IN WEATHER & CLIMATE Issue 1

Hurricane Matthew

Most costly natural disaster of 2016

I Pledge My... Hands To Larger Service

UGA Cooperative Extension helping in south Georgia storm relief efforts



4-H











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Activities adapted from Weather and Climate Variability Toolkit, published 2013. Toolkit was made possible through a grant from USDA NIFA: Climate variability to climate change: Extension challenges and opportunities in the Southeast USA and written and compiled by Melissa Griffin (FSU), Kathy Fearon (FSU), and Heather Kent (UF)

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Funding for this publication provided by a grant from USDA NIFA received from the University of Florida IFAS Extension 4-H Youth Development program an Equal Opportunity Institution. Issued in furtherance of Cooperative Extension work, Acts of May 18 and June 30, 1914, The University of Georgia College of Agricultural and Environmental Sciences (CAES) and the U.S. Department of Agriculture cooperating.



Source: NASA



United States Agriculture

Cover: Satellite imagery of National Institute Hurricane Matthew. of Food and Agriculture

ABOUT JOURNEYS MAGAZINE

Journeys is a magazine for middle school students produced by Georgia 4-H. This issue, Journeys in Weather and Climate, serves as the inaugural edition of the Georgia 4-H Middle School publication series. A journey is described as a trip, expedition, excursion or a tour. While this Journeys magazine won't allow you to physically take a trip, expedition, excursion or tour, we do hope it allows your mind to explore the content and concepts shared in the pages ahead.

The Chinese philosopher, Laozi, is credited with the saying, "A journey of a thousand miles begins with a single step." We hope this magazine begins a journey of exploration for you. Georgia 4-H can offer you many paths to explore in hopes of finding one that is of interest to you. In the pages ahead, you will read about individuals who credit Georgia 4-H for helping them find a path to their chosen career or college major. Through independent project work, content or subject exploration, public speaking experience, service to your community, and efforts to be part of a team, Georgia 4-H is excited to be a small part of your journey toward becoming a leader.

Join us on this journey to learn more about weather and climate, opportunities for careers related to weather and climate, and the importance of serving others, especially those who have been impacted by severe weather events. We also hope you will stop at the "Detours" along the way to apply your knowledge and explore topics more deeply with your classmates and educators.



Georgia 4-H is a partner in public education and strives to incorporate Georgia Standards of Excellence in the education materials for in-school use. The following Georgia Standards of Excellence are correlated to the content delivery included in this publication.

S6E4. Obtain, evaluate, and communicate information about how the sun, land, and water affect climate and weather.

d. Construct an explanation of the relationship between air pressure, fronts, and air masses and meteorological events such as tornados and thunderstorms.

e. Analyze and interpret weather data to explain the effects of moisture evaporating from the ocean on weather patterns and weather events such as hurricanes.



Think Green! Not just 4-H Green...but let's help do our part to recycle and reuse. Save this book, reread it or pass it along to a friend. If it's too worn, please recycle it.

In this Issue...

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Hurricane Matthew:

Most costly U.S. natural disaster of 2016

Written by Pam Knox

Hurricane Matthew was the most costly natural disaster in the United States in 2016. It started as a westward-moving wave in the atmosphere, which came off the coast of Africa and became a tropical storm on September 28. It became a strong hurricane just two days later, on September 30, and its path made a sharp right turn to the west northwest. The center of the storm moved over the western tip of Haiti, eastern Cuba, and through the Bahamas before moving up the east coast of Florida and Georgia. It came onshore in South Carolina and dropped a lot of rain in North Carolina before moving out to sea away from the United States. Along its path, it killed over 603 people and caused \$15.5 billion dollars in Haiti, Cuba, the Bahamas, and the United States.







This photo shows the path of Hurricane Matthew. Source: The Weather Channel

Although Matthew was stronger than the average hurricane, in many ways it was a typical storm. It formed just after the peak of the Atlantic hurricane season, which runs from June 1 to November 30. It formed a little north of the equator over water that was above 80° F in temperature, which is needed for tropical storms to develop. As the rotation of the winds around the storm got stronger, it became first a tropical storm with winds of 39 miles per hour and then a hurricane with winds of 74 mph. The unusually warm water in the Atlantic Ocean in 2016 helped it grow rapidly to become a Category 5 storm with winds of over 156 mph just a day after it became a hurricane.

Damage from tropical storms and hurricanes can come from several causes. Some storms cause most of their damage from the strong winds near the center of the storm, which blow down trees and buildings, shredding everything in their path. The winds in Matthew were responsible for a lot of the damage, deaths and injuries in Haiti, where it hit when it was near its peak strength. Another cause of destruction in tropical storms comes from storm surge. This is a dome of water moving along with the low pressure in the center of the storm which is even more damaging due to high waves on top of it. The high water levels caused erosion on the east coast beaches of Florida but mostly missed Georgia and the Carolinas because Matthew passed by there at low tide, which helped keep sea level lower. A third impact from tropical storms comes from heavy rains both in the rain bands ahead of the storm and in the center of the storm. In Matthew's case, the heaviest rains moved in ahead of the storm's center,

TOP FIVE NATURAL DISASTERS IN THE UNITED STATES IN 2016

- 1. Hurricane Matthew Caribbean, Bahamas, U.S., 9/28 10/10, \$15.5 billion, 603+ killed
- 2. Flooding Louisiana U.S., 8/9 8/16, \$10 \$15 Billion, 13 killed
- 3. Severe Weather Plains-Southeast U.S., 4/10 4/13, \$4.3 billion, 1 killed
- 4. Drought West-Northeast-Southeast U.S., 1/1 12/31, \$3.5 billion, 0 killed
- 5. Severe Weather Rockies-Plains-Southeast-Midwest U.S., 3/22 3/25, \$2.5 billion, 0 killed

dumping feet of rain in eastern North Carolina. This caused tremendous flooding that destroyed many buildings and bridges as well as fields and barns. However, even weak tropical storms can cause flooding rains if they move slowly enough.

Matthew's strong wind and rains hurt many people and buildings along its path, but the rain helped eliminate drought in parts of the Southeast U. S. as well. Tropical storms and hurricanes can bring benefits to the areas that they hit, as well as cause damage. Stay safe by preparing for these storms in advance and never driving through flooded areas when the storms hit. Always pay attention to what officials tell you to do when a storm is headed your way.



Wind damage observed at Burton 4-H Center on Tybee Island following Hurricane Matthew.

Saffir-Simpson Hurricane Wind Scale			
Category	Wind Speed	Damage	
1	74-95 mph	Very dangerous winds will produce some damage	
2	96-110 mph	Extremely dangerous winds will cause extensive damage	
3	111-129 mph	Devastating damage will occur	
4	130-156 mph	Catastrophic damage will occur	
5	>156 mph	Catastrophic damage will occur	







Real Impacts on Tybee Island

The Burton 4-H Center on Tybee Island sustained significant impacts as a result of Hurricane Matthew. Once the predictions indicated that the path of the storm would affect Chatham County, the staff began prepping the facility. Hurricane warnings were issued for the area, and on October 5 the staff evacuated safely. Once staff members returned to the property on October 10, they observed damage including 3"-16" of flooding in eight of the buildings. Wind damage included damaged roofs and the loss of trees. In order to make necessary repairs, the facility was closed to guests for seven weeks.



Do some research to bust these myths and misconceptions. Explain why each statement is incorrect.

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Spotlight on Careers

Written by Dr. J Marshall Shepherd

Dr. J. Marshall Shepherd is a leading international expert in weather and climate. Dr. Shepherd was the 2013 President of American Meteorological Society (AMS), the nation's largest and oldest professional/ science society in the atmospheric and related sciences. Dr. Shepherd is Director of the University of Georgia's (UGA) Atmospheric Sciences Program and Full Professor in the Department of Geography. He is the Georgia Athletic Association Distinguished Professor of Geography and Atmospheric Sciences. Dr. Shepherd is also the host of The Weather Channel's Award-Winning Sunday talk show Weather Geeks, a pioneering Sunday talk show on national television dedicated to science and contributor to Forbes Magazine. In 2014, Ted Turner and his Captain Planet Foundation honored Dr. Shepherd with its Protector of the Earth Award. Prior recipients include Erin Brockovich and former EPA Administrator Lisa Jackson. He is also the 2015 Recipient of the Association of American Geographers (AAG) Media Achievement award, the Florida State University Grads Made Good Award, and the UGA Franklin College of Arts and Sciences Sandy Beaver Award for Excellence in Teaching. In 2015, Dr. Shepherd was invited to moderate the White House Champions for Change event.

Prior to UGA, Dr. Shepherd spent 12 years as a Research Meteorologist at NASA-Goddard Space Flight Center and was Deputy Project Scientist for the Global Precipitation Measurement (GPM) mission, a multi-national space mission that launched in 2014. President Bush honored him on May 4th 2004 at the White House with the Presidential Early Career Award for pioneering scientific research in weather



and climate science. Dr. Shepherd is a Fellow of the American Meteorological Society. Two national magazines, the AMS, and Florida State University have also recognized Dr. Shepherd for his significant contributions. In 2016, Dr. Shepherd was the Spring Commencement

speaker at his 3-time Alma Mater, Florida State University and was recently selected for an SEC Academic Leadership Fellows program.

Dr. Shepherd is frequently sought as an expert on weather, climate, and remote sensing. He routinely appears on CBS Face The Nation, NOVA, The Today Show, CNN, Fox News, The Weather Channel, and several others. His TedX Atlanta Talk on "Slaving Climate

Zombies" is highly regarded and cited. Dr. Shepherd is also frequently asked to advise key leaders at NASA, the White House, Congress, Department of Defense, and officials from foreign countries. In February 2013, Dr. Shepherd briefed the U.S. Senate on climate change and extreme weather. He has also written several editorials for CNN, Washington Post, Atlanta Journal Constitution, and numerous other outlets and has been featured in Time Magazine, Popular

Mechanics, and NPR Science Friday. He has over 90 peer reviewed scholarly publications. NASA, National Science Foundation, Department of Energy, Defense Threat Reduction Agency, and U.S. Forest Service have funded his scholarly research. Dr. Shepherd was also instrumental in leading the effort for UGA to become the 78th member of the

University Corporation for Atmospheric Research (UCAR), a significant milestone for UGA.

Dr. Shepherd currently serves on the Earth Science Subcommittee of the NASA Advisory Council. He was a member of the National Oceanic and Atmospheric Administration (NOAA) Science Advisory Board, Atlanta Mayor Kasim Reed's Hazard Preparedness Advisory Group, United Nations World Meteorological Organization steering committee on aerosols and precipitation, 2007 Inter-governmental Panel on Climate Change (IPCC) AR4 contributing author team, National Academies of Sciences (NAS) Panels on climate and national security, extreme weather attribution, and urban meteorology. Dr. Shepherd is a past editor for both the Journal of Applied Meteorology and Climatology and Geography Compass, respectively.

Dr. Shepherd received his B.S., M.S. and PhD in physical meteorology from Florida State University. He was the first African American to receive a PhD from the Florida State University Department of Meteorology, one of the nation's oldest and respected. He is also the 2nd African American to preside over the American Meteorological Society. He is a member of the AMS, American Geophysical Union, Association of American Geographers (AAG), Sigma Xi Research Honorary, Chi Epsilon Pi Meteorology Honorary, and Omicron Delta Kappa National Honorary. He is also a member of the Alpha Phi Alpha Fraternity, Inc. and serves on various National Boards associated with his alma mater. Dr. Shepherd co-authored a children's book on weather and weather instruments called Dr. Fred's Weather Watch. Dr. Shepherd is originally from Canton, Georgia. He is married to Ayana Shepherd and has two kids, Anderson and Arissa.

DETOUR Here are some career-related questions for you to think about... • Have you ever considered a career related to weather or climate?



Meteorologist

Matt Daniel joined WMAZ in August 2014 and serves as the Weekend Meteorologist. He currently writes for EarthSky.org, which talks about the latest science stories around the world.

Matt has always had the passion for weather since the age of three, and has always enjoyed weather forecasting and studying tropical cyclones. Matt has won several awards in forecasting excellence, and made it into the final four of a weather forecasting competition that pairs up professors, graduate students, and undergraduates across the country. He is an active member of the American Meteorological Society, and enjoys reaching out to the community through events and school activities to simply increase weather awareness. Whether it is at schools or on television, he likes to inform and teach everyone of all ages not only how the weather will impact them but why it is occurring.

×

"I was a huge 4-H participant as a child. I still have fond memories of participating in **District Project Achievement** (DPA), Poultry Judging, and Soil Judging. In fact, one of my favorite projects science about weather was presented during my middle school years during DPA."

- Dr. Shepherd

• What skills do you have that can be applied to careers related to weather or climate? • What might you do to gain more experience in the areas of weather and climate?

Climatologist

Pam Knox is an agricultural climatologist for the University of Georgia's College of Agricultural and Environmental Sciences. She provides information on climate and agriculture to



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Extension agents, farmers, businesses, scientists and educators around the Southeast by giving presentations, writing a daily blog, and answering phone and email questions from a wide variety of groups and individuals. She also gives interviews to local newspapers and television and radio reporters about how the current weather and climate are affecting crops around Georgia. Pam's background is in meteorology, math, and physics, but she has been doing climate work for universities and the National Weather Service for most of the last 30 years. In her spare time, Pam makes quilts using sewing skills she learned in 4-H in Michigan.

I Pledge My... Hands To Larger Service

UGA Cooperative Extension helping in south Georgia storm relief efforts

Written by Clint Thompson

University of Georgia Cooperative Extension is aiding in relief efforts in multiple southwest Georgia communities that were impacted by a deadly weekend of inclement weather.

Andrea Scarrow, UGA Extension Family and Consumer Sciences program development coordinator for the Southwest District, said that those displaced or coping with property damage can find disaster recovery tips and resources at www.extension.uga.edu/environment/disasters. The link provides assistance to those who are trying to recover and rebuild after storm damage that resulted from tornadoes, hail, damaging winds and widespread flooding.

"UGA Cooperative Extension has many resources to help those who have been stricken by the damaging storms in southwest Georgia. With prolonged outages, consumers are often concerned about the safety of food stored in refrigerators and freezers. Whether the need is flood cleanup or financial considerations, Extension offers valuable, research-based information to support a community recovering from disaster," Scarrow said. "Southwest District Extension offices are ready to help their clients with questions related to the safety of food, water, home and family."



Worth County 4-H members help with storm aid. /Lauren Burdine - UGA Extension

Georgia Gov. Nathan Deal issued a state of emergency declaration on Monday, Jan. 23, for 16 south Georgia counties: Atkinson, Baker, Berrien, Brooks, Calhoun, Clay, Colquitt, Cook, Crisp, Dougherty, Lowndes, Mitchell, Thomas, Turner, Wilcox and Worth.

Dougherty County, still reeling from a storm on Jan. 2, was dealt another blow this past weekend. A tornado ripped through east Albany, leaving at least four people dead and many more without homes.

"I would say that a large majority of residents in Dougherty County have been impacted by both of these storms," said Dougherty County Extension Coordinator James Morgan. "While the first storm appeared to mainly impact the city, this past weekend impacted the county."

According to a press release issued by the Dougherty County Emergency Management Agency, officials estimate more than \$100 million in losses following the Jan. 2 storms and EF1 tornado on Sunday that left 164,500 cubic tons of tree and yard debris. Thousands of businesses and homes are without power.

The UGA Dougherty County Extension office is a drop-off location for donations. Morgan said there is a growing need for clothes, baby food, diapers, toiletries, shoes and socks.



Do some research to bust these myths and misconceptions. Explain why each statement is incorrect.

- 1. A highway overpass is a safe place to take shelter if you are on the road and see a tornado approaching.
- 2. It's safer to try to outrun a tornado in a vehicle than to take shelter at home.
- 3. Tornadoes never strike big cities.
- The wider a tornado is, the stronger it is. 4.
- 5. Opening windows to equalize air pressure will save a roof, or even a home, from destruction.

In response to the needs of Albany residents, UGA Extension Southwest District 4-H members are planning a canned food drive during their Junior/Senior District Project Achievement event at Rock Eagle 4-H Center in Eatonton, Georgia, from Feb. 3-5.

Another hard-hit area is Cook County, where a tornado struck early Sunday morning, killing seven. It also destroyed homes, turned irrigation pivots on end, and dumped grain bins in the middle of fields, according to Cook County Extension Coordinator Tucker Price.

"I've never seen anything like it before," Price said.

According to Worth County Extension Agriculture and Natural Resources Agent Blake Crabtree, some residents in Worth County are unable to leave their homes because of downed power lines. As of late Monday afternoon, more than 6,000 homes, covered by Mitchell EMC in Worth, Dougherty, and Mitchell counties, are without power.

In response, the Worth County Extension office is accepting toiletries and water to distribute to shelters that are housing displaced residents.

"This is a difficult time for the communities of south Georgia. People have lost loved ones, homes and, for some, their livelihoods. Being part of Extension, it's our duty to provide assistance and be a resource on which our residents can call," Crabtree said.

Neighboring Extension offices are accepting donations to aid in the relief efforts of those impacted by this weekend's storms. Baker County Extension is accepting water, nonperishable food items, clothes for all ages, hygiene items, first aid items, blankets, jackets, pillows, baby items, batteries, flashlights, and pet items.

Those who wish to donate should contact their local UGA Extension agent.



Worth County home damaged by the storms. /Albany Herald

More about Tornadoes



A tornado is a violently rotating column of air that descends from a thunderstorm and is in contact with the ground. The air in a tornado rotates because of wind shear, which is the change in wind speed and/or wind direction with height.

Unfortunately, tornadoes cannot be predicted days in advance. Forecasters can look for conditions that are favorable for the development of tornadoes, but they cannot determine which thunderstorm will produce one in advance. Forecasters work hard to look for severe weather. If a storm is identified as being capable of producing a tornado, then a warning is issued with as much lead time as possible.

Tornadoes are measured using a scale that is based on damage assessments called the Enhanced Fujita Scale.

Enhanced Fujita (EF) Scale			
Category	Wind Speed	Class/Type	
EFO	65-85 mph	Weak	
EF1	86-110 mph	Weak	
EF2	111-135 mph	Strong	
EF3	136-165 mph	Strong	
EF4	166-200 mph	Violent	
EF5	>200 mph	Violent	

KNOW THE DIFFERENCE!

Tornado Watch:

Be Prepared! Tornadoes are possible in and near the watch area. You should review emergency plans and be ready to act quickly if a tornado is approaching.

Tornado Warning:

Take Action! A tornado has been sighted or indicated by weather radar and there is imminent danger to life and property. You should move to an interior room on the lowest floor of a sturdy building and avoid windows.

Source: National Weather Service, NOAA: http://www.nws.noaa.gov/om/tornado/ww.shtm

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As you learned on pages 4-5, hurricanes are tropical cyclones with sustained winds of 74 miles per hour or more. Scientists use a variety of instruments to collect data during hurricanes to learn more about the storm and to protect the people and property that may be affected by the storm. One place that information is collected is from instruments located on buoys found in the ocean.



Imagine you had access to the data from a weather buoy in the ocean as a hurricane is approaching. The graph might look something like you see here. After reviewing the graph, answer the questions below.

- 1. At what time do you think the hurricane passed the buoy? What evidence do you have to support your answer?
- 2. What happens to the air pressure in a hurricane?
- 3. What happens to the wind speed in a hurricane?



When thunder roars, go indoors. Seek shelter in a substantial building immediately.



Safest place during a tornado is an interior room on the lowest level possible in a sturdy building or structure and avoid windows.



During floods, turn around, don't drown.



During cold temperatures, adding layers will help keep you warm.

MY 4-H Journey:

An Interview With Dillon Blount, Mitchell County 4-H'er

1. How long have you been involved in Georgia 4-H?

I have been involved with Georgia 4-H since just like 4-H does on communities. the fifth grade with several activities such as 4-H By performing community service Summer Camp, District Project Achievement, and activities throughout my 4-H career, I got hands-on competing at State Congress. I began my 4-H career with experience with people in the community and I realized District Project Achievement, which I did throughout that people needed more knowledge about weather. Giving middle and high school. I did a variety of projects ranging people more knowledge about the weather is a key thing I from the Horse category to the Physical, Biological and would like to do in my career. By having the opportunity Earth Sciences category. In my senior year of high school, to compete in District Project Achievement, I realized I placed third at the state competition in the category of giving presentations on the weather was something I really Physical, Biological, and Earth Sciences. My project focus enjoyed. The experience of presenting for District Project was tornadoes. Competing at the state level was a great Achievement gave me the skills and the know how to speak experience. Summer camp was also another amazing publicly about weather and weather related issues. Georgia 4-H experience. I attended camp as a camper in elementary and middle school, and then had the privilege 5. How do you hope to give back to 4-H in of being a teen leader at elementary camp for several years.

2. What are the skills you have learned in 4-H?

In Georgia 4-H, I learned skills such as public speaking, leadership, and community service. District Project Achievement made public speaking easier for me, and now I find that I am often in the position of speaking in front of a crowd. The leadership skills I learned from being a teen leader have helped me in college. I am currently the treasurer of the meteorology club at my college and I use the leadership skills gained in 4-H every day. Community service is another skill I learned and I still volunteer for community service in college with my meteorology club and on my own. By being in Georgia 4-H and learning the skills of leadership and citizenship, it has benefitted me tremendously and shaped me into the person I am today.

3. What career field are you considering?

I am currently pursuing a Bachelor's of Science degree in Meteorology. I would like to pursue a career in meteorology after graduating. I would like to forecast the weather while also performing research. Weather has always been a passion of mine. It began when I was young and my interest has followed me since childhood. The weather affects many things and is important in people's day-to-day life.

4. How did your 4-H experiences influence your career choice?

4-H had a major impact on my choice of meteorology. Through my 4-H project work, I realized at an early age that meteorology was a career field I could choose. I also recognized that through a career in meteorology I could make a major impact on my community

the future?

In the future, I would like to support a 4-H club wherever I live. I believe 4-H is a club that everyone should be involved in. I would like to continue to give presentations at camps during the summer and help young 4-H'ers have the best experience possible. 4-H is a program that I think is very beneficial. The experiences, friends, life skills, and memories made in the club will last a lifetime.











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Friend

Horse shoe

Crab

Contact your local county Extension office today! georgia4h.org/projectachievement GE%RGIA