brown/yellow outside. Some minerals are like bone/teeth. Small seeds. ~ 5 m away from patch.
F20	Fall	13-Oct-20	287	18:16	7	Outside	M	DH	Brown-yellow	1.59	1.02	No	1.23	0.29	0	0	0	Grass/Grain	No	Brown-yellow with some white outside. Soft inside. ~ 5 m away from patch.
F21	Fall	13-Oct-20	287	18:19	7	Outside	M	DH	Light yellow	1.89	1.13	No	1.30	0.36	0	0	1	Grass/Grain	No	Brown outside. ~ 1 m away from patch.
F22	Fall	13-Oct-20	287	18:25	6	Outside	U	DS	Light yellow	2.27	0.78	No	1.40	0.46	0	1	3	Grass/Grain	No	Brown-yellow outside. Soft inside. Very small and skinny.
F23	Fall	13-Oct-20	287	18:25	6	Outside	M	DH	Brown-yellow	3.20	1.12	No	1.45	0.51	0	1	1	Grass/Grain	No	Dark brown with some white spot on the outside. Broken.
F24	Fall	13-Oct-20	287	18:29	6	Outside	U	DH	Yellow	3.81	1.34	No	2.33	1.39	0	0	1	Grass/Grain	No	Dark brown with some white spot on the outside.
F25	Fall	13-Oct-20	287	18:31	6	Outside	M	DH	Brown-yellow	4.39	1.03	No	2.19	1.25	0	10	3	Grass/Grain	No	There are at least 10 small seeds. Dark brown with some white spot on the outside.

Table C6. Continued.

Scat ID #	Season	Date	Julian Date	Time	Site #	Inside/ Outside Cactus Patch	Scat Sex	Age (Dry/Wet; Soft/Hard)	Colour	Length (cm)	Width (cm)	Shaded ?	Weight with tin (g)	Weight w/out tin (g)	# of cactus seeds	# of seeds of other plants	# of pebbles/ minerals	Primary Element	Unsure?	Notes
F26	Fall	13-Oct-20	287	15:38	2	Outside	M	DH	Dark brown	2.98	0.96	No	1.62	0.68	0	0	0	Grass/Grain	No	Dark black/brown with some white outside.
F27	Fall	13-Oct-20	287	15:39	2	Outside	F	DH	Brown	2.71	1.78	No	2.58	1.64	0	10	3	Grass/Grain	No	Small seeds. Brown-yellow with some white otside.
F28	Fall	13-Oct-20	287	15:39	2	Outside	F	DH	Brown	2.35	2.08	No	2.51	1.57	0	14	6	Grass/Grain	No	At least 14 small seeds. Has insect wings. Brown with some white outside. Soft inside.
F29	Fall	14-Oct-20	288	8:43	21	Outside	F	WS	Black			No			0				Yes	Raccoon scat. All black with visible berry seeds.
F30	Fall	14-Oct-20	288	8:43	21	Outside	F	DH	Black	2.28	1.13	No	2.20	1.26	0	0	0	Sand	Yes	Might be deer scat instead. Black inside; coal-like texture. Very hard.
F31	Fall	14-Oct-20	288	8:52	21	Outside	F	DH	Dark brown	1.45	1.42	No	1.60	0.66	0	0	11	Dirt	No	Black with some white spots outside.
F32	Fall	14-Oct-20	288	10:27	8	Outside	F	DS	Yellow	2.20	0.81	No	1.42	0.48	0	0	0	Grass/Grain	No	Brown-yellow with white spots outside + 1 red spot.
F33	Fall	14-Oct-20	288	10:28	8	Outside	M	DH	Yellow	1.97	1.13	No	1.19	0.25	0	0	0	Grass/Grain	No	Brown with some white spots outside. Soft inside.
F34	Fall	14-Oct-20	288	10:28	8	Outside	U	DH	Yellow	3.18	0.87	No	1.23	0.29	0	0	0	Grass/Grain	No	Light yellow with black and white spots outside. Soft inside. Squished.
F35	Fall	14-Oct-20	288	10:29	8	Outside	F	DS	Yellow	3.50	2.52	No	1.56	0.62	0	0	0	Grass/Grain	No	Yellow with black and white spots outside. Squished.
F36	Fall	14-Oct-20	288	10:30	8	Outside	F	DS	Yellow	4.30	2.67	No	2.64	1.70	0	1	3	Grass/Grain	No	Brown-yellow with black and white spots outside. Small seed.
F37	Fall	14-Oct-20	288	10:31	8	Outside	U	DS	Yellow	2.16	0.89	No	1.11	0.17	0	0	0	Grass/Grain	No	Brown with white spots outside. Squished.
F38	Fall	14-Oct-20	288	10:33	8	Outside	F	DS	Yellow	4.68	2.00	No	2.89	1.95	0	0	2	Grass/Grain	No	Brown-yellow with black and white spots outside.
F39	Fall	14-Oct-20	288	10:34	8	Outside	U	DS	Yellow	1.59	1.10	No	1.15	0.21	0	0	0	Grass/Grain	No	Light yellow brown with black and white spots outside. Broken.
F40	Fall	14-Oct-20	288	10:35	8	Outside	U	DH	Yellow	0.95	1.16	No	1.12	0.18	0	0	0	Grass/Grain	No	Light brown with black and white spots outside. Soft inside. Broken.
F41	Fall	14-Oct-20	288	10:36	8	Outside	M	DH	Yellow	1.15	1.11	Yes	1.20	0.26	0	0	0	Grass/Grain	No	Brown with black and white spots outside. Soft inside.
F42	Fall	14-Oct-20	288	10:38	8	Outside	M	DH	Brown-yellow	2.57	1.10	No	1.39	0.45	0	0	0	Grass/Grain	No	Brown with black and white spots outside. Close to cactus patch ~30 cm.
F43	Fall	14-Oct-20	288	10:39	8	Outside	M	DH	Brown-yellow	2.10	0.97	No	1.28	0.34	0	0	2	Grass/Grain	No	White with some black outside. Close to cactus patch.
F44	Fall	14-Oct-20	288	10:40	8	Outside	M	DH	Brown-yellow	1.74	0.98	No	1.15	0.21	0	2	0	Grass/Grain	No	White with some black outside. ~ 1 m away from cactus patch. Small seeds.
F45	Fall	14-Oct-20	288	10:41	8	Outside	F	DH	Brown-yellow	2.98	1.82	No	1.83	0.89	0	0	1	Grass/Grain	No	Mainly white with some black and yellow outside. Soft inside. ~ 1 m away from patch.
F46	Fall	14-Oct-20	288	10:42	8	Outside	U	DH	Yellow	2.80	1.14	No	1.36	0.42	0	0	0	Grass/Grain	No	Mainly white with some black and light yellow outside. ~ 1 m away from patch.
F47	Fall	14-Oct-20	288	10:44	8	Outside	F	DH	Brown-yellow	2.79	2.54	Yes	2.28	1.34	0	0	3	Grass/Grain	No	Light brown with white spots outside. ~ 50 cm away from patch. Near tall grass.
F48	Fall	14-Oct-20	288	10:46	8	Outside	M	DH	Brown-yellow	4.02	0.91	Yes	1.66	0.72	0	0	0	Grass/Grain	No	Brown with black and white spots outside. ~ 50 cm away from patch. Near tall grass.
F49	Fall	14-Oct-20	288	10:47	8	Outside	M	DH	Yellow	2.90	0.79	Yes	1.20	0.26	0	0	0	Grass/Grain	No	Light yellow with black and white spots outside. ~30 cm away from patch.
F50	Fall	14-Oct-20	288	10:48	8	Outside	F	DH	Yellow	3.03	2.54	Yes	1.78	0.84	0	0	1	Grass/Grain	No	Light brown yellow with black and white spots outside. ~40 cm away from patch.
F51	Fall	14-Oct-20	288	10:50	8	Outside	F	DH	Brown-yellow	3.83	3.01	Yes	2.47	1.53	0	4	4	Grass/Grain	No	~ 20 cm away from patch. Small seeds. Mainly white and brown outside. 1 tooth-like object.
F52	Fall	14-Oct-20	288	10:51	8	Outside	F	DH	Brown-yellow	3.30	2.34	No	1.80	0.86	0	0	1	Grass/Grain	No	Mainly white and brown outside. Squished.
F53	Fall	14-Oct-20	288	10:52	8	Outside	M	DH	Brown-yellow	2.35	0.86	No	1.39	0.45	0	1	17	Grass/Grain	No	Not close to patch. Small seed. Mainly white with black spots outside. Soft inside.
F54	Fall	14-Oct-20	288	10:53	8	Outside	F	DH	Brown-yellow	2.19	1.86	Yes	1.58	0.64	0	2	5	Grass/Grain	No	Small seeds. Dark brown and white outside.
F55	Fall	14-Oct-20	288	10:55	8	Outside	U	DH	Brown-yellow	2.00	1.00	Yes	1.23	0.29	0	0	0	Grass/Grain	No	Dark brown and white outside.
F56	Fall	14-Oct-20	288	10:55	8	Outside	M	DH	Yellow	2.40	1.05	No	1.22	0.28	0	0	0	Grass/Grain	No	Brown, light yellow and white outside.
F57	Fall	14-Oct-20	288	10:57	8	Outside	M	DH	Brown-yellow	1.34	1.03	Yes	1.17	0.23	0	0	0	Grass/Grain	No	Dark brown with some white spots outside.
F58	Fall	14-Oct-20	288	12:15	10	Outside	M	WH	Dark brown	3.46	0.79	Yes	2.00	1.06	0	11	13	Dirt	No	Scat is fresh. Small seeds. Black to dark brown with a bit of white outside. Small. Very hard.
F59	Fall	14-Oct-20	288	12:16	10	Outside	M	DH	Brown	1.81	0.77	Yes	1.28	0.34	0	13	2	Grain/Dirt	No	At least 13 small seeds. Brown with some white spots outside. Small.
F60	Fall	14-Oct-20	288	12:18	10	Outside	F	DH	Black	1.84	1.33	Yes	2.05	1.11	0	3	4	Dirt	No	Small seeds. Black and brown-yellow with white spots outside. Hint of green.
F61	Fall	14-Oct-20	288	12:20	10	Outside	F	WH	Dark brown	1.69	1.28	Yes	1.84	0.90	0	13	1	Dirt	No	Small seeds. Black to dark brown outside.
F62	Fall	14-Oct-20	288	12:21	10	Outside	M	WH	Dark brown	1.36	0.80	Yes	1.30	0.36	0	5	0	Dirt	No	Small seeds. Black to dark brown outside.
F63	Fall	14-Oct-20	288	12:21	10	Outside	F	DH	Brown-yellow	3.14	2.35	No	3.34	2.40	0	1	2	Grass/Grain	No	Just outside of site 10. Small seed. Brown to light brown with some white outside.
F64	Fall	14-Oct-20	288	12:22	10	Outside	F	WH	Dark brown	2.60	2.12	No	5.58	4.64	0	11	24	Grain/Dirt	No	Just outside of site 10. At least 11 small seeds. Brown with white spots outside. Large pebbles. A bit sandy. Very hard.
F65	Fall	14-Oct-20	288	12:23	10	Outside	M	WH	Dark brown	3.16	0.65	No	1.84	0.90	0	3	2	Dirt	No	Just outside of site 10. Small seed. Dark brown outside. Small. A bit sandy. Very hard.
F66	Fall	14-Oct-20	288	12:25	10	Outside	M	DH	Brown-yellow	1.16	0.96	No	1.12	0.18	0	0	0	Grass/Grain	No	Just outside of site 10. Light brown-yellow with black and white spots.
F67	Fall	14-Oct-20	288	12:25	10	Outside	M	DH	Brown-yellow	1.01	0.96	No	1.06	0.12	0	0	0	Grass/Grain	No	Just outside of site 10. Light brown-yellow with black and white spots.
F68	Fall	14-Oct-20	288	12:26	10	Outside	F	WH	Black	1.68	1.24	No	1.84	0.90	0	0	3	Dirt	No	Just outside of site 10. Hint of green. Very hard. Small. Light brown with 1 white spot.
F69	Fall	14-Oct-20	288	12:27	10	Outside	U	DH	Brown-yellow	1.33	0.96	No	1.19	0.25	0	0	0	Grass/Grain	No	Just outside of site 10. Broken and small. Light brown yellow with black and white spots outside.
F70	Fall	14-Oct-20	288	12:29	10	Outside	M	DH	Brown	3.88	0.85	No	2.10	1.16	0	20	4	Grain/Dirt	No	Just outside of site 10. At least 20 small seeds. Brown to white on one side (outside).
F71	Fall	14-Oct-20	288	12:31	10	Outside	M	DH	Black	1.97	0.71	No	1.53	0.59	0	2	17	Grain/Dirt	No	Just outside of site 10. Small seeds. Hint of green. Black and white with some brown outside.
F72	Fall	14-Oct-20	288	12:33	10	Outside	F	DH	Black	2.08	1.55	No	2.63	1.69	0	0	8	Grain/Dirt	No	Just outside of site 10. Hint of green. Mainly black, white, and brown outside. Very hard.
F73	Fall	14-Oct-20	288	12:52	11	Outside	M	DH	Brown-yellow	4.02	1.05	No	1.89	0.95	0	0	2	Grass/Grain	No	Between site 10 and 11 (closer to 11). Small seeds. Brown and white outside.
F74	Fall	14-Oct-20	288	12:52	11	Outside	F	DH	Dark brown	2.19	1.77	No	2.50	1.56	0	5	1	Dirt	No	Between site 10 and 11 (closer to 11). Small seeds. Dark brown and white outside,
F75	Fall	14-Oct-20	288	13:05	11	Outside	M	DH	Brown-yellow	1.32	0.94	No	1.11	0.17	0	0	0	Grass/Grain	No	Brown with some white and black spots.
F76	Fall	14-Oct-20	288	14:04	12	Outside	F	DH	Brown	2.25	1.60	Yes	1.87	0.93	0	20	0	Grain/Dirt	No	3 of the seeds are similar to cactus seeds in size but not shape (Same as F119). 17 small seeds. Brown with some white outside.
F77	Fall	14-Oct-20	288	14:06	12	Outside	F	DH	Brown	2.65	1.83	No	1.70	0.76	0	7	4	Grass/Grain	No	Small seeds. Brown with black and white spots outside.
F78	Fall	14-Oct-20	288	14:38	13	Outside	M	DH	Brown-yellow	2.24	1.05	No	1.36	0.42	0	1	2	Grass/Grain	No	Small seed. Light brown with black and white spots outside.
F79	Fall	14-Oct-20	288	14:39	13	Outside	F	DH	Brown-yellow	2.92	2.16	No	2.60	1.66	0	1	8	Grass/Grain	No	Small seed. Brown to dark brown with white spots outside.
F80	Fall	14-Oct-20	288	14:40	13	Outside	M	DH	Brown	1.63	0.93	No	1.34	0.40	0	8	3	Grass/Grain	No	Small seeds. Brown with black and white spots outside.
F81	Fall	14-Oct-20	288	14:41	13	Outside	M	DH	Brown	1.25	0.99	No	1.20	0.26	0	0	1	Grass/Grain	No	Buried. Dark brown with white spots outside.
F82	Fall	14-Oct-20	288	15:31	14	Outside	F	WH	Brown			Yes			0				Yes	Raccoon scat? Brown-colored and have many visible small seeds. ~50 cm away from patch.
F83	Fall	15-Oct-20	289	10:40	16	Outside	M	WH	Dark brown	1.83	1.24	No	1.91	0.97	0	25	3	Dirt	No	At least 25 small seeds.Dark brown outside.
F84	Fall	15-Oct-20	289	10:42	16	Outside	M	WH	Dark brown	2.07	0.99	No	1.63	0.69	0	15	0	Dirt	No	At least 15 small seeds. Dark brown outside.
F85	Fall	15-Oct-20	289	10:43	16	Outside	M	WH	Dark brown	1.18	1.13	No	1.07	0.13	0	0	0	Dirt	Yes	Broken. Dark brown outside.

Table C6. Continued.

Scat ID #	Season	Date	Julian Date	Time	Site #	Inside/ Outside Cactus Patch	Scat Sex	Age (Dry/Wet; Soft/Hard)	Colour	Length (cm)	Width (cm)	Shaded ?	Weight with tin (g)	Weight w/out tin (g)	# of cactus seeds	# of seeds of other plants	# of pebbles/ minerals	Primary Element	Unsure?	Notes
F86	Fall	15-Oct-20	289	10:46	16	Outside	F	WH	Dark brown	1.82	1.47	No	1.73	0.79	0	0	0	Dirt	No	Dark brown to black with white spots outside. Small size.
F87	Fall	15-Oct-20	289	10:47	16	Outside	M	WH	Dark brown	1.64	0.93	No	1.48	0.54	0	4	0	Dirt	No	Small seeds. Dark brown outside.
F88	Fall	15-Oct-20	289	10:48	16	Outside	M	DH	Brown	1.59	1.03	No	1.38	0.44	0	2	0	Grass/Grain	No	~ 30 cm away from patch. Small seeds. Brown and white outside.
F89	Fall	15-Oct-20	289	10:52	16	Outside	M	WH	Dark brown	1.94	0.79	No	1.37	0.43	0	12	0	Grain/Dirt	No	At least 12 small seeds. Dark brown outside. Small size.
F90	Fall	15-Oct-20	289	10:57	16	Outside	M	DH	Brown-yellow	1.88	0.89	No	1.07	0.13	0	0	0	Grass/Grain	No	Brown to light brown with some white outside.
F91	Fall	15-Oct-20	289	15:09	17	Outside	F	WH	Brown	2.81	1.85	No	2.29	1.35	0	7	1	Grass/Grain	No	At least 7 small seeds. Dark brown outside. Stringy/long grass strands.
F92	Fall	15-Oct-20	289	15:11	17	Outside	M	WS	Dark brown	3.81	0.77	No	2.18	1.24	0	15	0	Dirt	No	At least 15 small seeds. Dark brown outside. Some grass pieces.
F93	Fall	15-Oct-20	289	15:12	17	Outside	U	WH	Dark brown	3.47	0.83	No	2.68	1.74	0	22	0	Dirt	No	Near sand nest. At least 22 small seeds. Brown with white spots outside. Some grass pieces.
F94	Fall	15-Oct-20	289	15:15	17	Outside	F	WH	Dark brown	4.38	0.97	No	2.62	1.68	0	35	0	Dirt	No	At least 35 small seeds. Dark brown with white spots outside. Some grass pieces.
F95	Fall	16-Oct-20	290	9:35	8	Outside	M	WS	Brown-yellow	4.40	0.99	No	1.40	0.46	0	0	0	Grass/Grain	No	Fresh. ~30 cm away from patch. Yellow with black and white spots outside.
F96	Fall	16-Oct-20	290	9:45	13	Outside	F	WS	Brown-yellow	0.93	1.01	No	1.16	0.22	0	1	0	Grass/Grain	No	Just outside of site 13. Small seed. Brown-yellow outside.
F97	Fall	16-Oct-20	290	11:25	19	Outside	U	DS	Brown-yellow	0.67	0.82	Yes	1.02	0.08	0	0	0	Grass/Grain	No	Close to big fingerling. Brown outside.
F98	Fall	16-Oct-20	290	11:33	19	Outside	M	WH	Brown	2.72	1.16	No	1.60	0.66	0	6	6	Grass/Grain	No	Small seeds. Brown outside.
F99	Fall	16-Oct-20	290	11:34	19	Outside	M	DH	Yellow	2.35	1.19	No	1.84	0.90	0	22	7	Grass/Grain	No	~20 cm away from patch. At least 22 small seeds. Light brown yellow with white spots outside. 2 pieces of scale found.
F100	Fall	16-Oct-20	290	11:36	19	Outside	M	DS	Light yellow	0.65	0.85	No	1.05	0.11	0	3	0	Grass/Grain	No	Next to a fingerling. Small seeds. Light brown yellow with white spots outside.
F101	Fall	16-Oct-20	290	13:45	30	Outside	F	DS	Dark brown	3.38	2.26	No	5.19	4.25	0	29	3	Dirt	No	4 of the seeds are similar to cactus seeds in terms of size but not shape (2 different species of seeds among the 4). Control site. Brown to dark brown with white spot outside.
F102	Fall	16-Oct-20	290	13:47	30	Outside	M	DS	Brown-yellow	0.88	0.82	No	1.05	0.11	0	0	0	Grass/Grain	No	Control Site. Light brown-yellow with some white outside.
F103	Fall	16-Oct-20	290	13:57	30	Outside	M	DH	Brown	2.24	1.02	Yes	2.09	1.15	0	3	4	Grain/Dirt	No	Control Site. Broken in half. Small seeds. Mainly white and light brown outside.
F104	Fall	16-Oct-20	290	14:28	22	Outside	F	DH	Brown	1.74	1.69	No	1.49	0.55	0	0	3	Grass/Grain	No	Brown and some white outside.
F105	Fall	16-Oct-20	290	14:29	22	Outside	F	DH	Brown	2.62	1.50	No	1.43	0.49	0	1	2	Grass/Grain	No	Small seed. Brown with white spots outside.
F106	Fall	16-Oct-20	290	15:02	23	Outside	F	DH	Dark brown	2.21	1.40	Yes	1.94	1.00	0	5	0	Dirt	No	Small seeds. Dark brown outside.
F107	Fall	16-Oct-20	290	15:32	24	Outside	F	DH	Black	2.50	1.56	Yes	2.43	1.49	0	0	0	Mineral	Yes	Black outside. Glittery and shiny outside. Too hard (mineralized).
F108	Fall	16-Oct-20	290	15:41	24	Outside	F	DH	Brown	2.28	1.45	No	1.65	0.71	0	2	1	Grass/Grain	No	Slightly outside site 24. Small seeds. Brown with white spots outside.
F109	Fall	16-Oct-20	290	16:01	25	Outside	M	DH	Brown	3.66	0.68	Yes	1.42	0.48	0	4	2	Grain/Dirt	No	May belong to baby wild turkey from a long time ago. Small seeds. Small size. Brown with white spots outside.
F110	Fall	16-Oct-20	290	16:01	25	Outside	U	DH	Brown	1.79	0.68	Yes	1.18	0.24	0	7	0	Grain/Dirt	No	May belong to baby wild turkey from a long time ago. Found near fingerling ~ 50cm away from patch. Small seeds. Small size. Brown with white spot outside.
F111	Fall	16-Oct-20	290	17:18	28	Outside	F	DS	Brown-yellow	2.09	1.46	Yes	1.86	0.92	0	3	7	Grass/Grain	No	Seeds are similar to cactus seeds in terms of size but not shape (same as F119). Brown outside. Have large pebbles.
F112	Fall	16-Oct-20	290	17:19	28	Outside	M	DH	Brown-yellow	0.65	0.93	Yes	1.08	0.14	0	0	0	Grass/Grain	No	Brown outside.
F113	Fall	16-Oct-20	290	17:32	29	Outside	F	DS	Brown	1.09	0.76	Yes	1.05	0.11	0	0	0	Grass/Grain	No	May belong to baby wild turkey. Beside fingerling. ~ 2cm away from patch. Brown outside.
F114	Fall	16-Oct-20	290	17:48	29	Outside	M	DS	Brown	2.66	1.01	Yes	1.43	0.49	0	0	0	Grass/Grain	No	~ 40 cm away from patch. Dark brown with some white outside.
F115	Fall	16-Oct-20	290	17:48	29	Outside	M	DH	Brown	1.56	0.89	Yes	1.27	0.33	0	3	0	Grass/Grain	No	~ 40 cm away from patch. Small seeds. Dark brown outside.
F116	Fall	17-Oct-20	291	9:23	31	Outside	M	DH	Brown	5.05	0.82	No	2.93	1.99	0	6	0	Grass/Grain	No	Found in open space. ~ 1 m away from patch. Small seeds. Brown outside.
F117	Fall	17-Oct-20	291	9:24	31	Outside	F	DH	Brown	2.22	2.03	No	2.61	1.67	0	16	1	Grass/Grain	No	Found in open space. ~ 1 m away from patch. At least 16 small seeds. Brown outside. Contain 3 small color pieces (green).
F118	Fall	17-Oct-20	291	9:43	31	Outside	M	DH	Brown-yellow	1.70	0.64	No	1.14	0.20	0	6	0	Grass/Grain	No	Broken. At least 6 small seeds. Brown outside.
F119	Fall	17-Oct-20	291	11:25	32	Outside	F	DH	Dark brown	1.85	1.70	No	1.79	0.85	0	14	2	Grass/Grain	No	terms of size but not shape. Brown to dark brown outside.
F120	Fall	17-Oct-20	291	11:25	32	Outside	F	DS	Brown-yellow	2.96	2.15	No	1.96	1.02	0	0	0	Grass/Grain	No	~ 1 m away from patch. Brown with some white outside.
F121	Fall	17-Oct-20	291	11:27	32	Outside	M	DS	Brown	1.51	1.08	Yes	1.29	0.35	0	0	0	Grass/Grain	No	Brown outside.
F122	Fall	17-Oct-20	291	14:00	35	Outside	U	DS	Brown	1.32	1.30	Yes	1.18	0.24	0	18	0	Grain/Dirt	Yes	Broken and buried in soil. At least 18 small seeds. Brown to dark brown outside.
F123	Fall	17-Oct-20	291	15:02	36	Outside	F	DH	Dark brown	2.87	1.90	No	2.54	1.60	0	25	0	Dirt	No	~30 cm away from patch. At least 25 small seeds. Dark brown with small white spot outside.
F124	Fall	17-Oct-20	291	15:21	36	Outside	F	DH	Dark brown	2.22	1.65	Yes	2.56	1.62	0	7	0	Dirt	No	Just outside of site 36. At least 7 small seeds. Dark brown outside.
F125	Fall	17-Oct-20	291	16:36	38	Outside	U	DS	Yellow	1.63	0.91	No	1.16	0.22	0	0	0	Grass/Grain	No	~ 1 m away from patch. Brown with some white outside.
F126	Fall	17-Oct-20	291	16:37	38	Outside	M	DH	Light brown	1.76	1.01	No	1.25	0.31	0	0	0	Grass/Grain	No	~ 1 m away from patch. Brow with black and white spots outside.
F127	Fall	17-Oct-20	291	16:37	38	Outside	M	DH	Brown-yellow	1.71	0.78	No	1.27	0.33	0	35	0	Grass/Grain	No	~ 1 m away from patch. At least 35 small seeds. Brown with some white spots outside.
F128	Fall	17-Oct-20	291	16:37	38	Outside	M	DS	Yellow	1.73	1.08	No	1.27	0.33	0	0	0	Grass/Grain	No	~ 50 cm away from patch. Brown with some white spots outside.
F129	Fall	17-Oct-20	291	16:38	38	Outside	F	DS	Brown-yellow	2.09	1.05	No	1.33	0.39	0	0	0	Grass/Grain	No	~ 5 cm away from patch. Brown with black and white spots outside.
F130	Fall	17-Oct-20	291	16:38	38	Outside	M	DS	Brown	1.17	0.80	No	1.10	0.16	0	0	0	Grain/Dirt	No	~ 35 cm away from patch. Mainly white with black spots outside.
F131	Fall	17-Oct-20	291	16:38	38	Outside	M	DS	Yellow	2.26	1.00	No	1.41	0.47	0	0	0	Grass/Grain	No	~ 25 cm away from patch. Brown to brown-yellow with black and white spots outside.
F132	Fall	17-Oct-20	291	16:40	38	Outside	M	DH	Brown-yellow	1.64	1.14	No	1.21	0.27	0	0	0	Grass/Grain	No	~ 5 cm away from patch. Brown with black and white spots outside.
F133	Fall	17-Oct-20	291	16:41	38	Outside	F	DS	Brown-yellow	1.48	1.15	Yes	1.22	0.28	0	0	0	Grass/Grain	No	Partially shaded by grass. ~75 cm away from patch. Brown to brown-yellow with black and white spots outside.
F134	Fall	17-Oct-20	291	16:41	38	Outside	M	DS	Brown-yellow	3.55	1.01	No	1.60	0.66	0	1	0	Grass/Grain	No	~20 cm away from patch. Small seed. Brown-yellow with white spots outside.
F135	Fall	17-Oct-20	291	16:42	38	Outside	M	DH	Dark brown	2.30	0.83	No	1.81	0.87	0	0	6	Dirt	No	~ 1 m away from patch. Brown with black and white spots outside. Small size.
F136	Fall	17-Oct-20	291	16:45	38	Outside	M	DS	Brown-yellow	5.00	0.88	Yes	1.87	0.93	0	0	1	Grass/Grain	No	Partially shaded by grass. Soil is still wet underneath scat. ~ 30 cm away from patch. Brown to brown-tellow with some white spot outside.
F137	Fall	17-Oct-20	291	16:47	38	Outside	M	DH	Dark brown	2.65	1.10	No	1.87	0.93	0	20	0	Dirt	No	~ 20 cm away from patch. At least 20 small seeds. Dark brown with white spots outside.
F138	Fall	18-Oct-20	292	11:18	2	Outside	M	DS	Brown	1.93	0.83	Yes	1.20	0.26	0	0	0	Grass/Grain	No	Brown with white spots outside.
F139	Fall	18-Oct-20	292	11:18	2	Outside	F	DH	Brown	1.76	1.24	Yes	1.46	0.52	0	0	1	Grass/Grain	No	Brown-yellow with white spots outside. Hint of green. Some stringy plant material.
F140	Fall	18-Oct-20	292	11:54	8	Outside	M	DS	Brown-yellow	2.46	0.92	Yes	1.35	0.41	0	0	3	Grass/Grain	No	Brown-yellow with white spots outside. Hint of green. Some stringy plant material.
F141	Fall	18-Oct-20	292	12:01	21	Outside	U	DH	Brown	0.86	0.77	No	1.18	0.24	0	0	0	Grass/Grain	Yes	Rabbit scats (5). Collected unofficially to see if cactus seeds would be in their scats. Found near fingerlings outside of the cactus patch. Soft inside.

Table C7. Descriptive data of *Opuntia cespitosa* fruit and wild turkey scat containing seeds. Fruits were provided by Dr. Taly Drezner. Wild turkey scat containing cactus seeds collected at Point Pelee National Park.

Count	Fruit/Scat	Date Collected	Time Collected	Origin	Date Dissected	Time Dissected	Fruit Color	Fruit Length (cm)	Fruit Diameter (cm)	Number of Seeds	Weight of total seeds (g)	Average Weight/seed (g)	Average Weight/seed (mg)	Note
1	Fruit	11-Aug-20	10:00 AM	Taly	17-Aug-20	12:15 AM	Green	4.5	0.5	27	0.25	0.0093	9.26	Small fruit
2	Fruit	11-Aug-20	10:00 AM	Taly	17-Aug-20	12:30 AM	Green	6	1.5	29	0.48	0.0166	16.55	Large and Spikier
3	Fruit	22-Oct-20	1:00 PM	Taly	01-Nov-20	1:00 AM	Red	5.6	1.34	10	0.38	0.0380	38.00	Lots of little spikes around the aeroles, seeds are more encased with fruit flesh (gooey/jelly-like), stained red on the outside, slippery in water
4	Scat	13-Oct-20	4:19 PM	Park	06-Nov-20	10:00 PM	N/A	N/A	N/A	2	0.03	0.0150	15.00	

*All seeds were air-dried for more than 48 hours before weighing them

Table C8. Descriptive data of *Opuntia cespitosa* seeds retrieved from fruits and wild turkey scat described in Table F7.

Seed ID	Source	Fruit/Scat ID	Season	Largest Diameter (mm)	Smallest Diameter (mm)	Average Diameter (mm)	Thickness (mm)	Shape	Color	Color Extra Notes	Texture	Note
1	Fruit	1	Summer	4.1	3.9	4	2.5	Comma	Ivory	Transluscent	Smooth	
2	Fruit	1	Summer	4.4	3.7	4.05	2.3	Comma	Ivory	Transluscent	Smooth	
3	Fruit	1	Summer	4.6	4.2	4.4	2.4	Comma	Ivory	Transluscent	Smooth	
4	Fruit	1	Summer	4.8	3.5	4.15	2.6	Comma	Ivory	Transluscent	Smooth	
5	Fruit	1	Summer	4.6	4.1	4.35	2.4	Comma	Ivory	Transluscent	Smooth	
6	Fruit	1	Summer	4.5	4.3	4.4	2.4	Comma	Ivory	Transluscent	Smooth	
7	Fruit	1	Summer	4.1	3.8	3.95	1.8	Comma	Ivory	Transluscent	Smooth	
8	Fruit	1	Summer	4.9	4.1	4.5	2.2	Comma	Ivory	Transluscent	Smooth	
9	Fruit	1	Summer	4.3	4	4.15	2.2	Comma	Ivory	Transluscent	Smooth	
10	Fruit	1	Summer	4.1	3.9	4	2.4	Comma	Ivory	Transluscent	Smooth	
11	Fruit	1	Summer	4.8	4.2	4.5	1.7	Comma	Ivory	Transluscent	Smooth	
12	Fruit	1	Summer	4.3	4.2	4.25	2	Comma	Ivory	Transluscent	Smooth	
13	Fruit	1	Summer	4.6	4.1	4.35	2	Comma	Ivory	Transluscent	Smooth	
14	Fruit	1	Summer	4.3	3.7	4	2.2	Comma	Ivory	Transluscent	Smooth	
15	Fruit	1	Summer	4.3	4	4.15	2.4	Comma	Ivory	Transluscent	Smooth	
16	Fruit	1	Summer	4.5	4.2	4.35	2.5	Comma	Ivory	Transluscent	Smooth	
17	Fruit	1	Summer	4.2	3.5	3.85	2.1	Comma	Ivory	Transluscent	Smooth	
18	Fruit	1	Summer	4.3	4	4.15	1.9	Comma	Ivory	Transluscent	Smooth	
19	Fruit	1	Summer	4.6	3.6	4.1	2.4	Comma	Ivory	Transluscent	Smooth	
20	Fruit	1	Summer	4.7	4.1	4.4	2.1	Comma	Ivory	Transluscent	Smooth	
21	Fruit	1	Summer	4.4	3.9	4.15	2.3	Comma	Ivory	Transluscent	Smooth	
22	Fruit	1	Summer	3.8	3.5	3.65	1.9	Comma	Ivory	Transluscent	Smooth	
23	Fruit	1	Summer	4.1	4	4.05	2.6	Comma	Ivory	Transluscent	Smooth	
24	Fruit	1	Summer	4.1	3.7	3.9	2	Comma	Ivory	Transluscent	Smooth	
25	Fruit	1	Summer	4.2	3.7	3.95	2.5	Comma	Ivory	Transluscent	Smooth	
26	Fruit	1	Summer	4.1	3.6	3.85	2.4	Comma	Ivory	Transluscent	Smooth	
27	Fruit	1	Summer	4.2	3.4	3.8	1.9	Comma	Ivory	Transluscent	Smooth	
28	Fruit	2	Summer	4.3	3.7	4	2.3	Comma	Ivory	Transluscent	Smooth	
29	Fruit	2	Summer	4.7	4	4.35	2.5	Comma	Ivory	Transluscent	Smooth	
30	Fruit	2	Summer	4.6	4.2	4.4	2.1	Comma	Ivory	Transluscent	Smooth	
31	Fruit	2	Summer	4.5	4.2	4.35	2.5	Comma	Ivory	Transluscent	Smooth	
32	Fruit	2	Summer	4.8	4.1	4.45	1.9	Comma	Ivory	Transluscent	Smooth	
33	Fruit	2	Summer	5.1	4.4	4.75	2.1	Comma	Ivory	Transluscent	Smooth	
34	Fruit	2	Summer	3.9	3.6	3.75	2.1	Comma	Ivory	Transluscent	Smooth	
35	Fruit	2	Summer	4.3	3.7	4	2.2	Comma	Ivory	Transluscent	Smooth	
36	Fruit	2	Summer	4.9	3.9	4.4	2.5	Comma	Ivory	Transluscent	Smooth	
37	Fruit	2	Summer	4.7	4.2	4.45	2.4	Comma	Ivory	Transluscent	Smooth	
38	Fruit	2	Summer	4.7	4.2	4.45	2.4	Comma	Ivory	Transluscent	Smooth	
39	Fruit	2	Summer	4.5	4.1	4.3	2.3	Comma	Ivory	Transluscent	Smooth	
40	Fruit	2	Summer	4.5	3.9	4.2	2.3	Comma	Ivory	Transluscent	Smooth	
41	Fruit	2	Summer	4.4	4.2	4.3	2.3	Comma	Ivory	Transluscent	Smooth	
42	Fruit	2	Summer	4.4	4.1	4.25	2.3	Comma	Ivory	Transluscent	Smooth	
43	Fruit	2	Summer	4.7	4.1	4.4	2.3	Comma	Ivory	Transluscent	Smooth	
44	Fruit	2	Summer	4.6	4.1	4.35	2.4	Comma	Ivory	Transluscent	Smooth	
45	Fruit	2	Summer	4.5	4.2	4.35	2.3	Comma	Ivory	Transluscent	Smooth	
46	Fruit	2	Summer	4.4	4	4.2	2.3	Comma	Ivory	Transluscent	Smooth	
47	Fruit	2	Summer	4.8	4.1	4.45	2.2	Comma	Ivory	Transluscent	Smooth	
48	Fruit	2	Summer	4.3	3.6	3.95	1.8	Comma	Ivory	Transluscent	Smooth	One side of Embryo (Black) exposed
49	Fruit	2	Summer	4.7	4.3	4.5	2.4	Comma	Ivory	Transluscent	Smooth	
50	Fruit	2	Summer	4.8	3.9	4.35	2.3	Comma	Ivory	Transluscent	Smooth	
51	Fruit	2	Summer	3.7	3.4	3.55	1.8	Comma	Ivory	Transluscent	Smooth	
52	Fruit	2	Summer	4.5	4.3	4.4	2.8	Comma	Ivory	Transluscent	Smooth	
53	Fruit	2	Summer	4.8	4.5	4.65	2.2	Comma	Ivory	Transluscent	Smooth	
54	Fruit	2	Summer	4.2	3.8	4	2.5	Comma	Ivory	Transluscent	Smooth	
55	Fruit	2	Summer	4.5	4.2	4.35	2.4	Comma	Ivory	Transluscent	Smooth	
56	Fruit	2	Summer	4.8	4.4	4.6	2.2	Comma	Ivory	Transluscent	Smooth	
57	Fruit	3	Fall	5.3	4.9	5.1	2.6	Comma	Light tan +red-pink outline	Transluscent	Smooth	
58	Fruit	3	Fall	5.5	4.7	5.1	2.8	Comma	Light tan +red-pink outline	Transluscent	Smooth	
59	Fruit	3	Fall	5	4.7	4.85	2.5	Comma	Light tan +red-pink outline	Transluscent	Smooth	
60	Fruit	3	Fall	5.3	4.5	4.9	2.6	Comma	Light tan +red-pink outline	Transluscent	Smooth	
61	Fruit	3	Fall	5.2	5	5.1	2.7	Comma	Light tan +red-pink outline	Transluscent	Smooth	
62	Fruit	3	Fall	5.1	4.9	5	2.7	Comma	Light tan +red-pink outline	Transluscent	Smooth	
63	Fruit	3	Fall	5.1	4.9	5	2.7	Comma	Light tan +red-pink outline	Transluscent	Smooth	
64	Fruit	3	Fall	5.2	4.7	4.95	2.8	Comma	Light tan +red-pink outline	Transluscent	Smooth	
65	Fruit	3	Fall	5.3	5	5.15	2.7	Comma	Light tan +red-pink outline	Transluscent	Smooth	
66	Fruit	3	Fall	5.2	5.1	5.15	2.8	Comma	Light tan +red-pink outline	Transluscent	Smooth	
67	Scat	4	Fall	3.9	3.5	3.7	2.2	Comma	Light tan + dark brown spots	Solid	Contains crevices and scars	Sharp edges around the middle of the seed is gone
68	Scat	4	Fall	3.8	3.5	3.65	2.4	Comma	Light tan + dark brown spots	Solid	Contains crevices and scars	Sharp edges around the middle of the seed is gone