

# Climate Action Plan

WSU Pullman and Statewide Research and  
Extension Centers/Units

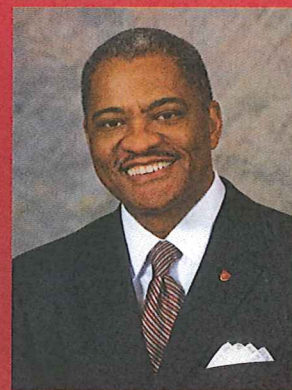
August 2011



WASHINGTON STATE  
 UNIVERSITY

*World Class. Face to Face.*

## Washington State University's vision for a Sustainable Future



I am pleased to present the Washington State University Climate Action Plan, the result of a collaborative planning process that has brought student, faculty, and staff representatives from across our university together in pursuit of a common goal.

Washington State University is committed, both through our research and by incorporating sustainable practices into our day-to-day operations, to reducing our environmental impact and to finding ways for our society to do the same.

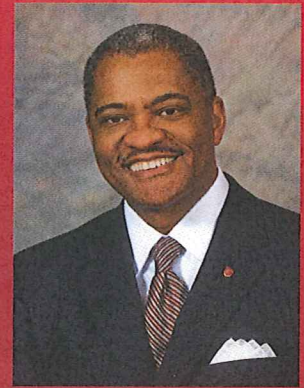
We have embarked upon a master planning process that is designed, in part, to create a more pedestrian-friendly campus. We have begun, and expanded, a green bike program, making bicycles widely available from stations on campus to allow easy access to a pollution-free transportation alternative. We have contracted with Zipcar, Inc., the world's leading car-sharing network, to offer a car-sharing program on our Pullman campus.

In 2008, we opened the first new residence hall we built in nearly four decades. It received a LEED Silver rating by incorporating innovative "green" strategies in its construction and operation, including geothermal heating and cooling, natural day lighting, natural habitat and vegetation, water efficient landscaping, and the use of regional and recycled materials where possible. The construction of this building is part of a 10-year overhaul of campus housing, an effort that is geared to provide more attractive alternatives to students and to create spaces that use resources more efficiently. Our current construction of research buildings is similarly geared toward incorporating sustainable practices and energy efficiency.

In August 2010, the state awarded WSU a \$3 million grant to assist with energy cost-saving improvement projects at the Pullman campus and the Puyallup Research Station. Some of the upgrades include lighting, controls, boilers, heating ventilation and air conditioning, and smart grid metering/demand reduction/conservation voltage reduction. We estimate the annual energy savings



## Washington State University's vision for a Sustainable Future



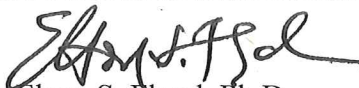
from these projects will be 2.4 million kWh and 117,000 therms of natural gas, saving approximately \$250,000 per year.

In 2010, WSU pumped and distributed 459 million gallons of water, 20 million gallons less than 2009, and the lowest amount in 50 years, a period marked by significant growth both in enrollment and facilities on our Pullman campus. The average daily use was 76 gallons per person per day. A comprehensive water-conservation strategy lies behind that record of success.

WSU has a history of excellence in the fields of electric power and energy systems. Researchers in the College of Engineering and Architecture are working to develop and incorporate new technologies aimed at improving the efficiency and reliability of the power grid. A group of WSU researchers is working with Avista on a demonstration project that hopes to make the City of Pullman the region's first smart grid community. The Pullman project is part of a Department of Energy regional smart grid demonstration project throughout the Northwest that is designed to expand upon existing electric infrastructure and test new smart grid technology.

WSU Extension faculty members develop and provide education to the public on energy and environmental issues. Through our research on renewable energy sources, sustainable agricultural practices and the effects of global climate change, WSU is helping chart the course to a more sustainable future. Through the education and research carried out in our Institute for Sustainable Design and our Center for Sustaining Agriculture and Natural Resources, we are encouraging environmental leadership.

We are proud of how far we have come at WSU and are fully aware that our initiatives must continue. This climate action plan will assist us in those efforts.

  
Elson S. Floyd, Ph.D.  
President



# Greenhouse Gas Inventories

Greenhouse gasses include carbon dioxide (CO<sub>2</sub>), nitrous oxides, methane, refrigerants, and other chemicals, each with a different global warming potential (GWP).

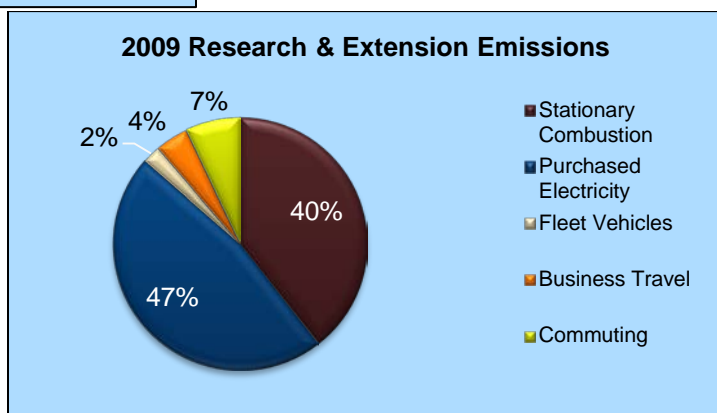
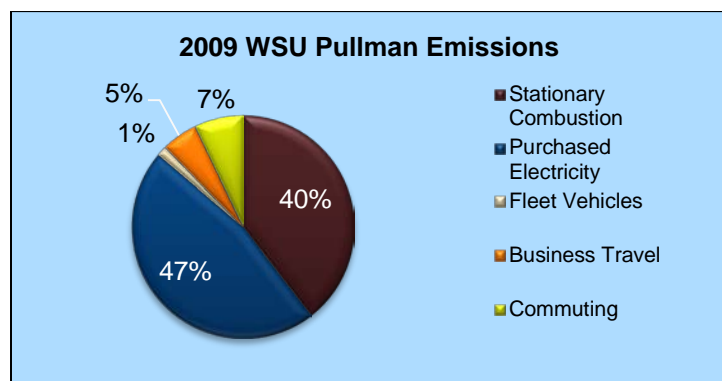
Carbon dioxide is the standard by which all other GHG are normalized; carbon dioxide's GWP is 1. For instance one metric ton of methane has the global warming potential of 21 metric tons (mt) of CO<sub>2</sub>. The following table shows the GWP of the various types of greenhouse gasses.

Carbon Dioxide (CO <sub>2</sub> )	GWP = 1
Methane	GWP = 21
Nitrous Oxide	GWP = 310
Hydrofluorocarbons	GWP = 12 – 11,700
Perfluorocarbons	GWP = 6,500 - 9,200
Sulfur Hexafluoride	GWP = 23,900

Total greenhouse gas emissions from an entity are reported in equivalent metric tons of CO<sub>2</sub> (eCO<sub>2</sub>)

## Sources of Greenhouse Gas (GHG) Emissions

Together WSU Pullman and Statewide Research and Extension Centers/Units emit about 162,000 mt of eCO<sub>2</sub> annually. Eighty seven percent (87%) of the emissions come from purchased electricity and stationary combustion (which is used to produce steam to heat the campus or space heating).

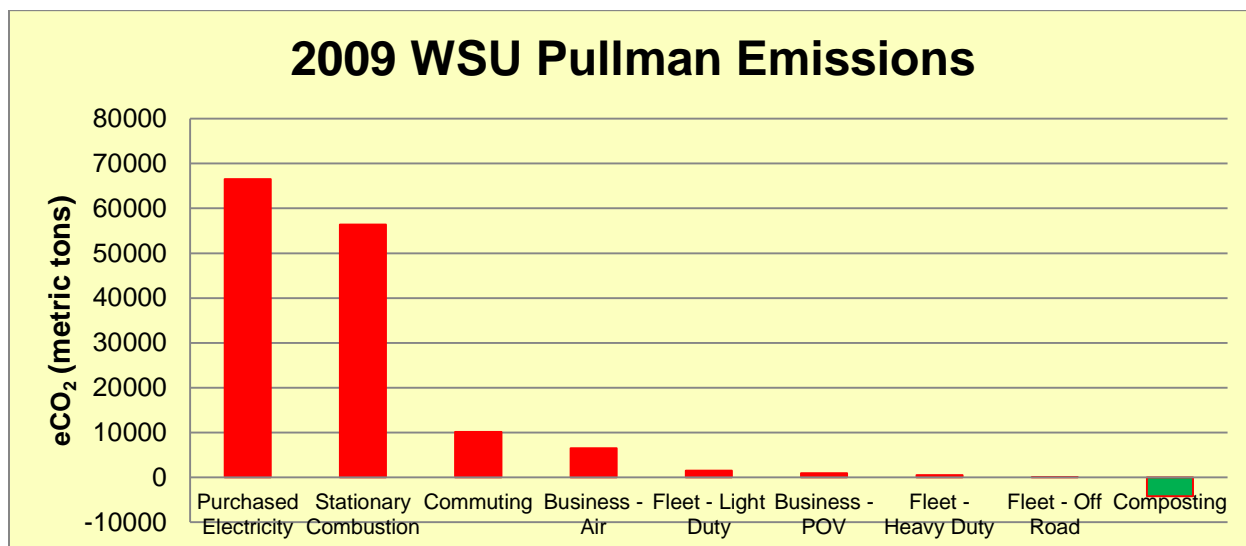




# Greenhouse Gas Inventories

## WSU - Pullman Greenhouse Gas Sources 2009

	<u>Equivalent Metric Tons- eCO<sub>2</sub></u>	<u>Percent</u>
<b>1. Purchased Electricity</b>	<b>66,511</b>	<b>46.7%</b>
<b>2. Stationary combustion</b> (Fuel burned in the steam plant, incinerator, and other boilers)	<b>56,375</b>	<b>39.6%</b>
<b>3. Daily Commuting</b> (Faculty, staff, and students)	<b>10,116</b>	<b>7.1%</b>
<b>4. University Air Travel</b>	<b>6,533</b>	<b>4.6%</b>
<b>5. University Fleet – Light Duty</b>	<b>1,499</b>	<b>1.1%</b>
<b>6. University Personal Vehicle Travel</b>	<b>908</b>	<b>0.6%</b>
<b>7. University Fleet – Heavy Duty</b>	<b>539</b>	<b>0.4%</b>
<b>8. University Fleet – Off Road</b>	<b><u>12</u></b>	<b>0.0%</b>
<b><u>Gross Metric Tons eCO<sub>2</sub></u></b>	<b>142,492</b>	
<b>9. Carbon Offsets -</b> (Composting)	<b><u>-4,206</u></b>	<b>-3.0%</b>
<b><u>Net Metric Tons eCO<sub>2</sub></u></b>	<b>138,286</b>	





# Greenhouse Gas Inventories

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## WSU – Research Centers & Extension Statewide Greenhouse Gas Sources 2009

	<u>Equivalent Metric Tons- eCO<sub>2</sub></u>	<u>Percent</u>
1. Purchased Electricity	11,230.3	47.0%
2, Stationary combustion	9,413.7	39.4%
3. Daily Commuting	1,681.3	7.0%
4. University Air Travel	878.8	3.7%
5. University Fleet – Light Duty	376.8	1.6%
6. University Personal Vehicle Travel	122.1	0.5%
7. University Fleet – Off Road	<u>168.7</u>	0.7%
<u>Metric Tons eCO<sub>2</sub></u>	23,871.7	





# Climate Action Plan Goals and Strategies

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This Climate Action Plan provides a framework for WSU's faculty, students and staff to work together and make short and long range decisions that will result in real, measurable reductions in greenhouse gas (GHG) emissions. Progress will be tracked using a recognized GHG inventory tool using metric tons of carbon dioxide equivalents (mt eCO<sub>2</sub>).

The Climate Action Plan (CAP) helps to implement WSU's Sustainability Initiative and strive towards **three major goals**:

## **Goal 1 Support and implement WSU's Sustainability Initiative and strategic plan goals and mission**

Washington State University's (WSU) Sustainability Initiative - Executive Policy # 24 vision is for "WSU to seek to provide an exemplary teaching, research, and outreach environment that fosters the conservation of natural resources, supports and enhances social responsibility, addresses community and economic development, and follows environmental, social, and economic practices."

## **Goal 2 Meet Environmental Protection Agency (EPA) and Washington Department of Ecology (WDOE) greenhouse gas and climate change goals**

In April 2009 the Washington State legislature passed into law GHG emission reductions targets for all State agencies for 2020, 2035 and 2050. The Washington Legislature and the Department of Ecology established 2005 as the baseline year for those targets. The GHG reduction targets are

- 15% of 2005 levels by 2020
- 36% of 2005 levels by 2035
- 57.5% of 2005 levels by 2050

It is unfortunate that the 32 % GHG reductions achieved by WSU from 1990 – 2005 will not count towards achieving these goals.

## **Goal 3 Meet the American College and University President's Climate Commitment (ACUPCC)**

As a signatory to the American College and University President's Climate Commitment, WSU has pledged to work towards net climate neutrality. Given the long time line for this commitment, the technological advances that will occur, and an uncertain budgetary future, WSU cannot, at this time, predict or commit to a specific date to achieve net climate neutrality. WSU's innovative research will help to accelerate achieving net climate neutrality at WSU, in the state, and beyond.





# Climate Action Plan Goals and Strategies

## History and Trends

WSU has been conserving energy and reducing greenhouse gases since the 1980s. In 1988, WSU received its first “Governor’s Energy Team Award for Excellence in Energy Management” and received the same award again in 2004.

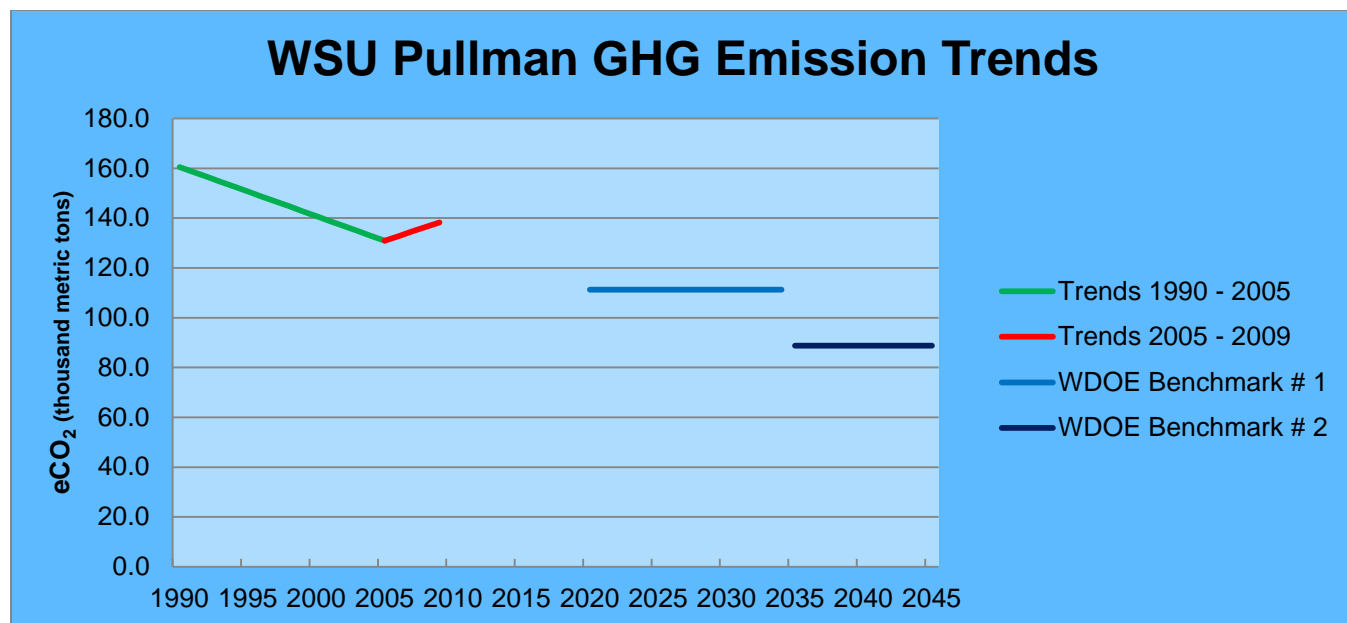
From 1990 to 2005 WSU Pullman reduced its GHG emissions by 32% or more than 2% annually through three major projects:

- Developed the first University Compost Facility in the nation (and still one of the largest) [1994]
- Energy Services Performance Contracting projects [2001 to present]
- New Campus Steam Plant [2004]

These major accomplishments are described in more detail later in this CAP.

This reduction was accomplished while the campus grew at a rate of about 1.3% annually.

From 2005 – 2009, GHG emissions have begun to increase. This increase can be attributed to severe winter weather, campus growth, increased burning of diesel at the new steam plant, and an increase in research activities.







# Climate Action Plan Goals and Strategies

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## Greenhouse Gas Reduction Strategies

This CAP will be a living document. It will be continually modified to react to changing budgets, technologies, opportunities, innovations and a changing regional and world climate.

To meet the Washington Department of Ecology Goals (15% reduction of 2005 levels by 2020, 36% reduction of 2005 levels by 2035 and 57.5% reduction of 2005 levels by 2050) and President's Climate Commitment Goal (Climate Neutrality), WSU Pullman and Statewide Research and Extension Centers/Units (WSU PRECU), will have to reduce the two largest sources (87 %) of their greenhouse gas emissions, Stationary Combustion and Purchased Electricity.

One option to address these emission sources is to purchase renewable energy credits (RECs) for electricity and carbon offsets for stationary combustion sources. The current estimated cost would be approximately \$ 300,000 per year.

Another option is to build a new biofuels boiler (supplemented with current natural gas boilers during peak demand) to heat the Pullman campus. With current technologies it is estimated that this will require more than \$ 60 million dollars of capital costs and increased operating costs of more than \$ 1 million per year.

WSU is committed to reducing GHG emissions using four major strategies.

- ☐ green development
- ☐ energy conservation
- ☐ transportation
- ☐ carbon offsets



green development  
energy conservation  
transportation  
carbon offsets



## **Background**

Each year the built environment consumes significant amounts of the nation's raw materials (40%), total energy produced (33%), and fresh water (17%). The challenge is to design intelligent, economically prudent projects that use a minimum of non-renewable energy, produce a minimum of pollution and wastes, and are generally environmentally benign; all the while increasing the safety, comfort, and health of the people who live and work in them.

In 2005 the State of Washington legislature passed Senate Bill 5509 which stated all state funded buildings over 5,000 square feet of conditioned or occupied space, should meet at least the United States Green Building Council's Leadership in Energy and Environmental Design's Silver Standard. There are four levels of project Certification (from lowest to highest): Certified, Silver, Gold, and Platinum.

Washington State University has been a member of the U.S. Green Building Council (USGBC) since 2006. The Leadership in Energy and Environmental Design (LEED) green building rating system is a nationally accepted benchmark for the design, construction, and operation of high performance green buildings.

The philosophy of building construction here at WSU has long been one of building sustainable facilities. Because of our nature we want our buildings to last 100 years or more. This is even more important in a time of dwindling natural and financial resources.

## **Strategies**

Washington State University campuses promote innovative, sustainable design and construction principles that improve safety, functionality, and energy efficiency that mirrors our respect for campus culture and heritage.



Several innovative “green” strategies are incorporated into WSU's new buildings, including geothermal heating and cooling, natural day lighting, sun shading devices to minimize heat load, site restoration with natural habitat and vegetation, water efficient landscaping, stormwater low impact development (LID), high reflective roof to reduce heat island effect, reduction of light pollution, educational signage system, water-use reduction in the building, construction waste management, use of regional materials, recycled materials and certified wood where possible.

More than twenty years ago Washington State University (WSU) built one of the first green roofs in the State of Washington over Terrell Library.

In the late 1970's and early 1980's WSU, in collaboration with Gear Powers, developed a campus-wide building automation system. With this system we were able to remotely monitor and manipulate the heating, ventilation, and air conditioning of the building. This technique was ultimately acquired by Siemens, which is recognized as one of the premier suppliers of building automation systems worldwide.

In 2010, WSU pumped and distributed 459 million gallons of water, 20 million gallons less than 2009, and the lowest amount in 50 years. The average daily use was 76 gallons per person per day.

The real story about WSU water conservation is one of innovation, progress, and social responsibility demonstrated by initiatives such as:

- Construction of a more water efficient steam plant that saves WSU approximately 30 million gallons per year.
- Aggressive efforts in leak detection and repair resulting in water savings of 11.5 million gallons per year,
- Elimination of water wasting equipment garnering another 10 million gallons annually in water savings.

## Past

It has been said the most sustainable building is one that is already built. At 115 years old Thompson Hall is truly a fine example of a sustainable building. Built in 1894 it is the oldest extant building on campus, and was constructed for less than \$50,000 using local red brick made from clay deposits taken one block away. Until 1968, it served as the Administration building as well as housing a number of other university functions. During the next 30 years, dozens of buildings were constructed as the college grew, including 20 that are still in use today as classrooms, offices, and dormitories.

*Thompson Hall  
1894 and today*





## Steam Plant

The new central steam plant on Grimes Way has been providing steam since 2004 and replaced the old coal-fired steam plant on College Avenue. The two new natural gas fueled packaged-unit boilers at the existing College Avenue Steam Plant (Boilers 1 and 2) have been retained as a satellite facility, and together the two plants supply 100 percent of the campus' steam needs. Primary equipment at the new central plant includes three boilers (capable of producing up to 83,000 lbs/hour steam supply each) and three each Reciprocating Internal Combustion Engine-Generators with a combined generation capacity of approximately 3.9 megawatts. The primary fuel resource used by the new boilers at the Grimes Way Steam Plant is natural gas with a diesel backup. Certain steam system upgrades were implemented to support the new facility, including: upsize of approximately 900 linear feet of existing piping on Grimes Way from the new plant to Quad-Services Road; rework of condensate handling facilities at the existing plant; and conversion of the two pressure (60 and 200 psi) distribution system to a single 100 psi system. This project is in response to both safety and reliability concerns expressed through an Emergency Declaration made by WSU in August 2000. New facilities assure WSU's goal to provide plant safety, reliability, increased fuel and operating efficiencies, energy conservation and environmental quality. In meeting both current and future needs for steam and electricity, the completed project limits WSU's exposure to fluctuations in utilities pricing, thereby offering potentially substantial savings in future operating costs.



## Present

### Compton Union Building (CUB)

Built in 1951 and first renovated in 1968 this building was in need of mechanical and electrical upgrades of inefficient systems and a cosmetic face-lift including insulated glazing. The most recent renovation was begun in 2006. Sustainability and energy efficiency are primary objectives of the renovation. For example, chilled beams were used to provide radiant heating and cooling to much of the building. Also, low VOC paints and adhesives were used for the finishes.

During the renovation the bulk of the existing building was demolished, retaining only the core structure and exterior shell. The building was expanded slightly at the ballroom and lower levels to total 235,000 square feet. Major architectural improvements include a stair and elevator tower from field level at the north, an associated pedestrian bridge to the first floor, and revised exterior entry and landscape elements on Terrell Mall. Mechanical, electrical, and plumbing







systems have been replaced in their entirety.

The renovated CUB is now fully air conditioned.

The renovated CUB project was completed in August 2008. The USGBC awarded the CUB LEED Silver Certification in 2009, thus making it the first LEED certified WSU facility.

## **Olympia Avenue Student Housing**

The first dormitory built on campus since 1972, this project is anticipating LEED Silver Certification while maintaining WSU's distinctive materials palette. Several innovative



sustainable strategies are incorporated into this 76,000 square foot building housing over 230 students including geothermal heating and cooling, natural day lighting, sun shading devices to minimize heat load, site restoration with natural habitat and vegetation, water efficient landscaping, stormwater collection and reuse for irrigation, high reflective roof to reduce heat island effect, reduction of

light pollution, educational signage system, water-use reduction in the building, construction waste management, use of regional materials, recycled materials and certified wood where possible. Olympia Avenue Student Housing was opened for student occupation in August 2009.

## **Clubhouse at Palouse Ridge Golf Club**

The Clubhouse at Palouse Ridge Golf Club (PRGC) is not a LEED registered project. However, several sustainable features are incorporated in the design of the Clubhouse. They include polished concrete floors, large overhangs, and the first closed loop ground source heat pump for heating and cooling of any WSU facility. Located in the center of PRGC, the Clubhouse provides expansive views of the Palouse hills, and is becoming a destination for alumni and visitors to Pullman. The 7,150 square foot Clubhouse serves students, faculty/staff, and community users, and has the capacity to host 80-100 guests for special events. Construction began in September 2007, and was completed in August 2008.





## East Campus Chilled Water Facility

This was a design-build project utilizing the Energy Services Performance Contracting (ESPC) process to provide additional production and supply of chilled water for the campus. Chilled water is used for the cooling of building environments during the year. Washington State University currently utilizes central chilled water production and distribution system to supply cooling for various buildings and facilities on campus. The use of a central system in lieu of individual chiller plants at each building saves considerable energy, operational, and maintenance resources. This project enhances these resource savings and supports the current and future demands for cooling throughout the campus.



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The project provides for 3,000 tons of cooling capacity. The building can be expanded to the west such that additional cooling capacity up to a total of 9,000 tons could be added in the future as demand growth dictates. Construction was completed in 2009 and the facility is online producing chilled water to meet the cooling needs of the campus.

## Future

### Veterinary Medical Research Science Building

The Veterinary Medical Research Science Building will provide approximately 128,000 gross square feet located within the Research and Education Complex on the Pullman campus. The building will provide properly equipped and environmentally controlled, state-of-the-art biomedical research and support space for the health science teaching and research programs. A vivarium is also included to provide modern animal holding facilities for gene targeted and knockout animals, as well as to provide essential quarantine space and specialized environmentally controlled space for biomedical research.





Because this is a research facility it is not mandated by the State of Washington to meet LEED standards. However, WSU strives to design all buildings with sustainable goals in mind. To that end, a one day eco-charette was held to brainstorm sustainable concepts that could be incorporated into the building. Some of those concepts included pervious concrete, building mounted photovoltaic panels, motion/light sensors, heating and cooling with a ground source heat pump system.

### **Paul G. Allen Center for Global Animal Health**

WSU's College of Veterinary Medicine's September 2004 Precinct Master Plan and subsequent updates identified building facilities in support of the WSU's School for Global Animal Health missions. This key facility will house and support the Paul G. Allen School for Global Animal Health's missions of infectious disease research and animal diagnostics. Phase I of the building program includes a 62,000 square foot, three-story facility that will house two floors of BSL2 research laboratory space, a 5,000 square foot BSL3 laboratory supporting both disease research and surveillance functions, and an administrative wing containing conference rooms and offices.

The building will house 100 scientific staff and is located southeast of the Veterinary Teaching Hospital within the College of Veterinary Medicine Precinct. The facility will utilize state-of-the-art energy management and sustainability strategies, and LEED Silver certification is being targeted. Construction began in June of 2010, with a 21-month construction schedule and occupancy in the spring of 2012.



Phase II of the building program is planned for the west side of the site, adjoining and sharing resources with the Paul G. Allen Center for Global Animal Health. It is planned at approximately 75,000 gross square feet and will house the Washington Animal Disease Diagnostic and Research Facility and Washington Animal Disease and Diagnostic Laboratory.





## WSU Pullman Master Plan

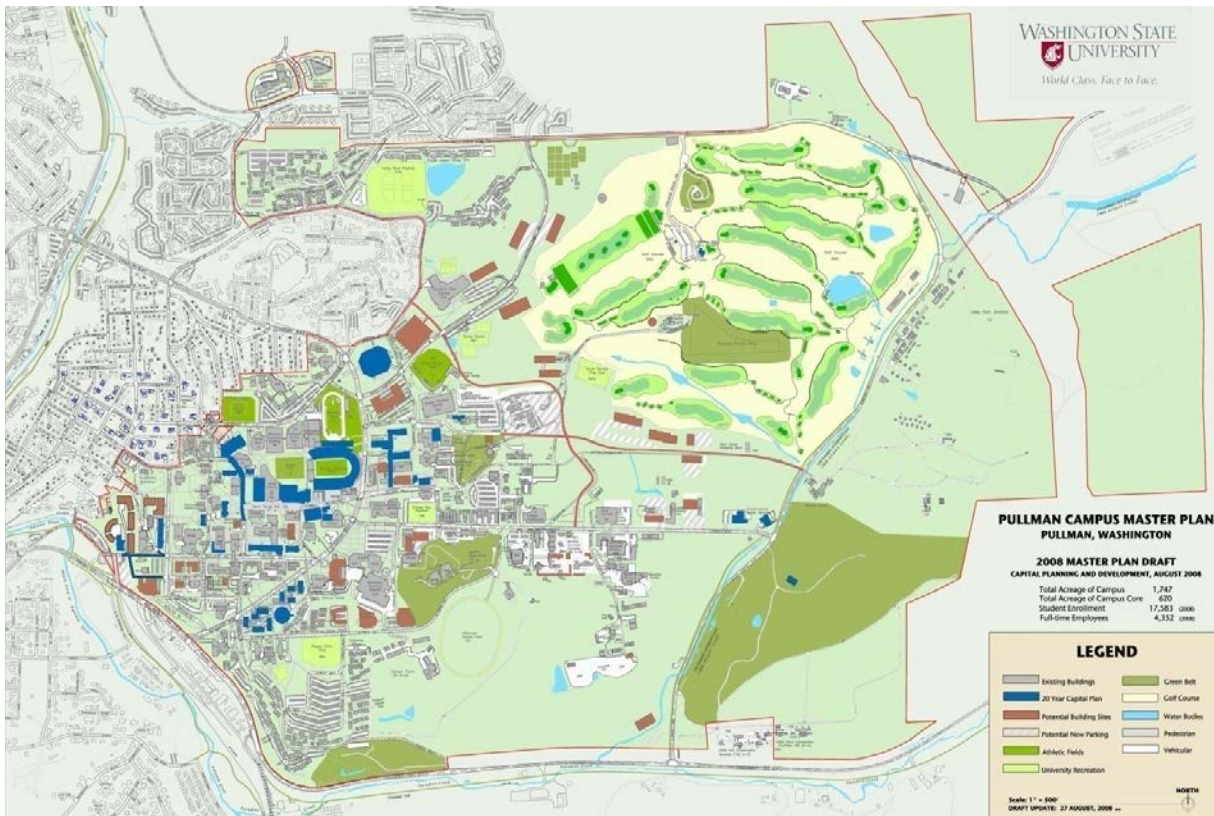
A new Master Plan Study of the Pullman campus took place in 2011. The resulting study incorporated a number of sustainable components.

Washington State University is engaged in a regular exercise of updating and expanding upon our Uniform Design and Construction Standards. These standards have an historic reference to and focus upon high performance, sustainable building design.

As we plan for the future, WSU will continue to provide innovative, sustainable design and construction principles that improve safety, functionality and energy efficiency that mirrors our respect for campus culture and heritage.

### Pullman Statistics (2010-2011)

- Student Enrollment: 18,232
- Total Building Square Footage: 10,629,420



- Total Pullman Campus Acreage: 1,745



green development  
energy conservation  
transportation  
carbon offsets



WSU has a long history of pursuing energy and resource conservation opportunities which have reduced greenhouse gas emissions.

### **Steam Plant**

In 2004 a new steam plant went into operation. This eliminated the use of coal on campus. This reduced steam plant greenhouse gas emissions from approximately 93,000 mt eCO<sub>2</sub> in 1990 to approximately 55,000 mt eCO<sub>2</sub> annually today.

### **Water Conservation**

In 2010, WSU consumed the lowest amount of drinking water on campus in the last fifty (50) years. This can partially be attributed to the installation of low flow shower heads throughout the residence hall and campus apartments, an improved irrigation system and an aggressive leak detection program.

### **High Efficiency Appliances**

Since 2007, 113 Energy Star washers have been installed in campus residence halls. Each washer saves 40 gallons of water per load saving water and energy. Additionally, 79 commercial washers USDOE compliant to 2007 commercial washers' standards for energy and water savings have been installed in the campus apartments. Since 2008, WSU has installed 176 new dryers which the manufacturer claims to be energy efficient.



### **Energy Services Performance Contracting (ESPC) Projects**

Since 2001, WSU has been partnering with an energy/resource consultant to evaluate and pursue ESPC projects that save energy/resources and are cost effective. These projects include:

- Campus-wide lighting upgrades
- Heating, Ventilation and Air Conditioning upgrades
- Chilled water system upgrades including a new central chilled water plant
- Greenhouse lighting and controls upgrades

ESPC projects completed to date have resulted in annual avoided energy use of over 15 million kWh of electricity (\$900k) and 60 million pounds of steam (\$500k). This is equivalent to an annual reduction of 6,173 metric tons eCO<sub>2</sub> and 5.9 metric tons eCO<sub>2</sub> respectively. New projects are being evaluated and funded if they are economically feasible.



The Washington State Legislature approved an appropriation of \$50 million in the 2010 Supplemental Capital Budget to stimulate job growth in the State by providing grant funding through the Department of Commerce for energy conservation projects in K-12 and Higher Education. The funds were dispersed in two rounds of competitive proposals. WSU submitted a total of 8 projects in the two rounds; five on the Pullman campus and one each at the Tri-City campus, the Spokane campus, and the Puyallup Research Station. All WSU proposals in both rounds were awarded grant funding. One of the Pullman projects is also receiving grant funding from the Department of Energy Smart Grid Demonstration Project. The projects total \$10.5 million in value and will result in annual avoided energy use of 3.1 million kWh of electricity (\$200k) and 14,309 million btu of natural gas/steam (\$120k). This reduction in energy consumption is estimated to reduce WSU's eCO<sub>2</sub> emissions by 2,121.7 metric tons annually.

Funding for the projects will be comprised of \$740k in utility rebates, \$2.48 million in State Treasury loans with debt service paid from energy savings, \$4.23 million in State Grant funds, \$1.8 million in DOE Smart Grid grant funds, \$324k in direct funding from Avista Utilities, \$70k in self-sustaining funds (SRC & Compost), and \$643k in Minor Capital funding.

The projects were developed and will be executed by our experienced Energy Services Performance Contracting (ESPC) team which has a record of delivering projects on schedule and within budget, as evidenced by over \$40 million in projects successfully completed at WSU since 2001.

## **Project Details**

The Round 1 Proposal included the following projects:

- ESPC Phase 16.1 WSU Puyallup Research Station - Upgrade lighting in 10 buildings to T8/electronic ballasts and upgrade outside lighting in selected areas. (In construction)
- WSU Pullman Campus:
  - ESPC Phase 1.22b Student Recreation Center Energy Upgrades - Upgrade the air handling systems for the two large gyms from constant volume to variable air volume, upgrade the controls on air handlers 4 and 5 to incorporate demand control ventilation and automate the outside air damper operation, upgrade the pool/spa water heating system with new high-efficiency boilers and modified pumping system, and retro-fit the gym lighting systems to address a safety hazard associated with older circuitry for compact fluorescent end-of-life operations. (Approved February 2011 – 95% complete)
  - ESPC Phase 13.6 Smart Grid Demonstration Project - Part of a collaborative effort being developed with Avista Utilities under a Department of Energy grant awarded to Battelle Labs for a Smart Grid Demonstration Project (SGDP). The State grant will enable WSU to participate in the DOE grant project once associated contracts are finalized. The WSU portion of the SGDP submitted for the State grant program has three primary facets on the Pullman campus : (Approved August 2011)



# Energy Conservation

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- HVAC retro-commissioning on 36 large buildings to return the HVAC systems to optimum operation and upgrade control programs to reduce waste energy use and incorporate capability to initiate selected system “load sheds” in the event of an electric grid instability signal from Avista without significant impact to teaching/learning/research activities.
- Development of an Enterprise Energy Management System (EEMS) for the Pullman campus utilizing networked Smart Meters to monitor energy/utility use at each building in a near-real-time mode with the energy data recorded and available for energy reporting, energy analysis, predictive maintenance, occupant use, etc.
- Implementing a Conservation Voltage Reduction system with Avista to provide optimized voltage control based on actual building voltages. A reduction in electrical demand as well as energy use is a result of the better voltage regulation.
- ESPC Phase 13.7 Sloan Hall HVAC Restoration – Upgrades of the 48-year old building control and air distribution systems in the first, second, and third floors to state-of-the-art direct digital controls and variable air volume distribution systems. This continues the HVAC Restoration work completed under ESPC Phase 13.4 project in the Sloan basement and ground floors. (Approved)

The Round 2 Proposal included the following projects:

- ESPC Phase 2.9a Information Technology Building Chilled Water Upgrade - The IT Bldg. server room cooling is provided by four dedicated chiller units which are now ~ 30 years old and are quite inefficient by present standards. The campus has a district chilled water system which provides chilled water at a much lower cost and higher reliability. This project will upgrade the present IT Building connection to the district chilled water system to provide sufficient capacity to cool the server rooms also and will provide a second connection from another location on the district chilled water system for redundancy. The existing four chillers will be re-configured into a backup capacity mode to provide cooling should there be a catastrophic failure of the district chilled water system. (Approved March 2011 – 85% complete)
- ESPC Phase 1.23 In-Vessel Composting facility - The Pullman campus Waste Management department has a very active composting operation which deals with all compostable waste streams at the University. Over 20 million pounds of materials are composted annually, including the waste streams associated with our Veterinary and Animal Sciences programs. A relatively small portion of those wastes may contain Bio Level 2 pathogens from research projects or diseased animals which have been destroyed by incineration. This project will provide a 2,400 gross ft<sup>2</sup> annex to the existing Compost Storage facility which will house a closed vessel, PLC-controlled and monitored compost system to allow certain Bio Level 2 pathogenic wastes to be safely decontaminated using the composting process. This will not only be much more energy efficient than incineration, but will avoid the resultant greenhouse gas emissions inherent in natural gas incineration. (Expected to be approved in October 2011)



## Potential GHG reduction projects

### Modify operations at the steam plant

In 2011 WSU is considering limiting the amount of diesel fuel used at the steam plant significantly below the level permitted. It is hoped that this action will help reverse the upward total GHG emission trend.

### Build a bio-fuel source steam plant

The use of bio-fuels for steam generation on campus could significantly reduce WSU's greenhouse gas emissions. The new plant would provide base operation steam for the University and it would be supplemented with natural gas combustion for peak demand times. Estimated costs for a new biofuels plant are approximately \$60 million dollars with an annual increase in operating costs of \$1.5 million dollars.



WSU is located in the heart of the Palouse, one of the most productive wheat growing regions in the world. More than 425,000 metric tons of wheat straw is produced within fifty miles of the campus annually. This resource could provide the fuel for a new steam plant providing baseline steam for the University (estimated at 88,000 mt of straw) annually supplemented with natural gas in times of high demand.

WSU has evaluated the combustion of biofuels on the Pullman campus for steam production. A new biofuels steam plant could reduce WSU greenhouse gas emissions by up to 45,000 metric tons of equivalent carbon dioxide per year. This would represent about an 80% reduction of WSU PRECU's stationary combustion (Scope 1) emissions. The proposed plant would allow WSU PRECU to meet the Ecology reduction target for 2020 by reducing GHG emissions more than 15% below 2005 levels.

### Optimize space utilization

Innovative management of WSU's building spaces could slow campus growth, reduce the cost and materials required for building new buildings and improve building space efficiency.

### Reduce purchased electricity

Purchased electricity is the largest source of greenhouse gas emissions associated with the operation of the University. Reducing the amount of electricity purchased is a simple way to reduce GHG emissions. WSU is considering metering various campus building to identify large energy users. Another way for the University to lower its emissions is to buy "green" power or renewable energy credits. The purchase of renewable power will increase the University's energy budget significantly.





# Energy Conservation

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- **Renewable energy credits - RECs— (i.e., solar, wind farm, etc. generated electricity)**  
RECs are available for purchase and they certify that a certain quantity for electricity has been generated from a qualifying type of renewable technology. “Green Tags” represent the environmental attributes of one megawatt hour of renewable energy that is physically metered and verified. RECs are not offsets.
- **Photovoltaic**  
Pullman offers an opportunity for the use of photovoltaics. As new buildings are being designed the addition of building integrated photovoltaics will be evaluated and pursued when cost effective.
- **Light Emitting Diode (LED) lighting**  
LED technology could greatly reduce the energy consumption for lighting. As this technology becomes reliable and cost effective WSU will incorporate it into appropriate campus locations.

## **Future technology improvements**

As the world moves toward carbon neutrality new technology will emerge that can assist the University in its goal of becoming climate neutral.



green development  
energy conservation  
transportation  
carbon offsets



## WSU Commuter Survey

In the winter of 2010 – 2011 Washington State University (WSU) conducted a Commuter Survey. The survey was sent by email to all WSU employees (faculty, administrators, and staff) and students (full time and part time) statewide. 3,778 persons responded to the survey. This response rate is more than 10% of the WSU students and employees statewide. Some of the surveys were incomplete or contained errors. Eighty five (85) surveys were discarded before analysis ( $3,778 - 85 = 3,693$  valid responses). The following table summarizes the responses from faculty, staff and students at WSU PRECU:

### LOCATION

	Faculty	Staff	Student	
Pullman	355	984	1,221	
Research Stations	18	42	6	
Extension/Statewide	20	50	14	
On-Line	7	1	74	
Totals	Faculty	Staff	Student	Total
	400	1,077	1,315	2,792

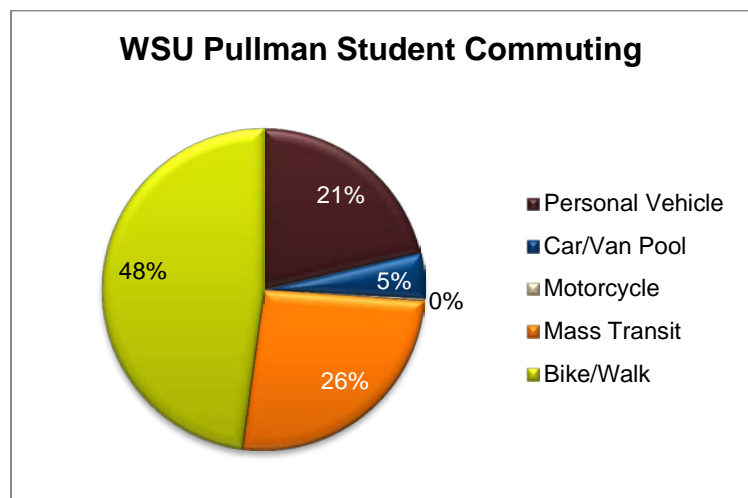
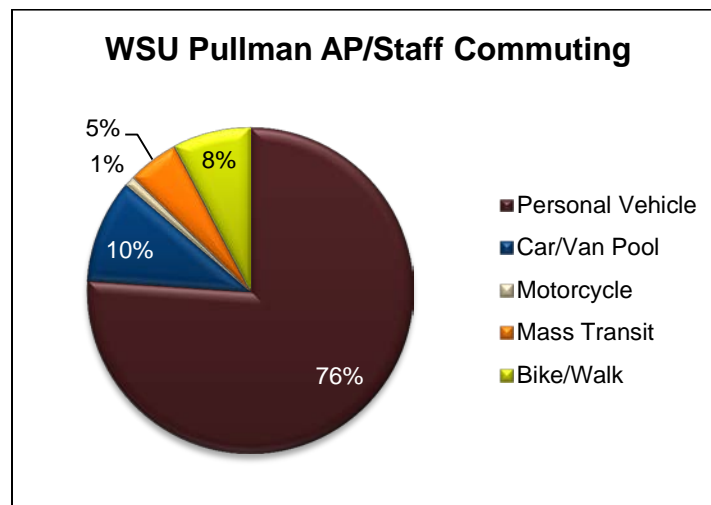
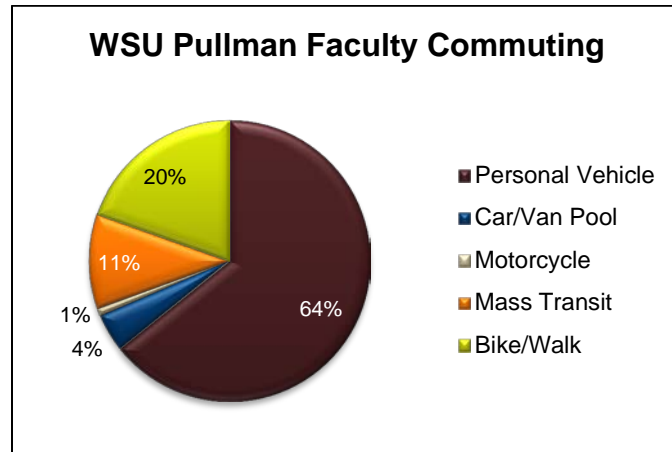
From the overall survey data the following statistics have been developed:

- Average Daily Commute 9.1 miles
- Average Daily Round Trips 1.3
- Average Personal Vehicle MPG 23.9
- Average Car Pool MPG 23.6
- Average Van Pool MPG 18.3
- Average Motorcycle MPG 36.4
- Average # of Riders in Personal Vehicle 1.3
- Average # of Riders in Car/Van Pool 3.0



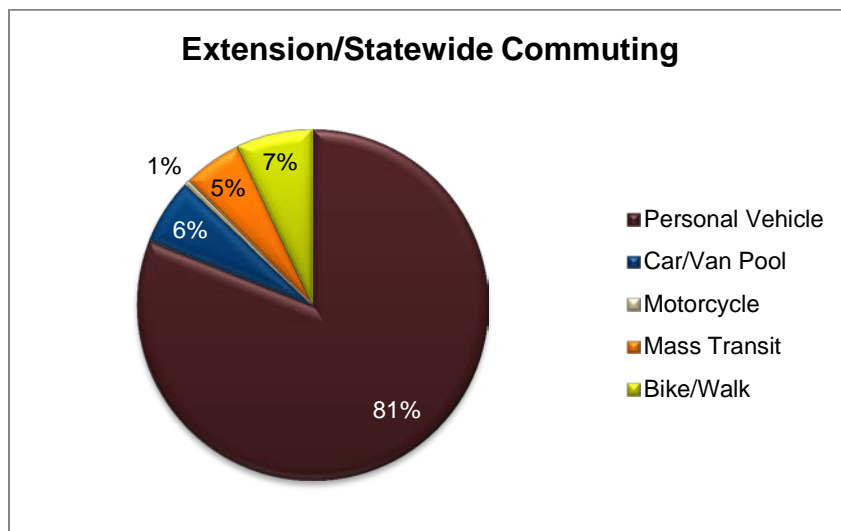
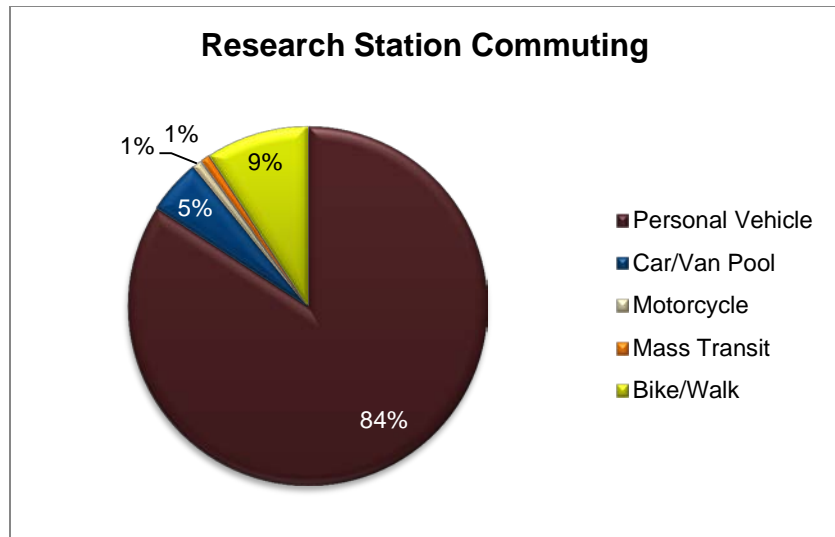
# Transportation

At WSU Pullman approximately 40% of the students live on campus and the majority of students live within a few miles of campus. Most of the faculty and staff live within 15 miles of campus.





## Commuting Statewide



Daily commuting, University owned fleet vehicles, and directly financed air travel are responsible for approximately 15% of WSU PRECU's greenhouse gas emissions.





## **Pullman Transit**

Pullman Transit was established in 1979. Ridership the first year was approximately 300,000.

The remainder of the 1980s saw changes to the bus service that increased ridership to over 600,000 riders per year.

In 1991 WSU students voted to give Pullman Transit additional operating funds to increase service and allow students, staff, and faculty to ride free. Ridership on the bus service increased to over 900,000.



In 2003, WSU Students passed a measure to charge every student \$15 per semester to improve bus service. As a result Pullman Transit ridership exceeded 1,000,000.

In 2009, WSU students voted to increase their student transit fee from \$15 to \$25 per semester.

By 2010 Pullman Transit bus ridership topped 1,420,000 rides.

In 2011, Pullman Transit submitted a grant proposal for the purchase of three hybrid buses.

Pullman Transit is considered to be one of the most cost effective and efficient systems in the country.

## **WSU Parking and Transportation Services**

WSU Parking and Transportation Services offers several transportation alternatives that encourage the use of mass transit, the use of car and van pools, and coordinates the WSU trip reduction and emergency ride home programs.

The programs listed below reduce WSU greenhouse gas emissions and help to achieve climate neutrality by reducing the combustion of fuel and release of greenhouse gas emissions.

### **Carpool - E-Mail List**

WSU-Carpool is an e-mail list sponsored by WSU Parking and Transportation Services. The WSU-Carpool e-mail list was created to facilitate the exchange of carpool information for the



WSU community. The list is for Washington State University staff, faculty and students to post and review carpool information about rides needed as well as carpool openings.

In February 2011, WSU contracted with Zimride, a ridesharing social network provider, to create more opportunities for ridesharing. To date, Zimride has over 900 participants from WSU. Since inception, approximately 180,652 miles, 7,084 gallons of gas and 137,437 pounds of CO<sub>2</sub> emissions have been saved as a result of the Zimride contract.

In July 2011, WSU contracted with Zipcar, a carsharing provider, to bring three new fuel efficient vehicles including one hybrid to campus. Zipcar is an alternative to car ownership as the vehicles are available on an as-needed basis. It is estimated that each Zipcar removes an equivalent of 15 personally owned vehicles from the roads.

## **Vanpools**

### WSU coordinated van pools

WSU Motor Pool coordinates van pools from Palouse, Colfax, Colton, Uniontown, and the Lewiston/Clarkston Valley.

### Whitman and Asotin County Public Transportation Area van pools

Whitman County and Asotin County operate a public transportation van pool that is available to WSU faculty, staff and students.

## **Other Resources**

### PalouseRideshare.org

The Palouse Rideshare project is a web-based system designed to connect riders with drivers in the Palouse region and beyond. Palouse Rideshare is intended to provide rider and driver connections for those who commute or travel the same routes on a regular basis.

### RideshareOnline.com

The state of Washington has a source of ride share information that can be found at the web site of RideshareOnline.com. This site offers a ride matching service for the entire state.

### CarpoolWorld.com

Another source of ride share information can be found at the CarpoolWorld.com web-site. This site offers a ride matching service for the entire planet. There are often people looking to share the expense of a commute to school or work or even to Seattle for the weekend, and beyond.

### Palouse Clearwater Environmental Institute

The Palouse-Clearwater Environmental Institute, a nonprofit environmental organization, serves as a regional clearinghouse for car and vanpool information and provides Van Pool services for students and commuters on three different routes in the Palouse-Clearwater region. The routes include the following: Moscow-Lewiston, Lewiston-Moscow, and Moscow-Lapwai.



## Commute Trip Reduction

Washington's Commute Trip Reduction (CTR) Law seeks to identify and establish commute alternatives that could reduce employee single-occupant vehicle use. Reducing single occupant vehicle use in turn will reduce greenhouse gasses.

## Emergency Ride Home

In order to promote alternatives to commuting in single-occupant vehicles, the University supports the Emergency Ride Home program. This program provides assurance of a ride in an emergency for those who use alternative commute methods.



green development  
energy conservation  
transportation  
carbon offsets



After implementation of the green development, energy conservation, and transportation strategies to reduce greenhouse gas emissions, WSU may need to use carbon offsets to meet required targets.

A carbon offset is a way to reduce GHG emissions when WSU PRECU cannot achieve climate neutrality while meeting its essential services. Carbon offsets are achieved through financial support of off-site projects that reduce greenhouse gas emissions. Carbon offsets may also be more cost effective than reducing WSU PRECU GHG emissions to achieve climate neutrality.

Examples of typical carbon offsets that WSU may consider if necessary include off-site:

- Renewable energy projects (e.g. wind farms or photovoltaic system)
- Energy efficiency projects
- Destruction of industrial pollutants (e.g. CFC capture and destruction)
- Destruction of landfill methane
- Composting agricultural/biological material
- Land use changes (e.g. reforestation or afforestation)
- Purchase of carbon offsets from recognized climate exchanges







If WSU purchases carbon offsets, they will be:

- Real and measurable
- Additional (emission reductions that would not have occurred otherwise)
- Permanent
- Verifiable

## Present Offsets

The WSU Compost Facility supports Washington State University's missions by managing the University's organic waste stream in an efficient, effective and safe manner.

The Compost Facility began operations in October 1994. The facility was the first university based compost facility to process all campus generated organic waste. Approximately 25,000



cubic yards (or 25 million pounds) are composted annually on 4 acres of asphalt surface. Research has been conducted at the facility to determine how feed stocks affect quality and effectiveness of inoculants and additives. The site is extensively toured by WSU compost classes, local K-12 schools and other universities.

Feed stocks are mixed and composted for 12 weeks. Piles are monitored for temperature and turned weekly. The final product is screened to remove any

residuals larger than 3/4" and moved to curing piles.

The standard mixture in 2008 generally included feed stocks in these proportions:

- 84% Animal manure and bedding
- 7% Wood/paper waste
- 5% Plant waste and soil
- 2% Laboratory animal waste
- 2% Dining center food waste



# Faculty – Education & Research

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## Past

The faculty interested in environmental science began a process of establishing a strong foundation for their work almost a decade ago, motivated primarily by the broad recognition that while there were many faculty members involved in environmental research, education and outreach work at the university – including faculty located on the main campus in Pullman, and on WSU campuses in Spokane, Vancouver, the Tri-Cities and throughout the WSU Extension system – these faculty members were scattered across many different academic, research and outreach units. In 2002 serious, persistent faculty-driven efforts were initiated to create a focal point for these faculty members to facilitate a more coherent approach to environmental studies at the university.

These faculty members succeeded in convincing a cadre of five deans to support their efforts and succeeded as well in creating a formal proposal to create the Center for Educational Research, Education and Outreach [CEREO]. That proposal was accepted by the WSU Faculty Senate in 2006, and the university's administration recognized the new unit and allocated funds for its operations. At the present time more than 150 faculty members from throughout the university are participating members of CEREO, and many of those faculty are actively engaged in the promotion of sustainability through the research, education and outreach work in which they engage. The creation of and the activities of CEREO (see website) have resulted in three major accomplishments:

- The creation of “roadmaps” for both undergraduate and graduate studies at WSU, allowing students and faculty alike to locate and take advantage of environmental offerings at the university.
- Support for the preparation of large, multi-disciplinary grant proposals to the National Science Foundation [NSF] (e.g., IGERT, NEON, ULTRA) and other funding sources to support research into sustainability.
- The facilitation of outreach education and applied research in local communities seeking to promote sustainability through policy adoption and operational programs. CEREO's Palouse Initiative brings together faculty from across campus to raise interest in sustainability education. It encourages faculty to apply locally inspired lessons into their classes.



## Present

A number of faculty members involved in CEREO are implementing the first large NSF grant secured with CEREO support. In August of 2009 the NSF awarded WSU a \$3,000,000, 5-year grant entitled Nitrogen Systems: Policy-Oriented Integrated Research and Education (NSPIRE) designed to support the graduate education of 30 PhD students in Engineering and the Biological and Physical Sciences who are dedicated to the interdisciplinary study of the nitrogen cycle with regard to the dynamics of global climate change. In addition to carbon, reactive nitrogen in the environment represents a major problem for ozone depletion and other environmental and public health hazards.



## Faculty – Education & Research

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CEREO is currently supporting five other multi-disciplinary groups of faculty engaged in constructing other grant proposals such as the one formulated by the faculty members who achieved NSF funding for NSPIRE. All of these efforts fit under the specific rubric of environmental and societal sustainability.

Recently, the Department of Energy announced that a group of Washington State University researchers will be working with Avista on a demonstration project that hopes to make the city of Pullman the region's first smart grid community. The Pullman project is part of a Department of Energy regional smart grid demonstration project throughout the Northwest that is designed to expand upon existing electric infrastructure and test new smart grid technology. Using smart grid technologies, the Pacific Northwest Smart Grid Demonstration Project will test new combinations of devices, software and advanced analytical tools that enhance the power grid's reliability and performance.



### Future

It is anticipated that at least some of the faculty members involved in CEREO will focus their own work, and that of their students, on the following topics of direct interest to Washington State University. It is anticipated that grant applications and doctoral dissertation projects will be directed toward the following areas related to:

- The study of carbon-generating, automobile-centered transportation systems at WSU, particularly with respect to the development of park n' ride, bike, pedestrian and pooled conveyance modes of person transport and movement about the campus. The campus master plan for the next 10 years places a heavy emphasis upon reducing the central campus of automobile traffic.
- The study of the possibility of a rail connection between Pullman and Spokane. This 75-mile corridor is increasingly heavily travelled, and the amount of future travel between these two parts of the WSU main campus is likely to continue to increase. The Health Sciences focus of the Spokane campus make it likely that the Interdisciplinary Design Institute's doctoral students will continue to scope out the feasibility of a rail connection between Pullman and Spokane which would connect to the several small rural communities along the route, all of which have given formal endorsements to the project. Preliminary studies indicate a strong interest in this possible future mode of travel between these two campus centers.
- The promotion of distance learning, teleconferencing, and telecommuting has been an established set of initiatives for some time at WSU; however, as the nation approaches the likelihood of the serious tracking of carbon emissions, some WSU faculty and graduate students will very likely initiate studies designed to document the emissions avoided by the adoption of alternatives to automobile and/or air travel to classes, meetings, and work.



# Faculty - Education & Research

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## Conclusion

The Climate Action Plan for WSU will most certainly gain support from the many faculty members who carry out research, education and/or outreach related to sustainability. With the creation of CEREO is it likely that these efforts will be well-supported and coordinated, and that the President's Climate Commitment will reach fruition at WSU.







## Past

In 1975, Associated Students of Washington State University (ASWSU) appointed a student committee named the Environmental Task Force (ETF). Over the years ETF has focused its efforts on many different environmental issues including air pollution and energy conservation. In the past few years ASWSU and the student body have been very supportive of green initiatives on campus. They firmly stand behind the ethics and principles of LEED certified building policies and alternative modes of transportation. In 2008, students signed a petition backing the Green Fund, which essentially gives each student the option to add an additional charge on their semester fee to go towards green initiatives on campus.



In 2008, ASWSU allocated resources and supported the Environmental Wellbeing Coordinator (EWC) position within the Wellbeing program. The EWC's job duties focus on sustainability, including the growth of the bike share program called Green Bike. The ultimate goal of the Green Bike program is to encourage a bike friendly culture on campus and to decrease air pollution and greenhouse gas emissions. The program launched in 2009 and continues to be well received by the WSU community. Additionally, the EWC, along with students in ESRP 490 Environmental Management Systems and Sustainability course, also created the WSU Green Living Guide which gives students information and tips about energy conservation and alternative modes of transportation. The EWC also continues to provide educational programming that encourages and educates students about living sustainably and work closely with many departments on campus to

integrate aspects of sustainability in programming, academics, and everyday life.

## Present

Currently there are 365 registered student organizations (RSOs) on the WSU campus among those there are several that have environmentally minded missions that focus on decreasing greenhouse gas emissions and energy use on campus.

Environmental Science Club's purpose is to give Washington State University students who are studying environmental science and regional planning and related fields an opportunity to interact with their fellow peers who are interested in the wellbeing of the environment and to work to improve the environment on campus and in the community. In the 2010-2011 academic year the club has hosted a recycling roundup during tailgating during a home football game, volunteered





## Student Involvement

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their time to highway and stream clean-up in the area, and worked with the city of Pullman to implement single stream recycling on College Hill. They also co-sponsored Earth Day activities giving a-way water bottles, re-useable bags and mugs, and energy saving light bulbs.

Two student groups, Engineers without Borders and Builders without Borders, assist disadvantaged communities across the Northwest and around the world to improve their quality of life through sustainable, environmental, and economically sound engineering projects. Through these projects WSU is developing students who implement sustainability worldwide. Engineers without Borders are working on several projects including endeavors in Africa and El Salvador. In Africa they are busy collaborating with Developing World Technologies to enhance and distribute a certain model of hand pump to farmers in rural Malawi. They are also working with Bridges to Prosperity, a non-profit organization, to design and install a foot bridge in El Salvador.

Students show their support in multiple ways; by allocating their fees to certain projects or by simply participating in initiatives. Below are two current projects that are supported by ASWSU, RSO's, and the student body that specifically target air pollution and alternative green energy initiatives.

**Green Bike:** This program presently offers over 100 bicycles for students, staff, and faculty, to use as an alternative mode of transportation for free. The purpose of this project is to build a bike friendly culture on campus while simultaneously decreasing automobile congestion, noise and air pollution, and greenhouse gases. We also hope to increase physical activity and a sense of place through cycling. The automated system; BIXI, was developed by the Public Bike System in Montreal to be convenient and easy to use; WSU is the first US University to implement this particular system. In our first year of operation 3,400 different people have used the bikes and the bikes have been checked out 8,500 times.



**Cougar Green Fund:** The Cougar Green Fund is a new program which began operation in Fall 2011. During registration each semester students have an option to donate \$5 as a student fee to contribute to the Student Cougar Green Fund.

The Washington State University (WSU) student Environmental Science Club and ASWSU Environmental Task Force helped create the Cougar Green Fund to provide resources for student sustainability and environmental projects on the WSU Pullman campus. WSU students can submit project and funding proposals for research, education, and outreach to enhance recycling, composting, green buildings, organic agriculture/food supply, transportation systems, water, energy conservation, and other sustainably-minded programs at WSU.

A Cougar Green Fund Board (Board), a sub-committee of the WSU Sustainability and Environment Committee (SEC) reviews the student Cougar Green Fund proposals and makes recommendations for



# Student Involvement

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approval to the entire SEC. The Board includes the SEC Student Environmental Science Club representative, the SEC WSU Environmental Task Force representative, a SEC Faculty member, and a SEC Staff member.

This new program brings a lot of promise for the betterment of the WSU Pullman campus, the first set of funding proposals will be selected during Fall 2011.

Residence Life has also committed to increasing sustainability among the students living on campus. The Sustainability Committee is comprised of two Resident Directors and 8-10 Resident Assistants and this group focuses primarily on energy conservation in the residence halls. The following campaigns are facilitated by the Residence Life Sustainability Committee:

- The One Thing Challenge is promoted during the fall semester. During the challenge Washington State University and University of Washington compete to see who can recruit the most students living on campus to commit to doing one thing that will conserve energy. Students from both universities log onto a website to make their commitment. The winner of the campaign is announced at the Apple Cup; a football rivalry between the two schools.
- The Avista Energy Competition. This competition is driven and funded by Avista and encourages every residence hall to compete against all other residence halls that registered to be a part of the competition. This program promotes saving energy, water, and resources through a host of posters, advertisements, programs, and events. The hall that saves the largest percentage of resources wins an award.
- Sustainability Showcase Showdown. This program is a team-based competition designed to encourage the implementation of a sustainability focused program or initiative during Spring Hall Week. Projects can involve any size population: a floor community, entire hall or complex, WSU, Pullman community, etc. A prize is awarded to the winning team. After the programs or initiatives are completed each group presents to the Residence Life Sustainability Committee.



Olympia Hall Student Government meets in lobby.

## Future

Students will continue to support movements and issues they find relevant, important, and worthy. As the environmental movement ebbs and flows like it has over the last 30 years student involvement will also ebb and flow. However, in the near future students at Washington State University have clearly



## Student Involvement

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shown dedication to reducing greenhouse gases and energy consumption. By supporting the above mentioned programs and projects they are using their voice, choice, and resources to commit to changing the face of WSU. With the establishment of the Cougar Green Fund students can now personally dedicate funds to green programs. The Green Bike program will continue to promote biking as a tangible mode of transportation and a substantial method to decrease the burning of fossil fuels. Students will continue to sit on the Environment and Sustainability committee to discuss how to eliminate greenhouse gas emissions, work with faculty and staff, and how to involve fellow students.







# Financing and Tracking Progress

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## Financing

Funding the strategies that will allow WSU to meet its greenhouse gas reduction goals will be a significant challenge. Current funding sources such as the energy service performance contracting program will continue to be utilized. In addition, WSU will explore the viability of new funding sources to meet the CAP goals such as:

- Pursue short-term and long-term funding from the legislature
- Enhanced Utility Rebate program
- A student supported Green Fund completed in 2011. See the summary above.

## Tracking Progress

To ensure that efforts to advance the CAP goals are effective and efficient WSU is developing a centralized project tracking system. For each project this system will track:

Project name  
CAP strategy the project supports  
Responsible person(s)  
Project budget  
Expected Emission Reductions  
Actual Emission Reductions

This tracking system will also be used in generating reports such as the required ACUPCC biennial reports.





# Financing and Tracking Progress

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The Climate Action Plan has been developed by the Sustainability and Environment Committee.

Production of this plan reflects Washington State University's commitment to sustainability and the environment. The plan can be viewed on the Campus Sustainability web site at

<http://sustainability.wsu.edu/>

