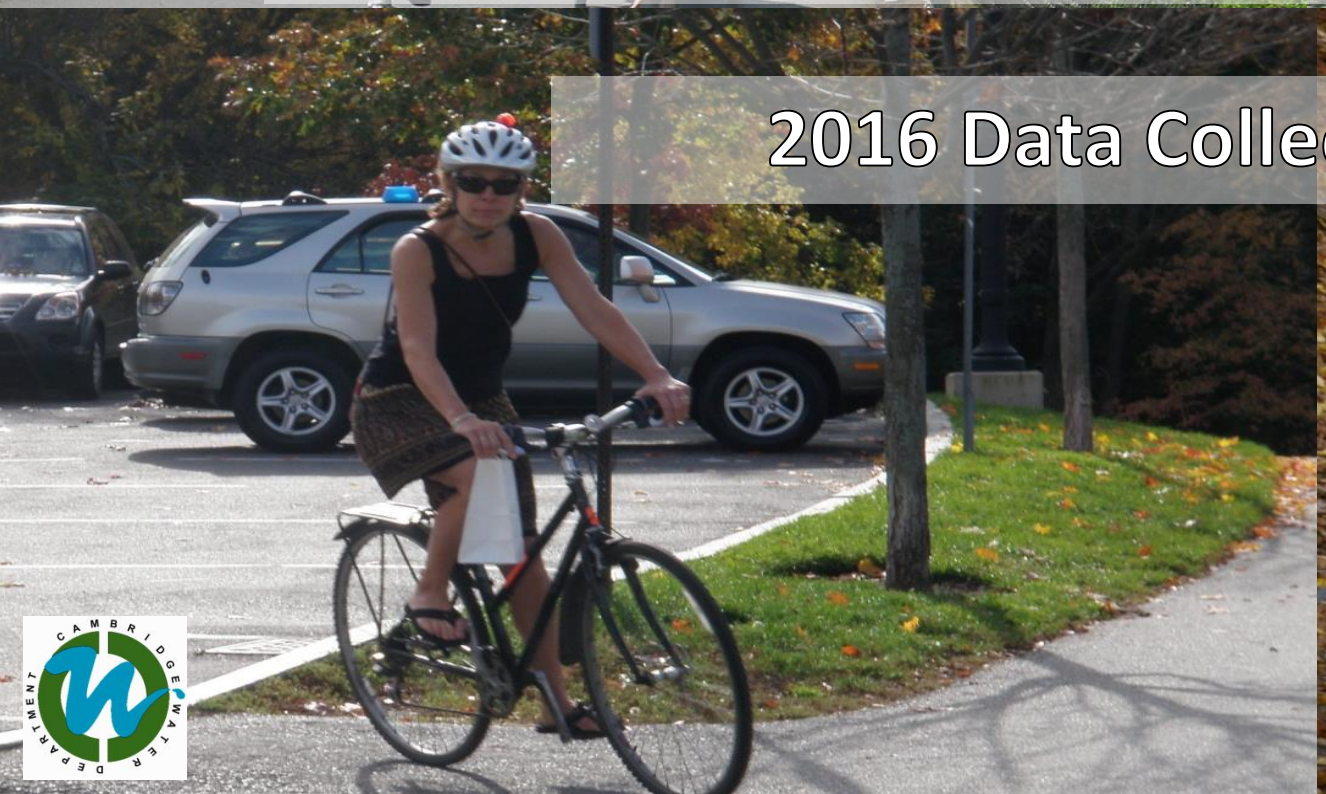
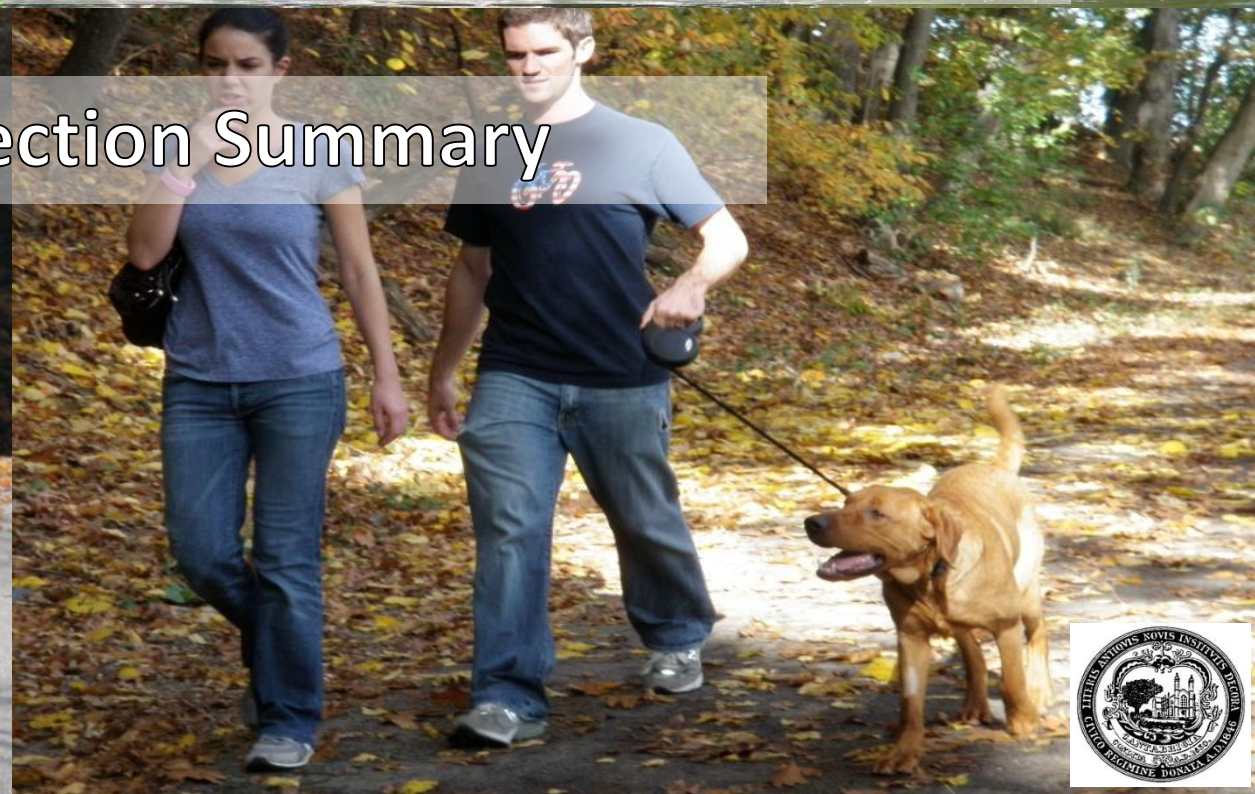
Fresh Pond Reservation Census Program

2016 Data Collection Summary





Program Outline

- Purpose
- Methods
  - Data collection
  - Quality control
  - Data exclusions
  - Data analysis
- Results
  - Annual overview
  - EcoCounter sensor data by site
  - Visual survey results
- Future Goals

Purpose

- To *quantify* and *qualify* users at Fresh Pond Reservation in order to inform management
  - Sensors at reservation entrances, the bike path, and perimeter road give an idea of user distribution throughout the day
  - Multi sensors differentiate between bike and pedestrian users

Methods

Methods • *Data Collection*

- Strategically-placed EcoCounter sensors at entrances and along perimeter road quantified Fresh Pond users
  - EcoCounter Pyro sensors count any heat producing body over 3ft tall
  - EcoCounter Multi sensors differentiate between pedestrians and cyclists
  - Sensors collect data in 15 minute intervals which is saved to an online database
- Visual surveys were conducted at sensor locations to further categorize users at Fresh Pond

EcoCounter Sensors

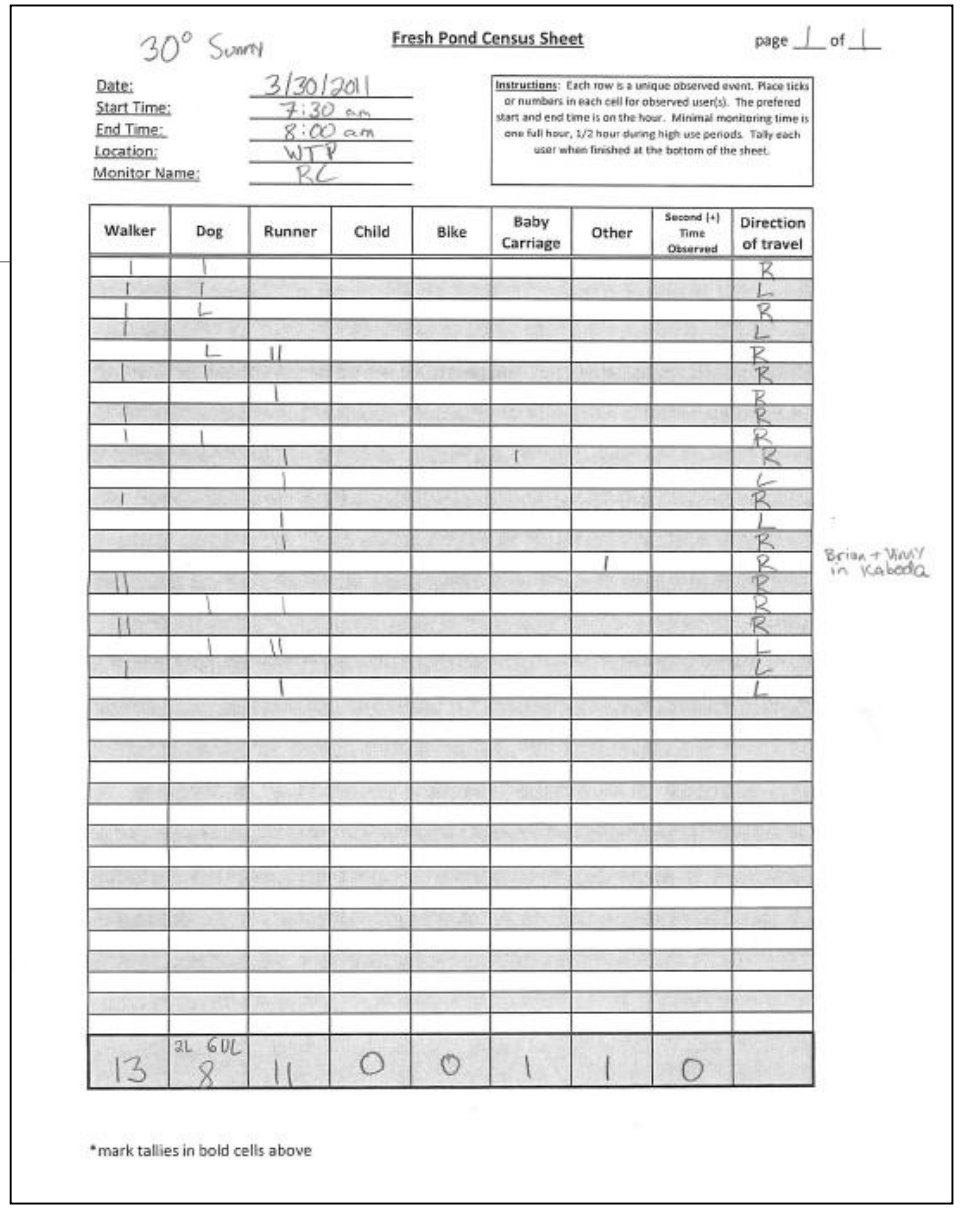
MULTI SENSOR

PYRO SENSOR

Visual Surveys

- Employee or volunteer conducted surveys next to sensor
- Recorded direction of travel and type of users
- Types of users included:
  - Pedestrians
  - Dogs (on/off leash)
  - Cyclists
  - Runners
  - Children
- Real-time feedback with the EcoCounter Android app helped to verify grouped events

Example Survey Datasheet



30° Sunny

Fresh Pond Census Sheet

page 1 of 1

Date: 3/30/2011
Start Time: 7:30 am
End Time: 8:00 am
Location: WTP
Monitor Name: RC

Instructions: Each row is a unique observed event. Place ticks or numbers in each cell for observed user(s). The prefered start and end time is on the hour. Minimal monitoring time is one full hour, 1/2 hour during high use periods. Tally each user when finished at the bottom of the sheet.

Walker	Dog	Runner	Child	Bike	Baby Carriage	Other	Second (+) Time Observed	Direction of travel
13	2L 6UL 8	11	0	0	1	1	0	

Brian + Vinny in Kabooda

*mark tallies in bold cells above

EcoCounter Sensor Locations

Entrances:

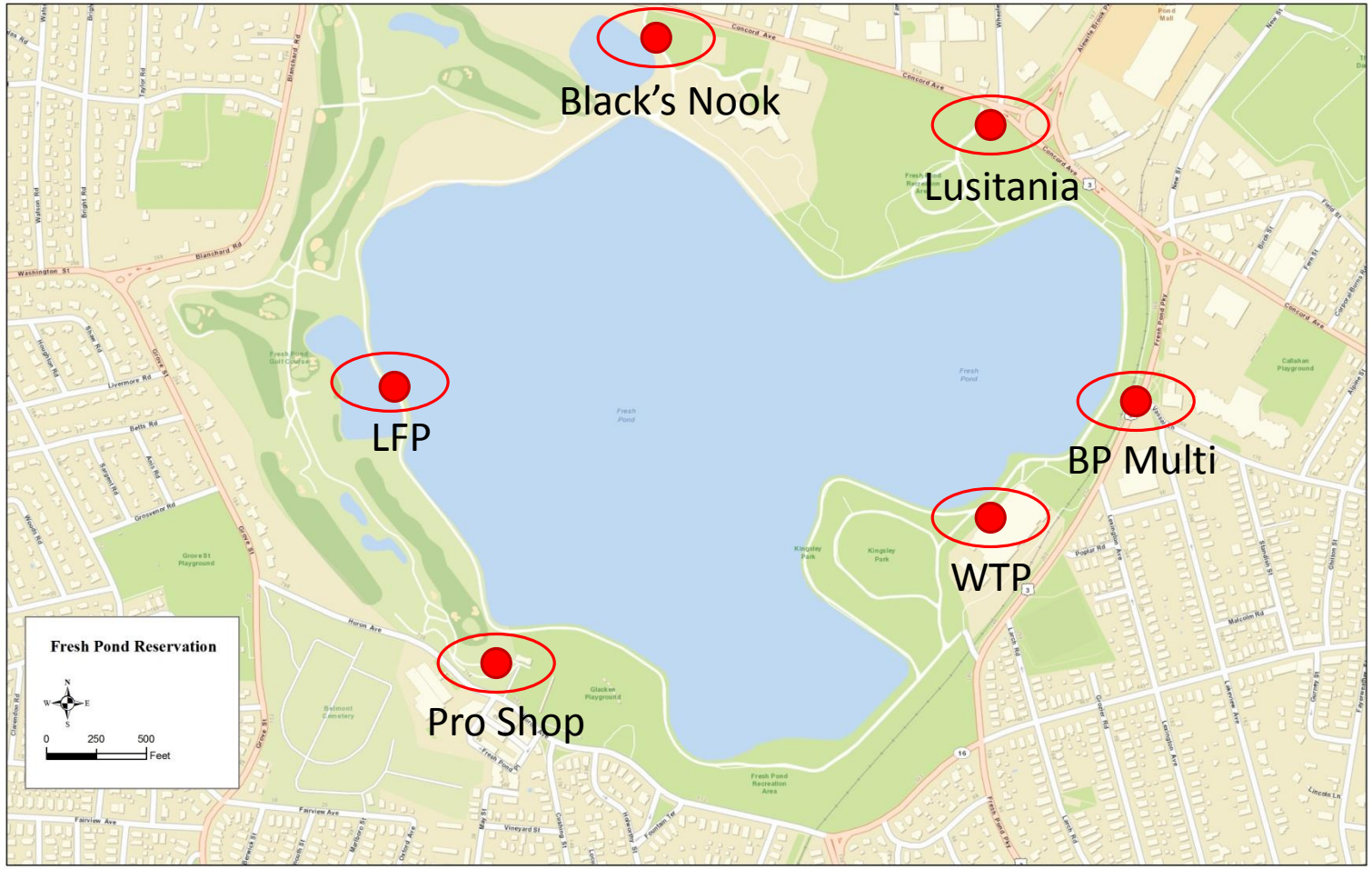
Black's Nook, Lusitania, and Pro Shop

Perimeter Road:

LFP and WTP

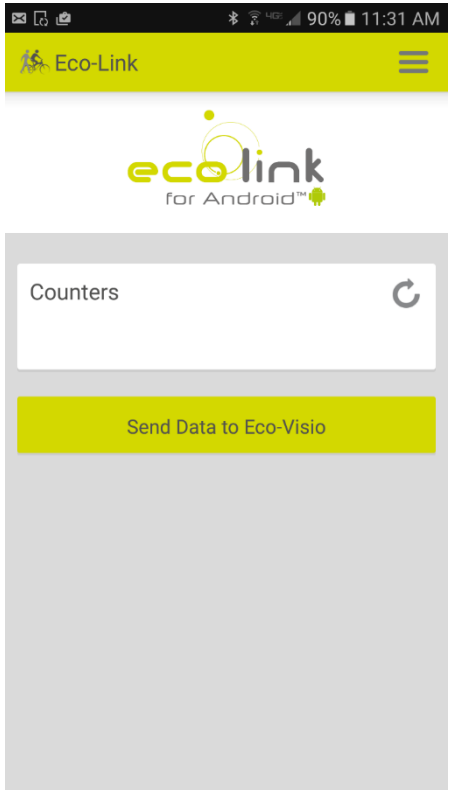
Multi Sensors:

WTP and BP Multi



Methods • *Quality Control*

- Sensors were visited weekly and checked for physical damage or environmental changes
- Data were downloaded and screened for anomalies weekly
- Sensor data were compared against visual survey data to identify any incongruities



EcoCounter Data Collection App

Methods • *2016 Data Exclusions*

Data exclusions were necessary when sensors recorded erroneous counts or when censors were offline for repairs

WTP Multi

- Periods of abnormally high bike counts from 2/22-3/3 and 11/14-12/14 in 2016
- Pedestrian data were not affected by these errors

BP Multi

- Caterpillar blocked pyro sensor on 7/11, 8/15, and 9/26 in 2016

Methods • *Data Exclusions or Errors, All Years*

Sensor	2011	2012	2013	2014	2015	2016
LFP	• Installed 1/6 • 8/1-9/28	• 11/13-1/2	• 2/4-2/19	• 1/17-1/22 • 4/15-4/23	• 2/2-2/4 • 2/9-2/11	
WTP	• Installed 1/7 • 11/7-12/1	• 6/29-7/26 • 11/15-12/3	• Bike counter installed 11/18	• 2/16-3/21 (Out counts only. Total counts unaffected.) • 7/1-10/31 • 11/4-11/6	• 1/27 • 2/2-2/4 • 2/9-2/11 • 2/15-2/17 • 2/19 • 6/30	• 2/2-3/3 (periodic anomalous bike counts excluded) • 7/3 • 7/5 • 11/14-12/14 (periodic anomalous bike counts excluded)
Black's Nook		• Installed 10/26 • 12/3-12/31	• 1/1-1/2 • 4/4-5/8	• 16-Apr		
Lusitania				• Installed 4/11	• 2/9-2/11	
BP Multi			• Installed 11/19	• 4/16	• 2/2-2/4 • 2/15-2/17 • 2/19 • 8/4-8/5 • 8/24	• 7/11 • 8/15 • 9/26
Pro Shop				• Installed 6/27	• 2/9-2/11 • 2/9-2/11	

Methods • *Data Analysis*

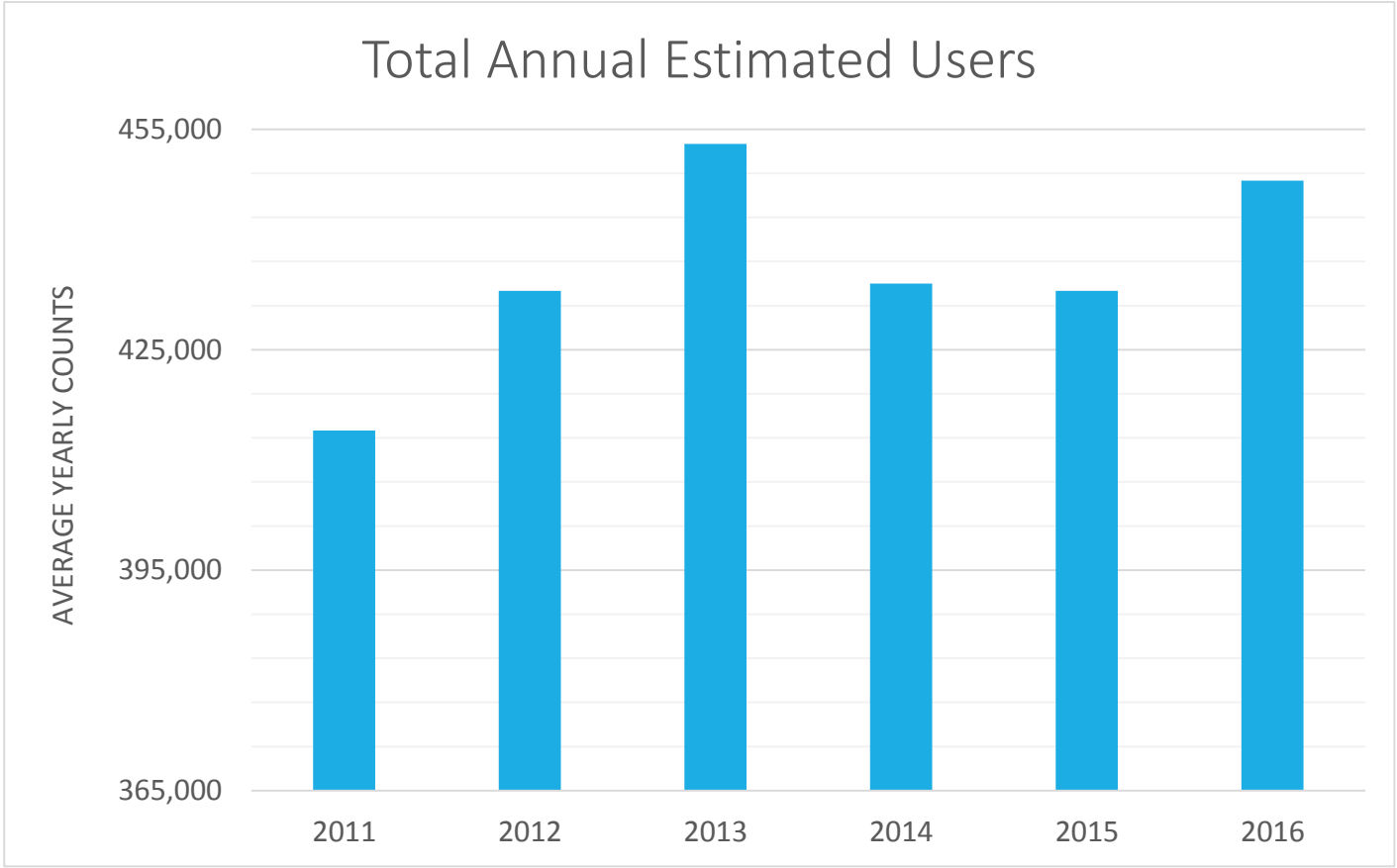
- Sensor results were grouped by location as being representative of the Entrances or the Perimeter Road
- Multi sensors were used to quantify cyclists separately from pedestrians
- Data were analyzed on yearly, monthly, daily, and hourly time scales to understand trends
- Data were presented as total counts (total of In and Out counts)
  - Counts may include users who pass sensors multiple times
- Visual surveys were compared to EcoCounter data to estimate sensor error and to characterize types of users

Results· *Annual Overview*

Results • *Annual Overview*

Year	Total Annual Estimated Users*
2011	414,000
2012	433,000
2013	453,000
2014	434,000
2015	433,000
2016	448,000

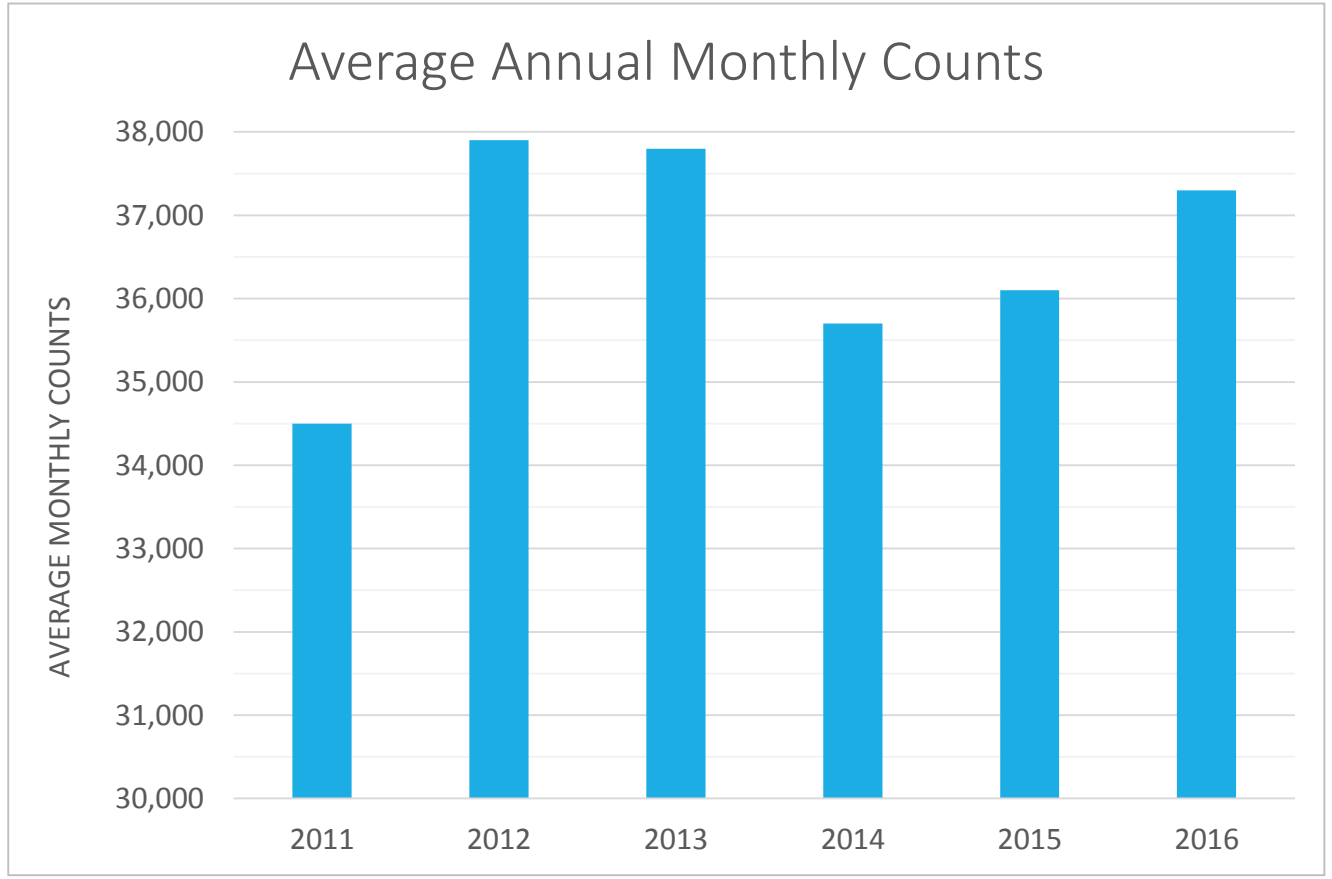
*Sum of the monthly averaged total counts of WTP Multi (pedestrians and cyclists) and LFP



Results • *Monthly Overview*

Year	Average Annual Monthly Counts*
2011	34,500
2012	37,900
2013	37,800
2014	35,700
2015	36,100
2016	37,300

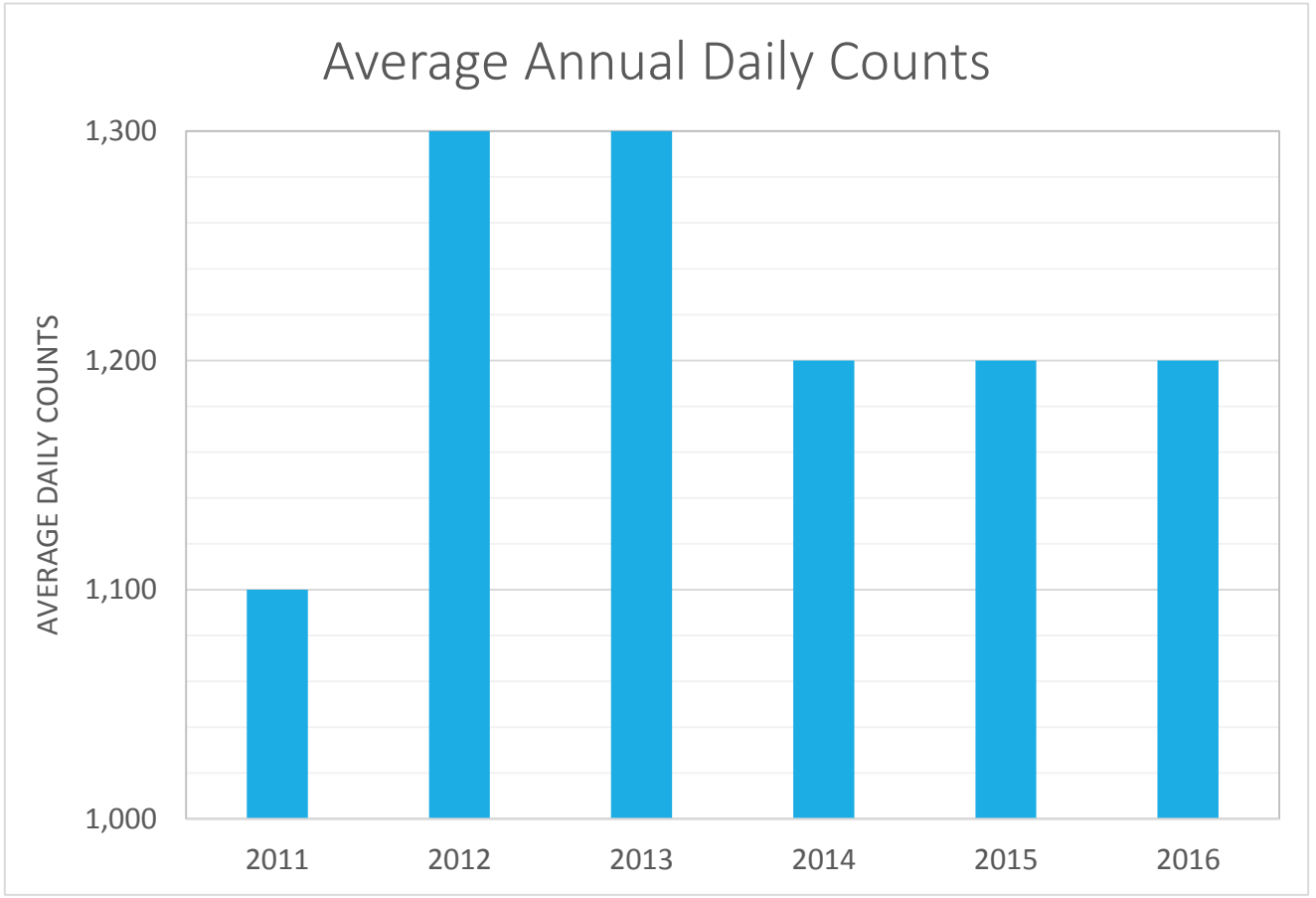
*Average of the monthly averages from WTP Multi (pedestrians and cyclists) and LFP



Results • *Daily Overview*

Year	Average Annual Daily Counts*
2011	1,100
2012	1,300
2013	1,300
2014	1,200
2015	1,200
2016	1,200

*Average of the daily averages from WTP Multi (pedestrians and cyclists) and LFP



Results • *Perimeter Road Sensors*

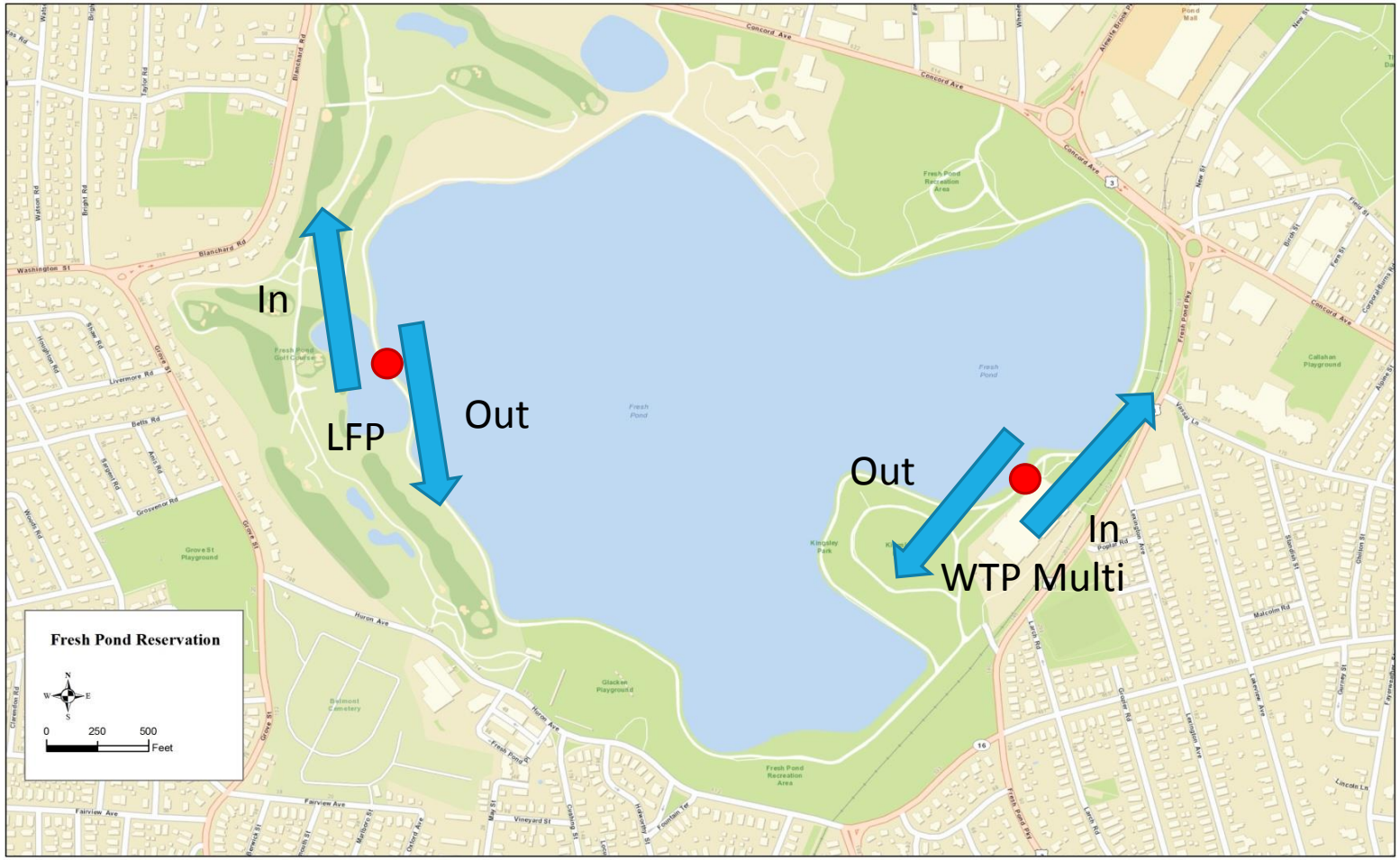
Perimeter Road EcoCounter Sensors

Little Fresh Pond (LFP)

- Directional

Water Treatment Plant Multi

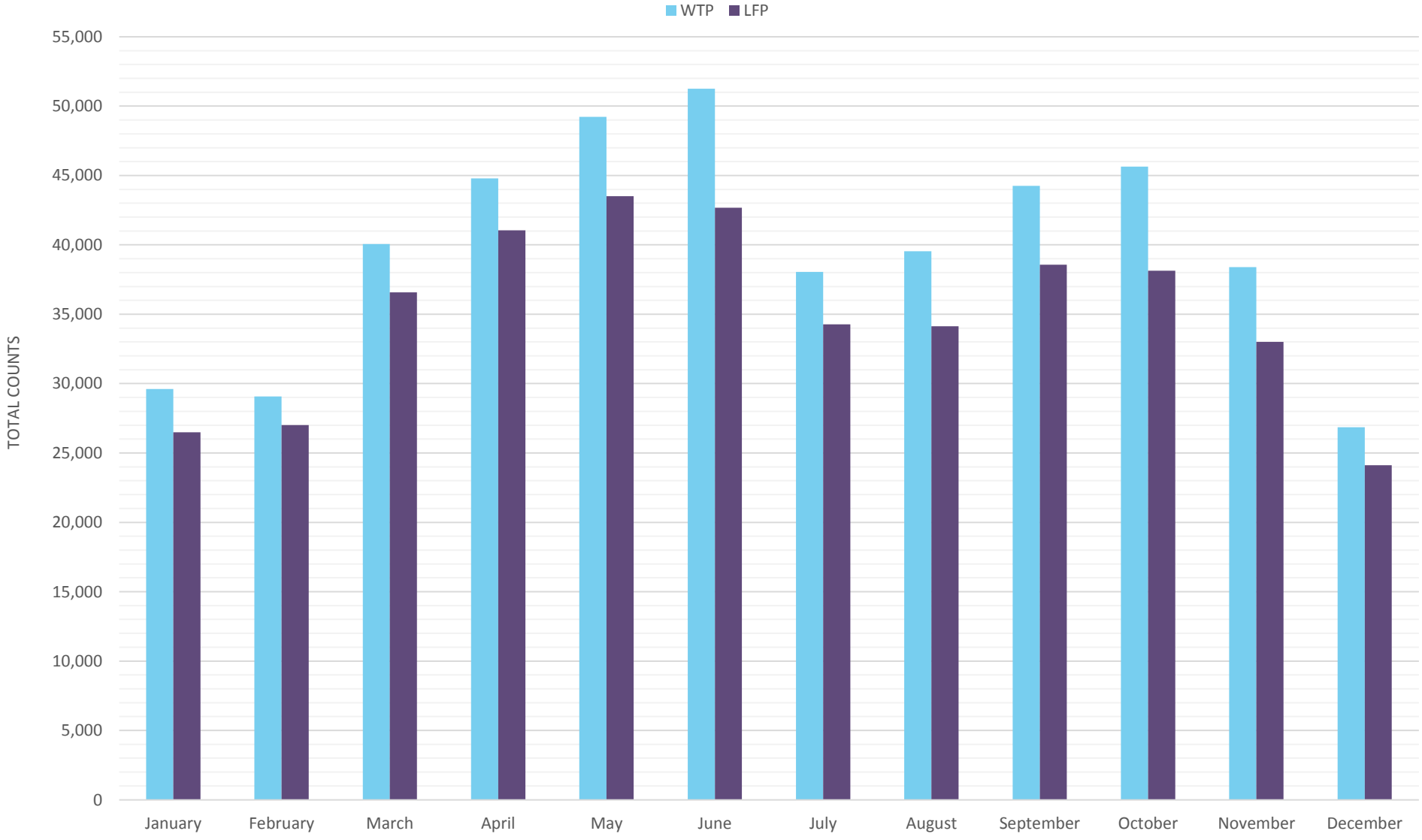
- Directional
- Differentiates between pedestrians and cyclists



2016 Perimeter Road Summary

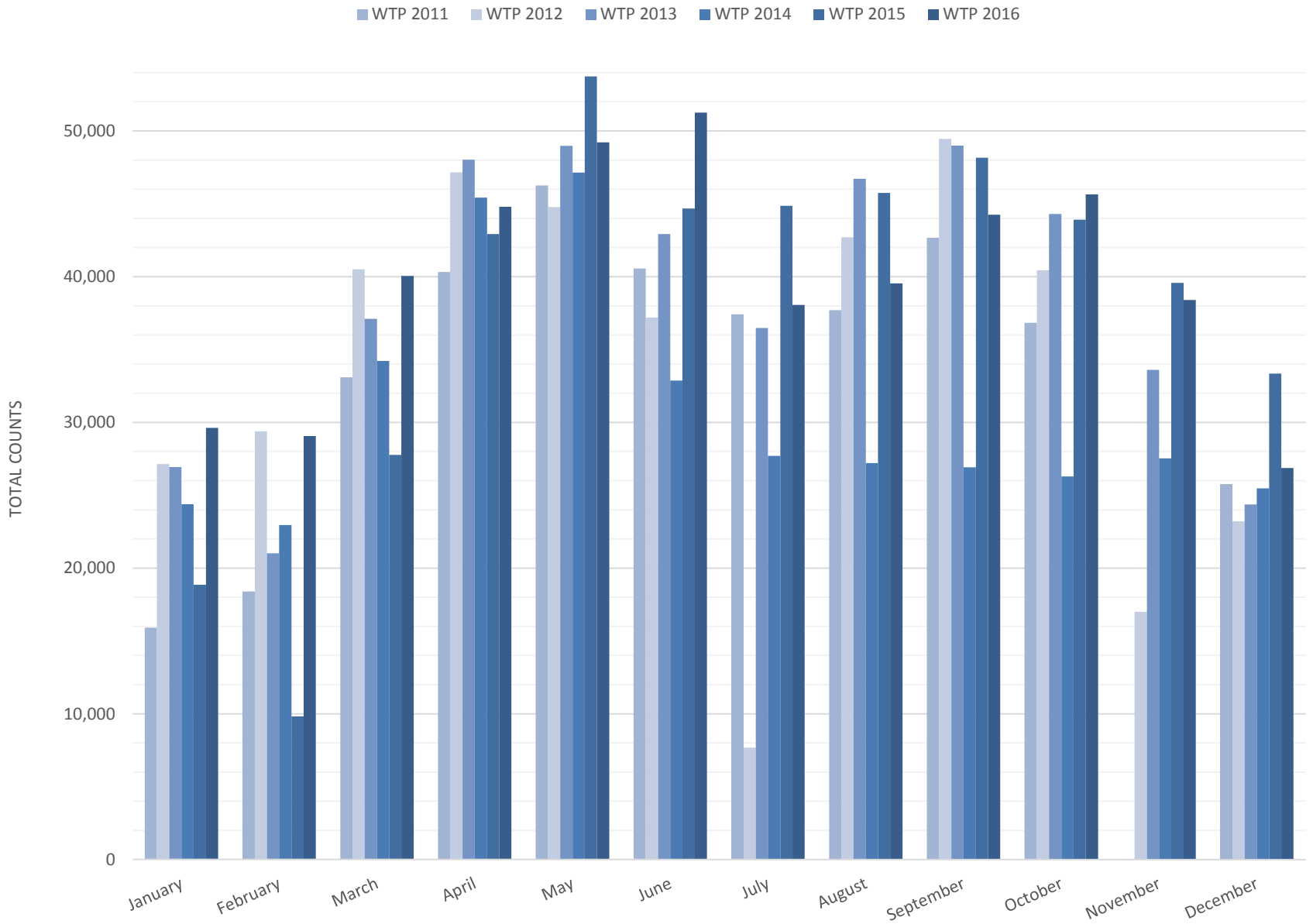
- May and June were the busiest months
- July and August had a lower number of users than other warm months, likely due to people being away on vacations
- Winter months had the lowest number of users
- Saturdays and Sundays had more users than weekdays
- Mid morning (9:00-12:00) and afternoon (15:00-17:00) were the busiest times of day

Monthly Eco-Counter Results
Perimeter Road, 2016



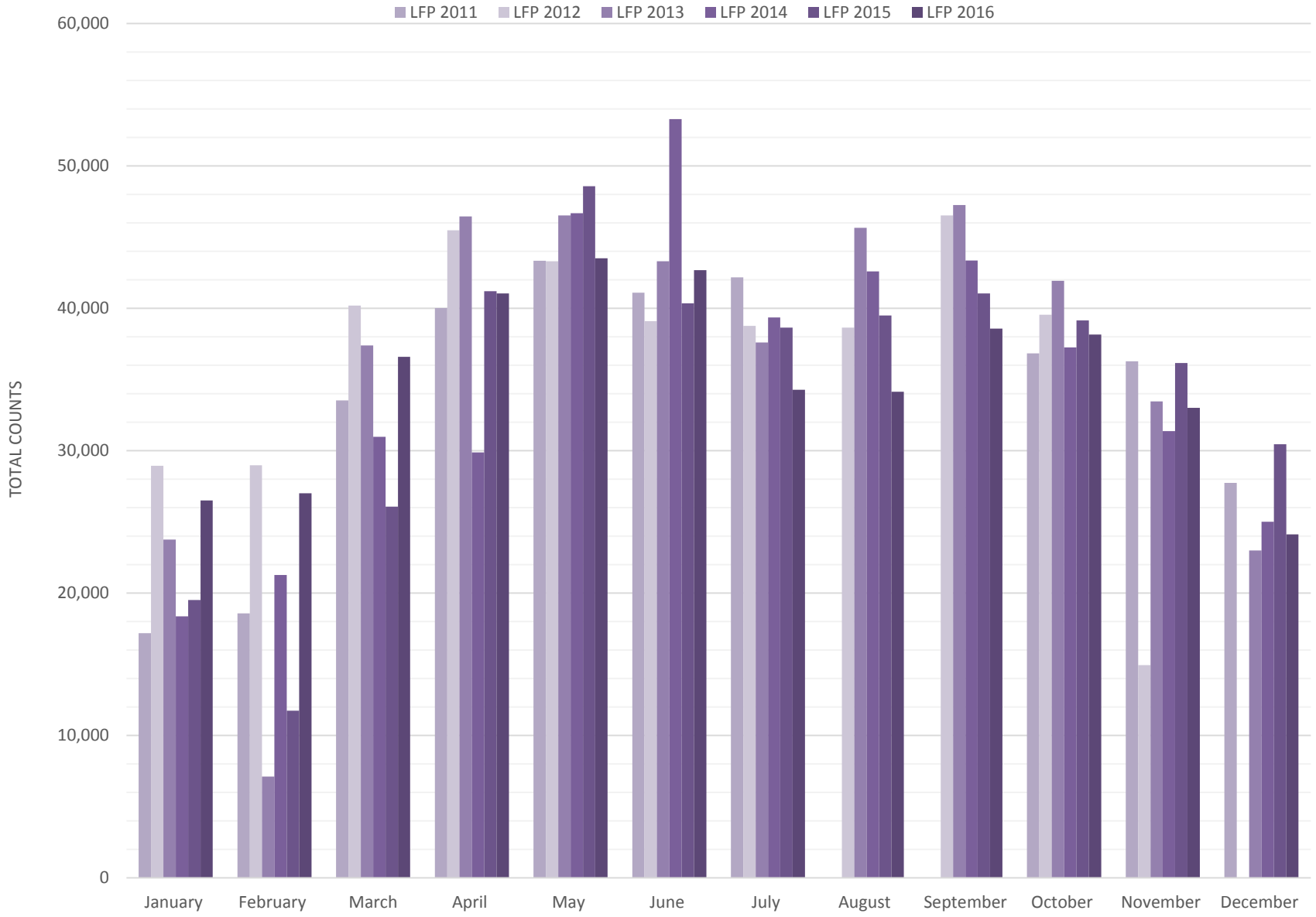
Data errors detailed on slides 11 & 12

WTP Sensor, Monthly Results 2011 - 2016



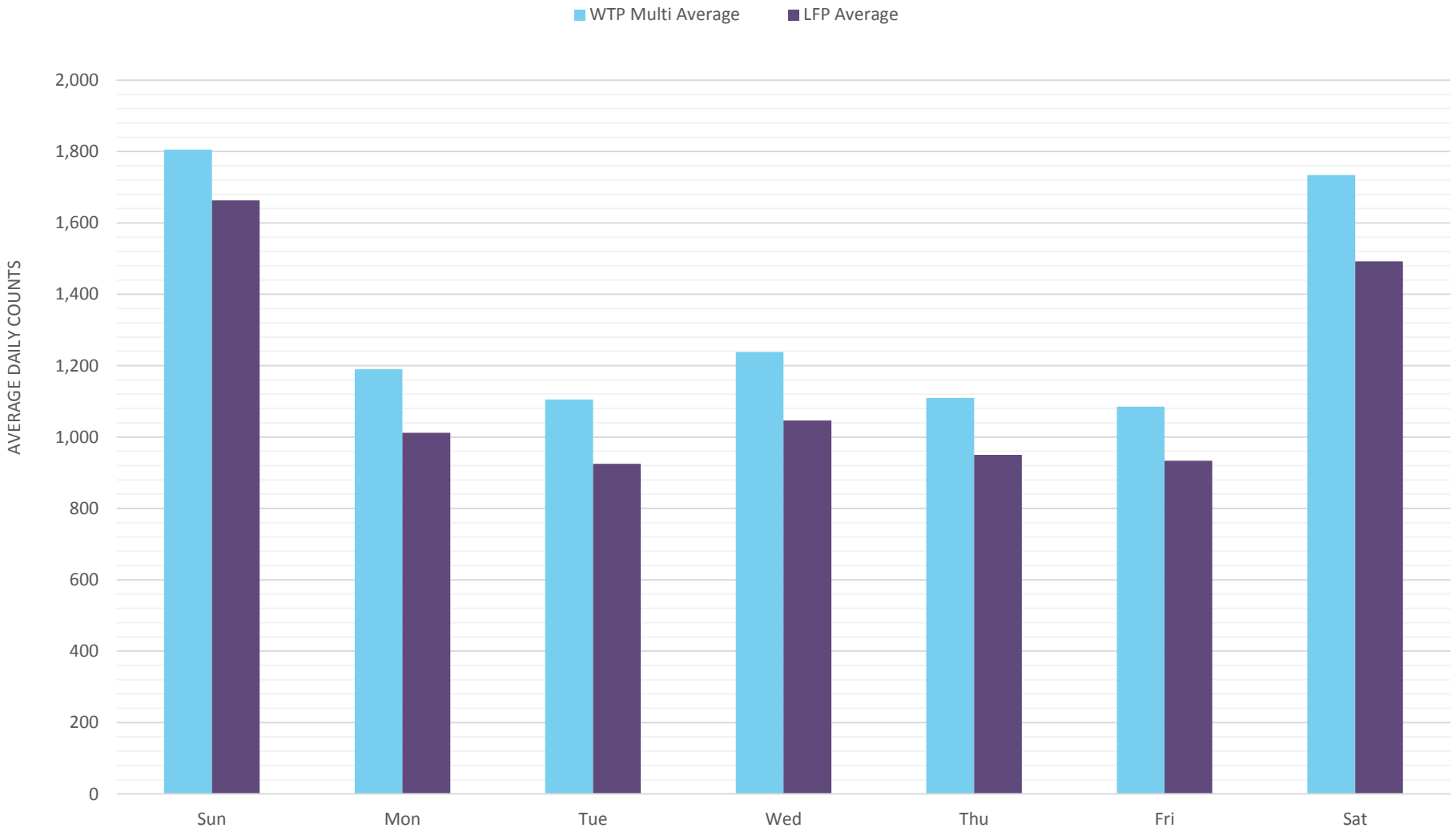
Data errors detailed on slides 11 & 12

LFP Sensor, Monthly Results 2011 - 2015



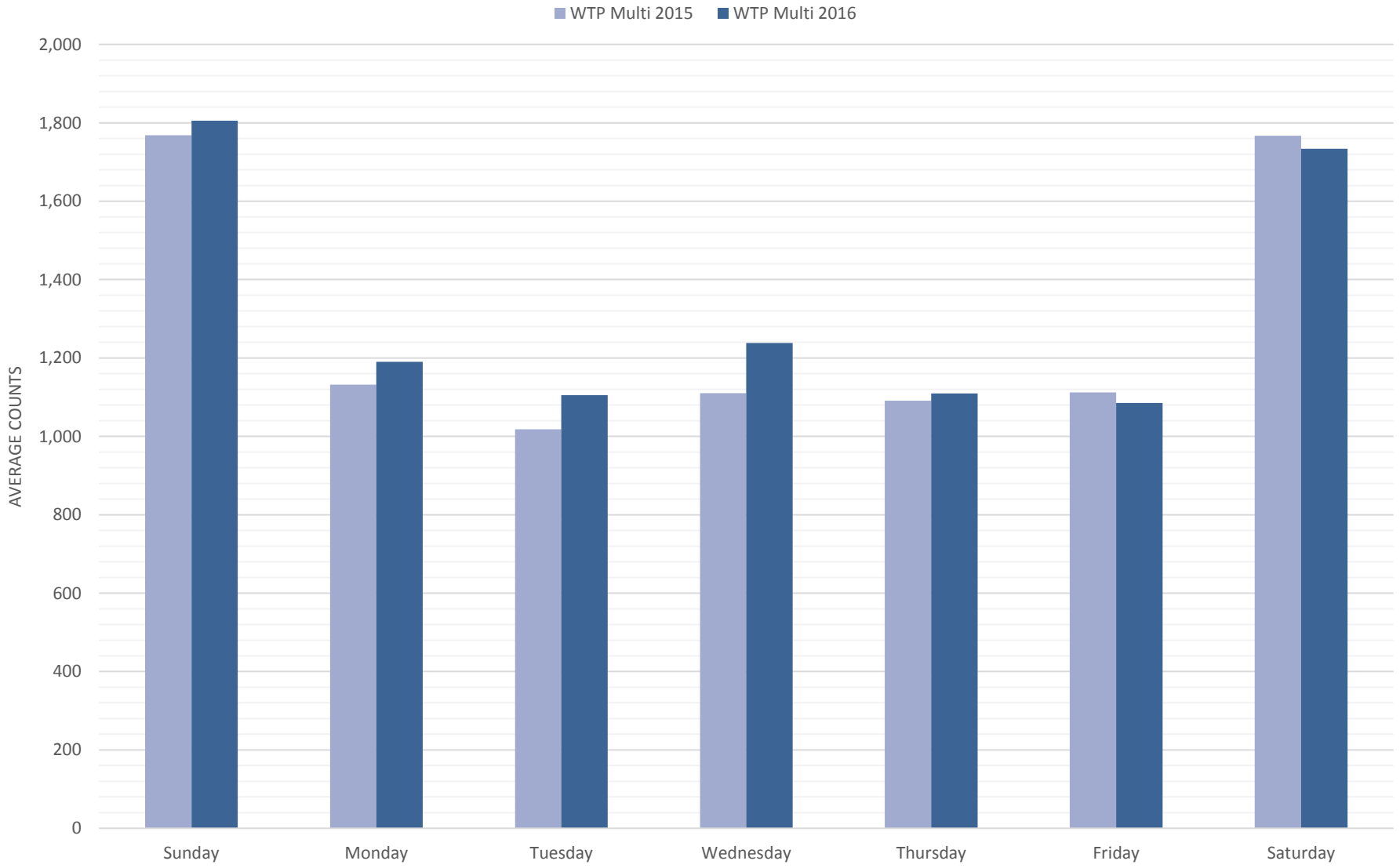
Data errors detailed on slides 11 & 12

Average Daily Counts
Perimeter Road Sensors 2016



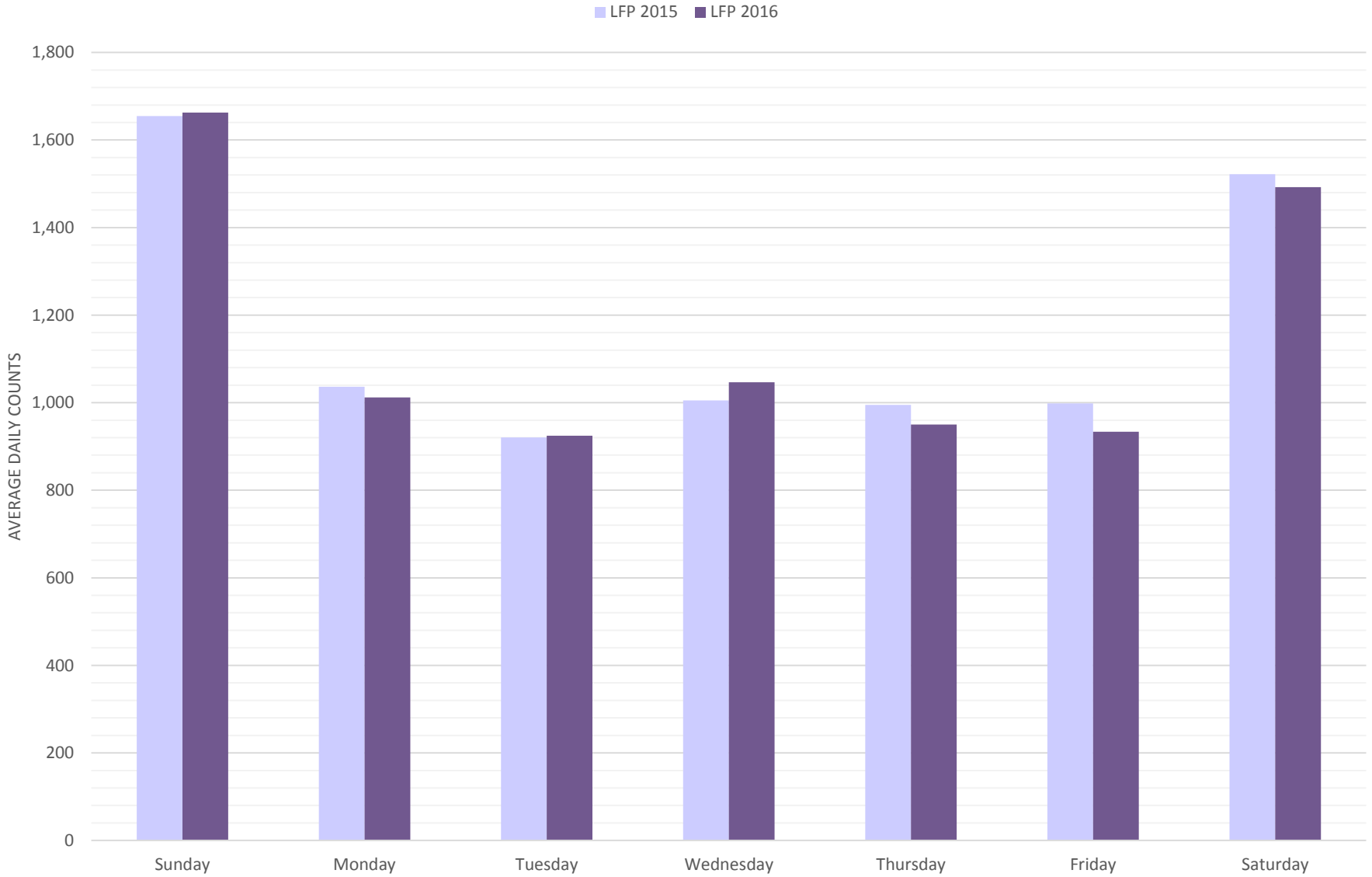
Data errors detailed on slides 11 & 12

Average Daily Counts
WTP Multi 2015,2016



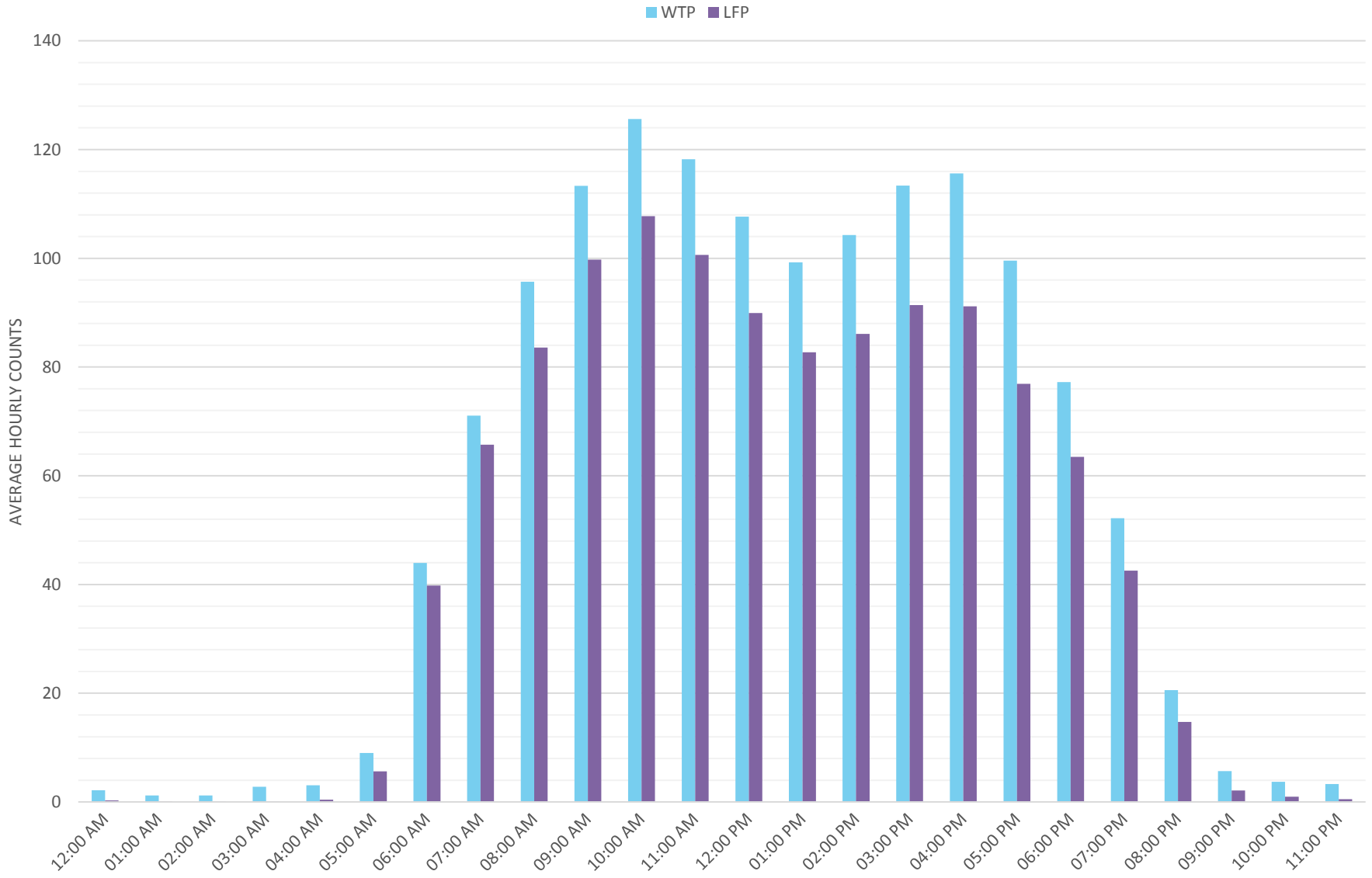
Data errors detailed on slides 11 & 12

Average Daily Counts
Little Fresh Pond 2015, 2016



Data errors detailed on slides 11 & 12

Average Hourly Counts
Perimeter Road 2016



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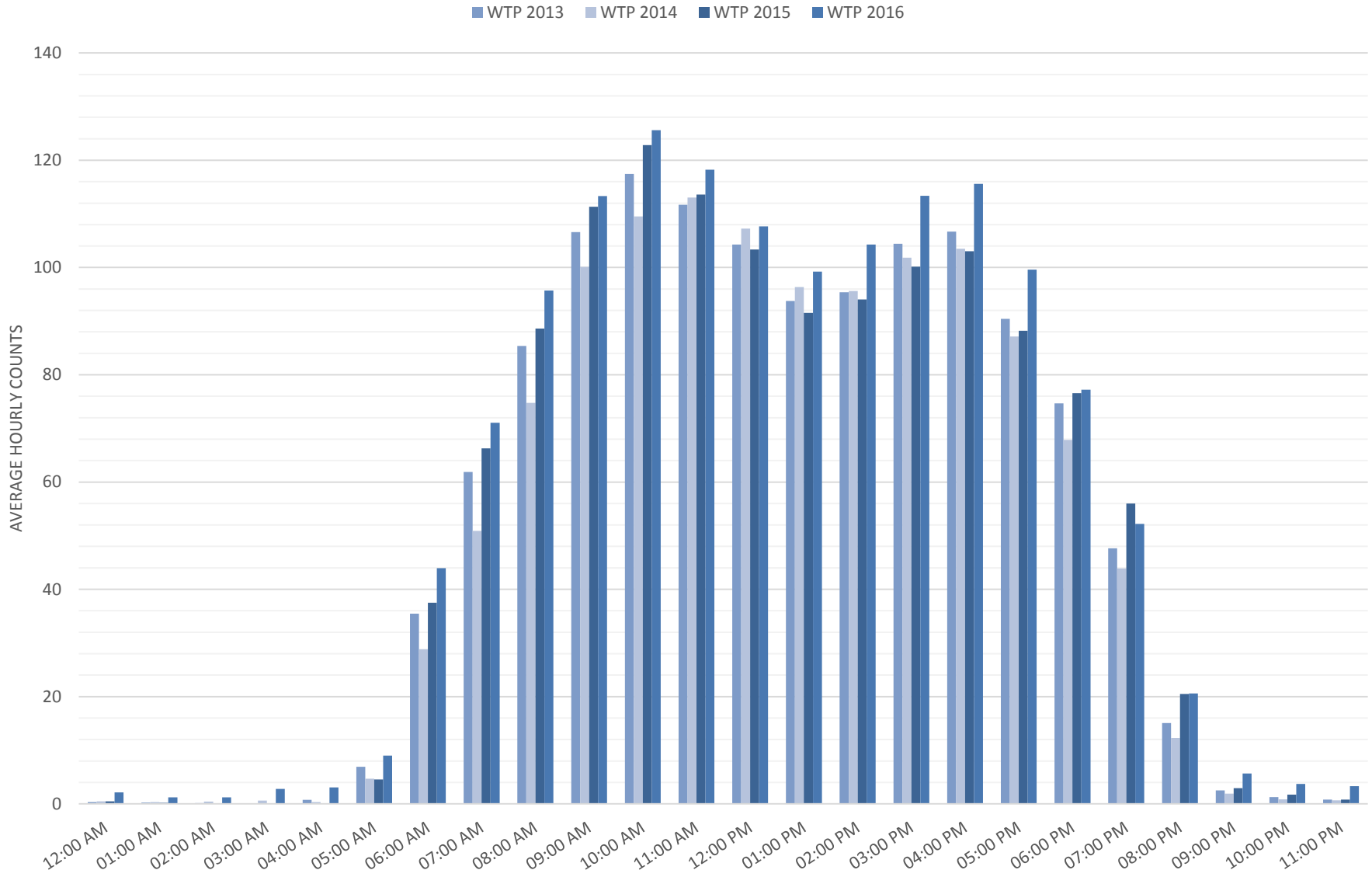
Average Hourly Counts
WTP 2013- 2016



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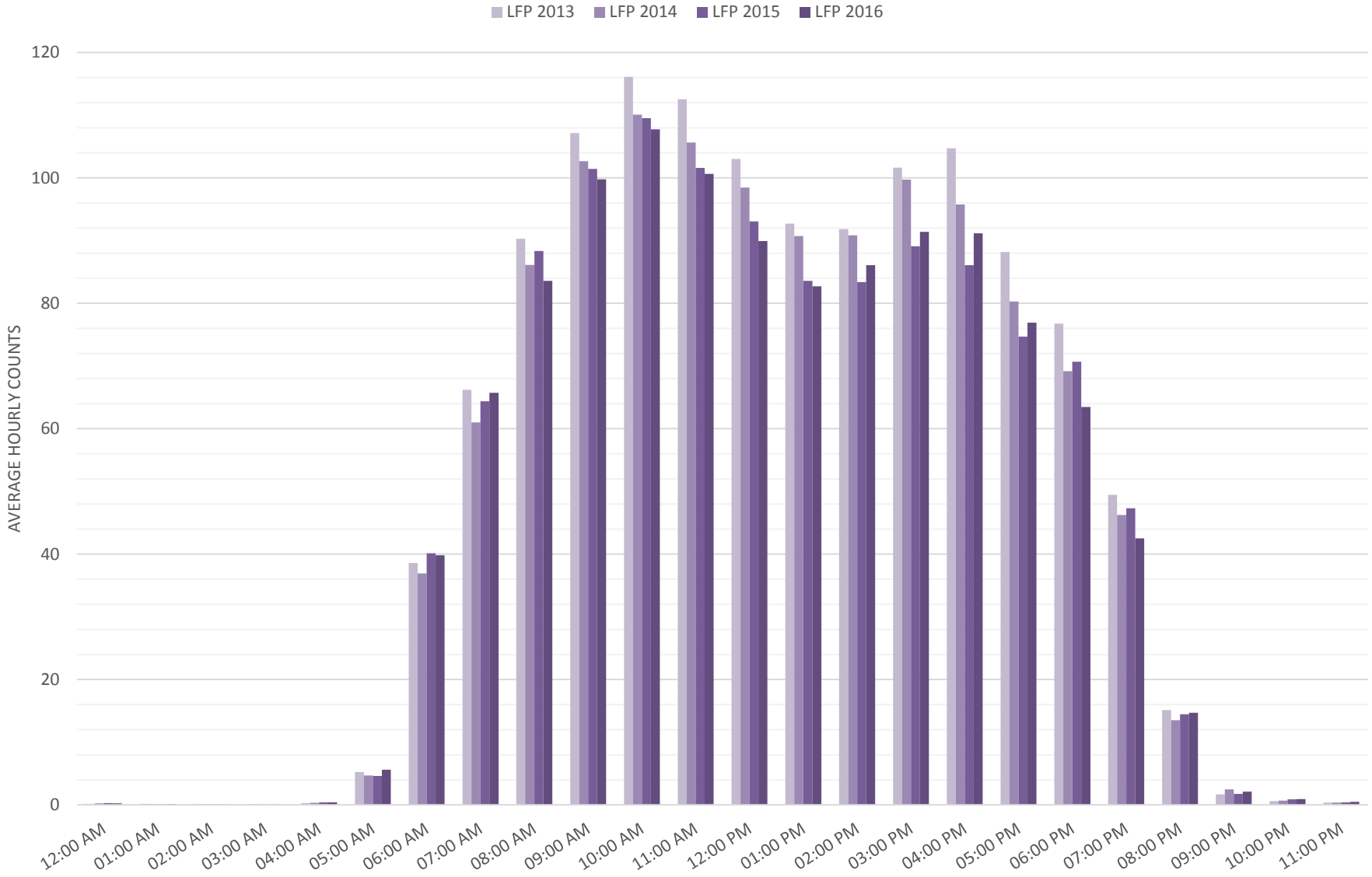
Average Hourly Counts
LFP 2013-2016



Data errors detailed on slides 11 & 12

Results • *Entrance Sensors*

Reservation Entrance EcoCounter Sensors

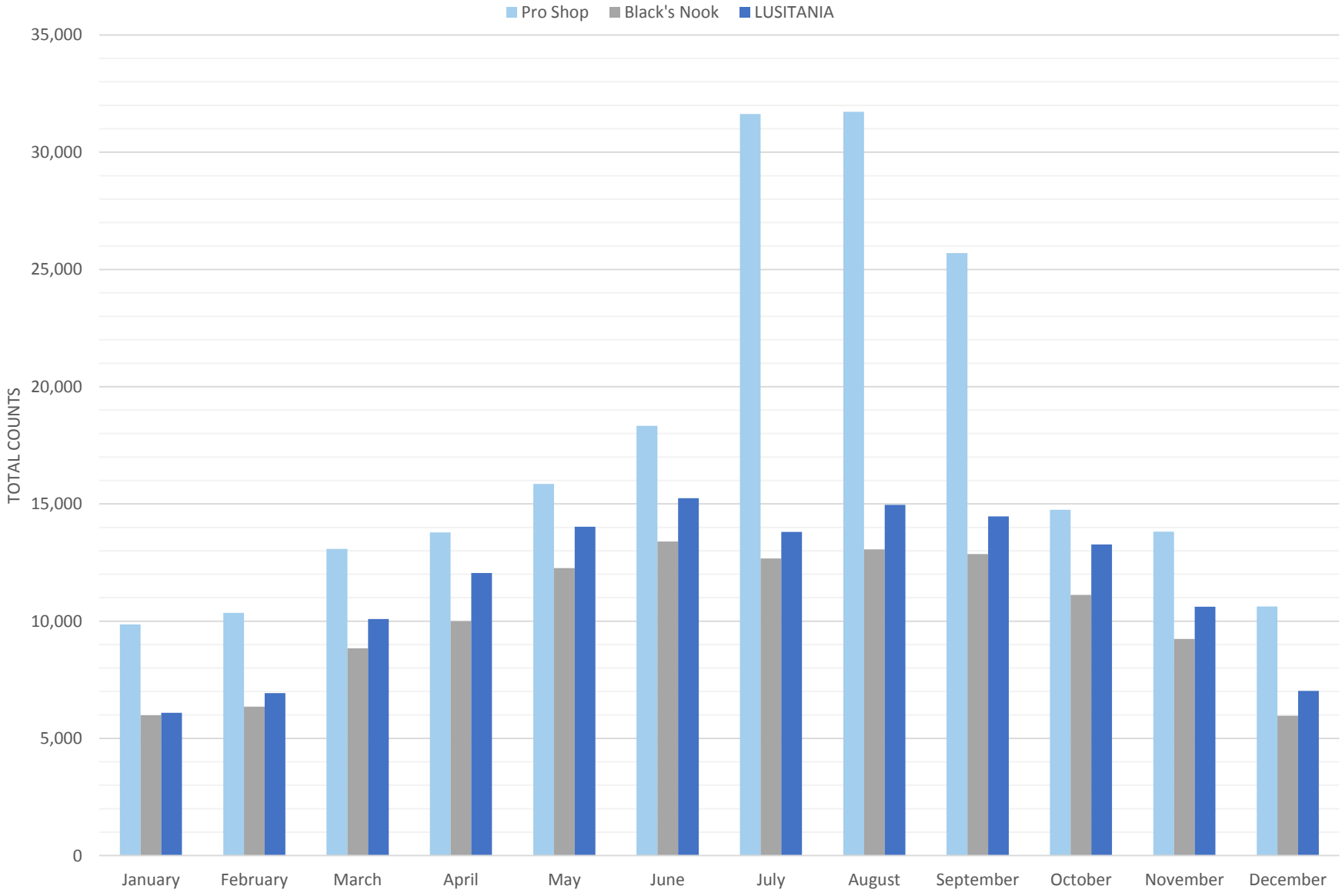
Black's Nook, Lusitania, and Pro Shop

- Directional

2016 Entrance Summary

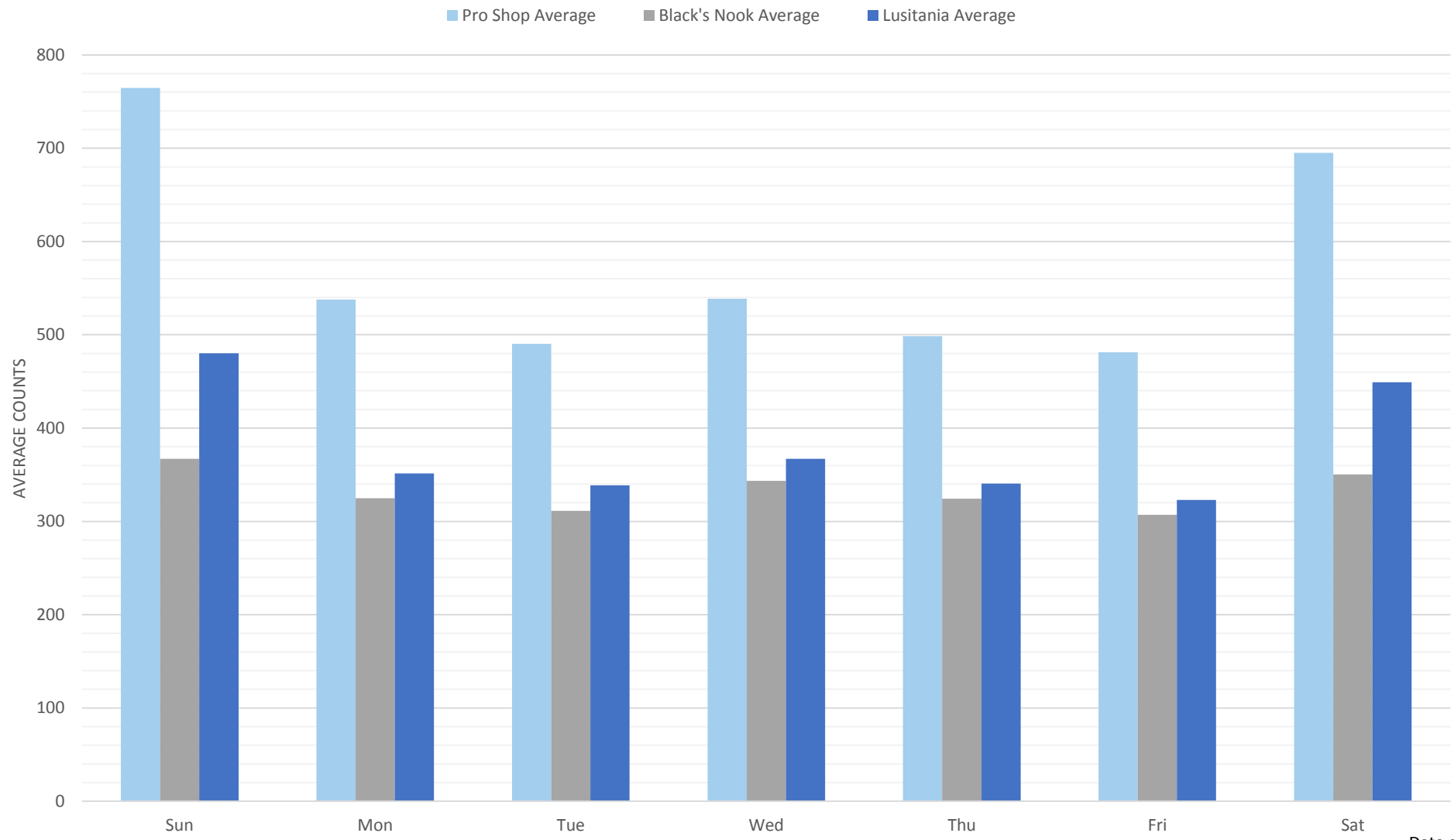
- Glacken Slope construction and resulting path closure likely caused the higher than average counts at Pro Shop from July to September
- Winter months had the lowest number of users for all three sensors
- Weekends had more users than weekdays at Pro Shop and Lusitania, while the number of users at Black's Nook was only slightly higher on Weekends than weekdays
- Mid morning (8:00-12:00) and afternoon to early evening (15:00-19:00) were the busiest times of day at Pro Shop
- Black's Nook and Lusitania had peak counts around lunchtime (12:00)
- All three sensors had an overall increase in hourly users from last year

Total Monthly Counts
Fresh Pond Reservation Entrances 2016



Data errors detailed on slides 11 & 12

Average Daily Counts
Fresh Pond Entrances 2016



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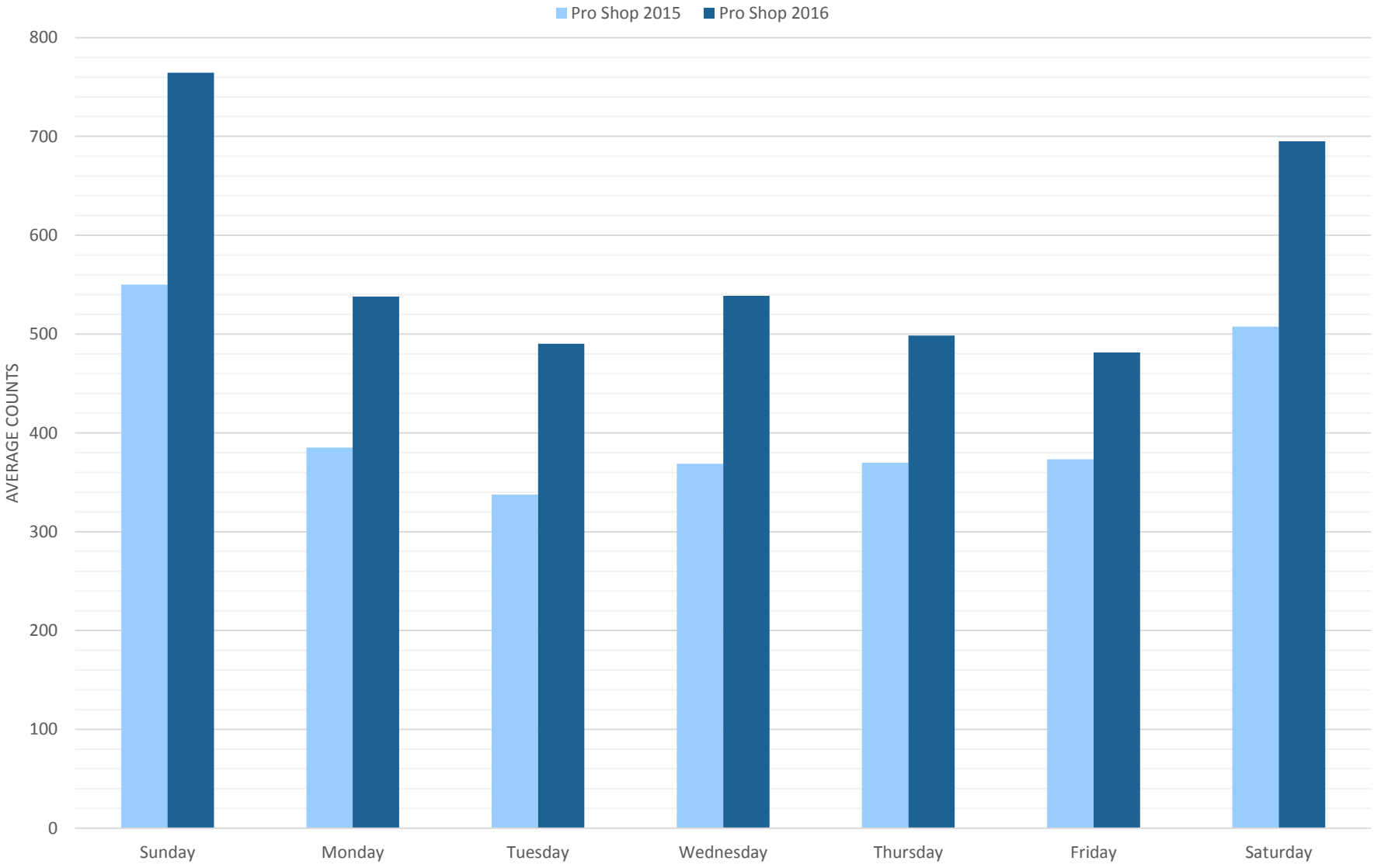
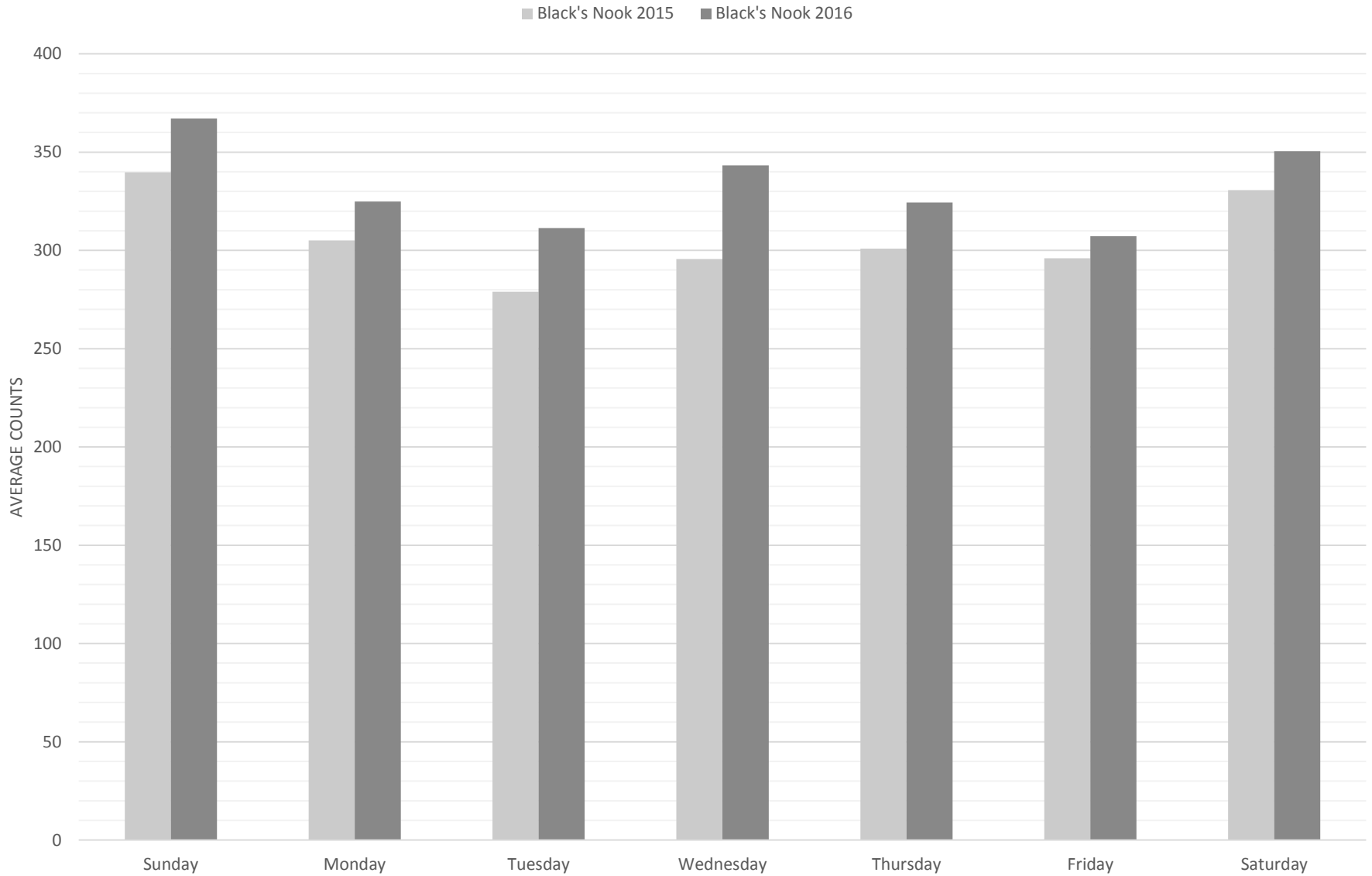
Average Daily Counts
Pro Shop 2015, 2016

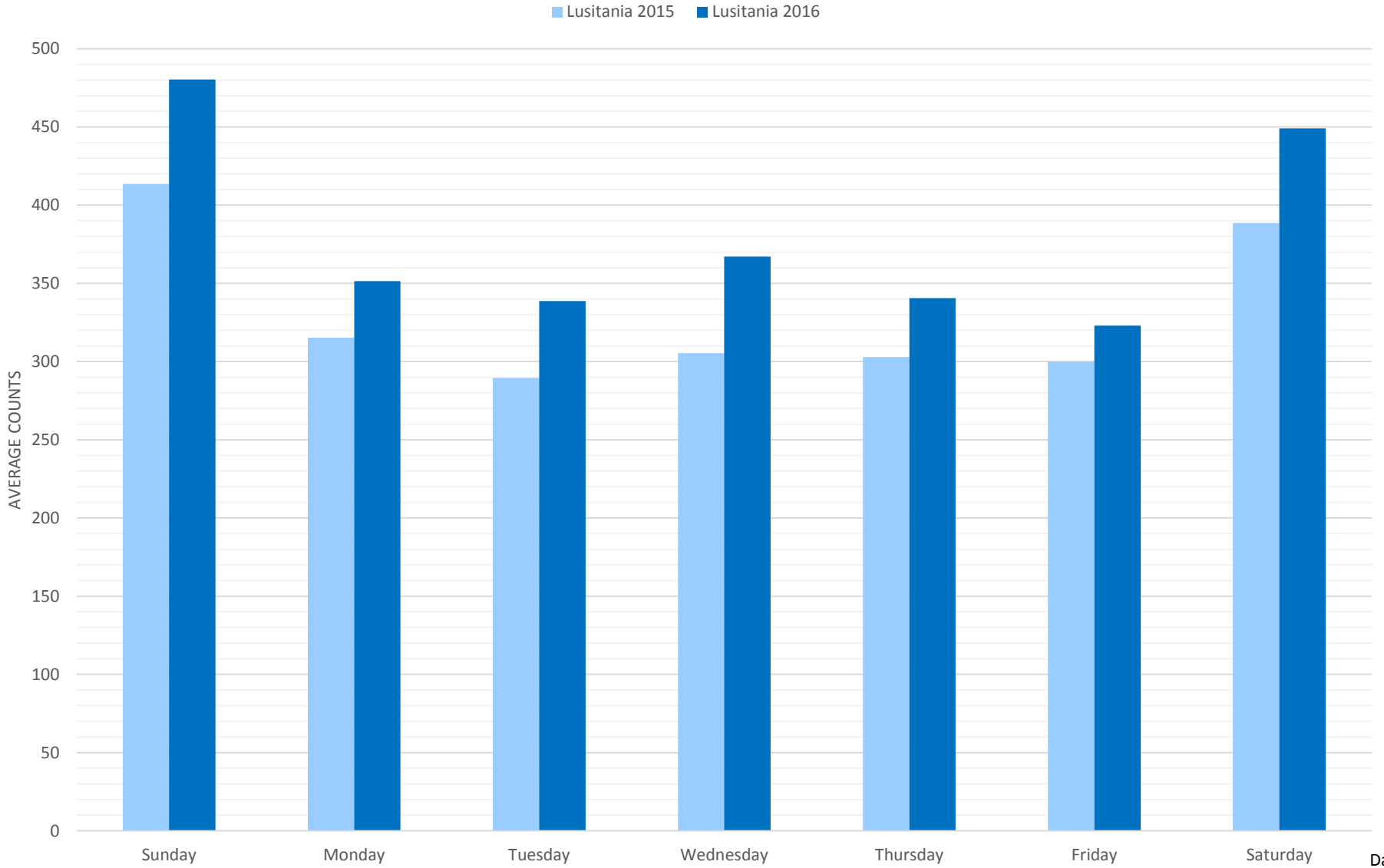


Data errors detailed on slides 11 & 12

Average Daily Counts
Black's Nook 2015, 2016



Average Daily Counts
Lusitania 2015, 2016



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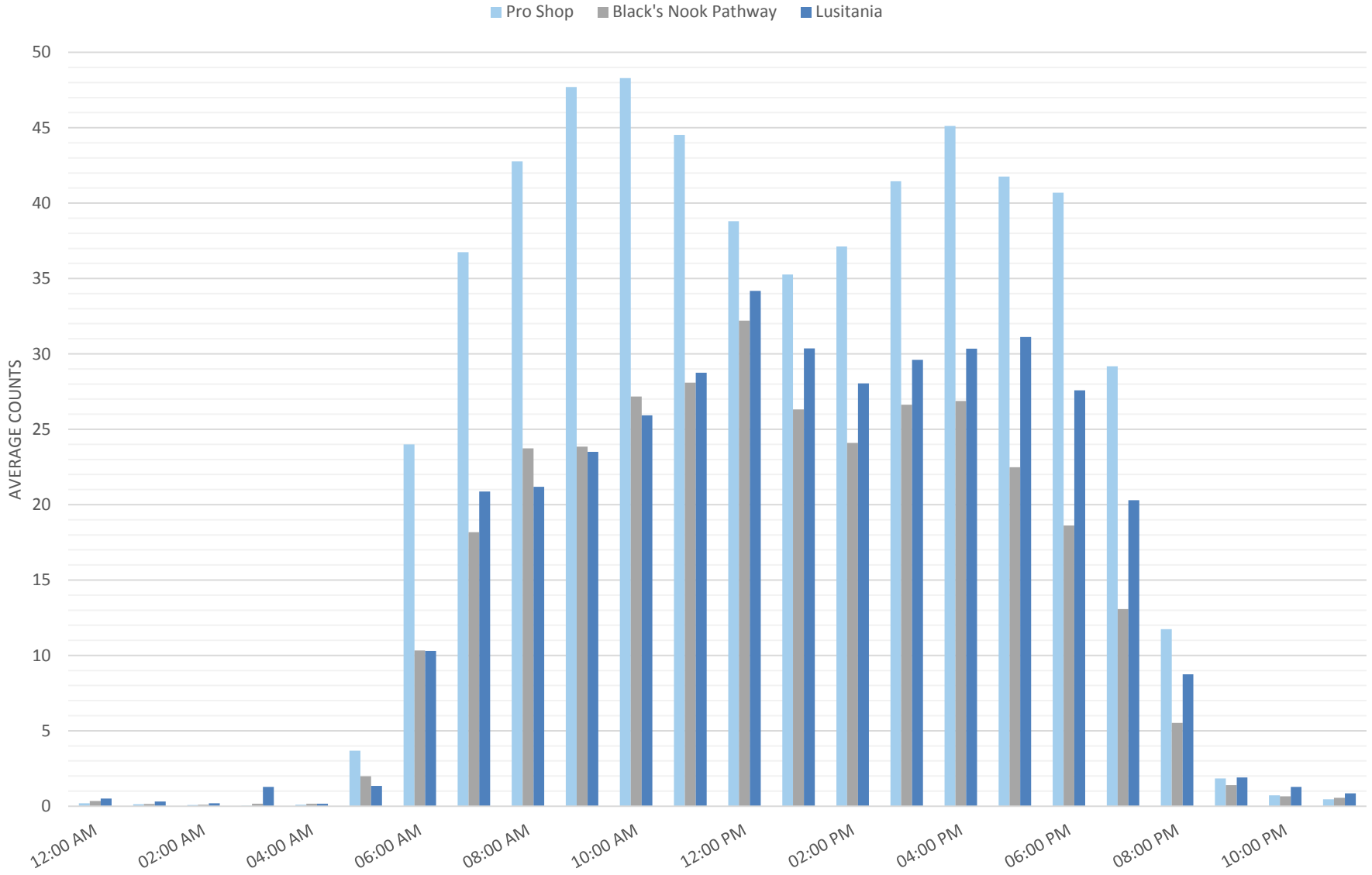
Average Hourly Counts
Entrances 2016



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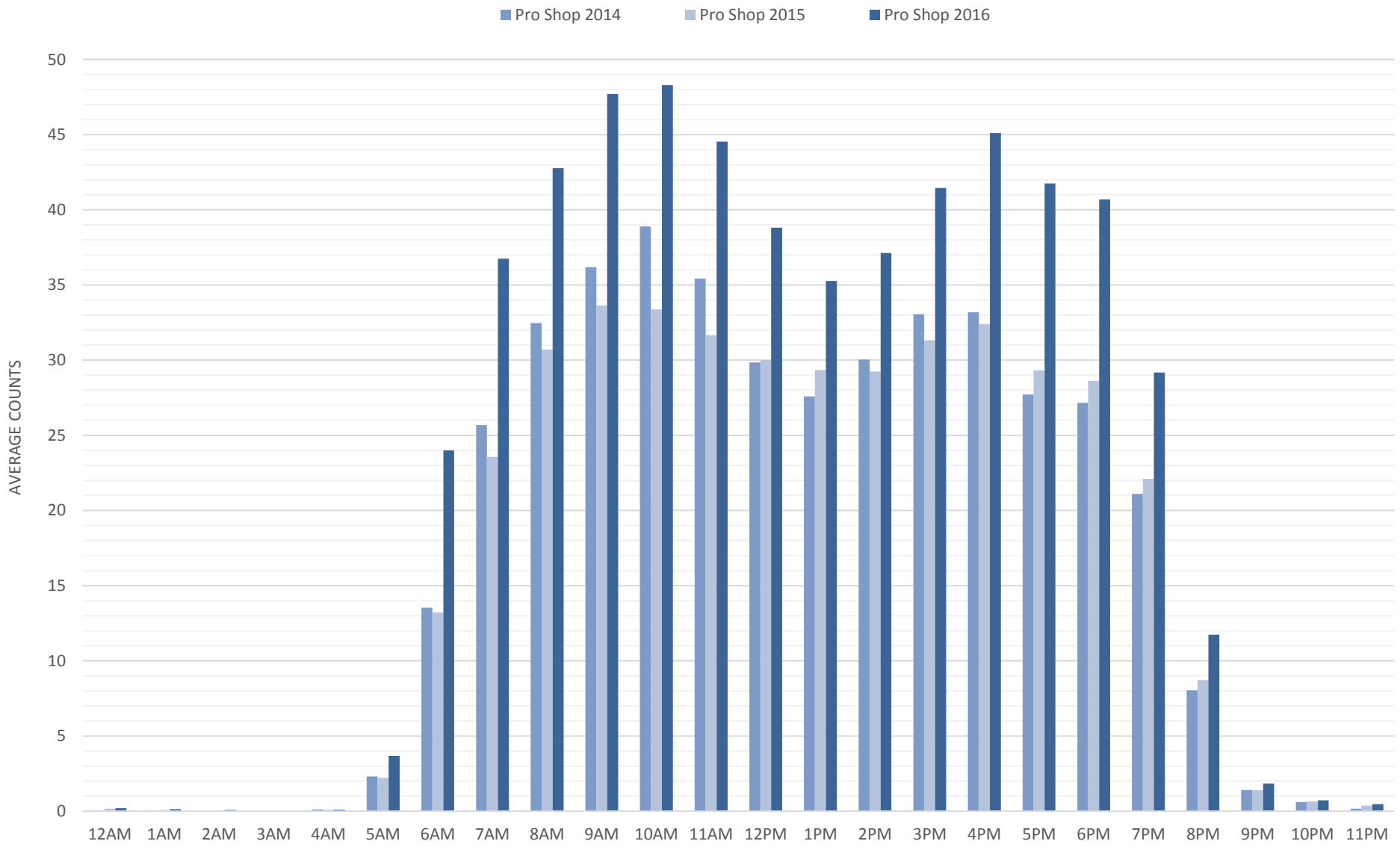
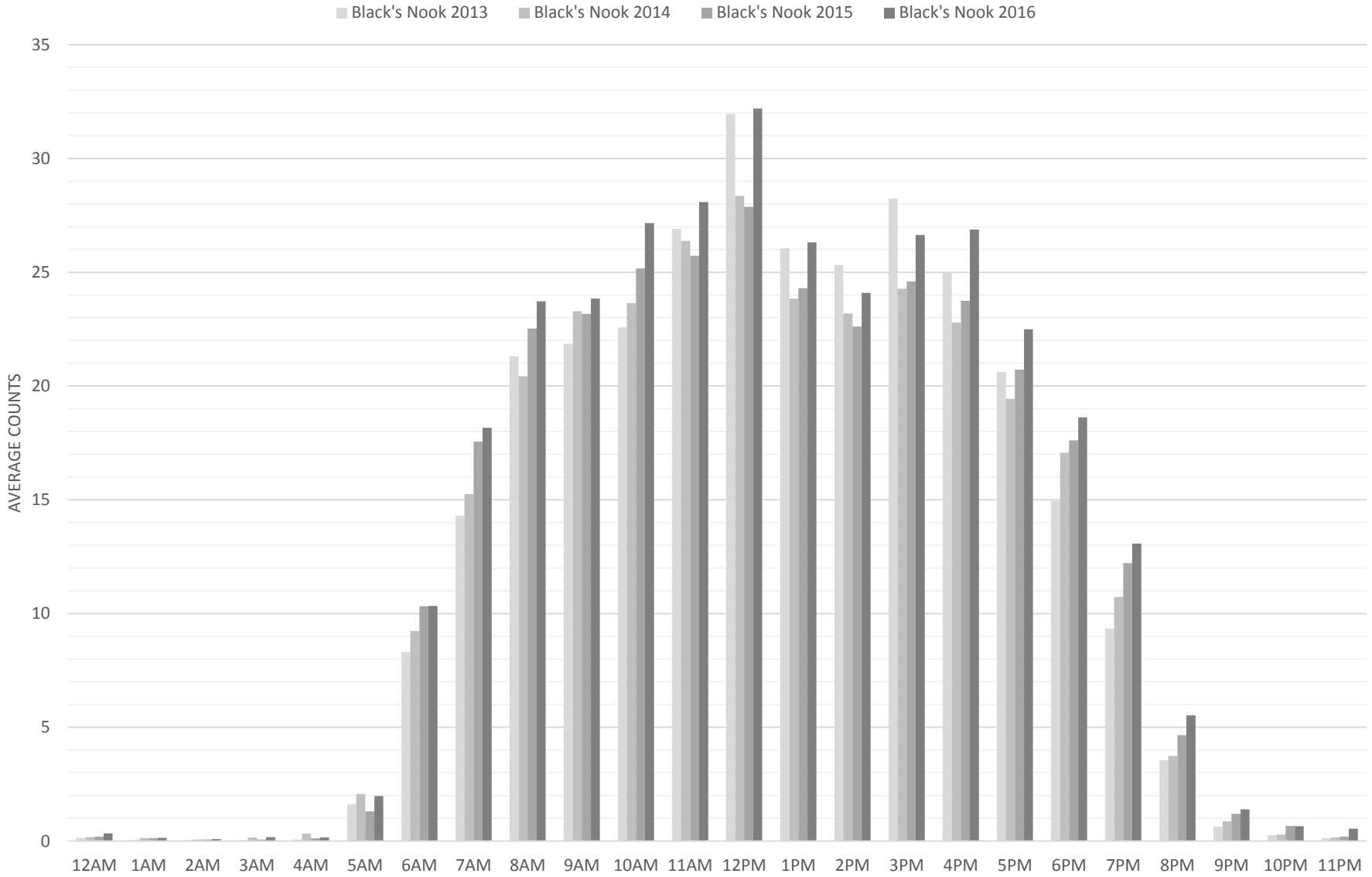
Average Hourly Counts
Pro Shop 2014- 2016



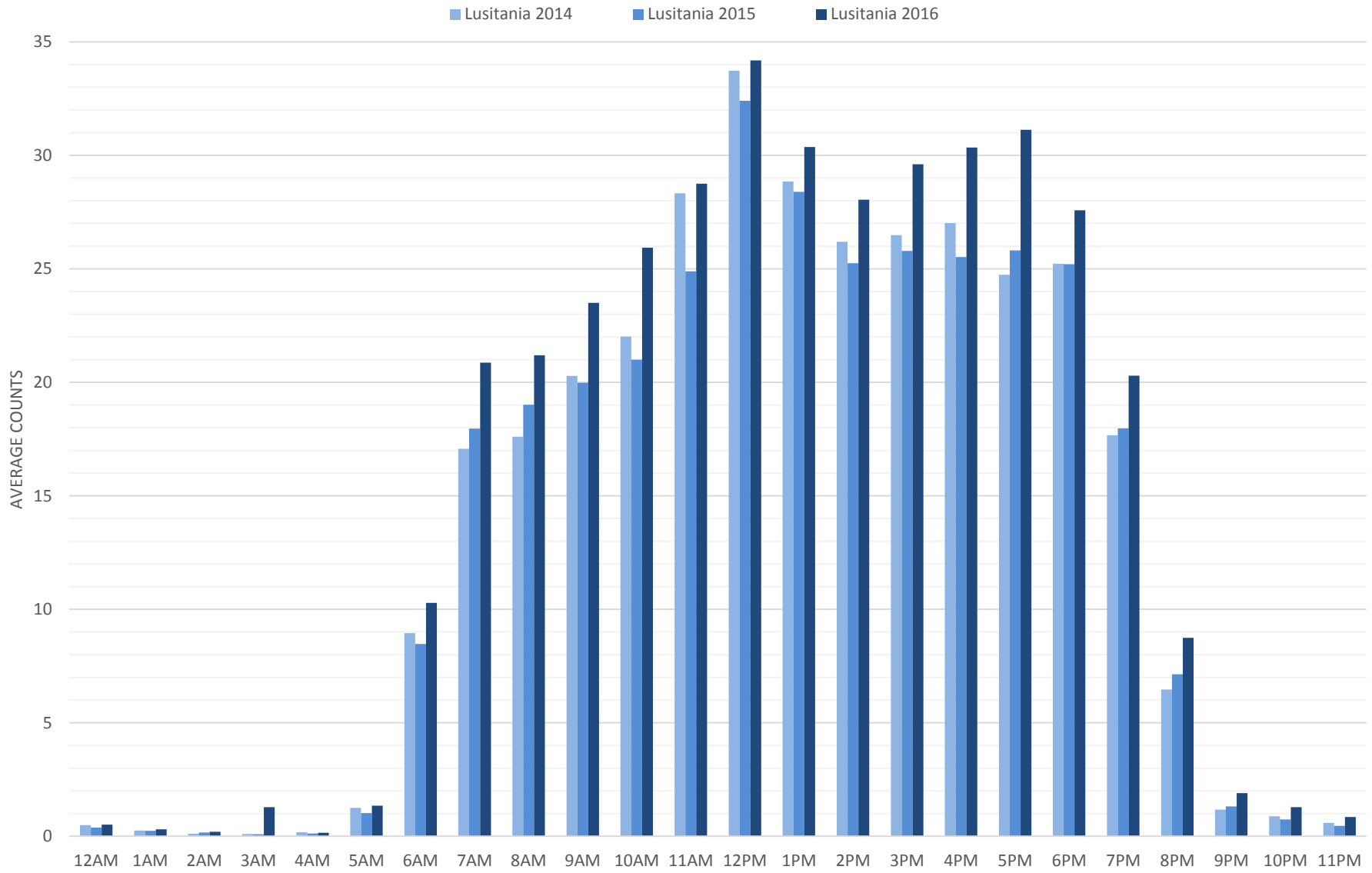
Data errors detailed on slides 11 & 12

Average Hourly Counts
Black's Nook 2013- 2016



*Data errors detailed on slides 11 & 12

Average Hourly Counts
Lusitania 2014- 2016



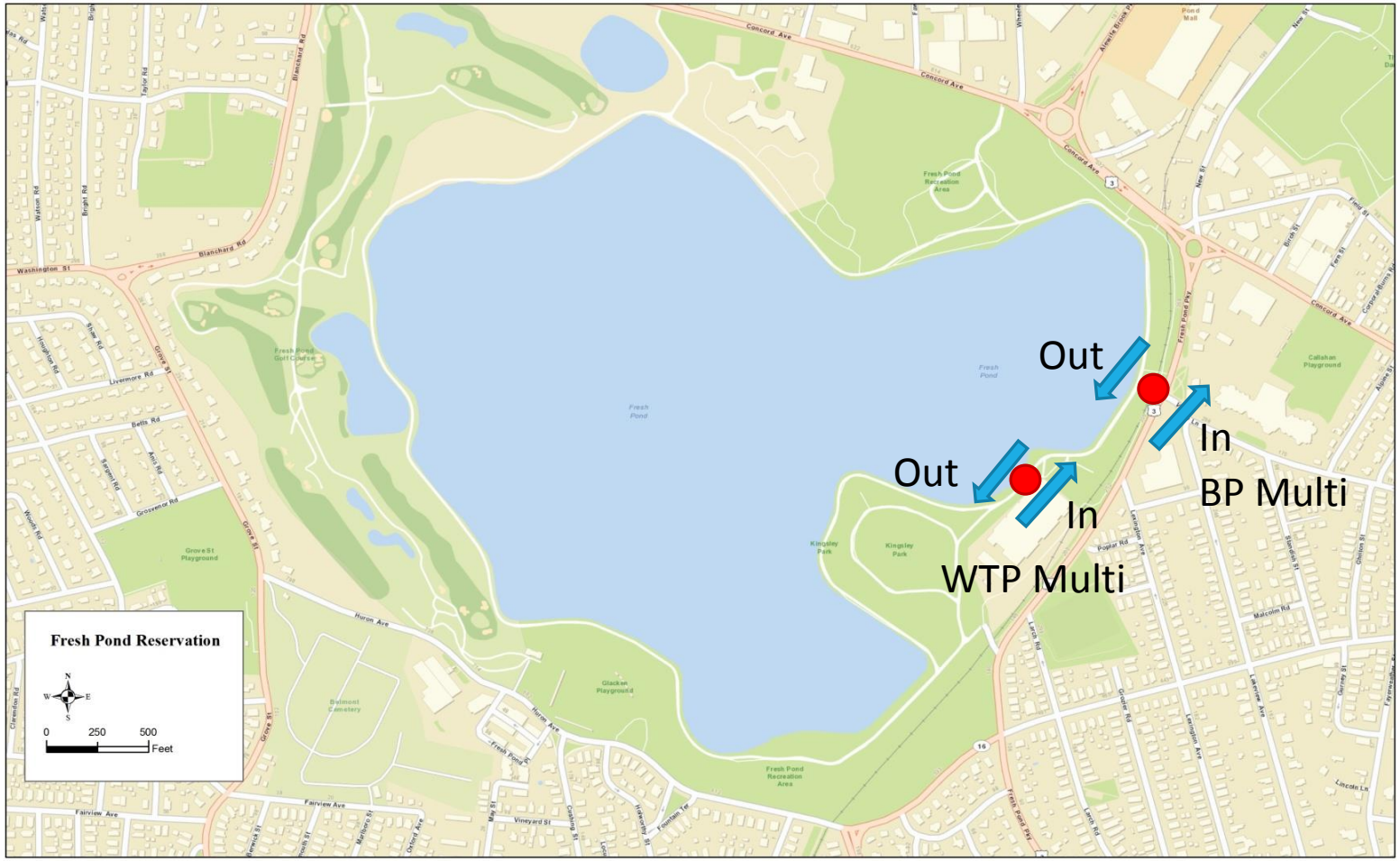
*Data errors detailed on slides 11 & 12

Results • *Multi Sensors*

Multi Sensor EcoCounter Sensors

Water Treatment Plant Multi (WTP Multi) and Bike Path Multi (BP Multi)

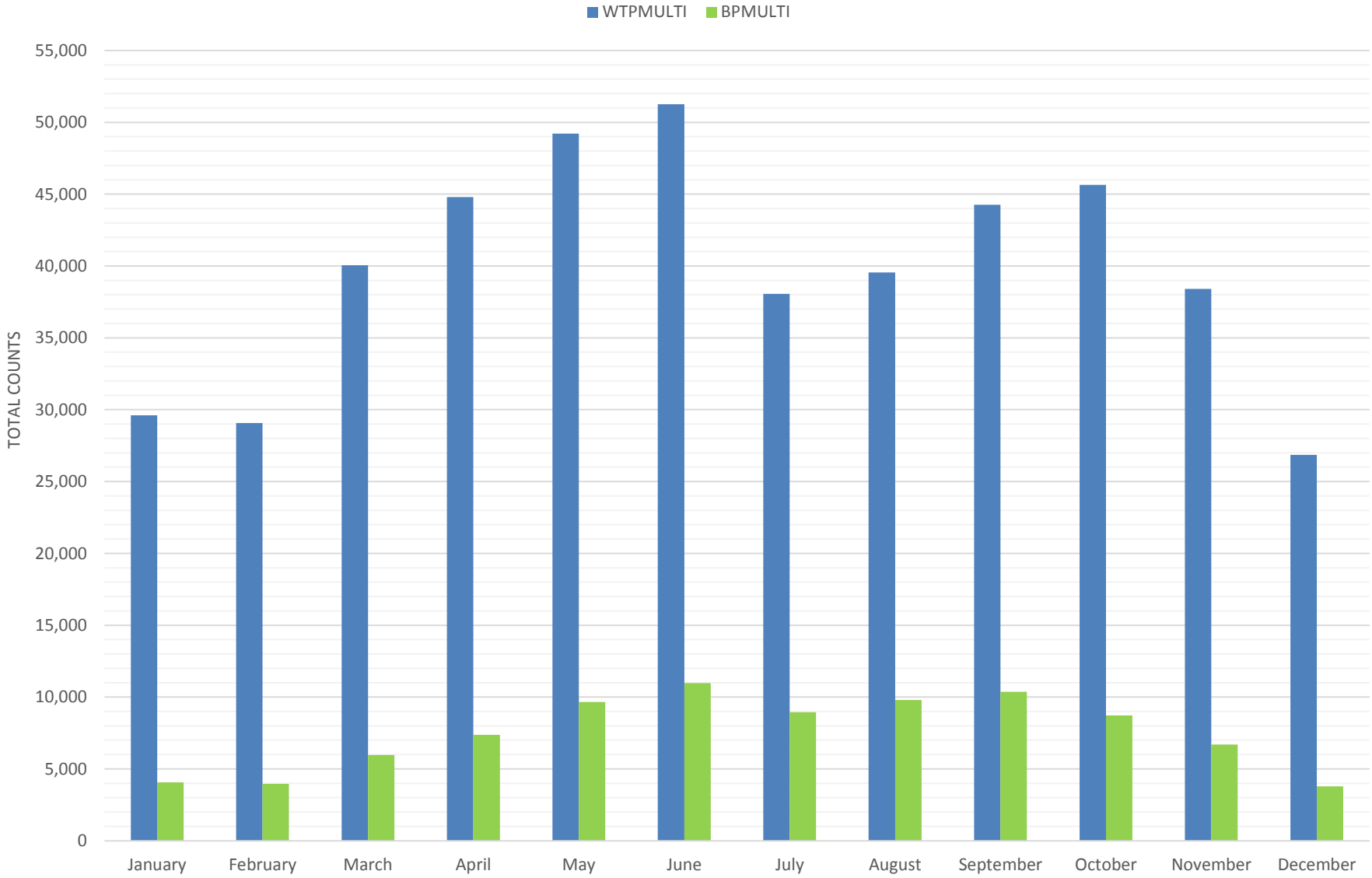
- Directional
- Differentiates between pedestrians and cyclists



2016 Multi Sensor Summary

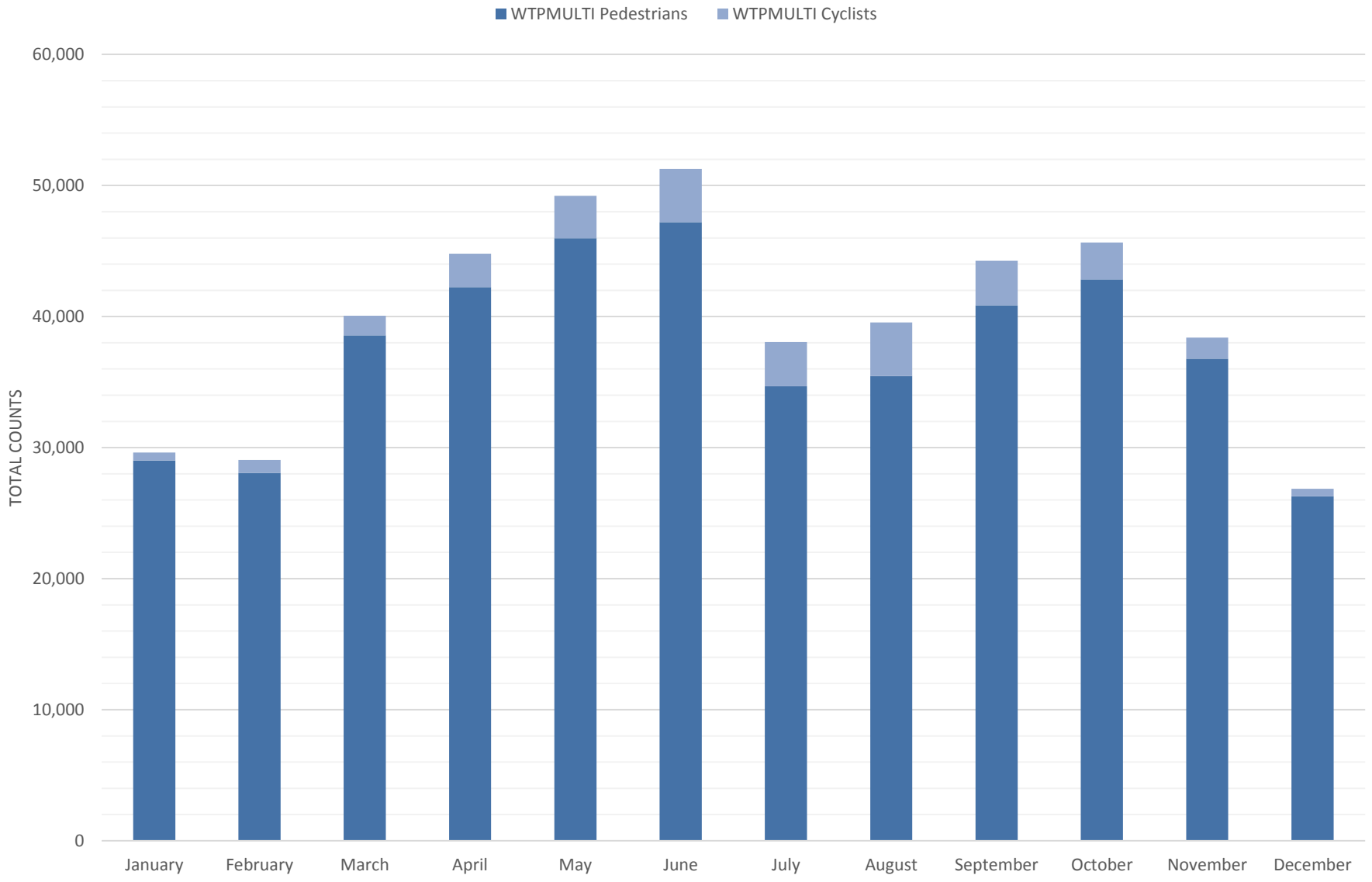
- Both sensors had the lowest number of users in winter months
- WTP Multi had more users on the weekends, while BP Multi had a more even distribution with only slightly more users on the weekdays, which is reflective of the recreational versus commuter users expected at each
- BP Multi had peaks in the number of users during commuting hours (7:00-9:00, 16:00-19:00), while WTP Multi had peaks in the mid morning and afternoon, as mentioned previously
- WTP Multi had an overall increase in hourly users from last year, while BP Multi had a slight decrease
- BP Multi has more bike users than pedestrian users, while WTP Multi has more pedestrian users

Total Monthly Counts
Multi Sensors 2016



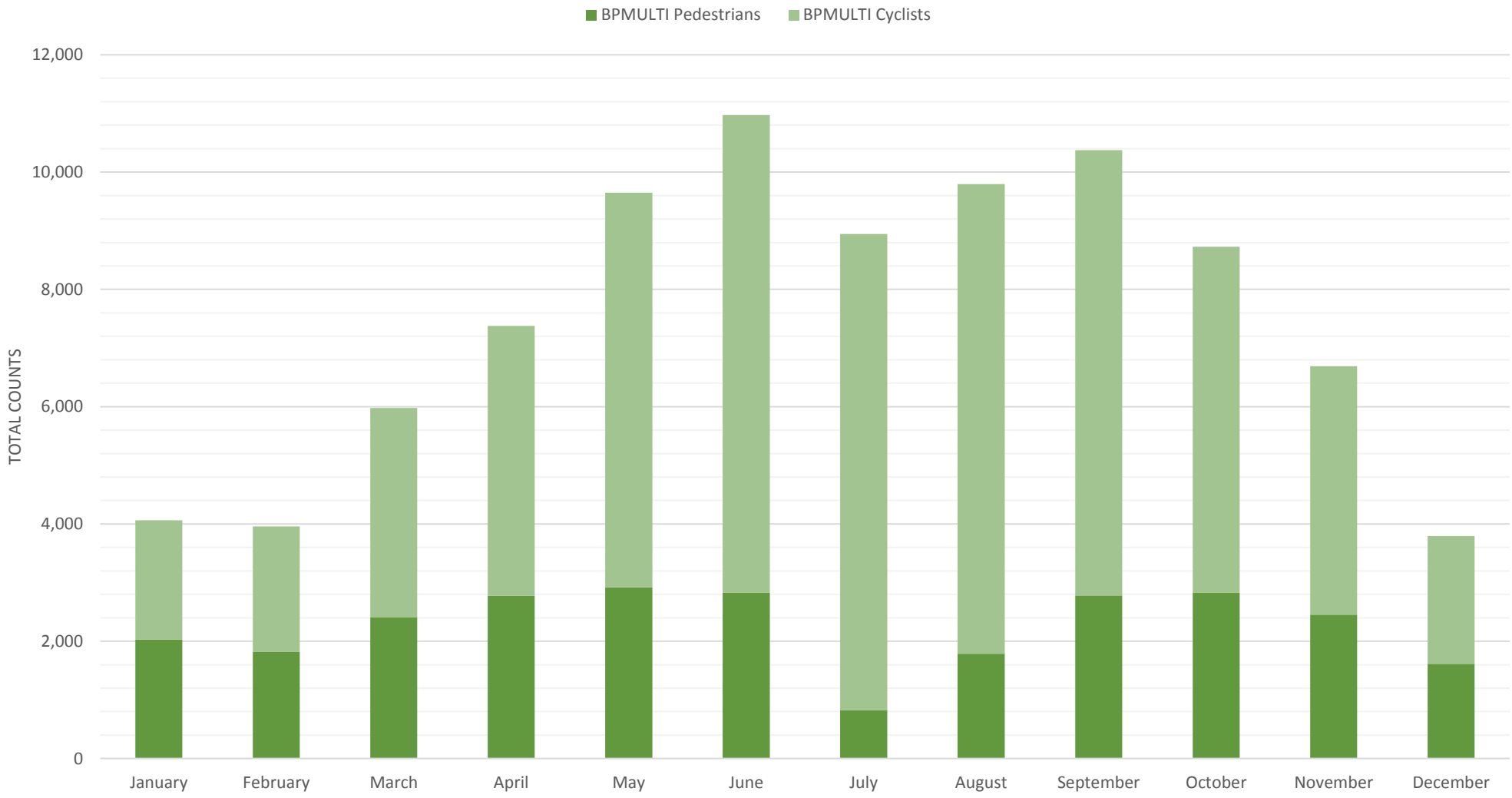
*Data errors detailed on slides 11 & 12

Total Monthly Counts
WTP Multi 2016



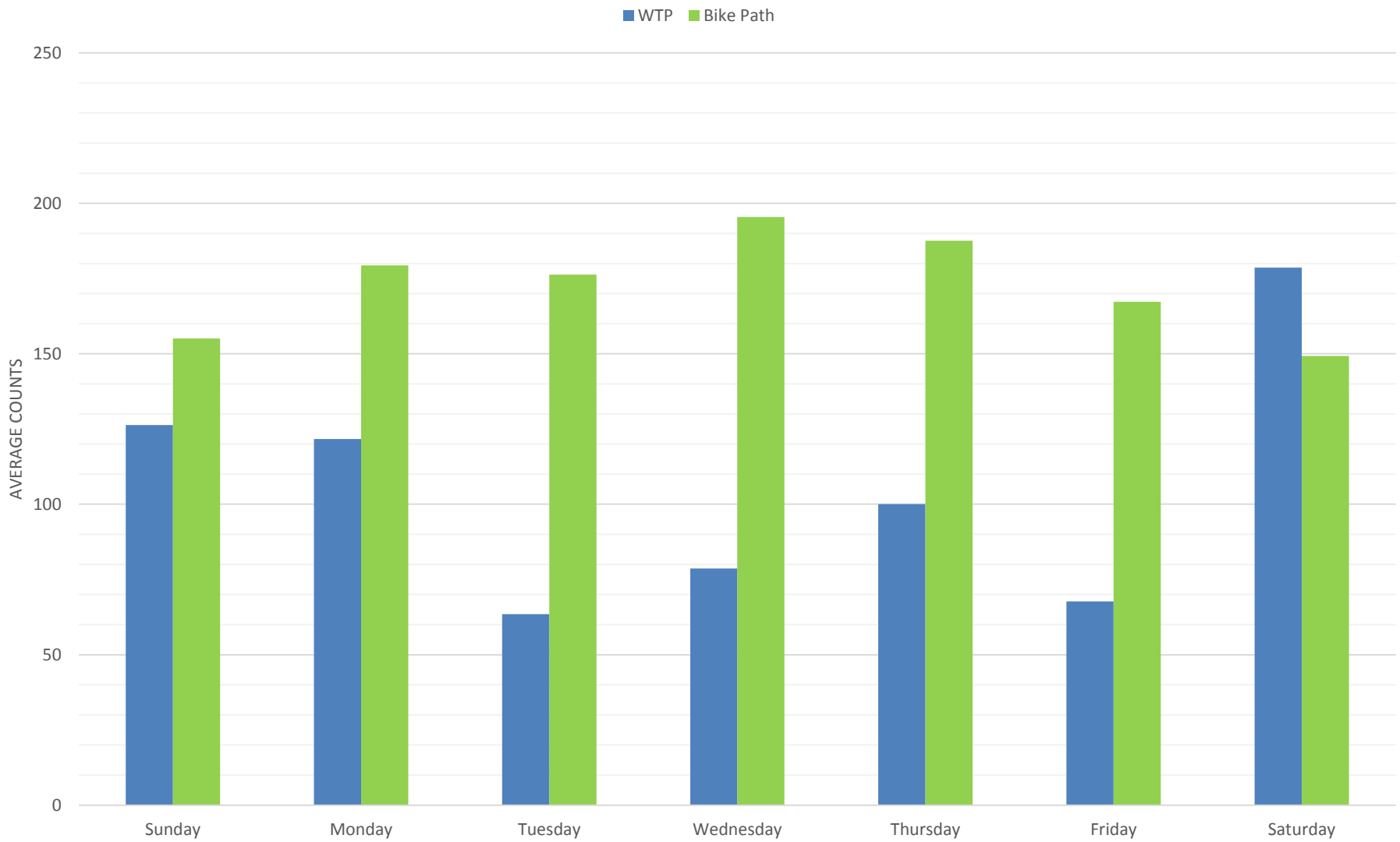
*Data errors detailed on slides 11 & 12

Total Monthly Counts
BP Multi 2016



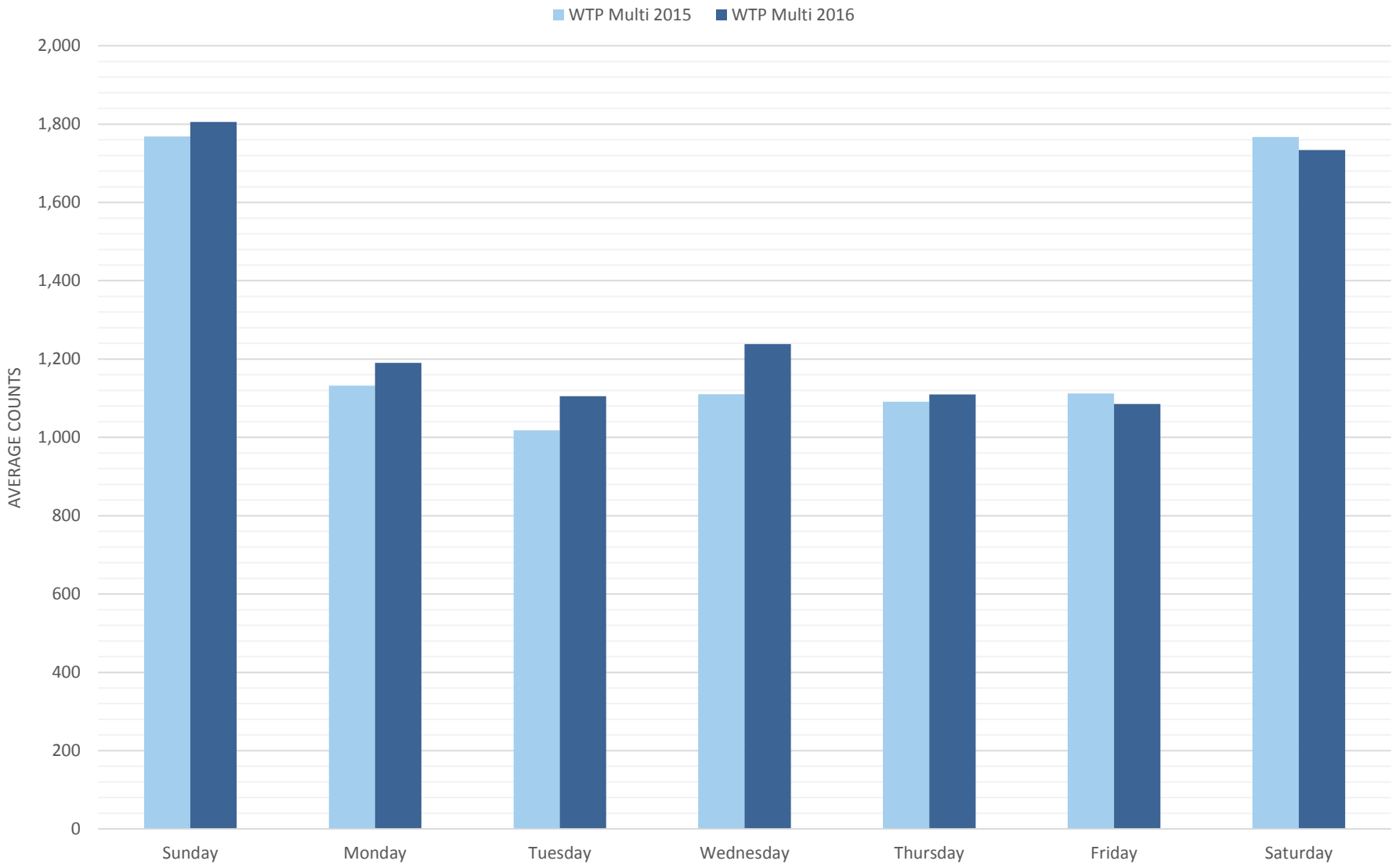
*Data errors detailed on slides 11 & 12

Average Daily Counts
Cyclists 2016



*Data errors detailed on slides 11 & 12

Average Daily Counts
WTP Multi 2015,2016



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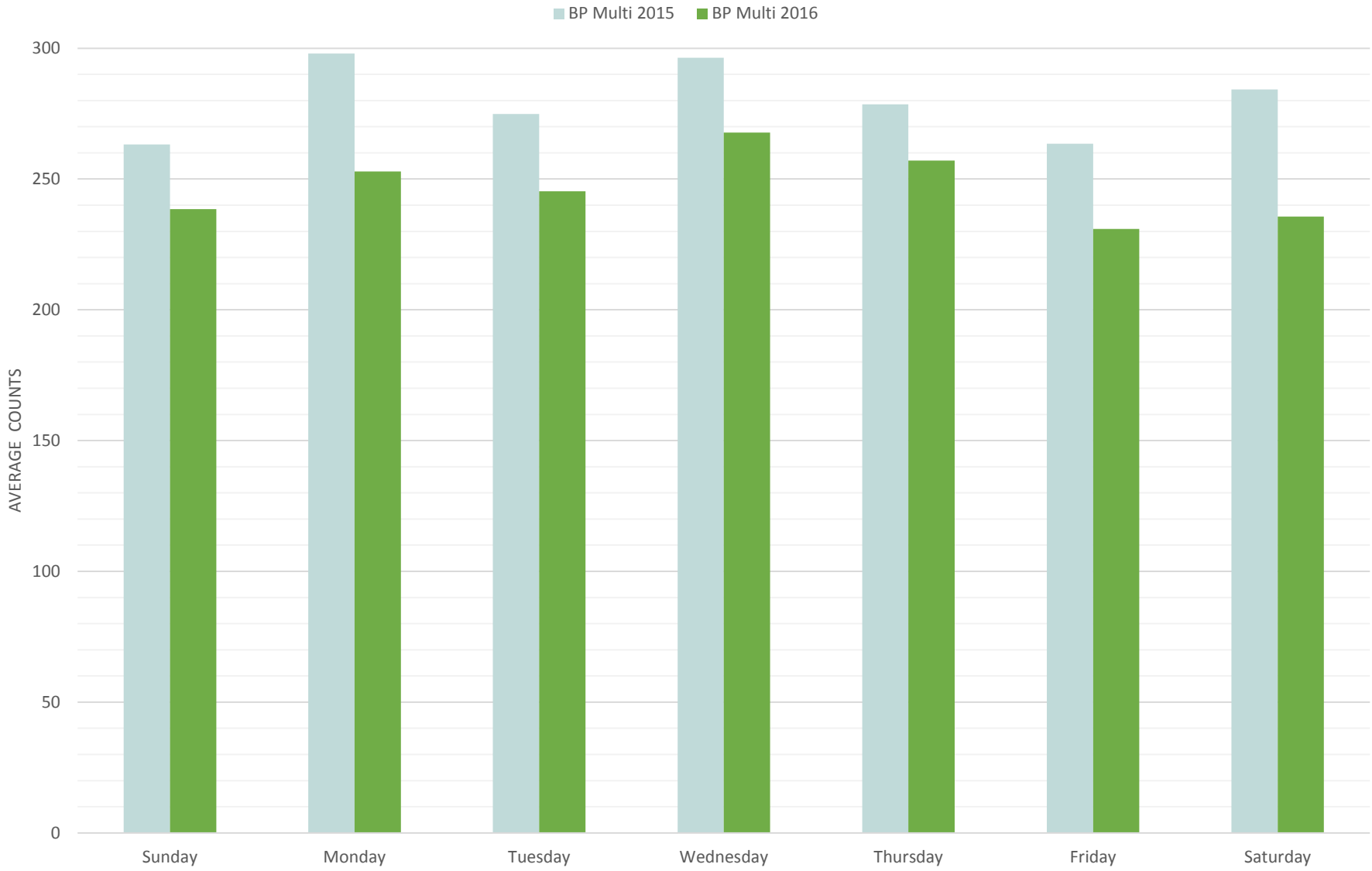
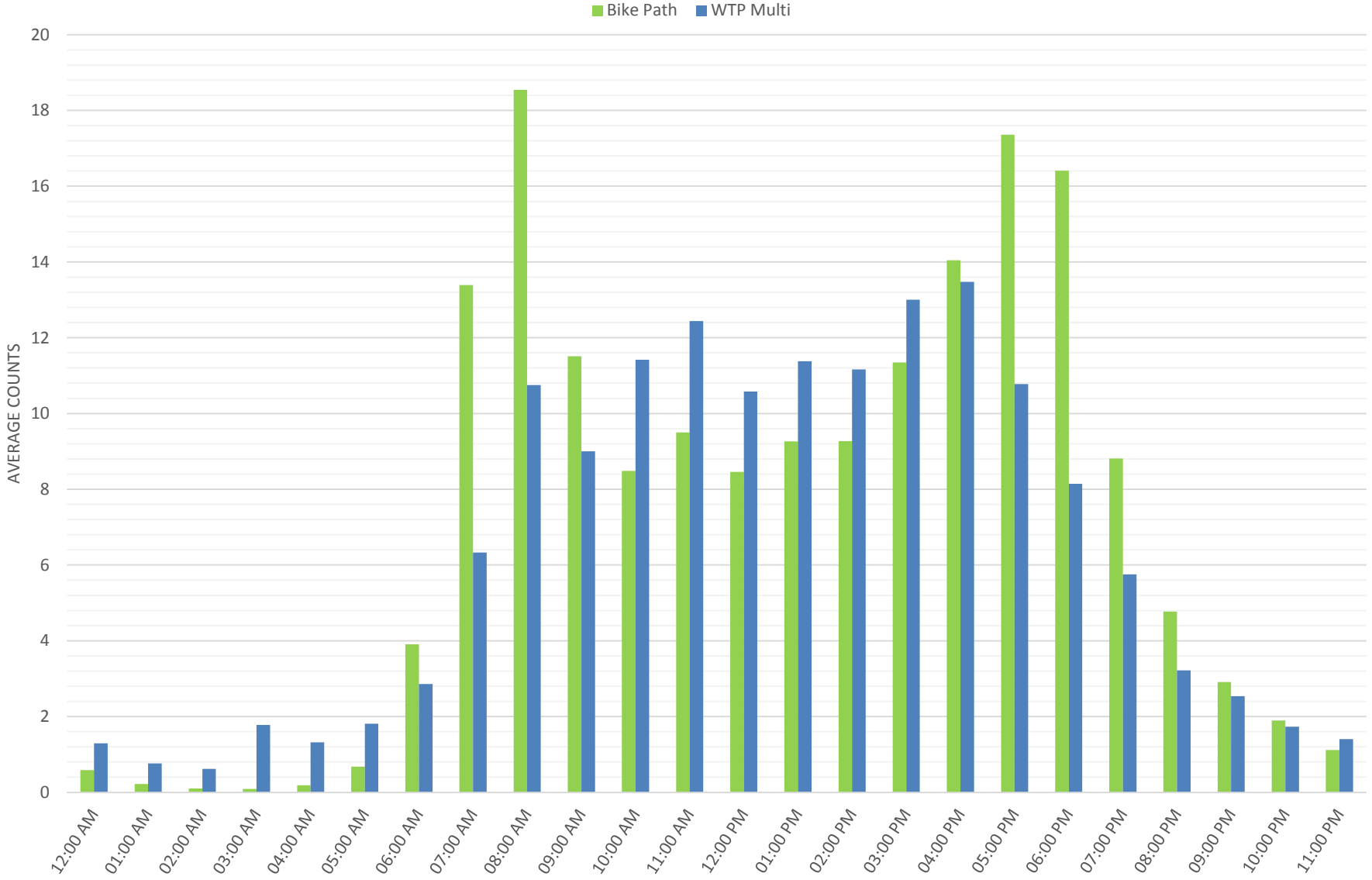
Average Daily Counts
BP Multi 2015,2016



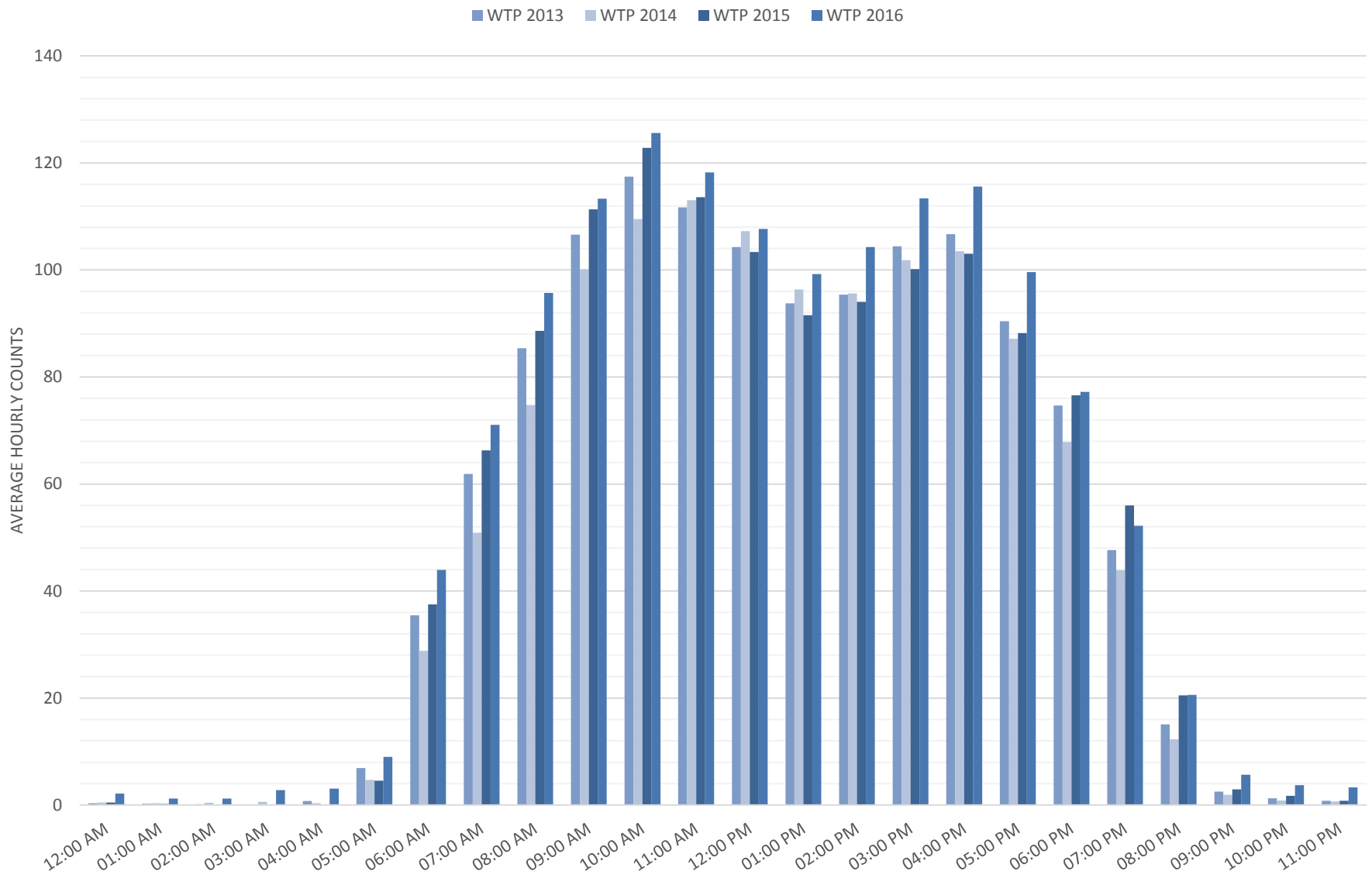
*Data errors detailed on slides 11 & 12

Average Hourly Counts
Cyclists 2016



*Data errors detailed on slides 11 & 12

Average Hourly Counts
WTP 2013- 2016



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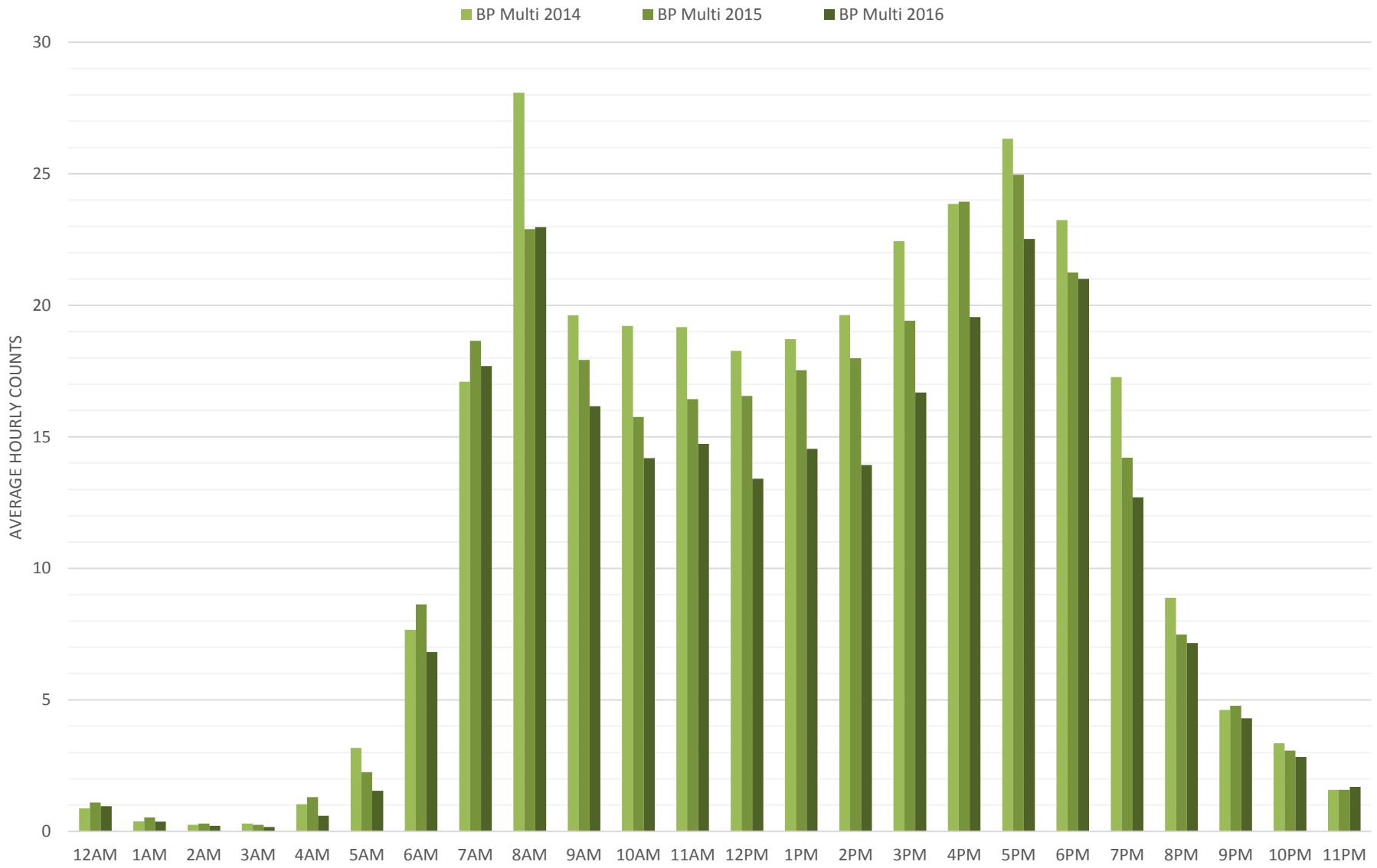
Average Hourly Counts
BP Multi 2014- 2016



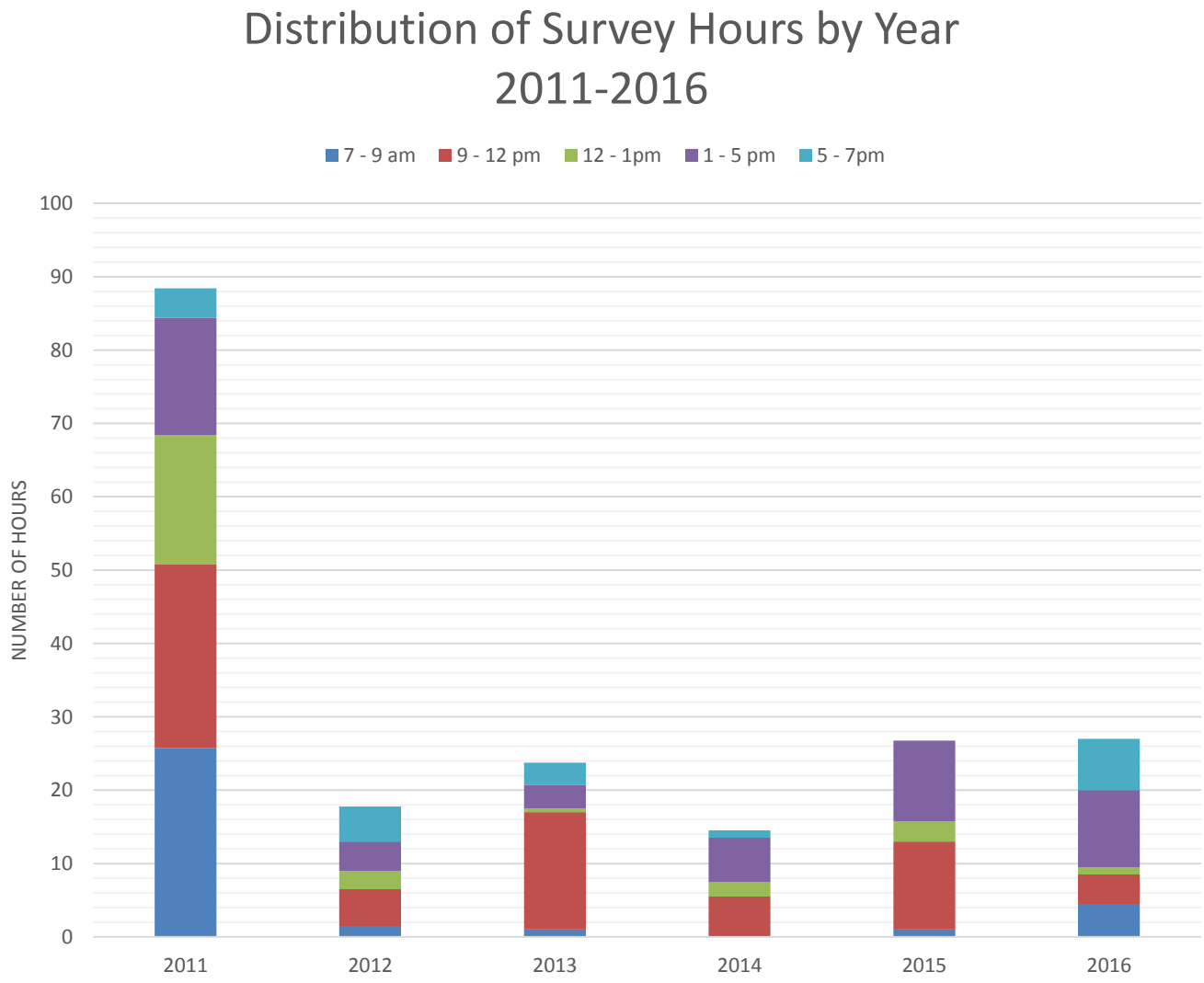
Data errors detailed on slides 11 & 12

Results • *Visual Survey Data*

Results

Survey Hours by Time Period

- Number of hours spent conducting surveys was almost exactly the same as last year
  - 2015= 26.75 hours
  - 2016= 27.00 hours
- At least one survey was conducted during each time period in 2016

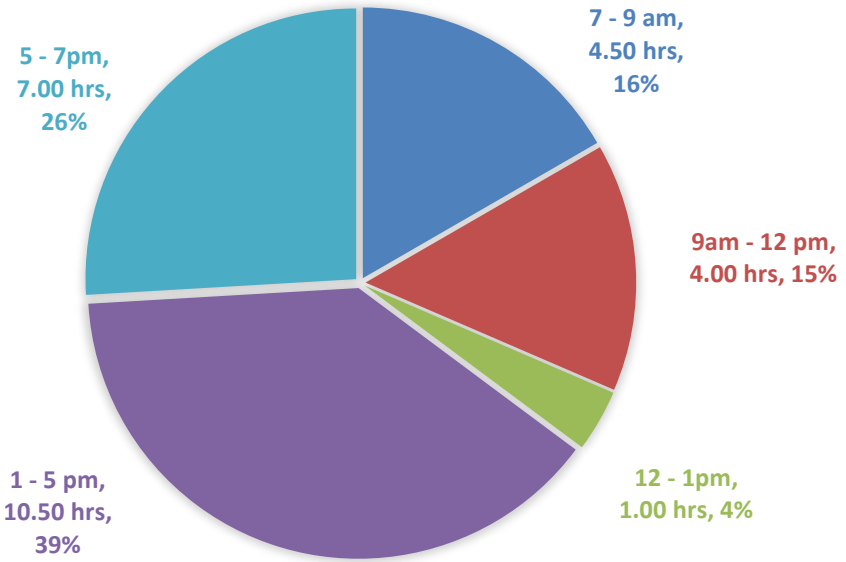


Results

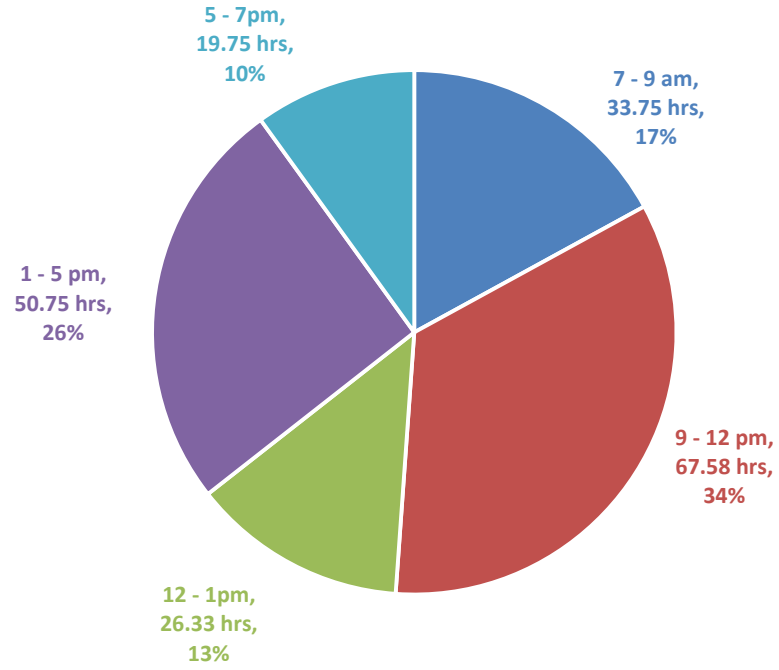
Survey Hours by Time Period

- 27 survey hours conducted in 2016
- 198 survey hours conducted between 2011 and 2016

CENSUS SURVEY HOURS BY TIME PERIOD 2016



Census Survey Hours by Time Period 2011-2016

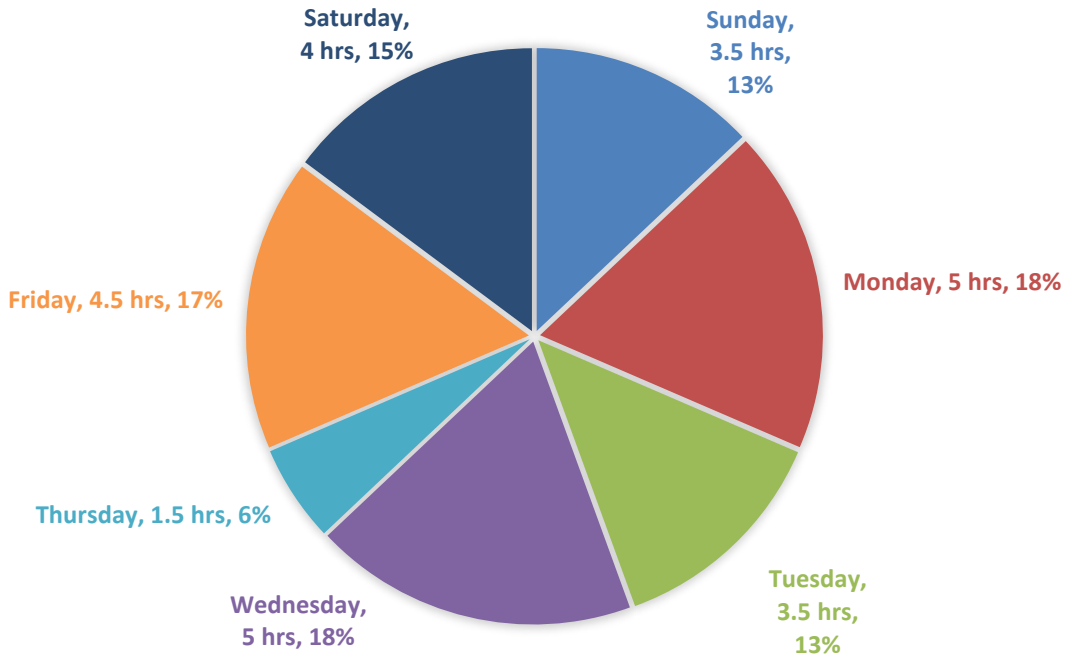


Results

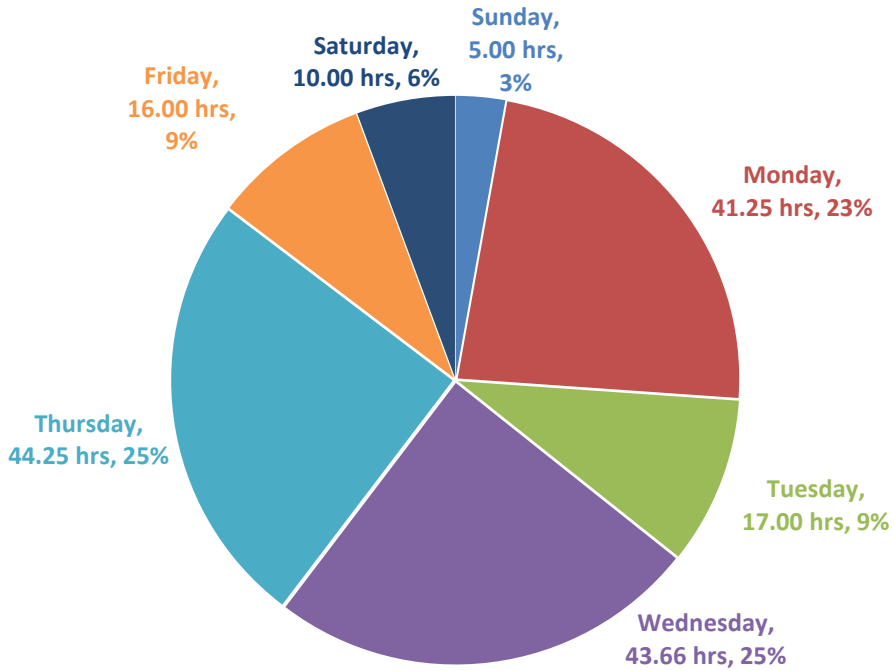
Survey Hours by Day

- Visual surveys in 2016 were distributed relatively evenly among days of the week

CENSUS SURVEY HOURS BY DAY 2016

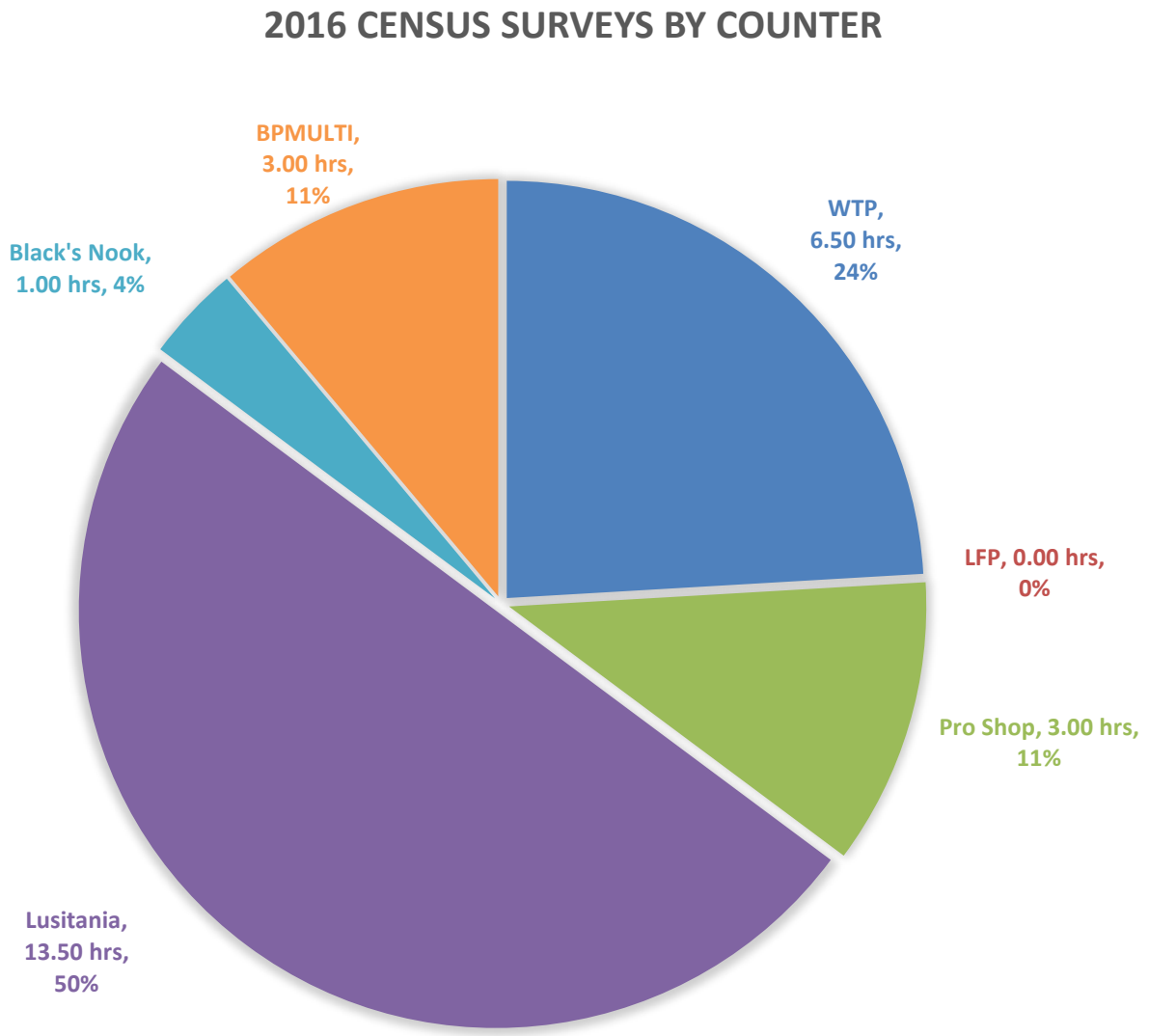


Census Survey Hours by Day 2011-2016



Results
Survey Hours by Sensor

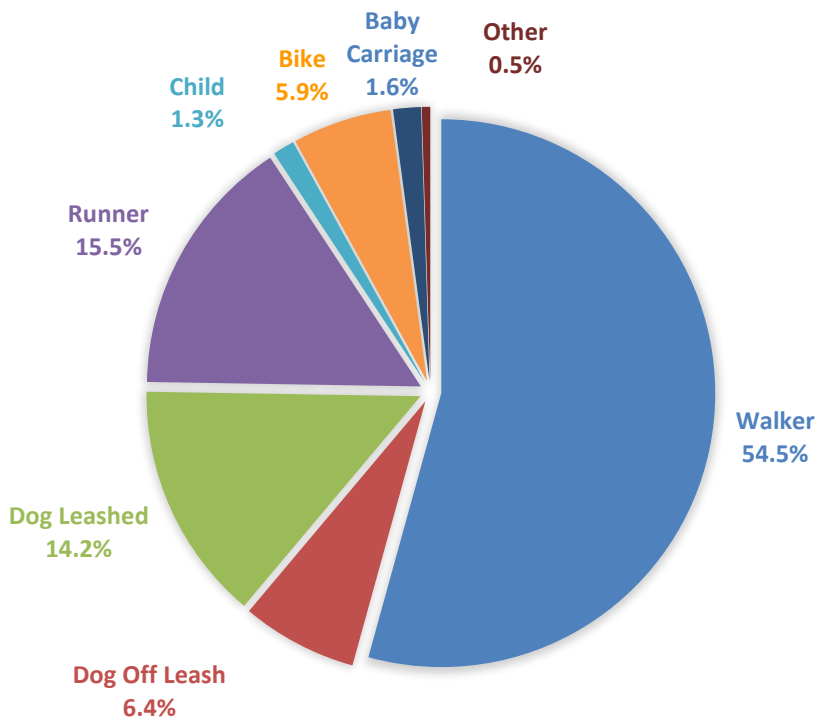
- All sensors except for LFP had surveys in 2016
- Lusitania had more surveys than other sensors due to focused volunteer efforts there



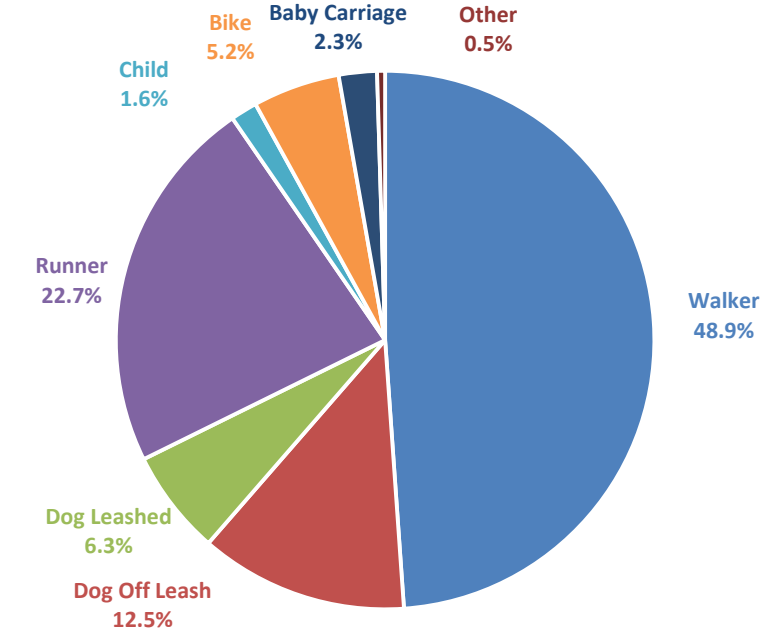
Results
Survey Data by User Type

- Walkers and runners accounted for approximately 70 percent of users at Fresh Pond
- Dogs accounted for approximately 20 percent of users at Fresh Pond

2016 CENSUS DATA BY USER TYPE



2011-2016 CENSUS DATA BY USER TYPE



Results • *Survey - Sensor Comparison*

- In 2016, sensors (compared to visual surveys):
  - Under counted 62% of the time
  - Over counted 26% of the time
  - Counted the same number of users 12% of the time
- From 2013-2016, sensors (compared to visual surveys):
  - Under counted users 62% of the time
  - Over counted users 30% of the time
  - Counted the same number of users 8% of the time

- Under counting is likely due to grouped events (when multiple users pass a sensor but are directly next to each other and do not trigger separate counts)

Future Goals

Future Goals

- Continue to track long term trends
- Inform Shared Use plan
- Use senor and survey data to better understand impacts on Fresh Pond Reservation from neighborhood housing development
- Conduct surveys using new schedule

Future Goals • *New Survey Schedule*

- Stratified census schedule randomizes times for surveys using specified time periods for weekdays and weekends
- Resulting schedule will ensure that surveys are completed on a regular basis and that they yield more robust data
- Survey format will remain the same as in past years
- Surveys will be conducted by employees and volunteers

If you would like to volunteer, please contact Michelle O'Donnell at modonnell@cambridgema.gov