



# KENNEDY SPACE CENTER

## **20** | Annual **17** | Sustainability Report



# Table of Contents

- 4 Sustainability Scorecard
- 8 KSC Energy Metrics
- 10 Central Campus
- 12 Energy Awareness Day
- 13 LED Lighting
- 14 Scientist of the Year
- 16 Beach Cleanup
- 17 Hurricane Damages Tree
- 18 Solar Farm
- 20 SEA Award Winners
- 22 Bracing for Storms
- 24 EPOC Award
- 25 Space Agriculture
- 28 Earth Day
- 29 America Recycles Day
- 30 Wildlife Q&A







“We came all this way to explore the moon, and the most important thing is that we discovered the Earth.”

— *Apollo 8 Lunar Module Pilot William Anders*

*The full Moon passes over Kennedy Space Center's Launch Complex 39 area. The massive Vehicle Assembly Building, left, and the mobile launcher will be used to assemble, process and launch NASA's Space Launch System rocket and Orion spacecraft for missions to the Moon and destinations beyond. Photo credit: NASA/Kim Shiflett*

# Sustainability Scorecard

The Sustainability Scorecard provides a quick snapshot of Kennedy Space Center's performance in meeting the sustainability goals outlined in the KSC Sustainability Plan. It provides a status of functional areas spanning greenhouse gas (GHG) emissions, sustainable buildings, sustainable acquisition, renewable energy, water intensity, fleet management, energy performance contracting, waste management, electronic stewardship and climate change resilience. The KSC Environmental Management Branch monitors the performance in each of these categories to achieve a "Go for Green" status and to identify opportunities for improvement.

## Goal 1 | Greenhouse Gases

Met the following goals: reduced greenhouse gas (GHG) scope 1 and 2 emissions by more than 24.8 percent and GHG scope 3 emissions by more than 16.9 percent compared to a FY 2008 baseline.

**SCORE: GREEN** Actual Reductions: Scopes 1 and 2 by 53.6 percent, Scope 3 by 30.5 percent.

**Green:** Meet the following targets:

- 1) Reduce Scope 1 and 2 GHG emissions by 24.8 percent (~2.8 percent annually) compared to a FY 2008 baseline. These emissions pertain to sources owned or controlled by the government (e.g. government fleet, stationary sources) and purchased electricity, heat or steam.
- 2) Reduce Scope 3 GHG emissions by 16.9 percent (~1.9 percent annually) compared to a FY 2008 baseline. These emissions pertain to activities not directly controlled by the government such as emissions from non-government vehicles (e.g. employee travel, commuting).

**Yellow:** Meet one of the two targets.

**Red:** Meet neither target.

## Goal 2 | Sustainable Buildings

Met three of four goal objectives. Missed achieving a data center power use effectiveness (PUE) ratio of 1.5 or less for existing data centers. The missed objective pertains to an index that measures how effectively a given data center is consuming power. A perfect system has a PUE of 1.0, the target PUE for existing data centers like the Kennedy Data Center (KDC) is 1.5 or less.

**SCORE: YELLOW** Remaining targets were met, but average data center PUE was 1.81 in FY 2017.

**Green:** Meet the following targets:

- 1) Reduce energy intensity use in Kennedy goal-subject (GS) facilities by 2.5 percent annually compared to a FY 2015 baseline (the FY 2025 target is 25 percent).
- 2) Identify strategies to evaluate existing buildings for future compliance to the revised Guiding Principles, and achieve energy, waste or water net-zero status in GS facilities.
- 3) Identify strategies to evaluate new building designs for incorporation of climate-resilient design elements.
- 4) Achieve a power usage effectiveness (PUE) target of 1.5 or less for existing data centers.

**Yellow:** Meet two of the four targets.

**Red:** Meet fewer than two targets.

### Goal 3 | Renewable Energy

Met the goal of having at least 10 percent of facility electricity consumption come from clean and renewable sources in FY 2017.

**SCORE: GREEN** More than 11.9 percent of electricity consumption came from clean sources and 15.2 percent came from renewable sources.

**Green:** Use at least 10 percent of electricity from clean and renewable sources as a percentage of facility consumption.

**Yellow:** Use at least 7 percent but less than 10 percent of electricity from clean and renewable sources as a percentage of facility consumption.

**Red:** Use less than 7 percent of electricity from clean and renewable sources as a percentage of facility consumption.

### Goal 4 | Water Use

Met the goal of reducing Kennedy's water intensity by at least 20 percent compared to a FY 2007 baseline.

**SCORE: GREEN** Water intensity reduced by 30.15 percent.

**Green:** Reduce water intensity by at least 20 percent, compared to a FY 2007 baseline.

**Yellow:** Reduce water intensity by at least 18 percent but less than 20 percent, compared to a FY 2007 baseline.

**Red:** Reduce water intensity by less than 18 percent, compared to a FY 2007 baseline.

### Goal 5 | Fleet Management

Met the goal of reducing GHG emissions per mile by 4 percent compared to a FY 2014 baseline and ensuring procured vehicles are at least 75 percent alternative fuel vehicles.

**SCORE: GREEN** Purchased and leased vehicle acquisitions were 100% Energy Policy Act (EPA) Alternate Fuel Vehicles and GHG emission goals were met.

**Green:** 1) Show that the fleet per mile GHG emissions are reduced by 4 percent of CO<sub>2</sub>e/mile as compared to a FY 2014 baseline.

2) Ensure vehicle acquisitions (purchased or leased) are at least 75 percent EPA Act Alternate Fuel Vehicles.

**Yellow:** Meet one of the two targets.

**Red:** Meet neither target.

### Goal 6 | Sustainable Acquisition

Met the dual goal objectives of training 100 percent of the applicable procurement workforce in sustainable acquisition (SA) requirements within two years, and ensure SA Data Requirement Deliverables (DRDs) are included in all applicable contracts.

**SCORE: GREEN** Currently, 100 percent of the applicable workforce is trained in Sustainable Acquisition requirements and sustainable acquisition language has been included in major contracts.

**Green:** Complete the following tasks:

1) Ensure 100 percent of the workforce is trained in Sustainable Acquisition requirements within two years of obtaining a position that requires sustainability consideration.

2) Ensure sustainable acquisition DRDs are included in all applicable major contracts.

**Yellow:** Complete at least one of the tasks.

**Red:** Complete neither task.

## Goal 7 | Pollution Prevention & Waste Management

Met the dual objectives of diverting from the landfill at least 50 percent of the non-hazardous, non Construction and Demolition (C&D) solid waste and 50 percent of the C&D waste.

**SCORE: GREEN** Sixty-eight percent of non-C&D solid waste and 84 percent of C&D waste got diverted.

**Green:** Meet the following targets:

- 1) Divert at least 50 percent of non-hazardous, non C&D solid waste.
- 2) Divert at least 50 percent of C&D waste.

**Yellow:** Meet one of the two targets.

**Red:** Meet neither target.

## Goal 8 | Energy Performance Contracting

Met the goal of initiating at least two energy performance contracts.

**SCORE: GREEN** Two performance contracts were initiated.

**Green:** Initiate two energy performance contracts.

**Yellow:** Initiate only one energy performance contract.

**Red:** No energy performance contracts initiated.

## Goal 9 | Electronic Stewardship

Met all goal objectives to ensure sustainable procurement preferences for electronic products, implementing policies for electronic equipment defaults to be environmentally sustainable, and employing environmentally sound practices for the disposition of all excess electronic products.

**SCORE: GREEN** Sustainable procurement practices are in place for electronic products, and more than 3,000 computer peripheral devices (e.g. monitors, keyboards and mice) were reused. And with duplex printing now the default state, an estimated 8.16 million sheets of paper are being saved annually.

**Green:** Complete the following tasks:

- 1) Ensure procurement preferences include environmentally sustainable electronic products.
- 2) Implement policies to set defaults for power management, duplex printing and other energy-efficient or environmentally sustainable features on all eligible agency electronic products.
- 3) Employ environmentally sound practices for disposition of all excess or surplus electronic products.

**Yellow:** Complete two of the three tasks.

**Red:** Complete only one task.

## Goal 10 | Climate Change Resilience

Met the goal objectives by completing a design for Hurricane Matthew repairs, completing a design for the overall KSC Dune Restoration Project, and coordinating with state and federal regulatory agencies for environmental permitting.

**SCORE: GREEN** The two designs were completed in July of 2017, and we continue to coordinate closely with our regulatory agencies.

**Green:** Complete all three of the following objectives:




- 1) Complete design for Hurricane Matthew repairs.
- 2) Complete design for the overall KSC Dune Restoration Project, Eagle IV to south of Launch Complex 39A.
- 3) Coordinate with state and federal regulatory agencies for environmental permitting.

**Yellow:** Complete two of three objectives.

**Red:** Complete less than two objectives.

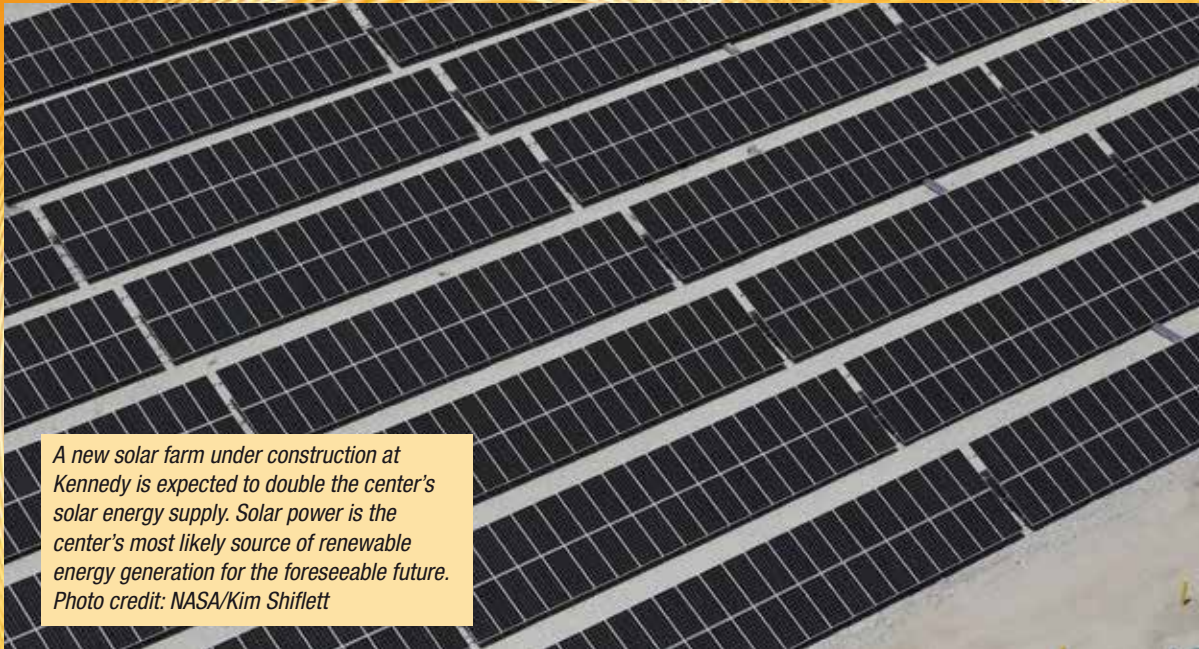
# KSC Priority Management Plans

**Metric Description:** Kennedy Space Center establishes high-priority environmental aspects (which can span multiple years) that require a Priority Management Plan (PMP). The goals for each FY 2017 high priority are listed in the metric below. These goals are reviewed and evaluated quarterly and given a score of Green, Yellow or Red. Green indicates the goal has been met or is on schedule to be met. Yellow indicates there is a possibility of not meeting the goal, and requires the owner of the goal to further monitor or make adjustments on the PMPs. Red signifies that the goal has not been met for the fiscal year, and requires the owner of the goal to provide an explanation for not meeting the goal and any corrective action to be implemented.

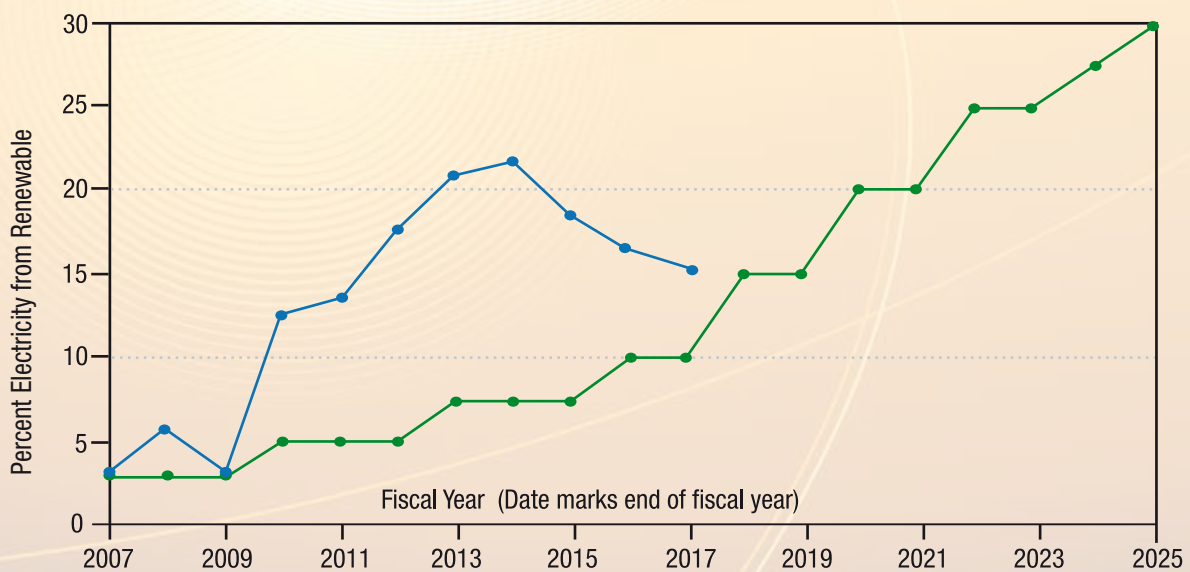
Status	Goals	Priority Management Plan (PMP) Tasks
	<p><b>Energy Efficiency (EMS-R-3282.01):</b></p> <ol style="list-style-type: none"> <li>1. Reduce energy intensity by 2.5 percent from FY15 baseline by Sept. 30, 2017</li> <li>2. Meet 10 percent renewable energy use goal from renewable energy sources by Sept. 30, 2017</li> <li>3. Formalize Ten-Year Energy Conservation Performance Plan by Sept. 30, 2017</li> <li>4. Hold Energy and Water Working Groups throughout the year</li> </ol>	<ol style="list-style-type: none"> <li>1.a. Completed energy audits of 25 percent of goal subject square footage per NASA Headquarters request and per Institutional Support Contract (ISC) contractual requirements</li> <li>1.b. Identified energy conservation measures (ECMs) to pursue energy projects</li> <li>1.c. Dispositioned ECMs through System Health And Readiness Program (SHARP) teams</li> <li>1.d. Developed group-approved ECMs into discernable projects</li> <li>1.e. Pursued execution of approved energy projects</li> <li>1.f. Determined the need for Kennedy's energy-related standard(s) pertaining to energy generation, HVAC, lighting (interior/exterior), etc.</li> <li>2.a. Engaged stakeholders in wind power dialogue</li> <li>2.b. Pursued expansion of self-generated solar power options</li> <li>2.c. Pursued expansion of hosted solar power generation</li> <li>3. Formalized and publish 10-year Energy Conservation Performance Plan</li> <li>4. Chaired and hosted Energy and Water Working Groups including sub-groups throughout the year</li> </ol>
	<p><b>Energy and Water Resiliency (EMS-R-3282.02):</b></p> <ol style="list-style-type: none"> <li>1. Identify opportunities to increase energy system resiliency by Sept. 30, 2017</li> <li>2. Identify opportunities to increase water system resiliency by Sept. 30, 2017</li> <li>3. Publish Emergency Energy Security and Conservation Plan by Sept. 30, 2017</li> </ol>	<ol style="list-style-type: none"> <li>1.a. Advocated for energy system resiliency by soliciting NASA Headquarters to fund a centerwide resiliency evaluation</li> <li>1.b. Explored energy system resiliency options</li> <li>2.a. Advocated for water system resiliency by soliciting NASA Headquarters to fund a centerwide resiliency evaluation</li> <li>2.b. Explored water system resiliency options</li> <li>3. Finalized the incorporation of Emergency Energy Security and Conservation Plan requirements into existing KSC documentation</li> </ol>
	<p><b>Dune Restoration (EMS-R-3280.03):</b> Stabilize Kennedy shoreline from northern boundary to southern boundary by FY 2019</p>	<ol style="list-style-type: none"> <li>1.a. Prepared Statement of Work for Hurricane Matthew shoreline restoration by Jan. 31, 2017</li> <li>1.b. Completed the Design Package by Sept. 30, 2017</li> <li>1.c. Prepared and submitted Biological Option document to U.S. Fish and Wildlife Services by Sept. 30, 2017</li> </ol>



# Energy Metrics



## KSC Renewable Energy Summary



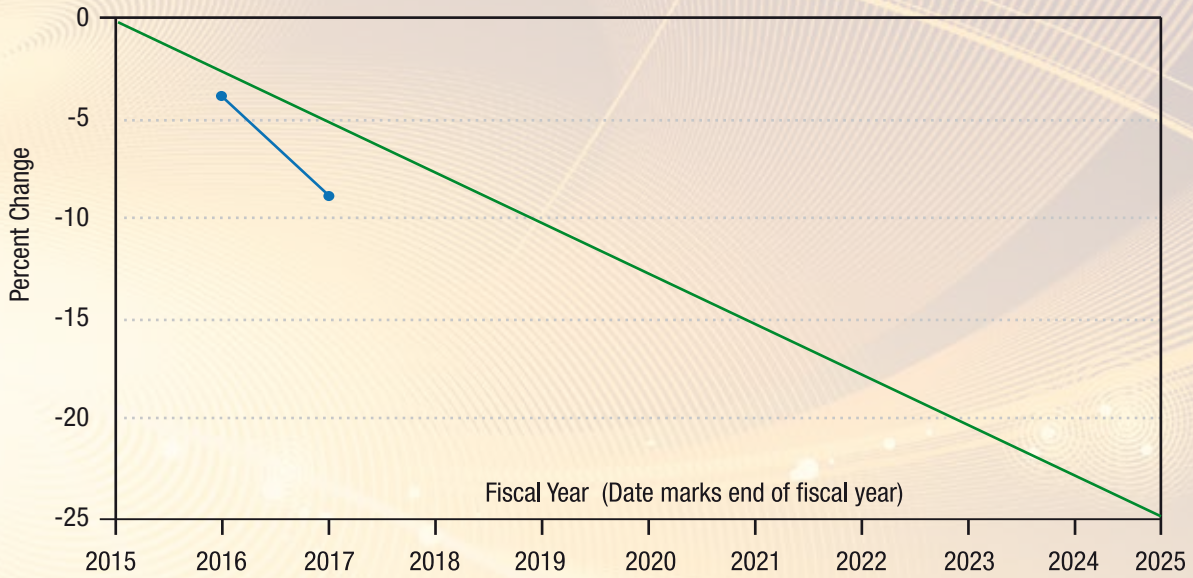
**Blue line** = actual, **Green line** = goal (above the line exceeds the goal).

Goal: At least 10 percent of KSC's total electricity consumption is from renewable energy sources for FY 2017.

Status: Kennedy Space Center exceeded the goal



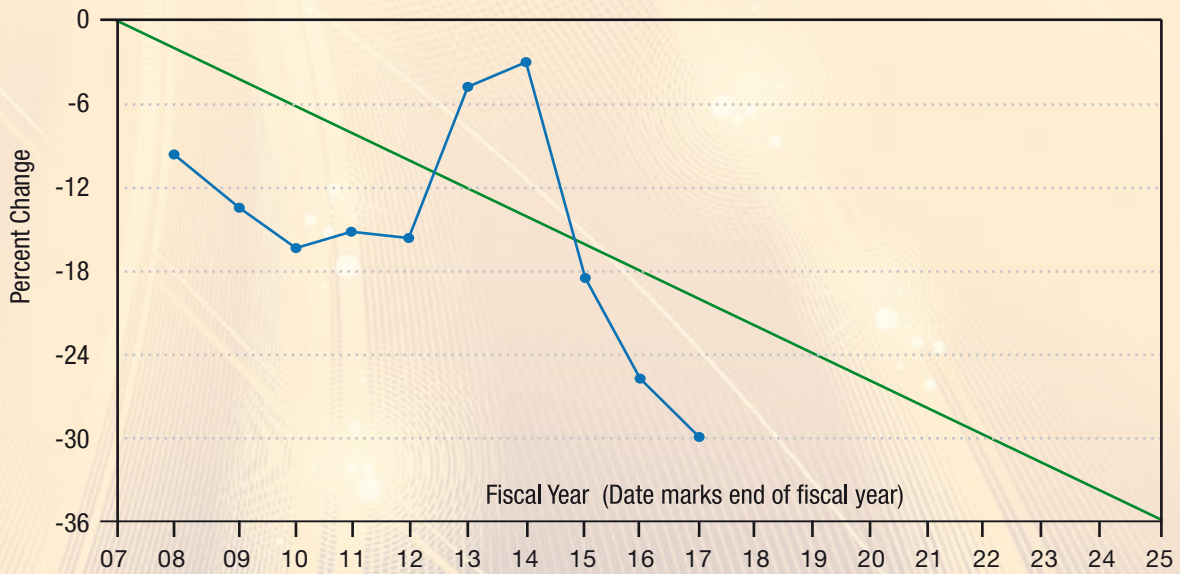
## KSC Energy Intensity



**Blue line** = actual, **Green line** = goal (below the line exceeds the goal).

Goal: Reduce energy use per gross square footage (GSF) by 2.5 percent annually through FY 2025, compared to FY 2015  
 Status: Kennedy Space Center exceeded the goal

## KSC Water Intensity



**Blue line** = actual, **Green line** = goal (below the line exceeds the goal).

Goal: Reduce potable water intensity (gallons per square foot) by 2 percent annually through FY 2025, compared to FY 2007  
 Status: Kennedy Space Center exceeded the goal



# Progress in Central C

Now that the Kennedy Space Center is a premier, multi-user spaceport, ongoing construction is adding new, ultra-modern facilities. A key element of the Central Campus makeover is a new, seven-story, 200,000-square-foot headquarters building that has taken shape in the heart of the spaceport. The facility boasts several sustainability- and efficiency-boosting features, including reflective materials, energy-saving interior lighting and electric vehicle battery charging stations.

The project is taking place in several phases. Phase 1 includes construction and outfitting of a shared services and office building to function as the first half of the new headquarters.

The headquarters building's glass facade, as seen from NASA Causeway, is complete. The exterior skin of the building also is nearly finished. The remainder of the glass components are being installed on each floor. Construction of interior walls and utilities on most floors is well underway.

The construction approach will provide a campus-like setting with several buildings surrounding a pedestrian-friendly outdoor courtyard. The concept, similar to what is used by many educational institutions, provides close proximity and access to several buildings. It also promotes the use of pedestrian walkways instead of vehicle traffic used today because of the distances between buildings.

Additionally, Central Campus phase 1 construction includes a separate facility to operate as a consolidated Kennedy Data Center which opened in October 2015. This 16,500-square-foot building operates year-round, 24 hours a day, seven days a week.

Kennedy's current headquarters is among the oldest at the spaceport, more than 50 years of service since it was built in the mid-1960s. The overarching central campus construction will consolidate several buildings and administrative spaces in what is known as the space center's Industrial Area.

*A key element of the Central Campus makeover is a new, seven-story, 200,000-square-foot headquarters building that has taken shape in the heart of the spaceport. Photo credit: NASA/Kim Shiflett*





# Campus Construction





# Energy Awareness Day Reveals Kennedy Doing Its Part



*Cory Taylor, an energy and water conservation specialist at the Kennedy Space Center, absorbs information at the Multi-Function Facility on Oct. 20, 2016. On the third Thursday in October, civil servants, contractors and several energy utilities promoted the awareness of our sustainability goals at Kennedy Space Center and at home. Photo credit: Cory Huston*

On Oct. 20, 2016, Kennedy Space Center promoted the center-wide effort to underscore how central energy is to our center's mission, security and environmental well-being. Employees, vendors, and representatives of local energy utility companies were on hand at Kennedy's Multi-Function Facility to share energy consumption data, energy conservation tips and ideas.

"There are things we can do at home and the office to meet our president's goals, be environmentally friendly and meet the sustainability goals outlined in the KSC Sustainability Plan," said Cory Taylor, an energy and water conservation specialist at Kennedy.

In keeping with the Executive Order goals set by then-President Obama, Kennedy continues to reduce energy consumption while increasing production from renewable sources.

For example, one of the goals is to reduce the amount of energy used per square foot in facilities on center by at least 25 percent by 2025 in comparison to what was used in 2015.

According to Nick Murdock, the energy and water conservation manager at Kennedy, every little bit adds up toward reaching our sustainability goals.

"Our goal is to be 30 percent dependent on renewable energy and we would like to meet and exceed this goal," Murdock said. "It's a lofty goal that we need to work toward."

Among those in attendance were Florida City Gas; Lutron Electronics Co., a lighting control company; and ISC Energy and Water, and Kennedy's energy and water conservation program.

# Retrofitting Facilities with Energy Saving Interior LED Lighting



In 2017, Kennedy upgraded lighting in numerous facilities to energy-efficient light emitting diode (LED) fixtures. LED light bulbs last longer and use less energy than other types of light fixtures. These upgrades have taken place in several buildings across the center, including Operations Support Building (OSB) and OSB II, Cryogenics Test Laboratory, Launch Equipment Shop, Launch Equipment Test Facility (LETf) Shipping and Receiving, Logistics Facility, Prototype Shop, Space Station Processing Facility (SSPF), Communications Maintenance and Storage, Occupational Health Facility, and Security Patrol Headquarters.

The lighting team received Kennedy Space Center's Sustainability Environment Awareness Award for retrofitting facilities with environmental friendly lighting, thereby reducing the energy consumption and operating costs.

*\*LED bulb shown for illustration only. Actual bulbs used in the Kennedy lighting upgrade are dimmable LED linear tube bulbs.*



# Breininger Named Kennedy's 2016 Scientist of the Year

Dr. Dave Breininger has long been a champion of conservation at the Florida spaceport.

Breininger is a senior scientist on the Kennedy Space Center Environmental and Medical Contract (KEMCON) supporting Kennedy Space Center's Ecological Program. On March 7, 2017, he was recognized as Kennedy's 2016 Scientist of the Year, accepting the award from Bill Gerstenmaier, associate administrator for the Human Exploration and Operations Directorate at NASA Headquarters in Washington, and Kennedy Space Center Director Bob Cabana.

"During the past two years, Dr. Dave Breininger has demonstrated outstanding scientific and leadership skills in support of Kennedy's Environmental Management Branch Ecological Program," the award citation reads. "His internationally recognized technical expertise has been instrumental in negotiations with the U.S. Fish and Wildlife Service Endangered Species Office for favorable biological opinions and permitting requirements associated with protected species and their habitats at the space center."

"Dave's experience, knowledge and leadership continually contribute to the NASA mission of sustainable space exploration."



*Dr. Dave Breininger, center, is awarded 2016 Scientist of the Year by Kennedy Space Center Director Bob Cabana, left, and Bill Gerstenmaier, associate administrator for the Human Exploration and Operations Directorate at NASA Headquarters. Photo credit: NASA*



Kennedy Space Center shares boundaries with the 140,000-acre Merritt Island National Wildlife Refuge. Here, space technology and a workforce of several thousand people must carefully coexist with several hundred species of animals and plants.

Breininger began working at Kennedy in 1978 while studying for his master's thesis. His interest in endangered species management and the relationship between population size and habitat quality was piqued in the early years of the Space Shuttle Program when the eastern indigo snake, Florida scrub-jay and southeastern beach mouse all were listed as threatened species. These species were headed toward extinction due to rapid habitat loss as a result of land development and wildfire suppression throughout the state of Florida.

Breininger has studied these species and their habitat requirements at Kennedy and throughout east central Florida, supporting U.S. Fish and Wildlife Service and state recovery efforts while ensuring Kennedy continued to protect and preserve these species.

Today he works closely with the U.S. Fish and Wildlife Service on the development of a prescribed-burn program that enhances the habitat for its resident animals and plants while reducing the chance of wildfires that could impact space program facilities and operations. Breininger is recognized internationally as an expert on this topic, having published more than 70 peer-reviewed scientific articles, book chapters and reports in addition to providing numerous professional and educational presentations.

Breininger received the University of Central Florida Outstanding Alumni Knight Award and the U.S. Fish and Wildlife Service Southeast Regional Director's Conservation Award in 2016.

Actively involved in education outreach and community service, Breininger serves on graduate committees at Florida Institute of Technology in Melbourne and University of Central Florida in Orlando, where he is a research associate.

He has served on several endangered species recovery teams and other conservation organizations, such as the Florida Institute of Conservation Science, Brevard County Environmentally Endangered Lands Selection and Management Committee, and Allen Broussard Conservancy. Breininger has collaborated with the Brevard Zoo and helped develop education materials for public display and for use by students in kindergarten through 12th grade.

As a senior scientist at Kennedy, he mentors staff in the use of modern statistical practices, modeling techniques, and field experiment design.

"I feel very lucky to work in such a great place surrounded by great people," Breininger said.



*A Florida scrub-jay crouches on a branch amid the brush at the Merritt Island National Wildlife Refuge in Florida. Breininger's interest in endangered species management was piqued in the early days of the Space Shuttle Program when the Florida scrub-jay, eastern indigo snake and southeastern beach mouse were all listed as threatened species. Photo credit: NASA/Ben Smegelsky*



# Volunteers Clean Kennedy Space Center's Beach



About 50 employees picked up 20 bags of trash and large debris along Kennedy's shoreline during a beach cleanup in preparation of the upcoming sea turtle nesting season.

Led by the center's Employee Resource Groups, the participants met at the Beach House, worked about an hour and covered approximately two miles in their efforts. Of the 72 miles of beach that form the eastern boundary of Brevard County, about six of those miles line the space center.

Unlike what might be found along a public beach, all of the debris that litters Kennedy's restricted beaches washes ashore after being discarded at sea. So before the group started, the center's Hazardous Materials team swept the beach to take care of any dangerous/suspicious items. They also stayed with the group through the entire cleanup on all-terrain vehicles and responded quickly to potentially dangerous items the group found.

Along with cleaning the beach, the group's team-building effort included attracting a diverse group of Kennedy workers to come together and make a positive impact. With sea turtle

nesting season set to begin in March, the group deemed the timing ideal. The beach looked completely transformed after the cleanup, said some of those taking part in the effort.

With Kennedy's shoreline being part of the top nesting area in the Western Hemisphere for loggerhead sea turtles, wildlife agencies consider it important to remove trash and debris along the coast whenever possible.

"We're hoping those sea turtles can have a safer nesting season with the newly clean beach," said Pri Thakrar, an engineer at Kennedy. "It was a beautiful day and we got a lot of positive feedback from the participants."

Thakrar, along with engineer and co-organizer Megan Yohpe, hope to make this a regular event.

*About 50 participants led by NASA Kennedy Space Center's Employee Resource Groups picked up about 20 bags of trash and other large debris along the center's shoreline before turtle-nesting season as a community service. Of the 72 miles of beach that form the eastern boundary of Brevard County, Florida, about six of those miles line Kennedy. Photo credit: NASA/Bill White*



A large, leafless tree with a nest in its upper branches, standing in a field of green vegetation. The tree is the central focus, with its bare, intricate branches spreading out against a background of dense, green, low-lying plants. A large, cup-shaped nest is visible in the upper part of the tree's canopy. The overall scene is a natural, outdoor setting.

# Tree Containing Historic Eagle Nest Damaged by Hurricane Irma

The Fish and Wildlife Service's senior biologist and botanist have determined that the State Road 3 eagle's nest tree was damaged by Hurricane Irma. The storm's winds persisted for an unusually long time. Stress from direct wind damage or wind-borne salt spray could have been significant enough to cause the tree to die, although the tree may have been previously weakened by a wildfire or pine bark beetle attack. Both scientists agree it is likely that the eagles would maintain the nest for many years after the death of the tree, but they eventually will need to seek a new location.



# PLANTING NEW SOLAR FARMS

Solar power generation at Kennedy is about to improve as the center expands its ability to produce clean energy in an environmentally friendly manner. A new solar farm is already under construction and is expected to double the amount of renewable energy generated and consumed by Kennedy. This will amount to approximately four percent of Kennedy's total electricity consumption. If taking into account additional renewable energy currently produced on Kennedy but sent to the power grid outside the center for consumption, that number grows to 18 percent and higher.

There are two solar farms at Kennedy: one in the Industrial area that produces 1 megawatt of power for the center's use, and another a couple miles south that produces 10 megawatts of electricity for Florida Power and Light (FPL). FPL built both and maintains them. They were built in late 2009 and early 2010, respectively.

"It is achieving what we had hoped for, so it's been a positive," said Nick Murdock, Energy and Water program manager for Kennedy. "It helps offset our utility costs and it also works to meet our renewable energy generation goals. It's been a success."

Solar power is the most likely source of renewable energy generation at Kennedy for the foreseeable future because it has proven its effectiveness and is approved for use in the refuge.

"Currently, we're a leader within the agency and we hope to continue being a leader of solar power generation in combination of our own power generation and the larger scale projects we host," Murdock said.





*The new solar farm under construction is expected to double Kennedy's solar energy supply to four percent of the center's total use. Photo credit: NASA/Kim Shiflett*





# Kennedy Teams Honored for Substantial Sustainability Efforts at the Spaceport

Three teams of Kennedy Space Center employees were honored with the Sustainable Environment Awareness (SEA) Award for Fiscal Year 2017: the Retrofitting Facilities with LED Lighting Team, the Central Campus Solar Photovoltaic Power Generation Team and the KSC Facility Defensible Space for Wildland-Urban Interface Fire Threat Team.

Developed by Kennedy's Environmental Management Branch, the SEA Award recognizes exemplary achievement that advances sustainability at the spaceport. Winners are chosen by Environmental committee members, who carefully assess each nomination using a variety of criteria, including innovation, impact to NASA's mission, outreach and teamwork.

The award's design represents a dedication to reusing and recycling, as it incorporates plate glass that came from the windows in Kennedy's Launch Control Center (LCC) firing rooms. Launch controllers and managers observed Apollo/Saturn V, space shuttle and other historic launches from these windows from 1963 until 2010.

There are 11 categories of the SEA Award: Greenhouse Gas Emission Reduction, Sustainable Buildings, Clean and Renewable Energy, Water Management, Fleet Management, Sustainable Acquisition, Pollution Prevention and Waste Reduction, Energy Performance Contracts, Electronic Stewardship, Climate Change Resilience and Tactical Support.





### *Retrofitting Facilities with LED Lighting Team*

## **Sustainable Buildings and Tactical Support Group Award**

*Sonia Miller, Jose Ribeiro and their team for implementing cost savings while providing an environmentally friendly and energy-efficient interior lighting retrofit at numerous NASA Kennedy facilities*

This lighting project directly supports Presidential Executive Order 13693 — Planning for Federal Sustainability in the Next Decade — by making Kennedy more energy-efficient. It also is providing better light quality to enhance the work environment and reduce maintenance costs.

### *Central Campus Solar Photovoltaic Power Generation Team*

## **Clean and Renewable Energy Group Award**

*Sam Ball and his team for advancing the use of clean and renewable energy while supporting NASA in meeting its sustainability goals*

This team was responsible for the installation of an approximately 2,000-kilowatt system of ground-based solar panels. In addition to ensuring compliance with Presidential Executive Order 13693, this project will help Kennedy meet renewable energy and net-zero energy goals by 2030.

### *KSC Facility Defensible Space for Wildland-Urban Interface Fire Threat Team*

## **Climate Change Resilience Group Award**

*Greg Gaddis and his team for dedication to process improvement by renegotiating the prescribed burn agreement and allocating resources to ensure defensible space around NASA facilities at Kennedy to reduce wildfire threat*

This group devised a plan to clear approximately 84,000 square feet of hazardous fuels from the vicinity of several Kennedy facilities. The team's actions created the possibility for a sustainable environmental solution supporting both fire hazard reduction and favorable habitat conditions for fire-dependent native species.





# *Kennedy Braces Naturally for Storms*

*Massive sand dunes, policies of keeping up-to-date on maintenance and a network of levees are a few of the items in place every day at NASA's Florida spaceport that are critical when storms approach.*

While hurricane season is underway, officials at Kennedy, the Merritt Island National Wildlife Refuge and the Canaveral National Seashore say they are prepared if a massive tropical system moves toward the center this season. Just as importantly, they said, their preparations don't wait for storm seasons – they take place year-round.

“Our ‘preparation’ is really long-term standard maintenance,” said Mike Legare, a supervisory wildlife biologist with the wildlife refuge. “However, if a major storm is coming and forecast to dump lots of water on us, we open the control structures so that water flows out and hopefully reduces flooding and prevents damage.”

Hurricane Matthew grazed Kennedy in October 2016, testing the sand dunes that line the ocean-side coast of the space center.

“The dunes are there to protect critical launch assets from surges, including those from hurricanes,” said Don Dankert, a biological scientist in the Environmental Management Branch of the Spaceport Integration and Services Directorate. Launch complexes dot the seashore along the Atlantic Ocean, each one with its own critical components that have to be protected. Some, including Launch Complexes 39A and 39B, are built atop structures that would keep rockets and spacecraft far above any storm surge on their own. The dunes and other measures also are vital to keeping a surge from swamping lower-lying equipment around pad perimeters.

The dunes were rebuilt after 2014, when Hurricane Sandy eroded away portions of them. The dunes are critical elements to repel





storm surge away from launch facilities and are vital to the seashore for other reasons, too.

“Kennedy’s shoreline is an important habitat for wildlife, including several endangered species such as the Southeastern beach mouse, gopher tortoise and indigo snake.”

For the Canaveral National Seashore on the north end of Merritt Island, the focus is on keeping man-made structures such as boardwalks and docks in good shape so they can handle any conditions that spring up. After the storm, plans are in place for surveys and to get any damage repaired.

“We make sure our hurricane plan is up to date,” said Laura Henning, the seashore’s public information officer. “We perform some preventative tree trimming if time permits.”

The levees around Kennedy are designed to keep the marshland around the center from becoming prized territory for mosquitoes. After a storm, when rainwater has built up around the area, extra emphasis is placed on keeping the levels low enough to prevent flooding, but too high for mosquitoes to thrive.

“It is an imperfect but annually very effective technique,” Legare said, “and much preferred over spraying pesticide.”



# ENVIRONMENTAL POINTS OF CONTACT AWARDED FOR EXPERTISE

New construction and upgrades to existing infrastructure are crucial to Kennedy Space Center's role as a premier, multi-user spaceport. Thanks to the expertise of Kennedy's Environmental Points of Contact, or EPOC, team, each of these critical projects is managed with environmental concerns and guidelines in mind.

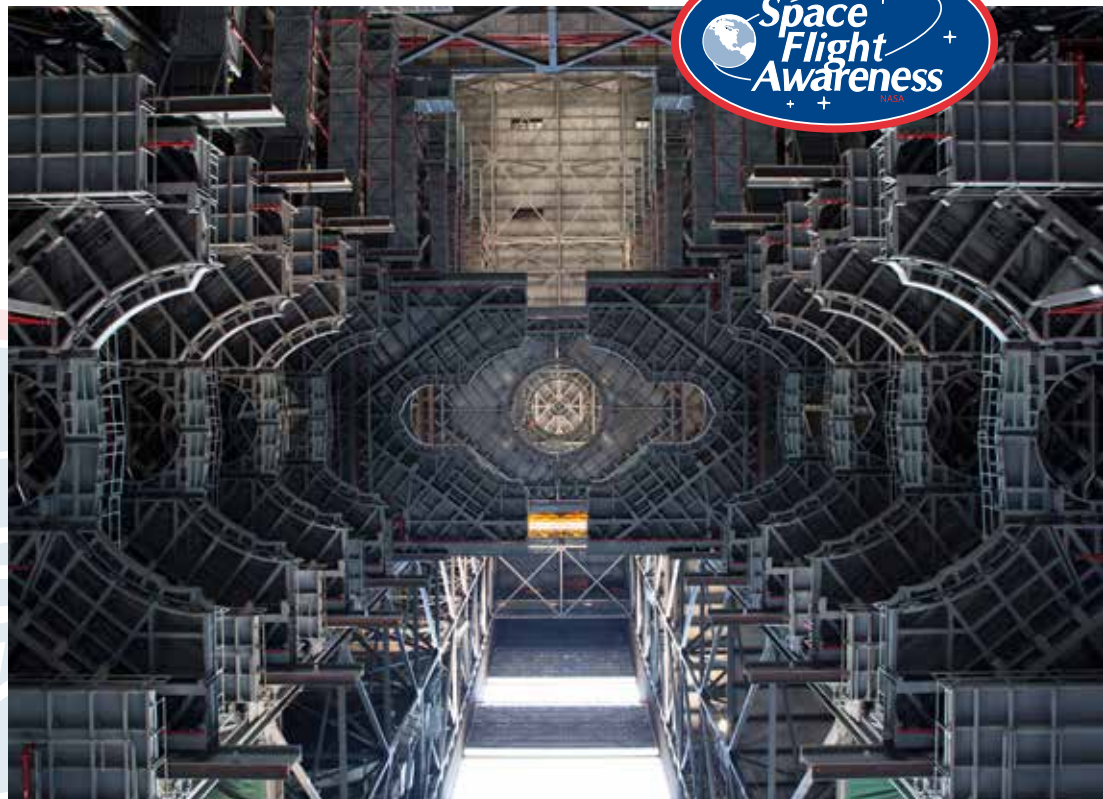
The EPOC team, as it's known at the spaceport, received a Space Flight Awareness Team Award honoring this group of specialists. NASA Environmental Management Branch nominated the EPOCs for the team award, citing the commitment, expertise, program interaction and "out-of-the-box thinking" each team member utilizes as they guide construction teams through the lifecycle of a project.

Team members are tasked with monitoring and support of these projects — jobs such as installation of the new Vehicle Assembly Building (VAB) platforms, upgrading the launch pads, and building the new Data Center and the headquarters building in the new Central Campus. The EPOC team works for the Kennedy Environmental and Medical Contract (KEMCON), the resident contractor for environmental efforts at Kennedy.

EPOC team members participate in every aspect of such projects, from conception and design, through con-

struction, to completion. Their involvement ensures environmental regulations, permitting and sustainability requirements are incorporated and followed, and waste products are managed and recycled or disposed of properly. They're also experts on LEED certification.

The four members of the EPOC team are Kristina Herpich, Lisa Ruffe, Nick Aleman and Tim Mrdjenovich. NASA also included Mike McDonnell in the Space Flight Awareness Award based on his years of service on the team prior to taking on new responsibilities with the Kennedy Environmental and Medical, or KEMCON, contract.



*The platforms in the Vehicle Assembly Building's High Bay 3, viewed here from below, were designed to surround and provide access to NASA's Space Launch System and Orion spacecraft. EPOC team members monitor and support projects such as the new platforms' installation. Photo credit: NASA/Bill White*



# Space Agriculture Planted in History



*A look at the Biomass Production Chamber at Kennedy back in 1991. Photo credit: NASA*

For more than 30 years, NASA's Dr. Raymond Wheeler has studied growing plants for space. Wheeler published a paper titled "Agriculture for Space: People and Places Paving the Way." It is a historical narrative outlining agricultural research conducted for space spanning the past 70 years. Wheeler's space farming research highlights novel technologies and findings that have been produced over the years, including the first use of light emitting diodes, or LEDs, to grow plants, as well as hydroponics and vertical gardening techniques. In Wheeler's work, one also sees that space agriculture has contributed to, and benefited from terrestrial, controlled environment agriculture and will continue to do so into the future. To read more about Wheeler's and other space farmers' work, go to <https://go.nasa.gov/2nPAIM9>.





*Kennedy Space Center facilities stand out against the green-and-blue landscape of the Merritt Island National Wildlife Refuge. Launch Pad 39B, foreground, is being readied to support the launch of the agency's Space Launch System (SLS) rocket. The iconic Vehicle Assembly Building, background, serves as the multi-user spaceport's central hub, capable of hosting a variety of rockets and spacecraft. Maintaining high-tech facilities while caring for the delicate ecosystems found throughout the refuge is an important part of Kennedy's environmental stewardship. Photo credit: NASA/Kim Shiflett*







# Celebrating Earth Day 2017

Kennedy hosted about 40 exhibitors who shared information on renewable energy, electric cars and Florida-friendly landscaping for the 48th Earth Day.

The event kicked off at the Operations Support Building II on April 20, 2017, then moved to the Kennedy Space Center Visitor Complex the next day, allowing employees and visitors to learn and benefit from an array of sources.

The celebration was designed to increase awareness of innovations that can contribute to sustainable living at work and at home.

Among the exhibitors were researchers from the University of South Florida (USF), displaying a biogas digester system that could convert any organic waste into clean-cooking gas and high-quality liquid fertilizer.



*Approximately 500 Kennedy Space Center employees attended the 2017 Earth Day event at the Operations and Support Building II on April 20. One of 40 exhibitors shared information on how the biogas digester system converts any organic waste into clean cooking gas and high-quality liquid fertilizer for gardens. Photo credit: NASA/Cory Huston*

“We are trying to get everyone to think more futuristically,” said Rhiannon Roberts, the internship coordinator for USF’s College of Global Sustainability.

There also were natural conservation specialists sharing ways to protect wildlife and Florida waters. Many employees took home native plants that will help the local environment.

Also included were representatives of the Merritt Island National Wildlife Refuge, Canaveral National Seashore, Brevard Zoo and General Motors. Other vendors shared information on Florida’s expanded biking and hiking trails. Representatives from the Brevard Zoo explained the zoo’s efforts to achieve sustainability, including a recycling program and enhanced sustainability signage within the zoo.

Earth Day in the United States, first celebrated April 22, 1970, is held nationally each April to promote environmental awareness and appreciation. For more than four decades, NASA has been using the vantage point of space to increase the understanding of Earth and safeguard the future while improving lives.



# EMPLOYEES CONTRIBUTE ON AMERICA RECYCLES DAY

Employees at Kennedy Space Center brought a wide variety of household items to work on Nov. 15 and 16, 2016, in conjunction with America Recycles Day.

America Recycles Day is a nationally recognized initiative dedicated to promoting recycling in the United States. Kennedy partnered with several organizations in order to donate as many of the items as possible to those who could use them the most in the Space Coast community. These included Goodwill Industries, Bridges BTC Inc., Cellphones for Soldiers, the Lions Club and the Ronald McDonald House.

Space center personnel were invited to bring electronic waste, from cell phones to computers; new or gently used household items such as sporting goods, home decor and kitchen items; shoes, clothing and eyeglasses; and many more. Kennedy's Sustainability team sponsored the event.

In total, spaceport employees made approximately 345 drop-offs. Televisions and cell phones were especially common.



"It turned out to be a great event," said Jeanne Ryba, NASA KSC Sustainability specialist. "Employees appreciated the convenience of dropping off their unwanted items and knowing they would be used again by someone in the community, or disposed of in an Earth-friendly way."

*Computers, monitors, vacuum cleaners and other electronics have been donated by employees at Kennedy in conjunction with America Recycles Day. Photo credits: NASA/ Kim Shiflett*





# KSC home to a diverse wildlife population

Kennedy Space Center is world-renowned for its rocket launches. But the Florida spaceport also is very much in touch with nature. It shares boundaries with the Merritt Island National Wildlife Refuge, making it home to a variety of wildlife.

Among the many animals that can be spotted on the center are alligators, bald eagles, sea turtles, manatees and beach mice. Experts with Kennedy's Environmental and Medical Contract (KEMCON) answer questions about these amazing creatures.



## ALLIGATORS

### Are alligators ecologically valuable?

Yes. They are important top predators that help keep populations of smaller animals under control. They also create a habitat for other wildlife in the marsh by digging holes that hold water during the dry season. Because alligators are top predators, they can live more than 60 years.

### Why is it illegal to feed alligators?

Alligators are reptiles and work on instinct, not intelligence. When they are fed by a person, they lose their natural fear of humans and start to associate people with food. They may eventually become aggressive and there is no way to “unlearn” this behavior. When this happens and it is reported to wildlife officials, the alligator is labeled a “nuisance animal,” and it is trapped and killed.

## BEACH MICE

### What is a beach mouse?

There are 16 subspecies of the old-field mouse; eight of these are considered to be beach mice. Two of the subspecies reside on Florida's east coast: the Anastasia Island beach mouse and the Southeastern beach mouse. The Pallid beach mouse lived on the east coast, but is believed to be extinct.

### Why are beach mice important?

Beach mice eat a variety of coastal plants, including seeds and flowers, which helps disperse these seeds throughout the coastal dune system promoting new growth that helps to stabilize the dunes making them more stable during storms and protecting the coast.





# MANATEES

## How large are manatees?

Adult manatees range in size from 9 to 11 feet and can weigh 1,000 to 1,500 pounds. Typically, adult females are larger than males. Female manatees reach maturity around 5 years and males between 7-9 years.

## What do manatees eat?

Manatees are herbivores that feed mainly on seagrasses in brackish and salt water, and on vegetation such as eelgrass in fresh water. Although they can graze heavily in a given area, they typically do not destroy the vegetation and it regrows for future feeding.



# BALD EAGLES

## Do eagles stay at Kennedy year-round?

Some eagles spend the entire year in Florida, but most migrate north during the nonbreeding season (April to August). It is very unusual to see an adult eagle at Kennedy during the summer months.

## Where do Kennedy's eagles go during the non-breeding season?

Florida eagles use three major migration routes: the Atlantic coast, the Appalachian Mountains and the Mississippi River valley. Most Florida eagles summer near the Chesapeake Bay or in the coastal plain of North Carolina, but some juvenile eagles travel all the way to Newfoundland.

# SEA TURTLES

## When are sea turtles nesting on the Kennedy beach?

Leatherback turtles sometimes can lay their eggs as early as March. Loggerheads tend to begin laying their eggs in late April or early May. Green turtles usually begin laying their eggs in late June, and can lay as late as October or November.

## Why do I see signs and bumper stickers that read "Turn off lights for sea turtles?"

Sea turtles use the light of the Moon and stars to navigate. Artificial lighting from street lights, buildings, and flashlights on the beach can mislead nesting and hatching turtles. They head toward the artificial lights away from the ocean and risk danger of being eaten by predators, such as raccoons and foxes. They also risk wasting precious energy wandering around that they need to get them far out to sea.







*Some prominences are seen as the moon begins to move off the sun during the total solar eclipse on Aug. 21, 2017, above Madras, Oregon. A total solar eclipse swept across a narrow portion of the contiguous United States from Lincoln Beach, Oregon to Charleston, South Carolina. A partial solar eclipse was visible across the entire North American continent along with parts of South America, Africa, and Europe. Photo Credit: NASA/Aubrey Gemignani*

National Aeronautics and Space Administration

**John F. Kennedy Space Center**  
Kennedy Space Center, FL 32899

[www.nasa.gov](http://www.nasa.gov)

SP-2018-05-582-KSC