



U.S. Fish & Wildlife Service

Fiscal Year 2008

Carbon Footprint Baseline Report

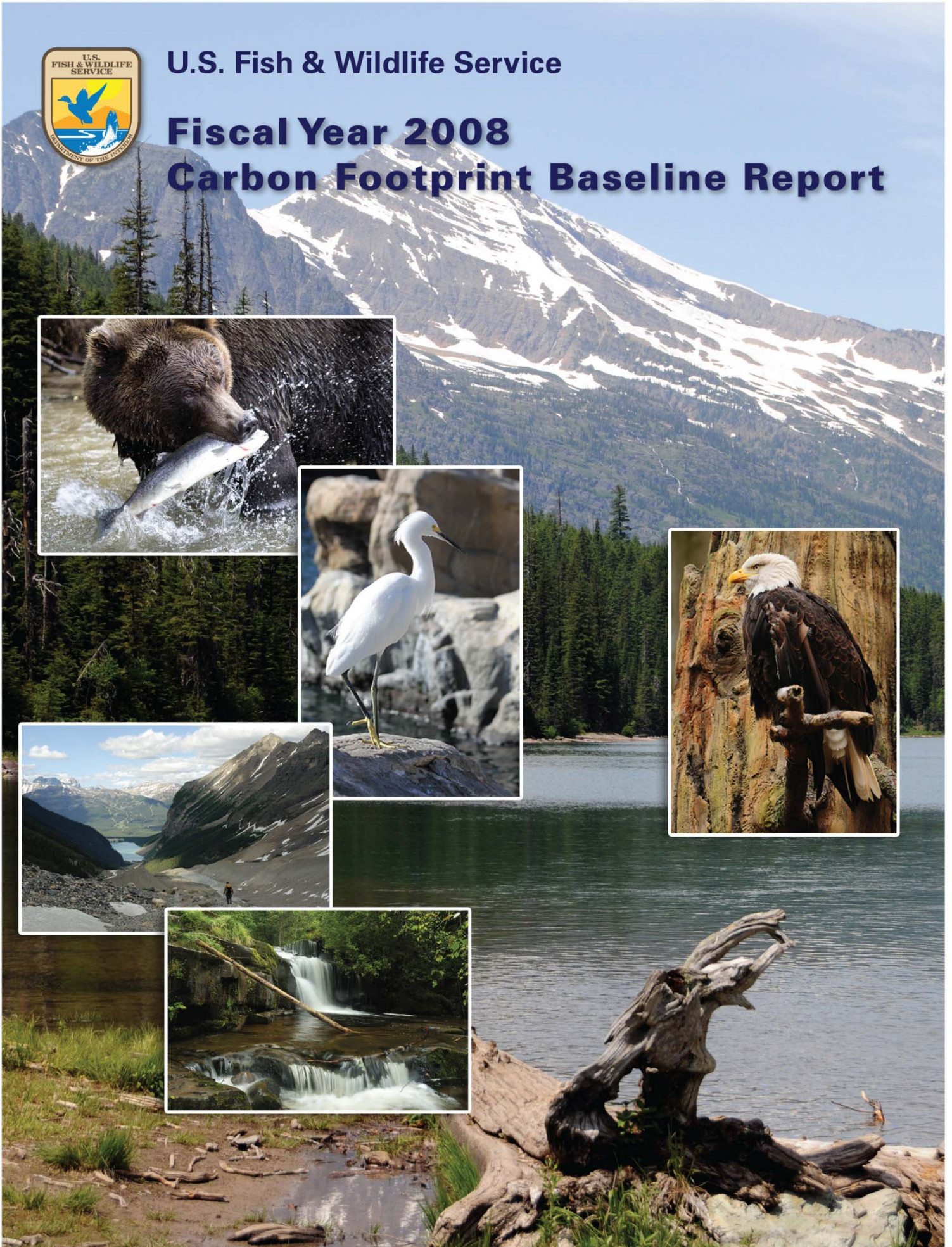


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1.0 Executive Summary

Climate change is an immense and growing challenge for all Federal agencies, and one that will particularly affect the fish, wildlife, and habitat resources the U.S. Fish and Wildlife Service (Service) protects. The Service has developed a strategic approach to respond to this challenge. This approach is presented in the documents *Rising to the Challenge: Strategic Plan for Responding to Accelerating Climate Change*, and the *5-Year Action Plan for Implementing the Climate Change Strategic Plan*. The Plans are developed around three major goals that relate to the Service mission: adaptation, mitigation, and engagement. This report supports the Service's mitigation goal, laying the foundation for determining, and ultimately reducing our greenhouse gas (GHG) emissions.

One objective of the mitigation goal is minimizing the amount of GHGs the Service emits into the earth's atmosphere. This goal comports with and exceeds requirements set forth in Presidential Executive Order (EO) 13514, and the U.S. Department of the Interior (Department) initiatives, by committing to achieve carbon neutrality by the year 2020.

A critical first step to reducing our GHG emissions is completing an inventory of carbon emissions from our operational activities (i.e., completing a carbon footprint baseline). Consistent with the Kyoto Protocol and accepted methodologies, the Service's GHG emissions account for carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride (CO₂, CH₄, N₂O, HFCs, PFCs, and SF₆). Quantities of these gases are calculated in tons of equivalent carbon dioxide (CO₂e). Following the requirements of EO 13514, the Service's carbon footprint baseline:

- Uses Fiscal Year (FY) 2008 data.
- Uses the World Resources Institute (WRI) / Logistics Management Institute's (LMI) Public Sector Standard - Provisional Draft (PSS). With the Department's support, the Service participated in the U.S. Department of Energy's (DOE) pilot application (i.e., "Road Test" of the WRI PSS – Provisional Draft).
 - Considers emission sources for which we have operational control, focusing on those activities we have the authority or mechanism to manage.
 - Accounts for scope 1, scope 2, and scope 3 emissions. Scope 1 emissions are the direct GHG emissions that come from sources owned or controlled by the organization, such as emissions from motor vehicle fleet transportation. Scope 2 emissions account for the indirect GHG emissions from the generation of purchased electricity consumed by an organization. Scope 3 is an optional reporting category covering all other indirect emissions, such as employee commuting.
- Identifies nine carbon emission sources: consumed energy, motor vehicle fleet transportation, owned aircraft, procurement, leased space, employee business travel, solid waste disposal, employee commuter travel, and visitor travel. Each carbon footprint source is comprised of one or more carbon elements. For example, employee business travel includes air transportation, car rentals, reimbursed miles, and hotel stays.
- Uses WRI and U.S. Environmental Protection Agency (EPA) calculation tools to quantify the carbon emissions.

When possible, the Service used data acquired from existing data collection activities, such as the Annual Energy Management Data Report and the Federal Automated Statistical Tool (FAST) motor vehicle fleet report. In instances where data was unavailable, estimates were developed, and assumptions and limitations were documented. The FY2008 carbon footprint baseline may be recalculated to reflect improved data, to meet changed / new regulatory mandates, or to incorporate improved methodology.

The Service calculated the carbon footprint baseline for FY2008 to be 169,037 tons of equivalent carbon dioxide (CO₂e). We sought to evaluate our footprint against Federal agencies of a similar size and mission; however, data is not currently available for other Federal agencies, or public organizations of a comparable size.

The Service's nine carbon emission sources are presented in **Figure 1**. The largest emission source is the generation of consumed energy. The next three largest contributors are motor vehicle fleet transportation, owned aircraft, and procurement, respectively.

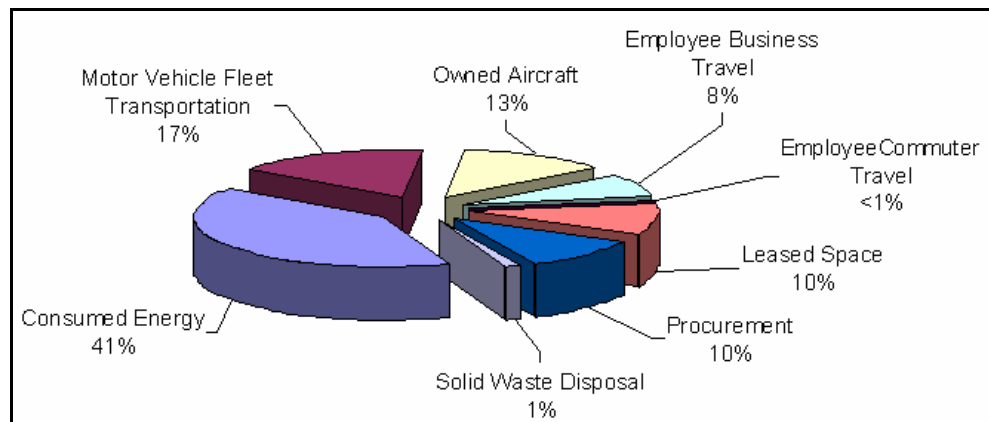


Figure 1: The Service's FY2008 Carbon Footprint Baseline by Source

Identification of these emission sources enables the Service to develop new, or more aggressively employ, strategies to achieve targets in current mandates and advance toward carbon neutrality. Such strategies include:

- Energy efficiencies - Reducing energy use in buildings by implementing energy efficiency projects.
- Renewable energy - Accelerating our carbon footprint reduction by using renewable energy including solar, geothermal, and wind energy technologies.
- Sustainable buildings - Incorporating "green" building principles and construction practices into construction projects and implementing "green" building operation and maintenance requirements.
- Motor Vehicle Fleet - Reducing petroleum fuel use, purchasing alternative fuel vehicles, increasing data accuracy, improving motor vehicle fleet management, and actively employing strategies presented in the Five-Year Motor Vehicle Fleet Plan.

In FY2010, and future years, the Service will use this baseline to identify opportunities to operate more sustainably, and prioritize activities to ultimately achieve carbon neutrality.

The Service will calculate its carbon footprint on an annual basis to measure progress in achieving GHG emission reductions and working toward carbon neutrality. Implementation of recommendations presented at the conclusion of this report should be adopted to facilitate this annual calculation.

¹ Visitor vehicle travel is included in the nine emission elements. This element is not represented on Figure 1 as the Service was unable to obtain related data. The Service is working with the National Park Service and Federal Highway Administration to assess carbon emissions from park and refuge visitors in future assessments.

2.0 Background

Climate change is an immense and growing challenge for all Federal agencies, affecting the fish, wildlife, and habitats the Service protects. As climate change concerns grow and there is more focus on addressing these challenges, the Service has the opportunity to demonstrate leadership by reducing its greenhouse gas emissions and ultimately achieving a net zero emissions profile (i.e., achieving carbon neutrality). The Service has developed a strategic approach to respond to this challenge built around the overarching goals of adaptation, mitigation, and engagement. This report supports the Service's mitigation goal.

One objective of the mitigation goal is minimizing the amount of GHGs the Service emits into the earth's atmosphere. A critical first step to reducing our GHG emissions is completing an inventory of carbon emissions from our operational activities (i.e., completing a carbon footprint baseline). The following sections of this report provide a brief overview of the Service's approach to establishing its carbon footprint baseline, while meeting and exceeding Departmental guidance and Executive Order (EO) 13514 requirements.

2.1 Aligning the Service's Carbon Neutral Goals with the Department of the Interior's Direction

The Department supports efforts to reduce greenhouse gas emissions. As a first step, the Department encouraged bureaus to participate in the Department of Energy (DOE) sponsored development of a Public Sector Standard (PSS) for greenhouse gas emission accounting. The PSS, developed by the World Resources Institute (WRI), is an adaptation of a corporate standard that is specifically tailored to consider organizational attributes unique to governments and public agencies. Nearly all the Department's bureaus and dozens of Federal agencies are participating in a pilot application, or "Road Test," of the PSS "Provisional Draft." The Road Test enables agencies to apply accepted methodologies and test their effectiveness and relevancy to Federal agencies. Agencies provide feedback to DOE and WRI to support development of a final PSS that reflects real-world experience. WRI and their partner LMI provided technical assistance and guidance to the Department and the Service throughout the conduct of the Road Test.

The Service was in the process of evaluating GHG accounting methodologies when DOE extended the opportunity to participate in the Road Test. By that time, the Service evaluated a number of methodologies and determined that the PSS methodology most closely aligned with the Service's objectives (see [Section 3.1.1 - WRI Public Sector Standard](#) for attributes of the PSS). The Service then worked with the Department to ensure our application of the PSS was consistent with the Department's direction, such as collecting data using a top-down approach and using existing data collection efforts when possible.

2.2 Executive Order 13514

President Obama signed EO 13514 on October 5, 2009, establishing an integrated strategy towards sustainability in the Federal government and making reductions in GHG emissions a priority for Federal agencies. The EO requires agencies to achieve a 20 percent reduction from FY2008 levels by the year 2020. The Service's goal of carbon neutrality by 2020 far exceeds this EO requirement, and demonstrates proactive leadership amongst government agencies.

Specifically, the EO requires agencies to identify, evaluate, and set targets for scope 1, scope 2, and scope 3 emission sources. Scope 1 emissions are the direct GHG emissions that come from sources owned or controlled by the organization, such as emissions from motor vehicle fleet transportation. Scope 2 emissions account for the indirect GHG emissions from the generation of purchased electricity consumed by an organization. Scope 3 is an optional reporting category that allows for the treatment of other indirect emissions, such as employee commuter travel.

The EO requires Federal agencies to include all scope 1 and scope 2 emissions in accounting for GHG emissions in their FY2008 carbon footprint baseline (to be completed by 2011), but defers accounting for scope 3 GHGs until the calculation of the FY2011 carbon footprint. However, the Service includes scope

3 emissions in its FY2008 carbon footprint baseline to meet internal objectives and take a leadership role. Including scope 3 emissions in the Service's baseline at this time will provide a more comprehensive accounting of GHGs and will develop necessary information on which to base subsequent reduction priorities.

2.3 The Service's Carbon Footprint Baseline Year

Executive Order 13514 requires agencies to establish goals for the reduction of scope 1 and 2 greenhouse gas emissions, relative to the FY2008 baseline, as outlined below in [Section 3.1.1.6 - Operational Boundaries](#). For this reason, the Service's carbon footprint baseline is calculated for GHG emissions for FY2008. The Service will calculate subsequent carbon footprints by fiscal year.

3.0 Methodology

Section 3.0 describes the methodology and process the Service used to account for and calculate carbon emissions.

3.1 Methodology Identification and Evaluation

Establishing the carbon footprint baseline is one of the first steps in a series of many actions necessary to address the goals outlined in the Service's Strategic and Action Plans, and meet Department guidance and Executive Order requirements.

The Service explored available guidance and standards for both private organizations and the public sector before selecting the most appropriate methodology. The selected guidance met the following criteria:

- Addresses the unique operating structure of the public sector.
- Meets the requirements of EO 13514.
- Aligns with the Department's direction.
- Incorporates best practices.
- Uses a widely-accepted methodology in the climate change and sustainability communities.

Methodologies considered include the United Kingdom's Department of Environment Food and Rural Affairs (UK DEFRA), and the WRI and the World Business Council for Sustainable Development's (WBCSD) Greenhouse Gas Protocol (GHG Protocol). Of these methodologies, the WRI and the World Business Council for Sustainable Development's GHG Protocol was found to be the most widely used international methodology for accounting and reporting GHG emissions.

The GHG Protocol provides the accounting framework for numerous GHG standards and programs, covering the six greenhouse gases covered by the Kyoto Protocol: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. The Carbon Disclosure Project, an independent, non-profit organization that holds the world's largest database of corporate carbon emissions and climate change information, reported that of the 281 S&P 500 companies that responded to a survey on carbon emission calculations, 204 companies (73 percent) used either the WRI GHG Protocol or a protocol based closely on this standard². WRI and LMI collaborated with businesses, non-governmental organizations, governments, and other stakeholders to develop the PSS to address government organizations' need for greater accounting guidance on common public sector activities.

3.1.1 WRI Public Sector Standard (PSS)

The GHG Protocol is the basis for the PSS. The PSS adapts the core accounting principles found in the GHG Protocol to the unique organizational and structural needs of public agencies. The PSS is developed through a multi-stakeholder process, allowing incorporation of input obtained from experienced public sector managers, agencies, and organizations such as EPA, DOE, the Climate Registry, and the Carbon Disclosure Project.

In addition to its wide acceptance, the WRI approach aligns with EO 13514, and incorporates previously developed best practices. The Service adopted the WRI approach based on these factors and the Department's encouragement to participate in DOE's pilot, the PSS "Road Test."

² PricewaterhouseCoopers, *Carbon Disclosure Project Report 2008, S&P 500* (PricewaterhouseCoopers © 2008), page 34.

3.1.1.1 Accounting Principles

The PSS provides generally accepted GHG accounting principles to ensure reported information represents a fair account of an organization's emissions. The following principles highlight the critical characteristics of GHG accounting and reporting:

1. **Relevance:** Help ensure the GHG inventory appropriately reflects the GHG emissions of the organization and serves the decision-making needs of both internal and external users.
2. **Completeness:** Fully account for and report on GHG emission sources and activities within the chosen inventory boundary.
3. **Consistency:** Use consistent methodologies to allow for meaningful comparisons of emissions over time. Transparently document changes to the data, inventory boundary, methods, or other relevant factors in the time series.
4. **Transparency:** Address relevant issues in a factual and coherent manner, based on a clear audit trail. Disclose relevant assumptions and make appropriate references to the accounting and calculation methodologies and data sources used, so that an external party can understand how the footprint is calculated.
5. **Accuracy:** Help ensure that the quantification of GHG emissions is neither over nor under actual emissions by a material amount, as far as can be judged, and that uncertainties are reduced as far as practicable.

3.1.1.2 Organizational Boundary

The organizational boundary is determined by the structure of the organization and the relationships of the parties involved. The PSS provides the flexibility to accommodate legal and organizational structures across the public sector.

The PSS defines two approaches for consolidating GHG emissions, control and equity share. The structure of the organization and the relationships among the parties involved drives which of these approaches is used as a framework for conducting the GHG inventory. The selected approach is applied consistently across the organization's operations. The control approach requires the organization to account for 100 percent of the GHG emissions for which it has financial or operational control. This approach is generally the most relevant approach for the public sector. The equity approach requires the organization to account for GHG emissions from operations according to its share of equity in the operation. The equity approach is generally more relevant in the private sector.

3.1.1.3 Operational Control Approach

The operational control approach was applied to this inventory as it appropriately reflects the Service's organizational structure, as the Service has the authority to introduce and implement operating policies. To carry this further, the PSS also recommends accounting for 100 percent of GHG emissions from government-owned and operated facilities. The operational control approach is applied consistently to each level of the Service to avoid both double counting and the inadvertent omission of emission sources.

3.1.1.4 Geographic Limits

To account for Service GHG emissions, data was used from all Service owned and operated locations in aggregate. Small areas were excluded, such as electrical use from Puerto Rico and Guam for lack of an established emissions factor such as those contained in EPA's "eGRID", which was used for the Continental U.S, and Alaska and Hawaii.

3.1.1.5 Double Counting

Double counting occurs when two or more organizations hold interest in the same operation and use different consolidation approaches. This includes emissions for other government agencies, such as a shared facility with the U.S. National Park Service, and private entities, such as a contractor that may operate on Service lands yet is responsible for their emissions (e.g., a waste disposal company that contracts with the Service). Every effort was made to avoid double counting; however, double counting

could still occur. The inventory can be rebaselined should we determine that emissions were double counted.

3.1.1.6 Operational Boundaries

The operational boundary defines the emission sources for operations that fall within the organization's established organizational boundary. For the Service, setting operational boundaries involves identifying emission sources, such as electricity, motor vehicle fleet transportation, and employee business travel. These sources are categorized into "scopes", which are defined for GHG accounting and reporting purposes (See **Figure 2**). Scopes are used to help delineate direct and indirect emission sources, improve transparency, and provide structure for varying types of climate policies and business goals. The Service's operational boundary consists of all emission sources within scope 1, scope 2, and scope 3. The process for defining the operational boundary is outlined in the following steps:

1. **Categorize emissions as either direct or indirect.** Direct emissions are emissions from sources that are owned or controlled by the organization. Indirect emissions are emissions that are a consequence of the activities of the organization, but occur at sources owned or controlled by another organization or company.
2. **Categorize direct and indirect emissions as scope 1, 2, or 3.** Direct and indirect emission sources are identified by scope to meet the requirements of EO 13514. Direct emissions are classified as scope 1, and indirect emissions are classified as either scope 2 or scope 3. As dictated by EO 13514, public sector organizations must report on scope 1 and scope 2 emissions, at a minimum.

Scope*	Description
Scope 1 - Direct GHG Emissions	Scope 1 accounts for direct GHG emissions from sources that are owned or controlled by the organization. For example, emissions from combustion in owned or controlled boilers, furnaces, or motor vehicles. Direct CO ₂ emissions from the combustion of biomass or biofuels are not included in scope 1.
Scope 2 - Electricity Indirect GHG Emissions	Scope 2 accounts for GHG emissions from the generation of purchased electricity consumed by the organization.
Scope 3 - Other Indirect GHG Emissions	Scope 3 accounts for the treatment of other indirect emissions. These emissions are a consequence of the activities of the organization; however, they do not come from sources owned or controlled by the organization. Common examples include transportation of purchased fuels, employee commuter travel, and employee business travel.

* EO 13514 requires agencies to identify emission sources by scope.

Figure 2: Overview of PSS Scopes

Figure 3, as presented in the WRI GHG Protocol³, provides an overview of the relationship between the scopes and the activities that generate direct and indirect emissions along an organization's value chain. An organization's value chain refers to the activities it performs to add value to its audience.

³ Institute, World. *The Greenhouse Gas Protocol*, (World Resources Institute and World Business Council for Sustainable Development © 2004), page 26.

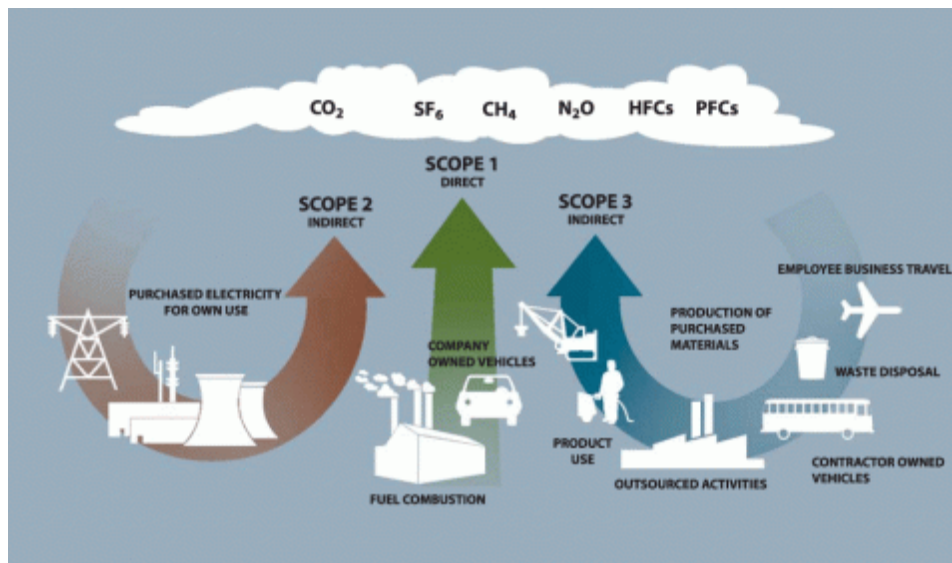


Figure 3: Overview of WRI GHG Protocol Scopes and Emissions

3.1.1.7 Inventory Boundary

The inventory boundary defines the emissions sources for an organization. For the Service, the inventory boundary reflects the intersection of the organizational definition (i.e., Service-wide), footprint geographic limits (i.e., all locales in which we operate) and operational activities (i.e., the activities we control) as presented below in **Figure 4**. The following steps are used to identify and calculate GHG emissions:

1. Identify GHG emission sources.
2. Select a GHG emissions calculation approach.
3. Collect activity data and choose emission factors based on the identified GHG emission sources.
4. Apply calculation tools.
5. Roll up GHG emissions data to the relevant organizational level.

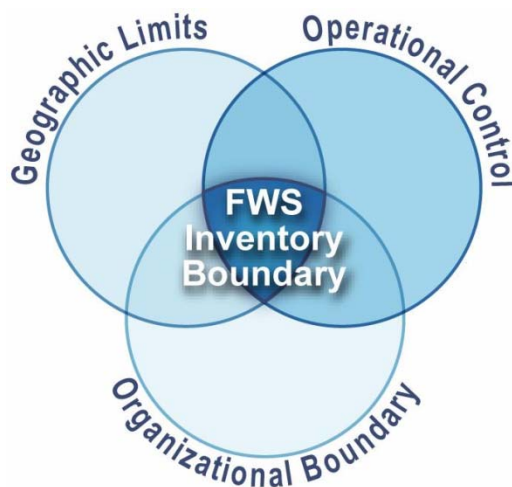


Figure 4: Overview of Inventory Boundary Identification

4.0 Consideration of Greenhouse Gas Emission Sources

To define the Service's inventory boundary, we identified potential GHG emission sources. We followed the PSS criteria outlined below to determine whether to include, or exclude, each element that comprises each emission source. [Section 5.0 - Estimating and Quantifying Carbon Emission Sources](#) provides detailed information by scope (note that including Scope 3 emissions is two years ahead of the requirements set forth in EO 13514). [Figure 5](#) presents the emission elements considered for inclusion in the FY2008 carbon footprint baseline.

Emission Elements Considered for Inclusion	
Consumed Energy (diesel, natural gas, gasoline, propane, fuel oil, wood) (scope 1)	Solid Waste Disposal (scope 3)
Boilers / Furnaces / Emergency Generators (scope 1)	Visitor Vehicle Travel (scope 3)
Motor Vehicle Fleet Transportation (scope 1)	Procurement (paper, fish food) (scope 3)
Incinerators (scope 1)	Employee Business Travel (scope 3)
Biodiesel (scope 1)	Employee Commuter Travel (scope 3)
Gases for Lab Testing (scope 1)	Transportation of Waste (scope 3)
Fugitive Emissions (scope 1)	Wastewater Treatment (scope 3)
Leaks from HVAC Systems (scope 1)	Fire Suppression Systems (scope 3)
Leased Asset Emissions (scope 1 and 2)	Outsourced Activities (oil / gas production, concessioners) (scope 3)
Purchased Building Electricity (scope 2)	Controlled Burns (scope 3)
Purchased Process Electricity (scope 2)	Wildland Fires (scope 3)
Generation of Electricity / Heat / Steam (scope 2)	Rice Fields (scope 3)
Heating, Ventilation, and Air Conditioning (HVAC) (scope 2)	Domestic Water (scope 3)
Wetlands / Rice Fields (scope 3)	Transportation of Purchased Fuels (scope 3)

Figure 5: Carbon Emissions Elements Considered For Inclusion

4.1 Accounting for Scope 1 and Scope 2 Emissions

Scope 1 and scope 2 emission sources are included in the Service's FY2008 baseline, as required by EO 13514, and prescribed in the PSS. The Service accounts for and reports on scopes 1 and 2 separately.

4.2 Accounting for Scope 3 Emissions

As described above, the Service has the discretion to choose whether or not to include each scope 3 emission source in the baseline. The Service has the opportunity to influence, yet not completely control, its scope 3 emissions; therefore accounting for these emissions will highlight opportunities to reduce overall GHG emissions. The following steps outline the review of the Service's scope 3 emission sources:

1. **Describe the value chain.** The Service considered the value chain related to the upstream (i.e., steps to achieve the mission) and downstream activities associated with operations undertaken by the Service and its partners to carry out its mission. Of the activities considered, the Service identified 28 potential GHG emission sources to consider for inclusion into the carbon footprint baseline (see [Figure 5](#)).
2. **Determine which scope 3 categories are relevant.** The Service determined that not all of the scope 3 emissions sources were relevant. The following criteria were used to determine relevancy:

- a. The size (or perceived size) of the emissions relative to the Service's total scope 1 and scope 2 emissions.
 - b. The emission source's relative contribution to the Service's carbon footprint baseline.
 - c. The degree to which the element is deemed critical by partners or stakeholders.
 - d. The level of emissions reductions that could be influenced by the Service.
 - e. Whether activities related to the emissions are outsourced or contracted.
3. **Identify partners along the value chain.** The Service's value chain is impacted partners that materially add to the value of a product or service. Activities of partners that contribute significant amounts of GHGs are included in the Service's inventory.
 4. **Quantify scope 3 emissions.** Scope 3 emissions information can be found in [Section 5.1 - Carbon Emissions Data Collection](#).

The Service considered the availability of data and calculation methods to determine whether to include each scope 3 emission element. Emission sources lacking sufficient data or calculation methods were excluded from the baseline calculations; however, recommendations to develop data are included in [Section 7.0 - Recommendations for Future Carbon Footprint Calculations](#). **Figure 6** presents the emission elements identified but excluded from the Service's carbon footprint baseline. Should data or calculation methods become available that can be applied to the FY2008 carbon footprint baseline, a recalculation or rebaselining should be conducted. Rebaselining is permitted as described in the PSS, and provides improved accuracy for overall GHG accounting.

Excluded Emissions Elements	Description of the Element	FWS Rationale for Exclusion
Gases for Lab Testing	Emissions resulting from the use or purchase of gases used in Service testing.	Based on information provided by our two largest labs, this element was excluded because the information is not currently tracked, most of the emissions are cleansed prior to release, and the amount of emissions are very small.
Fugitive Emissions	Emissions resulting from intentional or unintentional releases of gases on Service facilities.	This emission element is useful for organizations that have industrial processes that make use of large scale refrigerant gases and oil and gas production. The Service does not make use of these gases on a large scale and tracking for other sources, such as air conditioner units, is small and difficult to determine.
Leaks from Air Conditioning systems	Emissions specifically resulting from leaks of Hydrochlorofluorocarbons (HCFC) in air conditioners in Service vehicles and refrigeration equipment.	The Service cannot determine or quantify the emissions from air conditioning leaks. The Service also does not have a reporting device or records to capture this data.
Transportation of Waste (contracted)	Emissions resulting for the transportation of solid waste from Service facilities by a contracted organization.	According to the PSS, emissions from the transportation of solid waste are the responsibility of the contractor, who assumes their control. Including these emissions would amount to "double counting" as defined by the PSS.
Wastewater Treatment	Emissions resulting from treatment of wastewater generated by Service operations.	The Service cannot determine or quantify emissions resulting from wastewater treatment.
Fire Suppression Systems	Emissions resulting from the use of fire suppression systems.	Emissions from fire suppression systems are for manufacturers of fire suppression systems and organizations that use them on a large scale

Excluded Emissions Elements	Description of the Element	FWS Rationale for Exclusion
		basis, such as for fire emergency response. According to the Fire Suppression Systems Association, strategies are being developed at the manufacturer level to limit the amount of hydrofluorocarbons emitted by these systems. The Service cannot determine or quantify emissions from fire suppression systems. Additionally, the emissions would have a minimal contribution to the Service's carbon footprint.
Outsourced Activities (Oil / Gas production, concessioners)	Emissions from the oil / gas production of the Service and from concessioners on Service lands.	According to the PSS, these emissions are the responsibility of the lessor, who assumes their operational control.
Controlled (Prescribed) Burns and Wildland Fires	Emissions resulting from the controlled burns of Service lands.	Emissions from controlled burns will occur naturally regardless of Service activities. The Association for Fire Ecology issued a position paper supporting this view for both naturally occurring and prescribed burns. The ignition source, petroleum fuel, is captured in the Energy Management Data Report and included in our carbon emissions inventory.
Domestic Water	Emissions resulting from the procurement / use of domestic water.	According to the PSS, emissions are the responsibility of the community water system that assumes their operational control.
Transportation of Purchased Fuels	Emissions resulting from the transportation of purchased fuels to Service facilities.	These emissions are the responsibility of the entity that transports the fuel. The PSS specifically excludes this emission element citing that including would amount to "double counting" as this emission element is part of the vendor's carbon emissions.
Land Management (Wetlands and rice fields)	Emissions resulting from Service-created wetlands to enhance the production of wildlife and habitat.	The emissions from wetlands are excluded until further guidance from internal / external elements is available. As with the Fire Ecology position paper mentioned above, future guidance may determine wetlands, and their creation, are naturally occurring and therefore should not be included in the carbon emissions inventory. The Department, as required by EO 13514, will support the development of guidance for land management.

Figure 6: Excluded Carbon Emission Data Elements and Rationale

5.0 Estimating and Quantifying Carbon Emissions

This section details the carbon footprint emission elements included in the Service's footprint, the assumptions for each element, as well as the carbon emission calculators the Service used for determining the carbon footprint baseline. The carbon footprint baseline includes the six greenhouse gases covered by the Kyoto Protocol: carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride. The carbon footprint baseline is expressed in tons of carbon dioxide equivalents (CO₂e). Carbon dioxide equivalents are the international standard best practice and allows for direct comparisons of carbon emissions.

The carbon footprint emission elements are grouped into nine carbon emission sources: consumed energy, motor vehicle fleet transportation, owned aircraft, procurement, leased space, employee business travel, solid waste disposal, employee commuter travel, and visitor travel. Each carbon footprint source is comprised of one or more carbon footprint emission elements. For example, employee business travel includes air transportation, car rentals, reimbursed miles, and hotel stays. Similar or related emission elements are grouped to allow for easier analysis of the emission elements and to support the development of mitigation strategies. For example, the leased space emission elements, electricity and natural gas, are grouped under the leased space source in order to distinguish the emissions from Service owned and leased facilities.

Consistent with Departmental direction, the Service employed a top-down organizational approach to determine the FY2008 carbon footprint baseline. We obtained the information for each emission element at the Service-wide level, as opposed to a bottom-up approach that would have required a data call that may duplicate prior efforts to meet existing reporting mandates. This top-down approach helps to avoid double counting and accidentally excluding emissions.

5.1 Carbon Emissions Data Calculation

Where possible, WRI's calculation tools were used to quantify carbon emissions. WRI's calculation tools reflect peer-reviewed best practices. Additionally, WRI's tools align with the PSS, and GHG accounting and reporting principles. WRI's calculation tools are located at <http://www.ghgprotocol.org/calculation-tools>.

This analysis makes use of available data drawn from a variety of systems and databases that track Service activities. Since much of this data is unrelated to carbon emissions, assumptions had to be developed in order to use the PSS and related emissions calculators.

The carbon footprint baseline reflects nine carbon emission sources: consumed energy, motor vehicle fleet transportation, owned aircraft, procurement, leased space, employee business travel, solid waste disposal, employee commuter travel, and visitor travel. Each emission element is categorized into scope 1, scope 2, or scope 3, as defined by the PSS. The following sections outline the emission source, the data elements, data collection process, data assumptions, and the calculation method. **Figure 7** provides each source, the report section where the information can be located, the emission elements, and the tools used to calculate the respective carbon emissions.

Included Carbon Footprint Source	Section	Included Carbon Footprint Emission Elements	Calculation Tool	Scope
Consumed Energy	5.1.1	Natural Gas, Coal, Gas / Diesel Fuel Oil, Liquefied Petroleum Gas, Biodiesel	WRI GHG Emissions from Stationary Combustion - http://www.ghgprotocol.org/calculation-tools/all-tools	1
		Electricity	WRI GHG Emissions for Purchased Electricity, Heat, or Steam - http://www.ghgprotocol.org/calculation-tools/all-tools	2
Motor Vehicle Fleet Transportation	5.1.2	Aviation, Motor Fleet Vehicles ⁴	WRI GHG Emissions from Transport or Mobile Sources - http://www.ghgprotocol.org/calculation-tools/all-tools	1
Owned Aircraft	5.1.3	Aviation Usage	WRI GHG Emissions from Transport or Mobile Sources - http://www.ghgprotocol.org/calculation-tools/all-tools	1
Procurement	5.1.4	Paper	Environmental Defense Fund Paper Calculator - http://www.edf.org/papercalculator/	3
		Fish Food	Not Applicable	3
Leased Space	5.1.5	Natural Gas	WRI GHG Emissions from Stationary Combustion - http://www.ghgprotocol.org/calculation-tools/all-tools	1
		Electricity	WRI GHG Emissions for Purchased Electricity, Heat, or Steam - http://www.ghgprotocol.org/calculation-tools/all-tools	2
Employee Business Travel	5.1.6	Air Transportation	WRI Working 9 to 5 on Climate Change - http://www.ghgprotocol.org/calculation-tools/all-tools	3
		Car Rentals	WRI GHG Emissions from Transport or Mobile Sources - http://www.ghgprotocol.org/calculation-tools/all-tools	3
		Reimbursed Mileage	WRI GHG Emissions from Transport or Mobile Sources - http://www.ghgprotocol.org/calculation-tools/all-tools	3
		Hotel Stays	PricewaterhouseCoopers LLP Calculator for Hotel Stays - website is not available (proprietary information) - see appendices	3
Solid Waste Disposal	5.1.7	On-site Disposal	EPA Waste Reduction Model - http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html	3
Employee Commuter Travel	5.1.8	Vehicle Transportation	Emissions from Employee Commuting - http://www.ghgprotocol.org/calculation-tools/all-tools	3
Visitor Travel	5.1.9	Transportation	Not Applicable	3

Figure 7: Included Carbon Footprint Categories

⁴ Train travel data was not available.

5.1.1 Consumed Energy

Consumed energy emissions constitute 68,495 tons of CO₂e or 41 percent of the total CO₂e footprint of the Service. The consumed energy source captures the gas emissions from the energy used in Service-owned buildings, facilities, and operations and includes natural gas, electricity, coal, gas / diesel fuel oil, liquefied petroleum gas (LPG / propane), and biodiesel.⁵ Figure 8 presents the relative contributions of these elements to the Service's overall carbon footprint⁵.

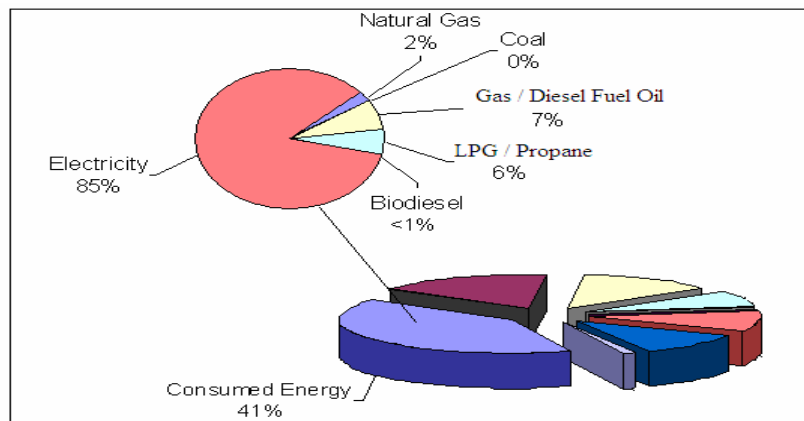


Figure 8: FY2008 Consumed Energy Carbon Footprint

5.1.1.1 Natural Gas, Coal, Gas / Diesel Oil, and Liquefied Petroleum Gas

The Service's emissions from natural gas, coal, gas / diesel fuel oil, and liquefied petroleum gas (LPG / propane) are categorized as scope 1 emissions. The volume, weight, and amount of the consumed emission element (i.e., natural gas, coal, gas / diesel oil, and LPG) were obtained from the Service's 2008 Energy Management Data Report. The data was entered into the WRI GHG Calculator for Stationary Combustion. We applied conversion factors, where appropriate, to obtain a metric that could be entered into the calculator.

We excluded wood from the carbon footprint baseline because consumption was not reported in the 2008 Energy Data Management Report and quantities of consumed wood were estimated to be sufficiently small and that they would minimally impact the overall inventory. To determine whether wood would have an impact on the inventory, we used available data on the wood consumption in quarters leased to employees. Our analysis identified a few instances where the Service provided an initial amount of wood provided to leased quarter tenants, usually a cord, and no further information on the amount of wood purchased, or gathered, by the tenant for the remainder of the year is available. Using these amounts, it was estimated the amount of wood constitutes less than .5 percent of the Service's total emission inventory, even when the variability of use is considered (e.g., winter weather).

5.1.1.2 Electricity

The Service's electricity consumption emissions are categorized as scope 2 indirect emissions. We used the electricity data in the annual 2008 Energy Management Data Report. The electricity data in the Energy Management Data Report is provided in kilowatt hours (kWh) per state. The WRI GHG Emissions for Purchased Electricity, Heat, or Steam calculator uses the EPA's Emissions and Generation Resource Integrated Database (eGRID) regions to determine the emissions data for the electric power sector. EPA's eGRID uses factors, based on the sub-region, to determine the level of emissions based on the mixture of fuels and / or incinerators used in that area. For example, the northwestern sub-regions use hydroelectricity as a source of power and therefore have lower relative carbon emissions.

⁵ Figures relating to the carbon emission sources may contain two graphs to illustrate the relative contributions of the carbon footprint elements in relation to the carbon emission source. The two-dimensional graph represents the carbon emission category and the associated carbon footprint elements, if applicable. The three-dimensional figure represents the Service's overall carbon footprint baseline.

To enter the data from the Energy Management Data Report into the WRI calculator format, we had to determine which states are in each EPA eGRID sub-region. After determining the eGRID sub-regions by state, the kWh per state was entered into the calculator with the appropriate factor. To determine how a state maps to an eGRID sub-region, it was assumed that if a state was predominately populated by a sub-region, it was assigned to that sub-region. [Appendix 12.2 - GHG Calculator Assumptions for eGRID Sub-regions](#) provides the eGRID sub-region for each state. The Service excluded kWh data for Guam, Puerto Rico, and the Virgin Islands as their electrical use is minimal and falls outside of any associated EPA eGRID sub-region.

With the eGRID sub-region assumptions, the kWh per state data was entered into the WRI GHG Calculator for Purchased Electricity, Heat, or Steam with the associated EPA eGRID sub-region to determine the Service's carbon emissions for electricity.

5.1.1.3 Biodiesel

The Service's biodiesel fuel use is categorized as a scope 1 emission, as prescribed by the PSS. Biodiesel data was obtained from the 2008 Federal Automated Statistical Tool Report. The total number of biodiesel gallons was entered in the WRI GHG Calculator for Transport or Mobile Sources. Based on the FAST report data, 100 percent biodiesel was selected as the fuel type in the WRI calculator.

5.1.2 Motor Vehicle Fleet Transportation

Motor vehicle fleet transportation emissions constitute 28,173 tons of CO₂e or 16 percent of the total CO₂e footprint of the Service. The motor vehicle fleet transportation source captures the emissions resulting from the combustion of fuels in Service owned and controlled mobile combustion sources, such as cars, trucks, and buses. Motor vehicle fleet transportation emissions are categorized as scope 1 emissions. [Figure 9](#) represents the relative contributions of these elements to the Service's overall carbon footprint.

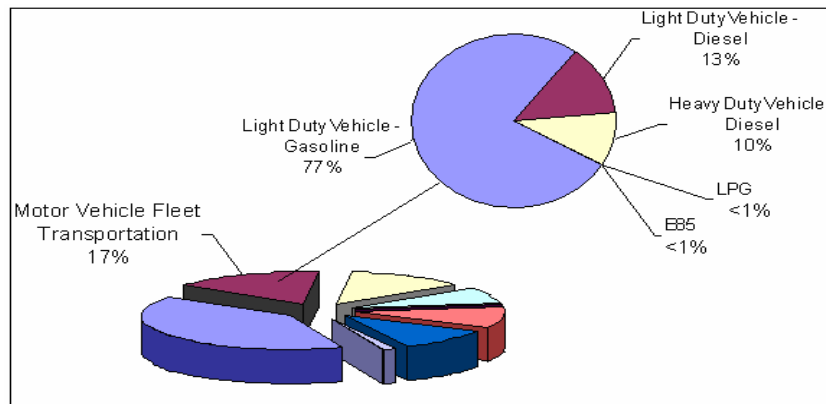


Figure 9: FY2008 Motor Vehicle Fleet Transportation Carbon Footprint

We used the 2008 FAST report to obtain the motor vehicle fleet data. The following assumptions were made to align the FAST Report with the WRI GHG Calculator for Emissions from Transport or Mobile Sources.

- All sedans use gasoline.
- All ambulances use diesel.
- All light duty 4x2 vehicles use gasoline.
- 30 percent of light duty 4x4 vehicles use diesel, 70 percent of light duty 4x4 vehicles use gasoline.
- 50 percent of medium duty 4x4 vehicles use diesel, 50 percent of medium duty 4x4 vehicles use gasoline.
- All heavy duty vehicles use diesel.

The WRI calculator does not include medium duty vehicles as a vehicle option. For this reason, the Service used the light duty emission factors for all medium duty vehicles. This assumption may

underestimate the carbon emissions for these vehicles. The Service also assumed the gallons for energy types other than diesel and gasoline provided on the FAST Report based on the energy types provided in the WRI calculator. [Appendix 12.3 - GHG Calculator Assumptions for FWS Motor Vehicle Fleet Transportation by Vehicle Type](#) illustrates the Service's motor vehicle fleet listed by vehicle type on the FAST Report, if they are owned or leased, and their fuel type. The Service was not able to assess electricity for vehicles in the WRI GHG Calculator for Emissions from Transport or Mobile Sources.

5.1.3 Owned Aircraft

Owned aircraft emissions constitute 21,494 tons of CO₂e or 13 percent of the total CO₂e footprint of the Service. The emissions from the Service's owned aircraft are categorized as scope 1 emissions. **Figure 10** presents the relative contribution of this source to the Service's overall carbon footprint.

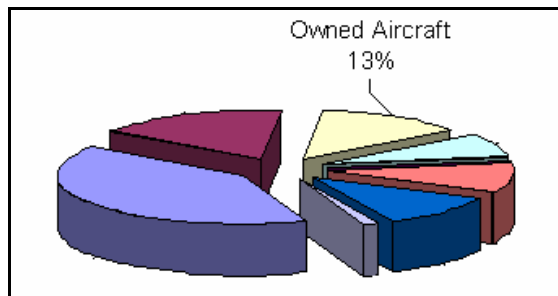


Figure 10: FY2008 Owned Aircraft Carbon Footprint

We obtained aviation gasoline and aviation jet fuel for the state of Alaska from the 2008 Energy Management Data Report. The data was converted from the current metric format in thousands of gallons to single gallons. The single gallons metrics for aviation gasoline and jet fuel were entered into the WRI GHG Calculator for Mobile Combustion.

The 2008 Energy Management Data Report does not include aviation data for the lower 48 states. To determine the aviation data for the lower 48 states, we obtained the aviation-related procurement records from the National Business Center (NBC). Invoices were separated to show the cost and gallons of aviation fuel from the invoices that only contained cost information. From the invoices containing cost and gallons of aviation fuel information, we determined an average cost per gallon of aviation fuel. The invoice amounts were then totaled and divided by the average cost per gallon to arrive at a total of 2.1 million gallons of aviation fuel consumed in the lower 48 states.

The invoices did not always clearly define whether the cost was associated with fuel use or with other expenses; we assumed that all aviation expenses listed in the invoices were for aviation fuel. Invoices related to fuel used in Alaska were removed as this data is captured in the 2008 Energy Management Data Report. The aviation fuel, in gallons, for the lower 48 states was entered into the WRI GHG Calculator for Emissions from Transport or Mobile Sources.

5.1.4 Procurement

Procurement emissions constitute 17,583 tons of CO₂e or 10 percent of the total CO₂e footprint of the Service. The procurement source captures emissions resulting from the procurement and use of items including paper and fish food. Procurement emissions are categorized as scope 3 emissions. **Figure 11** presents the relative contribution of this source to the Service's overall carbon footprint.

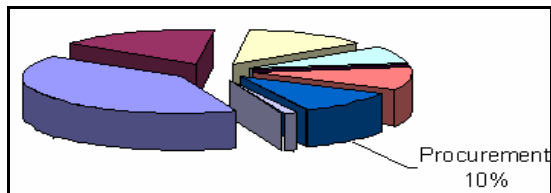


Figure 11: FY2008 Procurement Carbon Footprint

5.1.4.1 Paper

Carbon emissions occur in the manufacturing, distribution, and disposal of paper. We used data from the Division of Financial Management to identify the procurement costs for FY2008. Data was categorized by budget object class to provide information on costs for each procurement type. We assume the budget object class for "Office Supplies and Materials" captures all potential paper purchases for FY2008. Of the total value of purchases for office supplies and materials, 20 percent of the total cost was assumed to be paper purchases. This assumption was based on discussions with the Arlington Business Units and their estimates of paper purchases. The remaining 80 percent of office supplies and materials cost are assumed to include items such as printers, ink, pens, and staplers. Additionally, the following assumptions were made to calculate emissions for paper:

- Each ream weighs approximately five pounds.
- Field stations use 30 percent recycled copy paper.
- Each ream (i.e., package of 500 sheets) of paper cost \$4.00 in FY2008.

The 20 percent of the office supplies and materials cost assumed to be paper was divided by the \$4.00 per ream to obtain the total number of estimated reams purchased in FY2008. The total number of reams divided by five pounds per ream provides the estimated total number of pounds of paper purchased, and assumed to be consumed, by the Service in FY2008. The following calculation provides additional detail on how the total number of pounds of paper purchased at the Service in FY2008 was determined:

$\frac{20\% \text{ of Office Supplies and Materials (in Dollars)}}{\$4.00 \text{ per Ream}} = \text{Total Number of Reams}$
$\text{Total Number of Reams} \times \text{Five Pounds per Ream} = \text{Total Number of Pounds of Paper Purchased}$

Environmental impact estimates were made using the Environmental Defense Fund Paper Calculator. For more information, visit <http://www.environmentaldefense.org/papercalculator>. This calculator was selected for its effectiveness as it is commonly used by organizations throughout the world. The pounds of CO₂e from the Environmental Defense Paper Calculator were divided by 2,000 to obtain CO₂e tons. Until the more detailed procurement data is available, the Service assumes that all paper purchased is 30 percent recycled uncoated freesheet (e.g., standard copy paper).

5.1.4.2 Fish Food

The fish food element captures emissions resulting from the production, transportation, and use of fish food by the National Fish Hatchery System (NFHS). We were able to estimate the amount of fish food procured; however, the type of food and its related emissions could not be estimated. For the FY2008 carbon footprint baseline, the emissions from the production, transportation, and use of fish food by NFHS are not included. As we intend to include these emissions in our FY2008 baseline once data becomes available, this element will remain as an included element without data.

5.1.5 Leased Space

Leased space emissions constitute 17,091 tons of CO₂e or 10 percent of the total CO₂e footprint of the Service. The leased space emissions associated with fuel combustion (i.e., natural gas) are categorized as a scope 1 emission. Electricity, heat, and steam are categorized as scope 2 emissions. There is no distinction between Service owned and leased space where energy and electricity are consumed; therefore, the scopes are the same for owned and leased space. **Figure 12** presents the relative contributions of these elements to the Service's overall carbon footprint.

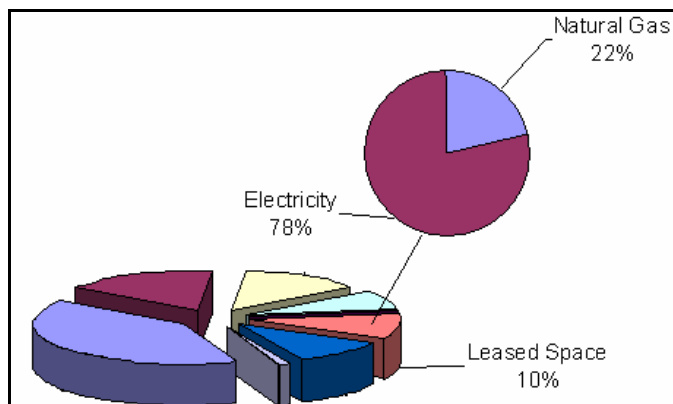


Figure 12: FY2008 Leased Space Carbon Footprint

Following the PSS operational control approach, we determined we have operating lease arrangements for which we have operational control over the emissions. Operational control for leased space means that portion of the building the Service occupies. In most arrangements, the Service is considered the lessee and the General Services Administration (GSA) is the leasing agency to the Service. When GSA leases for the Service through a third party (i.e., private organization), it is considered a non-GSA lease. Energy data for buildings such as Regional or Washington Offices that are leased through GSA were excluded from the Energy Management Data Report since the Service pays utilities to GSA through the Standard Level User Charge, or energy costs are included in the rent. GSA provided data for Regional Offices and the Washington Offices. The data excludes leased quarters, as well as steam and oil. GSA provided data on steam and oil usage for the leased space; however, we are unable to determine the portion, if any at all, that falls under Service control.

5.1.5.1 Natural Gas

The natural gas emissions from the Service's leased space are categorized as scope 1 emissions. GSA provided data for compressed natural gas consumption, in hundreds of cubic feet per square foot (SF), for 33 of the Service's 300 GSA leased buildings. GSA could not provide information for natural gas consumption for non-GSA owned buildings. Of the 33 GSA owned buildings, only 22 buildings use natural gas. Using the data provided for the 22 buildings, the Service determined the median to be 30.01 hundreds of cubic feet per SF of compressed natural gas. The data was in a bell-shaped distribution and the median represented a sample of the typical natural gas consumption of the GSA provided space. The Service multiplied the 30.01 hundreds of cubic feet per SF of compressed natural gas factor by 115,297 non-GSA leased SF to determine natural gas consumption for non-GSA leased space. The following calculation provides additional detail on how natural gas consumption for non-GSA leased space was determined.

$\frac{\text{Median Natural Gas Use Factor}}{\text{Square Foot}} \times \text{Total Square Feet for Non-GSA Leased Space} = \text{Natural Gas Consumption for Non-GSA Leased Space}$
--

This data was entered into the WRI Calculator for GHG Emissions from Stationary Combustion for both GSA leased and non-GSA leased space. This data also includes 100,000 SF of storage space and 8,358 SF from the Main Department of the Interior Building (MIB) located in Washington, D.C. in which the Service occupies. If this space is included in the Department's carbon footprint emissions for the Main Interior Building (MIB) in Washington D.C. we can remove this amount from the Service's footprint to prevent double counting.

5.1.5.2 Electricity

The electricity emissions from the Service's leased space are categorized as scope 2 emissions. We obtained information on the square footage for the 300 buildings the Service leases from GSA. The

Service leases 2,129,492 SF from GSA, and leases 115,297 SF from non-GSA parties. The information also included energy consumption figures, by month, for 33 of the GSA-owned buildings in which the Service has occupancy agreements, or leases. Although GSA provided SF data for leased space, GSA could not provide kWh for the Service's non-GSA leased space. To obtain a kWh factor to determine energy consumption for the non-GSA leased space, the Service totaled the consumption data by building, for the years 2007-2008, to obtain a median of 10.13 kWh per square foot. The data was in a bell-shaped distribution and the median represented a sample of the typical kWh consumption of the GSA leased space. The 10.13 kWh per square foot factor was multiplied by 115,297 SF to determine energy consumption figures for non-GSA leased space. The following calculation provides additional detail on how energy consumption for non-GSA leased space was determined.

Median kWh Factor Square Foot	X	Total Square Feet for Non-GSA Leased Space	=	Energy Consumption for Non-GSA Leased Space
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We used the WRI GHG Emissions for Purchased Electricity, Heat, or Steam calculator to calculate emissions from electricity. The same assumptions listed in [Section 5.1.5.2 - Electricity](#) for the eGRID sub-regions were applied to leased space electricity consumption to determine emission factors by power source. We excluded 14,949 SF in Puerto Rico and 1,352 SF in Guam for lack of a corresponding EPA eGRID sub-region. The Service's non-GSA leased space totals 117,000 square feet; however, we were only able to identify 115,297 square feet of space. The difference was assumed to be storage space.

5.1.6 Employee Business Travel

Employee business travel constitutes 13,649 tons of CO₂e or 8 percent of the total CO₂e footprint of the Service. The employee business travel source captures emissions resulting from the business travel of employees in non-Service owned assets such as planes, rental cars, trains, and hotels. Emissions from employee business travel are categorized as scope 3 emissions. [Figure 13](#) presents the relative contributions of these elements to the Service's overall carbon footprint.

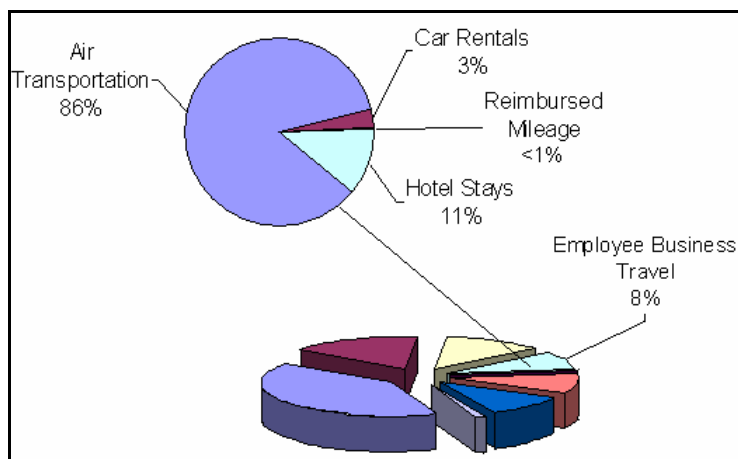


Figure 13: FY2008 Employee Business Travel Carbon Footprint

5.1.6.1 Air Transportation

We used the Service's travel system, GovTrip, to obtain the number of Service employees who traveled on business during FY2008, the number of days traveled, and the itinerary for the trip (e.g., departure and destination airports). To determine the employee's trip itinerary, we first identified the airport where the employee was departing. To determine which airport the employee departed from, the employee's

organization code was obtained from the corporate master table to locate the closest major airport to the organization code using the Global Airport Database, available at www.partow.net. To determine the airport where the employee was arriving, we used the closest major airport near the destination city zip code listed in GovTrip. The Service used a database of world airports, which contained the longitude and latitude of each airport, to determine the closest major airport from the arriving and departing zip code. The following criteria were used to determine major airports:

- For United States airports, only those airports classified by the Federal Aviation Administration (FAA) as primary airports were used.
- For Canadian airports, the 26 national airports were used because these airports carry more than 94 percent of all Canadian passengers.
- For all other countries, only those airports that have an assigned International Air Travel Association (IATA) number were used.

To derive total miles flown, we used the “Great Circle Distance” method to calculate miles to account for the curvature of the earth. The calculation was performed for each GovTrip voucher using the major airports determined for each voucher. Each flight was assumed to be direct and all flight miles were considered “long flights” as the average flight for a Service employee was over 1,000 miles. The data was entered into the WRI Calculator named 9 to 5 on Climate Change (for office based organizations) to determine the emissions from air transportation.

5.1.6.2 Car Rentals

The number of employees who rented cars during their business travel was obtained from the GovTrip system. Each GovTrip voucher indicates whether an employee had a rental car charge. If an employee had a charge, we included the total number of days (less one day for travel) for his / her trip in the car rental analysis. A review of major rental car companies’ policies on rentals showed that most companies rent cars on a 24 hour basis and charge renters for an additional day if the car is returned more than four hours past the designated return time. The emissions calculation assumes travelers are charged a full day when they pick up their rental car on the day of arrival and when the car is returned prior to departure. In FY2008 the number of car rental days for Service employees was 56,126 days.

The Revenue Management Department (i.e., Department responsible for tracking and setting rental rates as well as identifying daily mileage per business sector) of three major car rental companies provided an estimate of the average miles per day driven, per car, for their government business segment. We used the data provided by the Revenue Management Department and assumed the number of miles driven per car, per day, is 18.3 miles.

We determined that the estimated number of miles Service employees traveled in rental cars in FY2008 is 1,027,106 miles. To determine this number, the average number miles driven per car, per day, of 18.3 miles was multiplied by 56,126 days that Service employees rented cars. The number of miles traveled by Service employees during FY2008 was entered into the WRI GHG Calculator for Transport and Mobile Sources. The Service assumed all rental vehicles were late model passenger vehicles and used 100 percent gasoline. The following calculation provides additional detail on how the number of miles traveled by Service employees was determined.

Average Number of Miles Driven Per Day	X	Number of Rental Days for Service Employees	=	Number of miles traveled by Service Employees
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5.1.6.3 Reimbursable Mileage

Employees on business travel may use their personal vehicles for business travel in certain situations and are reimbursed for the number of miles driven. Additionally, if employees drive to an airport, they are reimbursed for any miles driven over the number of miles they would drive to get to work. We used information from GovTrip to determine that Service employees were reimbursed \$1.7 million for miles driven while on business travel in FY2008. This figure does not include trips less than 12 hours in duration as they would not submit a reimbursement voucher through GovTrip. The \$1.7 million in

reimbursed mileage was divided by the Internal Revenue Service's (IRS) 2008 reimbursement rate of \$0.505 per mile to calculate the total number of miles driven. The Service assumed all miles were driven by a midsize, gasoline only, vehicle. The number of miles was entered into the WRI Calculator named 9 to 5 on Climate Change (for office based organizations). The following calculation provides additional detail on how the number of miles traveled by Service employees, while on business travel, was determined.

$\frac{\text{Reimbursed Mileage (In dollars)}}{\text{IRS FY2008 Reimbursement Rate (In dollars)}} = \text{Total Number of Miles Driven by Service Employees, while on Travel}$
--

5.1.6.4 Hotel Stays

The Service used GovTrip data to determine the number of nights employees stayed in hotels. The number of hotel nights (to account for "travel days") was calculated using the length of travel minus one day. The number of nights Service employee stayed in a hotel in FY2008 was 180,871 nights.

The Service used a calculator PricewaterhouseCoopers LLP (PwC) developed as part of its internal carbon footprint assessment to account for the emissions from hotel stays, as WRI and EPA do not currently have a calculator for hotel stay emissions. [Appendix 12.4 - GHG Calculator Assumptions for Hotel Stays](#) provides the assumptions used for calculating GHG emissions for hotel stays.

5.1.7 Solid Waste Disposal

Solid waste emissions constitute 2,467 tons of CO₂e or 1 percent of the total CO₂e footprint of the Service. The solid waste disposal source encompasses emissions resulting from the disposal of waste generated in Service operations, such as paper. [Figure 14](#) provides the relative contribution of this source to the Service's overall carbon footprint.

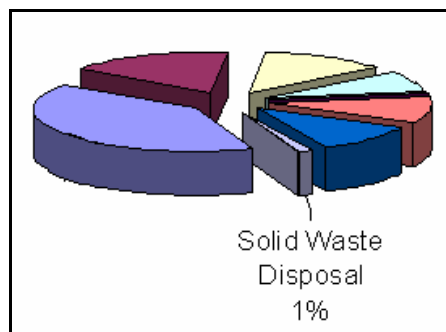


Figure 14: FY2008 Solid Waste Disposal Carbon Footprint

Data collected for the FY2008 Sustainable Practices Report, required by EO 13423, was used as a basis for solid waste disposal calculations. The Sustainable Practices Report, formerly known as the Resource Conservation and Recovery Act (RCRA) report, provides data on procurement and solid waste diversion. It should be noted that in FY2008 and prior years, only those Service facilities with six or more full time employees were required to report on their solid waste operation and diversion.

The waste diversion information in the Sustainable Practices Report is provided in two categories, construction trash and non-construction trash. The Service used the EPA Waste Reduction Model (WARM) calculator available at <http://www.epa.gov/climatechange/wycd/waste/calculators/Warmhome.html> to calculate the emissions from solid waste. The Service assumed construction waste was dimensional lumber, and was placed in a landfill and not recycled or combusted. The Service assumed non-construction waste was municipal solid waste, and was placed in a landfill and not recycled or combusted.

5.1.8 Employee Commuter Travel

Employee commuter travel constitutes 84 tons of CO₂e or less than one percent of the total CO₂e footprint of the Service. This source captures emissions resulting from the commutes of employees to and from Service facilities, both owned and leased. Emissions from employee commuter travel are categorized as a scope 3 emission. **Figure 15** presents the relative contribution of this source to the Service's overall carbon footprint.

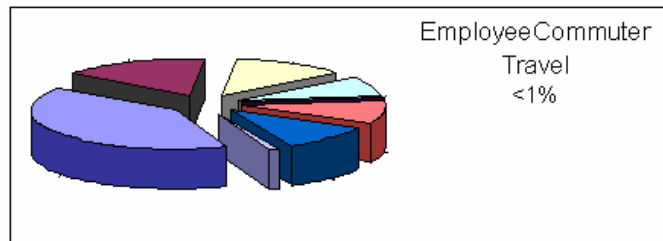


Figure 15: FY2008 Employee Commuter Travel Carbon Footprint

The Service employs roughly 8,500 employees, 5,942 of which were included in the data set to determine carbon emissions. Some of the employee commuter data travel was excluded because the data was either corrupted or was missing data points. We used each of the included employees' zip codes⁶ and their organization code addresses to determine the number of miles employees travel to and from work each day. We used the Google™ Application Programming Interface (API) to obtain directions, to and from home and work, and compute the driving distance between each employee's zip code and organization address. The Service assumed all commutes occurred in a motor vehicle that uses gasoline as the fuel source. The total number of miles obtained from API was multiplied by two to account for round-trip travel and was entered into the WRI GHG Calculator for Emissions from Employee Commuting.

Data on employee commuter benefits, or subsidies, were not included in the employee commuter travel analysis. This data was available; however, we assumed that a variety of vehicles would not have significantly altered or impacted this emission source. Likewise, data on the use of mass transit by Service employees in urban areas was not available.

5.1.9 Visitor Vehicle Travel

The visitor vehicle travel source captures emissions resulting from the travel of visitors to Service lands. Visitor vehicle emissions are categorized as scope 3 emissions. Visitor vehicle travel is an important factor to consider in the Service's carbon footprint; however, this source is not accounted for in the FY2008 carbon footprint baseline. The Service's National Wildlife Refuge System is participating in a test program in conjunction with the National Park Service and Federal Highway Administration to determine carbon emissions from park and refuge visitors. Developing measurements and data is expected to take up to two years once the project is underway. The Service will wait until the conclusion of the study to calculate visitor travel as the Service will use the methodologies developed during the study to determine emissions. As we intend to include these emissions in our FY2008 baseline once data become available, this source will remain as an included source without data.

⁶ Employee names were not used, or associated with zip codes, when determining the number of miles employees travel to and from work.

6.0 Carbon Emission Inventory Baseline

The Service employed a top-down organizational approach to determine the FY2008 carbon footprint baseline. The information for each emission element was obtained for the Service level, as opposed to a bottom-up approach. A bottom-up approach was not used as it would have required data calls that may have duplicated previous data calls that were issued to meet reporting mandates. Actual data was used when available. When actual data was not available, the approach to estimating, impediments to obtaining data, and assumptions were documented (see [Section 5.0 - Estimating and Quantifying Carbon Emissions](#)). The calculators used to calculate each emission element are presented in [Figure 7](#) of this report.

The Service's FY2008 baseline greenhouse gas emissions are an estimated 169,037 tons of equivalent carbon dioxide. Appendix 12.1 - The Service's Carbon Footprint details each of the Service's carbon emission sources, along with each element that comprises the carbon emission source, scope, data source, calculation tool, and GHG emissions. We sought to evaluate our footprint against Federal agencies of a similar size and mission; however, data is not currently available for other Federal agencies, or public organizations of a comparable size. Only limited data exists for a portion (i.e., 199) of the S&P 500 or other private sector organizations. [Figure 16](#) provides the breakdown of the Service's carbon footprint by source.

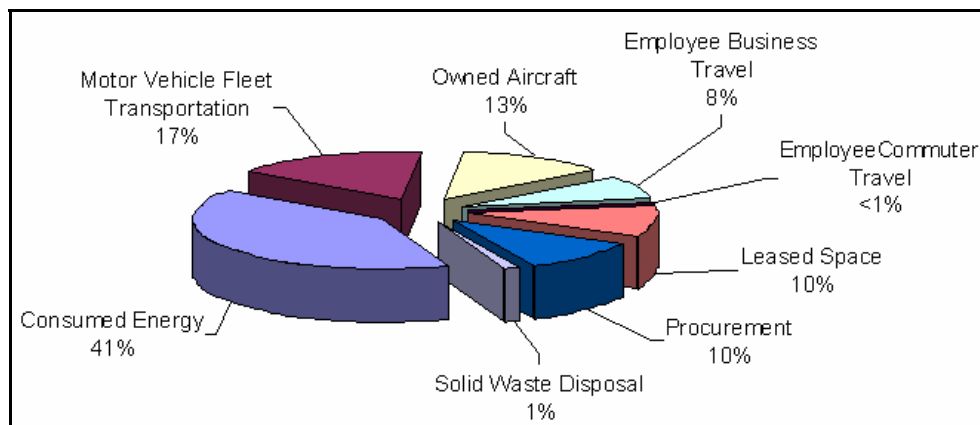


Figure 16: The Service's FY2008 Carbon Footprint Baseline by Source

7.0 Recommendations for Future Carbon Footprint Calculations

This report presents the Service's carbon footprint for FY2008. To measure progress for reducing its footprint, the Service will conduct an annual carbon footprint assessment. All sources identified in FY2008 will be considered in future years, recognizing that data availability may enable the inclusion of previously excluded sources (listed in [Section 4.0 - Consideration of Greenhouse Gas Emission Sources](#)). When appropriate, and in keeping with PSS guidance, a rebaselining, or recalculation of the FY2008 emissions may be conducted. Recommendations that would facilitate such improvements are summarized below.

7.1 Leased Space

The Service can work to identify more relevant emission factors and kWh metrics by working with GSA to include additional terms in lease contracts related to sustainable practices. The additional terms would stipulate that the lessor must provide the lessee, the Service, with information on electricity, natural gas, and petroleum fuel use by facility.

7.2 Motor Vehicle Fleet Transportation

The Service may consider using the EPA's calculator for motor vehicle fleet data in lieu of the WRI calculator. For the current effort, the Service had two options for calculating motor vehicle fleet transportation carbon emissions: the WRI GHG Calculator for Emissions from Transport for Mobile Sources and the EPA calculator for fleet. The Service used the WRI calculator for the baseline footprint calculation for consistency purposes, as WRI calculators were used to calculate emissions for the other sources. However, the vehicle types listed in the FAST Report were categorized differently than the vehicle types in the WRI GHG Calculator for Emissions from Transport for Mobile Sources. We were unable to choose the model year for each vehicle type and therefore assumed certain emission factors for medium duty vehicles. In the future, we may choose to use the EPA calculator because it uses total gallons of each fuel which may make it easier to calculate future motor vehicle fleet carbon footprints. It is worth noting that, for the current effort, the emissions calculated for the Service's motor vehicle fleet data in the WRI calculator closely resembled the emissions calculated in the EPA calculator.

7.3 Employee Business Travel

Modified methods are needed to improve the accuracy for carbon emissions from employee business travel (i.e., air transportation mileage, car rentals, reimbursed mileage, hotel stays). Possible means to obtain data include using a more detailed version of GovTrip, or employing an employee survey to characterize actual or average business travel trips.

7.4 Employee Commuter Travel

Improved methods are needed to capture carbon emissions from commuting to and from work more accurately. Although this is an indirect emission that is not owned or directly controlled by the Service, developing the most accurate data possible supports the EO 13514 directive to agencies to "implement strategies for transit, travel, training, and conferencing that actively support lower-carbon commuting and travel by agency staff." One option to improve data would be to conduct an employee survey asking detailed questions about their commute, such as if they drive or take mass transit, how many miles they travel, and how many days they commute during a typical work week. The survey would provide the Service with data to calculate the number of miles traveled, average fuel economy for miles traveled, and the frequency for employees that participate in carpools or mass transit. Additionally, distance data could be improved if, with employee consent, employee routes of travel from home their office locations were mapped. This approach is used extensively by other organizations (e.g., WRI) that track this emission source.

7.5 Procurement

For the current baseline effort, paper and fish food were identified as elements to be included in the procurement source. For future carbon footprint calculations, procurement elements other than paper and fish food also should be included.

7.5.1 Paper

The current method uses procurement records to estimate the number of reams of paper purchased. However, this method does not capture purchases made by an employee using a government-issued purchase card. To produce a more accurate number for the number of reams of paper the Service procures, the Service is considering developing a method to capture paper purchases with Service charge cards.

7.5.2 Fish Food

We were able to estimate the amount of fish food procured; however, there was no available method to calculate the emissions from this element. For future carbon footprints, the Service can work with the organizations that sell the Service fish food to obtain emission information based on the chemical compounds contained in the food.

7.6 Land Management

Carbon footprint emission elements related to land management activities such as prescribed burns and wildland fires are excluded from the FY2008 carbon footprint baseline due to a lack of methodologies at a nationwide scale. EO 13514 directs DOE, in coordination with DOI, to lead the development of the necessary guidance to consider and account for the sequestration and emissions of greenhouse gases resulting from Federal land management practices. The Service will continue to work with the Department and other agencies in this effort, while coordinating activities undertaken to address the Service's related Climate Change Action Priorities. Currently, the Service is supporting DOI's efforts to develop land management practices guidance related to prescribed fire on Service lands by September 30, 2010. The National Climate Team has recommended changing the due date for this guidance to September 30, 2011.

7.7 Improving Data Quality

The Service needs to improve data quality for future carbon footprint inventories. The Service uses a top-down approach to quantify its carbon footprint in order to avoid duplicating data collected for mandated reports, and minimize the reporting burden to the field. Currently, Service staff responsible for submitting mandated reports from which we draw data (e.g., Annual Energy Management Data Report, the FAST Report, and Sustainable Practices Report), routinely provide extensive quality assurance coordination with the field. The Service should also evaluate its reporting timeframes and mechanisms to assess whether we need to improve them, add to them, or possibly incorporate new tools to capture and improve the data required for future assessments. Maintaining good records as a year-round practice could also help alleviate errors that occur during end-of-year reporting.

7.8 Engaging with other Federal agencies

Accounting for the Service's GHG emissions is a complex and detailed process. To better account for the Service's GHG emissions and provide for a more accurate carbon footprint, the Service recommends engaging with other Federal agencies to streamline efforts and determine best practices for calculating certain carbon footprint emission elements. For example, GSA and EPA may be able to provide the Service with data and useful information to aid in calculating carbon emissions for motor vehicle fleet transportation.

7.9 Duplicating Carbon Footprints at the Regional Level

The methodology used to estimate the Service's carbon footprint baseline followed a top-down approach that can be replicated at the Regional level. Identifying each Region's carbon footprint could reveal areas on which to focus reduction efforts.

8.0 Building on Initial Steps to Reduce the Service's Carbon Emissions

For the past several years, the Service has undertaken efforts to operate more sustainably. To date, efforts and mandates have focused on individual subject areas such as improving energy efficiency, increasing renewable energy, implementing sustainable building designs, and managing the motor vehicle fleet, procurement, and waste diversion (for more information, see the Service's Environmental Stewardship and Greening the Government Annual Report). The issuance of EO 13514 brings together targets within each of these areas, not only to improve operations, but to collectively achieve a more sustainable profile and reduce carbon emissions. Though it is premature to quantify the impact the Service's initial measures have made to date, they are forward-looking strategies that provide a platform on which to develop more planned, proactive milestones and achievements.

8.1 Energy Efficiency

The Service spends more than \$17 million per year for energy and uses 36 million gallons of domestic water in approximately 7 million energy-using square feet of buildings. In FY2008, the Service successfully reduced building energy consumption. The Service has decreased energy intensity through the implementation of many cost effective efficient energy, lighting, renewable solar, wind, geothermal and biomass energy projects at Service field stations over the last several years. As part of the Climate Change Action Priorities, the Service has performed energy audits at some field stations in an effort to identify energy conservations measures. The Service also worked with GSA to undertake a number of energy efficiency projects at the Arlington Square Office in Arlington, Virginia.

8.2 Renewable Energy

A number of Service facilities have implemented solar photovoltaic, geothermal, and wind energy projects to reduce the amount of purchased energy. To date, at least three facilities operate solely using renewable energy resources, eliminating the need to build infrastructure or purchase electricity. These facilities, Brazoria National Wildlife Refuge (NWR), Farallon NWR, and Hopper Mountain NWR model the potential to maximize the use of renewable resources.

8.3 Sustainable Buildings

The Service has incorporated sustainable building practices into new construction and major renovations. The Service's achievements in this area are evident in the 13 Federal Energy Saver Showcase winners, and the eight Federal Energy and Water Management Award Winners recognized in recent years. Sustainable principles have been incorporated into standardized designs for visitor and administrative facilities, and are reflected in all construction initiated since 2007.

8.4 Motor Vehicle Fleet

Beginning in 2007, the Service took several steps to address new mandates requiring Federal agencies to address motor vehicle fleet performance. Once these plans are fully implemented they have the ability to deliver future carbon emission reductions. The Service's Five-Year Motor Vehicle Fleet Plan was ratified to contain strategies to improve fleet management effectiveness with emphasis on petroleum fuel reductions to reduce carbon emissions. We added a National Fleet Coordinator to the Washington Office staff to analyze performance, introduce effective fleet management practices, and form the Service's Transportation Review Board (STRB). The STRB is tasked with reviewing fleet performance annually to determine progress and make recommendations to improve results.

Additionally, the motor vehicle fleet management policy was revised to reflect criteria measured on the Office of Management and Budget's (OMB) "Transportation Management Scorecard." The Transportation Management Scorecard is updated quarterly, providing visibility to the Service's fleet performance in the areas of alternative fuel vehicle (AFV) acquisitions, reductions in petroleum fuel use mandated by EPOA of 1992, EPOA of 2005 and Executive Order 13514, and increases in alternative fuel use. The Service developed a FY2005 baseline for motor fleet vehicles and began tracking carbon emissions reductions

from petroleum fuel use in the motor vehicle fleet in FY2007. To date, the Service has reduced carbon emissions through successful efforts to right-size the motor vehicle fleet by procuring the proper number and composition of motor vehicles. This right-sizing enables us to meet the Service's needs and reduce petroleum fuel use.

9.0 Future Actions

The following section identifies upcoming action items and priorities identified through the Strategic and Action Plans, and external mandates. These actions and priorities will help to assess our progress each year, and advance our carbon footprint reduction efforts.

9.1 Annual Calculation

We will assess our carbon footprint on an annual basis. The assessment will be completed using emissions data for the prior fiscal year while maximizing the use of existing reporting requirements such as the annual Energy Management Data Report and the annual Federal Automotive Statistical Tool Report.

The Service began the process of accounting for and calculating the Service's carbon footprint in June 2009. A portion of this time was dedicated to researching GHG accounting methodologies, learning the PSS methodology, and determining the Service's inventory boundary. Conducting the annual assessment may require less time than the initial effort as there will not be a need to research methodologies in the future or determine the carbon emission elements. However, additional time may be invested as new calculators or emission factors are developed, or new sources or additional data collection actions are required.

9.2 Carbon Footprint Rebaseline

The PSS methodology recommends that organizations recalculate their carbon footprint baseline to reflect changes that would compromise the consistency and relevance of reported emissions data. Recalculating or rebaseline is in order when there is a need to include significant changes to the data, inventory boundary, data collection or evaluation methods, or other significant factors.

The Service's rebaselining practice will be based on a significance threshold. The Service will recalculate baseline emissions if a parameter or data element of the baseline changes by more than +/- 5 percent as determined on a cumulative basis from FY2008. For example, if the Service includes fire as an emission source in FY2010, and the source emission accounts for more than five percent of the FY2010 carbon footprint, fire should be calculated for FY2008, data permitting, and the FY2008 accounting adjusted accordingly. The rationale for rebaselining the carbon footprint would be thoroughly documented.

9.3 Follow-on Action Priorities

Developing, implementing, and improving strategies to reduce carbon emissions will aid in the Service's goal to be carbon neutral by 2020; however, focusing on developing strategies to reduce the Service's largest emission sources potentially can yield the greatest results.

10.0 Glossary of Definitions

Carbon Footprint	The sum of greenhouse gasses produced directly and indirectly related to an organization's activities.
Carbon Neutral	Carbon neutral means having a net zero carbon footprint, that is, it is achieving net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount that is sequestered. The Service's goal is to be a carbon neutral organization no later than 2020.
Direct Emission Source	Emissions are from sources that are owned or controlled by the organization.
Equivalent Carbon Dioxide (CO₂e)	The amount of carbon dioxide, by weight, emitted into the atmosphere that would produce the same estimated radiative forcing as a given weight of another radiatively active gas.
Greenhouse Gas (GHG)	The six gases covered by the Kyoto Protocol—carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulphur hexafluoride (CO ₂ , CH ₄ , N ₂ O, HFCs, PFCs, and SF ₆).
Indirect Emission Source	Emissions are emissions that are a consequence of the activities of the organization, but occur at sources owned or controlled by another organization or company.
Inventory Boundary	An organization's inventory boundary is comprised of their organizational and operational boundaries.
Kyoto Protocol	Adopted at the Third Conference of the Parties to the United Nations Convention on Climate Change held in Kyoto, Japan in December 1997, the Kyoto Protocol commits industrialized country signatories to reduce their greenhouse gas emission by an average of 5.2 percent compared with 1990 emissions, in the period 2008 - 2012.
Operational Boundary	The scope of emissions for operations that fall within the organization's established organizational boundary. This involves identifying emissions associated with operations, categorizing emissions as indirect or direct, and categorizing each emission into the scope of accounting for indirect emissions.
Organizational Boundary	An entity's organizational boundary is determined by structure of the organization and the relationships of the parties involved.
Renewable Energy	Energy produced by solar, wind, biomass, landfill gas, ocean (including tidal, wave, current, and thermal), geothermal, municipal solid waste, or new hydroelectric generation capacity achieved from increased efficiency or additions of new capacity at an existing hydroelectric project.
Scope 1	Accounts for the direct GHG emissions that come from sources owned or controlled by the organization, such as emissions from motor vehicle fleet transportation.
Scope 2	Accounts for the indirect GHG emissions from the generation of purchased electricity consumed by an organization.
Scope 3	Accounts for the treatment of all other indirect GHG emissions.

11.0 References and Citations

The following sources were referenced in this document or used when calculating the Service's carbon footprint baseline:

- PricewaterhouseCoopers, 2008. *Carbon Disclosure Project Report 2008*.
- World Resources Institute / World Business Council for Sustainable Development, 2004. *The Greenhouse Gas Protocol*.
- World Resources Institute / World Business Council for Sustainable Development, 2004. *The Greenhouse Gas Protocol*.
- World Resources Institute / Logistics Management Institute, *Public Sector Standard*.
- World Resources Institute, Calculation Tools, available at <http://www.ghgprotocol.org/calculation-tools>.
- Environmental Defense Fund Paper Calculator, available at <http://www.environmentaldefense.org/papercalculator>.
- Environmental Protection Agency's Waste Reduction Model, available at http://www.epa.gov/climatechange/wycd/waste/calculators/Warm_home.html.

12.0 Appendices

12.1 The Service's Carbon Footprint Baseline

Figure 17 details each of the Service's carbon emission sources, along with each element that comprises the carbon emission source, scope, data source, calculation tool, and GHG emissions.

Carbon Emission Source	Included Carbon Footprint Elements	Scope	Data Source	WRI Calculation Tool	GHG Emissions (tons CO ₂ e)	Assumptions and Rationale
Consumed Energy (Energy we use in our facilities)	Natural Gas	1	Energy Mgmt Report	GHG Emissions from Stationary Combustion	1,504	See Tab 1. Consumed Energy
	Coal	1	Energy Mgmt Report		-	See Tab 1. Consumed Energy
	Gas / Diesel Fuel Oil	1	Energy Mgmt Report		4,829	See Tab 1. Consumed Energy
	LPG / Propane	1	Energy Mgmt Report	3,925	See Tab 1. Consumed Energy	
	Biodiesel	1	FAST Report	GHG Emissions from Transport or Mobile Sources	28	See Tab 1. Consumed Energy
	Electricity	2	Energy Mgmt Report	GHG Emissions for Purchased Electricity, Heat, or Steam	58,208	See Tab 1. Consumed Energy
Emissions From Consumed Energy Subtotal					68,495	
Leased Space (Energy we use in our leased buildings)	Natural Gas	1	GSA	GHG Emissions from Stationary Combustion	3,720	See Tab 2. Leased Emissions
	Electricity	2	GSA	GHG Emissions for Purchased Electricity, Heat, or Steam	13,371	See Tab 2. Leased Emissions
Emissions From Leased Space Subtotal					17,091	
Motor Vehicle Fleet Transportation (The vehicles we own, lease, and operate)	Light Duty Vehicle - Gasoline	1	FAST Report	GHG Emissions from Transport or Mobile Sources	21,722	See Tab 3. Fleet Transportation
	Light Duty Vehicle - Diesel	1	FAST Report		3,730	See Tab 3. Fleet Transportation
	Heavy Duty Vehicle - Diesel	1	FAST Report		2,713	See Tab 3. Fleet Transportation
	LPG	1	FAST Report		6	See Tab 3. Fleet Transportation
	E85	1	FAST Report		3	See Tab 3. Fleet Transportation
Emissions From Fleet Transportation Subtotal					28,173	
Owned Aircrafts (The planes we own and fly)	Aviation Usage	1	FAST Report / EMR	GHG Emissions from Transport or Mobile Sources	21,494	See Tab 3. Fleet Transportation
Emissions from Owned Aircrafts Subtotal					21,494	
Employee Business Travel (Official travel by our employees)	Air Transportation	3	GovTrip	WRI Working 9 to 5 on Climate Change	11,645	See Tab 4. Emp Business Travel
	Car Rentals	3	GovTrip	GHG Emissions from Transport or Mobile Sources	405	See Tab 4. Emp Business Travel
	Reimbursed Mileage	3	GovTrip	WRI Working 9 to 5 on Climate Change	31	See Tab 4. Emp Business Travel
	Hotel Stays	3	GovTrip	PricewaterhouseCoopers Proprietary Calculator	1,568	See Tab 4. Emp Business Travel
Emissions From Business Travel Subtotal					13,649	
Employee Commuter Travel (Commuters to work by employees)	Vehicle Transportation	3	Service Records	GHG Emissions from Employee Commuting	84	See Tab 5. Employee Commuter Travel
Emissions From Commuter Travel Subtotal					84	
Visitor Travel (The visitors to our facilities)	Transportation	3	NWRS	Under Development	-	See Tab 6. Visitor Travel
Emissions From Visitor Travel Subtotal					-	
Procurement (The products we buy and use)	Paper	3	Procurement	Environmental Defense Fund Paper	17,583	See Tab 7. Procurement
	Fish Food	3	NFHS	N/A	-	See Tab 7. Procurement
Emissions from Procurement Subtotal					17,583	
Solid Waste Disposal (Construction and non-construction waste sent to landfills)	On-site Disposal	3	Sustainability Report	EPA Waste Reduction Model	2,467	See Tab 8. Solid Waste Disposal
Emissions from Waste Disposal Subtotal					2,467	
Total Tons of CO₂e Consumed by The U.S. Fish and Wildlife Service					169,037	

Summary of CO ₂ e Emissions by Scope	
Scope 1 Emissions	63,674
Scope 2 Emissions	71,579
Scope 3 Emissions	33,784
Total	169,037

Figure 17: The Service's Carbon Footprint Baseline

12.2 GHG Calculator Assumptions for Emission Sources (eGRID Subregions)

Figure 18 provides the assumptions eGRID subregion assumptions for electricity referenced in Section 5.1.1.2 - Electricity of the FY2008 Carbon Footprint Baseline Report. To determine how a state maps to an eGRID subregion, the Service assumed that if a state was predominately populated by a subregion, it was assigned to that subregion.

State	eGRID Subregion	State	eGRID Subregion
Alaska	ASCC Alaska Grid	Montana	WECC Northwest
Alabama	SERC Mississippi Valley	North Carolina	SERC Virginia/Carolina
Arkansas	SERC Mississippi Valley	North Dakota	MRO West
Arizona	WECC Southwest	Nebraska	MRO West
California	WECC California	New Hampshire	NPCC New England
Colorado	WECC Rockies	New Jersey	RFC East
Connecticut	NPCC New England	New Mexico	WECC Southwest
Delaware	RFC East	Nevada	WECC Northwest
District of Columbia	RFC East	New York	NPCC Upstate NY
Florida	FRCC All	Ohio	RFC West
Georgia	SERC South	Oklahoma	SPP South
Hawaii	HICC Miscellaneous	Oregon	WECC Northwest
Iowa	MRO West	Pennsylvania	RFC East
Idaho	WECC Northwest	Rhode Island	NPCC New England
Illinois	SERC Midwest	South Carolina	SERC Virginia/Carolina
Indiana	RFC West	South Dakota	MRO West
Kansas	SPP North	Tennessee	SERC Tennessee Valley
Kentucky	SERC Tennessee Valley	Texas	ERCOT All
Louisiana	SERC Mississippi Valley	Utah	WECC Northwest
Massachusetts	NPCC New England	Virginia	SERC Virginia/Carolina
Maryland	RFC East	Vermont	NPCC New England
Maine	NPCC New England	Washington	WECC Northwest
Michigan	RFC Michigan	Wisconsin	MRO East
Minnesota	MRO West	West Virginia	RFC West
Missouri	SERC Midwest	Wyoming	WECC Northwest
Mississippi	SERC South		

Figure 18: Assumptions for eGRID Subregions

12.3 GHG Calculator Assumptions for FWS Motor Vehicle Fleet Transportation by Vehicle Type

Figure 19 illustrates the Service's motor vehicle fleet listed by vehicle types on the FAST report, if they are owned or leased, and the fuel type referenced in Section 5.1.2 - Motor Vehicle Fleet Transportation of the FY2008 Carbon Footprint Baseline Report.

Vehicles (FAST Report)	Owned	Leased	Total	Diesel Motor Vehicle	Gas Motor Vehicle
Sedans	194	96	290		290
Ambulances	1		1	1	
Light Duty Trucks 4x2	356	50	406		406
<i>Light Duty Trucks 4x4 Diesel*</i>	195		195	195	
Light Duty Trucks 4x4	2,578	209	2,787	2,787	
<i>Medium Duty Vehicles 4x4 Diesel*</i>	1,175		1,175	1,175	
Medium Duty Vehicles 4x4	1,081	94	1,175		1,175
Heavy Duty Vehicles	985	7	992	992	
Totals	6,565	456	7,021	2,363	4,658

*Taken as a percentage of this category to reflect vehicles with diesel.

Figure 19: Assumptions for FWS Motor Vehicle Fleet Transportation by Vehicle Type

12.4 GHG Calculator Assumptions for Emission Sources (Hotel Stays)

Figure 20 through Figure 22 provides the assumptions used for calculating GHG emissions for hotel stays referenced in Section 5.1.6.4 - Hotel Stays of the FY2008 Carbon Footprint Baseline Report.

Activity	Female	Male	Units Per Night	Reference	Low	High	Average	Units
Laptop Use	10.00	10.00	Hours		45.00	50.00	47.50	Watts
Shower Morning	20.00	20.00	Min	C	2,200.00	2,200.00	2,200.00	Btu/Min
Shower Evening	10.00	20.00	Min	C	2,200.00	2,200.00	2,200.00	Btu/Min
Room Temperature Summer	72.00	69.00	F	D	1,119.27	2,238.55	839.45	Btu/h
Room Temperature Winter	80.00	77.00	F	D	746.18	1,865.45	652.91	Btu/h
TV Use 36"	2.50	2.50	Hours		133.00	133.00	133.00	Watts
4 Lights On	5.00	5.00	Hours		240.00	480.00	360.00	Watts
Ironing	15.00	20.00	Min		1,000.00	1,800.00	1,400.00	Watts
Hair Dryer	30.00	-	Min		1,200.00	1,875.00	1,537.50	Watts
Cell Phone Charger	10.00	10.00	Hours		20.00	24.00	22.00	Watts
Blackberry Charger	10.00	10.00	Hours		20.00	24.00	22.00	Watts

Figure 20: Assumptions for General Hotel Behavior

Activity	General Usage	Reference	Units Per Night	Low	High	Average	Units
Vacuum cleaner	20.00		Min	1,000.00	1,440.00	1,220.00	Watts
Clothes washer	3.18	A, B	Night	350.00	500.00	425.00	Watts
Clothes washer (Water Heating)	0.11	A, B	Night	-	17,600.00	8,800.00	Btu
Clothes dryer	6.36	A, B	Night	1,800.00	5,000.00	3,400.00	Watts
Lights On	20.00		Min	240.00	480.00	360.00	Watts

Figure 21: Assumptions for Room Service Behavior

Reference	Assumptions
A	A Clothes Washer/Dryer will take four sets of Linens, washing for 30min, drying for one hour. In Warm/Cool cycle it takes 40 gallons of water to do one load of laundry. It takes 440 British Thermal Units (Btu) to heat one gallon of water. If you wash and rinse your laundry with hot water, this would require 17,600 Btu. If you use warm water, your energy use is 8,800 Btu. If you use cold water, no energy is required to heat the water.
B	Average Stay is 2.36 nights.
C	The shower uses up to five gallons of water per minute. It takes 440 Btu to heat one gallon of water, or 2200 Btu per minute. Thus, a 10 minute shower uses 50 gallons of water and 22,000 Btu of energy (20-minute shower uses 44,000 Btu).
D	Assume gas heat (80% efficiency) and electrical cooling (Energy Efficiency Rate 10). A wall, ceiling, or floor loses heat at a rate related to the "R" value. One square foot with a T2-T1 degree temperature difference on the two sides of the wall and for R=1 transfers heat at the rate of T2-T1 Btu per hour. $Btu\ per\ hour = A \cdot (T_2 - T_1) / R$ where A is area in square feet, T2-T1 is the temperature difference in degrees F, and R is the measure of resistance to heat flow. Assume room with dimensions of 30 by feet (900 square feet). Floor and ceiling each contribute 900 square feet. The wall perimeter is 120 feet and interior walls are 8 feet high. Total area of all parts is 2,280 square feet. At a temperature difference of 75F standard degrees Fahrenheit and for R value of 11, heat is lost at a rate of $2,280 \cdot T_2 - 75 / 11$ Btu per hour. T2 is temperature increased by room user. Assume that heating/cooling goes on at night, during the day the temperature is returned to standard energy use for 14 hours is zero (incremental). Half of the Year is Winter, Half is Summer.
E	One watt for one hour = 3.412 Btu.
F	Kg to Short Ton: 1 Kg = 0.00110231131 Ton.

Figure 22: Assumptions for Hotel Stays