



# CALIFORNIA STATE SCIENCE FAIR 2015 PROJECT SUMMARY

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| <b>Name(s)</b><br><b>Kimberly Fuentes; Martin Liu; Zoe Parcels</b>   | <b>Project Number</b><br><b>S1109</b> |
| <b>Project Title</b><br><b>Cigarette Butt Accumulation and Mitigation in the City of Santa Monica</b>  |                                       |
| <b>Abstract</b><br><b>Objectives/Goals</b><br>The purpose of the present study is to evaluate the accumulation rate of cigarette butt pollution at different location and time frames and to assess the effectiveness of city pollution management efforts in the city of Santa Monica.<br><b>Methods/Materials</b><br>Seven streets with high foot traffic were surveyed over a one year period using a 2 meter belt transect on the edge of the curb. The data were collected once a week on a set day for four consecutive weeks, once per season. Printed maps and a photo geo-tagging system, were used to mark the location of cigarette butts; hot-spots were defined as $>25$ cig./m <sup>2</sup> . Recorded butts were collected to avoid recounting during the following collection.<br><b>Results</b><br>The results indicate that Broadway has the highest abundance (0.84 cig./m <sup>2</sup> )( $p<0.0001$ ) In the short term (1 week) while Arizona has the highest abundance on the long term (2 months). The 3rd Street Promenade had the lowest count for both time frames. Hotspots were found to not re-occur at the same location. When compared to Winter (lowest cig. count), the Spring collection yielded the highest number of cigarette collected ( $p<0.0001$ ) followed by Summer ( $p<0.0001$ ) while Autumn yielded a statistically insignificant difference ( $p=0.7949$ ). 69% of cigarette butts were found in the street while 31% were found on the sidewalk.<br><b>Conclusions/Discussion</b><br>The data suggest that not enough maintenance efforts are allocated to Arizona. The low abundance of cigarettes on the 3rd street Promenade may be explained by the smoking ban and constant maintenance in place there. The non-reoccurrence of hotspots suggests that placing cigarette disposal units would be ineffective. The high numbers in the Spring collection may be explained by the influx of tourist, as it was performed in late Spring, during the beginning of Summer vacation. The study suggests that there is a long term accumulation effect, suggesting that the mitigation efforts from the city are not completely effective The high percentage of cigarette butts found in the street is possibly due to the tendency of business owners to sweep leaves in front of their business into the street as well as the ability of breeze to displace cigarette butts from sidewalks into streets but not vice-versa. |                                       |
| <b>Summary Statement</b><br>The present study locates cigarette butt pollution on different time frames and appraises the effectiveness of the City of Santa Monica in mitigating this issue.  |                                       |
| <b>Help Received</b><br>Santa Monica High School students helped with collection, Dr. Belin advised us with analysing the data   |                                       |