Fuel Staffing Analysis:

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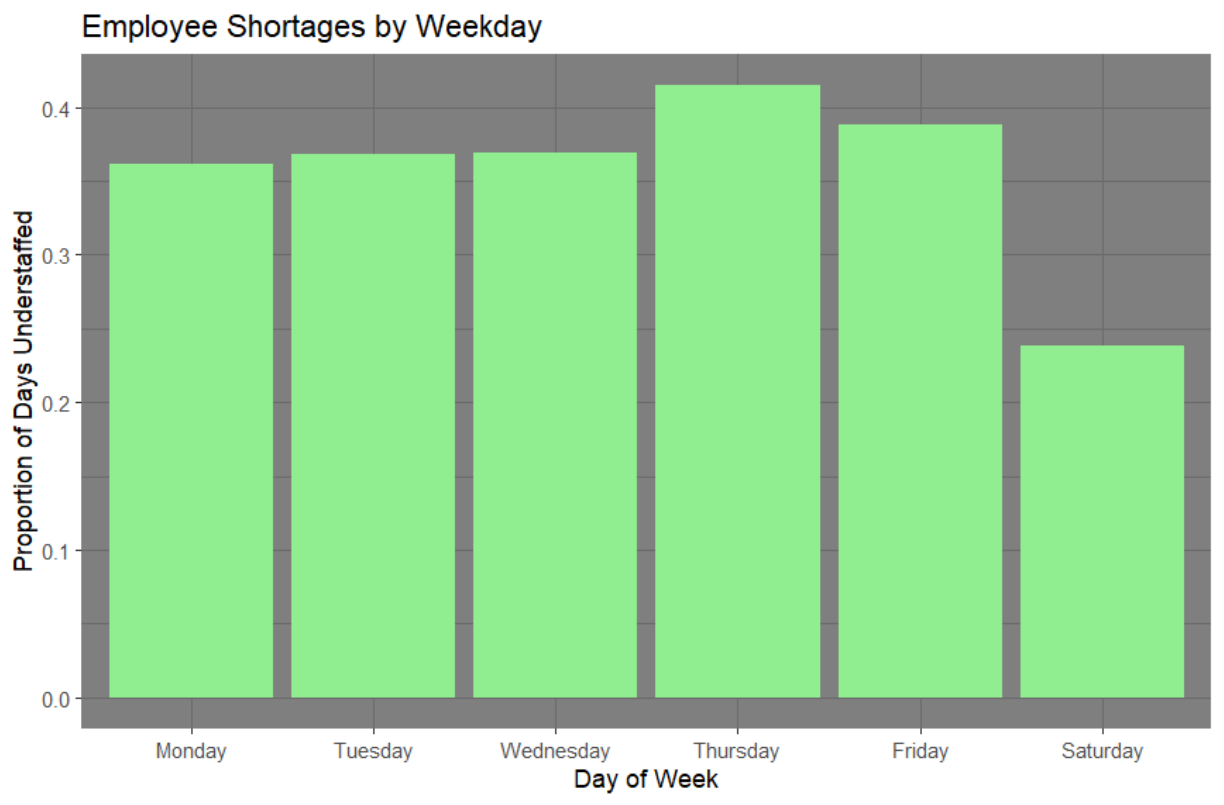
- Quality Staffing Gaps
- Store-Specific Patterns
- Modelling Staffing Needs
- Flexible Staffing Strategy Proposal

Quality Staffing Gaps

- Saturday saw the least days understaffed across the ten locations, while Thursday consisted of the most
- Tuesday logged 250 data points with other days in the graph containing 260



Understaffing Analysis at Fuel Locations

Amount of days understaffed while gauging service

Store	Days Understaffed	Average Customers Served
Columbus - Downtown	93	504
Columbus - Short North	81	460
Canton - Belden	58	328
Columbus - Polaris	51	434
Akron - Main St	48	406
Ashland - Center	47	251
Columbus - Campus	47	513
Columbus - Easton	46	465
Bucyrus - Square	41	180
Delaware - Downtown	41	251

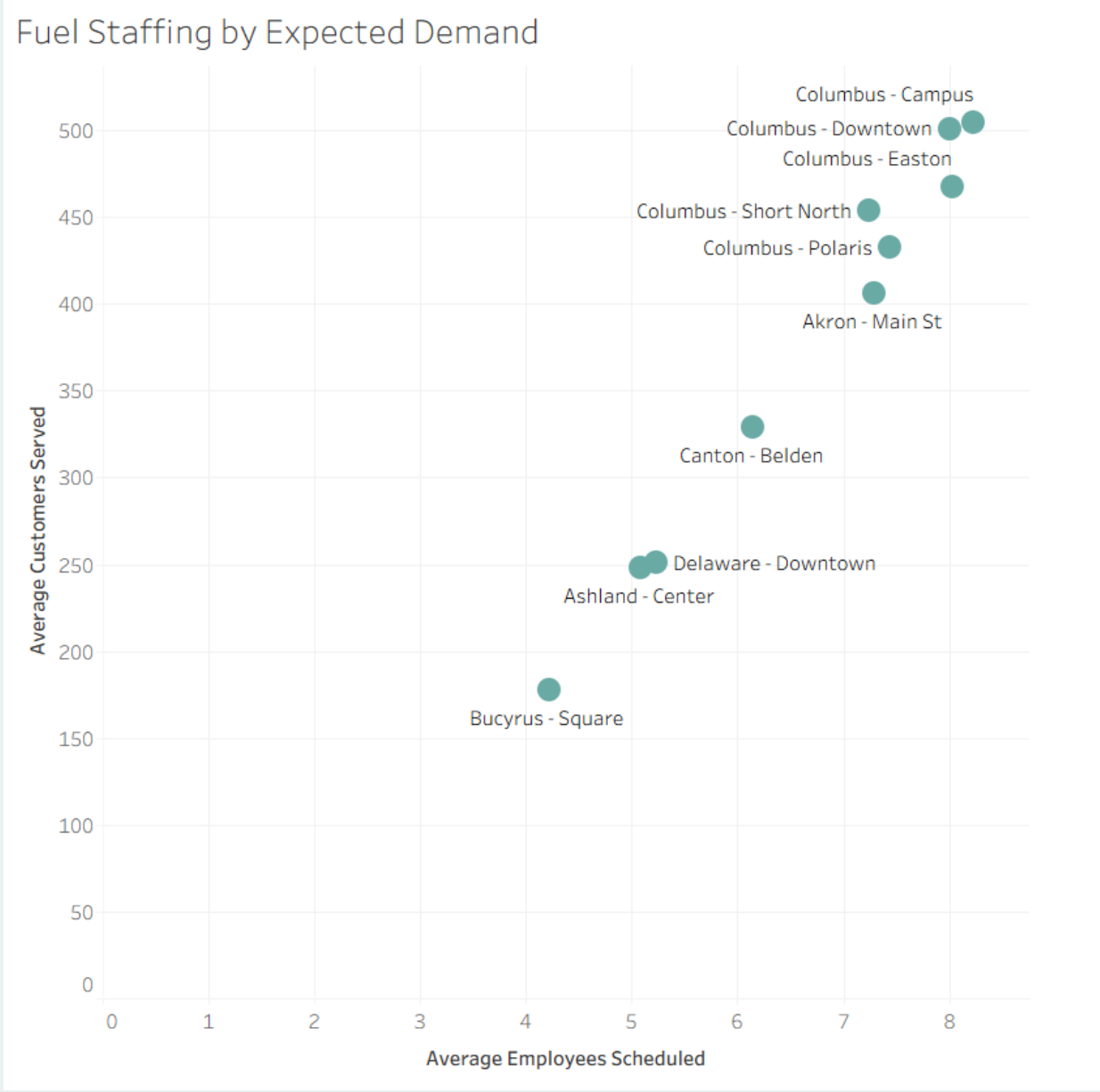
Table help from https://gt.albert-rapp.de/styling

- Two Columbus locations stood significantly higher than the others on days understaffed (with 155 days observed for all locations).
- Locations with increased customer amounts served generally saw more understaffing

Store-Specific Patterns

Store Name	Weather Impact Low	Normal	High
Columbus - Campus	8.480	8.248	7.920
Columbus - Downtown	8.118	7.990	7.842
Columbus - Easton	8.320	8.063	7.389
Columbus - Short North	7.235	7.298	6.958
Columbus - Polaris	7.708	7.505	6.923
Akron - Main St	7.320	7.442	6.235
Canton - Belden	6.192	6.211	5.750
Ashland - Center	5.077	5.119	4.900
Delaware - Downtown	5.240	5.318	4.700
Bucyrus - Square	4.480	4.173	4.100

- Decline across the board in staffing as weather gets worse
- However decline in staffing doesn't appear to be major with weather changes (Akron the most with around one less employee)



- Positive trend with more employees and increased customers, with Columbus locations leading the group

Model Staffing Needs

- Includes regressors of estimated demand, and dummy variables for store location, day of week, weather impact, and if there is a local event
- Tuesday-Thursday weren't significantly different than Friday impacting employees required
- Better weather shows significance with having more required employees while local events indicate a staffing reduction
- Interpretation Example: Fair-weather Monday with average demand at Delaware having no events
- Estimated value of employees required would look like:

4.12 + .0078(260) + 1(-0.81) + 1(-.098) + 1(.1131) + 1(0) --> 5.36 (would likely round down to 5 employees)

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Call:
lm(formula = Employees_Required ~ Store_Name + Daily_Demand +
    weekday + Weather_Impact + Local_Event_Flag, data = fuel_data)

Residuals:
     Min       1Q   Median       3Q      Max
-1.43685 -0.29033 -0.00058  0.33325  1.23355

Coefficients:
                                 Estimate Std. Error t value Pr(>|t|)
(Intercept)                     4.1163380  0.1201588  34.257  < 2e-16 ***
Store_NameAshland - Center     -0.9847222  0.0651161 -15.123  < 2e-16 ***
Store_NameBucyrus - Square     -1.3250701  0.0790957 -16.753  < 2e-16 ***
Store_NameCanton - Belden      -0.3881523  0.0515627  -7.528 8.77e-14 ***
Store_NameColumbus - Campus     0.1354573  0.0550066   2.463 0.013904 *
Store_NameColumbus - Downtown   0.1961981  0.0594965   3.298 0.000997 ***
Store_NameColumbus - Easton     0.2097657  0.0503158   4.169 3.23e-05 ***
Store_NameColumbus - Polaris   -0.0969190  0.0480828  -2.016 0.044009 *
Store_NameColumbus - Short North -0.1809885  0.0519197  -3.486 0.000504 ***
Store_NameDelaware - Downtown  -0.8105074  0.0636544 -12.733  < 2e-16 ***
Daily_Demand                    0.0077579  0.0002672  29.033  < 2e-16 ***
weekdayMonday                  -0.0976181  0.0383361  -2.546 0.010982 *
weekdaySaturday                -0.3196791  0.0442116  -7.231 7.56e-13 ***
weekdayThursday                -0.0335969  0.0366657  -0.916 0.359652
weekdayTuesday                 -0.0525882  0.0374548  -1.404 0.160509
weekdayWednesday               -0.0403328  0.0368187  -1.095 0.273494
Weather_ImpactLow               0.1131307  0.0428454   2.640 0.008364 **
Weather_ImpactNormal            0.1274101  0.0334977   3.804 0.000148 ***
Local_Event_FlagYes            -0.1377149  0.0423301  -3.253 0.001165 **
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Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 0.4164 on 1531 degrees of freedom
Multiple R-squared:  0.9321,    Adjusted R-squared:  0.9313
F-statistic:  1167 on 18 and 1531 DF,  p-value: < 2.2e-16
```

- Stepwise regression on most variables to predict required amount of employees.

$$Y = \beta_0 + \beta_1 X_{DailyDemand} + \sum_{i=2}^{10} \beta_i D_{StoreLocation} + \sum_{j=11}^{15} \beta_j D_{Weekday} + \sum_{k=16}^{17} \beta_k D_{WeatherImpact} + \beta_{18} D_{LocalEvent}$$

Flexible Staffing Strategy

From the data so far, I'd be more careful to schedule more employees mainly at the Columbus locations.

Additionally I would look further into scheduling on Thursdays as they look to be much more understaffed than Saturdays.

Bonus graphics on the right provide:

- demand expectations further analysis
- weekday customer trends

Understaffing by Expected Demand

Comparing averages of demand by staffing

Store	Understaffed Expected Demand	Properly Staffed Expected Demand	Expected Demand Difference	Demand Over Capacity (Day
Akron - Main St	424	422	2	7
Ashland - Center	258	251	7	4
Bucyrus - Square	188	182	6	5
Canton - Belden	346	344	2	6
Columbus - Campus	547	517	30	6
Columbus - Downtown	566	550	16	10
Columbus - Easton	488	488	0	5
Columbus - Polaris	456	450	6	6
Columbus - Short North	511	489	22	10
Delaware - Downtown	261	262	-1	7