

**CALIFORNIA CLIMATE ACTION REGISTRY
CY 2007 EMISSIONS SUMMARY**

**PACIFIC SOUTHWEST REGION
PACIFIC SOUTHWEST RESEARCH STATION**

JUNE 2008

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EXECUTIVE SUMMARY

This greenhouse gas emission inventory was generated using data previously collected by National and Regional level databases. Mobile combustion emission sources from R5 fleet came from the Environmental Management Information System (EMIS) for fleet purchased under the Working Capital Fund. Additional mobile combustion data was available through the General Services Administration (GSA) for PSW fleet. Stationary combustion sources of natural gas, propane, and purchased electricity was provided by the National Finance Center. Data was then analyzed using California Climate Action Registry's (CCAR) General Reporting Protocol, Version 3.0 and the CCAR online calculator tool, CARROT. Equations and emission factors provided by the General Reporting Protocol were used to determine a carbon dioxide equivalent value, which is used to compare the potential climate impact by individual reporting units.

The majority of emissions from Region 5 originated from direct mobile sources (i.e. fleet) whereas indirect emissions from purchased electricity comprised the bulk of GHG emissions for PSW. Direct stationary emissions may greatly increase in future reporting years if purchase card data for propane fuel becomes available. It is estimated that over half of our propane purchases are obtained through the use of purchase cards.

Figure A: Summary of total GHG emissions

Total FS GHG emissions in California				
	Direct Mobile (MTCO ₂ e*)	Direct Stationary (MTCO ₂ e*)	Indirect Emissions (MTCO ₂ e*)	Total Emissions (MTCO ₂ e*)
Region 5	37,643	6,046	13,823	57,513
PSW	361	206	552	1,119
Total FS Emissions for California (MTCO₂e*)				58,632

* MTCO₂e: Metric tons of carbon dioxide equivalents. CO₂e is a measure for comparing carbon dioxide with other GHGs based on the global warming potential of each greenhouse gas. For specific factors, please see Appendix C, CCAR General Reporting Protocol v.3.0 April 2008.

While some data was available for reporting, the quality of this data for the purposes of greenhouse gas reporting can greatly be improved upon. Significant data collection is needed in the future to accurately represent our greenhouse gas emissions. More information on fuel obtained through purchase cards, the inclusion of non-highway fleet in our fleet databases, and detailed information on buildings and refrigeration units are examples of some data that is currently missing. This GHG emissions inventory report represents estimates of our non-biological operations for Forest Service operations in California based on our current best available data.

This was the first year of CCAR greenhouse gas reporting for R5 and PSW. Many data needs were identified through this process, and while these figures might not include all GHG emissions for R5 and PSW, it does provide a reference point of comparison with future inventory reports. Changes within the California Climate Action Registry's organization may also affect how GHG emissions are reported in upcoming years.

CCAR has announced that it will be focusing on a new program called the Climate Action Reserve. This program will develop an offset registry to allow members to inventory and purchase biological carbon offsets. CCAR has encouraged all members to join The Climate Registry, a North American scale greenhouse gas registry. However, the Forest Service will need to decide at a national level whether or not to partake in future GHG inventory endeavors with The Climate Registry due to its North American scale.

I. INTRODUCTION

In an effort to reduce greenhouse gas (GHG) emissions, Region 5 and PSW joined the California Climate Action Registry (CCAR) as a reporting member in 2007. CCAR was established by the California State Legislature in 2000, and now exists as a private, non-profit organization that houses a voluntary greenhouse gas (GHG) inventory. It provides membership to businesses, non-profit organizations, municipalities, agencies, and other entities with operations in California. CCAR enables members to both establish greenhouse gas (GHG) emissions baselines, and track current and future emissions, in an effort to reduce overall GHG emissions.

By joining CCAR, we have committed to reporting all non-biological GHG emissions from Forest Service operations within California. Activities will be reported annually by calendar year, starting with 2007. By quantifying and registering our greenhouse gas emissions with California Climate Action Registry (CCAR), we can track our progress in mitigating the agency's impact on climate change.

Region 5 and PSW will report only non-biological greenhouse gas emissions from operations in the first phase of membership with CCAR. Examples of emissions are:

- Direct emissions such as fleet of vehicles
- Indirect emissions from energy used in our facilities including electricity, natural gas, and propane

Results from CCAR reporting will be applied to EPA Climate Leaders, another voluntary GHG inventory that the Forest Service is participating in. PSW and R5 serve as one of several case studies for the inaugural year of reporting 2007 emissions for EPA Climate Leaders.

II. REPORTING REQUIREMENTS

CCAR requires reporting only carbon dioxide emissions in the first year of reporting while EPA Climate Leaders, requires all six greenhouse gases to be reported. Because our results are being applied to both registries, all greenhouse gases were included in the first year of reporting. There are six major greenhouse gases: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆). Fossil fuel combustion data was collected to calculate an overall carbon dioxide equivalent (CO₂e) amount. Carbon dioxide equivalent (CO₂e) is a useful measure for comparing carbon dioxide with other GHGs which often have higher global warming potentials. It is calculated by multiplying the metric tons of a gas by the appropriate global warming potential factor¹.

Geographic Scope

Region 5 and PSW are reporting only GHG emissions from California. Thus, emissions from the Institute of Pacific Forestry in Hilo, Hawaii are not included even though it is within the PSW organization.

¹ Appendix C, California Climate Action Registry General Reporting Protocol v. 3.0 April 2008

Organizational Boundaries

The types of emissions reported to CCAR are determined first by defining the organizational boundary of an entity. R5 and PSW have defined its organizational boundary as management operational control, where 100% of emissions will be reported for operations and facilities that are controlled by the agency. While leased facilities and vehicles are included in this report, other sources of emissions such as work performed by contractors are not included.

This inventory does not include activities from public visitors, concessionaires, and contractors operating on National Forest land, as well as permitted facilities such as oil and gas operations, as well as ski resorts. This inventory also excludes prescribed fire and wild fire suppression activities.

II.A. TYPES OF EMISSIONS

Direct Emissions

Direct emissions include emissions that are controlled or owned by R5 and PSW. We are required to report all direct emissions that originate from the following:

- Mobile combustion sources such as owned or leased vehicles, airplanes, boats, heavy equipment;
- Stationary combustion sources used for production of electricity, steam, or district heating and cooling. Includes sources such as diesel generators or propane use;
- Process emissions from manufacturing; and
- Fugitive sources including leaks of HFCs from air conditioning systems.

Indirect Emissions

Indirect emissions are produced by sources owned or controlled by another entity. Required indirect emissions include purchased electricity, steam, and district heating or cooling.

Optional Reporting

Members are also encouraged to report indirect GHG emissions from sources such as employee commuting, business travel, and off-site waste removal. While these sources are not included in our initial inventory, including them will produce a more complete report of our GHG emissions.

II.b. THIRD PARTY VERIFICATION

CCAR requires that all emission reports are to be verified by a third-party certifier. Furthermore, emission results will only become publicly available if an entity passes certification. While entities are required to undergo the verification process, new members have three years to successfully pass verification. Costs associated with verification can be significant given the number of reporting units in R5 and PSW alone. Given the high cost of verification while knowing that our data availability and quality can be greatly improved upon, R5 and PSW have decided to forgo the verification process for our initial year of reporting.

III. RESULTS AND DATA DISCUSSION

The bulk of GHG emissions for R5 are a result of direct mobile emissions (65%), while the main source of GHG emissions for PSW are from indirect electricity emissions (49%). Direct stationary emissions, mostly from propane use, comprise the smallest fraction of GHG emissions for both R5 and PSW, 11% and 18% respectively.

Figure A.1. Graph GHG emissions by R5

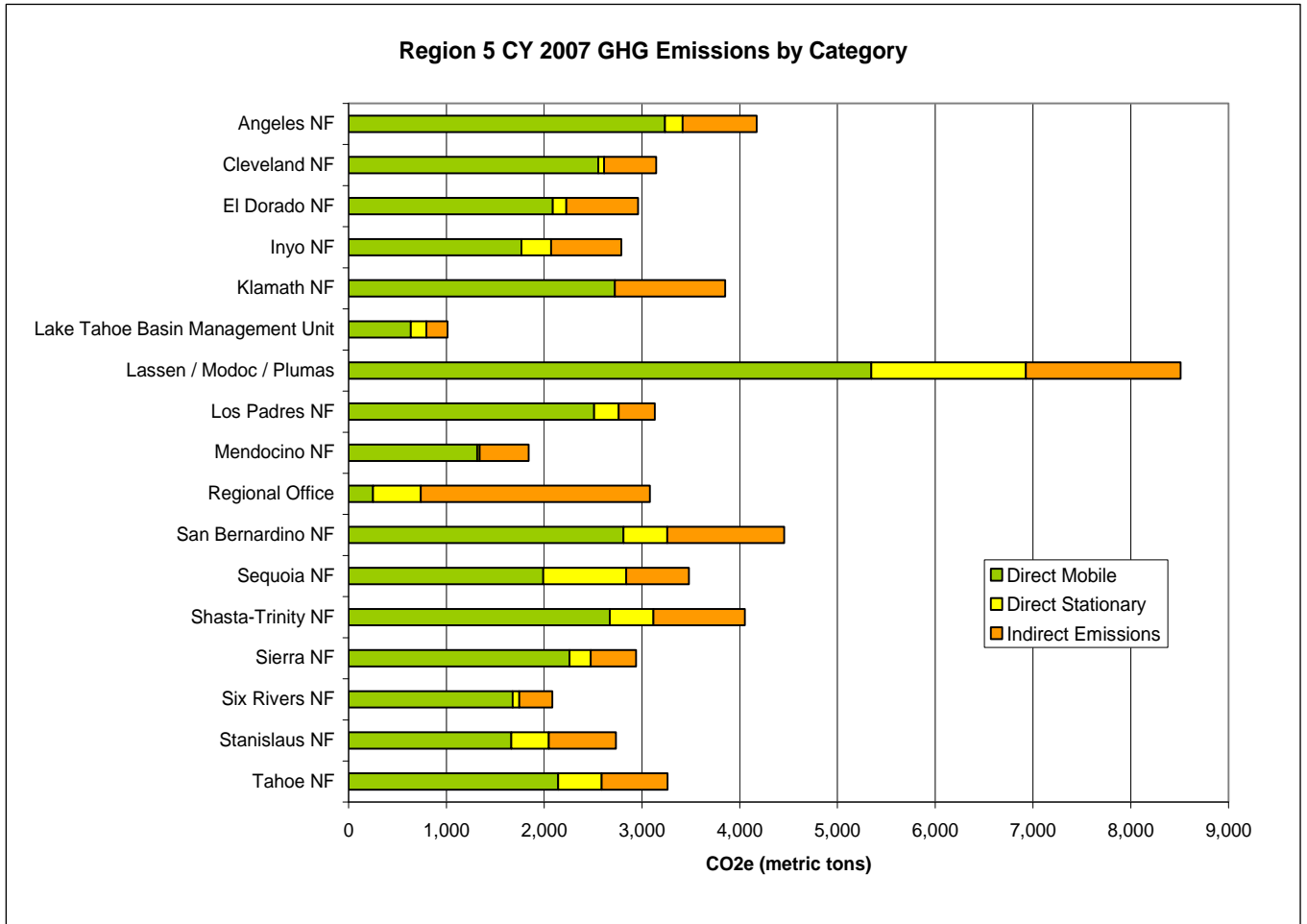
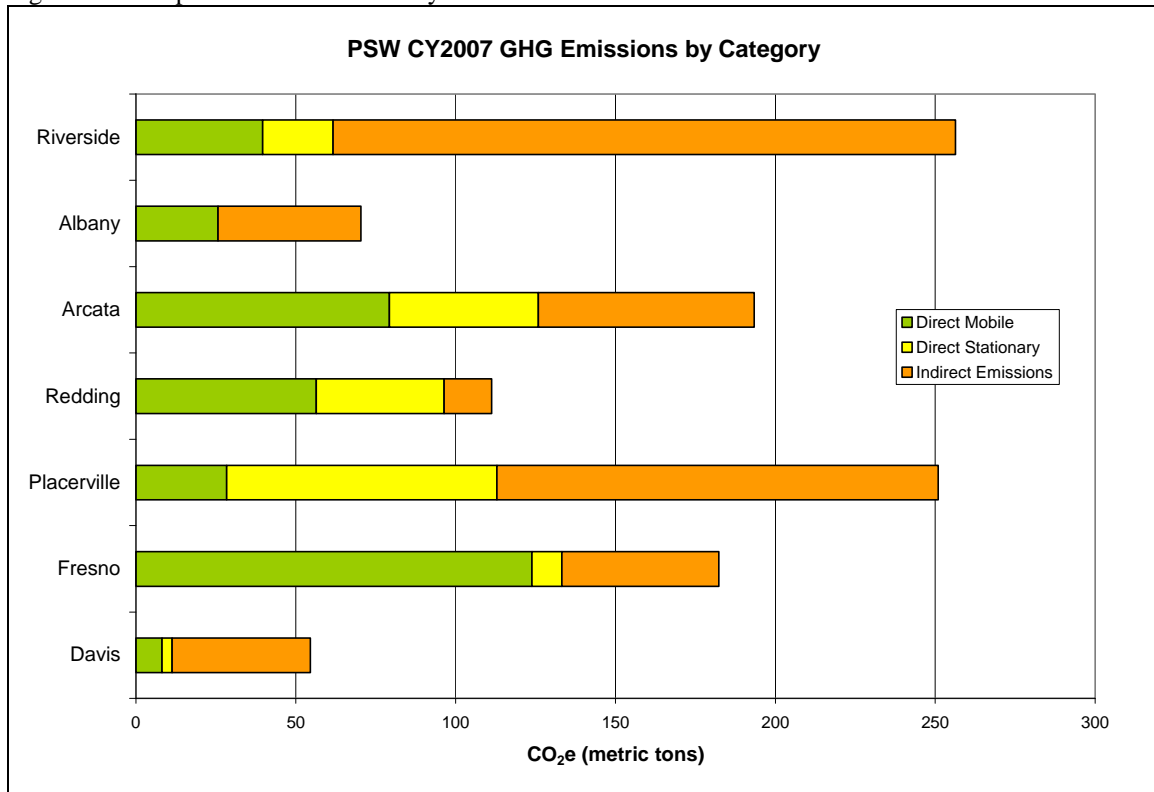


Figure A.2. Graph of GHG emissions by PSW



Our greenhouse gas emissions as a whole in California for one year is roughly the same amount of carbon dioxide emissions from 136,333 barrels of oil consumed² and some 6,654,143 gallons of gasoline consumed.³ If we were to offset our GHG emissions, it would take roughly 1,503,154 urban tree seedlings to be grown for 10 years to sequester the same amount of GHG emissions emitted in one year of our operations.⁴

² Assuming 0.43 metric tons CO₂/barrel. EPA (2007). [Inventory of U.S. Greenhouse Gas Emissions and Sinks: Fast Facts 1990-2005. Conversion Factors to Energy Units \(Heat Equivalents\) Heat Contents and Carbon Content Coefficients of Various Fuel Types. U.S. Environmental Protection Agency, Washington, DC. USEPA #430-R-07-002 \(PDF\)](#) (2 pp, 216K, [About PDF](#)).

³ Assuming 8.81×10^{-3} metric tons CO₂/gallon. EPA (2007). [Inventory of U.S. Greenhouse Gas Emissions and Sinks: Fast Facts 1990-2005. Conversion Factors to Energy Units \(Heat Equivalents\) Heat Contents and Carbon Content Coefficients of Various Fuel Types. U.S. Environmental Protection Agency, Washington, DC. USEPA #430-R-07-002 \(PDF\)](#) (2 pp, 216K, [About PDF](#)).

⁴ Assuming 0.039 metric ton CO₂ per urban tree planted. U.S. DOE (1998). Method for Calculating Carbon Sequestration by Trees in Urban and Suburban Settings. Voluntary Reporting of Greenhouse Gases, U.S. Department of Energy, Energy Information Administration.

Figure B.1. GHG emission values by reporting unit and emission type

Forest Service GHG emissions in California for CY2007			
	Direct Mobile (MTCO₂e)	Direct Stationary (MTCO₂e)	Indirect Emissions (MTCO₂e)
Region 5			
Tahoe NF	2,142	447	672
Stanislaus NF	1,664	383	687
Six Rivers NF	1,679	66	340
Sierra NF	2,260	215	465
Shasta-Trinity NF	2,672	445	936
Sequoia NF	1,990	849	642
San Bernardino NF	2,811	449	1,197
Regional Office	248	492	2,342
Mendocino NF	1,316	24	502
Los Padres NF	2,510	253	369
Lassen / Modoc / Plumas	5,345	1,582	1,582
Lake Tahoe Basin Management Unit	637	159	217
Klamath NF	2,723	0	1,130
Inyo NF	1,767	303	719
El Dorado NF	2,088	139	734
Cleveland NF	2,553	61	532
Angeles NF	3,237	179	758
R5 Totals	37,643	6,046	13,823
PSW			
Davis	8	3	43
Fresno	124	9	49
Placerville	28	85	138
Redding	56	40	15
Arcata	79	47	68
Albany	26	0	45
Riverside	40	22	195
PSW Totals	361	206	552
California Sub-Totals	38,004	6,252	14,375
Total Emissions (MTCO₂e)	58,632		

A portion of the data needed for the GHG inventory is currently available at the regional or national level. However, the data available was primarily collected for accounting and recordkeeping purposes and do not provide the most accurate measure of estimating greenhouse gases. Figures reported in the GHG inventory are estimates based on the best available data.

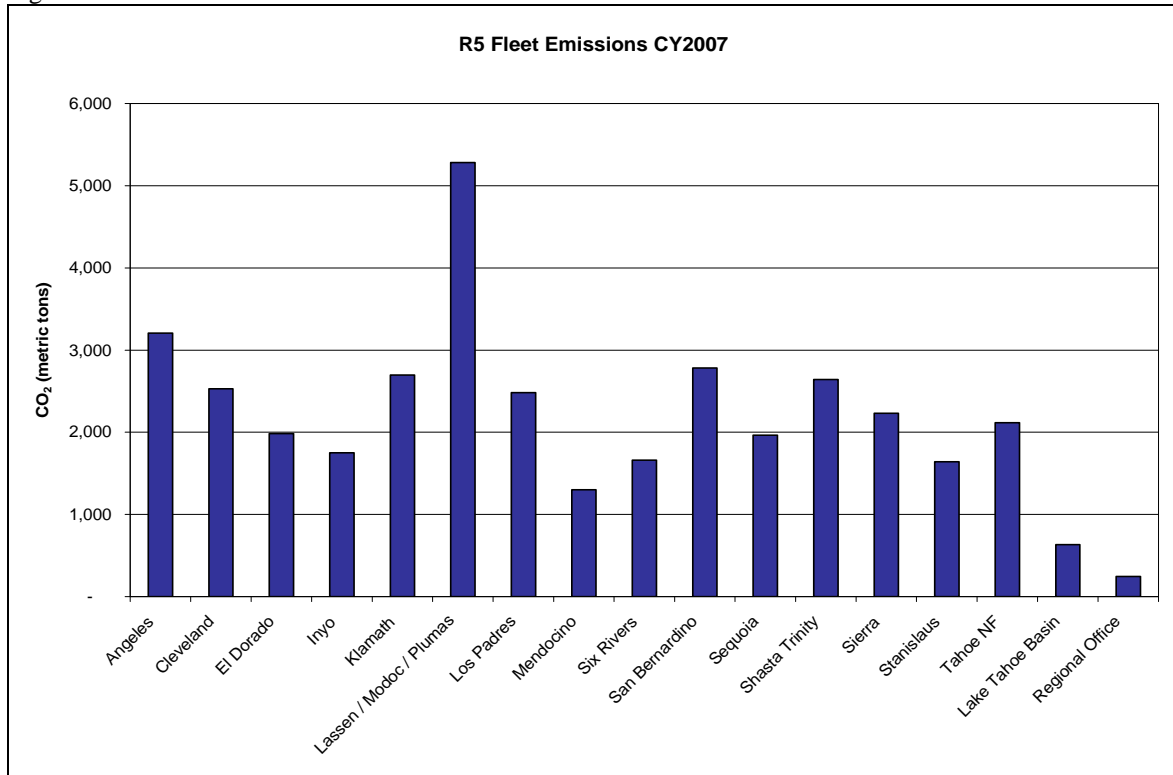
III.A. DIRECT EMISSIONS

Mobile Combustion: Fleet

Vehicles are used across the agency to accomplish our mission. We have over 5,590 highway and non-highway vehicles combined in R5 and PSW. In R5 alone, over 4,052,174 estimated gallons of fuel were used in CY2007⁵. This is an 11% increase from FY2004, where 3,649,667 gallons of fuel were consumed in the region.⁶

R5 and PSW emitted a total of 38,004 MTCO₂e in greenhouse gas emissions. This is roughly the same amount of emissions as burning 198 railcars of coal.⁷ Figure B.2 and B.3 show GHG emissions measured in carbon dioxide equivalent (metric tons) by forest and research station.

Figure B.2. Mobile combustion GHG emissions from fleet in R5

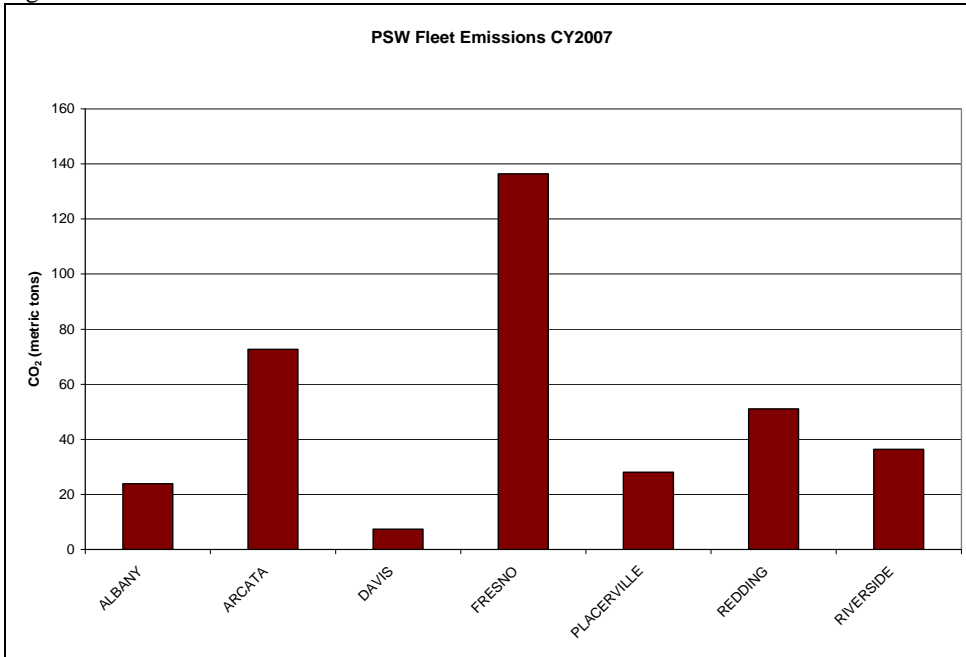


⁵ Calculated by dividing total miles driven by EPA MPG standards.

⁶ Data derived from R5 & PSW Environmental Footprint Report FY04 - "Increasing Sustainable Operations in the Forest Service Pacific Southwest: Reducing Our Environmental Footprint"
http://fsweb.psw.fs.fed.us/Sust_Ops-Env_Ftprnt_in_the_FS_Pac_SW_Dec_06.pdf

⁷ EPA Greenhouse Gas Efficiency Calculator: <http://www.epa.gov/solar/energy-resources/calculator.html>
Assuming the amount of coal in an average railcar was 100.19 short tons, or 90.89 metric tons.

Figure B.3. Mobile combustion GHG emissions from fleet for PSW



Fleet Data Sources

Data needed to determine direct mobile emissions include the amount and type of fuel used, vehicle type, model year, and the gross vehicle weight rating. Emission factors for carbon dioxide, methane, and nitrous oxide are selected for the appropriate make and model year of the vehicle.⁸

The majority of R5 mobile GHG emissions can be tracked by using data from the Equipment Management Information System (EMIS). While EMIS does not track the amount of fuel consumed, it does provide odometer readings of total miles driven. From this information, we can estimate the amount of fuel consumed per vehicle by using EPA mpg standards.

PSW vehicles are leased through the General Service Administration (GSA) and are thus not tracked by EMIS. GSA was able to provide information on odometer readings and the type of fuel used for each vehicle. The amount of fuel consumed by PSW was estimated from this information and used to calculate GHG emissions.

This inventory does not include emissions from non-highway fleet, use of personal occupancy vehicles, airline and car rental use while on travel status, or employee commuting. Further discussion on data availability and completeness follows in Section III.C.

⁸ See Appendix C of California Climate Action Registry GRP 3.0 for specific emission factors.

III.B. INDIRECT EMISSIONS AND STATIONARY COMBUSTION

Facilities Results and Data Sources

Purchased electricity represented all indirect emissions in this inventory while stationary combustion mostly comprised of propane, liquefied propane gas (LPG), and natural gas. Since FY2004⁹, there has only been a 1% increase in the consumption of electricity. Natural gas consumption has increased by 37% while propane has increased by a staggering 997%. This significant change could reflect a movement away from obtaining fuel through purchase cards, or may be due to data entry errors as discussed in the following section.

Figure C.1 – Indirect emissions and stationary combustion: Energy Consumption

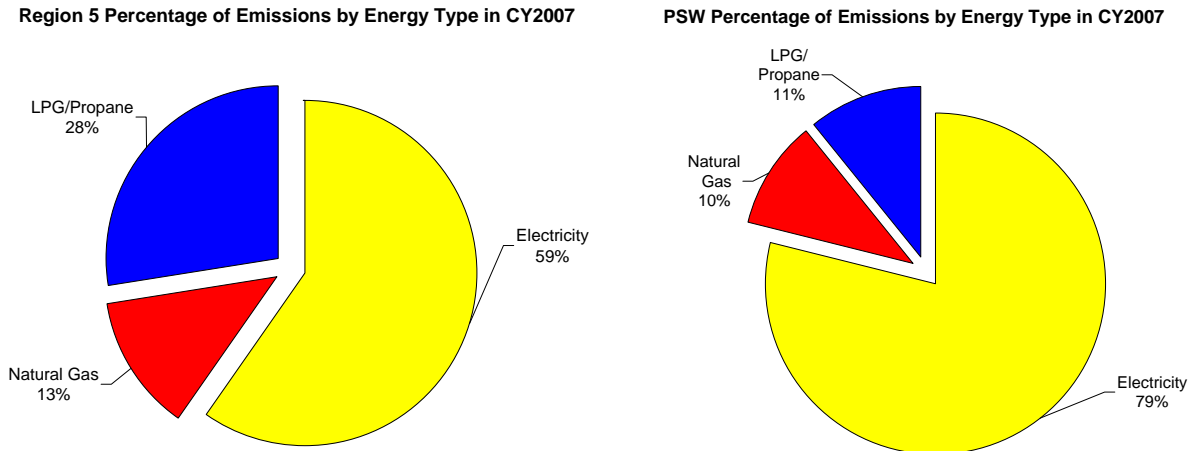
R5/PSW Energy Portfolio			
CY 2007	Consumption	Cost	Emissions (MTCO₂e)
Electricity (kWh)	27,623,393	\$ 3,716,293	19,016
R5	25,940,586	\$ 3,470,951	18,244
PSW	1,682,807	\$ 245,342	772
Natural Gas (Thous. Cubic Ft.)	37,109	\$ 399,573	3,959
R5	35,260	\$ 379,180	3,858
PSW	1,849	\$ 20,393	101
Propane (gallons)	722,984	\$ 740,586	8,498
R5	705,212	\$ 722,459	8,392
PSW	17,772	\$ 18,127	106
Grand Total:		\$ 9,712,904	62,946

Values in Figure C.1 do not reflect energy obtained through purchase cards, nor do they account for leased space. Electricity used within leased facilities was estimated by using building square footage as a proxy¹⁰, and were incorporated into the total GHG emission numbers in Figure A. All other electricity data was provided by the National Finance Center (NFC). From Figure C.2, we can see that building electricity use is the dominant source of GHG emissions for indirect and stationary combustion. Propane comprises a greater percentage (28%) at R5 than at PSW (11%). Further discussion on the quality of energy data follows in Section III.C.

⁹ R5 and PSW Environmental Footprint Report FY2004: “Increasing Sustainable Operations in the Forest Service Pacific Southwest: Reducing Our Environmental Footprint”
http://fsweb.psw.fs.fed.us/Sust_Ops-Env_Ftprnt_in_the_FS_Pac_SW_Dec_06.pdf

¹⁰ Appendix C: California Climate Action Registry General Reporting Protocol v. 3.0 April 2008.

Figure C.2. Comparison of energy use by fuel type for R5 and PSW



III.C. DATA INTEGRITY AND COMPLETENESS

Direct Mobile Combustion Data

Although EMIS is one of the more comprehensive datasets we have available, EMIS only includes vehicles purchased through the Working Capital Fund. Therefore, all vehicles purchased with project dollars are not accounted for in this inventory. This database also does not include employee use of personal occupancy vehicles while on official status or corporate leases. Most of the non-highway fleet including ATVs, snowmobiles, boats, planes, riding mowers, and other heavy FS equipment are also missing from this dataset. Furthermore, fuel used in hand held equipment such as chainsaws, mowers, and drip torches are also unavailable at this time.

An additional source of fleet data is available through the PCMS/Voyager system. This dataset shows all fuel purchases (gas, diesel, marine, aviation) charged to any Voyager card in the system. However, bulk fuel and GSA vehicle fuel consumption is not included. Unfortunately, the PCMS/Voyager dataset has been compromised for FY06 & FY07. Fuel quantities were reported at 10,000 times higher than actual amounts in the two fiscal years. The specific time frame of the discrepancy has not yet been determined. As a result, fuel purchase amounts were divided by an average fuel price to calculate fuel consumption quantities. Fuel prices fluctuate regularly, causing large discrepancies in calculated fuel quantities. Subsequently, only EMIS was used to estimate GHG emissions for fleet within R5.

Fleet Data Recommendation

Improving upon the PCMS/Voyager dataset has the potential to provide more accurate GHG emissions reports, as this dataset can track the actual amount of fuel purchased. Methods of data collection, coding, and storage currently vary by region for EMIS. EMIS systems would also need to be standardized across the agency if we report our emissions on a national level. If PCMS/Voyager and EMIS were linked together, one could know the actual amount of fuel used, miles driven, and money spent in operating a vehicle instead of relying on estimates. In addition, these data collection systems would need to include both vehicles purchased through project dollars and non-highway fleet to more accurately reflect our greenhouse gas emissions.

Reporting data for flights and vehicular use while on travel status is considered optional reporting. However, many employees regularly partake in travel while on official status. Many employees also use POVs for official business, which is currently not recorded under EMIS or PCMS/Voyager. Including these sources of GHG emissions will produce a much more accurate inventory of our operations.

Energy Emissions Data Description

Forest Service energy data is currently collected as utility bills sent directly to the National Finance Center (NFC). This poses significant challenges for emissions reporting for several reasons including data entry errors and the inability for forest units to track their energy consumption. McNeil Technologies was contracted to create an Energy Baseline Report for FY 2003 for the Forest Service agency-wide. Consultants discovered large data abnormalities in NFC electricity data while constructing the baseline. After completing a unit cost analysis of the NFC electricity data, they found that fuel prices were much lower than national averages. Their findings are as follows:

- Natural Gas 83% below national average of \$8.29 per thousand cubic foot¹¹
- Fuel Oil 35% below national average of \$1.355 per gallon¹²
- LPG/Propane 11% below national average of \$1.274 per gallon¹³
- Electricity 6% below national average of \$0.0872 per kilowatt-hour¹⁴

It was determined that the most likely cause of these abnormalities can be attributed to manual data entry errors at NFC. Utility bills are manually entered into the NFC database instead of through automated electronic transmission. This process can introduce

¹¹ EIA, *Natural Gas Annual 2003*, Table 23, Average Price of Natural Gas by State and Sector, 2003, commercial sector.

¹² EIA, *June 2007 Monthly Energy Review*, Table 9.8c, No. 2 Distillate Prices to Residences: Selected States and U.S. Average.

¹³ EIA, Petroleum Navigator Website, <http://tonto.eia.doe.gov/dnav/pet/hist/d900100002A.htm>.

¹⁴ EIA, *Electric Power Annual 2005 - State Data Tables Website*, 1990 - 2005 Average Price by State by Provider (EIA-861) http://www.eia.doe.gov/cneaf/electricity/epa/average_price_state.xls

significant errors in the database. Furthermore, McNeil technologies discovered confusion over commodity units, such as billing in hundreds of cubic feet (CCF), instead of thousands of cubic feet (MCF), or therms (100,000 Btu). For our reporting purposes, data was corrected for by creating an acceptable range of prices for each energy type. Each transaction was analyzed and anomalies were corrected using average state fuel prices for electricity, natural gas, and propane when the calculated unit costs fell outside of the following ranges¹⁵:

- Electricity, between \$0.05 & \$0.25 per kilowatt-hour
- Fuel oil and propane, between \$1.00 & \$3.00 per gallon
- Natural gas, between \$3.50 & \$15.00 per thousand cubic feet

In the FY2003 energy report, McNeil Technologies found that 61% of Forest Service energy data cannot be allocated to a specific unit. Most of this discrepancy lies with propane and fuel oil obtained through purchase cards. Purchased cards have been used to acquire fuels such as propane and fuel oil in addition to utility purchased energy. While individual transactions are recorded, it is not systematically traced back to the unit that made the purchase, nor is the quantity of the purchased fuel available. Since more than half of propane, and the majority of fuel oil and coal were obtained through purchase cards (see Figure D.1), we are severely limited in our analysis for these types of energy use.

Figure D.1: Exhibit 3 from FY2003 Energy Baseline¹⁶

Forest Service Energy Cost, FY 2003			
	Revised NFC Data	Purchase Card Data	Total
Electricity	\$ 22,991,284	\$ 14,233,144	\$ 37,224,428
Fuel Oil	\$ 450,572	\$ 1,416,621	\$ 1,867,193
Natural Gas	\$ 2,104,992	\$ 846,151	\$ 2,951,143
LPG / Propane	\$ 3,178,292	\$ 3,742,901	\$ 6,921,193
Coal	\$ 735	\$ 65,528	\$ 66,263
Facility Energy Total	\$ 28,725,875	\$ 7,494,349	\$ 36,220,224
Percentages	79%	21%	

An analysis of existing NFC data also shows that many facilities that are known to use propane have charges listed under natural gas instead of propane. In addition, the same facilities show no spending associated with propane under the current database while most units do regularly purchase propane.

Lastly, all data reported to NFC is only for FS owned facilities. Buildings that are leased by R5 and PSW often have energy paid through the facility owner, and are not reported to NFC. For Region 5, 1.6% of its 7,698 buildings are leased, whereas 8.3% of PSW's buildings are leased or occupied under a memorandum of understanding. For PSW, leased buildings comprise 14.8% of PSW's square footage. We can only estimate the

¹⁵ The range was determined by the range of prices paid by commercial customers across the states as reported by the Energy Information Administration. <http://www.eia.doe.gov/cneaf/electricity/page/>

¹⁶ FY 2003: Energy & Environmental Footprint for U.S. Forest Service Facilities, McNeil Technologies

amount of energy consumed by using square footage as a proxy, but this may significantly under-represent actual energy use.

Stationary Combustion: Generators

Generators are often used at fire camps to provide electricity in remote locations. Although fire suppression activities were not included for the first year of reporting, including this source of emissions is important for future inventories. However, there is currently no comprehensive database of all fuel used in generators. These generators sometimes run on diesel from existing fuel tanks, or use fuel provided by vendors. However, separating how much fuel went to mobile combustion through fire engines and other vehicles vs. the amount of fuel used for electricity generation is unknown. In addition, multiple agencies often work together in fire suppression events. Data on how much fuel is going to specific agency vehicles or generators is not currently collected.

A summary table (Figure E.1) shows current data needs for creating a GHG gas inventory as well as indicate if further data collection is needed.

Indirect and Direct Emissions Data Recommendations

Perhaps the single most important step to improving our data accuracy for indirect emissions is to address human error introduced by hand-entering electricity bills at NFC. Creating an automatic feeder system that captures electricity bills electronically will greatly improve the quality of the data. Another potential improvement would be to modify our purchase card datasets to efficiently and automatically track units of propane obtained, and where these purchases originated from. Lastly, creating a standardized dataset fuel used for generators across regions and stations will provide data to report emissions from direct stationary combustion.

Figure E.1 – Summary table of data requirements and availability

CCAR Reporting Data Needs					
	Type of Emissions	Data needed	Data Available	Additional Data Collection?	Additional Information
Fleet (Gasoline and Diesel)	Mobile	Amount and type of fuel used, vehicle type, and model year. Gross vehicle weight rating. If amount of fuel used is unavailable, can use miles driven as a proxy.	Yes - EMIS and Voyager Cards	No	Fleet data uses odometer readings and average EPA gas mileage to estimate amount of fuel used. EPA averages don't account for off-road driving. Methodology for calculating MPG have changed for vehicle models 2008, which results in lower MPG across the board. This is important to consider when comparing across years. In addition, EPA MPG ratings assume 55% city driving, 45% highway driving, FS vehicles typically do not follow this pattern. Major discrepancy between EMIS and Voyager systems,
Electricity Use	Stationary	Units of energy consumed. If unavailable, can use cost as a proxy.	Partial	Yes	Electricity use is captured through utility bills in the NFC database. There are significant data entry errors in this, and serves as a poor proxy for units of energy used. In addition, leased facilities are not included in NFC. Square footage is used to estimate the amount of electricity used.
Propane	Stationary	Units consumed, stored	Partial	Yes	Missing propane obtained through purchase cards. NFC data shows most units as not buying propane, while most units use propane. Can obtain vendor information through purchase card data, but data only shows individual transactions. Would need to track down each individual purchase card holder and ask them what and how much they purchased.
Natural Gas	Stationary	Units consumed	Partial	Yes	A lot of propane in NFC dataset seems to be incorrectly coded as natural gas. Also sometimes inputted as the wrong unit of measurement.
Generators - Gasoline and Diesel	Stationary	Amount and type of fuel used	Partial	Yes	Fuel tank issue - cannot separate out what fuel was used for mobile vs. stationary combustion for bulk fuel.
Heating Oil	Stationary	Amount consumed	Partial	Yes	NFC data available, but no data available for purchase cards
Non-highway fleet (atvs, snomobiles, planes, boats, etc)	Mobile	Amount and type of fuel used, vehicle type, and model year. If unavailable, can substitute hours of operation	No	Yes	Fuel obtained may be through purchase cards, or filled up at the FS unit fuel tank. No bulk fuel tank records, and cannot decipher between how much fuel was used for highway vs. non-highway vehicles.
Fuel Tank	Both	Amount and type of fuel stored, in addition to initial and ending amount stored in the calendar year.	No	Yes	Fuel tanks are present at most FS units. However, type of use is not currently logged in a standardized manner on all forests. Also want to avoid double counting amount of fuel used with miles driven under EMIS.
Project dollar vehicles, tanks, equipment, generators	Both	Amount and type of fuel consumed, equipment type, hours of operation, model year, GVWR if applicable	No	Yes	Requires field level collection. Not currently captured under existing systems
HVAC and refrigerator	Stationary	Type and quantify of units, total refrigerant charge, annual leak rates, types of refrigerant	No	Yes	Requires field level collection. INRA has the capability to capture this information, but this information is not currently reported.
Hand held tools including chainsaw, burn mix, portable water pumps, etc.	Stationary	Type of equipment, actual fuel consumption or hours of operation	No	Yes	Field data call required.
Fire Camp Fuel Use	Stationary	Type of equipment, actual fuel consumption or hours of operation	No	Yes	Potential problem in dividing how much fuel was used by agency, and type of fuel use.

IV. FUTURE CONSIDERATIONS

Inventorying our greenhouse gases has revealed that our largest source of emissions comes directly from fleet. Sustainable Operations efforts in the agency may want to focus on this source to achieve the most reductions in our GHG emissions. Initiatives such as vehicle-sharing and purchasing more fuel efficient vehicles have already begun at some FS units.

As Figure E.1 shows, almost all types of emissions are lacking the necessary information to accurately report GHG emissions. Additional data collection will need to be integrated at the field, regional, and national levels. Given our multiple energy reporting requirements such as the Energy Policy Act of 2005 and Executive Order 13423, creating a national level, automated data collection system designed for collecting GHG emissions and energy data would greatly benefit the agency. This effort would be most effective if coordinated at the national level to ensure that data collection systems are standardized across the agency.

California Climate Action Registry transition to The Climate Registry

CCAR has recently announced to its members that they are shifting their focus as a GHG registry to a new program called the Climate Action Reserve (the Reserve). The Reserve aims to develop voluntary project-level emissions reduction registry, essentially creating an offset registry in anticipation of a cap and trade system.

CCAR has been actively supporting the development of The Climate Registry (TCR). TCR is a collaboration of state, province, and tribal members in North America with a mission to standardize and centralize GHG data collection into a North American GHG Registry. As a result, CCAR is encouraging their members to shift their GHG footprint reporting from CCAR to TCR within 1 to 3 years. All historical data reported to CCAR will be transferable to TCR. However, R5 and PSW can no longer focus on California only emissions, as TCR's minimum reporting requirement is for all North American GHG emissions. Thus, R5 and PSW can no longer serve as an individual reporter; TCR requires a FS agency-wide commitment. The decision on whether or not to join TCR needs to be made at the national level.

APPENDIX A: CCAR GHG Emissions Reports by Forest and Lab

Angeles National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	3,236.73	3,206.55	0.09	0.09	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	179.09	176.32	0.01	0.01	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	3,415.82	3,382.88	0.10	0.10	0.00	0.00	0.00	0.00 metric ton

* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.

Indirect Emissions	CO2e	CO2	CH4	N2O	Unit
Purchased Electricity	758.40	757.29	0.01	0.00	metric ton
Purchased Steam	0.00	0.00	0.00	0.00	-
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-
TOTAL INDIRECT	758.40	757.29	0.01	0.00	metric ton

Cleveland National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	2,553.42	2,528.41	0.07	0.08	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	60.86	59.77	0.00	0.00	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	2,614.29	2,588.18	0.07	0.08	0.00	0.00	0.00	0.00 metric ton

* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.

Indirect Emissions	CO2e	CO2	CH4	N2O	Unit
Purchased Electricity	531.91	531.20	0.00	0.00	metric ton
Purchased Steam	0.00	0.00	0.00	0.00	-
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-
TOTAL INDIRECT	531.91	531.20	0.00	0.00	metric ton

EI Dorado National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	2,008.04	1,983.35	0.08	0.07	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	138.71	135.89	0.00	0.01	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	2,146.75	2,119.24	0.08	0.08	0.00	0.00	0.00	0.00 metric ton

* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.

Indirect Emissions	CO2e	CO2	CH4	N2O	Unit
Purchased Electricity	733.74	732.67	0.01	0.00	metric ton
Purchased Steam	0.00	0.00	0.00	0.00	-
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-
TOTAL INDIRECT	733.74	732.67	0.01	0.00	metric ton

Inyo National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	1,766.90	1,751.07	0.15	0.04	0.00	0.00	0.00	metric ton
Stationary Combustion	302.74	296.36	0.00	0.02	0.00	0.00	0.00	metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	2,069.64	2,047.43	0.16	0.06	0.00	0.00	0.00	metric ton
* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	719.12	718.07	0.01	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	719.12	718.07	0.01	0.00	metric ton			

Klamath National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	2,723.04	2,696.90	0.08	0.08	0.00	0.00	0.00	metric ton
Stationary Combustion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	2,723.04	2,696.90	0.08	0.08	0.00	0.00	0.00	metric ton
* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	1,129.64	1,018.19	5.24	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	1,129.64	1,018.19	5.24	0.00	metric ton			

Lake Tahoe Basin Management Unit

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	636.54	629.15	0.02	0.02	0.00	0.00	0.00	metric ton
Stationary Combustion	159.37	157.85	0.01	0.00	0.00	0.00	0.00	metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	795.90	787.00	0.03	0.03	0.00	0.00	0.00	metric ton
* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	216.77	216.45	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	216.77	216.45	0.00	0.00	metric ton			

Lassen / Modoc / Plumas National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	5,345.23	5,282.95	0.20	0.19	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	1,582.16	1,578.98	0.06	0.01	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	6,927.39	6,861.94	0.26	0.19	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	1,582.14	1,579.89	0.01	0.01	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	1,582.14	1,579.89	0.01	0.01	metric ton			

Los Padres National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	2,510.33	2,483.21	0.08	0.08	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	253.06	248.94	0.01	0.01	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	2,763.40	2,732.14	0.09	0.09	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	368.72	368.18	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	368.72	368.18	0.00	0.00	metric ton			

Mendocino National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	1,316.08	1,300.96	0.04	0.05	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	23.87	23.80	0.00	0.00	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	1,339.95	1,324.76	0.05	0.05	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	501.99	501.25	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	501.99	501.25	0.00	0.00	metric ton			

Regional Office – Vallejo

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	248.38	243.91	0.01	0.01	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	491.57	488.63	0.05	0.01	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	739.95	732.54	0.06	0.02	0.00	0.00	0.00	0.00 metric ton

* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.

Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	2,342.19	2,338.76	0.02	0.01	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	2,342.19	2,338.76	0.02	0.01	metric ton			

San Bernardino National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	2,810.98	2,782.55	0.08	0.09	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	448.68	442.79	0.03	0.02	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	3,259.66	3,225.33	0.11	0.10	0.00	0.00	0.00	0.00 metric ton

* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.

Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	1,197.00	1,195.25	0.01	0.01	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	1,197.00	1,195.25	0.01	0.01	metric ton			

Sequoia National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	1,990.42	1,965.58	0.07	0.08	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	848.85	831.94	0.02	0.05	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	2,839.26	2,797.52	0.09	0.13	0.00	0.00	0.00	0.00 metric ton

* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.

Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	642.22	641.28	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	642.22	641.28	0.00	0.00	metric ton			

Shasta-Trinity National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	2,671.82	2,642.97	0.09	0.09	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	444.73	443.34	0.05	0.00	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	3,116.56	3,086.31	0.14	0.09	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	935.67	934.30	0.01	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	935.67	934.30	0.01	0.00	metric ton			

Sierra National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	2,260.31	2,231.55	0.09	0.09	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	215.20	210.56	0.00	0.01	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	2,475.51	2,442.11	0.09	0.10	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	465.49	464.81	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	465.49	464.81	0.00	0.00	metric ton			

Six Rivers National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	1,679.02	1,662.15	0.05	0.05	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	66.39	65.62	0.00	0.00	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	1,745.41	1,727.78	0.05	0.05	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	339.89	339.39	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	339.89	339.39	0.00	0.00	metric ton			

Stanislaus National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	1,663.98	1,642.81	0.06	0.06	0.00	0.00	0.00	metric ton
Stationary Combustion	383.41	375.22	0.01	0.03	0.00	0.00	0.00	metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	2,047.39	2,018.03	0.07	0.09	0.00	0.00	0.00	metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	686.82	685.81	0.01	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	686.82	685.81	0.01	0.00	metric ton			

Tahoe National Forest

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	2,141.79	2,117.11	0.06	0.08	0.00	0.00	0.00	metric ton
Stationary Combustion	447.36	438.94	0.01	0.03	0.00	0.00	0.00	metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	2,589.15	2,556.05	0.08	0.10	0.00	0.00	0.00	metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	671.75	670.76	0.01	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	671.75	670.76	0.01	0.00	metric ton			

PSW – Davis Lab

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	8.19	7.42	0.00	0.00	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	3.13	3.13	0.00	0.00	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	11.33	10.54	0.00	0.00	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	43.27	43.26	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	43.27	43.26	0.00	0.00	metric ton			

PSW Fresno Lab

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	123.87	113.27	0.02	0.03	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	9.38	9.35	0.00	0.00	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	133.25	122.63	0.02	0.03	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	49.05	49.04	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	49.05	49.04	0.00	0.00	metric ton			

PSW Placerville

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	28.36	25.44	0.01	0.01	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	84.53	82.67	0.00	0.01	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	112.89	108.10	0.01	0.01	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	138.04	138.02	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	138.04	138.02	0.00	0.00	metric ton			

PSW Redding

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	56.42	51.09	0.01	0.02	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	39.95	39.46	0.00	0.00	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	96.37	90.55	0.01	0.02	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	14.88	14.88	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	14.88	14.88	0.00	0.00	metric ton			

PSW Arcata

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	79.27	72.72	0.01	0.02	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	46.58	46.44	0.01	0.00	0.00	0.00	0.00	0.00 metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	125.85	119.16	0.02	0.02	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	67.55	67.54	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	67.55	67.54	0.00	0.00	metric ton			

PSW Headquarters Albany

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	25.70	23.91	0.00	0.01	0.00	0.00	0.00	0.00 metric ton
Stationary Combustion	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	25.70	23.91	0.00	0.01	0.00	0.00	0.00	0.00 metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	44.64	44.60	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	44.64	44.60	0.00	0.00	metric ton			

PSW Riverside

Direct Emissions	CO2e	CO2	CH4	N2O	HFCs*	PFCs*	SF6	Unit
Mobile Combustion	39.61	36.40	0.01	0.01	0.00	0.00	0.00	metric ton
Stationary Combustion	22.09	22.02	0.00	0.00	0.00	0.00	0.00	metric ton
Process Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
Fugitive Emissions	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-
TOTAL DIRECT	61.70	58.42	0.01	0.01	0.00	0.00	0.00	metric ton
<p>* HFCs and PFCs are classes of greenhouse gases that include many compounds. These columns may reflect the total emissions of multiple HFC and PFC compounds, each of which has a unique Global Warming Potential (GWP). Emissions of each gas are first multiplied by their respective GWP and then summed in the total CO2-equivalent column.</p>								
Indirect Emissions	CO2e	CO2	CH4	N2O	Unit			
Purchased Electricity	194.59	194.30	0.00	0.00	metric ton			
Purchased Steam	0.00	0.00	0.00	0.00	-			
Purchased Heating and Cooling	0.00	0.00	0.00	0.00	-			
TOTAL INDIRECT	194.59	194.30	0.00	0.00	metric ton			