1 Initial Hypotheses or Questions

1.1 Motivation

Cities are dynamic entities, shaping and being shaped by social, cultural, physical, political, and geographical forces. Bicycle racks represent the confluence of all of these: political realities that determine the funding for installation; social and cultural trends over time that build communities and put restaurants and activities on the map; and geographical realities that determine accessibility by bicycle. Can information about bike racks provide insight into these city-shaping forces?

1.2 Hypotheses

- *Hypothesis 1:* Did the lifting of the bike ban on BART (Dec 1, 2013[1]) affect bike parking installations?
    - If so: were certain areas affected more than others?
    - What was the timeline for bike parking changes?
    - What can we learn about city priorities and resources from bike parking alone?
- *Hypothesis 2:* What insights can we develop about the city from bike parking information?
    - Do certain areas get more bike parking installed, and if so, can we speculate on why based on city geography? Or knowledge of neighborhoods?
    - What does the landscape of city bike parking look like over time?

1.3 Analysis Plan

I plan to answer basic questions first (such as number of racks installed, types of rakcs installed, etc.), and get a feel for the data, then hopefully build some interactive maps for brushing, linking, and highlighting to show changes of the city bike-parking landscape over time.

2 Data Source(s)

2.1 Description

Dataset: This dataset contains the locations of bicycle parking racks installed by the SFMTA. The data includes locations that are installed on sidewalks, in on-street bicycle corrals, in city-owned garages, and in parklets. This dataset does not include racks installed on private property or in privately owned garages. Locations are associated to an address so they may not reflect their actual placement along the sidewalk. The dataset is updated quarterly as racks are continuously installed upon request from the public, businesses, and property owners as well as where the SFMTA sees demand.

URL: https://data.sfgov.org/Transportation/Public-Bicycle-Parking/4jy4-tbju

Time period: 1996-2017

Dataset size: 3464 rows, 17 columns.

Columns and descriptions:

ADDRESS:	Address that bike parking directly fronts;
LOCATION:	Business or location name where bike parking fronts;
STREET:	Street where bike rack is located (may differ from business address);
PLACEMENT:	Where bike parking is located (SIDEWALK, ROADWAY, PARKLET, GARAGE, PARCEL, GARAGE CAGE);
RACKS:	Number of racks installed;
SPACES:	Number of spaces installed;
INSTALL_MO:	Month Installed;
INSTALL_YR:	Year installed;
LAT:	Latitude;
LON:	Longitude

Most important columns are LAT/LON, Install_Yr, Placement, Racks, and Spaces. Unfortunately, Install_Mo is "null" (every row of that column is empty) so that information is lost.

2.2 Source(s)

The dataset[1] is updated quarterly as racks are continuously installed upon request from the public, businesses, and property owners as well as where the SFMTA sees demand. It was linked from the awesome-public-datasets repo[2] on github. It's unclear how the SFMTA "sees" demand, however: I'd be very interested in learning more about their data-collecting methods.

2.3 Format

The data is available in a variety of formats including KML, GeoJSON, csv, and JSON. I downloaded and used CSV.

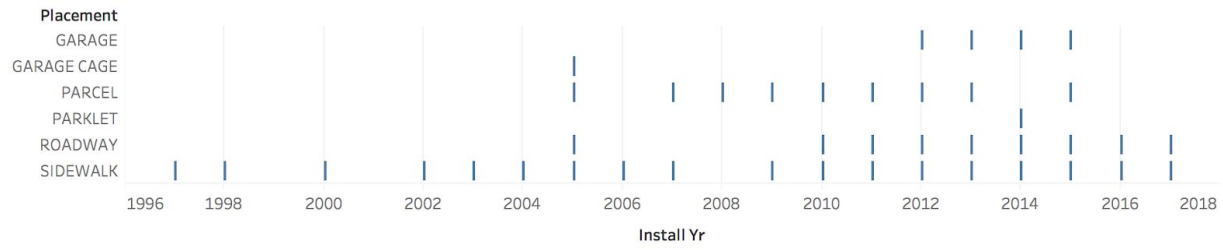
2.4 Transformations

The data was well-formatted. I created a calculated field to show the total number of racks, so I could display installations per year. I also deleted entries for years that were zero.

3 Exploration

3.1 - Number of racks per year?

First, I just wanted to quickly see how many racks were installed in each year. As I was struggling to figure out how to do that with Tableau (still a novice!), I created this visualization:



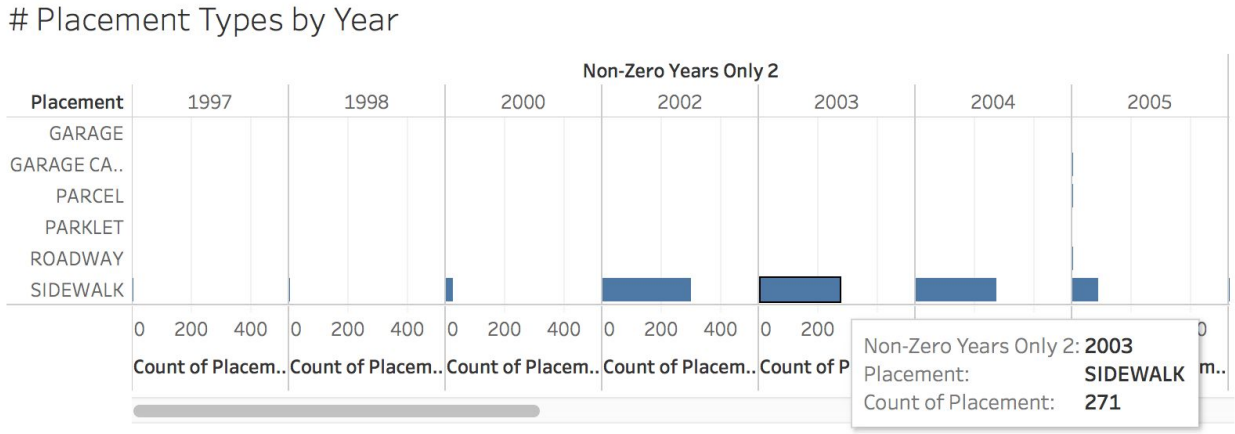
This surprisingly provided quite a lot of useful information. Namely: it's immediately clear that in 2005, the city began installing roadway, parcel, and garage cage racks whereas from 1996-2005

[1] https://datasf.org/about/
[2] https://github.com/awesomedata/awesome-public-datasets

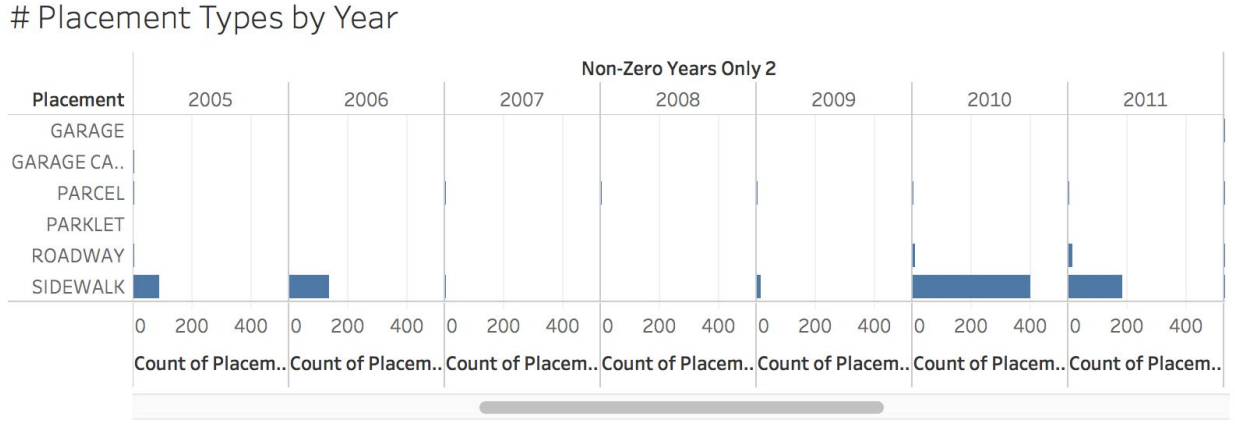
it was only sidewalks. The city didn't install any racks in "parklets" until 2014. Is that because they didn't install bike racks in parklets until then, because the notion of a parklet didn't exist until then, because they started tracking installation locations at a higher level of granularity in 2005, or some other reason? I can't know for sure (though the sudden increase in installation types in 2005 does indicate to me that they started keeping track of more details then). No matter the reason, the increased granularity and focus on bike rack installations together indicate an increased commitment to better bike support in the city.

3.2 - Number of Placement Types per Year

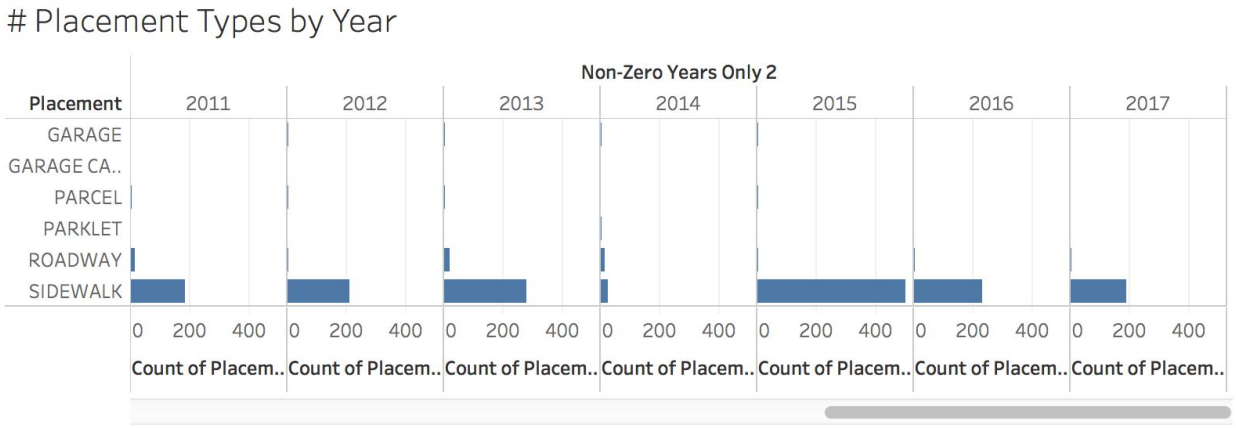
Next, I wanted to see how many of each type were installed per year. This visualization isn't the easiest to read since sidewalk installations really dominate and wash out the other placement types, but you can easily see that there is quite a lot of variation over the years. For instance, in 2002 there was a HUGE jump (again: assuming the data is accurate here).



There was also a big dip in 2007 - this was just before the financial crash of 2008...were things already headed downhill for the city by then? Or was there something else that caused that? Maybe the powerful segway lobby was putting pressure on the mayor to limit bike parking?



There is also a dramatic dip in 2014:

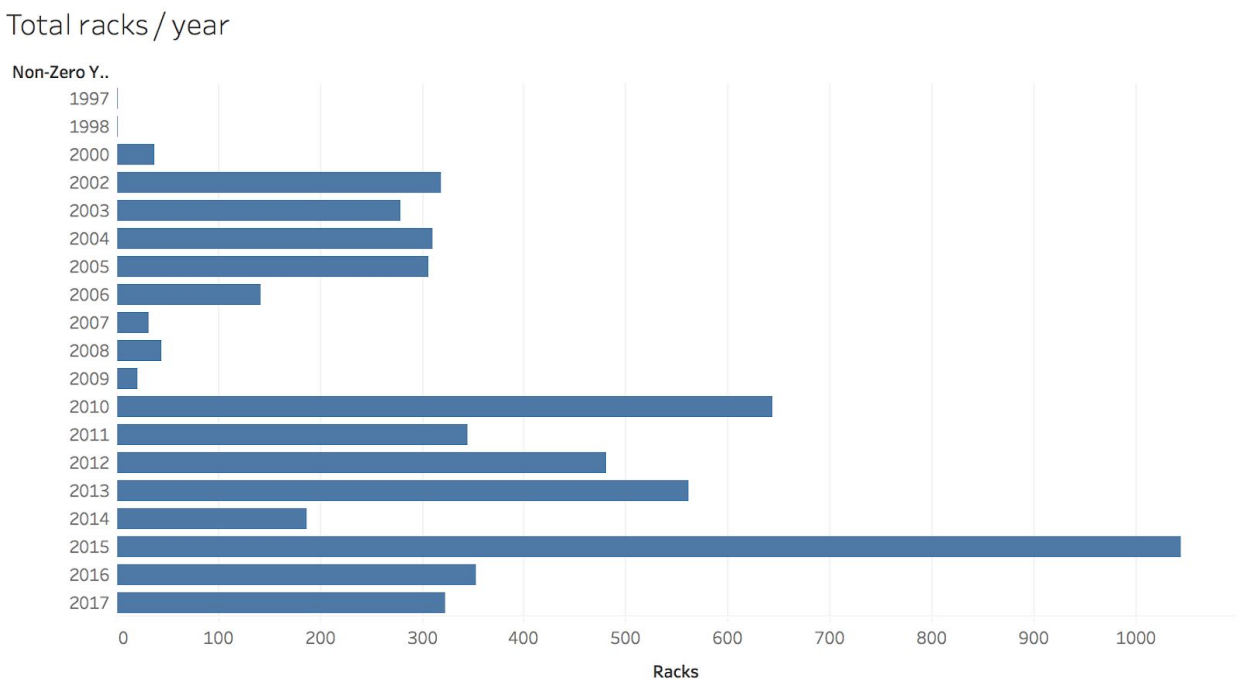


At first, I thought this was particularly unfortunate since the BART ban on bikes was lifted in December 2013[3], and I was hoping to see an increase in bike racks in 2014 rather than a huge decrease, but after thinking about this more: it's possible the city saved their entire bike rack installation budget for 2014, spent the year collecting data about where installations would be useful, and then used that saved money to install even more racks in 2015. 2015 saw the most new bike rack installations throughout the entire time period, which would support this hypothesis. In fact, it would explain both the 2014 dip and the 2015 massive increase.

3.3 Total racks installed per year

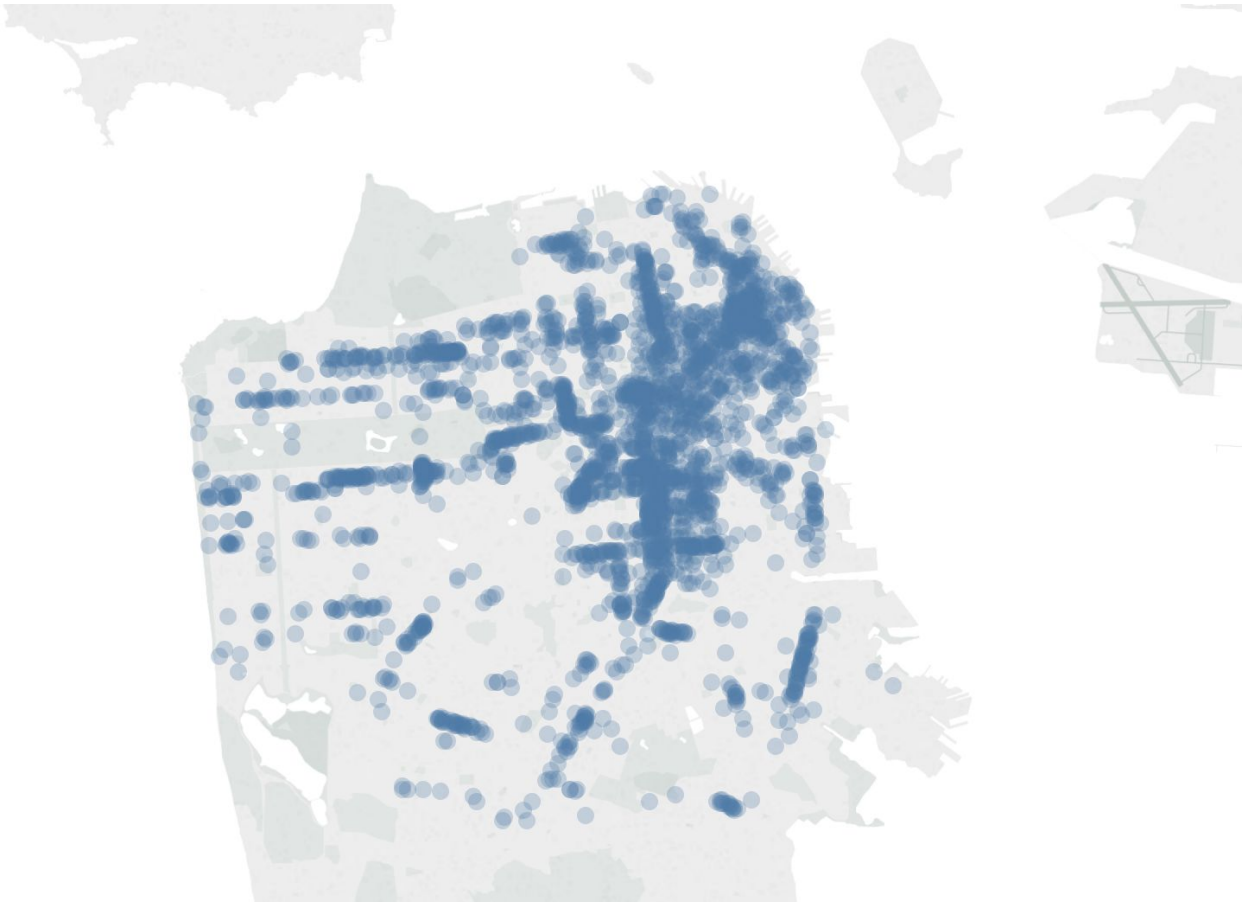
This more clearly shows the dip between 2006-2010. Rather than providing answers, this is showing what questions may be useful to ask next, namely: how does funding for bike parking work? What can explain the dips from 2007-2009 and in 2014? What else was happening in the economy around that time? I know SF has made a ton of changes to make the city more bike friendly in the last few years, and it's interesting to see that reflected here as well.

[3] https://www.bart.gov/news/articles/2013/news20131024

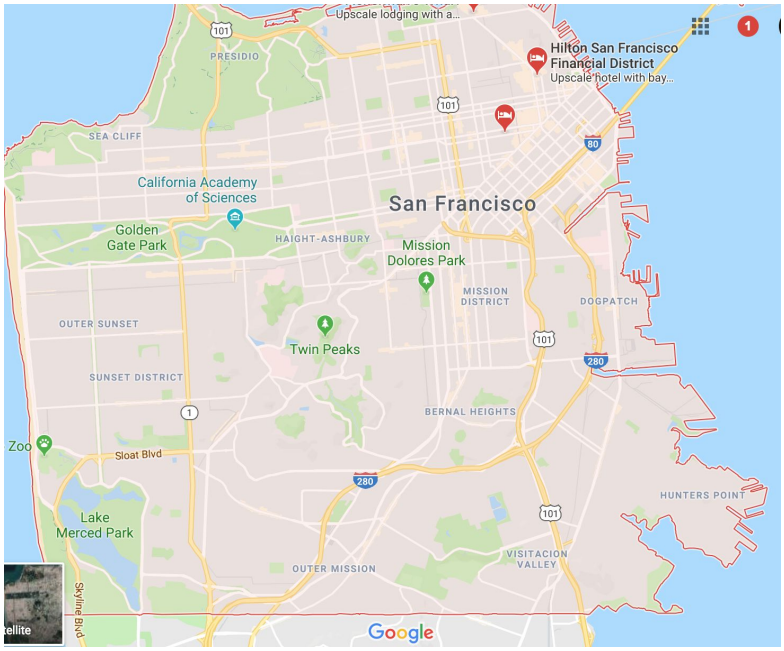


3.4 All rack locations on map

Plotting the latitude and longitude w/ a semi-transparent color in a point distribution map shows some hot spots as well as some dead zones. Downtown is thick with racks. When people go home they store their bikes inside, so there may be less need for public bike racks in neighborhoods. There are some interesting little unexpected (to me) pockets, like the line on the right side below Dog Patch and to the left of Hunter's Point:

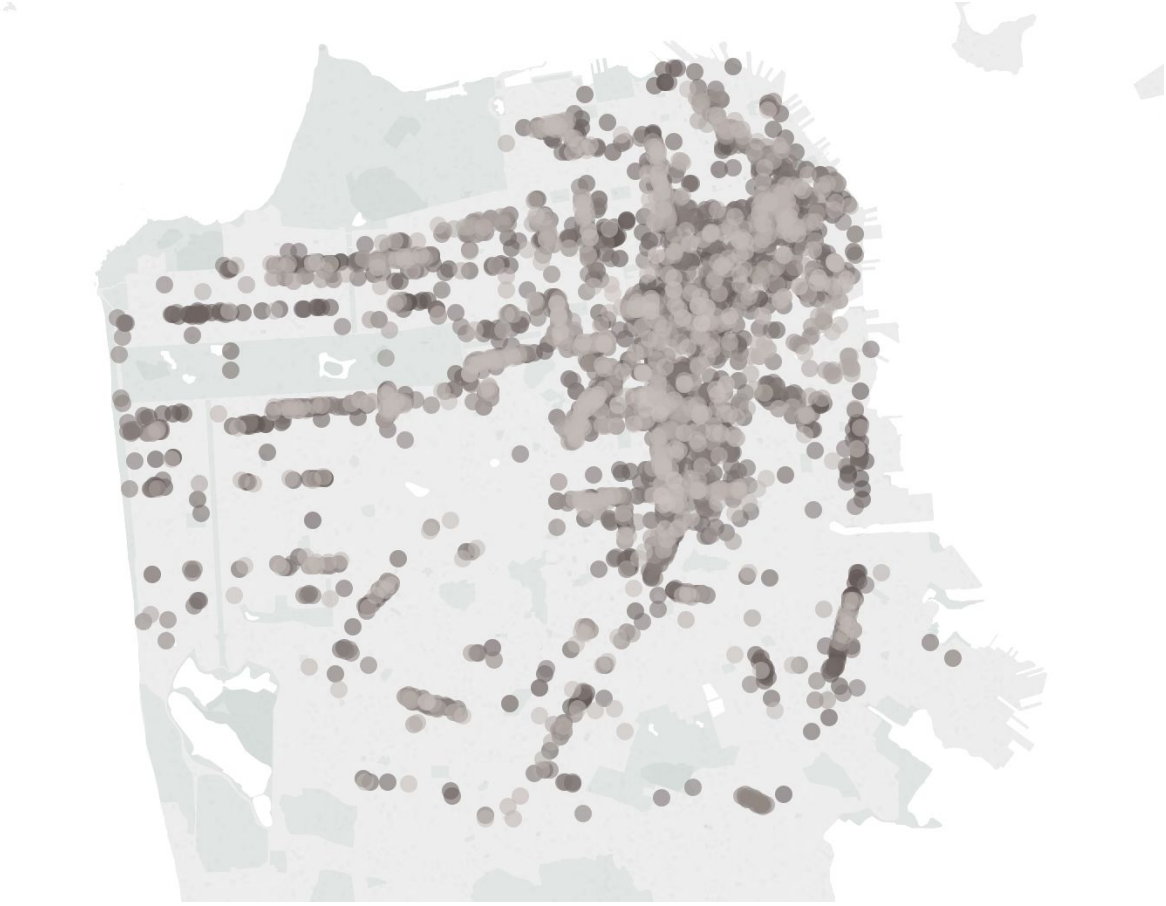


See the same area from Google Maps. I'm not familiar with that region at all, so I can't say what's over there, but now I'm more likely to visit that region: there must be something drawing all those bikers! I do know it's fairly flat, especially compared with the Twin Peaks area, which is a big blank zone completely empty of bike racks right in the center of the map.



The two dark zones filled with bike racks on either side of Golden Gate Park stand out, since they're not the roads directly adjacent, they're both one or two blocks out. Being familiar with that area, I know those roads by the park aren't bike-friendly at all, so it makes sense that the racks are on the "bike-friendly" roads instead. I'm shocked at how few are in Golden Gate Park itself: is that because another department controls those, and the data didn't get added here?

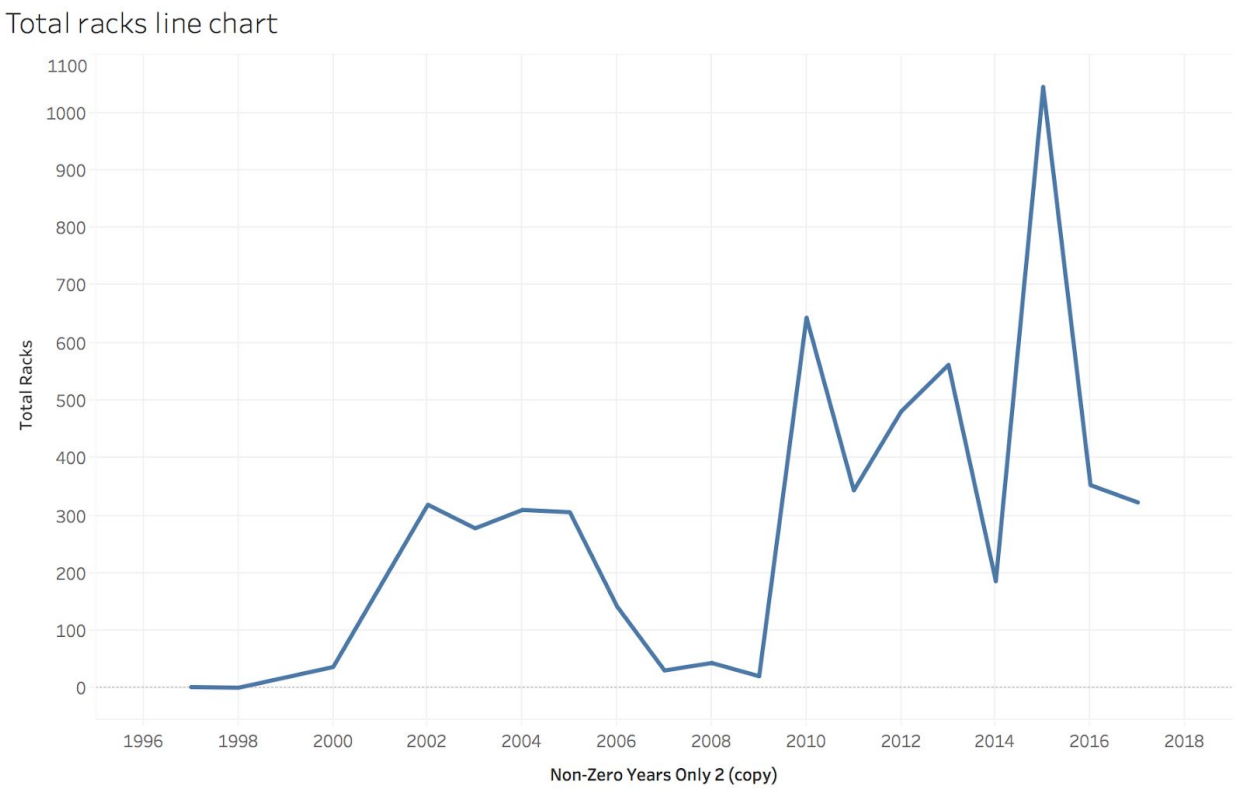
Next I tried to differentiate the years by color intensity:



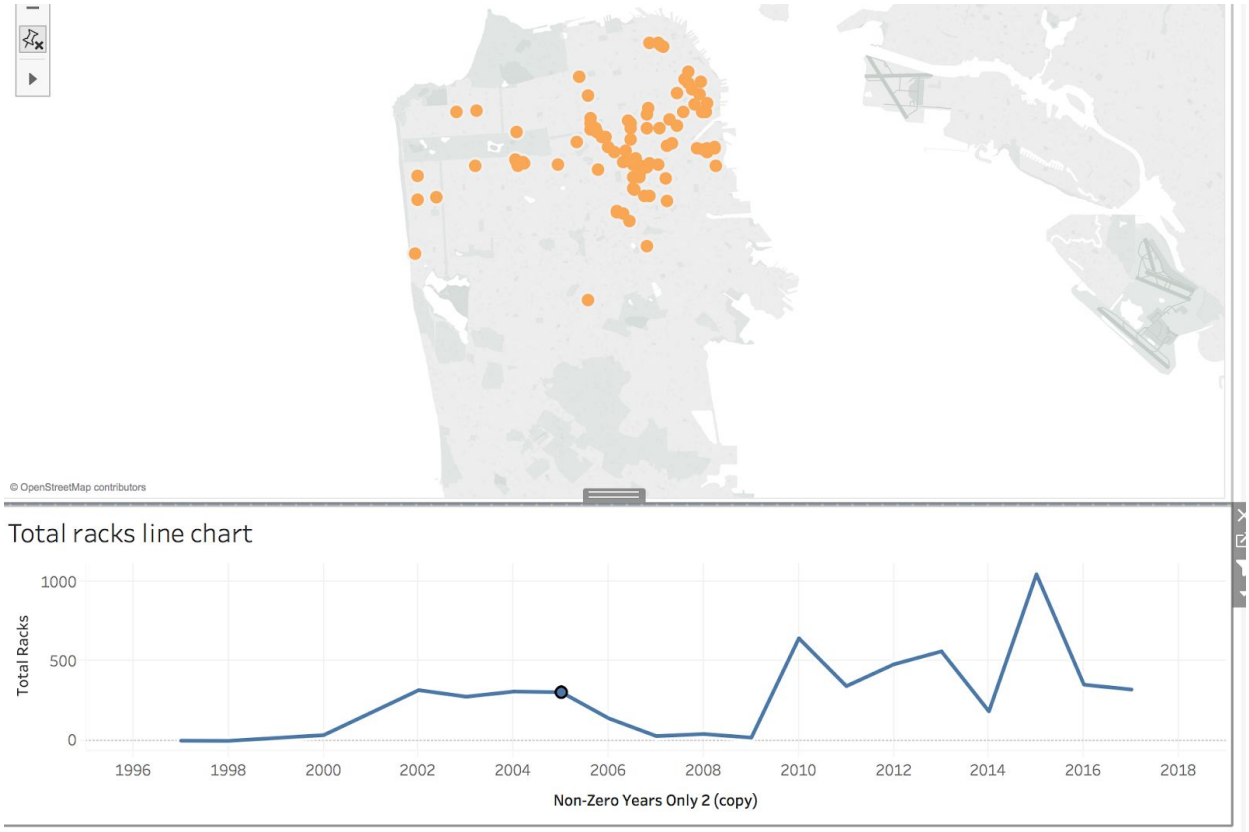
It didn’t work at all. Especially because the older years are on top of the newer ones. Looks like I need a way to interactively filter things...

3.5 Towards an Interactive Map

The difficulty in visualizing the # of racks with the above maps drove me to build an interactive map. First, I constructed a line chart showing the total # of racks per year:



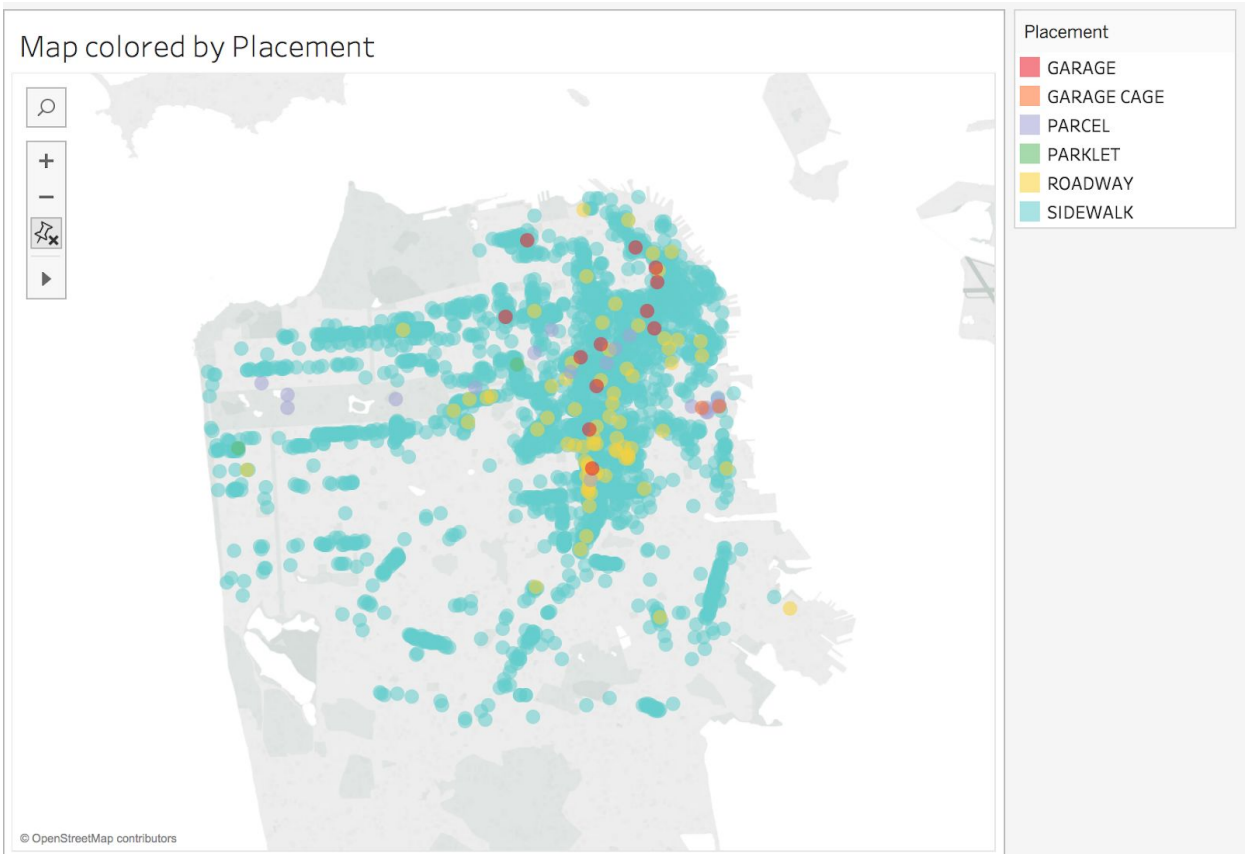
If I add that to a dashboard as a filter on the map, I can click on a given point, and only the datapoints associated with that year will show up:



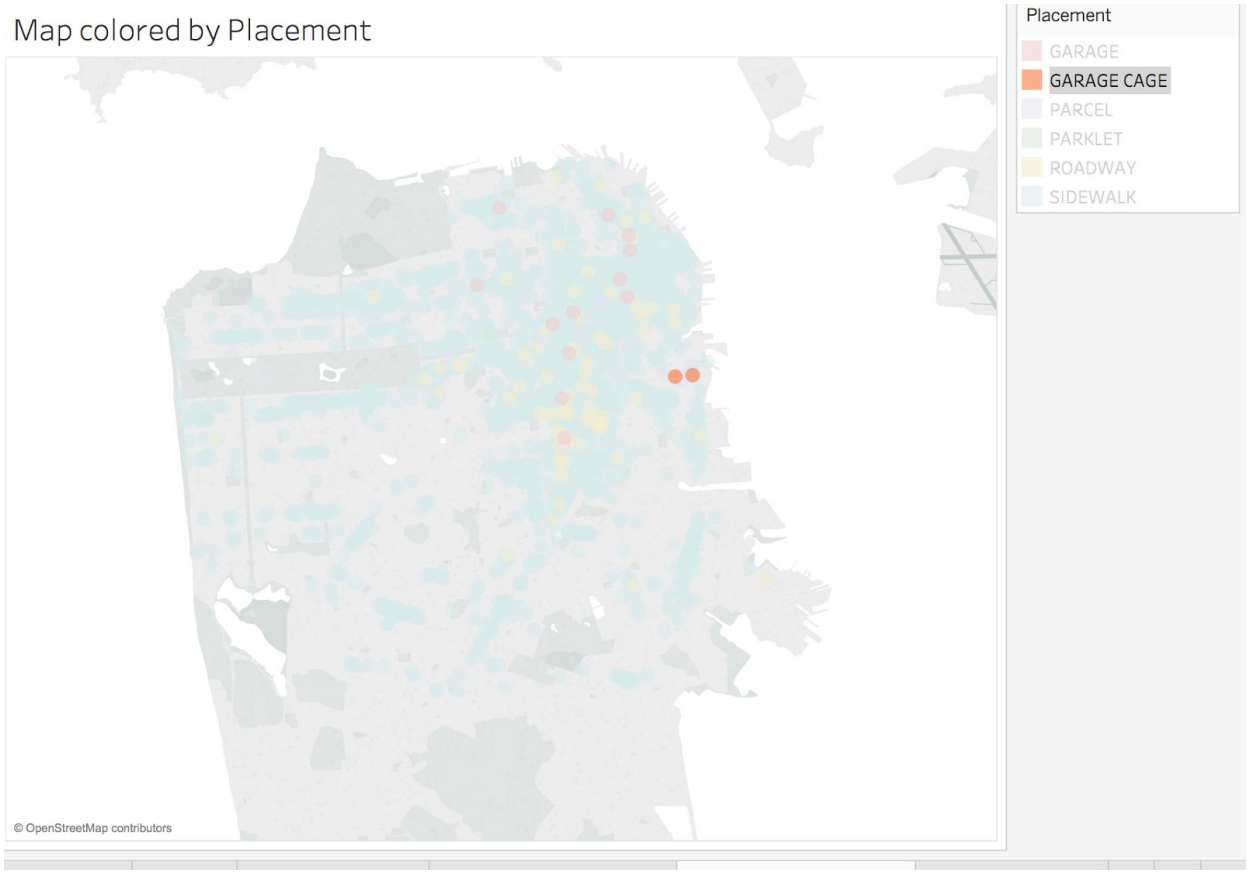
I'd like to be able to smoothly drag my mouse over the line chart and see things change...but this is a pretty good first start.

3.6 Map color-coded by placement type

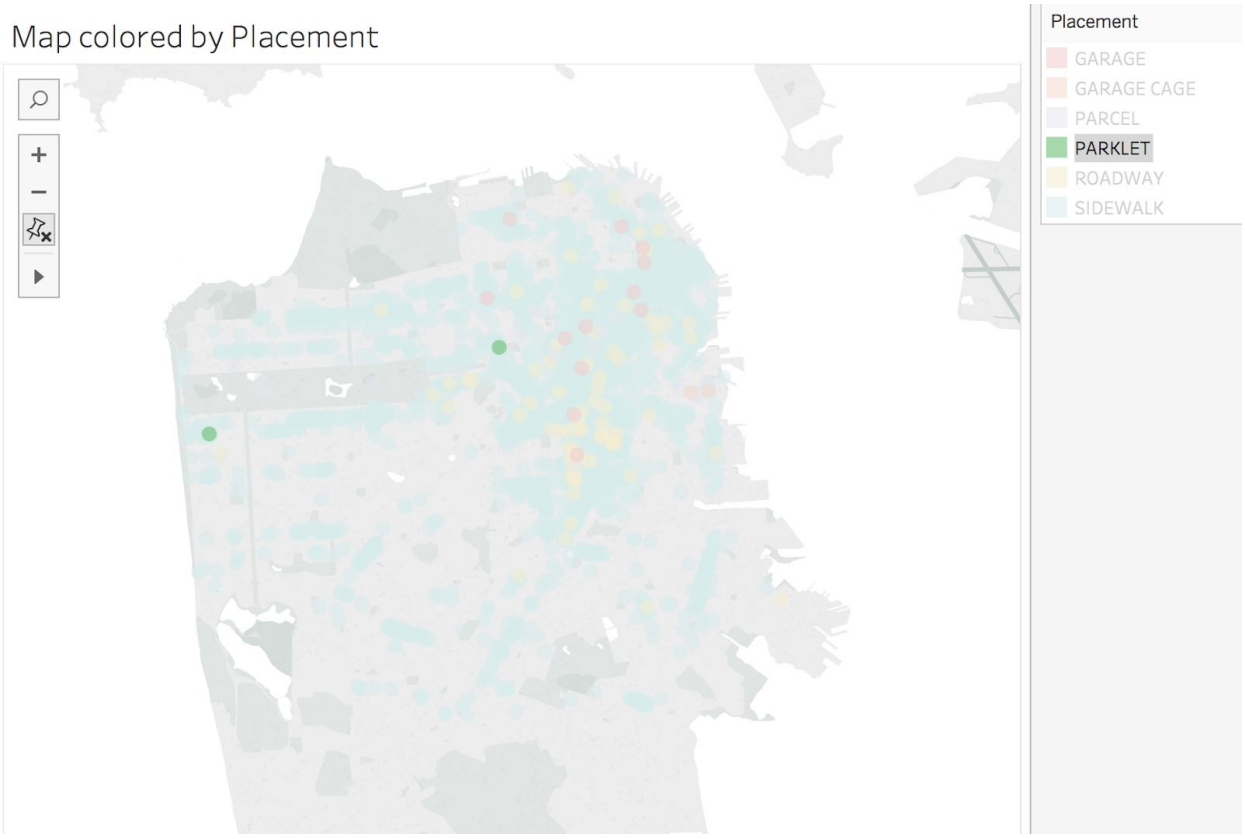
This maps shows the location of all the different types of racks. What stands out are the fact that garage racks are primarily in the "Downtown" part of the city, and that the most widespread type are sidewalk racks.



You can also select a given placement type. Apparently there are only two garage cages. Those are directly located at the 4th and King Caltrain station, which I suspect is the reason for their existence:



Only two parklets!



This makes a nice dashboard when combined w/ the “total racks per year (See Dashboard “Rack Type by Year”).

At this point I was getting a sense of the city, and the timeline of bike installations, which was my initial goal.

4 Dashboards

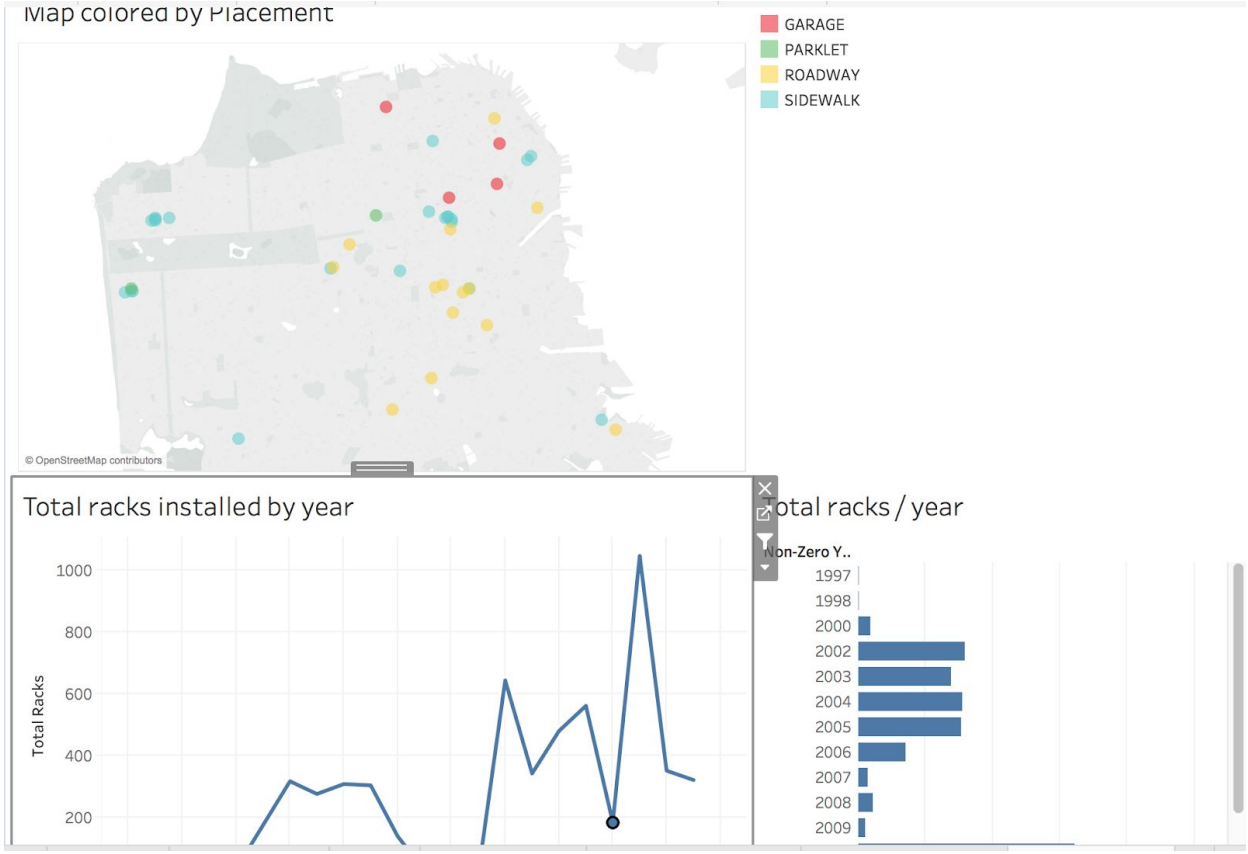
For each hypothesis, create a final Tableau dashboard that presents your response to that hypothesis (confirming or refuting). In some cases, multiple hypotheses may be illustrated in one dashboard, or vice versa.

Provide a paragraph describing each dashboard you created, along with appropriate screenshots. Explain how the dashboard responds to the hypotheses or answers the questions you posed. Be sure to make good figure captions for your final dashboard(s).

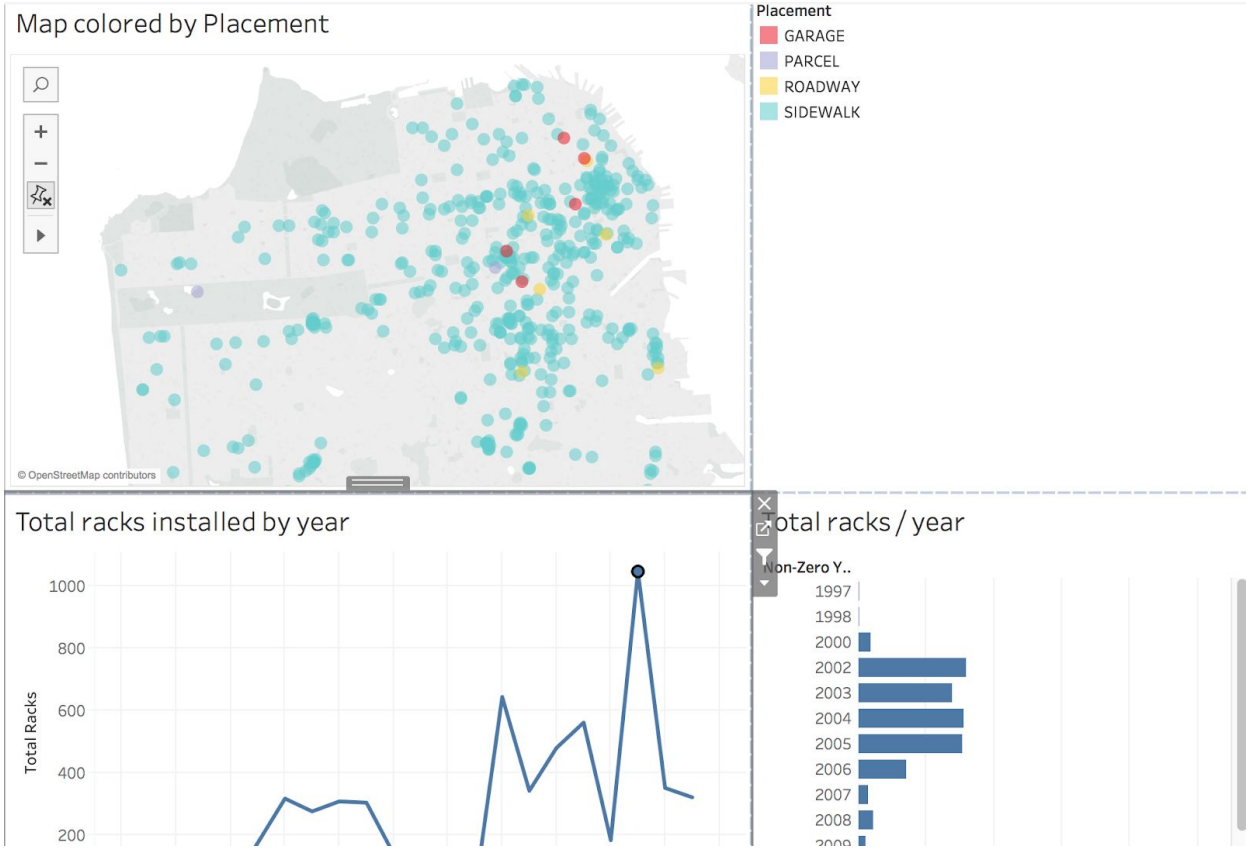
4.1 Hypothesis 1: Did the lifting of the bike ban on BART affect bike parking?

Dashboard name: Dashboard 1.

Description: This dashboard features a map with all rack placements color-coded. It uses the line graph showing total rack installations by year as a filter, so you can select a given year and see it visualized on the map. For example, you can easily view the racks installed in 2014 (the year after the ban was lifted):



Compared with the rack installations in 2015 (the year after the ban was lifted):



The line chart on the bottom clearly shows the yearly trend in bike rack installations. After the increase in 2010, 2014 was the lowest year, while 2015 had the most new installations across the entire time period. It is reasonable to think perhaps the city saved their 2014 budget, spent the year gathering data about where to install more bike racks, and then spent nearly double in 2015. This fits nicely with my hypothesis, but needs more data to confirm!

4.1.1 If so: were certain areas affected more than others?

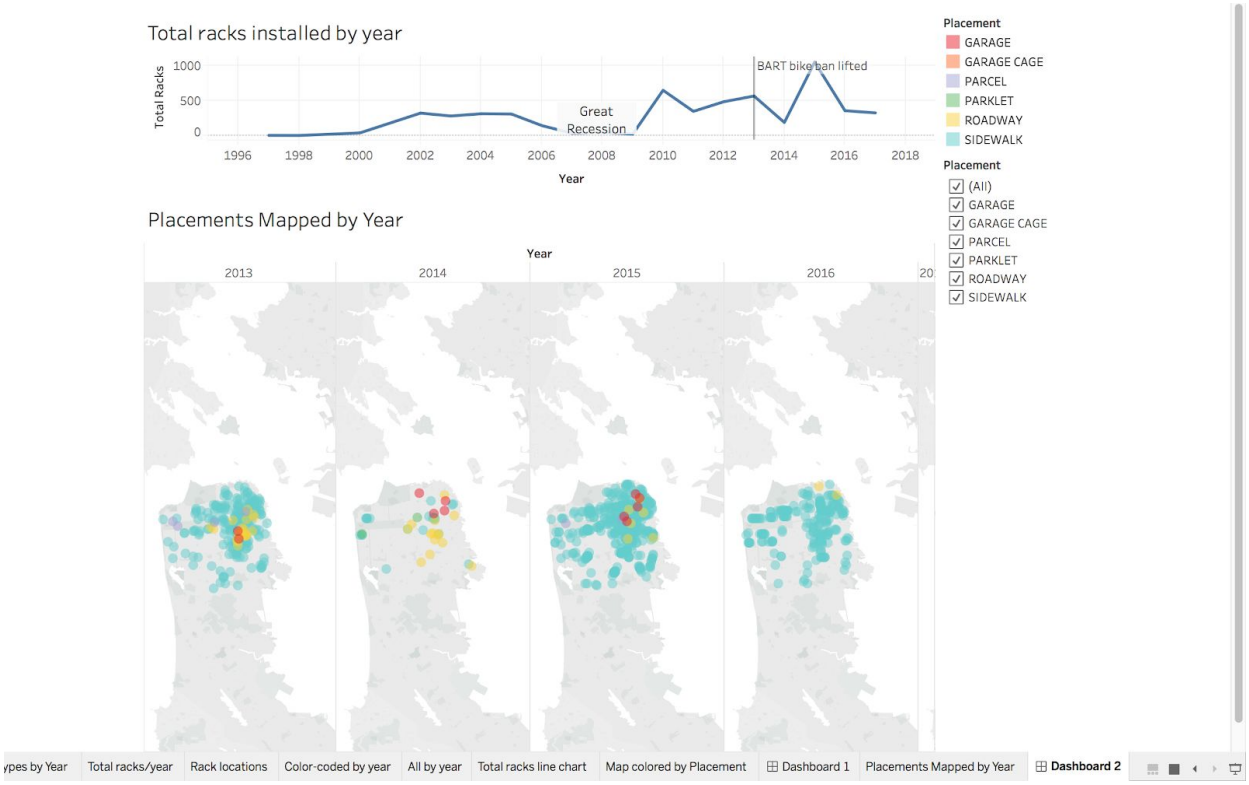
This dashboard helps us see that regardless of whether the bike ban had an effect, certainly it's clear that the downtown area gets the highest number of installations. This implies that the city expects the greatest use to be by commuters and tourists, since those areas are likely to be frequented by both. There are also clear blank spots in the hilly areas. I am surprised by how few bike racks have been installed out by Ocean Beach: it's a gentle sloping ride out to the beach, and a popular place to visit.

4.1.2 What was the timeline for bike parking changes?

The interactive dashboard lets you see the change in bike rack installations. The most relevant for this hypothesis is the big dip in 2014 (from 562 in 2013 to 186 in 2014), and then the massive spike in 2015 (up to 1,045). It is reasonable to think perhaps the city saved their 2014 budget, spent the year gathering data about where to install more bike racks, and then spent nearly double in 2015. This fits nicely with my hypothesis, but needs more data to confirm!

4.2 Hypothesis 2: What insights can we develop about the city from bike parking information?

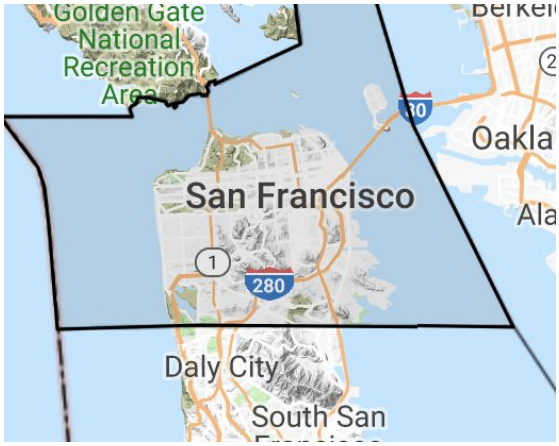
Dashboard: Dashboard 2
What stands out here are the types of racks being installed. Namely, the “downtown” region of SF has a lot of racks installed in garages. This area is both residential as well as businesses, and it’s clear that outdoor and indoor space are at a premium. Looking instead at “parcels” and “parklets” they tend to be installed along what I recognize is a popular “bike corridor”. It’s interesting to see this shown so clearly on the map. Overall, the city build all types of racks primarily in the North-Eastern quadrant. This downtown area is probably the most densely packed part of the city, and due to microclimates is also one of the most temperate areas. Parking is also expensive here, so it makes sense to prioritize bike-accessible areas.



4.2.1 What can we learn about city priorities and resources from bike parking alone?

Because the city prioritizes rack installations in the downtown or economic center of the city, it seems they’re focused on solving commuter issues rather than providing recreational activities. This of course will then make it more difficult to ride one’s bike for pleasure, and limits accessibility to part of the city that don’t have as many racks.

The political boundaries of the city are also clear from any map of all placements. There are never racks installed lower than the city limits:



4.2.1.2 What does the landscape of city bike parking look like over time?

The largest change in rack installations over time was between 2013 and 2014 when almost zero new racks were installed on sidewalks. Compared with other years, when the majority of rack installations were sidewalks, this difference really stands out. More information is needed to capture the reason why, but the visualization helps reveal that as a question worth asking.

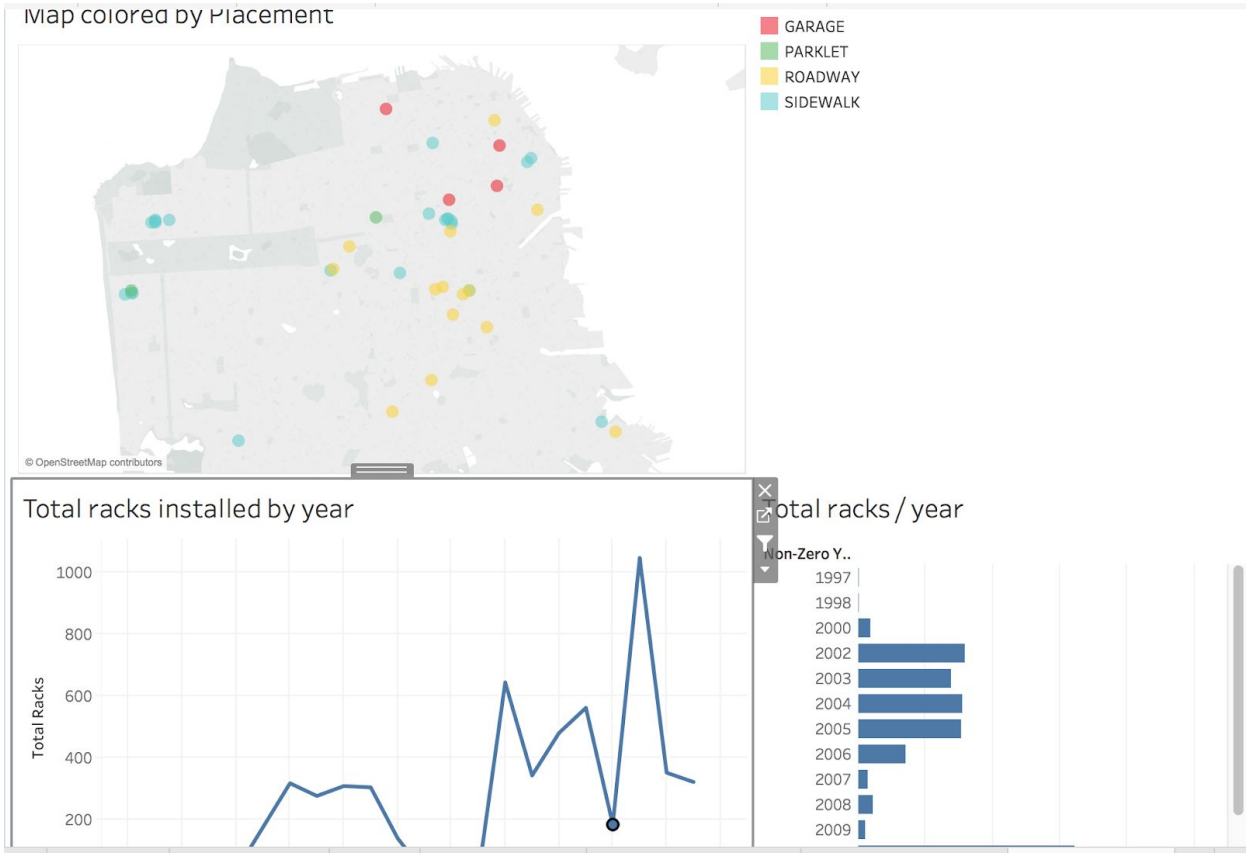
4.2.2 Do certain areas get more bike parking installed, and if so, can we speculate on why based on city geography?

Despite the fact that the West Portal is a popular location with many shops and activities, with easy access to Ocean Beach, there are relatively few bike racks installed there. This must primarily be due to the large mountains surrounding the area on three sides, meaning it is only accessible via BART (or very hard-core bikers).

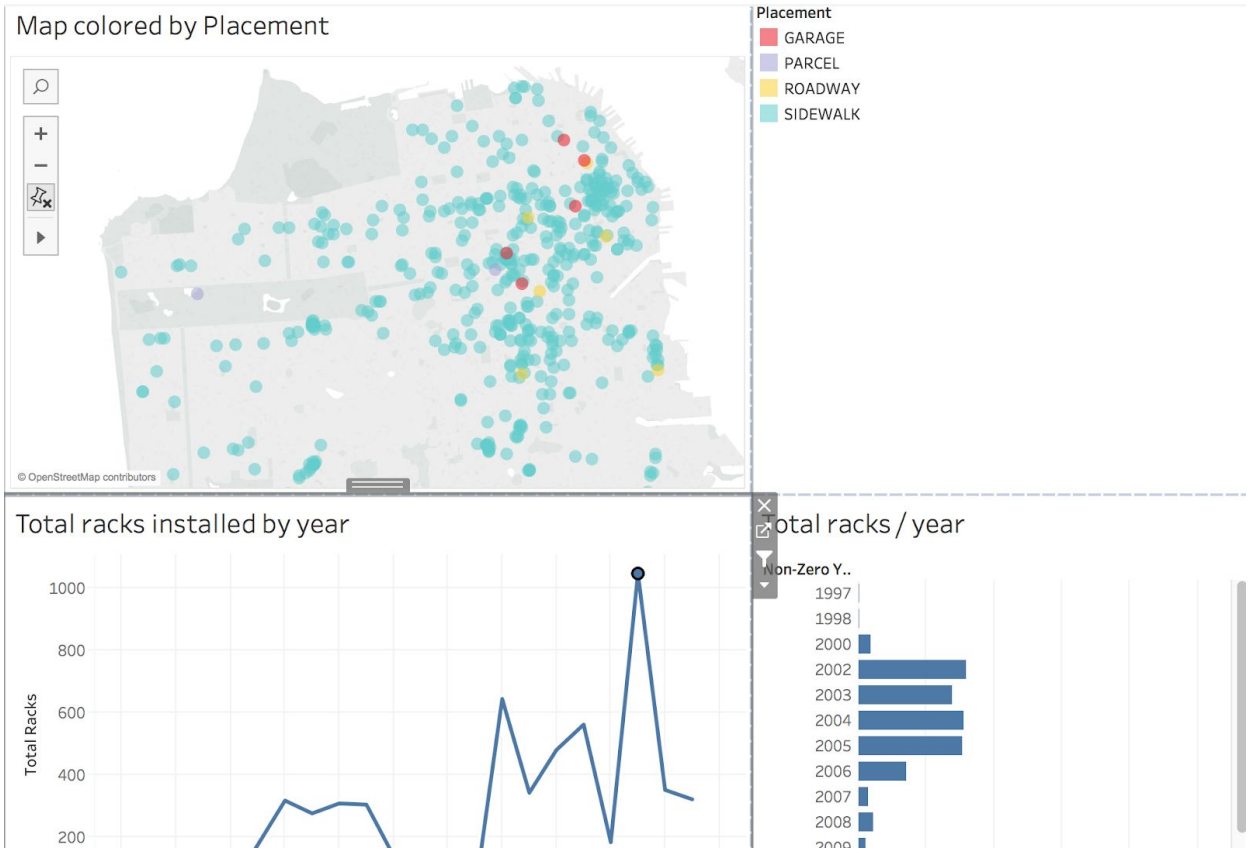
5 Conclusion

Overall, I felt that this was merely the beginning of what I'd like to make a much deeper dive into much more city data. On that note, after digging into the dataset more, it was not nearly as rich as I thought it would be at first. To be honest, I threw my hypotheses out immediately, in the interest of purely engaging with the data as it was, which was highly satisfying. After a few basic explorations, I revisited my hypotheses to help drive my investigation forward. After realizing the data didn't include monthly information, I had to scale back my hypotheses, looking at yearly trends instead. Upon reflection, this might not matter since I believe the city gets a yearly budget, not a monthly one (in other words my initial hypothesis was potentially based on a flawed understanding).

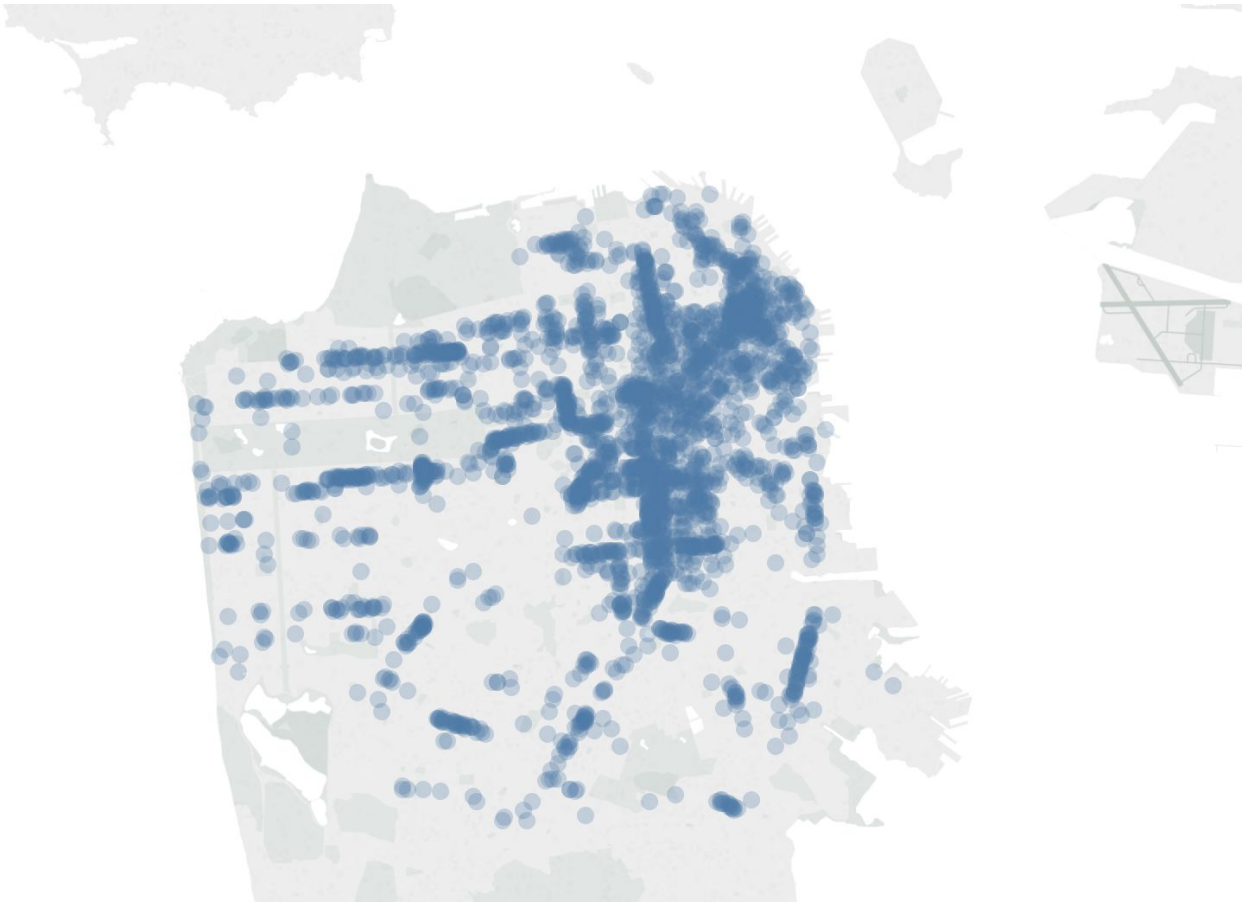
Seeing the change from 2014:



To 2015:



I am clinging to my hypothesis that the changes are related to the BART bike ban...but I'd really need more data to say for sure. The geography of the city does stand out clearly, with the Twin Peaks area being nearly devoid of racks:



I am still puzzled by the lack of racks in Golden Gate Park.

A note: I am assuming in all cases that the data accurately reflects what actually happened. For example, the data show that only 1 sidewalk rack was installed in the entire year of 1996, and 1998. It's possible they simply didn't track the number of bike rack installations and this is "dummy data", but for the purposes of this project, I am assuming the city accurately tracked all installations in the years listed.