

Spatial and temporal patterns of bird-window collisions at Vancouver Island University, Nanaimo, British Columbia

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Background

- An estimated 16 to 42 million birds die from window collisions every year in Canada.¹
- Researchers have found that percent glass coverage, glass reflectivity, proximity and height of nearby vegetation and internal and external lighting all impact collision rates.^{2,3,4,5}
- Daytime collisions are common year-round and are correlated with building characteristics and vegetation proximity.^{3,5,6}
- Nighttime collisions are common during migration and can be influenced by internal and external lighting of buildings.^{1,6}
- More birds are believed to die due to window collisions during fall and spring migration than during winter or summer months. This may be an inaccurate assessment since the majority of studies have focused on fall and spring migration, rather than studying collisions year-round.^{2,6}
- Variations in bird population density can be affected by environmental conditions such as weather, temperature, habitat and food availability, as well as breeding success and survival rates, which can influence temporal and spatial differences in bird-window collisions (BWCs).^{7,8}

Objectives

- Identify locations at VIU where birds collide with windows.
- Determine if collisions are more frequent during the day or night.
- Determine if there are seasonal differences in collisions rates.

Materials and Methods

- Eight buildings on the VIU Nanaimo campus were monitored bi-weekly for evidence of BWC from June 5, 2018 to March 1, 2019.
- The buildings surveyed included 170 (The Gathering Place), 193 (Student's Union), 200 (Student Affairs), 205 (Academic and Career Preparation), 305 (Library), 310 (Theatre), 355 (Arts and Sciences), and 356 (Education and Social Sciences).
- Each building was surveyed for signs of BWCs including dust markings or feathers stuck to the windows, or signs on the ground including feathers and injured or dead birds.
- For each BWC, the building façade, percent glass coverage, window transparency and reflectivity along with vegetation details were recorded.
- Once a month, six surveys were conducted, three at sunrise and at sunset, to evaluate daytime and nighttime collisions.
- The VIU community was encouraged to participate in reporting BWCs through the Citizen Science form accessible at <https://wordpress.viu.ca/viubirdwindowcollisions/>.⁹

Results

- In total, 271 evidences of collisions were recorded (240 window prints, 31 carcasses). Strike locations are shown in **Figure 1**. BWC hotspots were located on the west and south side of building No. 193, east side of No. 200, north side of No. 205, west side of No. 305, and all around building No. 355.
- A total of 15 different species were found and identified. Intact carcasses are shown in **Figure 2**, along with 11 additional carcasses found through the Citizen Science reports.
- Significantly more BWCs occurred during the day (26) rather than at night (5) ($\chi^2=14.2$, $df=1$, $p<0.001$) (**Figure 3A**).
- There was a significant difference in the number of BWCs between seasons ($\chi^2=125$, $df=2$, $p<0.001$). There were more collisions in the summer (168), and least during the winter (18) (**Figure 3B**). There was 85 collisions, with the most carcasses found (17), during the fall.
- A total of 36 Citizen Science entries reported 11 window strikes and 25 carcasses.

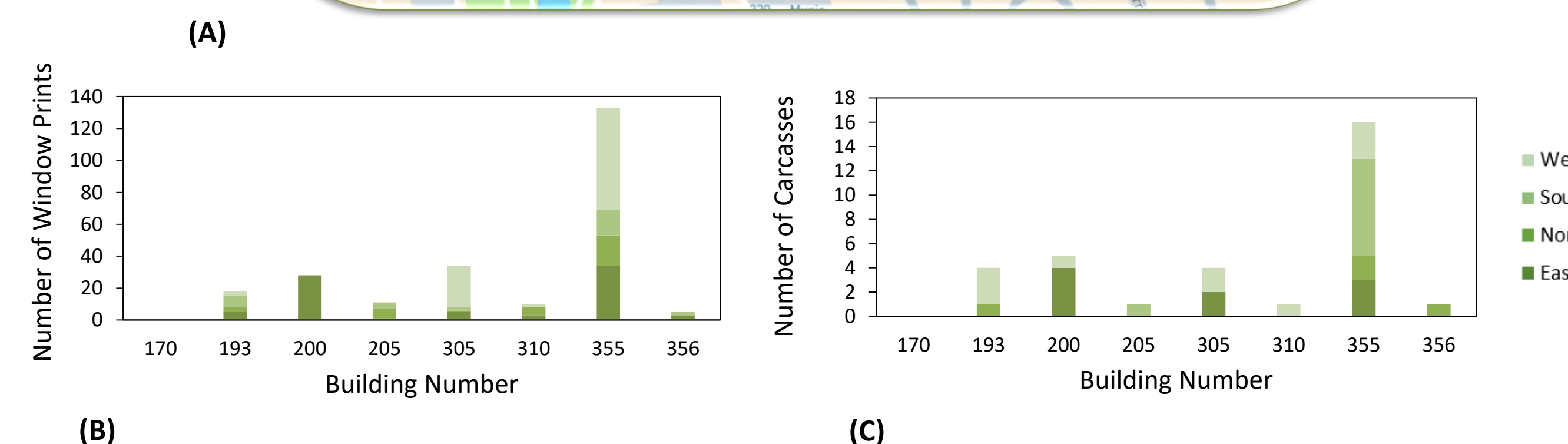
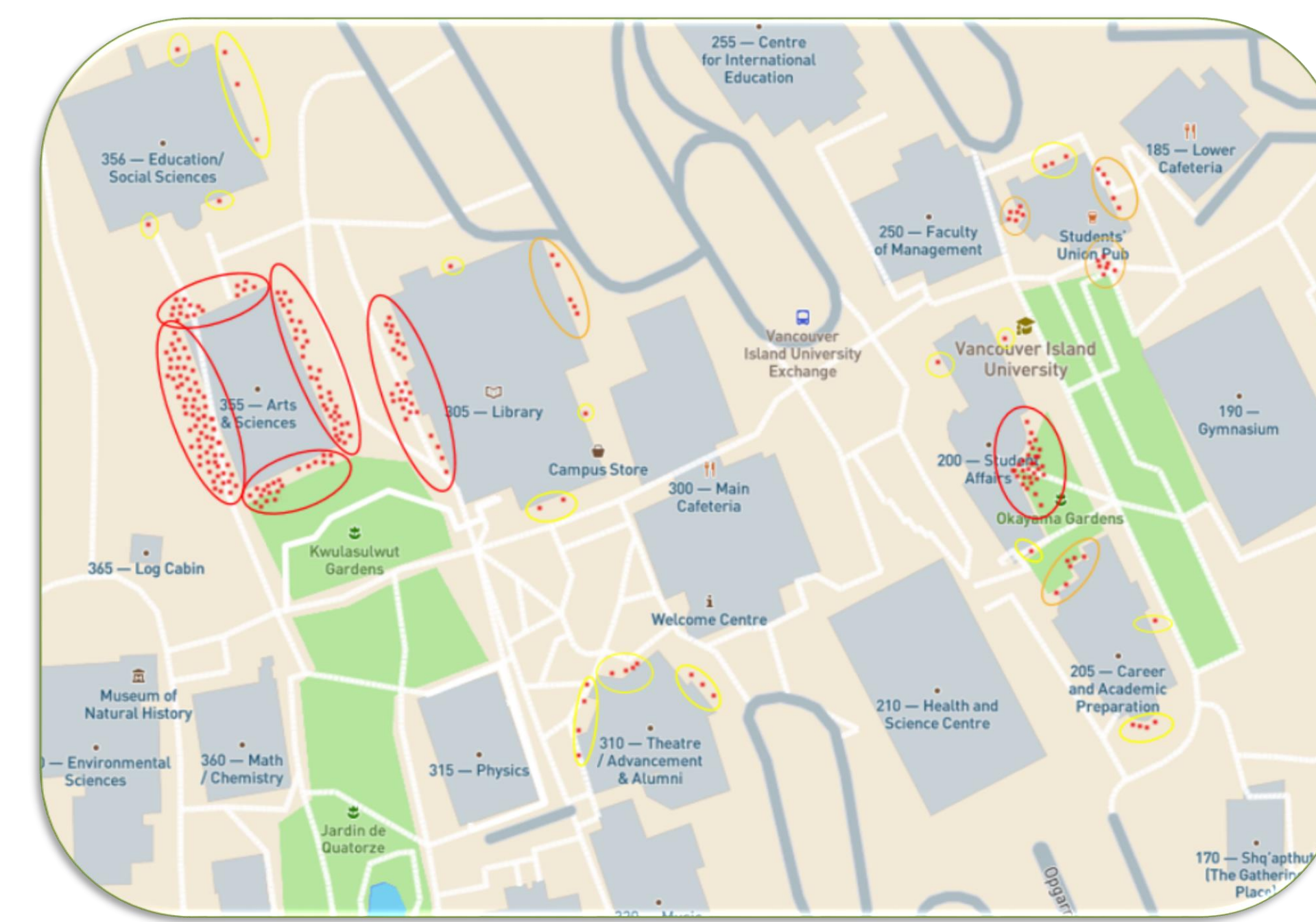


Figure 1. (A) Map of BWCs (red dots) found at the eight buildings surveyed; red circles indicate more than 8 collisions, orange circles indicate 5-8 collisions, yellow circles indicate 1-4 collisions. The number and location of (B) bird-window prints and (C) carcasses found at the eight buildings surveyed. The cardinal direction of the building façades where evidence of collisions were found are indicated with different colours.



Figure 2. Photograph of 32 birds found dead from bird-window collisions during surveys (21) and citizen science reports (11) between June 5, 2018 to March 1, 2019; From right to left, top to bottom row: 7 American Robins, 1 Northern Flicker; 3 Varied Thrush, 1 Black-headed Grosbeak, 1 Spotted Towhee, 1 Cedar Waxwing, 1 Swainson's Thrush, 1 Bushit, 1 Anna's Hummingbird, 2 Golden-crowned Kinglets, 1 Orange-crowned warbler; 1 Fox Sparrow, 1 Savannah Sparrow, 1 House Finch, 6 Dark-eyed Junco, 1 Orange-crowned Warbler, 1 Wilson's Warbler, 1 Orange-crowned Warbler.

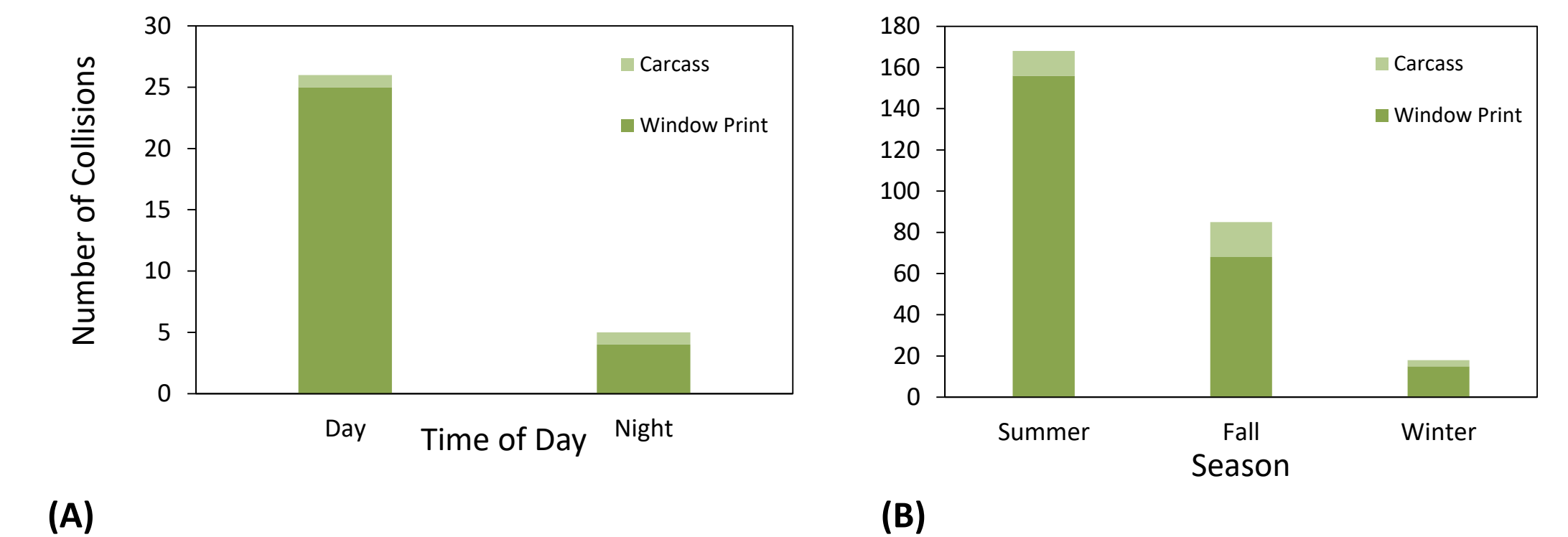


Figure 3. (A) Day and night collisions found at buildings 305, 310, 355, and 356 during the weeks of June 26-29, July 24-27, August 28-31, September 25-28, October 30-November 2, December 25-28, January 22-25, and February 19-22. (B) Seasonal variation in BWCs at the eight buildings surveyed. Summer included the months of June, July, and August; Fall included the months of September, October, and November; Winter included the months of December, January, and February.

Discussion

- Buildings No. 193, 200, 205, 305, and 355 are high impact areas. The majority of the windows where BWCs occurred were moderately to highly reflective with nearby vegetation.⁹
- More collisions occurred during the day indicating that window characteristics and nearby vegetation may be playing a larger role than migration patterns and building lighting.^{3,5,6}
- Contrary to other studies, more BWCs occurred during the summer, indicating that more research is required during the breeding season rather than just during migration.⁵
- BWCs continue to be a problem at VIU and mitigation measures should be enacted at the hotspots where research should continue to ensure the mitigations are effective.

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Acknowledgements

I thank my supervisor, Eric Demers for his guidance and support, along with my committee members, Tim Goater and Jamie Gorrell. I would like to thank Martin Angelstad for his advice and assistance. Thank you to Kimberley Barrett for volunteering to conduct surveys and to all those who participated in the Citizen Science Reports. I also wanted to acknowledge Kaitlin Ovcharov who laid the ground work for this project. Furthermore, I would like to thank VIU Facilities & Ancillary Services for allowing me to conduct this research on campus.

