



Southernmost Weather Reporter

**National Weather Service
Weather Forecast Office
Key West, FL**



Southernmost Weather Reporter

National Weather Service ~ Key West, FL

Welcome to 2017 Winter Report

FEB 2017

Inside this Report:

We would like to welcome you to the second edition of the “Southernmost Weather Reporter” from the Florida Keys National Weather Service (NWS). In this newsletter you will find information about some of the most important office events that have occurred since our first edition was released in May 2016. The tropics were active in 2016, with Tropical Depression #9 (the storm that would eventually become Hurricane Hermine) forming over the Florida Keys coastal waters in late August, and Hurricane Matthew threatening the Keys in early October before it eventually impacted the east coast of Florida and the Carolinas. We were “all hands on deck” for these two events, conducting numerous briefings, working closely with our core Federal, state, and local partners, and launching special upper air releases every six hours. Our office participated in what was a first for the NWS: a long-term deployment on board a NOAA research vessel to provide decision support. Meteorologists Chip Kasper and Chris Rothwell each joined the science team aboard the NOAA Ship *Nancy Foster* for an expedition in the coastal waters of the Florida Keys in August. The NOAA-led research team conducted scuba operations and undertook a variety of research tasks, collecting data necessary to inform management decisions within the Florida Keys National Marine Sanctuary. Kasper and Rothwell gave daily shipboard marine weather briefings to support safety of life at sea and weather-sensitive decision making pertaining to voyage planning and execution, and were completely integrated into the daily rhythm of ship and science operations.

We conducted a lot of unique initiatives to strengthen both land and marine partnerships including conducting Skywarn presentations at Key West and Ocean Reef, hosting presentations on board Coast Guard cutters, and deploying marine signs at marinas throughout the Keys. We held our first ever Aviation Workshop this past May, with Delta Airlines, NWS Miami, Monroe County Airports and many other partners participating. In September, we brought scientists down from NWS Headquarters and multiple NWS Forecast Offices in south Florida and the Florida



Keys along with a broad and diverse community of users and core stakeholders who utilize Mesonet data in the emergency management, aviation, agricultural, and public health sectors.

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Welcome to 2017 Winter Report (cont.)

Over two days, the attendees reviewed observational assets in the Keys and determined how best to move forward with deploying, maintaining, and utilizing those assets, in both the programmatic and operational frameworks.

At the office, we brought on two new meteorologists: Melody Lovin (a Forecaster), who came to us from NWS Duluth, and David Ross (the Observing Program Leader) who came to us from NWS Miami. This brought our office up to a full staff of 18 meteorologists out of a total staff of 21. A number of our meteorologists received local Isaac Cline Awards commemorating their hard work. We started up a new diversity program at the office, celebrating National Hispanic Heritage Month, and participated in the NWS "Week of Service" by participating in International Coastal Cleanup Day. Our NOAA Weather Radio was converted over to the new Broadcast Message Handler Software, which will result in even faster broadcast of critical warning and forecast information.

Sincerely,

Matt Moreland

Meteorologist-in-Charge

Florida Keys National Weather Service

Florida Keys NWS Participates in Hurricane Tabletop Exercise at Naval Air Station Key West

By: Matt Moreland

On July 29, 2016, Matt Moreland, Meteorologist-in-Charge of the Florida Keys National Weather Service (NWS), participated in a hurricane preparedness tabletop exercise hosted by Naval Air Station (NAS) Key West on Boca Chica Key. The scenario used for the exercise was "Tropical Storm Beetle", a fictional storm which developed near Cuba then impacted the Keys about 48 hours later as a storm with intensity on the borderline between a strong tropical storm and a Category 1 hurricane. Florida Keys NWS provided the mock storm and graphics used in the scenario. Navy Fleetweather based in Virginia provided the main weather briefing for each forecast timeline, while the NWS was on site to answer additional questions. Participants from different divisions at NAS Key West ran through different time stamps of the forecast and discussed the critical decisions that would need to be made for each forecast period. Examples of Navy critical decisions include whether to evacuate personnel or shelter-in-place, setting up shelters, staffing levels at the EOC, preparation for HAZMAT/environmental issues, fuel vehicles, parking plans, vehicle placement, and what divisions should remain on duty during the storm. The Navy also went through response and recovery scenarios following a storm's impact.

This exercise helped to further strengthen the relationship between the Florida Keys NWS and NAS Key West. The tropics became active a few weeks following the exercise. Both entities worked together during the early phases of Hurricane Hermine as it developed near the Keys, and Hurricane Matthew as it threatened but ultimately tracked east of the Keys. The NWS participated in conference calls hosted by the Navy, while NAS Key West participated in briefings conducted by the NWS. Decision support provided by the Florida Keys NWS office aided Navy emergency management in critical decisions that had to be made and in answering questions during both events.

Florida Keys NWS Provides First-Time SKYWARN Training to the Ocean Reef Community

By: Jon Rizzo

When hazardous weather threatens the Florida Keys, meteorologists at local National Weather Service (NWS) offices partner with the nearly 290,000 trained SKYWARN storm spotters across the country. SKYWARN storm spotters form a volunteer corps of specially-trained weather observers who help enhance local public safety by accurately reporting weather observations and storm damage directly to their local NWS office.

In July, the Florida Keys NWS visited Ocean Reef to provide them with their first SKYWARN storm spotter training course. Ocean Reef is a 2500-acre private community at the far northeast end of the Florida Keys, whose population can range from about 800 residents and visitors in summer to several thousand in winter. Ocean Reef is served by its own community association, which operates its own public safety and public works units. While SKYWARN storm spotter training is conducted as a free course to the general public, the public safety leadership at Ocean Reef adopted a unique approach to introducing severe storm spotting and training to its community. The class of 21 included representatives of their public safety division, U.S. Coast Guard Auxiliary Flotilla 13-4, and the leaders of Ocean Reef's numerous recreational activity centers. In class, these community leaders learned the basics of thunderstorm development and structure, identification of tornadoes, waterspouts, damaging winds and hail, how to report information directly to the Florida Keys NWS, and basic severe weather safety.

The focus on the training of public, maritime, and recreational safety leaders empowers Ocean Reef to know how to receive critical NWS warnings, recognize severe weather clues, and make decisions to protect their community at large. Whether Ocean Reef residents and visitors are on the courts, having a round of golf on their courses, or sailing on the local waters, the Ocean Reef Community Association has become a stronger partner in the NWS's mission to protect life and property against severe weather impacts.

SKYWARN classes are announced on the NWS website at www.weather.gov/key, as well as on Facebook and Twitter. However, your Florida Keys NWS reminds you that SKYWARN training doesn't have to wait for a scheduled public course, nor is it limited to private communities. If you would like SKYWARN storm spotter training for your government agency, employees, homeowner's or condominium association, please contact Jon Rizzo, the Warning Coordination Meteorologist at 305-295-1316 extension 223 or via email at jonathan.rizzo@noaa.gov.



National Weather Service Forecasters Join NOAA Ship *Nancy Foster* Expedition in the Florida Keys

By: Kennard “Chip” Kasper

Florida Keys National Weather Service (NWS) forecasters, Chip Kasper and Chris Rothwell, each joined the science team aboard the NOAA Ship *Nancy Foster* for an expedition in the coastal waters of the Florida Keys in August 2016. Rothwell was on the ship from 10–14 August, and Kasper was aboard from 14–22 August. The project, “Florida Keys National Marine Sanctuary Coral Reef Condition Assessment, Coral Reef Mapping, and Fisheries Acoustics Characterizations” was conducted mainly between Key West and the Dry Tortugas in the NOAA Florida Keys National Marine Sanctuary. The NOAA-led research team conducted scuba operations and undertook a variety of research, collecting data necessary to inform management decisions within the Florida Keys National Marine Sanctuary. Scientists conducted habitat mapping and collected imagery to validate habitat maps; tagged fish with acoustic transmitters to understand their movement patterns; serviced instruments deployed in the sanctuary to listen to fish tagged with acoustic transmitters; and deployed drop cameras, stereo-cameras, and a wave glider that provided visual and acoustic observations that complemented direct diver observations.



Meteorologist Chip Kasper delivers an impromptu weather briefing to Paul Barbera, a scientist from Florida Fish and Wildlife.

Kasper and Rothwell gave daily shipboard marine weather briefings to support safety of life at sea and weather-sensitive decision making pertaining to voyage planning and execution, and small boat dive operations. They were completely integrated into the daily rhythm of ship and science operations, participating in daily safety briefings on the bridge, with the ship’s officers, department heads, and the chief scientist. Each day, they drafted a weather outlook for the next day, which was submitted to the ship’s operations officer, and included in the “Plan of the Day” which circulated during the late afternoon hours. In addition, they participated in an evening science team meeting, providing a summary and

explanation of the day’s weather as it pertained to science operations, as well as the outlook for the next day. The 24/7 duty forecasters at WFO Key West supported Kasper and Rothwell by providing twice daily e-mail briefings in PowerPoint and PDF formats. In addition, chat software was utilized extensively to share data, information, and knowledge among the deployed and WFO forecasters.

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National Weather Service Forecasters Join NOAA Ship *Nancy Foster* Expedition in the Florida Keys (cont.)

This expedition proved to be a prolific learning experience not only for the NWS forecasters involved, but also the other NOAA Corps officers, crew, and scientists. Kasper and Rothwell each presented an evening seminar (20–30 minutes) to officers, crew, and scientists, highlighting NWS operations and services and other aspects of the NWS Marine, Tropical, and Tsunami Services Program (e.g., hurricanes). Moreover, Kasper and Rothwell observed and participated in weather-sensitive



Meteorologist Chris Rothwell provides the daily briefing to the captain, officers, and science team lead on the bridge of the *Nancy Foster*.

operations, communicated with operators, and determined areas for improvement regarding the quality, value, and presentation of NWS weather, water, and climate data forecasts, and warnings.

Participating institutions in this year's *Nancy Foster* expedition included the NOAA/Florida Keys National Marine Sanctuary, NOAA/National Centers for Coastal Ocean Science, NOAA/National Weather Service, Florida Fish and Wildlife Conservation Commission/Fish and Wildlife Research Institute, and Harbor Branch Oceanographic Institute.



A water level view of the 186 foot *Nancy Foster*.

NWS Invites the Florida Keys to Be a *Force of Nature* Through the Weather-Ready Nation Ambassador Program

By: Jon Rizzo

Your Florida Keys National Weather Service (NWS) has a mission to issue forecasts and warnings for the protection of life and property, enhance the national economy, and help build a Weather-Ready Nation that is increasingly aware and prepared to respond to weather impacts. The Florida Keys NWS began its Weather-Ready Nation efforts with working more closely with our emergency response partners, sharing preparedness and response training activities, and providing advanced decision support services during emergencies and events where vulnerability to weather impacts is high.



However, people in the United States continue to be seriously injured or killed from the impacts of severe weather despite advances in the accuracy and lead-time provided by NWS weather warnings. To help improve community awareness of weather impact risk and community resilience, the NWS offers a new way for the public to become involved: The Weather-Ready Nation Ambassador program. Weather-Ready Nation Ambassadors in the Florida Keys commit to working with the NWS to achieve these goals. This program is open to government, non-profit organizations, academic institutions, and private industry. This broad spectrum of new partners provides a force multiplier for the NWS to better educate the public on their weather risks and how best to prepare and respond. There is no cost for an organization to join the program.

To be recognized as a Weather-Ready National Ambassador, organizations commit to:

1. Promotion of Weather-Ready national messages and themes to their stakeholders;
2. Engaging with NWS personnel on potential collaboration opportunities;
3. Sharing their success stories of preparedness and resilience;
4. Serving as an example by educating employees on workplace preparedness.

In response, your Florida Keys NWS can help provide weather hazard outreach materials, explore innovative approaches for collaboration with your organization, and assist with formal StormReady Supporter or Community recognitions. If you're ready to help the Florida Keys become a "*Force of Nature*", teach the communities about weather risks and preparedness, and plan to respond for weather emergencies, consider joining the nearly 4,000 Weather-Ready Nation Ambassadors across our nation. You may register online at

<http://www.nws.noaa.gov/com/weatherreadynation>

Florida Keys NWS Hosts Aviation Workshop

By: Bill Cottrill

WFO Key West hosted the first annual Florida Keys Aviation Workshop, held at the Florida Keys National Marine Sanctuary, Eco-Discovery Center on May 5, 2016. Many of our core local, regional, and national aviation partners were in attendance.

After an opening statement by Meteorologist-in-Charge, Matt Moreland, Aviation Program Manager, Bill Cottrill spoke about WFO Key West operations with respect to terminal forecast and airport weather warnings at the Marathon and Key West International Airports. Miguel Sierra, forecaster from Central Weather Service Unit (CWSU)

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Florida Keys NWS Hosts Aviation Workshop (cont.)

Miami, presented on their operations and how they impact air travel in south Florida and the Florida Keys. Delta Airlines sent meteorologist Heather Heitzman and dispatcher Kevin Blumberg to explain Delta Operations at the shortest international runway in the United States. Both Delta pilots and co-pilots require special certifications to fly into Key West airport, and the flights are subject to weather thresholds unique to this airport.

T.J. Henderson, Assistant Director for Airports in Monroe County, presented an overview of operations and statistics for the Key West and Marathon airports. Also, Lead Forecaster and KBYX radar focal point Mike Rapsik spoke about the strengths and weaknesses of the radar located on the north side of Boca Chica Naval Air Station (NAS). Matthew Bloemer, forecaster at the CWSU in Peachtree City, GA, and former forecaster at our office, attended via webinar and gave a presentation on his research: "A Florida Keys Lightning Climatology."

A few of the partner representatives in attendance included Bob Inscoe, Director Trauma Star, Glenn Cullingford, Florida Keys Mosquito Control District, and CDR Rory DuPont and CDR Luke Barradell, of Boca Chica NAS Sun Downers (VFC-111). Lively interaction followed each presentation with contact information shared through the entire group.

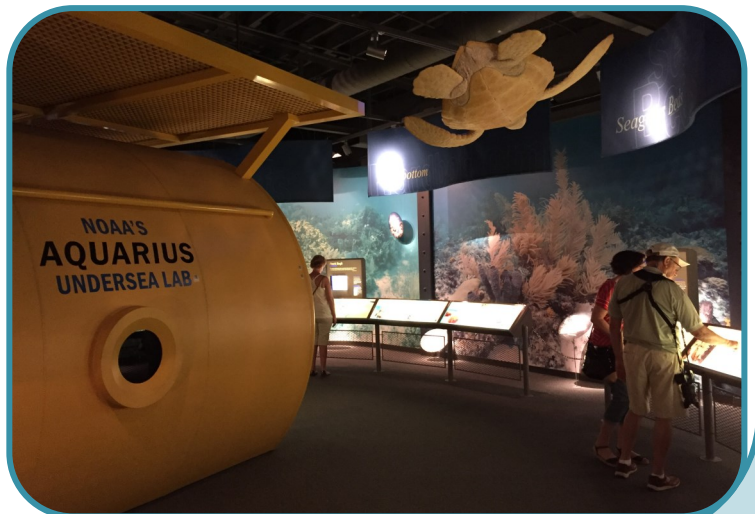
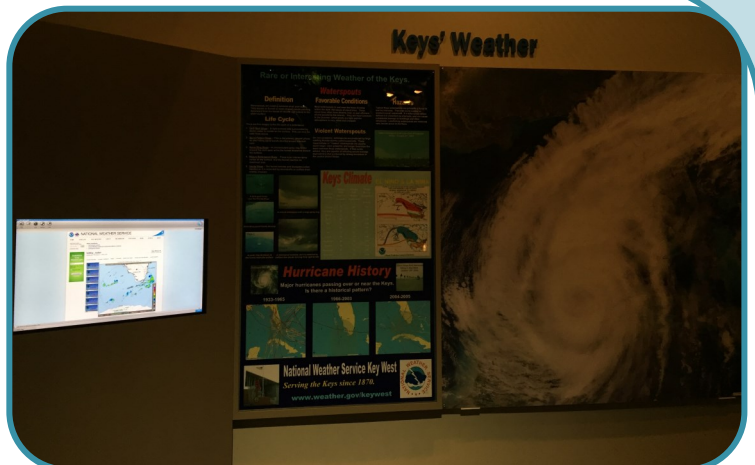
Visit NOAA's Eco-Discovery Center in Key West

By: Kennard "Chip" Kasper

The National Weather Service (NWS) maintains a weather exhibit at the Florida Keys Eco-Discovery Center in Key West. The Eco-Discovery Center is a world-class attraction located at the NOAA Dr. Nancy Foster Florida Keys Environmental Complex adjacent to Truman Harbor in Old Town Key West. The Center features more than 6,000 square feet of interactive exhibits, which interpret the resources and management efforts of the Florida Keys National Marine Sanctuary, two national parks, and four national wildlife refuges.

The Florida Keys NWS exhibit features a display highlighting the climate and weather of the Florida Keys and adjacent coastal waters, including an interactive kiosk, allowing visitors to access the latest climate, weather, and water warnings, forecasts, and observations online. The Florida Keys NWS facilities and electronics team recently refurbished the interactive kiosk. Be sure to check it out during your next visit!

Find more information about the Florida Keys Eco-Discovery Center at <http://floridakeys.noaa.gov/ecodiscovery/visit.html>.



U.S. Coast Guard Cutter Visits

By: Kennard “Chip” Kasper

Florida Keys National Weather Service (NWS) meteorologists visited three U.S. Coast Guard Sentinel-class fast response cutters in 2016: U.S. Coast Guard Cutter (USCGC) *Kathleen Moore*, USCGC *Charles David Jr*, and USCGC *Isaac Mayo*. The purpose of the visits was to provide local marine weather training for the command and crew of each cutter, with a focus on marine weather hazards around the Florida Keys and Straits of Florida. Each presentation also included a briefing on NWS marine weather operations and services and a valuable discussion concerning NWS impact-based decision support services to the U.S. Coast Guard. The visits were led by senior forecaster and marine program meteorologist, Chip Kasper, with assistance from meteorologists Krizia Negrón and Brandon Fling.

A total of six fast response cutters are homeported at U.S. Coast Guard Sector Key West. The Sentinel-class fast response cutter is a relatively new Coast Guard patrol boat that is capable of deploying independently to conduct missions that include port, waterways, and coastal security; fishery patrols; search and rescue; and national defense.

Top: U.S. Coast Guard Fast Response Cutter makes way in the Gulf of Mexico waters. Photo Credit: Flickr/Coast Guard News.



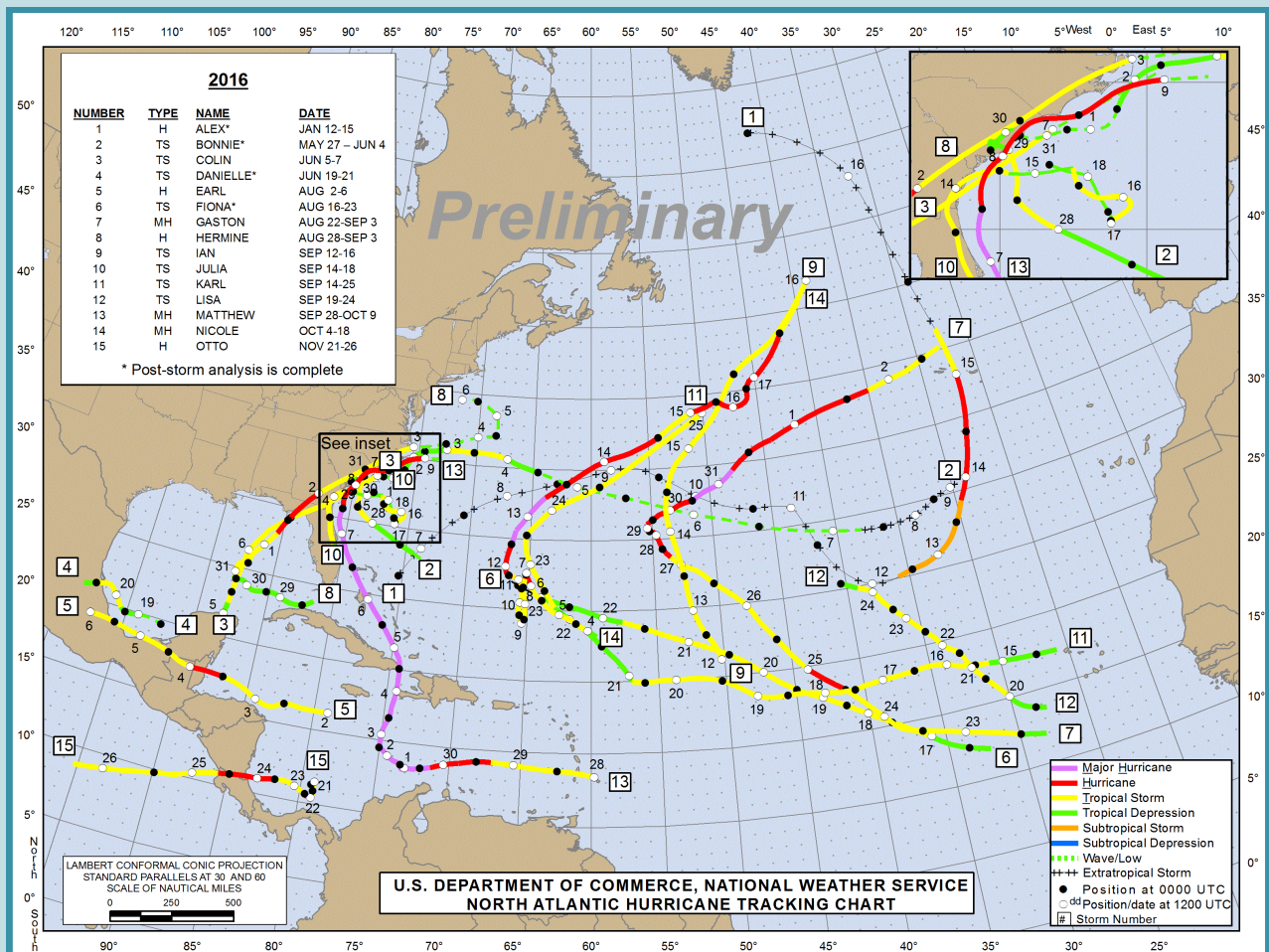
Meteorologists from the Florida Keys NWS and the crew from U.S. Coast Guard Cutter (USCGC) *Kathleen Moore* (middle) and USCGC *Isaac Mayo* (bottom).

2016 Atlantic Basin Hurricane Season Summary

By: Bill South

This was the first above-normal Atlantic basin hurricane season since 2012. Fifteen named storms formed, seven of which became hurricanes, with three of those hurricanes reaching major hurricane status. From 1981-2010, Atlantic basin hurricane seasons averaged twelve named storms, six hurricanes, and three major hurricanes. Five named storms made landfall in the United States during 2016, the most since 2008, when six named storms struck the United States. Hermine was the first hurricane to make landfall in Florida since Hurricane Wilma in 2005. The strongest and longest-lived hurricane of the season was Matthew, which maintained major hurricane status for eight days, from September 30 to October 7. Matthew was the first category five hurricane in the Atlantic basin since Hurricane Felix in 2007.

Name	Dates	Maximum Wind (mph)
Hurricane Alex	Jan 12 – Jan 15	85
Tropical Storm Bonnie	May 27 – Jun 4	45
Tropical Storm Colin	Jun 5 – Jun 7	50
Tropical Storm Danielle	Jun 19 – Jun 21	45
Hurricane Earl	Aug 2 – Aug 6	80
Tropical Storm Fiona	Aug 17 – Aug 23	50
Major Hurricane Gaston	Aug 22 – Sep 3	120
Hurricane Hermine	Aug 28 - Sep 3	80
Tropical Storm Ian	Sep 12 – Sep 16	60
Tropical Storm Julia	Sep 13 – Sep 18	40
Tropical Storm Karl	Sep 14 – Sep 25	70
Tropical Storm Lisa	Sep 19 – Sep 24	50
Major Hurricane Matthew	Sep 28 – Oct 9	160
Major Hurricane Nicole	Oct 4 – Oct 18	130
Hurricane Otto	Nov 21 – Nov 26	110



Tracks of the tropical storms and hurricanes of the 2016 Atlantic Hurricane Season.

Florida Keys NWS Hosts Weather Observations Meeting

By Brandon Fling

On September 7, 2016, the Florida Keys National Weather Service (NWS) Observations Team held the first ever “Florida Keys and South Florida Mesonet” meeting at the Eco-Discovery Center in Key West. The objective of this meeting was to gather our partners and customers throughout the Keys and south Florida to discuss the need for developing an integrated network of weather observations (mesonet), and obtain an understanding of how weather observations are needed and impact them. The NWS was represented by personnel from NWS Headquarters, including the National Mesonet Program manager, as well as personnel from the Florida Keys, Miami, and San Diego NWS offices. Local and regional partner participation included Keys Energy, Florida Keys Mosquito Control, Keys Marine Lab, and the Southeast Coastal Ocean Observing Regional Association. This gathering of NWS colleagues and our regional partners resulted in a wealth of information sharing, especially on the implementation and utilization of weather observations.

The structure of the meeting was to highlight the resources available to develop and maintain a mesonet, while identifying those data deficient areas in need of additional weather observations. Following presentations from NWS Headquarters and the NWS field offices, our partners presented and discussed how weather impacts their operations, how weather observations are utilized, and identified locations where more observations are needed. Throughout the meeting, future projects were discussed and how collaboration would help increase the likelihood of success, while tailoring the projects to meet



Davis weather station at Curry Hammock State Park.

the needs of multiple agencies.

On the second day, personnel visited several prospective observation locations throughout the Florida Keys. These visits enabled personnel to meet with community partners interested in housing an observation station, while brainstorming the logistics of installing and maintaining the sites.



Meteorologist Brandon Fling presents at the mesonet meeting in Key West.

FEMA Hurricane Awareness Courses Held in the Keys June 2016

By: Matt Moreland

The National Disaster Preparedness Training Center (NDPTC), working with staff from the Florida Keys National Weather Service (NWS), facilitated two FEMA AWR-343 Hurricane Awareness courses in the Keys in June 2016. We held one course in Tavernier in the Upper Keys on June 7 and a second delivery in Key West on June 8. These courses were attended by dozens of NWS core partners from throughout the Keys. This four-hour awareness-level course provides emergency managers, first responders, and community members with a basic understanding of the latest knowledge in hurricane science, forecasting, warning, and preparedness. This course enhances the ability of state/local decision-makers to identify and describe the hazards associated with hurricanes and to better prepare for and mitigate the impacts of high winds, heavy rain, and storm surge. This course is presented as an awareness-level course; a successful participant is able to identify and recognize the hazards associated with hurricanes and take any necessary steps to prepare. Throughout the process of the training course delivery, meteorologists from the Florida Keys NWS office took a very active role in facilitating the course by remained engaged with the content, class discussions, and on social media.

The NDPTC, based at the University of Hawaii, provides natural hazards training courses nationwide as a member of the FEMA-funded National Domestic Preparedness Consortium. As a Weather-Ready Nation Ambassador, NDPTC develops and delivers training courses that not only provide the opportunity for local emergency managers, first responders, and members of the general public to better understand the challenges posed by weather hazards, but also help strengthen relationships between local NWS offices and their core partners when representatives of the local office can be in attendance. These courses attempt to close the gap between science and decision making. This is the same gap that the NWS addresses every day with every forecast, every warning, and every phone call from a concerned member of the public. The collaboration between the Florida Keys NWS office and NDPTC exemplified the benefit of supporting a strong presence during first responder and emergency manager training courses.

Lending a Hand to the Local Community

By: Krizia Negrón

As part of the 6th Annual NWS Week of Service, Florida Keys NWS Meteorologists Brandon Fling and Matt Moreland (pictured on the right) joined the world's largest volunteer effort for our ocean, by participating in the International Coastal Cleanup. And they couldn't ask for a better day to join other volunteers collecting trash at the Nature Preserve Beach in Key West on September 17, 2016. Special thanks to both of them for taking time to help out the local community.



GIS: Decision Support Services Using 2010 Census Data

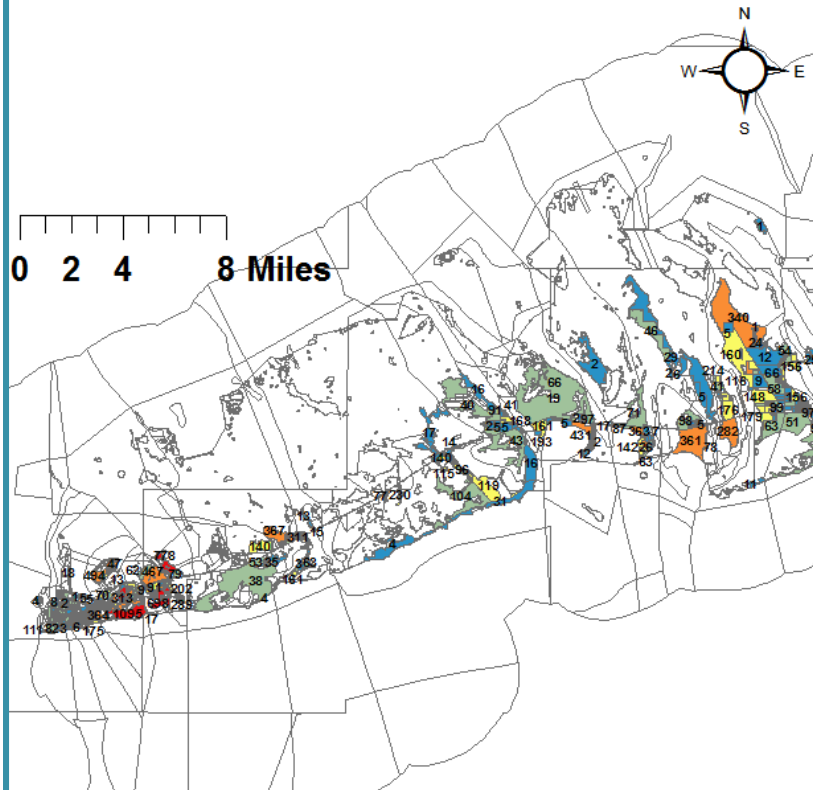
By: David Adam Futterman

The portion of the National Weather Service (NWS) mission - "protection of life and property" now relies heavily on communicating impacts to our core partners. One of our most valued core partners, the Monroe County Emergency Management Agency (MCEM), relies on their knowledge of the impacts of dangerous weather on our local geography, in particular, the two primary threats to life and property, which are storm surge and high winds. This article briefly discusses the importance of a Geographic Information System (GIS) tool, which is block census population data.

This demographic data is paramount in tactical planning, used not just for core partners within the Florida Keys, such as MCEM, but also for other organizations concerned with safety at both the state and federal levels, e.g., the Florida Division of Emergency Management and the American Red Cross. The latest available data, the 2010 block data, is tabulated through a nationwide survey conducted every ten years by the Department of Commerce Census Bureau. This block data is also the smallest geographic unit used by the Census Bureau. Each of these blocks contain generally between 600 and 3,000 people, which makes it ideal for Decision Support Services (DSS). Each block provides a near 100 percent estimate of the population in a given area.

Using ArcGIS software, these blocks are extracted from a national data set. It should be noted that the block data from the Florida Keys is skewed due to the seasonal variation of population across the Keys that occurs during survey time, as well as by a significant number of folks on live aboard boats, not tallied by the census takers as well. Using this block data, Florida Keys NWS forecasters can determine the number of people affected by the issuance of forecasts or warnings across certain areas within the Keys. This critical information can be relayed to core partners before, during, and after a weather disaster.

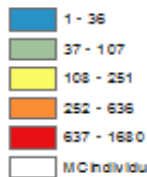
2010 Census Block Populations Big Pine to Key West



Block populations in the Lower Florida Keys from smallest to greatest

Census2010blocksmminus0pop

POP10



This map displays a large number of census blocks throughout the Florida Keys. Although this map represents only the Lower Keys, there are approximately 1,713 blocks that make up the entire Florida Keys area. All areas of Monroe County composed of the 2010 Census Block population data are colored using five categories ranging from green (least populated) to red (most populated) with an attendant scale shown in the legend.

Weather Information for Mariners

By: Kennard “Chip” Kasper

Access to quality marine weather information on the water is essential for any safe, enjoyable voyage. Nearly 30,000 watercraft are registered in the Florida Keys, with thousands of additional vessels brought in each year by visitors. Many of these vessels operate out of the nearly 100 marinas in the Florida Keys. Each marina represents an important center of maritime activity where mariners prepare their vessels before, during, and after boating, fishing, or diving excursions. The marina is where boaters fuel their vessels, address maintenance issues, communicate with other boaters and marina personnel, and plan trips. Often, the marina is also the place where mariners check the weather before heading out on the water.

In the interest of providing ready access to quality, local marine weather information, Florida Keys National Weather Service (NWS) staffers designed and had manufactured highway-grade



Marine weather information signs at a marina (top) and at Bahia Honda State Park (bottom).

marine weather information signs with a clean, professional look. These signs are intended to provide marina patrons with ready references for *local* marine weather information, including web, smartphone, VHF, and social media sources. Members of the Florida Keys NWS marine team, along with the U.S. Coast Guard Auxiliary and Monroe County Marine Resources Division, have been visiting dozens of marinas, fuel docks, and boat ramps during the last year and a half, distributing signs to interested marina operators in the Florida Keys. The goal is that the signs, which highlight NOAA marine weather information sources, will serve to point marina patrons toward potentially life-saving NWS marine weather warnings, advisories, forecasts, and observations.

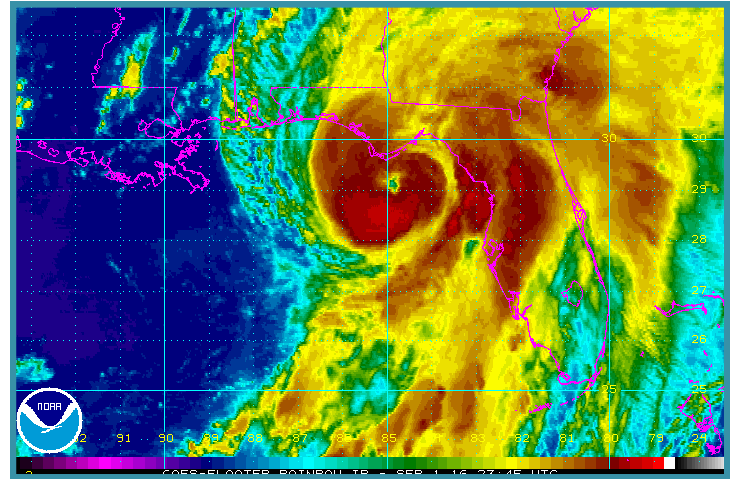
A Closer Look at Hurricanes Hermine and Matthew

By: Melody C. Lovin

The 2016 Atlantic Hurricane Season will best be remembered by Floridians for two specific storms that targeted the state: Hermine and Matthew. Let's take a closer look at these storms and their impacts to Florida and the Florida Keys.

Hurricane Hermine:

Hermine became a tropical depression on August 28, 2016 about halfway between the Florida Keys and Cuba. It remained rather disorganized for a few days, and drifted westward into the Gulf of Mexico before intensifying to a tropical storm on August 31. This westward drift allowed the Florida Keys to stay out of the swath of tropical storm force winds. The storm later accelerated to the northeast in response to a developing trough over the southeastern United States (US), and intensified to hurricane status on September 1. Hurricane Hermine made landfall just east of St. Marks, Florida as a Category 1 hurricane, packing winds of 80 mph and a minimum pressure of 982 millibars. Hermine was the first hurricane to make landfall in Florida since Hurricane Wilma in 2005, breaking an 11 year hurricane-free streak for the state. Within four hours of making landfall, Hermine's winds dropped below hurricane force and the storm weakened back to a tropical storm. The storm continued to weaken as its center crossed into Georgia and skirted the southern US seaboard before emerging into the Atlantic Ocean from the Outer Banks of North Carolina, where it transitioned into a post-tropical cyclone. After its transition, the wind field expanded as it drifted to the



Infrared satellite imagery of Hurricane Hermine, September 1, 2016.



Hermine's low pressure center history.

northeast, affecting coastal portions from New York to Massachusetts, before dissipating.

Impacts to the state of Florida: Despite only being a Category 1 hurricane, impacts from Hermine in the state of Florida were widespread. Numerous trees and power lines were downed in the Florida Big Bend region, with approximately 80 percent of residents of the state capital, Tallahassee, losing power. The outer bands of the storm spawned a weak tornado in Windermere, Florida which stayed on the ground for 1.2 miles and was rated an EF-0. One fatality occurred in Ocala when a tree fell on a man camping in a tent. Flooding was significant in coastal counties, with nearly 3,000 structures damaged in Citrus County. Insured losses to property in Florida reached \$80 million USD.

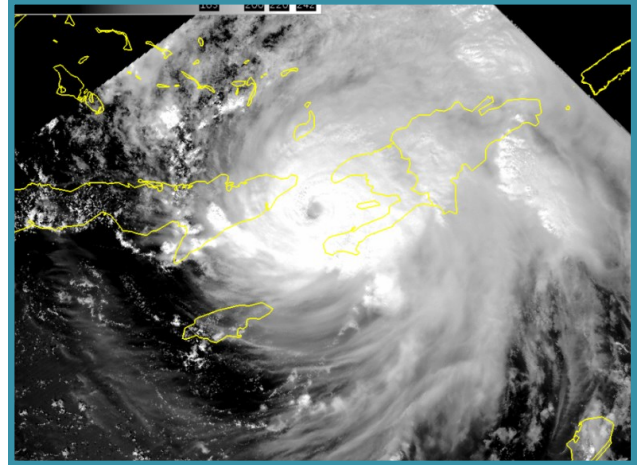
Impacts to the Florida Keys: Little to none. No tropical storm warnings were issued, and no damage was reported. The outer bands of Hermine produced some rainfall across the island chain – but nothing atypical of a summertime shower pattern.

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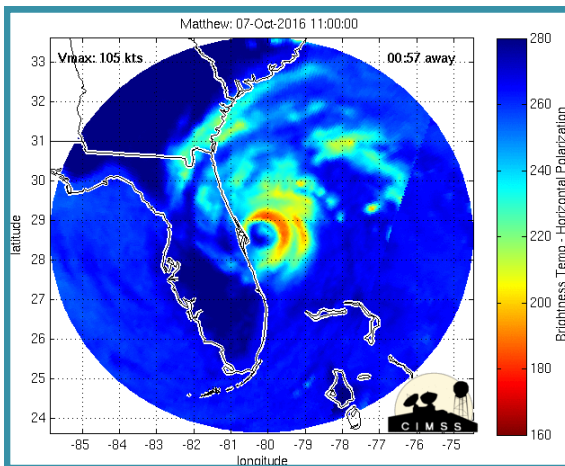
A Closer Look at Hurricanes Hermine and Matthew (cont.)

Hurricane Matthew

Matthew started off as a robust wave off of Africa in late September and traveled thousands of miles as such through the eastern Atlantic. Matthew developed into a tropical storm just east of St. Lucia on September 28 and then explosively intensified, much faster than predicted by forecast model consensus, as it encountered the warm waters of the Caribbean. Matthew achieved hurricane status on September 29 and then became a Category 5 storm the following day, doubling its wind speed from 80 mph to 160 mph in a mere 24 hours. At a latitude of 13.3° N, the storm set a record for southernmost Category 5 hurricane ever recorded. Matthew made a hard right turn toward the north on October 4 and made landfall in Haiti (where an estimated 1600 lost their lives), Cuba, and the Bahamas before approaching the Florida from the east as a major hurricane. With the western edge of the eyewall remaining 12 miles offshore, Hurricane Matthew did not technically make landfall in Florida, but coastal Florida from near Vero Beach to Jacksonville Beach experienced hurricane wind impacts due to hurricane force winds extending 45 miles out from the center. The storm continued northward, skirting the Georgia coast before making a fourth landfall, this time in Cape Romain National Wildlife Refuge, South Carolina, having weakened to a Category 1 hurricane. Matthew curved eastward and spread hurricane storm force winds across coastal North Carolina and widespread flooding rains to much of the Southeastern US before becoming post-tropical east of the Outer Banks of North Carolina, dissipating on October 10. In the U.S., 49 deaths were attributed to Hurricane Matthew.



Visible imagery of Category 5 Hurricane Matthew approaching eastern Cuba, October 4, 2016.



Microwave Imagery of Hurricane Matthew, October 7, 2016.

Impacts to the state of Florida: In addition to hurricane force winds occurring from the Treasure Coast to Northeast Florida, Hurricane Matthew produced major damage to sand dunes across Jacksonville Beach, and flooded the St John's River. State road A1A was washed away in Flagler Beach. Nearly one million people were left without power as Matthew skirted the eastern Florida coast. Twelve people in the state of Florida died. The Kennedy Space Center in Cape Canaveral sustained millions of dollars in damage, and the GOES-R satellite launch, scheduled for early October, was delayed by more than a month. The National Hurricane Center described Hurricane Matthew as the strongest hurricane to affect Georgia and Northeast Florida since the 1898 Georgia Hurricane.

Impacts to the Florida Keys: Minor. The Upper and Middle Keys were placed under a Tropical Storm Warning ahead of the approaching storm on October 4. On October 6, a land observation indicated peak gusts of 41 mph a few miles south of Old

Rhodes Key. A Weatherflow site measured a peak gust of 48 mph at Carysfort Reef Light. Storm total rainfall topped out at 1.59 inches at Peterson Key Everglades National Park. Less than one foot of storm surge was observed. Minor power outages occurred in the Upper Keys. Minor street flooding occurred along low lying bayside neighborhoods in Key Largo. No damage was reported in the Middle or Lower Keys.

Florida Keys NWS Honors its Staff

By: Krizia Negrón

During the September office meeting, Meteorologist-in-Charge Matt Moreland and the Local Office Team recognized the work and effort of some of the Florida Keys National Weather Service (NWS) staff members by rewarding them with a local level Isaac M. Cline Award. From the NWS Directives, the Isaac M. Cline Award "recognizes operational excellence of line and program staff employees in the delivery of products and services supporting and enhancing the achievement of NWS strategic and operating plans. The awards are named in honor of Isaac M. Cline, one of the most recognized employees in weather service history."

The employees recognized were:

- Sean Daida for Meteorology
- Brandon Fling for Data Acquisition Management
- Bill Cottrill for Outreach
- Krizia Negrón for Diversity Management
- Laura Kasper for Support Services
- Kennard "Chip" Kasper and Chris Rothwell for Leadership

Congratulations to all!

A New Voice for NOAA Weather Radio

By: Elizabeth Vickery

Have you ever wondered how tornado warnings or other severe weather emergencies are communicated by the National Weather Service (NWS)? This is done with NOAA Weather Radio (NWR), also known as, "The Voice of NOAA's NWS." NWR is one of the most crucial services we provide to the Florida Keys community.

As part of the NWS's Weather-Ready Nation initiative, the NWR system received a major overhaul last year, its biggest since 1998. This is very exciting news for our organization. It will disseminate warnings and additional weather information in a more fluid and organized way. The new system used to implement this process is called Broadcast Message Handler, or BMH.

What is NWR? NWR is a nationwide network of radio stations broadcasting continuous weather information directly from the nearest NWS office. NWR broadcasts official Weather Service warnings, watches, forecasts and other hazard information all year long to the public.

NWR's history: In April of 1965, the devastating Palm Sunday Tornado Outbreak occurred. In the Midwest states of Indiana, Ohio, Michigan, Wisconsin, Illinois and Iowa, there were 47 tornadoes resulting in a large loss of life. After, one of the key recommendations resulting from the storm survey team was the establishment of a nationwide radio network that could be used to broadcast weather warnings to the public. Beginning in 1966, the Environmental Science Services Administration (ESSA) started a nationwide program known as "ESSA VHF Weather Radio Network." In the early 1970s, this network changed, and has since been known as NWR. Throughout its history, NWR has saved countless lives and undergone many iterations. This past September, Florida Keys NWS had the exciting opportunity to upgrade to the newest system, BMH.

So what exactly is changing? To the everyday listener, the only thing you may notice is a clearer voice. This is due to the new NeoSpeech text-to-voice software. The voice dictionary may at times mispronounce words and adjustments will be made to the database over the next year or so.

By the end of 2016, the NWS will have replaced all sites with BMH. If you happen to hear something mispronounced, feel free to give us a call at 305-295-1316.

Science Officer Receives the Public Education Award at the 2016 FL Governor's Hurricane Conference

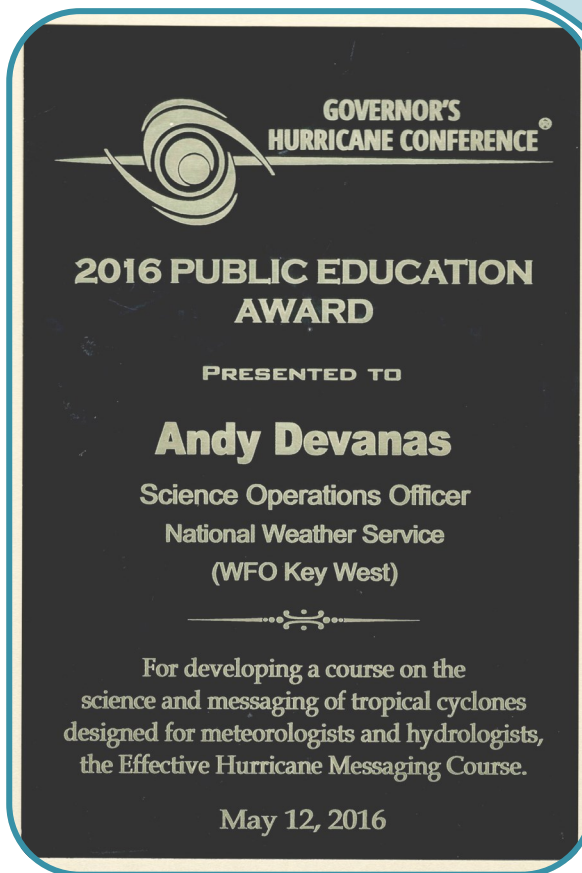
By: Matt Moreland

Andy Devanas, the Science Officer (SOO) for the Florida Keys National Weather Service (NWS), received the Public Education Award at the 2016 Florida Governor's Hurricane Conference. He received the award alongside Dave Sharp, the SOO at NWS Melbourne, Dan Brown, Warning Coordination Meteorologist at the National Hurricane Center (NHC), Jamie Rhome, Team Lead of the NHC Storm Surge Unit, Robbie Berg, Hurricane Specialist at NHC, Jennifer McNatt, Emergency Response Specialist - Team Lead at the NWS Southern Region Regional Operations Center, and Shannon White, Training Officer with the NWS Forecast Decision Training Branch.

This group was awarded for their work in the development and facilitation of the Effective Hurricane Messaging (EHM) Course. Several factors led to the development and necessity of this course in the NWS. There have been numerous changes to the NWS tropical program over the last several years. Meteorologists and hydrologists in the NWS must have a deep knowledge of the science behind the graphics, products, and services developed at the national, regional, and local office levels for tropical cyclones, and have the ability to communicate impact-based information in a clear, concise way to NWS customers and core partners. A proposal for a comprehensive classroom tropical course was drafted in 2011. An initial "test" version of the course was held in June 2012. Since that point the group has worked hard to further improve the course during each of its four iterations. The course will be held again in April 2017 at NHC.

The EHM Course is a five-day course focused on both science and crisis communications and aimed at meteorologists and hydrologists within the NWS. The EHM Course provides a highly-interactive classroom setting where participants can become skilled in crisis communication for a tropical cyclone event. The course has been attended by select management and forecasters from each of the coastal or state-supporting local NWS offices that are impacted by tropical cyclones. Subject matter experts with tropical expertise from throughout the weather enterprise compose and conduct the training curriculum. Students are given a chance to interact directly with social scientists, emergency managers, NHC staff and NWS leaders in the tropical program. Course participants are given the chance to share best practices on hurricane messaging, and also collaborate on ideas and provide feedback on briefing templates and other ways to improve NWS products/services. Each of the participants is run through a hurricane-focused media scenario which includes "feet to the fire" practice interviews. The course ends with a full-scale simulation based on a mock storm case which has been developed by the facilitators.

Congratulations again to Andy and thanks for all of your hard work!



2016 Keys Climate Summary

By: Brandon Fling

Coming off the heels of the warmest year on record in 2015, 2016 finished as the 16th warmest year on record in Key West dating back to 1872. The average temperature was 78.7°F, or 0.9°F above normal. As a result, 2016 marked the sixth consecutive year with above average temperatures and the ninth out of the last 10 years to obtain such a feat. Considering the exceptional warmth of 2015, which came in at 2.1°F above normal, the 2015-2016 period ended as the warmest 2-year stretch on record with an average temperature at 1.6°F above normal. The above normal warmth was felt along the Middle Keys as well, with Marathon registering an annual average temperature of 79.4°F, or 1.0°F above normal.

There were 24 temperature and precipitation records set or tied in Key West (see table below). This pales in comparison to 2015, when a total of 67 records were set or tied. The majority of the temperature records set/tied in 2016 were warm minimum temperatures, coming in with 14 records total. December 2016 was abnormally warm, amassing 9 total temperature records set/tied, and ranking as the 2nd warmest December on record in Key West, behind only 2015. The lone daily minimum temperature record observed in 2016 was a low temperature of 63°F on May 8, breaking the previous record of 65°F recorded in 1988 and tying the lowest temperature on record for the entire month of May.

Daily records broken or tied during 2016 at Key West International Airport.

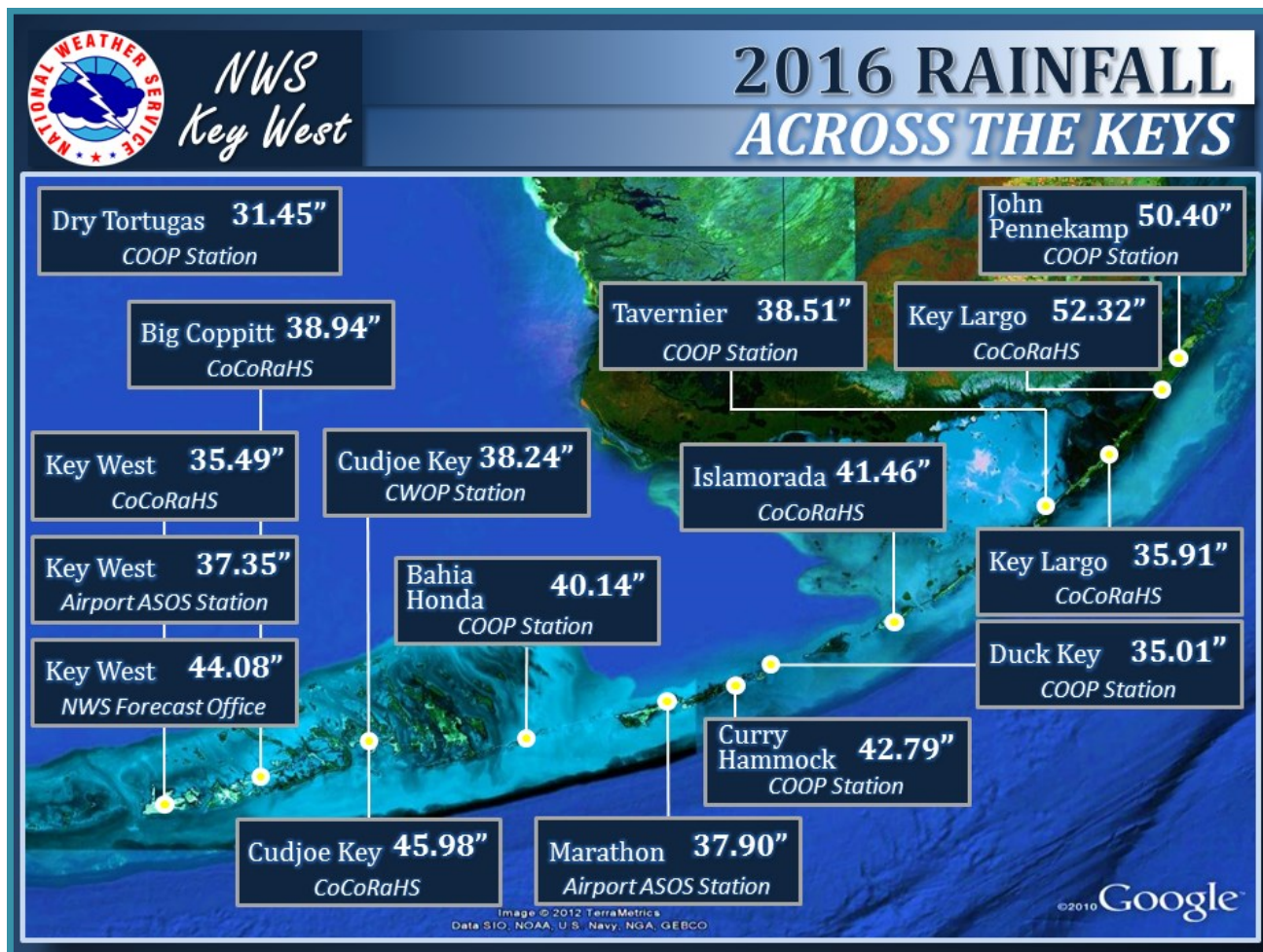
	Maximum Temperature	Cold Maximum Temperature	Warm Minimum Temperature	Minimum Temperature	Precipitation
Broken	2	-	5	1	2
Tied	5	-	9	-	-
Total	7	0	14	1	2

It was a dry year across the Florida Keys, with many locations coming in at least several inches of rainfall below normal, while some stations recorded in excess of 7 inches of rainfall below normal. Key West finished with 37.35 inches of rainfall, which fell at just 2.48 inches below normal. As always, rainfall differences in the Keys can vary greatly over short distances due to the island chain effects at play, and that is visible when comparing the annual rainfall totals between the NWS office in Key West and the Key West International Airport. These two sites reside approximately two miles apart, but the recording station located at the Florida Keys NWS office in Key West saw 6.73 inches more rainfall than the airport (see next page for map).

Drier conditions were observed across the Middle Keys, where the Florida Keys Marathon Airport observed 37.90 inches of rainfall, falling 8.27 inches below normal. The highest rainfall totals across the Florida Keys were found in the Upper Keys, where a Community Collaborative Rain, Hail and Snow Network (CoCoRaHS) site measured 52.32 inches of rain, and our Cooperative Observing Program (COOP) site at the John Pennekamp State Park observed 50.40 inches for the year.

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2016 Keys Climate Summary (cont.)



2016 Rainfall total across the Florida Keys.

The drier than normal conditions were not a total surprise, at least for the latter half of the year as the El Niño Southern Oscillation (ENSO) phase favored La Niña conditions across the region. Typically in a La Niña pattern, warmer and drier than normal conditions are observed across south Florida. This was evident during the month of November, as it finished as the 4th driest on record in Key West with just 0.11 inches of rainfall. The October-December period was the 11th driest such period on record in Key West with just 3.97 inches of rain, the normal being 9.45 inches. With the start of 2016 under one of the strongest El Niño in the past 30 years, there was a transition to ENSO Neutral late in the spring and early summer, with a transition to La Niña favored conditions by late summer and fall. It is important to keep in mind that despite which ENSO phase is in place, there is no direct relationship with individual storms or a particular weather event. Rather the ENSO phase sets the stage for certain weather conditions to be more prominent than normal.

A complete 2016 report of the Florida Keys climate will be available soon on our webpage at www.weather.gov/key > Climate and Past Weather > Local Data/Records > Florida Keys Climatology - Local Page.

Celebrating Hispanic and Latino American Culture, Heritage, Contributions... and Food!

By: Krizia Negrón

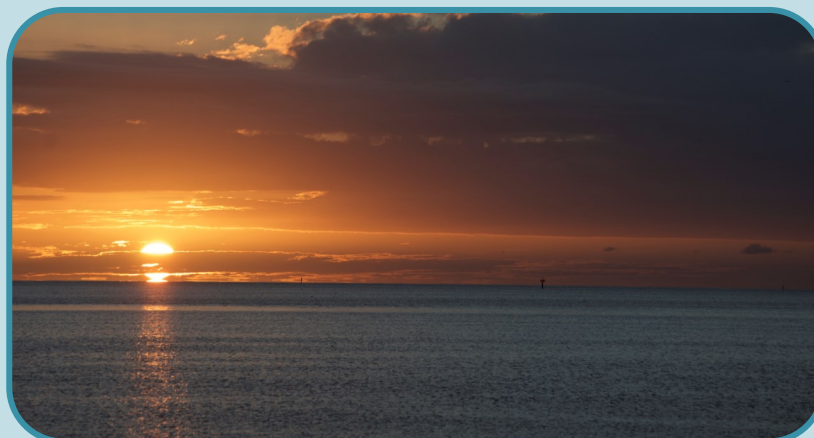
Krizia Negrón, Florida Keys NWS Diversity Program Leader, launched the celebration of National Hispanic Heritage Month. At the end of September's monthly office meeting, she highlighted some of the most famous hispanics in the United States and their accomplishments to advance diversity in our country. The staff also had the opportunity to discuss ways to reach a diverse workplace, like remembering to treat others as you want to be treated, to accept people as the individuals they are, to focus on finding similarities and not differences in others, and to celebrate differences by promoting respect through inclusion and valuing others.



Part of the staff “thumps up” our achievements in social media and gets ready to enjoy a delicious Latin lunch.

Following the presentation, a delicious lunch was provided. The menu included: “arroz con gandules” (rice with green peas, Puerto Rican style) “ropa vieja” (shredded beef), “pollo cubano” (chicken breast Cuban style), and “flan de vainilla” (vanilla custard). We also celebrated the passing of two social media milestones on the office's accounts: 40,000 Likes on the office Facebook Page (www.facebook.com/NWSKeyWest) and 10,000 Followers on the Twitter account (www.twitter.com/nwskeywest). These were celebrated with another sweet treat: a custom cake from Key West Cakes.

¡Buen provecho!



Florida Keys NWS Staff Attends Annual Meteorological Meeting

By: Kennard "Chip" Kasper

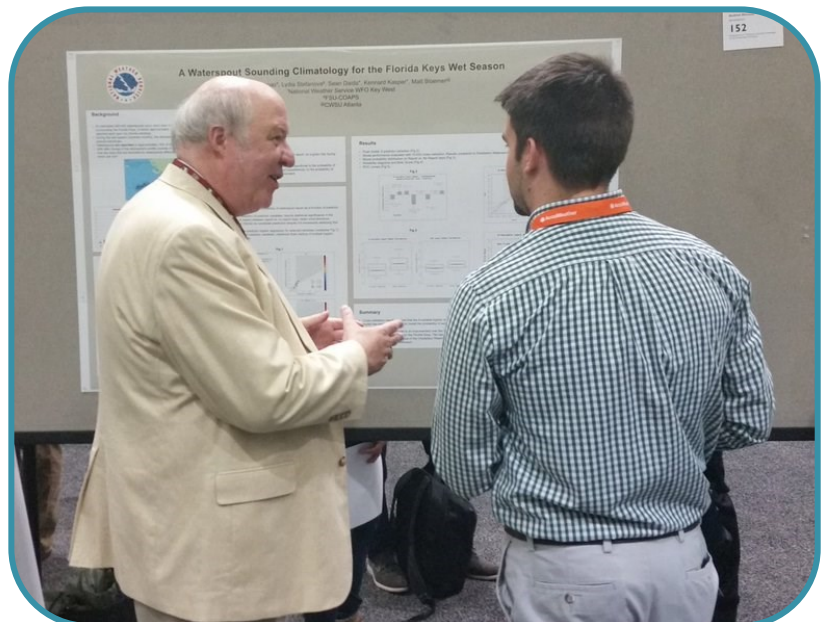


Science Officer, Andy Devanas, and Senior Forecaster, Chip Kasper, attended the 97th American Meteorological Society (AMS) Annual Meeting in Seattle, Washington, from January 22–26, 2017. Andy and Chip joined over 4,400 scientists, educators, students, and other professionals from across the weather, water, and climate community to share knowledge, learn, and collaborate.

Andy and Chip gave poster presentations, highlighting both applied research and NOAA impact-based decision support activities at the National Weather Service (NWS) forecast office in Key West. Andy's presentation, "Development of a Waterspout Climatology for the Florida Keys Wet Season", described ongoing research

that will help forecasters better predict those days on which waterspouts are most likely to occur during the rainy-season months of June through September. Chip's presentation, "NOAA Collaboration in the Florida Keys", highlighted the many areas in which the staff of the Florida Keys NWS collaborate with staffs from other NOAA line offices in the Florida Keys. These NOAA collaboration areas include environmental monitoring, impact-based decision support services, ecosystems, training and exercises, and public education and outreach.

Founded in 1919, the AMS is the nation's premier scientific and professional organization promoting and disseminating information about the atmospheric, oceanic, hydrologic sciences.



Meteorologist Chip Kasper (top) and Science Officer Andrew Devanas (bottom) presenting their posters at the AMS Annual Meeting.

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Andrew Devanas, Science Officer
Christopher Rothwell, General Forecaster
Laura Kasper, ASA/Meteorologist
Matt Moreland, Meteorologist-in-Charge



*Cover photo: Sunset at Fort Zachary Taylor State Park,
Key West by Krizia Negrón*

