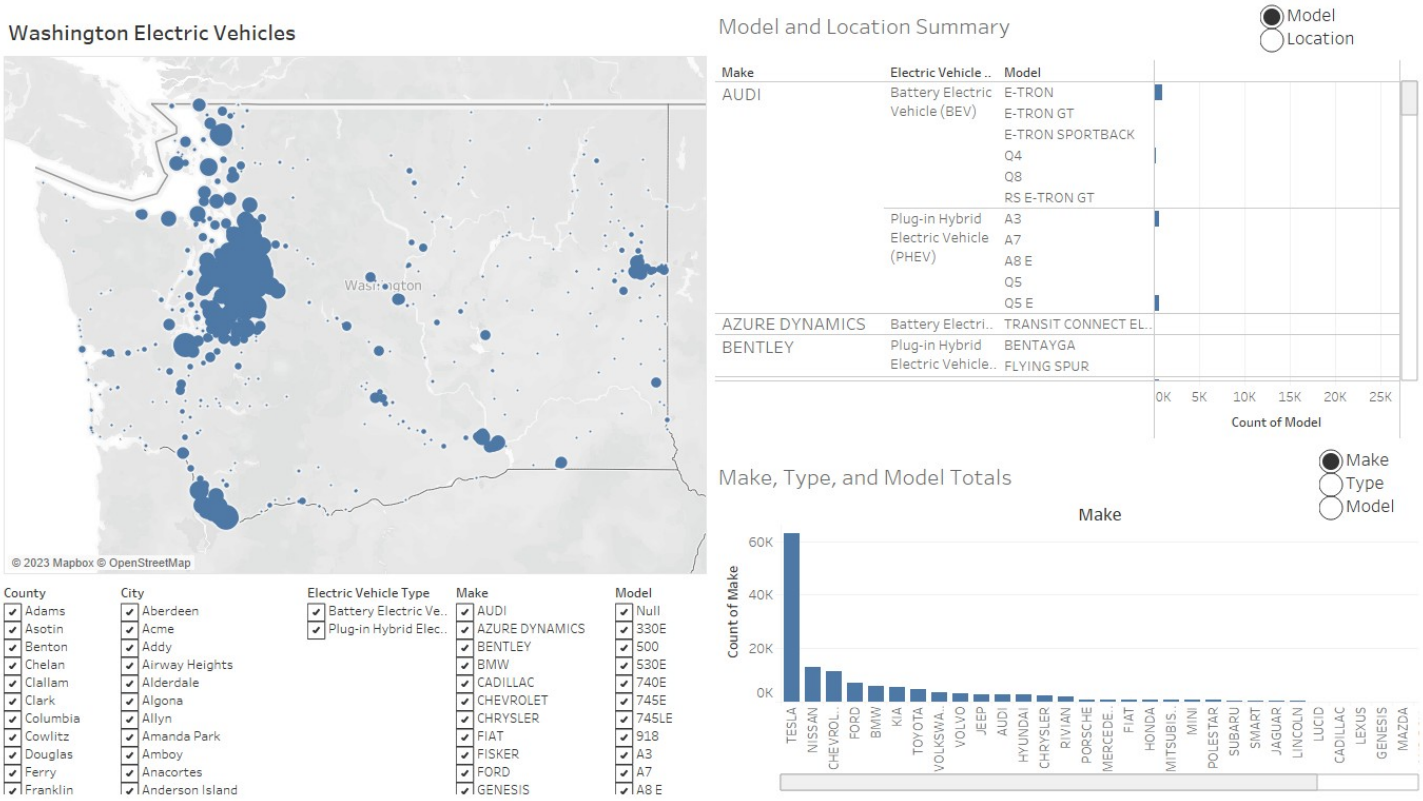
Analysis of Electric Vehicles in Washington State Project Demonstration

This document provides a guide on the use of the dashboard to view electric vehicle registration in the state of Washington. The state of Washington tracks the registration of electric cars including information such as the model and the location where the car is registered. Analyzing the registration data can provide insights into electrical vehicle adoption. Consumer preferences can be determined and best-selling models can be calculated. The areas where electric vehicles are being most adopted can also be found.

The visualization will include multiple charts, a map, as well as filtering options in order to answer the above questions. Specifically, there will be a map showing the quantity of cars at each location as well as a list to view exact model quantities. A list will also be available to show the different models at each location. A summary will also be available that shows the make, type, and models of vehicles. Filter options will also be available to target specific locations, makes, types, and models.

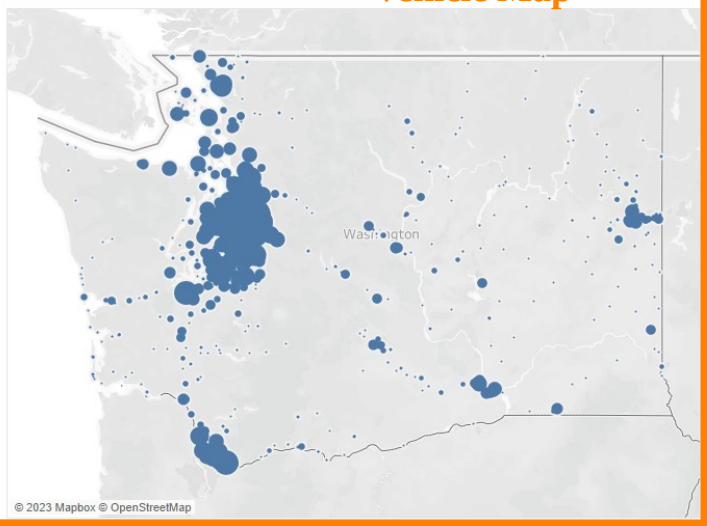
The visualization is shown below:



This visualization contains four distinct areas. The left side of the visualization features a map showing the location of electric vehicles and filter options. The right side of the visualization gives summary and totals for models and locations as well as makes, types, and models. A toggle switch for the two graphs on the right side allow the user to switch between the model and location list for the top graph, and the totals for makes, types, and models on the bottom graph.

Washington Electric Vehicles

Vehicle Map

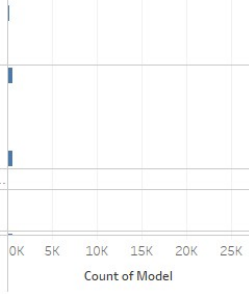


Model and Location Summary

Model List

Model
Location

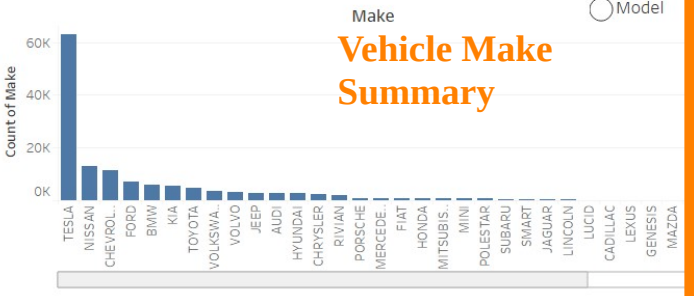
Make	Electric Vehicle ..	Model
AUDI	Battery Electric Vehicle (BEV)	E-TRON
		E-TRON GT
		E-TRON SPORTBACK
		Q4
		Q8
		RS E-TRON GT
	Plug-in Hybrid Electric Vehicle (PHEV)	A3
		A7
		A8 E
		Q5
		Q5 E
AZURE DYNAMICS	Battery Electri..	TRANSIT CONNECT EL..
BENTLEY	Plug-in Hybrid Electric Vehicle..	BENTAYGA
		FLYING SPUR



Make, Type, and Model Totals

Make
Type
Model

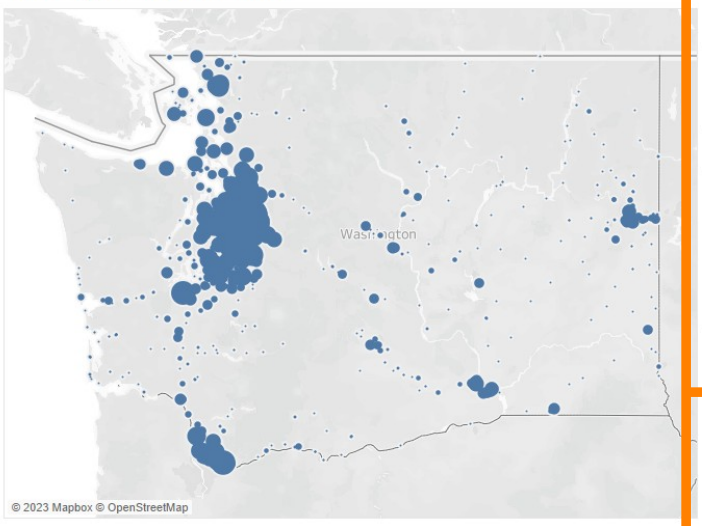
Vehicle Make Summary



Filters

County	City	Electric Vehicle Type	Make	Model
Adams	Aberdeen	Battery Electric Ve..	AUDI	Null
Asotin	Acme	Plug-in Hybrid Elec..	AZURE DYNAMICS	330E
Benton	Addy		BENTLEY	500
Chelan	Airway Heights		BMW	530E
Clallam	Alderdale		CADILLAC	740E
Clark	Algona		CHEVROLET	745E
Columbia	Allyn		CHRYSLER	745LE
Cowlitz	Amanda Park		FIAT	918
Douglas	Amboy		FISKER	A3
Ferry	Anacortes		FORD	A7
Franklin	Anderson Island		GENESIS	A8 E

Washington Electric Vehicles



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Ferry	Anacortes		FORD	A7
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Model and Location Summary

Model
Location

County	City
Adams	Othello
	Ritzville
	Lind
	Hatton
Asotin	Clarkston
	Asotin
Benton	Richland
	Kennewick
	West Richland
	Benton City
	Prosser
	Grandview
	Rich
	Pros

Location List

0K 5K 10K 15K 20K 25K

Count of Electric Cars

Make, Type, and Model Totals

Make
Type
Model

Electric Vehicle Type

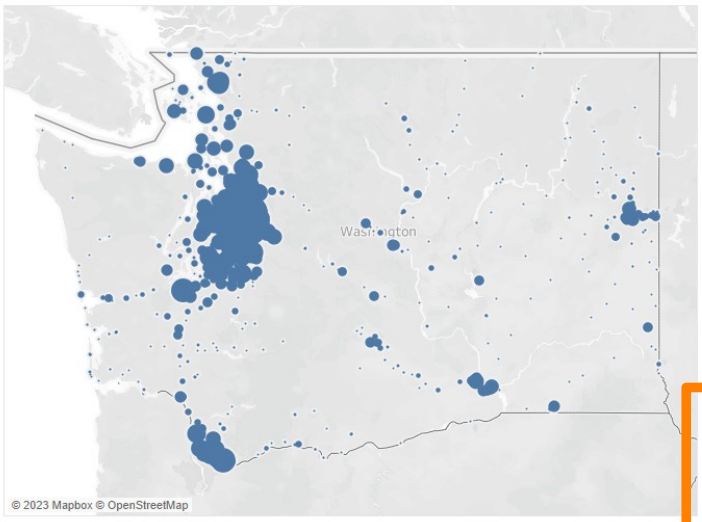
Count of Electric Vehicle Type: 100K, 50K, 0K

Vehicle Type Summary

Battery Electric Vehicle (BEV)

Plug-in Hybrid Electric Vehicle (PHEV)

Washington Electric Vehicles



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Model and Location Summary

Model
Location

County	City
Adams	Othello
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	Kennewick
	West Richland
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	Grandview
	Rich
	Pros

0K 5K 10K 15K 20K 25K

Count of Electric Cars

Make, Type, and Model Totals

Make
Type
Model

Model

Count of Model: 20K, 10K, 0K

Vehicle Model Summary

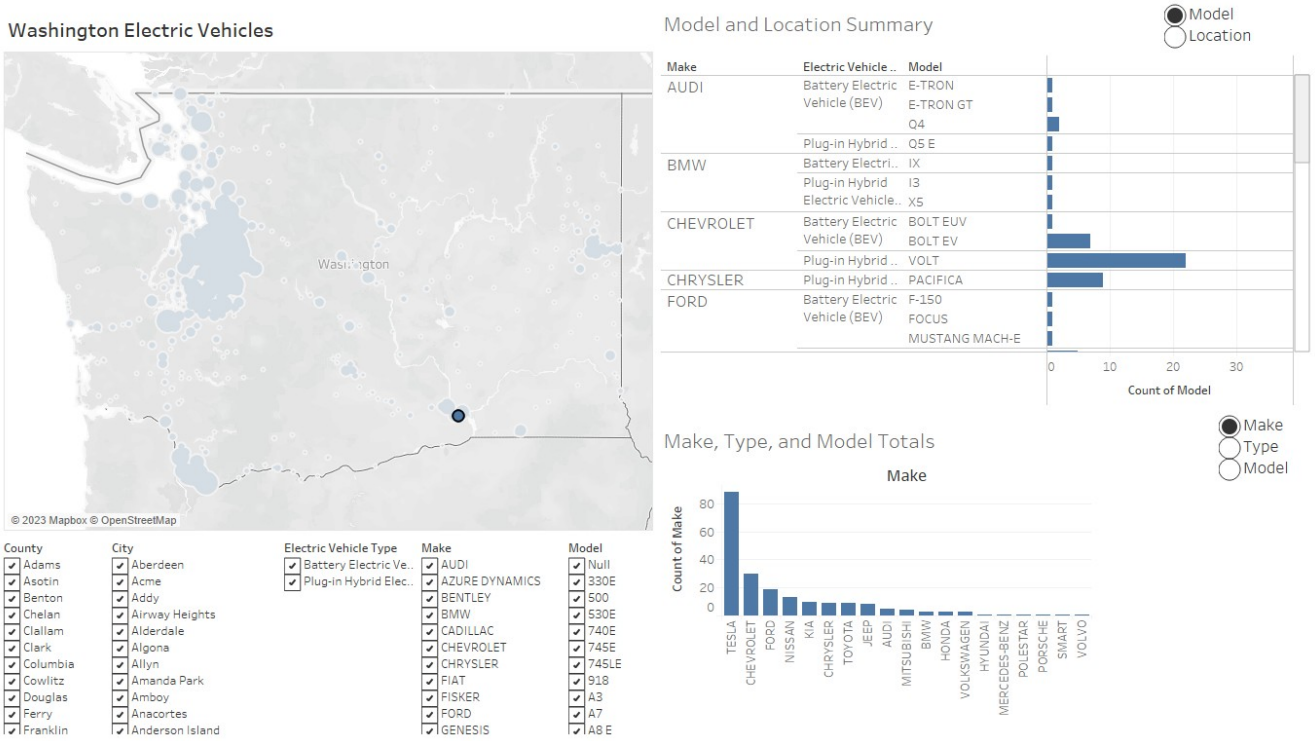
MODEL 3, MODEL Y, LEAF, MODEL S, BOLT EV, MODEL X, VOLT, NIRO, ID.4, PRIUS PRIME, WRANGLER, PACIFICA, MUSTANG MACH-E, XS, I3, FUSION, C-MAX, EV6, RAV4 PRIME, IONIQ 5, R1T, XC90, E-GOLF, BOLT EUV, PRIUS PLUG-IN, E-TRON, XC60, 500, CLARITY, PS2

Map:
The map shows the concentration of electric vehicles. Circle sizes are proportional to the amount of vehicles. Areas with larger circles contain more vehicles than area areas with smaller circles. Circles are placed based on the coordinates of the vehicle registration. There may exist multiple circles for a city depending on the location of the coordinates. The graph can be panned and zoomed in order to batter view locations of vehicles in highly concentrated areas.

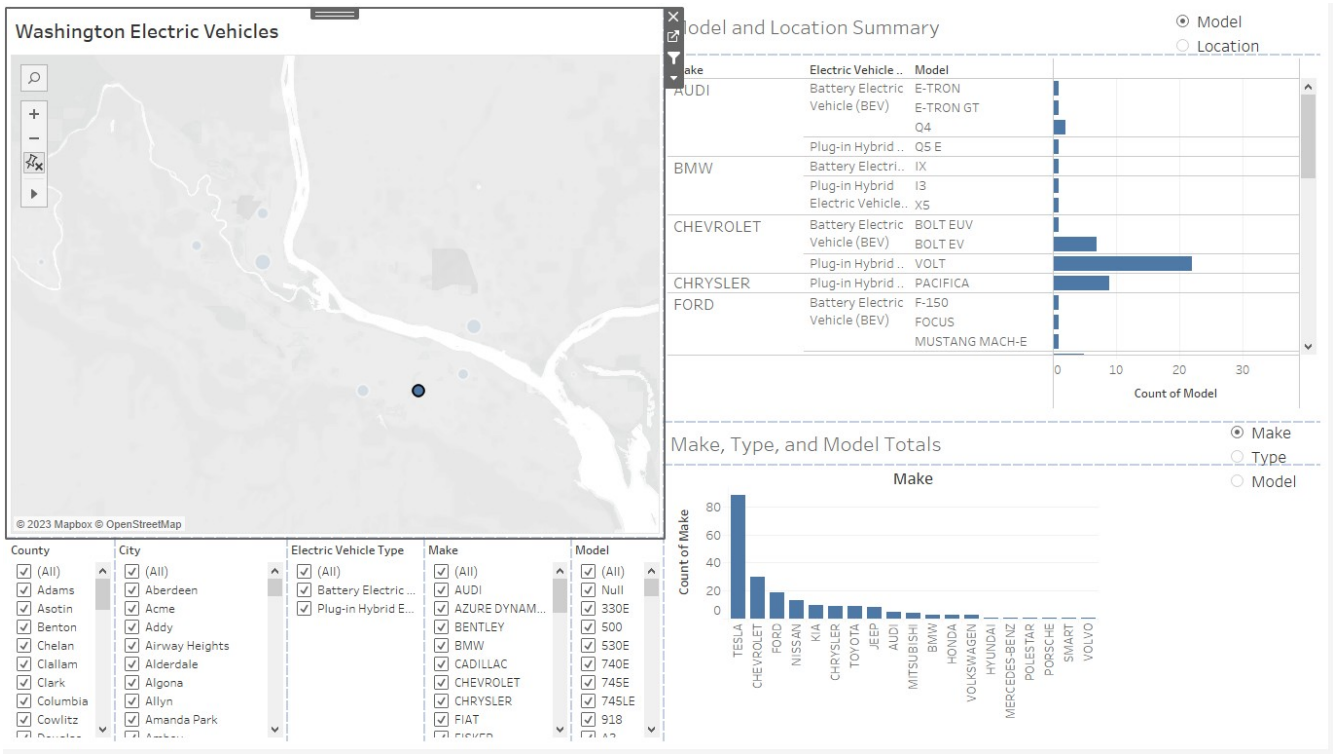
The map gives the user a visual representation of locations. Looking at the map offers a quick way to see locations without looking at the location list as well as a quick way to compare the number of vehicles in each location. Individual points on the map can also be selected to see the breakdown of vehicles at that location. Using filter options, the user can quickly see locations for various makes, types, and models. Specific counties and cities can also be selected to see locations of vehicles in those specific areas.

An example of a specific point selected is shown below. The charts on the right change to show the models represented by that point. A panned and zoomed version is also shown. The pin icon can be used to reset the map. Click anywhere in the map where there is not a data point to reset the data selection.

Selected Point

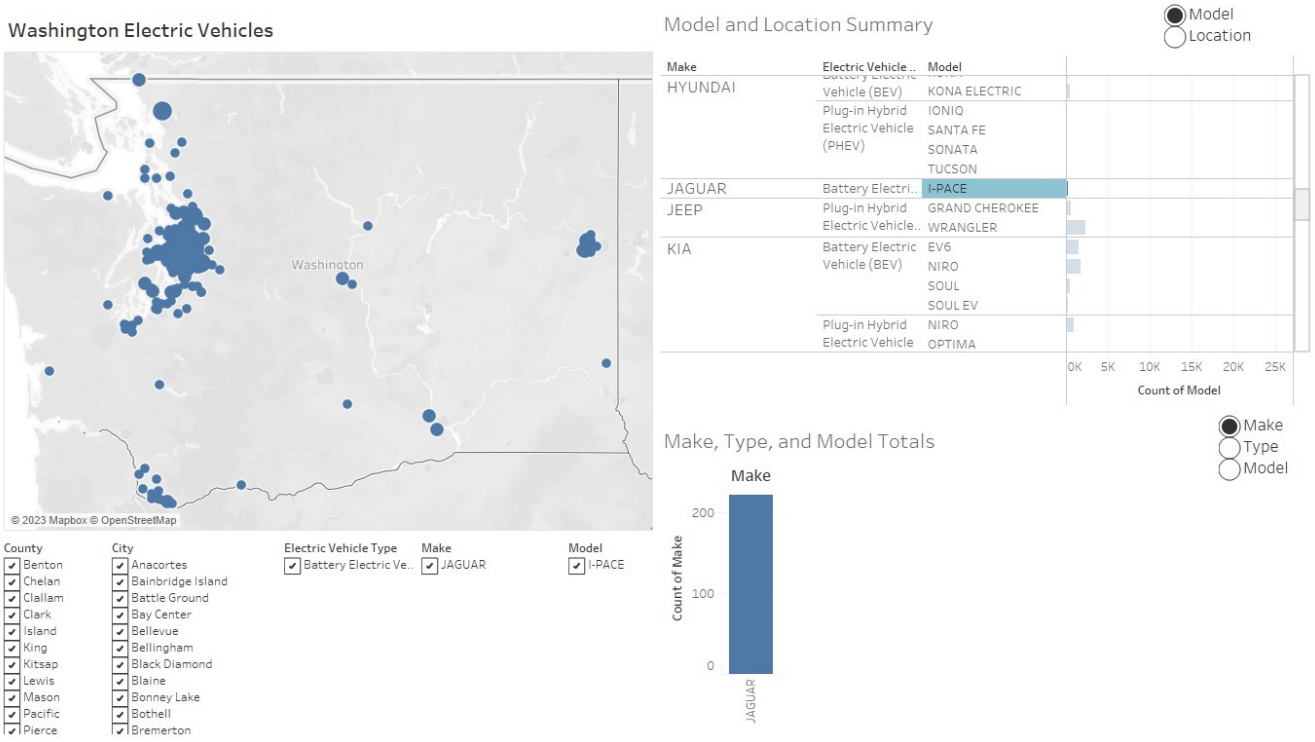


Panned and Zoomed Version



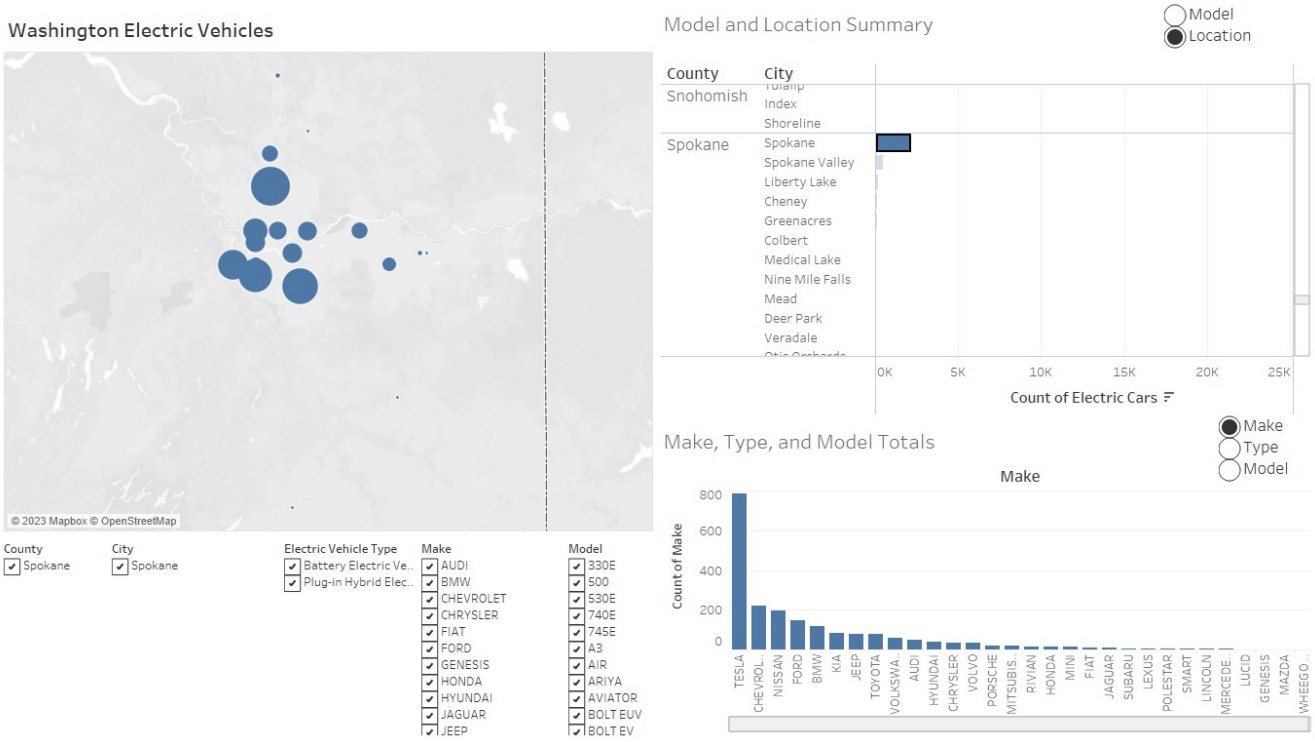
Model List:
This list gives the quantity of individual models. The list is broken down by make, type, and model. This list can be used to see the count of individual models for an area selected on the map. The filter options can also be used to see the count of models that match a specific search. For example, if only one manufacturer is selected from the filters, the model list will only show the count of cars from that manufacturer. A location could also be selected, to see the count of models from that manufacturer in the specified location.

An individual model is selected from the list to so that only those models show on the map. In this example, the Jaguar I-Pace is selected from the model list. The registration locations are shown on the map. Notice also that the make chart below only shows Jaguar once the I-Pace is selected. Click on the same model to deselect the model and view all data.

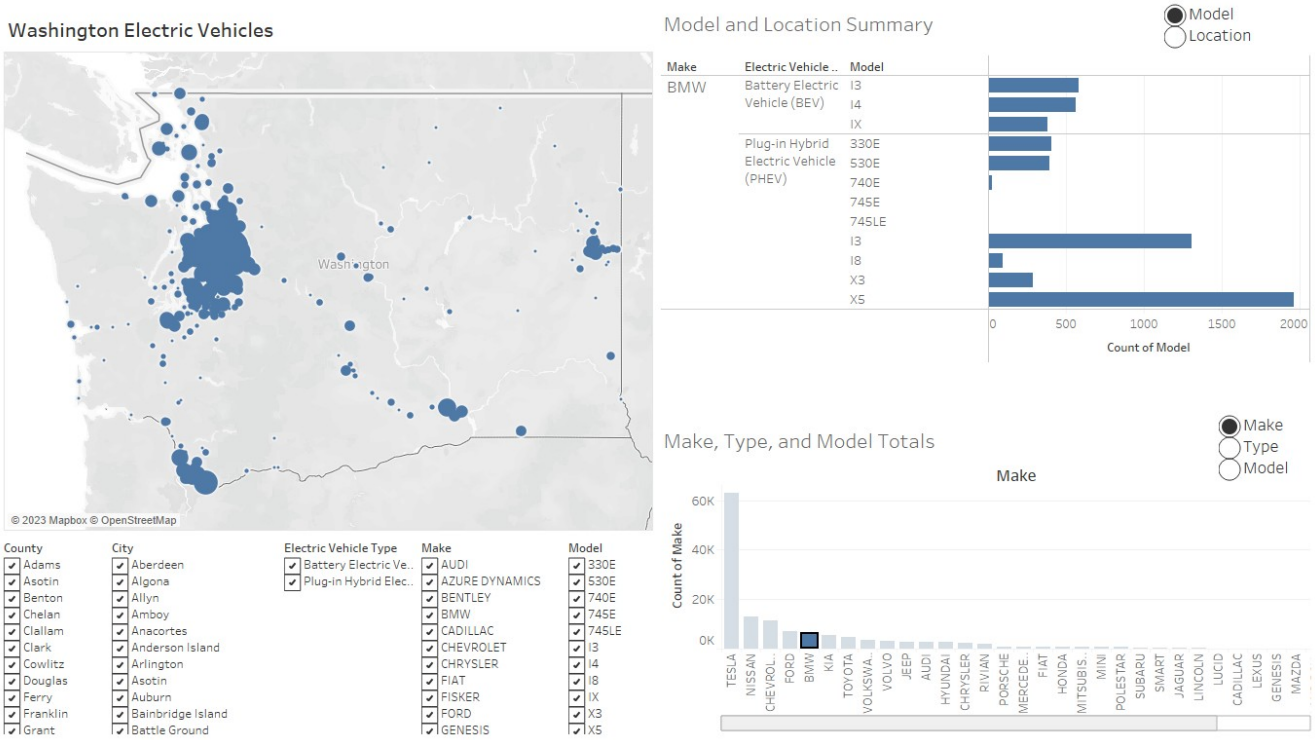


Location List:
Selecting the location list radio button which change the chart to show the location list. This list shows the count of cars in each city. This chart is useful when utilizing the filter options. Specific makes, types, or models can be selected using filters. The location list will then display the count of matching vehicles in each location. Combining this with the map allows the user to determine where vehicles matching the criteria are located as well as the count of vehicles in each location.

An example showing the city of Spokane is selected. Only locations in Spokane are shown on the map. The make chart below only counts the vehicles that are located in Spokane. Click on the city again to deselect the city and view all data.

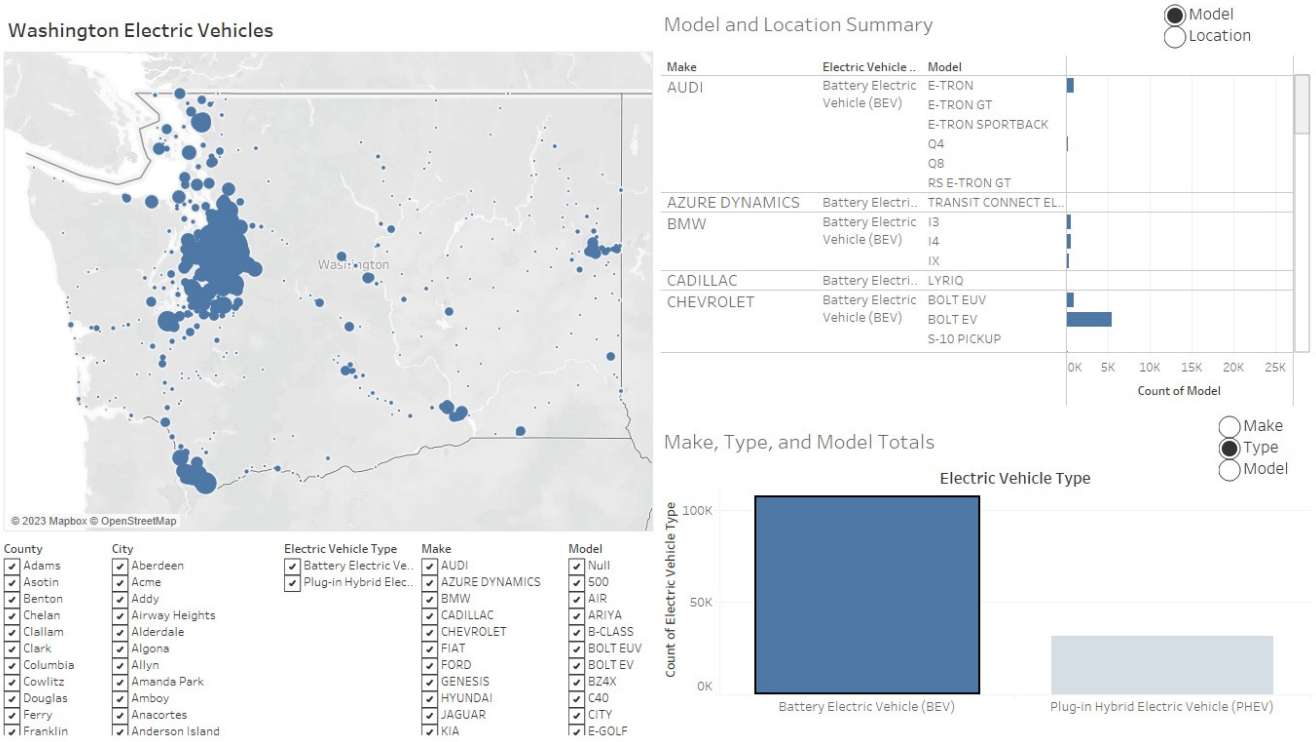


Vehicle Make Summary:
This chart shows the count of vehicles for each manufacturer in descending order of count. This chart is useful to see the difference in vehicle registrations for a given area in order to compare which makes are more popular. The graph is scroll-able to see all makes. Makes can also be selected to view only those makes on the map. In the chart below, BMW is selected, showing only BMWs on the map. The make can be clicked again to deselect and view all data. Notice that the model list above only shows BMW models.

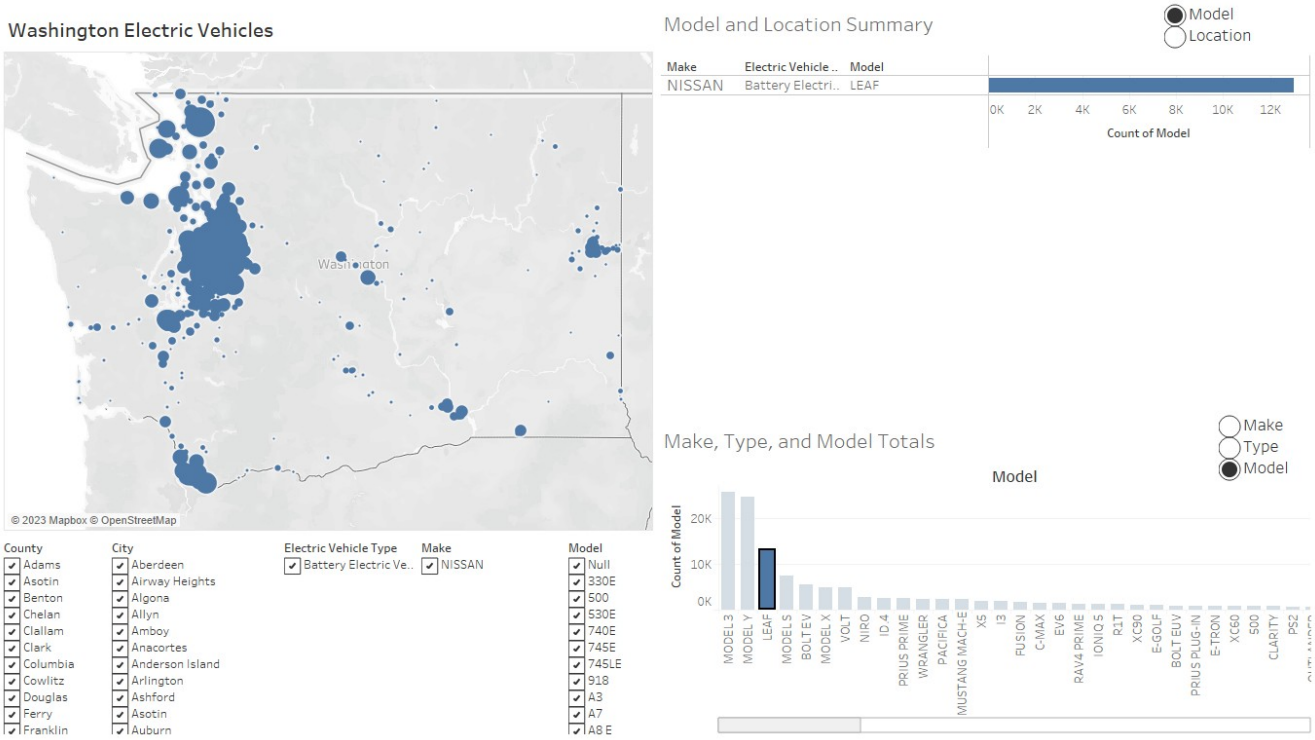


Vehicle Type Summary:
The vehicle type chart can be shown by selecting the vehicle type radio button. This chart shows the number of battery electric vehicles (BEV) compared to plug-in hybrid electric vehicles (PHEV). This graph is used to see the breakdown of BEVs vs PHEVs for a given criteria. For example, a location can be selected from the map and the chart will give the count of each type of vehicle in that location. The filter options can also be used to create criteria. For example, a manufacturer can be selected to see the difference in registration of BEVs and PHEVs for the manufacturer.

In the example below, BEV was selected, showing only BEVs on the map as well as only BEVs on the model list. The type can be clicked again to deselect and view all data.

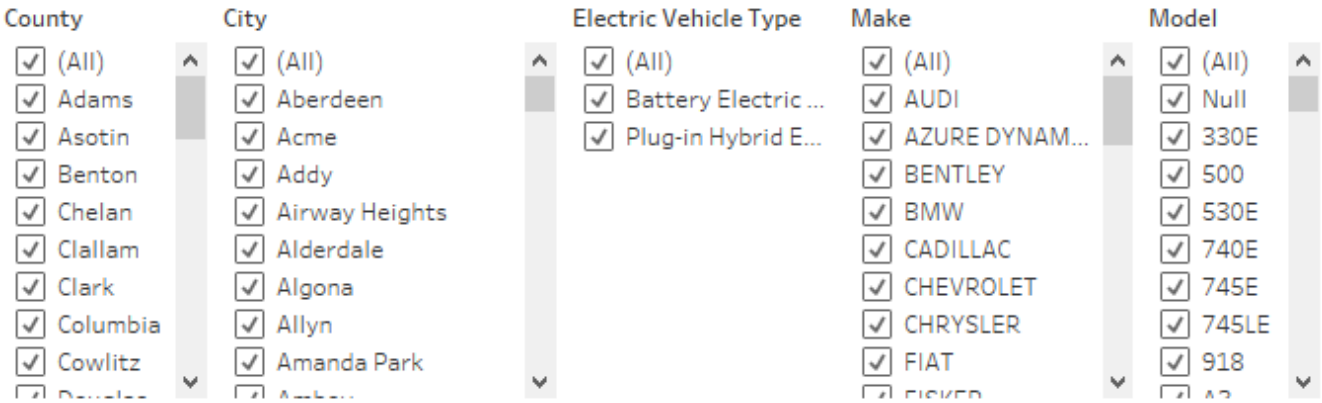


Vehicle Model Summary:
The vehicle model chart can be shown by selecting the vehicle model radio button. This chart can be used to show the most popular models in an area. The graph is scroll-able to see all models. In the example below, the Leaf was selected, showing only Leafs on the map and on the model list.



Filter:
The filter offers a way to easily select specific options. The user has the option to select a single or multiple parameters for each filter. The filter will automatically remove non-relevant options, such that if a user selects a specific make, only models from that manufacturer will be displayed in the model category.

The filter offers a powerful way to explore the data. The user can select specific locations to see what vehicles are registered. As an example, the user could select two cities to see the difference in quantity and types of models registered in those cities. The user also could compare two or more manufactures to see the difference in sales of vehicles. If a user wants to know where the highest concentration of a specific model is, the user could select that model and view where that model is registered in the state. The filter options allow great flexibility to create specific combinations of options in order to compare the exact data that is needed.



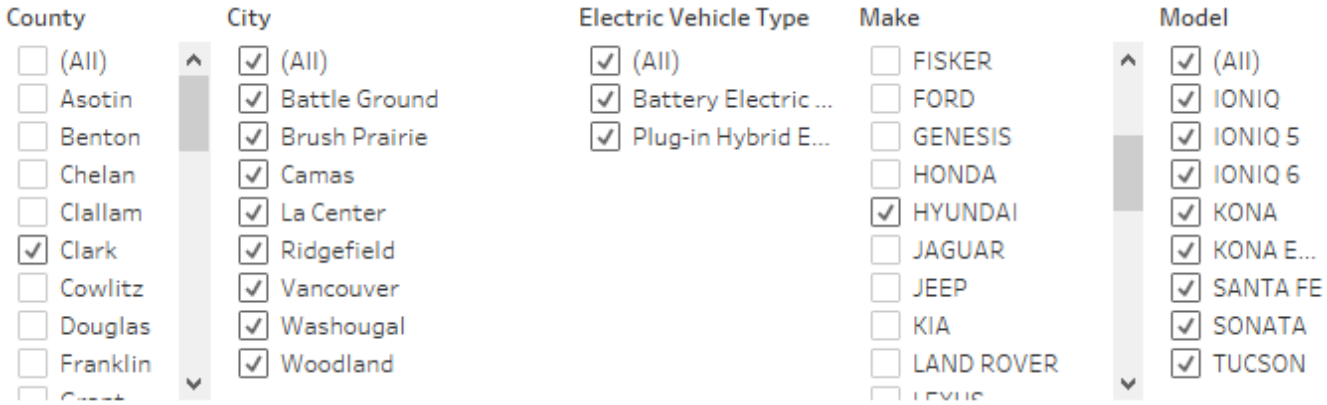
Analysis Walk-Through

Two walk-through analysis will be demonstrated to answer the following questions:

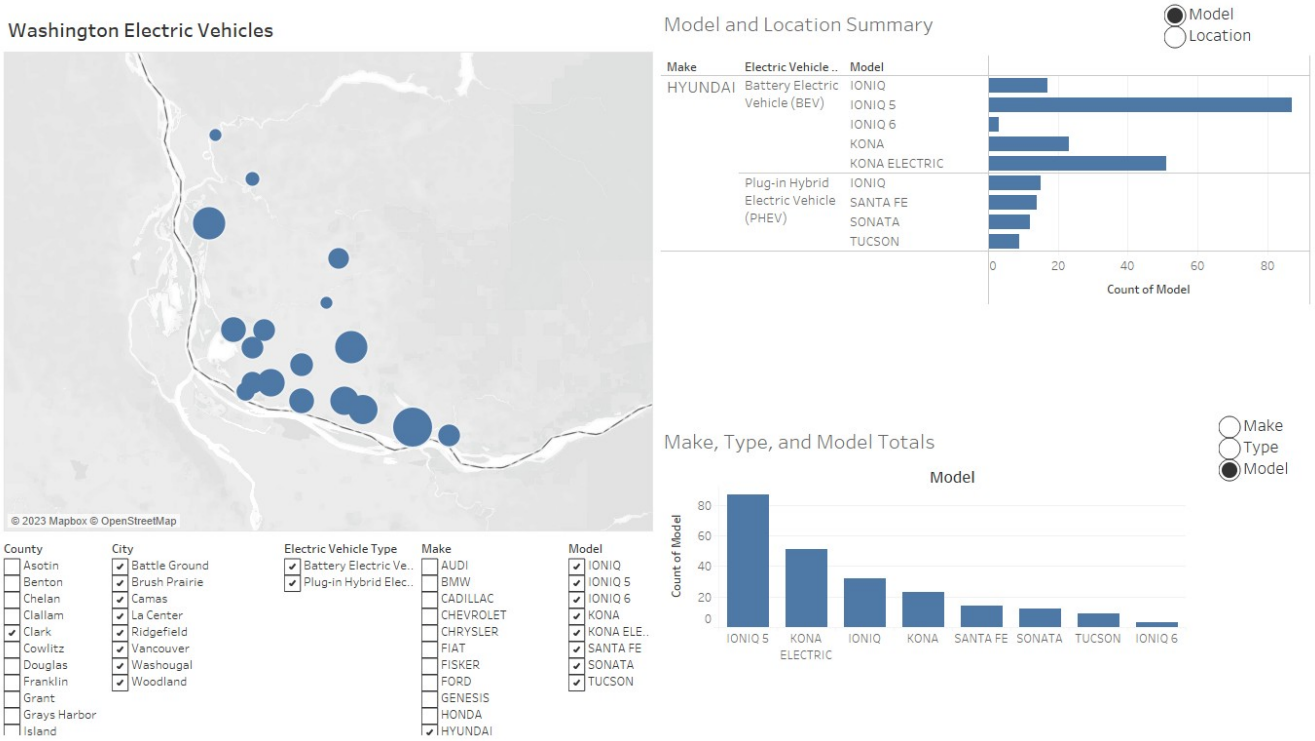
- What is the quantity of Hyundai electric vehicles in Clark County?
- What locations are BEV BMW vehicles registered?

What is the quantity of Hyundai electric vehicles in Clark County?

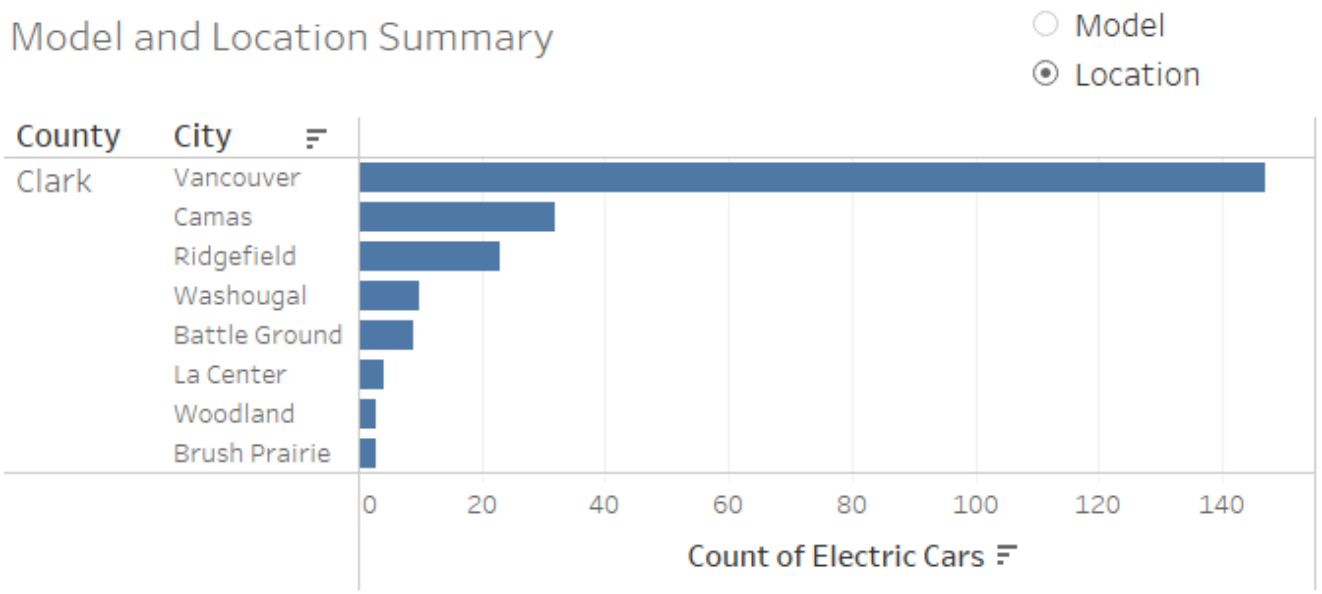
Set the filters to only show Clark County and Hyundai vehicles.



The map shows only Clark county and the model list displays only Hyundai models. The model summary also shows the most common models. Notice that the filter only shows Hyundai models.

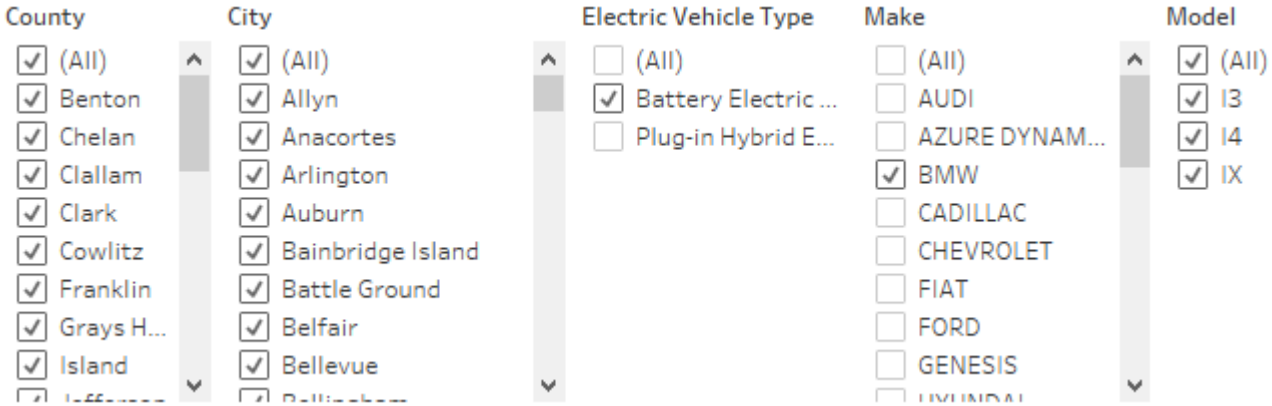


The location list can be selected to show the quantity of Hyundai electric cars in each city in Clark county.

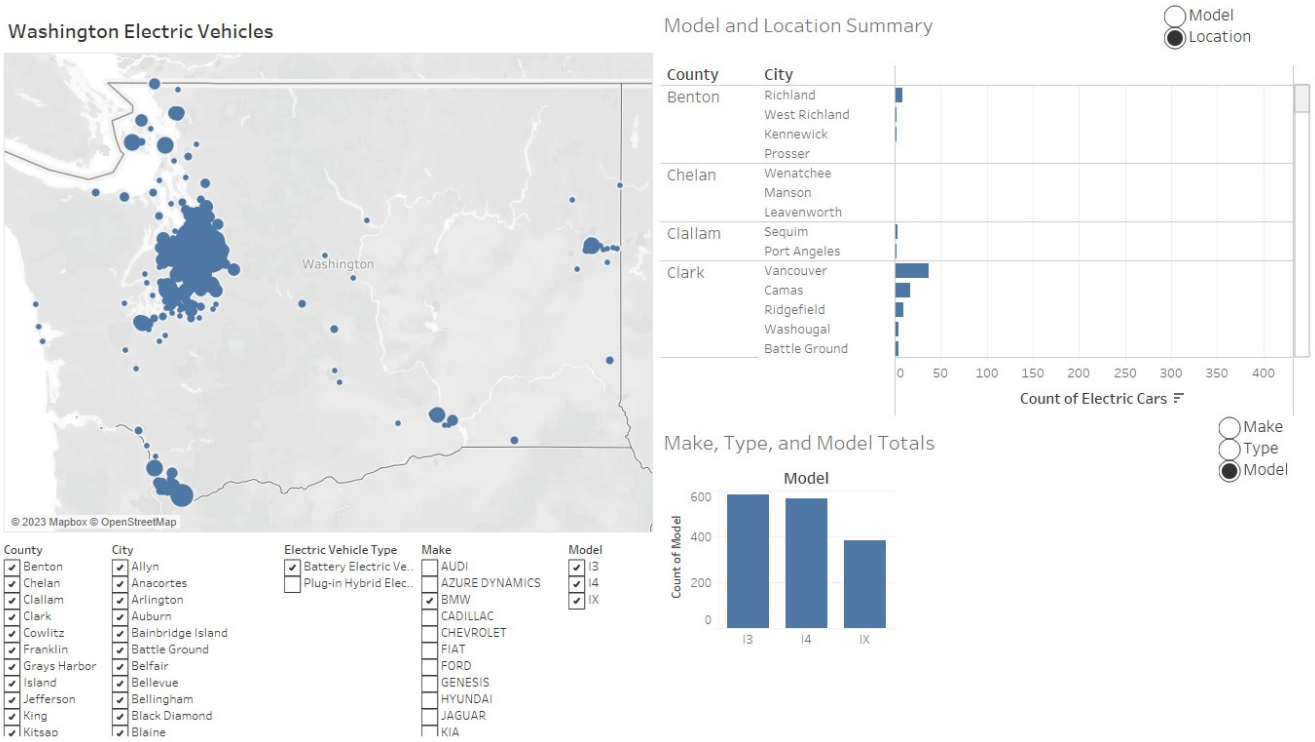


What locations are BEV BMW vehicles registered?

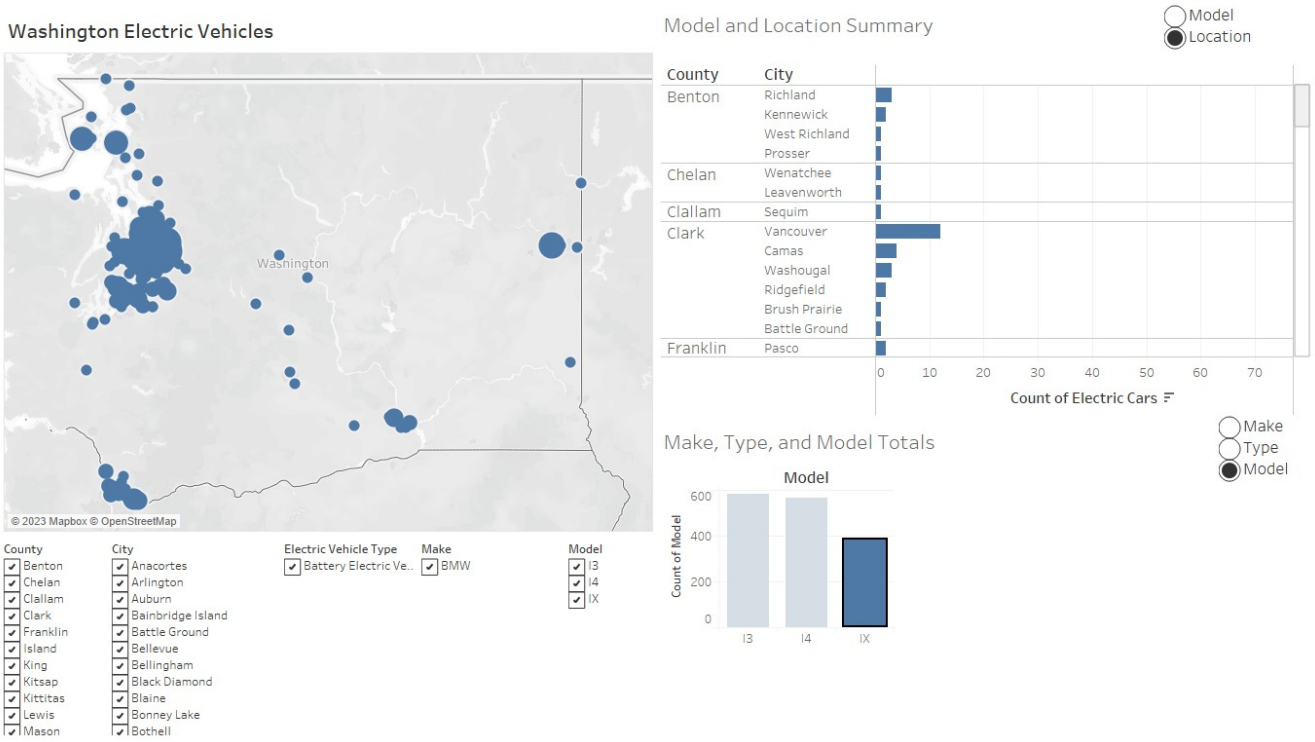
Start by selecting BEV from the type filter and BMW from the make filter.



The map will only show BMW BEV types. The location list shows the number of BMW BEVs in each city. The model summary shows the total quantity of each BMW BEV model in Washington.



Individual models such as IX can be selected to see only the quantity of IX models in each city. In this example, the IX model is selected using the model chart instead of the filter option. Note that the filter does not show the other two models excluded even though only IX are included for each chart.



Summary

Each of these charts can provide insight into specific questions for the user. The map and location list can be utilized to find where electric vehicles are that match specific criteria. The model list and type summaries can be used to breakdown electric vehicles by location. This gives the user the opportunity to essentially search by either vehicle types and models first or by location first and then further refine the data search.

Each of these graphs also has the option to act as a filter. Clicking on a specific item on a chart will reduce the data to only items matching that item. For example, a point could be selected on the map showing only vehicles in that location. BEVs could be selected from the type chart showing only BEVs in that location. A manufacturer could then be selected from the model list, resulting in only models from that manufacturer that are BEVs in the specified location appearing on the model list. This ability to select multiple criteria gives the user the ability to break down the data to exactly match the information they interested in.