Estimating Occupancy of Commuter Parking Zones at OSU

Funfay Jen

Prince Fefemwole

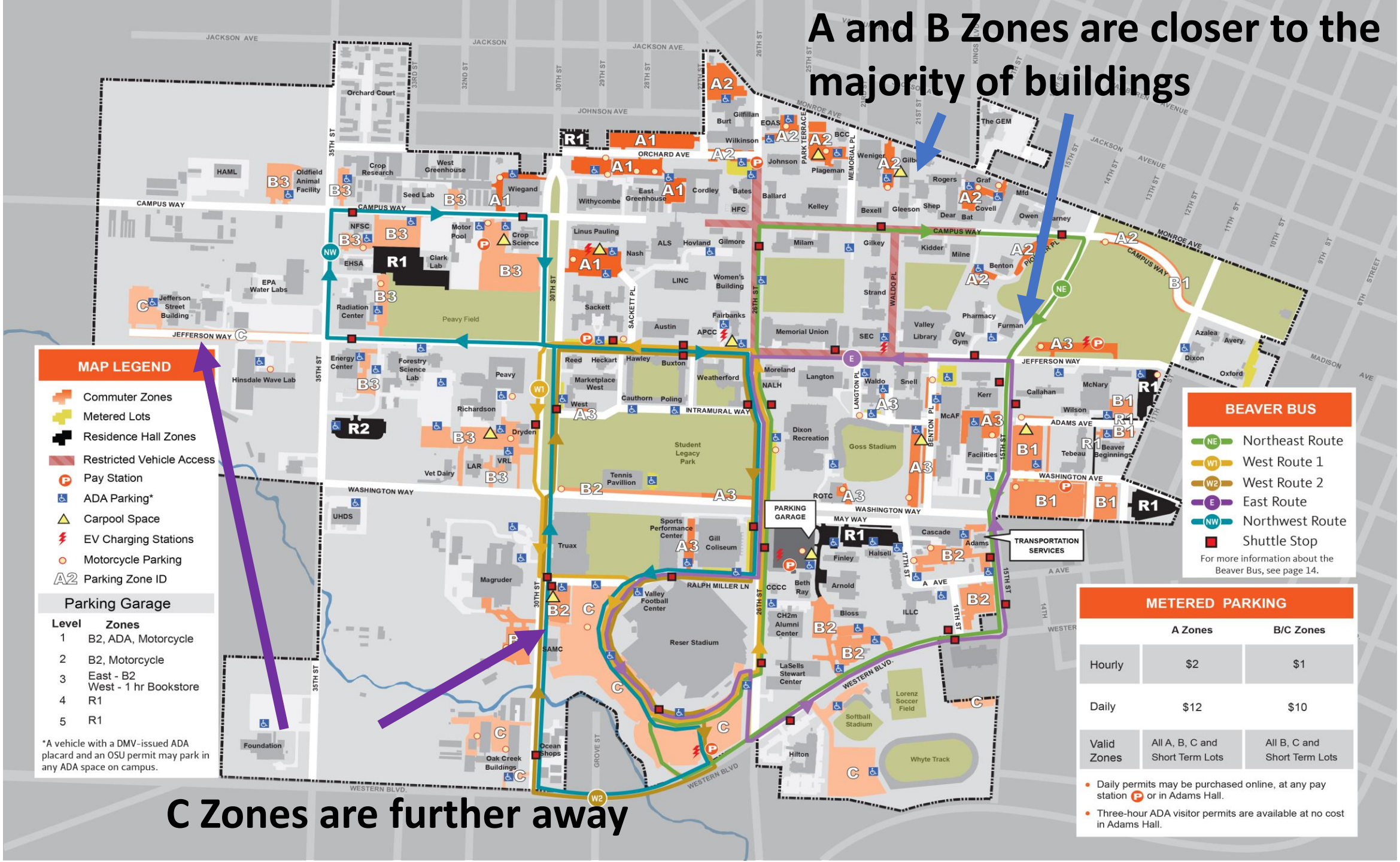
Suhas Shastry

Jillian Cosgrove

Background

- All parking lots on the OSU campus have been grouped into zones based on parking use patterns, and total permit sales in each zone are limited to improve parking availability.

https://transportation.oregonstate.edu/parking/parking-guidelines


A and B Zones are closer to the majority of buildings
C Zones are further away
MAP LEGEND
Commuter Zones
Metered Lots
Residence Hall Zones
Restricted Vehicle Access
Pay Station
ADA Parking*
Carpool Space
EV Charging Stations
Motorcycle Parking
A2 Parking Zone ID
Parking Garage
Level Zones
1 B2, ADA, Motorcycle
2 B2, Motorcycle
3 East - B2 West - 1 hr Bookstore
4 R1
5 R1
*A vehicle with a DMV-issued ADA placard and an OSU permit may park in any ADA space on campus.
BEAVER BUS
Northeast Route
West Route 1
West Route 2
East Route
Northwest Route
Shuttle Stop
For more information about the Beaver Bus, see page 14.
METERED PARKING
A Zones
B/C Zones
Hourly $2 $1
Daily $12 $10
Valid Zones All A, B, C and Short Term Lots All B, C and Short Term Lots
Daily permits may be purchased online, at any pay station or in Adams Hall.
Three-hour ADA visitor permits are available at no cost in Adams Hall.
PARKING GARAGE
TRANSPORTATION SERVICES
JACKSON AVE
JOHNSON AVE
ORCHARD AVE
CAMPUS WAY
JEFFERSON WAY
WASHINGTON WAY
INTRAMURAL WAY
RALPH MILLER LN
WESTERN BLVD
MONROE AVE
ADAMS AVE
MADISON AVE
HAML
Oldfield Animal Facility
Crop Research
West Greenhouse
Seed Lab
Wiegand
Withycombe
East Greenhouse
Cordley
Bates
HFC
Ballard
Kelley
Johnson
Plageman
Wilkinson
Burt
Gilfillan
EOAS
BCC
Weniger
Rogers
Graf
Covell
Bexell
Gleeson
Shep
Dear
Bat
Owen
Mfd
The GEM
NFSC
EHSA
Clark Lab
Motor Pool
Crop Science
Peavy Field
Linus Pauling
Nash
ALS
Hovland
Gilmore
LINC
Women's Building
Sackett
Austin
APCC
Fairbanks
Jefferson Street Building
EPA Water Labs
Radiation Center
Energy Center
Forestry Science Lab
Hinsdale Wave Lab
Peavy
Richardson
Dryden
VRL
LAR
Vet Dairy
Tennis Pavilion
Student Legacy Park
Reed
Heckart
Hawley
Buxton
Weatherford
Marketplace West
Cauthorn
Poling
Milam
Gilkey
Kidder
Milne
Benton
Strand
Waldo PL
Memorial Union
SEC
Valley Library
GV Gym
Pharmacy
Furman
Moreland
NALH
Langton
Waldo
Snell
Kerr
McAf
Callahan
McNary
Wilson
Tebeau
Beaver Beginnings
Facilities
Dixon Recreation
Goss Stadium
ROTC
MAY WAY
Finley
Halsell
Cascade
Adams
Azalea
Avery
Dixon
Oxford
UHDS
Magruder
Truax
Sports Performance Center
Gill Coliseum
Valley Football Center
Reser Stadium
SAMC
Foundation
Ocean Shops
Oak Creek Buildings
Grove St
CCCC
Beth Ray
Arnold
Bloss
ILLC
CH2m Alumni Center
LaSells Stewart Center
Lorenz Soccer Field
Softball Stadium
Whyte Track
Hilton
A AVE
14TH
15TH ST
16TH ST
17TH ST
26TH ST
30TH ST
35TH ST

Background

- The price of an annual commuter permit varies by zone.

Figure 1: Prices of Commuter Parking Permits at OSU in 2018

Valid Sept. 20, 2018 through Sept. 24, 2019	A Zones (1, 2, 3)	B Zones (1, 2, 3)	C Zone
August 14 - October 31, 2018	$522	$351	$108
November 1, 2018	$479	$322	$99
December 1, 2018	$436	$293	$90
January 1, 2019	$393	$264	$81
February 1, 2019	$350	$235	$72
March 1, 2019	$307	$206	$63
April 1, 2019	$264	$177	$54
May 1, 2019	$221	$148	$45
June 1, 2019	$178	$119	$36
July 1, 2019	$135	$90	$27

Background

- A-zone permit holders may also park in the B and C zones
- B-zone permit holders may also park in the C zone
- C-zone permit holders may not park in any other zones

Figure 2: Rules for parking between zones

If you purchased this permit:	You may park in these zones:
A1	A1, B1, B2, B3, C
A2	A2, B1, B2, B3, C
A3	A3, B1, B2, B3, C
B1	B1, C
B2	B2, C
B3	B3, C
C	C

Research Question

Someone interested in buying an annual commuter permit may ask: is it worth it to pay for the more expensive permit?

REASONING FOR YES

- A and B zones are closer to the majority of buildings on campus → may allow the driver to get to class faster.
- Occupancy of A and B Zones may be lower, since they can park in lower zones, but not vice versa.

REASONING FOR NO

- Occupancy of A and B Zones may be higher → would have to spend extra time driving from lot to lot looking for a space.
- More expensive pass may not guarantee convenience.

Project Goals

1) Estimate percent occupancy of commuter parking lots on the OSU campus on Monday at noon.

2) Determine whether significant differences exist in percent occupancy between zones.

Sampling Design

- **Stratified sampling design** with zones A, B, and C as strata.
- How many lots per zone?
  - We'd like to sample many lots to achieve good precision (<10%)
  - Want to sample all lots at the same time on the same day to reduce temporal variation.
  - But we only have 4 group members! (Budget constraints)

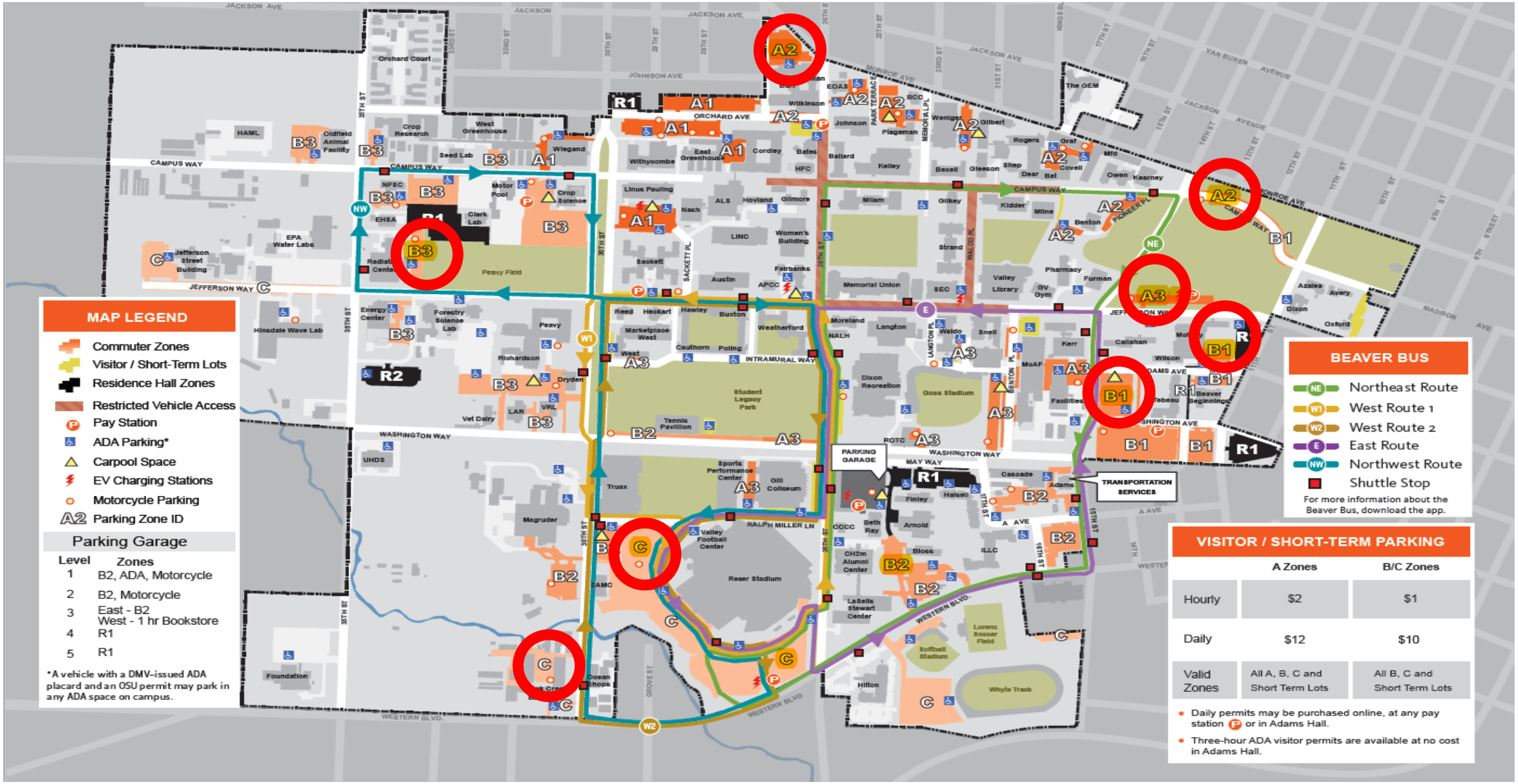
→ **Proportional allocation of 8 lots total**

Sampling Methods – Selection of lots

1. The map of parking lots was obtained from the University website (https://transportation.oregonstate.edu/parking/maps).
2. Parking zones were divided into 3 sections with various sub-sections (A – A1, A2 & A3, B-B1,B2 & B3 and C)
3. Parking zones were listed by 3 group members and randomly selected by the 4th member to prevent bias.
   - **Zone A:** 3 lots out of 19
   - **Zone B:** 3 lots out of 23
   - **Zone C:** 2 lots out of 10*

   * Broke up stadium lot into 6 separate “sublots” so the size of the sublot was comparable to lots in A and B zones

Selected lots for sampling



Sampling Methods – Pilot survey

- All group members surveyed one lot together (November 20)
- Agreed on rules for sampling

Sampling Methods – Pilot survey

Sampling Methods – Pilot Survey

Handicapped and motorcycle spaces → not counted

Sampling Methods – Pilot Survey

Service Vehicle spaces and Loading Zones → not counted

Sampling Methods – Pilot Survey

Semi-permanent objects in spaces → not counted

Sampling Methods – Pilot Survey

- **If car arrives or leaves in uncounted area ahead of you → count**
- **If car pulls out behind you → ignore**

Sampling Methods – Pilot survey

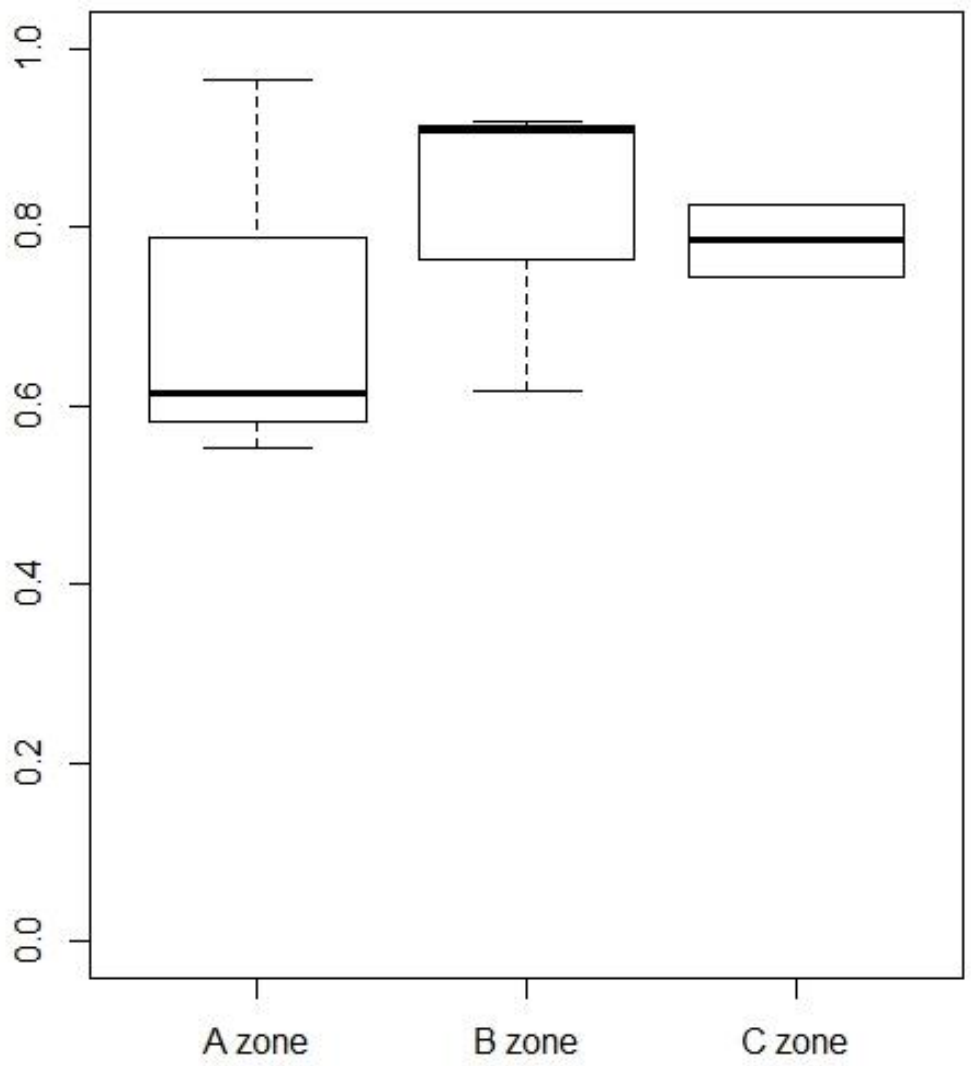
- **Basic rules:**
  1. Pretend you are someone searching for a parking space in an average sized sedan.
  2. Systematically walk or drive up and down rows in the parking lot.
  3. If you would be allowed to park there with a commuter parking pass, and there is nothing semi-permanent obstructing the space, and one average-sized sedan could fit in the space, count it as a parking space.
  4. Count the number of occupied vs. unoccupied spaces.
     1. If car leaves in front of you → unoccupied
     2. If a car arrives in front of you → occupied
     3. Anything that happens behind you → ignore

Sampling Methods – Measuring Occupancy

1. Data was collected on November 26 between 12 and 12:45 pm
2. Number of spaces occupied in each parking lot were counted according to agreed upon protocol.
3. Each person sampled 2 lots.

Preliminary Results

- Occupancy rates do not appear to be significantly different between zones.



Preliminary Results

$$\widehat{y_a} = 0.71$$
$$\widehat{y_b} = 0.81$$
$$\widehat{y_c} = 0.79$$

$$\widehat{var(y_a)} = 0.50$$
$$\widehat{var(y_b)} = 0.03$$
$$\widehat{var(y_c)} = 0.0033$$

$$y_{str} = 0.77$$
$$\widehat{var(y_{str})} = 0.06$$

OSU commuter parking lots are **77%** occupied on Mondays at noon.

Tentative Conclusions

- You should be able to find parking in A, B, or C lots reliably on Mondays at noon without having to drive between multiple lots.

- Occupancy does not seem to be significantly different between zones (though the estimate for C was lower than A and B).

- You should select a commuter parking pass based on your budget and desire for proximity to buildings, and not be concerned with differences in occupancy between zones.

Limitations of Study

- Parking occupancy may vary by time of day.
  - We sampled at the lunchtime hour, occupancy may be biased low if people leave campus for lunch.

- Parking occupancy may vary by day of the week.
  - Classes generally run on a MWF, TH schedule.