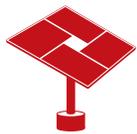


# JSC

# Annual Sustainability Report 2012

**12%** REDUCTION  
in electricity  
consumption  
from FY 2011

**\$54,400,000**  
in equipment redistribution  
instead of disposal



**404,644 kWh**  
of renewable energy  
generated onsite

**99%** REDUCTION  
in hazardous  
waste generation  
over 20 years

**280,000** of water  
runoff  
**GALLONS** saved for  
irrigation



**321,660**  
SQUARE FEET  
of certified green  
building space



**750 ACRES**  
containing rare Texas  
Coastal Prairie Habitat

**11%** REDUCTION  
in water use  
from FY 2011

**3** more  
efficient  
chillers  
installed

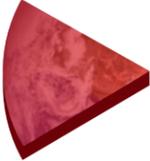
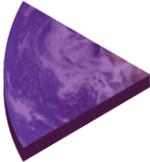
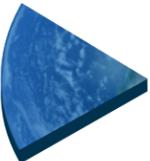
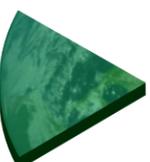
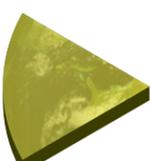
**\$30,000**  
saved in 10 weeks through  
a JSC Green Team energy-  
saving competition

**69%** REDUCTION  
in petroleum fuel  
use in fleet vehicles  
from FY 2005



One Presidential  
GreenGov award  
earned by NASA

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# Sustainability at JSC

Sustainability is a mindset that demonstrates a balance between economic vitality, environmental stewardship, and social responsibility when considering short and long-term planning. Businesses refer to this concept as the "The Triple Bottom Line." The National Aeronautics and Space Administration (NASA) Johnson Space Center (JSC) has been implementing aspects of sustainability for over 20 years, and with the NASA Strategic Sustainability Performance Plan (SSPP) providing specific sustainability goals and targets, JSC can provide a coordinated effort to reach and even surpass these goals. JSC developed the fiscal year (FY) 2012 Annual Sustainability Report to document these efforts and bring awareness to the JSC community.

As the first report of its kind, this JSC Annual Sustainability Report is an accumulation of JSC's sustainability efforts over FY 2012. The report provides a status on how JSC is working to accomplish NASA's SSPP sustain-

ability goals and tasks and includes major accomplishments from past years. Statuses fall under 6 major resource areas, as defined in the JSC Sustainability Engagement Strategy: Energy, Materials & Waste, Water, Land, Air, and People. This is by no means an exhaustive list of accomplishments. More success stories and goal details are available on the [JSC Sustainability Web Site](#).

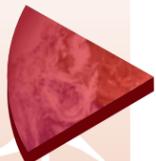
JSC may not have funding for all the necessary environmental projects to instantly transform JSC into a sustainable facility, but the Federal government and NASA set over 60 goals and targets for JSC to accomplish over the next few years. In order to reach these goals, we must make every project and program an opportunity to generate positive environmental impacts and improve JSC's environmental, social, and economical standing. As this report shows, every effort does make a difference, and we challenge each one of you to find ways to incorporate sustainability into your lives every day, at work and at home.



## Considering Cost Alone Can Be Expensive!

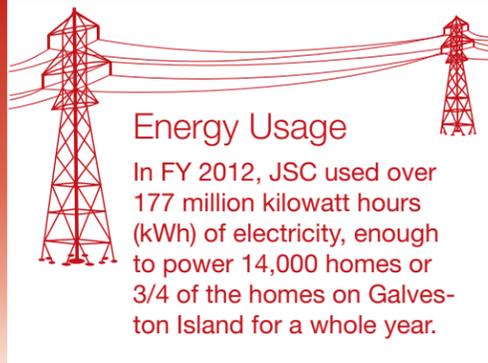
Sustainability helps us consider all the costs of a project or process. If you just consider the product or installation costs, you might end up paying more for maintenance, energy, waste disposal, or regulatory compliance in the long run. Life-cycle analyses can help prevent hidden costs, maximize the return on your investment, and reduce environmental impacts.

**Environmentally friendly and less expensive, who would have thought?**



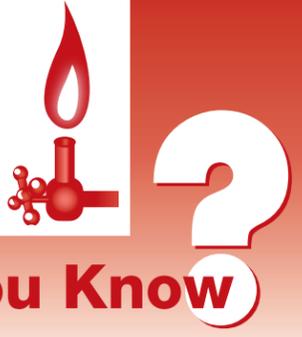
# Energy

Energy resources include energy sources that JSC needs to operate the site. Topics covered in this area include electricity, natural gas, and fuel consumption, as well as renewable energy sources and building efficiency.



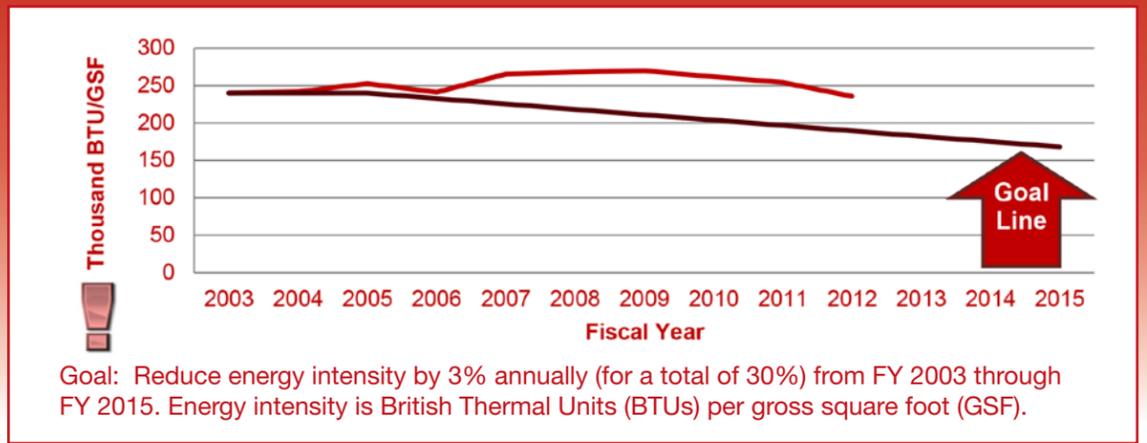
**Energy Usage**  
In FY 2012, JSC used over 177 million kilowatt hours (kWh) of electricity, enough to power 14,000 homes or 3/4 of the homes on Galveston Island for a whole year.

**Natural Gas Impact**  
JSC would have to plant 2 million trees to absorb all the carbon dioxide released from burning natural gas at JSC in FY 2012.



**Did You Know**

## JSC Energy Intensity



## Energy Meters

All buildings over 5,000 square feet have electricity meters to monitor building use and efficiency.



## Electricity Reduction

**12%**  
In FY 2012, JSC reduced electricity consumption by 12% from FY 2011.

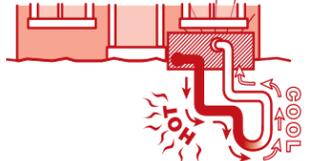
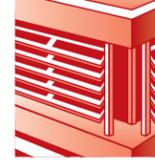
## New Energy Dashboard

In FY 2012, JSC designed an **Energy Dashboard** that employees can use to look at how their buildings are performing.



## JSC's Onsite Renewable Sources

During FY 2013, 7.5% of JSC's electricity usage must be from renewable sources.

<p><b>Solar</b> JSC has 14 solar panel arrays at the Child Care Center.</p> 	<p><b>Solar/Wind</b> JSC has 22 solar and wind-powered parking lights.</p> 	<p><b>Wind</b> JSC has 2 wind turbines at the Child Care Center.</p> 
<p><b>Geo-thermal</b> JSC has geo-thermal heat pumps at the Child Care Center.</p> 	<p><b>Solar Water Heaters</b> JSC has solar thermal water heaters at the Gilruth and Child Care Centers.</p> 	<p><b>Solar Sunshades</b> JSC's newly renovated Building 12 has 240 solar panels on the sunshades installed on the side of the building.</p> 

When first installed, JSC's renewable sources and energy conservation measures won the Center the 2010 NASA Blue Marble Award for Excellence in Energy and Water Management. In FY 2012, 11% (20 million kWh) of JSC's electricity came from renewable energy generated onsite and the purchase of Renewable Energy Credits for offsite electricity generation.

## FY 2013 Focus Areas

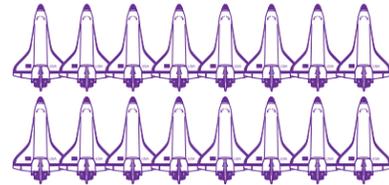


1. Encourage behavior that saves energy, such as unplugging electronics when not in use.
2. Identify additional areas for energy improvements.
3. Encourage employees to turn off computers during nights and weekends.

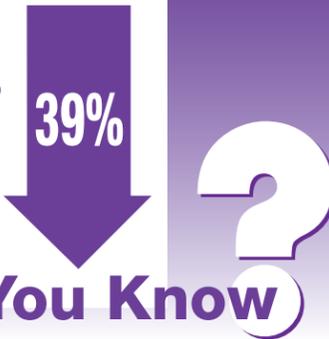
# Materials & Waste

Materials & Waste resources include anything that JSC buys, sells, or disposes of to keep the site running and the Mission accomplished. Topics covered in this area include green purchasing, reuse, recycling, and pollution prevention.

JSC recycled 2.8 million pounds of trash in FY 2012, equivalent to the weight of 16 Orbiters. This saved JSC \$228,000.

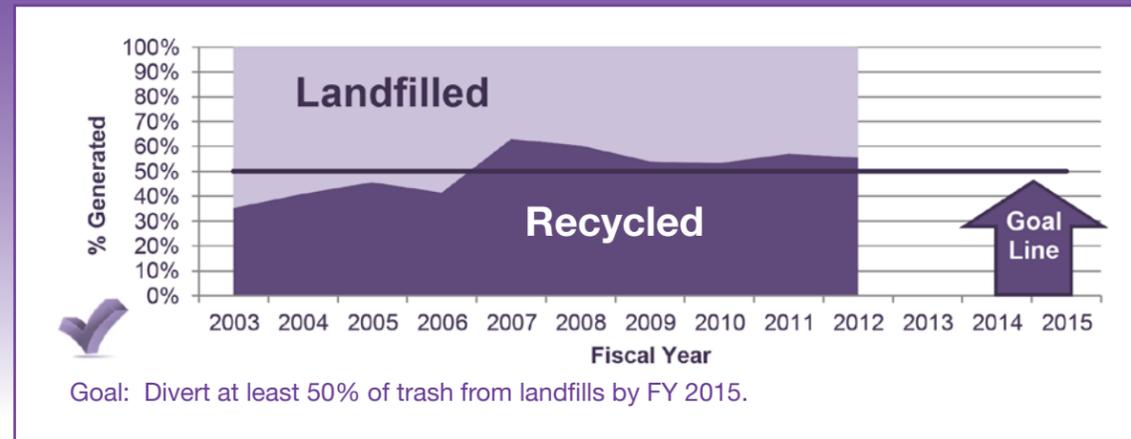


JSC reduced hazardous waste generation by 39% in 2 years, from 62,853 pounds in FY 2010 to 38,500 pounds in FY 2012.



**Did You Know**

## JSC Waste Diversion



## Recycling Benefits



Recycling save money and meets Agency sustainability goals. Any revenue from recycling more valuable items, like scrap metal, helps fund the cost of recycling bins, outreach efforts, and pollution prevention projects.

## Composting

In addition to mulching leaves and branches, JSC collects preparation scraps from the 2 cafés as part of a pilot project.

In FY 2012, JSC composted 638,940 pounds, avoiding over \$50,000 in waste disposal costs.



## Biobased Can Help You Save

In FY 2011, JSC substituted a biobased cutting fluid for a petroleum product in 20 metal fabrication machines, saving \$30,000 per year in waste disposal costs.



## Amazing Past Achievement!



Installing a Zero-Waste Pollution Prevention system for the JSC Photo Lab in 2003 completely eliminated one of the largest hazardous waste streams at JSC — it historically generated over 5 million pounds a year.

## YOU Make A Difference!



Recycling plastic bottles started with YOU! Because JSC employees demanded plastic bottle recycling, JSC initiated site-wide collection in 2008. Every effort does make a difference!

## JSC's Pollution Prevention Success

99%

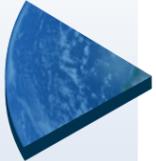


Over the past 20 years, JSC reduced hazardous waste generation by 99.9%, saving hundreds of thousands of dollars.

## FY 2013 Focus Areas



1. Expand the composting program.
2. Improve the waste diversion rates at unmanned recycling locations.
3. Improve construction and demolition debris recycling and reporting.
4. Increase sustainable acquisition purchases for designated items (e.g., signs, cleaners, carpet, paint, toner cartridges, office products, etc.).



# Water

Water resources include the water that comes and goes from the site. Topics covered in this area include potable water, water reuse, firewater, wastewater, and stormwater. JSC is very close to several lakes, streams, and bayous, so managing our water resources appropriately is critical.

## Potable Water

JSC uses enough water each year to supply over 2,400 houses a year, over 307 million gallons.

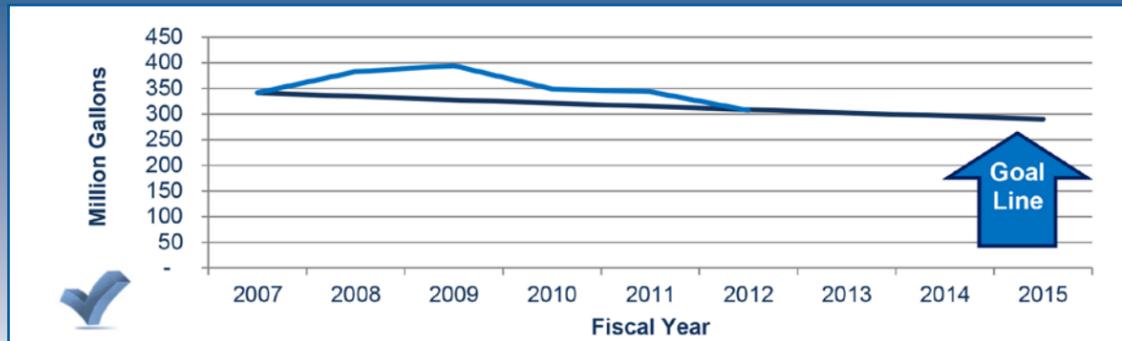
## Wastewater

JSC decreased the wastewater sent offsite for treatment by over 15% over the past 6 years from 233 million gallons in FY 2007 to 200 million gallons in FY 2012, saving \$63,000.



## Did You Know

## Water Consumption



Goal: Reduce potable water use by at least 26% from FY 2007 through FY 2020.

## Potable Water

The Clear Lake City Water Authority provides water to JSC; however, JSC does have 2 wells for emergency use. If JSC uses the wells, the water is treated in 2 above ground tanks before being distributed throughout the site.

# 11%

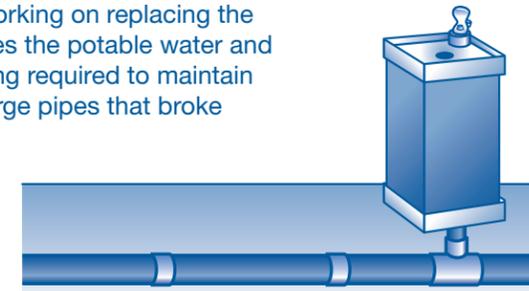
JSC reduced potable water use by 11% since FY 2011.

## Subsidence

Past well-water pumping in the Houston area caused subsidence, or sinking. JSC has sunk over an entire foot in elevation since 1973. Now only about 15 feet above sea level, JSC may see greater flooding impacts from storms.

## Water Line Project

Over the past year and a half, JSC has been working on replacing the potable water lines onsite. The project separates the potable water and fire water systems, which will reduce the flushing required to maintain water quality standards. The old system had large pipes that broke frequently during droughts. The upgraded system utilizes smaller pipes that will eliminate age-related pipe breaks and ensure proper pressure and supply. Also, all buildings now have water meters that can help identify and address problems or leaks.



## Building 20 Water Savings

Building 20 is a certified green building that saves potable water by using condensation from air conditioning to water the landscaping around the building.



## Amazing Past Achievement!

During the summer 2011 drought, JSC started collecting and storing water from well flushing to use for irrigation. The project saved over 280,000 gallons of potable water over the last year.

## Mall Pond Water Project

This year, JSC replumbed the ponds in the Mall area to recirculate instead of drain into storm drains. The project will save approximately 10 million gallons a year, enough to fill 200,000 bathtubs.



## FY 2013 Focus Areas



1. Encourage the use of WaterSense and water saving fixtures and appliances.
2. Identify target areas for water conservation projects.
3. Encourage water fountain use instead of water dispensers.



# Land

Land resources include any physical structures, infrastructure, and land-based natural resources that JSC owns, maintains, builds, protects, or uses to operate the site. Topics covered in this area include landscaping, wildlife, agriculture, vegetation, roads, and buildings, including green buildings and historic facilities.

## Green Roofs

Building 12 has over 68,000 plants on its green roof! Green roofs help filter stormwater and provide better insulation, which reduces cooling and heating costs.



## Facilities at JSC, EF, and SCTF

- 196 Buildings
- About 4.4 million square feet of office space
- 1,600 Acres
- JSC has 8 out of NASA's 30 LEED buildings.
- JSC has 321,660 square feet of green building space.



## Did You Know

## Remembering our Heritage

JSC has 3 National Historic Landmarks, including the Apollo Mission Control and Viewing Room, the Building 32 Space Environment Simulation Lab Chambers A and B, and the Saturn V Rocket. Sixteen more facilities are eligible for listing on the National Register of Historic Places.

## JSC Green Buildings (LEED Certified)

Platinum	Gold	Silver	Certified
			
B20	B2N 26 265 12 (pending)	B29 207A	B27

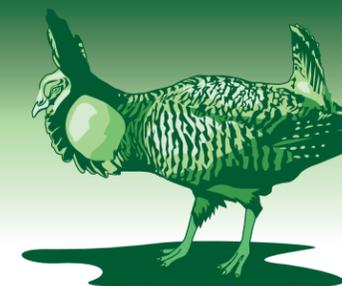
## Did You Know?

- JSC recycles 50% to 90% of all Leadership in Energy and Environmental Design (LEED) construction waste and demolition debris.
- LEED buildings use 30% to 50% less energy and water compared to non-LEED buildings.
- JSC purchases 100% green power through credits for each LEED building onsite.
- Drought-tolerant landscaping surrounds each LEED building, reducing the need for irrigation.
- The air smells clean and fresh! LEED buildings require the use of low-emitting materials (i.e., paints, carpet, composite wood, and adhesives) to improve the indoor air quality.
- Many building materials used during construction contain recycled content.
- LEED buildings have cool roofs (i.e., reflect more sunlight) to lower cooling costs.

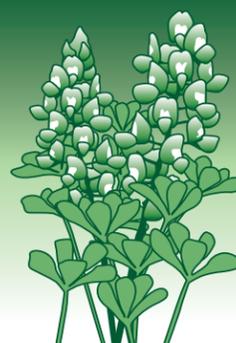
## Partnerships for Texas Critters

JSC helps local schools learn about Agricultural Science and Education with the Texas Longhorn Project.

Only found in Texas, the critically endangered Attwater's Prairie Chicken finds a quiet home at JSC in partnership with the Houston Zoo breeding program.



## Sustainable Landscapes



- Over 10 acres of wildflowers and sustainable landscapes make JSC beautiful.
- JSC uses all native Texas plants in new landscaping, saving water and reducing fertilizer and pesticide use.
- When JSC cleans out the ponds in the Mall Area, the pond sludge composts into a natural fertilizer that is used around the site.

## Invasive Plants

Invasive plant species are a growing problem. JSC has 13 species of concern that:

- Spread continuously;
- Choke out native species that feed and house our native wildlife;
- Cause more mowing because they grow taller than native species; and
- Are costly and difficult to remove.

## Protecting Our Coastal Prairie



Historically, Texas had 6.5 million acres of Texas Coastal Prairie Habitat. Today, there is only 1% of this vital habitat left, and 750 acres at JSC contain Texas Coastal Prairie Habitat.

## JSC Wildlife

JSC has over 250 plant and animal species, including hawks, rabbits, and 150 deer.



## FY 2013 Focus Areas



1. Develop the Space Life Sciences Laboratory facility.
2. Renovate Building 45.
3. Remove invasive species and begin 500-acre habitat restoration efforts.
4. Maximize the use of office space to reduce resource use.
5. Integrate sustainable maintenance practices in buildings.

# Air

Air resources include both indoor and outdoor air. Topics covered in this area mainly focus on outdoor air quality, greenhouse gas emissions, and toxic chemical reduction. This is a relatively new area, so JSC is still working on gathering data and developing a complete greenhouse gas inventory.

Greenhouse gases trap heat from the sun in the Earth's atmosphere. The Federal government is starting to track and reduce greenhouse gas emissions based on 3 different source categories:

## Scope 1

Emissions from the JSC Fleet and onsite generators, boilers, refrigerators, and air conditioning units.

## Scope 2

Emissions from electricity, heat, or steam generated offsite.

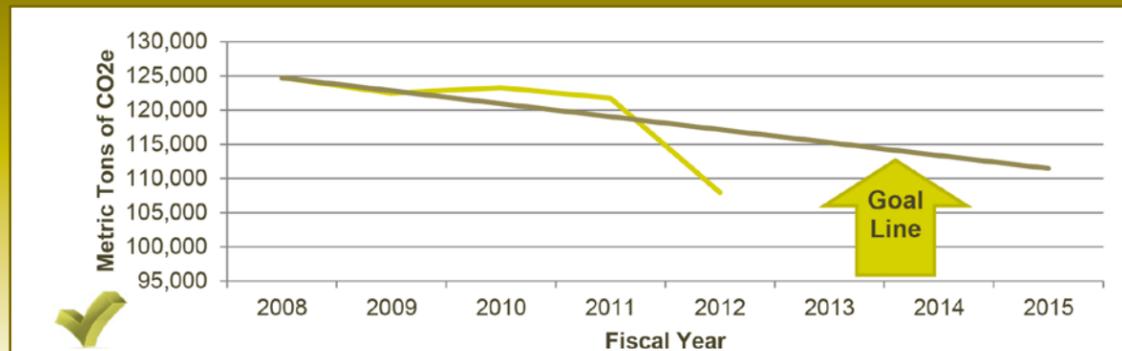
## Scope 3

Emissions from travel, commuting, and trash disposal.



## Did You Know

## JSC Scope 1 & 2 Greenhouse Gases



Goal: Reduce Scope 1 & 2 greenhouse gas emissions by 18.3% from FY 2008 through FY 2020.

## Ozone: The Good, the Bad, and the Ugly



### The Good

Ozone in the stratosphere protects the Earth from harmful radiation from the sun. Certain refrigerants and solvents can degrade good ozone.

### The Bad

Ground-level ozone forms when pollutants from combustion interact with sunlight. The result is smog.

### The Ugly

Houston has too much ground-level ozone, causing smog and health problems for the young, the old, and the sick. Now, major emission generators must work together to reduce ground-level ozone. This is why counties around Houston require emission tests in car inspections.

## Bad Ozone Days

In 2012, Houston had 43 days with bad ozone levels. Fear not! This was a decrease from the 52 bad ozone days in 2011.

## Onsite Combustion and Emission Sources

JSC has several combustion and emission sources onsite to support people and operations, including:

- 4 large boilers,
- 33 chillers, and
- 27 generators.

Many of these sources are old and inefficient – some over 50 years old.



## Carpool Pays!

Did you know that JSC carpool and vanpool vehicles can get assigned parking spots on-site? Make sure to sign up with NuRide.com to get rewards for your carpooling excellence!

## Telework

If 10,000 JSC employees telework once a month, it would save approximately 1,500 metric tons of carbon dioxide equivalents per year. This reduces emissions the same as if JSC grew 38,462 sapling trees for 10 years.

## FY 2012 Accomplishments

1. JSC removed the last of Class I refrigerants from large cooling systems and fire suppression systems. Class I refrigerants have one of the largest greenhouse gas potentials if leaked into the environment.
2. JSC now uses battery backup systems to support Mission Control during bad weather instead of using generators.
3. JSC replaced old, standby electrical generators with new, emission-certified engines over the past 2 years.
4. JSC replaced 3 chillers with newer, more efficient models and added a new chiller that also uses less harmful refrigerants.



## FY 2013 Focus Areas



1. Encourage employees to replace organic-based solvents and cleaners with products that emit fewer pollutants.
2. Expand the JSC greenhouse gas inventory to include Scope 3 sources.
3. Encourage the replacement of target refrigerants, such as R-12 and R-22.
4. Encourage and record savings from telework and carpooling initiatives.

# People

People are essential to sustainability and to achieving the triple-bottom line, as well as one of JSC's most valuable resources. Behavior change can make the difference when funds run low, and with over 50 years of innovative thinking and accomplishments with some of the top minds in the world, JSC can make significant strides towards surpassing Agency sustainability goals. Topics covered in this area include employee wellness, behavior change, awareness, environmental planning, and technology transfer.

## It Makes a Difference!

Every action you take to meet JSC sustainability goals makes a difference! You might not think your individual actions save that much, but when all 10,000 people at JSC shut off their monitor when they leave their desk or print double-sided, the savings add up!

## Ecological Footprint

If everyone on Earth lived like people in the U.S., it would take 7 Earths to sustain us.



## Did You Know?

## JSC Sustainability Engagement Strategy



In FY 2012 and early FY 2013, JSC worked with over 50 stakeholders to develop the JSC Sustainability Engagement Strategy to help increase awareness about Agency sustainability goals and Center sustainability efforts.

## JSC Helps NASA Win A Presidential Award!

Early in FY 2012, NASA won a "Lean, Clean, and Green" Presidential GreenGov Award in part because of 2 JSC projects. Congratulations!



## JSC Sustainability Teams

JSC has 4 Center-wide Sustainability Teams:

1. Environmental Stewardship Subcommittee
2. JSC Green Team
3. JSC Sustainability Partnership Team
4. JSC Contractor Environmental Partnership

Have an idea for a sustainability team? Start your own!



## How Do I Help?

1. Incorporate sustainable features to make every project an environmental project.
2. Get involved with a team or start your own.
3. Check out the JSC Sustainability Web Site (<http://www6.jsc.nasa.gov/ja/ja13/capp.cfm>) for more information on sustainability goals and tips towards making a difference.

## JSC Green Team Exterminates the Copy Beetle



If you stacked the amount of paper JSC consumes in a month, the stack would be as tall as the Saturn V rocket. In FY 2010, JSC reduced printing by well over 26,147 pages (52 reams) in 4 weeks by challenging each JSC Organization to reduce copies.

## JSC Green Team Slays Energy Vampires



In FY 2012, JSC challenged buildings to reduce their energy consumption. The competition saved 9,000 kWh per day and over \$30,000 in just 10 weeks. The 2 winning buildings reduced their energy usage by 26% and 20%.

## Contractors in Action

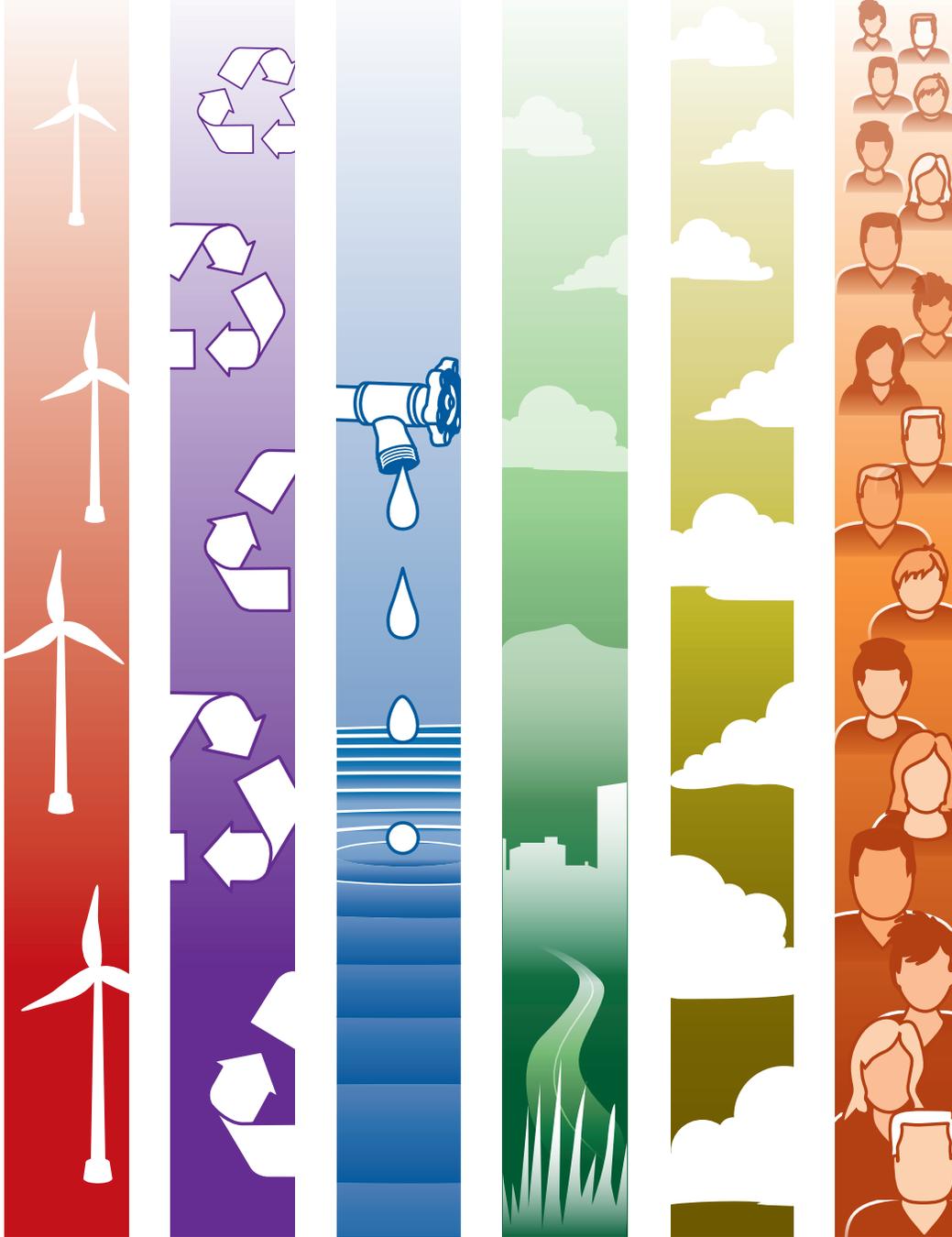
The JSC Contractor Environmental Partnership (CEP) and volunteers hosted 5 community electronic recycling events at Space Center Houston from FY 2009 through FY 2012, collecting over 595,500 pounds of electronics for responsible recycling and 15,554 pounds of paper for shredding and recycling.



## FY 2013 Focus Areas



1. Increase awareness of Agency and Center Sustainability Goals.
2. Provide employees with information on how to make a difference at work and at home.
3. Encourage behavior changes that support Mission success and sustainability goals.
4. Encourage employees to incorporate features with positive environmental impacts into every project.
5. Record more success stories about what JSC is doing and has done to meet sustainability goals.



Are you interested in how JSC measures up against NASA's sustainability goals and targets? Check out JSC's sustainability status on the [JSC Sustainability Web Page](#).

Do you have questions, suggestions, ideas, or success stories? Tell us about it! E-mail [JSC-Sustainability@mail.nasa.gov](mailto:JSC-Sustainability@mail.nasa.gov) with your story.

Join the JSC Sustainability Movement. Find out how you can help, and make a change.

***Why? Because Every Effort Makes a Difference!***