Final Report

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# Introduction

Air is vital for the majority of living organisms on Earth. As such, the quality of the air should be of paramount importance to us. However, past and current ignorance as well as Mother Nature has led to multiple occurrences that contributed to air pollution. Some of the human caused events are the creation of many industries and human-built buildings such as health care buildings that contribute to air pollution. Some of the events that contribute to air pollution that is out of human control are excessive wildfires. According to Moore et al., “increases in physician visits for respiratory diseases of between 46 and 78% above 10-year mean rates were observed for three weeks during the forest fire period” (Moore et al. 2006). The only thing we can do is to decrease air pollution output from humans. One way that we can do that is by using lower sulfur marine fuel oil on main engines on ships at sea as opposed to high-sulfur heavy fuel oil, which has been found to result in a large reduction in the fine particle concentration of markers for heavy fuel oil combustion (Tao et al. 2013). These reductions in sulfate particulates can really help the environment, and many people do not know about small changes they can make in order to help the environment. Another human-caused event that contributes to air pollution is vehicle traffic. Especially in San Francisco, overcrowding and traffic is a big issue. As a result from this, most people in San Francisco lean towards using public transport such as BART or Muni, which is a good alternative to car emissions. A lot of people also tend to walk or bike more, which increases foot traffic leading to less vehicle pollution. This is only a problem when there is bad weather, leading to conditions where people can no longer walk. Bad weather can increase the number of cars used, which in turn, increases traffic and then pollution. Air pollution as a result of traffic has also been found to create respiratory issues in surrounding residents. In the San Francisco Bay Area, traffic pollution has caused respiratory problems including bronchitis symptoms and asthma in children (Kim et al. 2004).

The decreased quality of air does not only affect humans, it can affect other organisms such as birds and plants. It has been found that the presence of highways had decreased the population size of birds for an entire area of study (Reijnen and Foppen 1994). In addition to air pollution as a result of traffic, noise pollution is also a point of concern. It was found that if the environmental noise was louder at a certain location, free-ranging nightingales would sing louder compared to quieter environmental locations (Brumm 2004). This is significant because it is an example of a bird’s change in behavior as a result of noise pollution. Their change in song might compromise mating interactions because of decreased quality of sound. Acoustic-dependent communication suffers greatly in environments with a lot of noise pollution. It was also found that different species of birds react differently to air pollution. While one species of birds reacted negatively to air pollution at the egg stage, another reacted very negatively at the nesting stage (Eeva 1996). In addition, these birds were also found to have a reduced number of breeding occurrences as a result of air pollution (Eeva 1996).

My question is what is the correlation between air quality (Air Quality Index) and bird biodiversity. My hypothesis is that there is a positive correlation between the number of species of birds and good air quality (according to the Air Quality Index). Bad air quality leads to lung and cardiovascular issues that would lower the number of species of birds per area. Another question I have is what the correlation between air quality (number of toxic volatile compounds) and bird biodiversity. I believe that there is a positive correlation between the number of species of birds and lesser amounts of toxic volatile compounds. More toxic volatile compounds lead to respiratory and heart issues that would lower the number of species of birds per area.

# Methods

# Add text here.

## Site Locations and Descriptions

Add text here.

## Field Sampling Design

# Add text here.

## Data Analysis and Statistics

# Add text here.

# Results

## Subsections are ok in the results section too

# Add a number of code chunks in the Results section. These should read in, subset and plot the data as needed (no need to save any figures to pdf, since they will be put into the rendered document when you click ‘knit’), and, for any hypotheses that you want to test, an appropriate statistical test.

# Load libraries  
library("dplyr")

##   
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':  
##   
## filter, lag

## The following objects are masked from 'package:base':  
##   
## intersect, setdiff, setequal, union

library("tidyr")

## Warning: package 'tidyr' was built under R version 3.6.2

library("ggplot2")  
library("readr")  
library("rebird")  
library("citr")

# Discussion

# Sources Cited

Brumm, H. 2004. The impact of environmental noise on song amplitude in a territorial bird. Journal of animal ecology 73:434–440.

Eeva, T. 1996. Direct and indirect effects of air pollution on two hole-nesting bird species. Zoology 72:624–635.

Kim, J. J., S. Smorodinsky, M. Lipsett, B. C. Singer, A. T. Hodgson, and B. Ostro. 2004. Traffic-related air pollution near busy roads: The east bay children’s respiratory health study. American journal of respiratory and critical care medicine 170:520–526.

Moore, D., R. Copes, R. Fisk, R. Joy, K. Chan, and M. Brauer. 2006. Population health effects of air quality changes due to forest fires in british columbia in 2003. Canadian journal of public health 97:105–108.

Reijnen, R., and R. Foppen. 1994. The effects of car traffic on breeding bird populations in woodland. I. Evidence of reduced habitat quality for willow warblers (phylloscopus trochilus) breeding close to a highway. Journal of Applied ecology:85–94.

Tao, L., D. Fairley, M. J. Kleeman, and R. A. Harley. 2013. Effects of switching to lower sulfur marine fuel oil on air quality in the san francisco bay area. Environmental science & technology 47:10171–10178.