

# Report: Spatiotemporal Data

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## Introduction

Mistford's nature preserve is experiencing a decrease in the Rose-Crested Blue Pipit songbird. An ornithologist is attempting to understand the extent to which factory chemical output and human traffic could be impacting the bird's environment. In our research we attempted to use data the ornithologist provided to better understand the origins of the environmental changes.

Our evidence can support the following inferences:

1. Factories in the area such as Kios and Radiance are producing methylosmine and other VOCs.
2. Radiance is producing the most VOCs out of the companies who claim to be environmentally responsible.

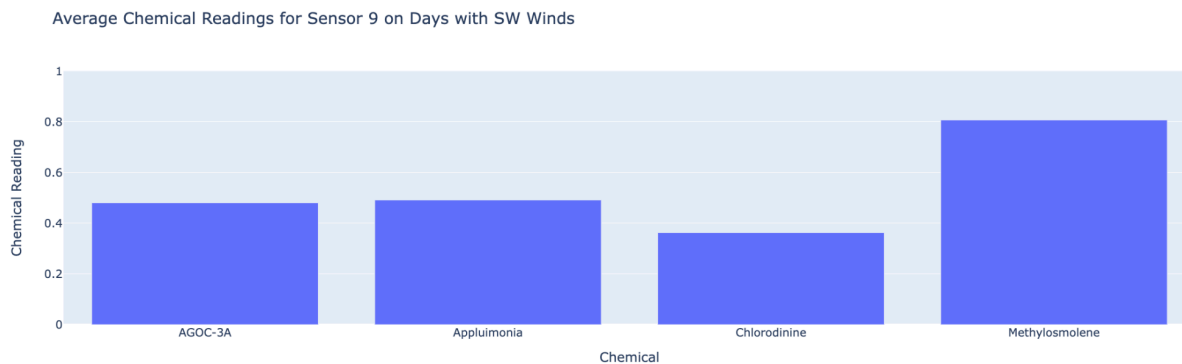
### Hypothesis 1a: Sensor 9 is NE of Radiance.



*[Fig. 1a] Map of Mistford's nature preserve where the top of the map is North and the red line represents the geographic relationship between sensor 9 and Radiance.*

Here we can see that sensor 9 is North East of Radiance by seeing the direction the red line points.

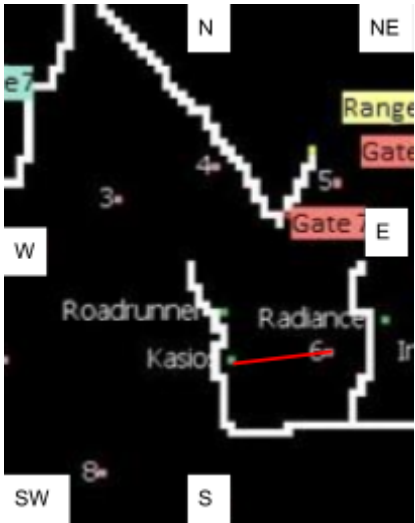
### Hypothesis 1b: Radiance is producing more VOCs than AGOC-3A.



*[Fig. 1b] Bar graph comparing sensor 9's measurements of Methylosmolene, Chlorodinine and AGOC-3A on days with SW wind during 2016.*

On days when the wind blows from the SW over Radiance's factory to Sensor 9, we can see that the monitor is detecting noticeably more harmful Methylosmolene, corrosive Chlorodinine and irritating Appluimonia than the non-harmful substitute AGOC-3A. VOC's like Methylosmolene are known to harm life forms such as the Rose-Crested Blue Pipit songbird.

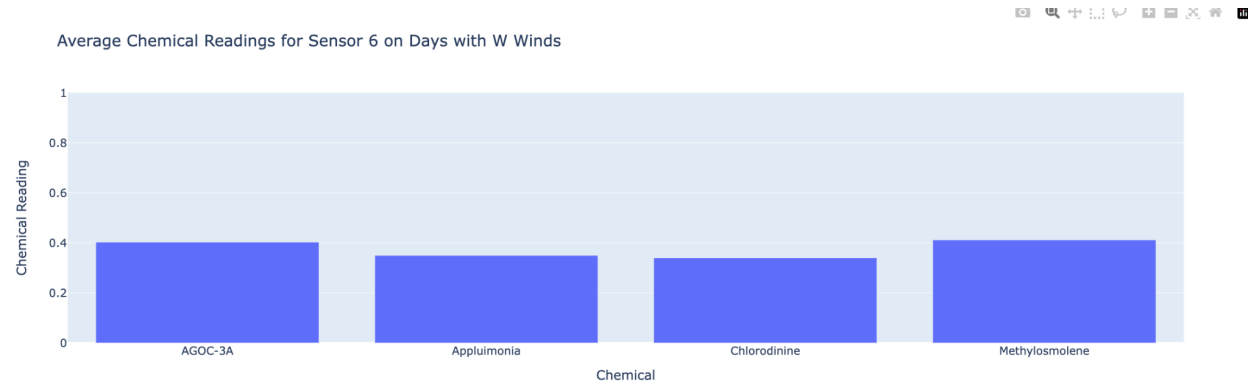
**Hypothesis 2a: Sensor 6 is E of Radiance.**



[Fig. 2a] Map of Mistford's nature preserve where the top of the map is North and the red line represents the geographic relationship between sensor 6 and Kasios.

Here we can see that sensor 6 is East of Kasios by seeing the direction the red line points.

**Hypothesis 2b: Kasios is producing more VOCs than AGOC-3A.**



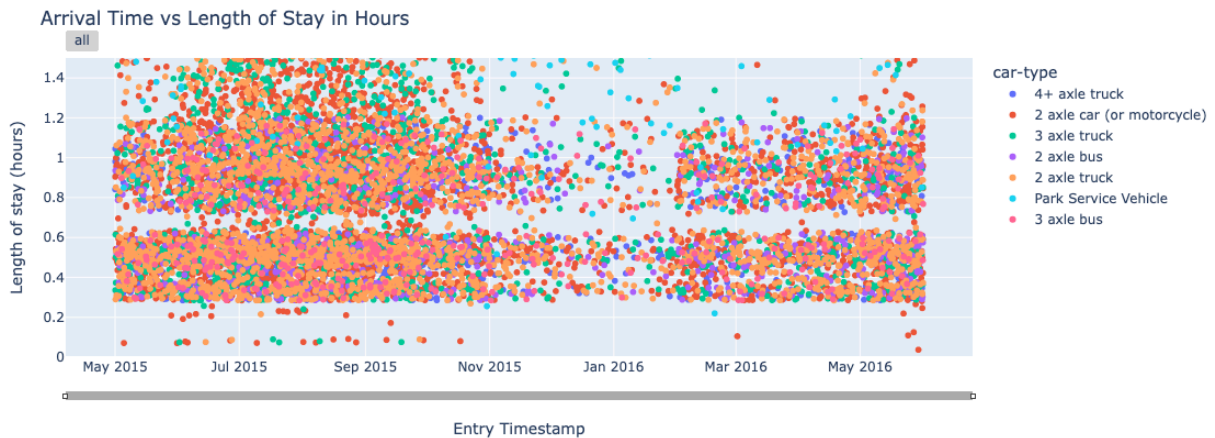
[Fig. 2b] Bar graph comparing sensor 6's measurements of Methylosmolene, Chlorodinine, Appluimonia and AGOC-3A on days with W wind during 2016.

On days when the wind blows E over Kasios' factory to Sensor 6, we can see that the monitor is detecting the same quantity of harmful Methylosmolene as the non-harmful substitute AGOC-3A. The sum of the chemical readings for Appluimonia, Chlorodinine and Methylosmolene are almost triple that of AGOC-3A. The continuing pollution of the nature preserve at the hands of irresponsible companies refusing to reduce their output of VOCs could be a factor in the decline of the Rose-Crested Blue Pipit songbird.

### Hypothesis 3: Radiance is a bigger polluter than Kasios

When comparing the data from figure 1b and 2b we can see that Radiance produced ~.8 units and Kasios produced ~.4 units of Methylosmolene. Showing that of the factories who vowed to reduce their output of VOCs, Radiance is the larger polluter by twice that of its competitor.

### Hypothesis 4a: After entering the park, it takes at least 15 minutes to exit again

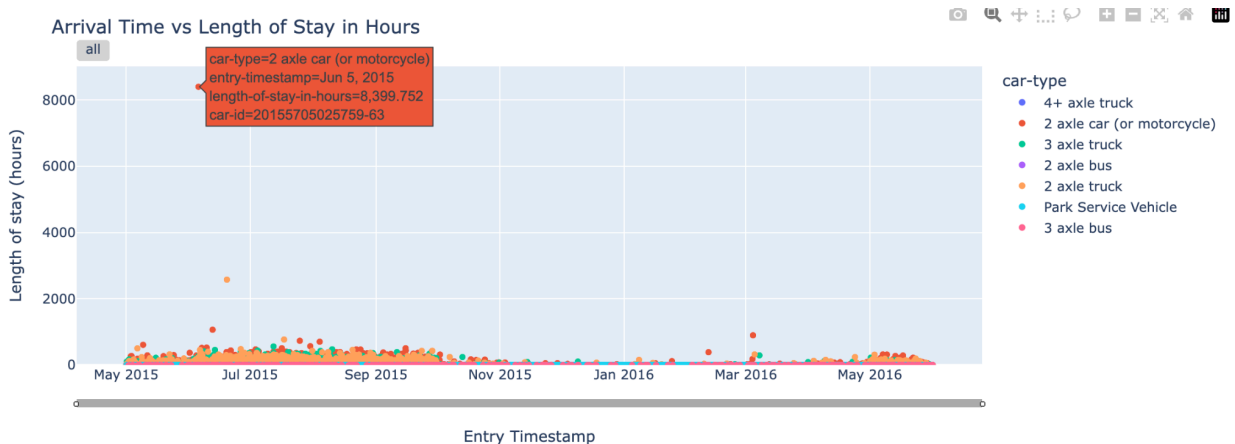
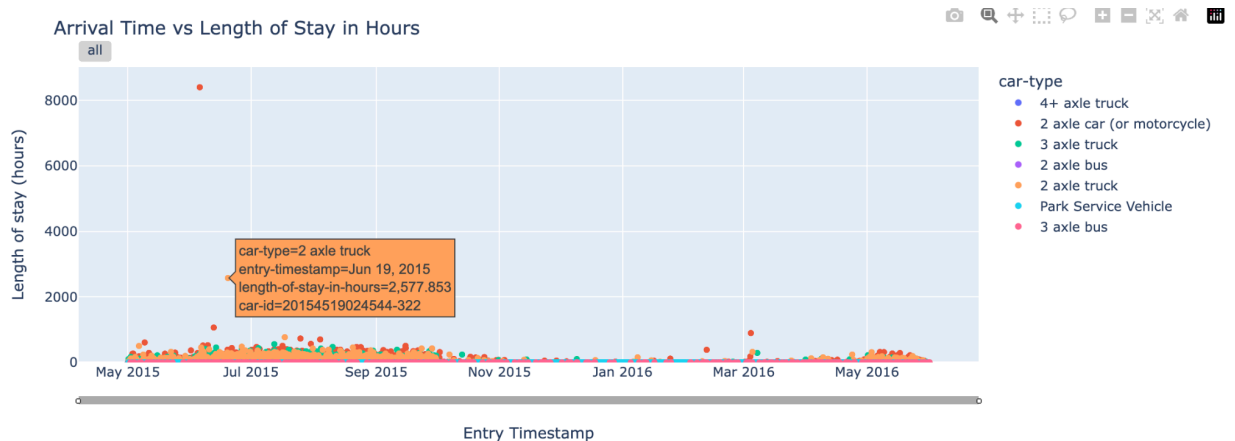


*[Fig. 3] Scatterplot comparing vehicle entry time to how long the vehicle was in the park based on last recorded timestamp.*

Figure 3 shows that hardly any vehicles entered and exited the park again within fifteen minutes, indicating that most park entrances are located at least a fifteen minute drive apart.

# Recommendations

1. **Investigate chemical output of other factories in the region:** Following Hypothesis 3, we should check the chemical output of other companies in the area to ensure that Radiance is the highest emitter.
2. **Interview vehicle owners that have frequented the park for an excessive amount of time:** The owners of vehicles 20154519024544-322 and 20155705025759-63 are clear outliers in terms of how long they have been around the park. These individuals may have something to do with Pipit's struggles. Even if not, having spent so much time in the park means they may have noticed something important during their stay. Refer to the figures below to see how unusual these lengths of stay are compared to other visitors.



3. **Collect data about where the vehicles are located in the park:** It is important to know where people and their vehicles are in relation to the song birds' habitat. Human traffic through nesting zones may be contributing to the birds' decline.
4. **Collect data about where the Rose-Crested Blue Pipit nests and feeds:** Maybe a factory with lower emissions is having a greater negative impact on the birds because the company is located near a nesting zone. Additionally, knowing where the birds are will help us to see how humans are affecting them.