

Insights into Household Vehicle Fleet Composition in Oregon

by

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Oregon is one of a number of states and countries that have adopted targets for reducing greenhouse gas emissions in order to avoid the most serious consequences of global warming. According to state statute, the goals for Oregon are to halt the increase in greenhouse gas emissions by 2010, achieve greenhouse gas emission levels that are 10 percent below 1990 levels by 2020, and achieve greenhouse gas levels that are 75 percent below 1990 levels by 2050.¹ These goals are ambitious but necessary in order to avoid the most serious consequences of global warming.

The transportation sector is a significant contributor to greenhouse gas emissions in Oregon. It is estimated to be responsible for 34 percent of the emissions of Oregonians. About three-quarters of those emissions are generated by light-duty gasoline powered cars and trucks.² It is unlikely that the greenhouse gas reductions goals can be met unless substantial changes are made to light vehicle fleets, fuels, and usage. This new reality poses challenges for transportation modelers, who are used to modeling travel demand, but pay little or no attention vehicles or fuels. Transportation models need to become more encompassing in order to provide the information that decision-makers need to craft transportation and land use policies that will help meet the greenhouse gas reduction goals.

To meet the need, the Oregon Department of Transportation (ODOT) developed the GreenSTEP (GREENhouse gas State Transportation Emissions Planning) model. GreenSTEP simulates the vehicle ownership and use of Oregon households and the attendant greenhouse gas emissions in response to a large number of variables such as population by age cohort, urban densities, urban form, highway capacity, public transportation service levels, and demand management programs. The model considers the composition of the vehicle fleet (type, age, fuel economy) in order to compute the amount of fuel consumed and the resulting greenhouse gas emissions. Submodels simulate the number of vehicles owned by each household and the types of vehicles owned (auto or light truck), and whether a vehicle might be an electric vehicle. Most of these models were estimated using household survey data from the 2001 National Household Travel Survey.

To support future enhancements of the GreenSTEP model, the Oregon Household and Activity Survey (OHAS) includes a series of questions about household fleet composition, covering current, replacement, and retired vehicles. These data elements were designed in conjunction with members of the Oregon Modeling Steering Committee. There are three groups of questions. The first are asked of all households and focus on defining the current household vehicle fleet composition. The second group of questions obtains more details about replacement vehicles for a subset (20%) of participating households. The final

group of questions focuses on vehicles that were “retired” (given up or not replaced) within the past three years. With these three sets of questions, it is possible to identify current vehicle fleet composition, rates and reasons for replacement or retirement, and from all this, begin to identify trends in household vehicle fleet composition for households in Oregon.

The data contain three groups of variables

- **Current fleet composition** (all participating households): for each current vehicle, obtain year, make model, body type, fuel type, ownership status, whether it’s been serviced in the past six months, and whether the vehicle is used for commercial or business purposes.
- **More detailed vehicle information** (random subset of 20% of households) – for each current vehicle, obtain year vehicle was acquired, whether vehicle was a replacement or addition, amount paid for vehicle, factors influencing vehicle acquisition
- **Retired vehicle information** – (same random subset of 20% of households) – for each retired vehicle, obtain how many vehicles were retired (given up/not replaced), for each, year, make and model, body type, reason for vehicle retirement.

OHAS is a multi-year, multi-regional effort that began in Spring 2009, focusing on ODOT Regions 3 and 4. As show in Figure 1, these two ODOT regions comprise 15% of the state’s population dispersed across almost half of the state’s land area. Demographically, these regions are comprised of small, low income households (62% have 1-2 persons and 66% report a household income of less than \$50,000). The majority of these households (95%) own at least one vehicle. The population is mixed in terms of elderly (25%) and non-elderly households.

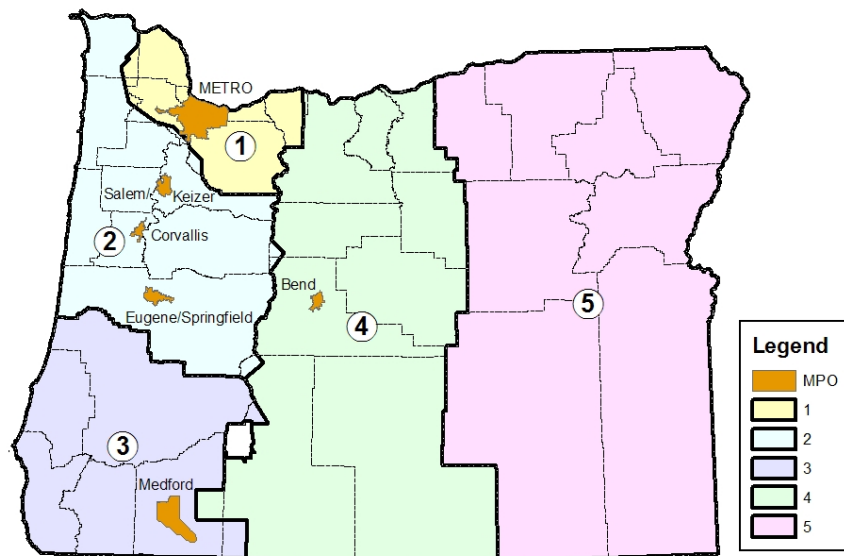


Figure 1: Oregon MPOs and ODOT Regions

A total of 3,161 households participated in the spring 2009 survey effort. These households reported owning 7,213 vehicles, or an average of 2.28 vehicles per household. Tables 1 and 2 summarize the current fleet composition for these households in terms of body type and vehicle age. In general, most households reported owning a car (39%) or truck (33%), with 40% of vehicles manufactured before 1998. Using a chi-squared test at the 90% confidence interval, there are statistical differences in fleet composition and vehicle age based on the household’s reported income. Lower income households reported owning more cars and vans, which higher income households reported owning more SUVs and Trucks. In terms of vehicle age, the lower income households reported owning older vehicles as compared to higher income households.

Table 1: Fleet Composition

Fleet composition	< \$50k	\$50k+	total
Car	42.7%	37.1%	39.3%
Van	8.3%	6.0%	6.9%
SUV	12.4%	17.4%	15.4%
Truck	31.7%	33.9%	33.0%
Other/refused	4.9%	5.6%	5.4%
Total	100.0%	100.0%	100.0%

Source: Oregon Household and Activity Survey for ODOT Regions 3 and 4

Table 2: Vehicle Age

Vehicle Age	< \$50k	\$50k+	total
pre 1988	17.5%	11.4%	13.8%
1988-1993	15.9%	11.1%	13.0%
1994-1997	18.2%	12.8%	14.9%
1998-2001	19.6%	20.4%	20.1%
2002-2005	17.9%	24.0%	21.6%
2006+	8.7%	17.6%	14.1%
refused	2.3%	2.8%	2.6%
Total	100.0%	100.0%	100.0%

Source: Oregon Household and Activity Survey for ODOT Regions 3 and 4

For 498 participating households, more details about the household fleet were obtained. As indicated above, this included information about the year vehicle was acquired, whether the vehicle was a replacement or addition, the amount paid, and factors influencing the decision to make a change in the household fleet. The results are shown in Table 3.

Table 3 – Fleet Acquisition

Year Acquired	< \$50k	\$50k+	total
pre 1988	3.9%	2.7%	3.2%
1988-1993	6.2%	4.6%	5.2%
1994-1997	7.3%	7.3%	7.3%
1998-2001	15.6%	18.6%	17.4%
2002-2005	27.0%	28.5%	27.9%
2006+	35.1%	33.1%	33.9%
Refused	4.9%	5.2%	5.1%
Replacement or Addition?			
Replacement	63.2%	63.5%	63.3%
Addition	32.1%	31.5%	31.8%
Refused	4.7%	5.0%	4.9%
Price Paid			
Received for Free	6.4%	1.6%	3.3%
<\$10k	42.3%	39.4%	40.5%
\$10k-<\$20k	22.3%	23.2%	22.9%
\$20k+	14.0%	21.8%	19.0%
Refused	14.9%	14.0%	14.3%
Reason for Change			
Wanted better fuel economy	18.6%	16.8%	17.5%
wanted larger vehicle	14.1%	15.8%	15.1%
Wanted smaller vehicle	2.6%	2.4%	2.5%
Wanted different style/something new	18.0%	25.4%	22.4%
Current vehicle had problems	21.2%	13.8%	16.7%
Other	25.5%	25.9%	25.8%

Source: Oregon Household and Activity Survey for ODOT Regions 3 and 4

Statistically, there was no difference in the proportion of vehicles that were acquired as replacements vs. additions to the household fleet based on household income. However, in terms of the year acquired and the amount paid for the vehicle, low income households tended to keep their vehicles longer and paid less for their vehicles than the higher income households. In addition, statistically, low income households were more likely to replace their vehicles because the former vehicle had a problem while higher income households were more likely to replace for a different style of vehicle.

The final set of questions obtained details about the vehicles that were replaced in the household fleets: the number of vehicles retired in the past three years; the year and body type; and the reasons for retirement are summarized in Table 4. Among the 1165 households that were asked about vehicle retirement, 85 reported retiring at least one vehicle without replacing it. A total of 97 retired vehicles were reported.

As indicated in Table 4, most vehicles that were retired were older vehicles (pre-2002). They were mainly cars (56%) and trucks (25%). The main reason for retirement was to exchange the vehicle for a different type of vehicle, because the vehicle was totaled, or because the vehicle had engine problems. There were no statistical differences in vehicle retirement by income.

Table 4: Vehicle Retirement

Year retired	< \$50k	\$50k+	total
pre 1988	23.9%	11.8%	17.5%
1988-1993	23.9%	17.6%	20.6%
1994-1997	15.2%	17.6%	16.5%
1998-2001	15.2%	33.3%	24.7%
2002-2005	15.2%	13.7%	14.4%
2006+	2.2%	3.9%	3.1%
refused	4.3%	2.0%	3.1%
Fleet composition			
Car	50.0%	60.8%	55.7%
Van	6.5%	2.0%	4.1%
SUV	10.9%	11.8%	11.3%
Truck	28.3%	21.6%	24.7%
Other	4.3%	3.9%	4.1%
Reason for Retirement			
Exchanged for something larger	6.5%	9.8%	8.2%
Exchanged for something smaller	0.0%	5.9%	3.1%
Exchanged for something with better fuel economy	6.5%	3.9%	5.2%
Vehicle had Engine problems	17.4%	3.9%	10.3%
Totaled the vehicle	10.9%	11.8%	11.3%
Exchanged for a different style of vehicle	6.5%	19.6%	13.4%
Wasn't using the vehicle/didn't need	8.7%	2.0%	5.2%
Wanted to have fewer vehicles to save money	2.2%	2.0%	2.1%
Wanted to have fewer vehicles because of HH change	2.2%	2.0%	2.1%
Other	39.1%	39.2%	39.2%

Source: Oregon Household and Activity Survey for ODOT Regions 3 and 4

The following conclusions can be drawn from this analysis:

- The current household vehicle fleet in rural Oregon is largely comprised of cars (39%) and trucks (33%). Low income households are more likely to own cars, while higher income households are more likely to own SUVs.
- In terms of fleet age, 27% of vehicles were manufactured before 1994, 35% between 1994 and 2001, and 36% after 2001. Low income households tend to own older vehicles, on average, while higher income households tend to own newer vehicles.
- Two-thirds of household vehicles are acquired as replacements for existing household vehicles, and this does not differ by income.
- Two-thirds (62%) of the current household vehicle fleet was acquired after 2001 and 41% were acquired for less than \$10,000. Low income households tended to acquire their vehicles earlier and for a lower price than the higher income households.
- 22% of vehicles were replaced because the owners were ready for something new or different, while 18% were exchanged because the owner wanted better fuel economy, and 17% replaced a vehicle that had problems. Lower income households were more likely to replace their vehicles because of problems, while higher income households were more likely to replace for a different style/something new.
- Most vehicles that were retired were older vehicles (pre-2002). They were mainly cars (56%) and trucks (25%).

- The main reason for retirement was to exchange the vehicle for a different type of vehicle, because the vehicle was totaled, or because the vehicle had engine problems. There were no statistical differences in vehicle retirement by income.

These survey data will help the ODOT to improve the household vehicle ownership and type models in GreenSTEP. The present models are based on western region data from the 2001 NHTS. The household survey data will provide Oregon-specific data for the models.

The data will also help ODOT develop more sophisticated transition models of changes in household vehicle ownership. Currently, GreenSTEP models transitions in the vehicle fleet at an aggregate level, and then allocates the resulting fleet characteristics to households. With this approach, policy effects on the fleet are asserted rather than modeled. The household survey data will allow vehicle fleet transitions to be modeled on a disaggregate household basis and will allow policies affecting vehicle ownership by vehicle type to be modeled. Overall fleet characteristics then would be aggregated from the disaggregate household vehicle characteristics.

Other parts of GreenSTEP will be undoubtedly be improved as the vehicle and household data is examined further and related to other relevant data about the environments (transportation, land use, economic, policy) in which the survey households are located. This will help provide modeling support that is urgently needed by decision-makers to decide what steps Oregonians need to take to rapidly lower their greenhouse gas “wheelprints”.

¹ Oregon Revised Statutes 468A.205

² Oregon Department of Transportation, Transportation Planning Analysis Unit, *Background Report: The Status of Oregon Greenhouse Gas Emissions and Analysis*, October 2009, <http://www.oregon.gov/ODOT/TD/TP/docs/HB2186page/Background.pdf>