



Sustainability

ROCKY MOUNTAIN REGION

and Our Baseline Ecological Footprint

November 2005





To sustain the health, diversity, and productivity of the nation's forests and grasslands to meet the needs of present and future generations.

–The Forest Service Mission

□ Introduction

As we enter a new century of service, we recognize that to be true to our mission, we must acknowledge the ecological, economic and ethical impacts of our business operations. There are finite resources on the planet to sustain a growing, ever-consuming population. Our need for these resources ties us to the land – today and in the future. All we use comes from the earth; and all the waste we generate must be processed by the earth. Worldwide there are only 4.5 biologically productive acres of land per person. A single person living in the United States requires, on average, 24 biologically productive acres to support his/her consumption. The earth currently has a population of 6.1 billion people, many of whom want to move towards a U.S. lifestyle. As an agency charged with stewardship and conservation leadership, and as a global citizen, the Forest Service must acknowledge its level of consumption and its impacts on the earth's increasingly finite resources.

For the first time in our agency's 100-year history, we are attempting to quantify our own resource use and some of the impacts associated with our business operations. In essence, we are trying to describe our "ecological footprint" which will give us a better understanding of the overall impact we have on the ecological systems of the earth.

In the following five sections, we seek to understand our current actions and resource use and impacts in the areas of energy, water, fleet transportation, waste prevention, recycling and green purchasing. Consider this a work in progress, reflecting the ongoing nature of this effort. Although this effort was focused on the Rocky Mountain Region, the process used is intended to be transferable. Region 2, in partnership with State and Private Forestry in the Washington Office, is taking a leadership role in seeking ways to integrate environmental stewardship and sustainability into our day-to-day operations.

□ Energy - Facilities

WHAT WE KNOW

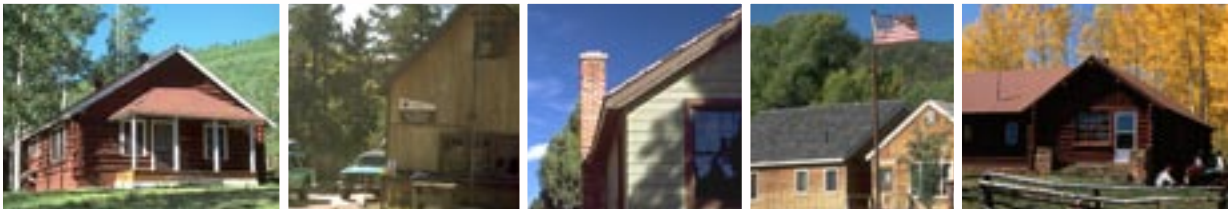
The Rocky Mountain Region currently uses four main sources of energy for their facilities – electricity, natural gas, propane, and fuel oil. Wood is an additional minor source of heat. Electricity use¹ in 2004 was approximately 4,300 kw/h per employee – the total electricity use in the region was enough to power approximately 861 average homes. Estimated CO₂ emissions resulting from our facilities energy use would be the same as adding 400 vehicles to our fleet. In 2004, the total cost of our energy bill was just under one million dollars.

	Annual Consumption	Annual Cost	Est Carbon Emissions (Metric Tons)
Electricity	9,214,400 kw/h	\$670,300	1548
Natural Gas	27,267 MCF	\$197,300	408
Propane	63,500 gallons	\$64,700	103
Fuel Oil	6,700 gallons	\$5,900	18

The data is most certainly understating regional consumption. We aren't tracking purchase card payments to utility companies, primarily for propane and fuel oil, and the numbers don't include utilities paid through a building or site lease.

WHAT WE NEED TO KNOW

- The source of the electricity used. It is assumed that the majority of electricity is coal generated due to the geographic location of R2.
- Number and location of existing renewable energy installations at Region 2 facilities.
- A regional baseline figure of BTUs /square- foot. To monitor progress will require some assumptions about gross square feet of heated building space in the region.
- Energy use from leased buildings/sites or energy paid for by a purchase card.
- Type and number of renewable energy installations.



¹Use data was derived from the FY2004 Energy Consumption and Cost Data compiled by the Washington Office and based on account payments to utility companies. This data is available for sorting by individual forests and also by energy vendor.

GOALS, GUIDELINES, AND EXISTING FEDERAL POLICY

2005 Energy Bill

- Reduce energy consumption 20% by 2015 relative to FY03 baseline
- 3% of energy purchases must be from renewable energy sources by 2007, 7.5% by 2013
- Only purchase Energy Star and FEMP recommended products
- Incorporate specifications for all energy related procurement, including construction, renovation, and service contracts as well as equipment and product purchases
- Buildings to be designed to 30% more efficient than ASHRAE standard or International Energy Code if it is LCCA effective
- Sustainable design principles must be applied to building design

Executive Order 13123

- Greenhouse gas emissions – 30% reduction by 2010 based on 1999 levels
- Conduct energy efficiency audits on 10% of facilities annually
- Increase use and purchase of renewable energy.
- Install 20,000 solar electric systems at Federal Facilities by 2010
- Reduce petroleum use

USDA Draft Asset Management Plan

- LEED Silver rating for projects over 1 million dollars

FOR MORE INFORMATION, CHECK OUT THE FOLLOWING WEB SITES

<http://www.eere.energy.gov>

<http://www.doe.gov>

<http://www.epa.gov/cleanenergy/egrid/index.htm>

<http://eia.doe.gov/>

<http://www.ofee.gov/sb/sb.htm>

Did you know that in FY05, Region 2 purchased 730 megawatt hours of biomass- based renewable energy certificates for \$16,800? This was approximately 8% of our power use for only an additional 2.5% cost.

□ **Water**

WHAT WE KNOW

Water is often considered the cheap utility, too inexpensive for conservation to be financially worthwhile. However, water is costly in many ways; it depletes aquifers, requires energy for pumping, chemicals for treatment and staffing to operate treatment and wastewater treatment plants. By using water efficiently, we can protect water sources, improve water quality, and reduce the amount of energy used to treat, pump, and heat water. Water heating accounts for 19% of home energy use. If 20% of U.S. homes used high efficiency clothes washers, national energy savings could be 285 billion BTUs² per day³ – enough to supply the needs of over one million homes.

Average use of metered potable water per capita per day in the Rocky Mountain Region is over 200 gallons/day/person. In 2004, there were 2,159 permanent employees in Region 2. This equates to 14,750 gallons of use per year per employee or each employee using 57 gallons (a barrel) a day for each of the 261 working days during the year.

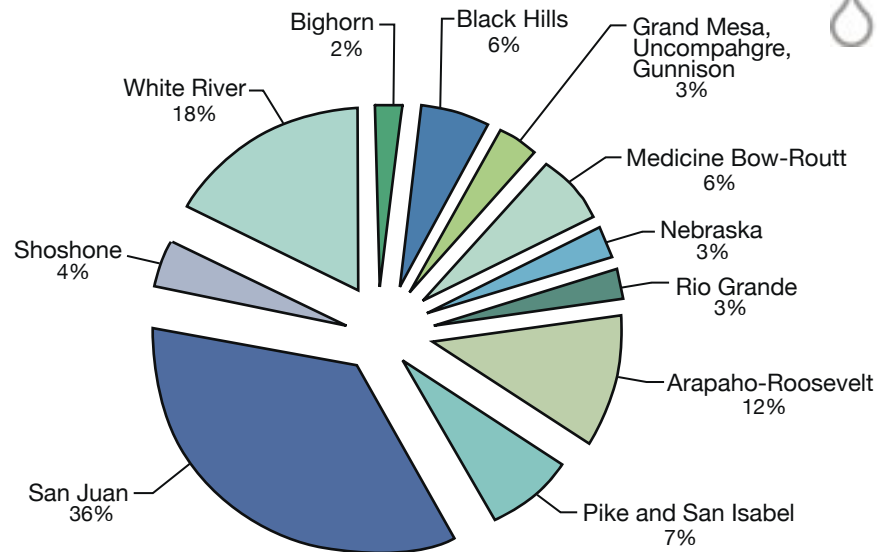


Annual Consumption (Gallons)	Annual Cost
31,840,900.0	\$125,068

² BTU – British Thermal Unit, the amount of energy needed to raise the temperature of one pound (~ 1 pint) of water one degree Fahrenheit.

³ From http://www.epa.gov/water/water_efficiency.html

Annual R2 Water Consumption, by Forest



WHAT WE NEED TO KNOW

- Water use from facilities using wells/springs.
- Water use at campgrounds. (A T&D project is researching ways to meter campground hand pump use).
- Water use from leased buildings/sites or water paid for by a purchase card.

GOALS, GUIDELINES, AND EXISTING FEDERAL POLICY

Executive Order 13123

- Best management practices must be implemented
- Consumption to be reduced from 2000 base year by 30% 2006, 50% 2008 and 80% by 2010

FOR MORE INFORMATION, CHECK OUT THESE WEB SITES

<http://www.waterbusters.org/>

<http://pubs.cas.psu.edu/FreePubs/pdfs/uh164.pdf>

<http://www.epa.gov/water/you/chap1.html>

<http://www.epa.gov/OW/you/chap3.html>

<http://www.rmi.org/sitepages/pid123.php>

□ Fleet / Transportation

WHAT WE KNOW

In this category, the indicator for Region 2 use and impacts is miles driven for trucks and cars or hours operated for heavy equipment, such as road graders, backhoes, and bulldozers. The region has 1668 fleet vehicles.

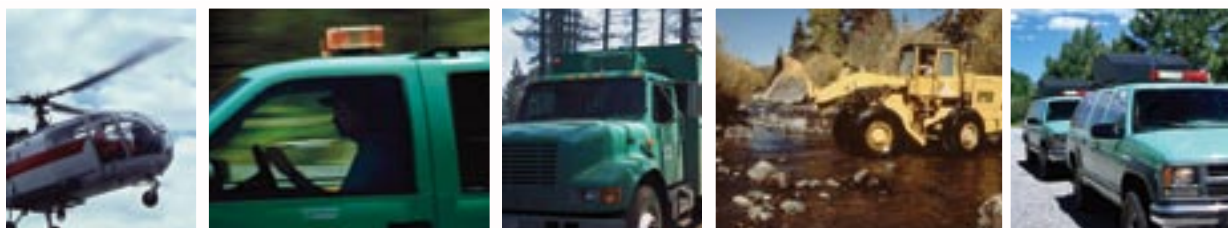
In Fiscal Year 2004, about 14.1 million vehicle-miles were driven by highway-legal motor vehicles, and more than 21,000 hours of heavy equipment operation were logged. It would require more than 2,500 acres of trees to absorb the annual tons of greenhouse gas emissions from our highway legal vehicles.

Vehicle/Equipment Type	Miles driven or hours operated	Est. Tons of Emissions ^{1,2}
Highway-legal vehicles, all classes	13,613,500 miles (excluding diesels)	9,390
Diesel, Heavy Equipment	21,100 hours	16.1 (NO _x) 0.9 (PM) 8.6 (CO)
Diesel, Highway Vehicles	474,700 miles ("Converted" to 11,800 hours)	18.0 (NO _x) 1.0 (PM) 41.9 (CO)

- 1) For gasoline-powered vehicles, the greenhouse gas estimates presented here are “full fuel-cycle estimates” and include the three major greenhouse gases emitted by motor vehicles: carbon dioxide, nitrous oxide, and methane. Full fuel-cycle estimates consider all steps in the use of a fuel, from production and refining to distribution and final use. This gives a more complete picture of how using a particular fuel contributes to climate change.

Numerous assumptions and calculations are necessary to estimate full fuel-cycle greenhouse gas emissions in carbon dioxide equivalents. Because of this, estimates from different sources will vary somewhat. The above estimates are taken from the U.S. Department of Energy’s GREET model, version 1.5 developed by Argonne National Laboratory.

- 2) Primary targeted emissions for diesel vehicles are nitrous oxide, particulate matter, and carbon monoxide. Estimates were calculated using average emissions/horsepower- hour from EPA tables.



WHAT WE NEED TO KNOW

- Gallons of petroleum used is not currently tracked as a separate number.
- Amount and type of fuel purchased for forest fuel tanks.
- Use of alternative fuels. Purchases of ethanol or biodiesel from a commercial supplier must be coded correctly by that supplier and often the amounts available are very limited.
- Use and impacts from other Forest Service equipment – tractors, ATVs, motorcycles, and snowmobiles, boats, lawn equipment, gas-powered tools.
- Use from airline travel and travel using personal vehicles.

GOALS, GUIDELINES, AND EXISTING FEDERAL POLICY

- Executive Order 13149 requires 20% reduction in consumption by at least 20 percent by the end of FY 2005, compared with FY 1999 petroleum consumption levels.
- Executive Order 13150 – directs agencies to provide staff with alternatives for work related transportation and fuel use.

FOR MORE INFORMATION, VISIT THESE WEB SITES

<http://www.eere.energy.gov/afdc/>

<http://www.eere.energy.gov/cleancities/>

<http://www.fueleconomy.gov>

□ Waste Prevention, Recycling and Green Purchasing

WHAT WE KNOW

Green purchasing, waste prevention and recycling efforts vary by unit in Region 2. The Arapaho-Roosevelt National Forest’s efforts were examined because they are probably reflective of average activities Regionwide. Three main areas were analyzed: paper use, electronics use, and use of hazardous materials.

The amount of recycling is different for each unit based on the access to recycling efforts in the area and the presence of an employee who acts as a recycling / waste prevention champion. There is no existing Regionwide inventory of recycling efforts or waste prevention activities for each forest.

Green purchasing includes buying products made from recycled content, environmentally preferable products and services, biobased products, energy- and water-efficient products, alternate fuel vehicles, products using renewable energy, and alternatives to hazardous or toxic chemicals.

In 2005, the Arapaho-Roosevelt National Forest bought \$657,000 of office and project supplies. Items included tires, automobile supplies, paint, hardware and construction material, and office supplies. At least 1/3 of these products could have been “green” purchases. Assuming the Arapaho-Roosevelt figures are typical, there are significant opportunities for green purchasing in the Region. There is currently no method to track what products we purchase that meet green purchasing criteria.

Paper Use and Electronic Equipment on the Arapaho-Roosevelt National Forest and in Region 2

	Arapaho-Roosevelt SO	All A/R Forest Offices*	Regionwide*
Paper**	16,000 lbs/yr	29,000 lbs/yr	320,000 lbs/yr
Desktop computers	132	238	2,618
Laptops	30	54	594
Plotters	2	8	88
Scanners	3	8	88
Printers	11	21	231
FAX machines	4	8	88
Copy machines	4	10	110

* Numbers prorated based on Arapaho Roosevelt Supervisor’s Office figures.

**The paper is used for hand writing, in the computer printers, copy machines, FAXs, and other applications and is 30% post-consumer recycled

Of the Arapaho-Roosevelt’s 16,000 lbs of paper consumed annually, approximately 7,600 lbs is recycled. The forest contacted their local recycling service to find out what data was available on their efforts. Waste-Not Recycling provided a report which summarized the amount of paper the forest recycled as well as the impacts this effort had on the environment. That amount saved was equal to 64 trees, 7,600 kilowatt hours of electricity, and 13,300 gallons of water.

There are three important ‘pressure points’ affecting the paper resource consumed and recycled. One is the presence or absence of a robust recycling program in the office. The second is to conserve to begin with (a common theme with all resources). The third is the purchase of paper already high in recycled content. This could be a challenge given the perceived performance problems of high recycled content paper in machinery.

All the forest’s computers (CPUs, monitors, keyboards, mouse, scanners, printers etc.) are currently recycled by Dell, Inc. This policy is likely to change next year to allow for local recycling. The turnover rate is every three years for computers, monitors, and printers 5-7 years.

Flammable and Toxic Materials Inventoried by the ARNFPNG in 1994⁵

	QUANTITY	NUMBER OF DIFFERENT PRODUCTS INVENTORIED
LIQUIDS Example: acids, adhesives, automotive, cleaners, detergents, disinfectants, pine oil, linseed oil, liquid fuel, diesels, gas, oil products, herbicides, insecticides, paint, preservatives, sealants, solvents, stains, thinners	4140 gallons	868
SOLIDS Example: adhesives, cleaners. Detergents, disinfectants, fertilizers, grease, insecticide, lime, concrete, lubricants, rotenticides, sealers, varnish, waxes	11,096 pounds	83
AEROSALS Example: tree marking paint, paint, cleaners, deodorants, insecticide, lubricants, insect repellants.	1031 cans	72

Using the current number of employees on the forest, every employee would have to store 18 gallons of liquid material, 48 pounds of solid material, and 5 cans of aerosol in their cubicle.

In partnership with the solid waste company, the forest went dumpster diving and analyzed the dumpster contents. The amount in the dumpster could be reduced by about one half; it still contained materials that could be recycled – paper, pop cans, cardboard, and some organics.

⁵ The information in the table is from the 1994 Hazardous Materials Inventory on the Arapaho-Roosevelt National Forest. This data only includes those products utilized by the Forest Service currently and those which are obsolete (i.e., no longer useful products, waste material). It does not include those materials utilized by contractors (building cleaning companies) or by other uses (ski areas, special use permits, recreation special use permits, etc.). We believe that this inventory has been reduced but there has not been a recent inventory completed to confirm more current quantities of flammable and toxic materials.

WHAT WE NEED TO KNOW

- The amount of recycling for each forest in the region.
- Location of recycling efforts within the region.
- Money spent on solid waste disposal regionally.
- Makeup of our solid waste.
- A method for tracking green purchasing.
- Ways to increase employee knowledge and awareness about green purchasing requirements.

GOALS, GUIDELINES, AND EXISTING FEDERAL POLICY

- Executive Order 13101, Greening the Government through Waste Prevention, Recycling, and Federal Acquisition, 1998. Under 13101, waste prevention and recycling must be incorporated into agency operations, and disposal is viewed as a last resort. Specifically, Section 705 mandates that agencies initiate a program to promote cost-effective waste prevention and recycling of reusable materials, that agencies designate a recycling coordinator for each facility or installation, and that Executive agencies consider cooperative ventures with State and local governments to promote recycling and waste reduction in the community.
- Resource Conservation and Recovery Act, 1976: RCRA provides for proper management of hazardous waste at all stages including its generation, transportation, treatment, storage, and disposal. It also provides for the management of non-hazardous solid waste. RCRA requires that all federally leased and owned buildings comply with local recycling and solid waste ordinances. For complete information, visit <http://www.epa.gov/region5/defs/html/rcra.htm>.
- Federal Facilities Compliance Act of 1992: Federal facilities are required to comply with the Solid Waste Disposal Act and are subject to fines and penalties if they fail to do so. For complete information, visit http://www.epa.gov/swerffrr/documents/federal_facility_compliance_act.htm
- Farm Security and Rural Investment Act (2002 Farm Bill), Section 9002
- Executive Orders, 13123, 13148, 13149, 13221
- Federal Acquisition Regulations
- Energy Policy Act 2005 requires procurement of Energy Star and FEMP recommended products.

MORE INFORMATION IS AVAILABLE AT:

<http://www.ofee.gov/wpr/wpr.htm>

<http://www.ofee.gov/gp/gp.htm>

<http://www.ofee.gov/gp/training.html>

□ Conservation/Sustainable Leadership

To sustain the health, diversity, and productivity of the Nation's forests and grasslands to meet the needs of present and future generations – The Forest Service Mission

As an agency embarking on our next 100 years of service, it is important to reflect not only on where we have been but also where are we going. What story do we envision and wish to celebrate for the Forest Service in the next year, in the next decade, or in the next century? As an agency proud of its conservation leadership, it is time for us to seek out deliberate acts of conservation that reduce the impacts of our day-to-day operations – our ecological footprint – on increasingly finite resources. We have choices to make as we create this future story. It likely will include the central themes of conservation, stewardship, and sustainability as a firm connection to our past. To make sustainability an integral part of the way we do business in the future, we can:

- Quantify our resource use and connect the impacts of that resource use with our job of resource management.
- Identify barriers to implementing sustainable operations. Subsequently adopt methods, procedures and policies to help diminish these barriers.
- Integrate sustainability as a performance element for our employees.
- Continue partnerships and seek new partnerships with other federal, state and local entities that are also working towards the triple bottom line of sustainability.
- Seek partnerships where we traditionally have not had them, such as with our utilities suppliers.
- Use sustainability to help us support the rural communities in which we work.
- Take credit for the conservation that we are already doing, and share our successes with ourselves, our partners, and our communities.



Gifford Pinchot

Gifford Pinchot believed that each generation must redefine conservation. This ecological footprint document is only a first step at creating a story of conservation leadership for present and future generations. As we look ahead to the next 100 years, we must take responsibility now for the individual and cumulative ecological, economic, and ethical impacts of our actions.

“Nobody made a greater mistake than he who did nothing because he could only do a little.”

– Edmund Burke, Whig MP for Bristol 1774-80

ACKNOWLEDGMENTS

I would like to thank the EcoFootprint Team for pioneering sustainability efforts in Region 2. What we have accomplished so far would not have been possible without your time, energy, and expertise. I look forward to doing great – and sustainable – things with you in the future.

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A sustainable organization:

- stays financially healthy,
- minimizes use of total resources,
- maximizes use of renewable resources,
- minimizes waste and pollution,
- maximizes value from resources,
- maximizes benefits to people,
- recognizes linkages,
- balances the impacts of actions,
- and leaves the world better for the next generation.

Borrowed from the National Renewable Energy Lab's sustainability effort.