

A wide-angle photograph of the Golden Gate Bridge in San Francisco, California, viewed from a distance across the water. The bridge's towers and suspension cables are visible against a blue sky with light clouds. The image is divided into three vertical panels by thin white lines.

# Estimating the State Fuel Tax Paid on Gasoline Used in the Off- Highway Operation of Vehicles for Recreation

January 27, 2007

OHMVR Commission Meeting  
Sacramento, CA

## ► Component 1 Survey

- Random Digit Dial Telephone Survey of over 15,000 households in California (7/2003 – 12/2003)
- Used to estimate percent of households that own an OHV, percent of households that engage in off-highway vehicle recreation and the population of non-registered vehicles

## ► Component 2 Survey

- Collection of written log books from over 15,000 California vehicle owners (4/2004 – 3/2005)
- Used to determine amount of gasoline Californians use for off-highway vehicle recreation

# Overall Results

(Annual Gallons used)  
Comparison Against Existing Model

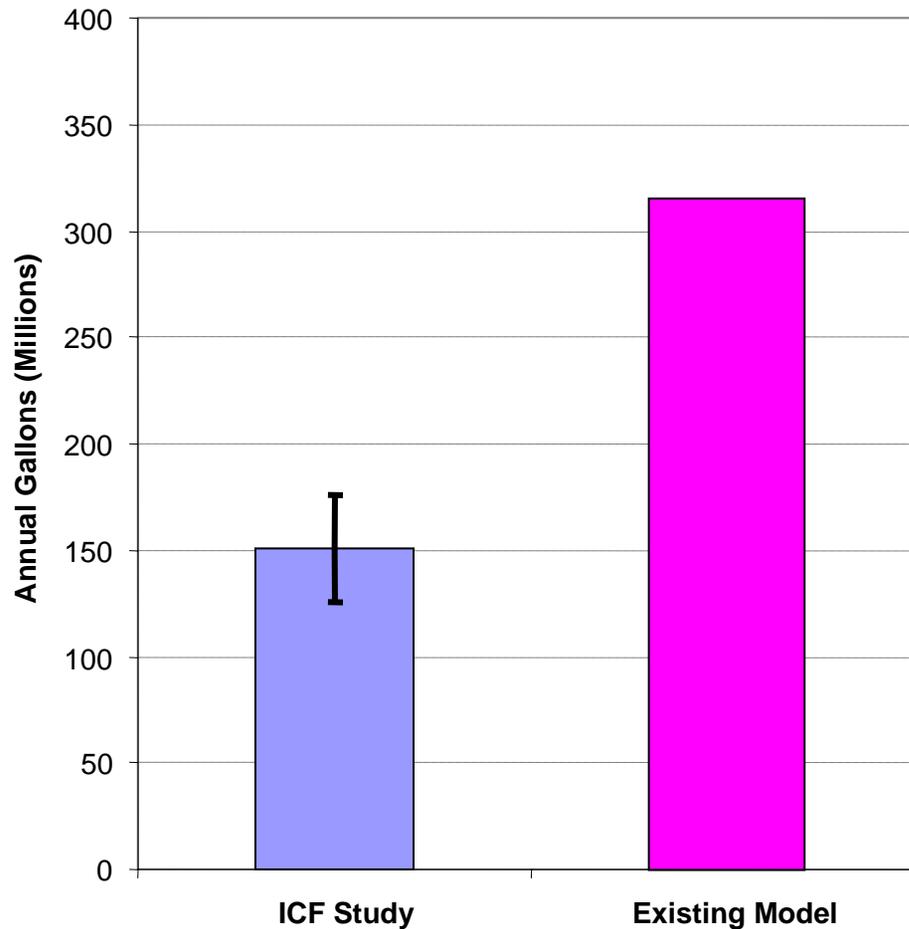
Vehicle Type	ICF Survey	Existing Model
<b>Street Licensed</b>	<b>124,747,354</b>	<b>79,741,098</b>
<b>NSL Registered</b>	<b>20,014,590</b>	<b>34,439,819</b>
<b>NSL Unregistered</b>	<b>6,207,327</b>	<b>201,808,816</b>
<b>Total Gallons</b>	<b>150,969,270</b>	<b>315,989,733</b>
<b>Total Tax Revenue</b>	<b>\$27,174,469</b>	<b>\$56,878,152</b>

The ICF Surveys predicted that Californians use approximately 151 million gallons of gasoline recreating off-highway on public lands within a 16.8% margin of error at the 95% confidence interval.

# Statistical Lesson

- ▶ That means that we are 95% certain that the amount of fuel used by Californians for off-highway vehicle recreation on public lands falls between 125 million gallons and 176 million gallons
- ▶ We are also 95% certain that the tax revenue generated from those gallons falls between \$22.6 million and \$31.7 million
- ▶ A larger sample size would probably reduce the margin of error but most likely would not change the answer significantly – Halving the margin of error would require 4 times the sample size

# Graphical Representation



As shown on left, the margin of error does not account for the large difference between the ICF study and the Existing Model

Quadrupling the sample size would just narrow the error bar, but most likely would not change the mean significantly

# Why the large difference?

- ▶ New Survey showed a significant drop in ratio of non-registered to registered vehicles from 1990
- ▶ Misinterpretation of vehicle types by Existing model
- ▶ Assumption that non-registered vehicles use fuel at the same rate as registered vehicles on a average annual per vehicle basis (ICF survey indicates they use about 60% less)
- ▶ Average annual fuel use per vehicle by 4WD SL vehicles lower than in 1990

## Existing Fuel Tax Model

Where revenue comes from

<b>Vehicle Type</b>	<b>Street Licensed</b>	<b>OHV Registered</b>	<b>OHV Non-Registered</b>
<b>Number of Vehicles (Millions)</b>	<b>25.75</b>	<b>0.79</b>	<b>4.53</b>
<b>Number of Gallons (Millions)</b>	<b>79.74</b>	<b>34.44</b>	<b>201.81</b>
<b>Tax Revenue (Millions)</b>	<b>\$14.35</b>	<b>\$6.20</b>	<b>\$36.33</b>

Total Annual Tax Revenue estimated for 2004/2005 fiscal year is \$56.88M. 64% comes from Non-Registered vehicles

# Existing Tax Transfer Model

## Vehicle Count Model

- uses DMV data to determine vehicle counts in a given month for each vehicle type
- This model has not been updated since 1990
- 4WD street licensed vehicle models produced since 1990 are characterized by this model as 2WD vehicles
- A majority of ATVs produced since 1990 have been characterized as off-highway motorcycles

## Tax Revenue Model

- Calculates non-registered vehicle counts based upon registered vehicle counts from Vehicle Count Model based upon non-registered to registered OHV ratios established in 1990
- Calculates fuel used based upon Vehicle Count Model inputs and fuel use per month per vehicle type estimates developed in 1990
- Since non-registered vehicles were not surveyed in 1990, assumes fuel use by non-registered vehicles (gallons per month per vehicle) is the same as for registered vehicles

## Non-Registered/Registered Ratios

Vehicle Type	Existing Model	ICF Survey
Motorcycles	5.9	0.62
ATVs	2.5	0.51
4 Wheel	7.6	2.77
Snowmobiles	7.0	0.45
Other	19.0	3.74

Because motorcycles make up the largest group of off-highway vehicles according to the Vehicle Count Model, the Tax Revenue Model estimates 6 non-registered vehicles for every one registered vehicle

# Existing Fuel Tax Model Details

<b>Vehicle Type</b>	<b>Vehicles (1000s)</b>	<b>Gallons (Millions )</b>	<b>Revenue (Millions)</b>
<b>2 Wheel Drive SLVs</b>	<b>9,291</b>	<b>50.33</b>	<b>\$9.06</b>
<b>4 Wheel Drive SLVs</b>	<b>647</b>	<b>15.41</b>	<b>\$2.77</b>
<b>OHMCs (Reg)</b>	<b>686</b>	<b>30.80</b>	<b>\$5.54</b>
<b>OHMCs (Non Reg)</b>	<b>4,047</b>	<b>181.71</b>	<b>\$32.71</b>
<b>ATVs (Reg)</b>	<b>59</b>	<b>1.69</b>	<b>\$0.30</b>
<b>ATVs (Non Reg)</b>	<b>148</b>	<b>4.21</b>	<b>\$0.76</b>

Over 57% of Revenue comes from Non-Registered Off-Highway Motorcycles based upon an estimate of 5.9 unregistered OHMCs for every 1 registered



# Existing Vehicle Count Model

## Actual DMV counts versus Vehicle Count Model

Counts of vehicles used for model input are significantly different than actual DMV counts (October 2004)

Vehicle Type	Vehicle Model	Actual DMV
2WD SLVs	9,320,229	7,817,512
4WD SLVs	649,985	3,205,250
OHMCs (Reg)	656,816	338,169
ATVs (Reg)	57,448	335,897

Motorcycle industry council estimates 330,600 OHMCs in California for 2003. They also confirm that ATV sales in the last 10 years would give a 50/50 mix of ATVs and OHMCs.



# Current Fuel Tax Model

## DMV Count Changes over Time

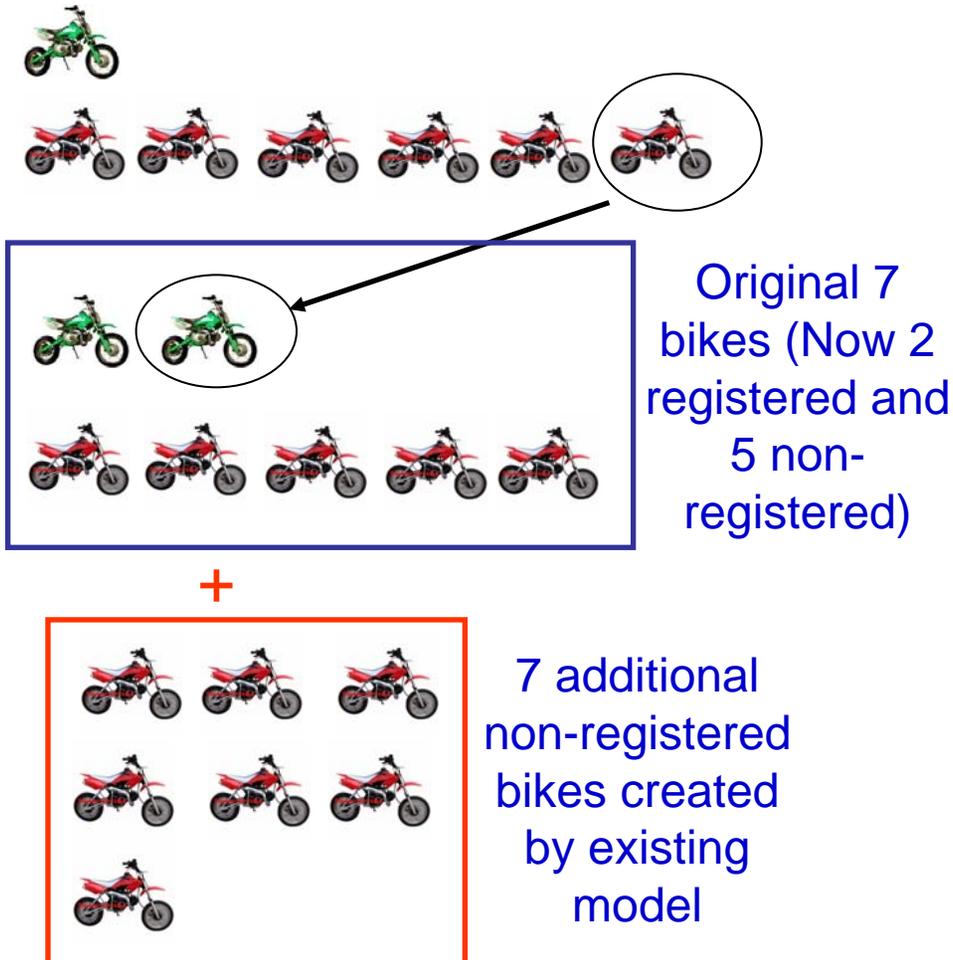
Vehicle Class	Vehicle Count Model		Actual
	October 1989	October 2004	October 2004
<b>Cars</b>	<b>14,603,184</b>	<b>14,887,946</b>	<b>14,221,617</b>
<b>SL 2WD</b>	<b>4,278,144</b>	<b>9,320,229</b>	<b>7,817,512</b>
<b>SL 4WD</b>	<b>194,403</b>	<b>649,985</b>	<b>3,205,250</b>
<b>SL MC</b>	<b>560,839</b>	<b>537,329</b>	<b>559,377</b>
<b>SL Other</b>	<b>552,164</b>	<b>442,280</b>	<b>277,540</b>
<b>OHMC</b>	<b>207,633</b>	<b>656,816</b>	<b>338,169</b>
<b>ATVs</b>	<b>76,636</b>	<b>57,448</b>	<b>335,897</b>
<b>OH 4W</b>	<b>6,974</b>	<b>18,478</b>	<b>19,329</b>
<b>Snowmobiles</b>	<b>6,263</b>	<b>18,894</b>	<b>18,502</b>
<b>OH Other</b>	<b>12,998</b>	<b>2,435</b>	<b>2,168</b>

SL = Street Licensed, OH = Off-Highway

- ▶ Misrepresenting ATVs as Motorcycles greatly increased non-registered vehicle counts
  - Estimates ~ 1.4 million additional non-registered vehicles because OHMC ratio is 5.9 while ATV ratio is 2.5
  
- ▶ Model did not account for non-registered vehicles becoming registered
  - For each non-registered vehicle that became registered, 6 more non-registered vehicles appeared

# Existing Model Flaws

## Registered versus Non-registered



- Start with 1 registered and 6 non-registered motorcycles
- When one non-registered is subsequently registered, existing model counts the 2 registered and estimates 12 non-registered based upon the 6 non-registered to 1 registered ratio inherent in the model
- Existing model not able to handle registering of previously non-registered vehicles

- ▶ Non-Registered to Registered Ratios found to be significantly less than in 1990 study
  - Average multiplier went from approximately 6 to 1 down to 0.63 to 1
- ▶ Fuel use for non-registered actually less in gallons per year per vehicle than registered vehicles
  - Actual annual average fuel use per non-registered vehicle approximately 60% less than per registered vehicle



# Effect of Various Corrections to Non-Registered Vehicles

<b>Change</b>	<b>Vehicles (Millions)</b>	<b>Annual Gallons (Millions)</b>	<b>Tax Revenue (Millions)</b>
<b>ATVs counted as MCs</b>	<b>-1.36</b>	<b>-72.4</b>	<b>-\$13.03</b>
<b>Change in Non-Registered to Registered Ratios</b>	<b>-2.72</b>	<b>-111.5</b>	<b>-\$20.07</b>
<b>Change in Average Vehicle Fuel Consumption</b>	<b>-0-</b>	<b>-11.7</b>	<b>-\$2.11</b>
<b>Total</b>	<b>-4.08</b>	<b>-195.6</b>	<b>-\$35.21</b>

57% of revenue drop due to newer Non-Registered to Registered Ratios

# Possible Reasons for Drop in Non-Registered Vehicles

- Significantly more enforcement at county/state parks/federal lands after 1990 study
- Dealers now register vehicles when sold
- Grantees under State Parks program now have to enforce off-highway registration as part of receiving State grant monies
- Check points within Parks, BLM and Forest Service Lands check on vehicle registration
- Amnesty programs with DMV clerk on premises to avoid large fines



# Effect of Various Corrections to Registered OHVs

<b>Change</b>	<b>Vehicles (1000s)</b>	<b>Annual Gallons (Millions )</b>	<b>Tax Revenue (Millions )</b>
<b>Poor Treatment of DMV Classifications</b>	<b>-72.8</b>	<b>-8.10</b>	<b>-\$1.46</b>
<b>Change in Average Vehicle Fuel Consumption</b>	<b>-0-</b>	<b>-6.33</b>	<b>-\$1.14</b>
<b>Total</b>	<b>-72.8</b>	<b>-14.43</b>	<b>-\$2.60</b>

Loss of approximately 10% of registered vehicles due to misclassification of non-recreational vehicles by Vehicle Count Model.  
Fuel difference due to classifying ATVs as MCs



# Effect of Various Corrections to Street Licensed Vehicles

<b>Change</b>	<b>Vehicles (1000s)</b>	<b>Annual Gallons (Millions )</b>	<b>Tax Revenue (Millions )</b>
<b>Poor Treatment by DMV of Vehicle Classifications</b>	<b>+334.1</b>	<b>+50.87</b>	<b>+\$9.16</b>
<b>Change in Average Vehicle Fuel Consumption</b>	<b>-0-</b>	<b>-5.86</b>	<b>-\$1.06</b>
<b>Total</b>	<b>+334.1</b>	<b>+45.01</b>	<b>+\$8.10</b>

Gain in tax revenues due to correctly classifying 4WD vehicles and including vehicles between 8500 and 10,000 lbs GVWR in 2WD and 4WD categories. Before these vehicles were in “Other” category. New “Other” category now includes vehicles between 10,000 and 14,000 lbs.

## ▶ Component 1 Survey

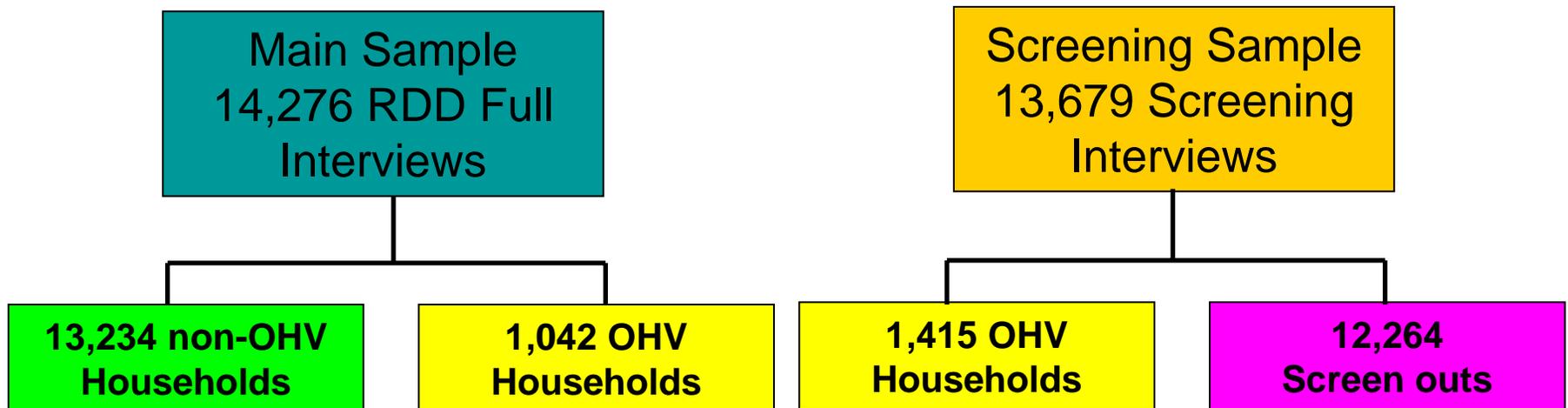
- Random Digit Dial Telephone Survey of over 15,000 households in California (7/2003 – 12/2003)
- Used to estimate percent of households that own an OHV, percent of households that engage in off-highway vehicle recreation and the population of non-registered vehicles

## ▶ Component 2 Survey

- Collection of written log books from over 15,000 California vehicle owners (4/2004 – 3/2005)
- Used to determine amount of gasoline Californians use for off-highway vehicle recreation

# Component 1 Methodology

- Use Random Digit Dial (RDD) probability sample with strategic oversampling
  - Geographic areas with higher OHV ownership
  - OHV owning households



## ▶ Component 1 Telephone Interviews Asked

- Number of non-street licensed vehicles
  - Model year and vehicle type for each vehicle
  - Whether they were used off-highway in the last year
- Number of street licensed vehicles
  - Model year and vehicle type for each vehicle
  - Whether they were used off-highway in the last year
- Name and Address
- Number of telephone lines

# Component 1 Results

- ▶ 15,691 completed interviews
  - 943 N.S.L. OHV owning households (6.01%)
    - 5.7% in 1990
  - 2,097 drove off-highway in last 12 months (13.36%)
    - 447 drove rental vehicles (2.85%)
    - 1,845 drove their own vehicle (11.76%)
    - 1,551 drove on public lands for recreation (9.88%)
    - 14% in 1990
- ▶ Confusing definition of public lands in Tyler's analysis led to higher off-road numbers

- ▶ Component 1 Telephone Interviews provided data on 2,457 Households with 5,204 off-highway vehicles
  - 176 vehicle were street-licensed
  - 192 used on closed course only
  - 37 were not recreation vehicles
    - Farm Tractors (26)
    - Water/Dump Trucks (4)
    - Bulldozers/Excavators (4)
    - Property Management Vehicles (2)
    - Old Ambulance (1)

- ▶ **Determining non-registered Vehicles**
  - If another vehicle is found in the household in one of the DMV databases but specific vehicle cannot be found, that vehicle is determined to be non-registered
- ▶ **Data Gathered**
  - Vehicle type and model year
  - Name, address and telephone number
- ▶ **Matching Process**
  - October 2004, April 2005, and October 2005 DMV snapshots used for identification purposes

## ► Matching Process (continued)

- If the vehicle type and model year are found, the vehicle is considered a match (Exact)
- Considered a match (Near) if vehicle type is correct and model year is within 3-5 years depending on age
- If vehicle type is same but newer model year is found, it was considered a replacement vehicle (Replaced)
- A different vehicle type was found from the one claimed but the same or near model year (Mistake)
- If vehicles appear in DMV data set but were not identified in the telephone interview, they are added (Added)
- If the vehicle is not found but another vehicle is found, considered non-registered (Verified Non-Registered)

# Matching Process

Matching Type	Number of Vehicles
Exact	895
Near	578
Replaced	334
Mistake	40
Added	306
Verified Non-Reg	1,141
Bad	370
Not Found	1,135

## UnRegistered/Registered Ratios

- ▶ Results weighted using Component 1 Survey household weights to account for over-sampling of some counties, number of telephone lines and OHV owners
- ▶ 195 vehicles were close course only vehicles and were eliminated
- ▶ 1,135 vehicles could not be found (households not in DMV data sets)
- ▶ If a household cannot be found in the DMV data sets, it is not counted in determining unregistered to registered ratios

## ► Matching included

- Names with slight misspellings at the same address
- Addresses that have the same person at the same street number but street name misspelled
- When possible, the same person at two different addresses (unique name and near city PO box)

## ► Reverse Phone Directory used when possible to fill in address information and correct misspellings



# Estimated Non-Registered Vehicle Populations (Thousands)

Vehicle Type	Existing Model		ICF Study
	1990	2004	2004
Motorcycles	1,225	3,875	210
ATVs	192	144	172
4 Wheel Vehicles	53	140	54
Snowmobiles	44	132	8
Other	247	46	9
<b>Total</b>	<b>1,760</b>	<b>4,338</b>	<b>453</b>

Approximately 222,000 OHVs are inactive

# Component 2 Survey

## Street Licensed Vehicle Categories

Car 2WD

SUV 2WD

Truck 2WD

Van 2WD

Street Motorcycle

Other

Car 4WD

SUV 4WD

Truck 4WD

Van 4WD

Dual Sport Motorcycle

# Comparison with Tyler

1990 Survey Type	ICF Survey Types
Regular	Cars 2WD, Cars 4WD
2WD	SUVs, Trucks and Vans 2WD
4WD	SUVs, Trucks and Vans 4WD
Motorcycle	Street and Dual Sport Motorcycles
Other	Other

# DMV Type Matches

DMV Type	ICF Types
Car - Subcompact	Car
Car - Compact	Car
Car - Midsize	Car
Car - Large	Car
Car - Sport	Car
Cross Uts – Small – Car	Car

# DMV Type Matches

DMV Type	ICF Types
Pickup - Compact	Truck
Pickup - Standard	Truck
Pickup – 8501-10,000 lbs GVWR	Truck
GVWR 3 Truck (10,001-14,000 lbs GVWR)	Other
GVWR 4-8 Truck (> 14,000 lbs GVWR)	Not included



# DMV Type Matches

DMV Type	ICF Types
Sport Utility - Compact	SUV
Sport Utility – Midsize	SUV
SUV - Large	SUV
SUV – 8,501 – 10,000 lbs GVW	SUV
Cross Uts – Small - Truck	SUV
Cross Uts – Midsize	SUV



# DMV Type Matches

DMV Type	ICF Types
SUV - Large	SUV
SUV – 8,501 – 10,000 lbs GVWR	SUV
Van – Compact	Van
Van – Standard	Van
Van – 8,501 – 10,000 lbs GVWR	Van

- ▶ Log books asked
  - Gallons, miles and hours driving off-highway
  - Recreational areas visited
  - Recreational pursuits during off-road travel
  - Percent towing
  - Percent of hard driving
  - Type of fuel used
  - Fuel purchased in California
- ▶ For all vehicles, gallons used off-road was used in analysis

- Obtained Street-Licensed Vehicle counts by County for October 2004 (Cenzer)
- Obtained Street-Licensed ratios of 2WD to 4WD by County for October 2004 (Cenzer)
- Obtained Street-Licensed Motorcycle counts by County broken into Street and Dual Sport Motorcycle categories for October 2004 (Cenzer)
- Obtained Non-Street Licensed counts by county for October 2004 (Cenzer)
  - Counts of Motorcycles and ATVs significantly different from counts used by current tax model

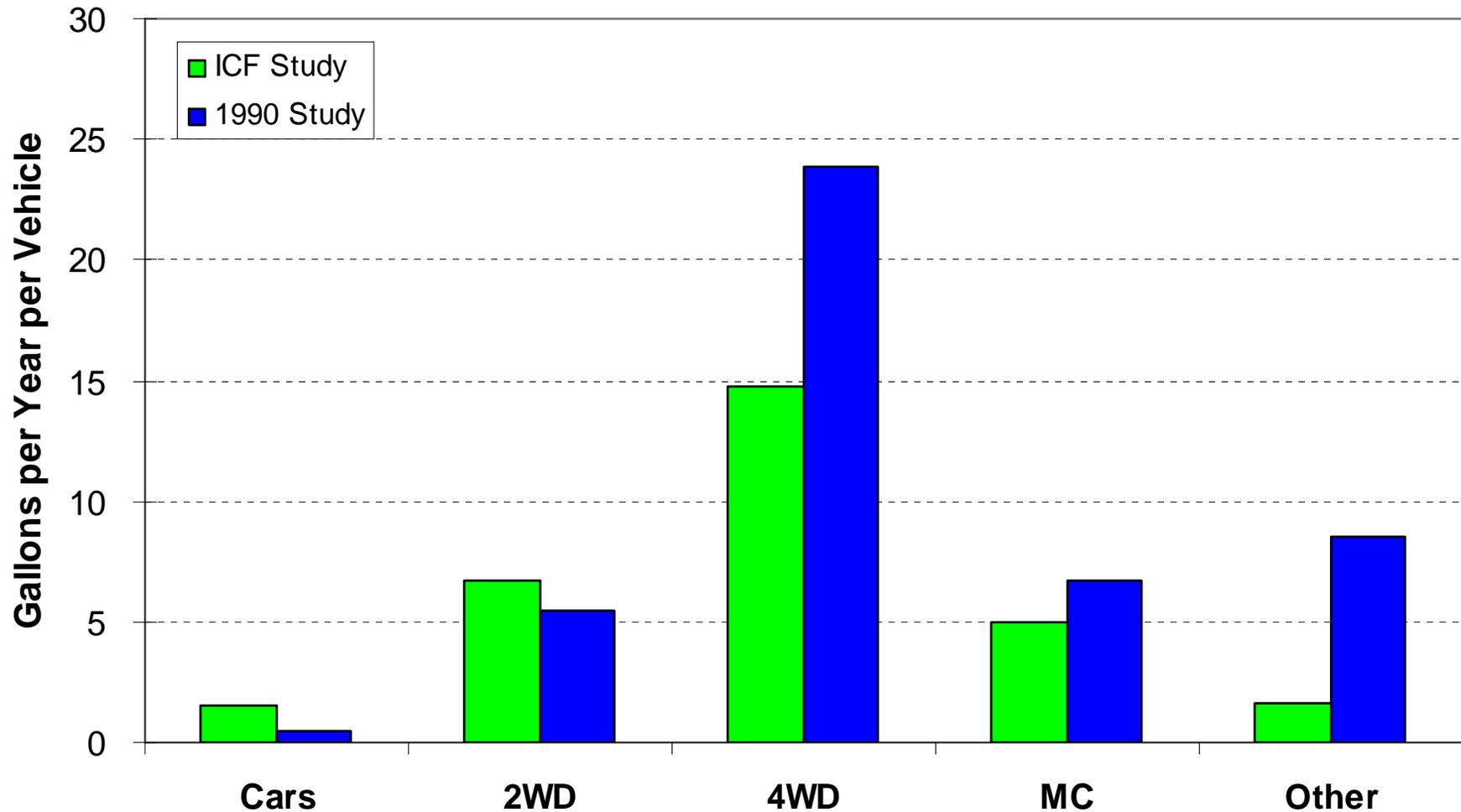
# Component 2 Survey

## Weighting Scheme

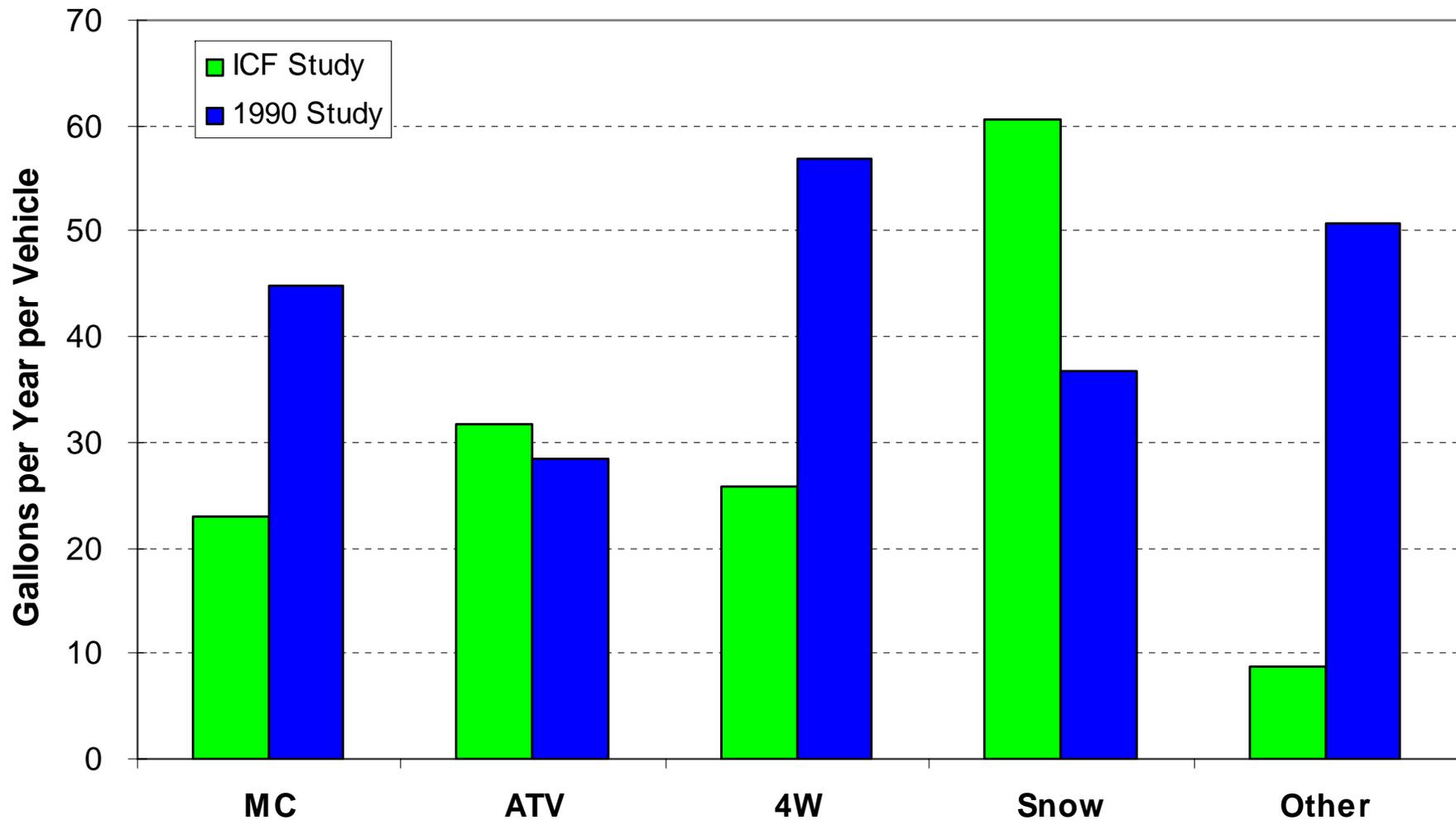
- ▶ Number of log books per wave per vehicle type counted for each county
- ▶ Weight determined as total vehicles per vehicle type per county divided by number of log books per wave per vehicle type per county
- ▶ For non registered NSL vehicles and Wave 1 vehicles, weighting based upon Component 1 weights

# Annual Fuel Use Rates

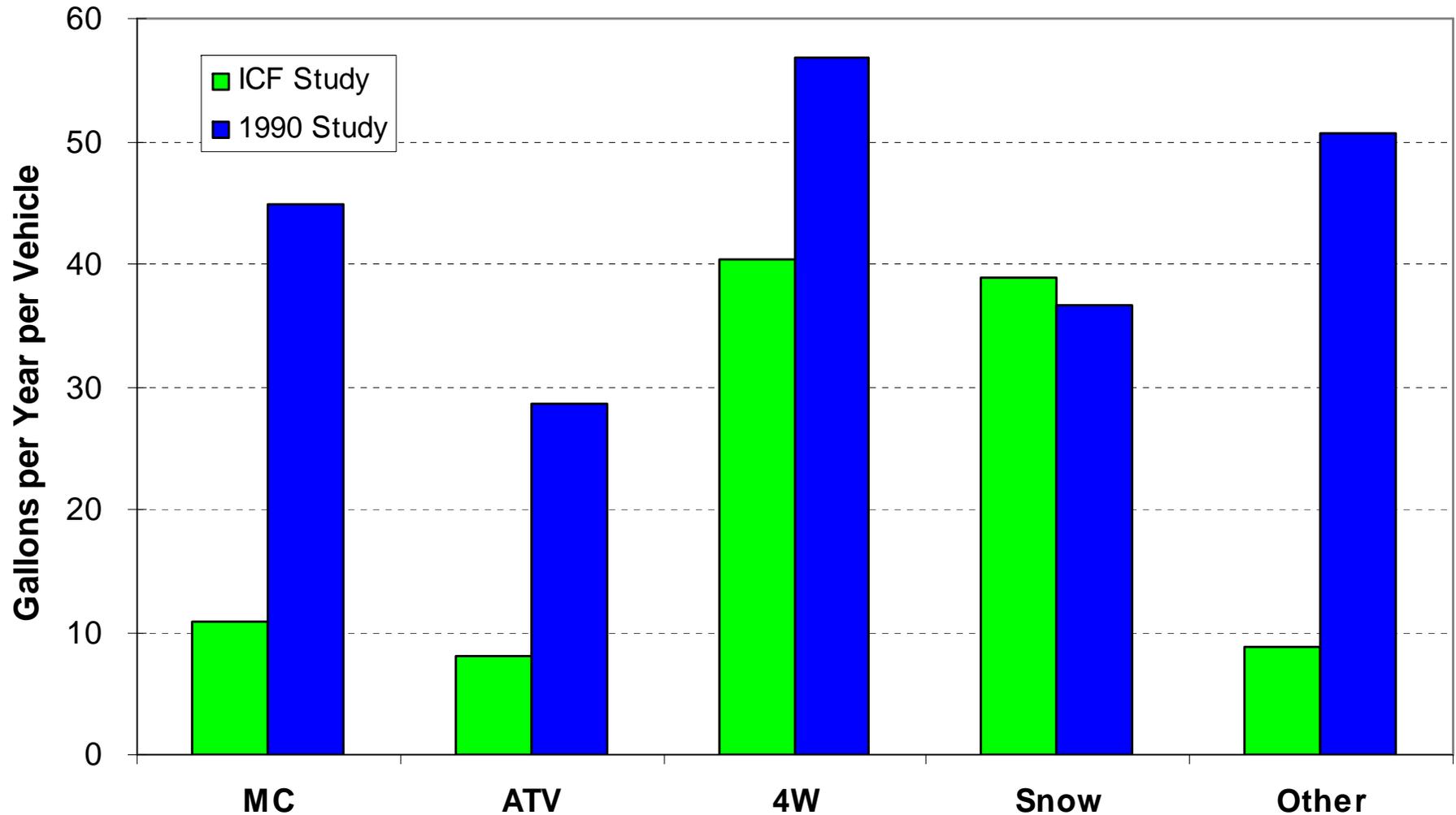
## Street Licensed Vehicles



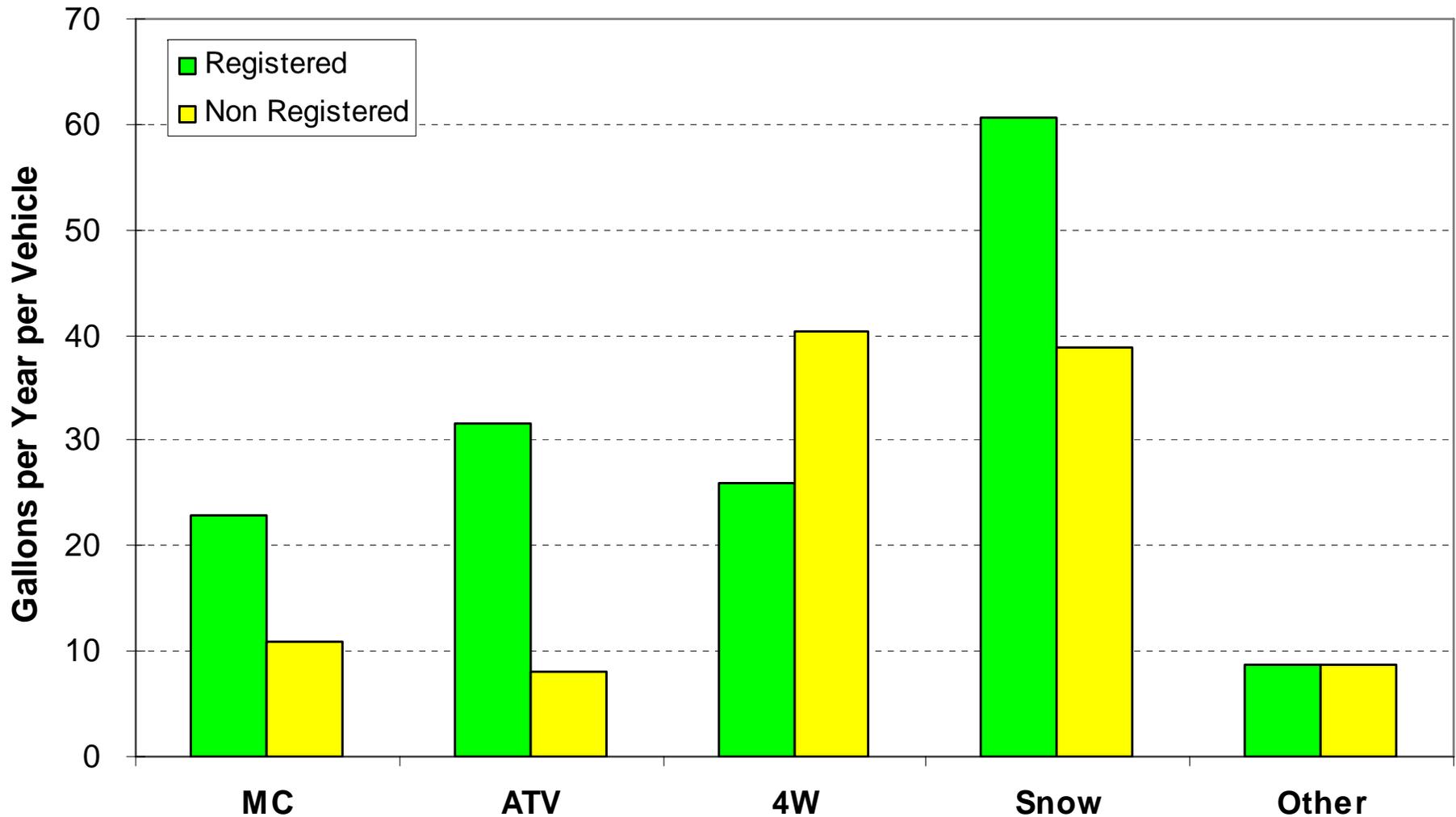
# Annual Fuel Use Rates Registered OHVs



# Annual Fuel Use Rates Unregistered OHVs



# Registered versus Non-Registered





# Top 8 Recreational Pursuits

(Annual Gallons used [Thousands])

Recreational Pursuit	SLV	OHV	Percent
Recreational Driving	60,873	21,239	54.4%
Camping	16,825	1,882	12.4%
Fishing	10,578	337	7.2%
Hiking/Jogging/Walking Pets	8,330	472	5.8%
Hunting/Target Practice	7,400	361	5.1%
Bicycling	3,459	656	2.7%
Skiing/Snowboarding	2,804	20	1.9%
Picnicking	2,573	230	1.9%
<b>Total of Top 8</b>	<b>112,842</b>	<b>25,197</b>	<b>91.4%</b>

## Top 10 Counties of Recreational Destinations (Annual Gallons used [Thousands])

County	SLV	OHV	Percent
Los Angeles	17,993	3,293	14.1%
San Bernardino	16,006	3,317	12.8%
Imperial	11,622	6,306	11.9%
Kern	13,164	1,792	9.9%
San Diego	8,910	617	6.3%
Tuolumne	8,043	505	5.7%
Riverside	5,025	1,313	4.2%
Humboldt	4,781	125	3.2%
El Dorado	3,154	1,368	3.0%
Tulare	4,099	152	2.8%
<b>Total of Top 10</b>	<b>92,797</b>	<b>18,789</b>	<b>73.4%</b>

# Non-Responder Study

- ▶ NuStats examined non-responders to a household travel survey and compared results against participants of the study
- ▶ In general
  - Non-responders to survey actually traveled less than responders
  - Non-responder trip length, trip purpose, and mode not statistically different from responders
  - Non-contacted households (screened calls) were not statistically different than refusers (refused to participate)
  - Non-contacted households tended to be younger, male and smaller households

- ▶ The ICF Study is a significant improvement over the 1990 study in methodology and sample size
- ▶ Both Studies represent a snapshot in time, although the newer study is closer to what is happening today
- ▶ The new study discovered several flaws in the existing tax transfer model
- ▶ Study indicates that Street-Licensed vehicles consume over 80% of recreational fuel in 2004
- ▶ Study indicates a significant reduction in non-registered vehicles since 1990