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The Lake Breeze

The Newsletter of the Buffalo Forecast Office

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Severe Weather Awareness Week—April 22-28, 2007

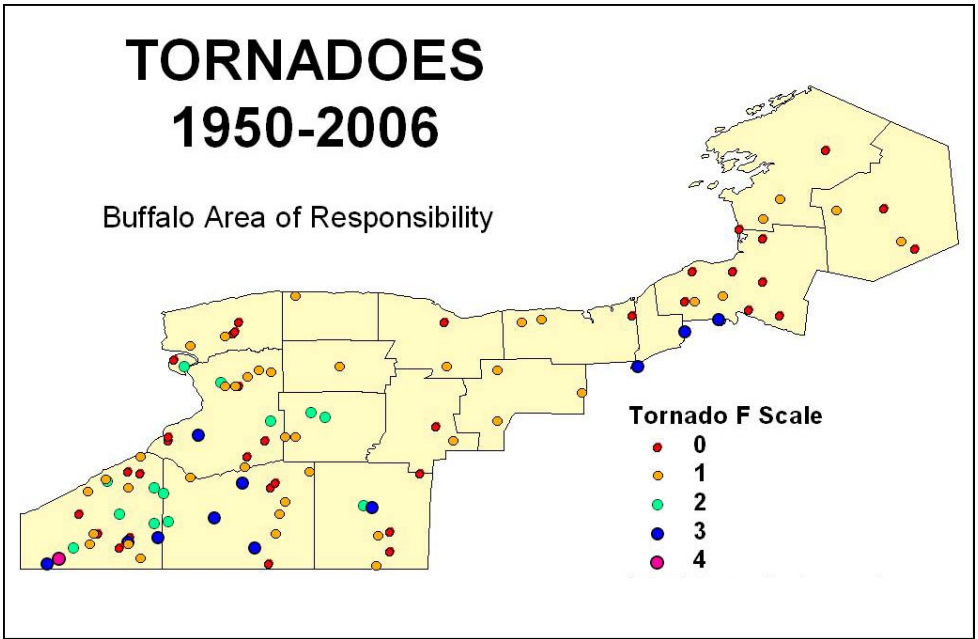
Governor Eliot Spitzer has proclaimed the week of April 22 through 28, 2007 as Severe Weather Awareness Week in New York State.

The National Weather Service (NWS) joins the Governor, in partnership with State Agencies, local agencies, volunteer and private sector organizations in urging all New Yorkers to learn how to protect themselves from the hazards of flooding, tornadoes and severe thunderstorms. The NWS will be providing information about western and north-central New York weather hazards and weather safety throughout the week through Public Information Statements, outreach to emergency management offices, media, and schools, and through our website.

In addition to information about severe weather, the NWS in partnership with the New York State Emergency Management Office and the New York State Broadcasters Association will conduct the 19th annual Severe Weather Awareness Week Drills. Communications capabilities for warning dissemination will be tested across the Empire State scheduled for April 24th and April 26th.

These capabilities include NOAA's All-Hazards Weather Radio, NOAA Weather Wire Service, the emergency management community's National Warning System (NAWAS), and the New York State Police Information Network (NYSPIN). NAWAS and NYSPIN are New York's official emergency management communication systems for State agencies and local officials. Also, volunteer broadcasters will use this opportunity to test the Emergency Alert System (EAS).

Throughout this issue of The Lake Breeze, you will find valuable information on how to keep yourself and your family protected during the upcoming severe weather season.



The above map marks all of the tornadoes that have occurred in the Buffalo NWS Area of Responsibility from 1950 through 2006. A total of 103 tornadoes have occurred during those 57 years. While only one was ranked an F4 on the Fujita Scale, these tornadoes resulted in 5 deaths and 44 injuries. Total property damage from these storms is estimated at over 35 Million dollars.

INSIDE THIS ISSUE:

WATCH

Conditions are favorable for severe weather in or near the watch area. Watches are issued for tornadoes, severe thunderstorms and flash floods.

WARNING

The severe weather event is imminent or occurring in the warned area. Warnings are issued for tornadoes, severe thunderstorms, flash floods and river flooding

Marine Spotter Program

Here's your opportunity to "contribute to the cause" by helping the National Weather Service get as much information about the current weather as possible. With few official weather observation sites on the Great Lakes, the Buffalo Forecast Office is always looking for more observations from weather spotters.

Marine Observation Platforms on the Great Lakes continue to expand on a daily basis, not only from the National Weather Service, but many of our partners as well. However, Lake Erie covers an area of nearly 10,000 square miles with a shoreline of nearly 900 miles. Lake Ontario covers nearly 8,000 square miles with a shoreline nearly 800 miles long. It is obvious that no observation network could completely monitor the conditions over such large areas.

What are we looking for?

If conditions in your area do not match the latest forecast, it's time to give us a call. That information will be used to update forecasts if necessary and may even be relayed on our NOAA Weather Radio as an hourly update from our spotter network.

What to report?

Identification—Name of your vessel or the operators name

Location—Reckoning is easiest (for example, I am on Lake Erie 6 miles northwest of Dunkirk)

Weather—If we don't have it in the forecast, call it in

Visibility—Fog is a real problem on the lakes, especially when warm air moves over the cool water. It can be very localized and can occur in between our observation sites. It should always be reported if less than 5 miles

Wind Direction—Local winds on the lakes are difficult to predict.

Wind Speed—This is critical information and if the forecast does not adequately cover wind conditions, we must know.

Remember, wind direction and speed have to be calculated on a moving boat.

Wave Heights—Another critical piece of information. The NWS forecast of wave heights are defined as "Significant Wave Heights" (defined as the height of the top third of all waves)

For more information about our Marine Spotter Program, contact our Marine Focal Point, forecaster Tom Paone at thomas.paone@noaa.gov.

GPS Impacted by Solar Radio Burst

During an unprecedented solar eruption last December, researchers at Cornell University confirmed solar radio bursts can have a serious impact on the Global Positioning System (GPS) and other communication technologies using radio waves. The findings were announced earlier in the month in Washington, D.C., at the first Space Weather Enterprise Forum — an assembly of academic, government and private sector scientists focused on examining the Earth's ever-increasing vulnerability to space weather impacts.

Solar radio bursts begin with a solar flare that injects high-energy electrons into the solar upper atmosphere. Radio waves are produced which then propagate to the Earth and cover a broad frequency range. The radio waves act as noise over these frequencies including those used by GPS and other navigational systems which can degrade a signal.

NOAA, NASA and partner agencies in the National Space Weather Program are looking to the future needs of our highly technical society, and are anticipating seamless specification and prediction of the atmosphere from the ground to the edges of the Earth's magnetosphere and beyond to the Moon and Mars. NOAA's Space Environment Center is the nation's first alert of solar activity.

"Space weather cuts across many different federal agencies and is a particularly fruitful area in which to develop sustained partnerships between government agencies and academia," said Brig. Gen. David. L. Johnson, U.S. Air Force (Ret.), director of NOAA's National Weather Service. "We are, and will continue, to work together to keep the public ahead of nature's storms."

Forecasters from NOAA's Space Environment Center in Boulder, Colo., observed two powerful solar flares on December 5 and 6, 2006. These violent eruptions originated from a large sunspot cluster identified by NOAA.

On December 6, 2006, a solar flare created an unprecedented intense solar radio burst causing large numbers of receivers to stop tracking the GPS signal. Using specially designed receivers built at Cornell University as sensitive space weather monitors, Cornell scientists were able to make the first quantitative measurements of the effect of earlier solar radio bursts on GPS receivers. Extrapolations from a previous moderate event led to the prediction that larger solar radio bursts, expected during solar maximum, would disturb GPS receiver operation for some users.

"In December, we found the effect on GPS receivers were more profound and wide spread than we expected," said Paul Kintner, Ph.D., professor of electrical and computer engineering at Cornell University. "Now we are concerned more severe consequences will occur during the next solar maximum."

"This solar radio burst occurred during the solar minimum, yet produced as much as 10 times more radio noise than the previous record," said Dale Gary, Ph.D., chair and professor of the physics department at New Jersey Institute of Technology. "Measurements with NJIT's solar radiotelescope confirmed, at its peak, the burst produced 20,000 times more radio emission than the entire rest of the Sun. This was enough to swamp GPS receivers over the entire sunlit side of Earth."

The Global GPS Network, a set of precise GPS receivers used for a variety of scientific and real-time applications, was also affected by this solar disturbance. These applications include a very high accuracy positioning service that can provide a user's position with 10 to 20 cm accuracy anywhere in the world, on land, in the air or in Earth's orbit.

"NASA wants to better understand this solar phenomenon so we can limit the adverse impacts on real-time systems," said Tony Mannucci, Ph.D., principal technical staff and supervisor, Ionospheric and Atmospheric Remote Sensing Group at the NASA Jet Propulsion Laboratory.

Additionally, researchers at Boston College found the December 6 event was the first time a solar radio burst was detected on the civil air navigation system, Wide Area Augmentation System (WAAS).

"Although our findings indicate the effects of this solar burst were less intense on WAAS than on other operational systems, mainly due to the robust system design, it is important for us to consider the potential impact of future, more powerful, solar radio bursts during periods of high solar activity," said Patricia Doherty, co-director and senior scientist, Institute for Scientific Research at Boston College.

There are three key points to remember about solar radio bursts. "First, society cannot become overly reliant on technology without an awareness and understanding of the effects of future space weather disruptions," said Anthea Coster, Ph.D., MIT Haystack Observatory. Second, the December 6 event dramatically shows the effect of solar radio bursts is global and instantaneous. "Third, and equally important, the size and timing of this burst were completely unexpected and the largest ever detected. We do not know how often we can expect solar radio bursts of this size or even larger."

Further Information On the Web:
National Centers for Environmental Prediction:
http://www.ncep.noaa.gov
Space Environment Center: http://www.sec.noaa.gov
NOAA primer on Space Weather:
http://www.sec.noaa.gov/primer/primer.html

Thunderstorm and Lightning Safety

Before the Storm...

- Develop a plan for you and your family for home, work, school, and when outdoors.
- Have frequent drills.
- Know the county or parish in which you live and the names of nearby major cities. Severe weather warnings are issued on a county or parish basis.
- Check the weather forecast before leaving for extended periods outdoors.
- Watch for signs of approaching storms.
- If a storm is approaching, keep a NOAA Weather Radio or AM/FM radio with you.
- Postpone outdoor activities if thunderstorms are imminent. This is your best way to avoid being caught in a dangerous situation.
- Check on those who have trouble taking shelter if severe weather threatens.

When Thunderstorms Approach...

- Remember: if you can hear thunder, you are close enough to the storm to be struck by lightning. Go to safe shelter immediately!
- Move to a sturdy building or car. Do not take shelter in small sheds, under isolated trees, or in convertible automobiles.
- If lightning is occurring and a sturdy shelter is not available, get inside a hard top automobile and keep windows up.
- Get out of boats and away from water.
- Telephone lines and metal pipes can conduct electricity. Unplug appliances not necessary for obtaining weather information. Avoid using the telephone or any electrical appliances. Use phones ONLY in an emergency.
- Do not take a bath or shower.
- Turn off air conditioners. Power surges from lightning can overload the compressors.
- Get to higher ground if flash flooding or flooding is possible. Once flooding begins, abandon cars and climb to higher ground. Do not attempt to drive to safety. Note: Most flash flood deaths occur in automobiles.

If Caught Outdoors and No Shelter Is Nearby...

- Find a low spot away from trees, fences, and poles. Make sure the place you pick is not subject to flooding.
- If you are in the woods, take shelter under the shorter trees.
- If you feel your skin tingle or your hair stand on end, squat low to the ground on the balls of your feet. Place your hands on your knees with your head between them. Make yourself the smallest target possible, and minimize your contact with the ground.
- If you are boating or swimming, get to land and find shelter immediately!

Tornado Safety

If a Warning is issued or if threatening weather approaches:

- In a home or building, move to a pre-designated shelter, such as a basement.
- If an underground shelter is not available, move to an interior room or hallway on the lowest floor and get under a sturdy piece of furniture.
- Stay away from windows.
- Get out of automobiles.
- Do not try to outrun a tornado in your car; instead, leave it immediately.
- Mobile homes, even if tied down, offer little protection from tornadoes and should be abandoned.
- Occasionally, tornadoes develop so rapidly that advance warning is not possible. Remain alert for signs of an approaching tornado. Flying debris from tornadoes causes most deaths and injuries.

The 30/30 Rule of Lightning Safety

30 Seconds: Count the seconds between seeing the lightning and hearing the thunder. If this time is 30 seconds or less, then the lightning is close enough to be a threat. Seek shelter immediately.

30 Minutes: After seeing the last lightning flash, wait 30 minutes before leaving shelter. More than half of lightning deaths occur after the thunderstorm has passed. Stay in a safe area until you are sure the threat has passed.

Flash Flood Safety

When you receive a Flash Flood Warning: Go to higher ground Climb to safety!

- Get out of areas subject to flooding. This includes dips, low spots, canyons, washes, etc.
- Avoid already flooded and high velocity flow areas. Do not attempt to cross flowing streams.
- If driving, be aware that the roadbed may not be intact under flood waters. Turn around and go another way. NEVER drive through flooded roadways!
- If the vehicle stalls, leave it immediately and seek higher ground. Rapidly rising water may engulf the vehicle and its occupants and sweep them away. Remember, it's better to be wet than dead!
- Be especially cautious at night when it is harder to recognize flood dangers.
- Do not camp or park your vehicle along streams and washes, particularly during threatening conditions.

During the flood:

- Avoid areas subject to sudden flooding.
- If you come upon a flowing stream where water is above your ankles, STOP! Turn around and go another way.
- Do not attempt to drive over a flooded road. The depth of water is not always obvious. The roadbed may be washed out under the water, and you could be stranded or trapped.
- Children should NEVER play around high water, storm drains, or viaducts.

After the flood:

- If fresh food has come in contact with flood waters, throw it out.
- Boil drinking water before using. Wells should be pumped out and the water tested for purity before drinking. If in doubt, call your local public health authority.
- Seek necessary medical care at the nearest hospital. Food, clothing, shelter, and first aid are available from the Red Cross.
- Do not visit disaster areas. Your presence might hamper rescue and other emergency operations.
- Electrical equipment should be checked and dried before being returned to service.
- Use flashlights, not lanterns, torches or matches, to examine buildings. Flammables may be inside.
- Report broken utility lines to appropriate authorities.

Severe Weather Reporting

The staff at the Buffalo National Weather Service welcomes your reports of severe weather. Severe weather reports are an integral part of our warning decision process.

WHAT TO REPORT

- Tornadoes, Funnel Clouds and Wall Clouds
- Rotating Thunderstorms
- Wind Gusts greater than 45 mph
- Hail (any size!)
- Wind Damage (downed trees, structural damage to buildings)
- Flooding (tributaries overflowing, flooded roads/ basements)
- Heavy Rain (rate of 2 inch an hour or greater)
- Power Outages during a storm
- Any weather related deaths or injuries

HOW TO REPORT

When making a report, remember to answer three basic questions…

- What happened? Type of Event (Tornado, downed trees, etc.)
- When did the event happen? Also, the duration of the event
- Where did the event happen? Location of event (town or city, portion of county, major intersections)

DETERMINING WIND SPEEDS

One of the critical elements of severe storm spotting is the ability to estimate wind speeds. Remember, the more accurate your wind speeds are, the more helpful they are to the forecasters. Here is a simple guide to use to help estimate wind speed.

Wind Speed	Observed
< 10 mph	Rustling leaves
10-20 mph	Small limbs in motion
21-30 mph	Large branches and limbs in motion; whistling in telephone wires
31-39 mph	Whole trees in motion; difficult to walk against the wind
40-54 mph	Twigs break off trees; wind impedes walking; slight structural damage done to chimneys and shingles. **Start reporting winds at this level!**
55-72 mph	Damage to roofs and antennas; shallow rooted trees pushed over; large limbs (greater than 2" in diameter) are broken off' trees
73-112 mph	Peels surface off roofs; windows broken;

New Tool to Track Atmospheric Carbon Dioxide by Source

Scientists from NOAA's Earth System Research Laboratory (ESRL) announced today a new tool to monitor changes in atmospheric carbon dioxide and other greenhouse gases by region and source. The tool, called CarbonTracker, will enable its users to evaluate the effectiveness of their efforts to reduce or store carbon emissions.

The online data framework distinguishes between changes in the natural carbon cycle and those occurring in human-produced fossil fuel emissions. It also provides verification for scientists using computer models to project future climate change. Potential users include corporations, cities, states and nations assessing their efforts to reduce or store fossil fuel emissions around the world.

"NOAA encourages science that adds benefit to society and the environment. CarbonTracker does both," said retired Navy Vice Admiral Conrad Lautenbacher, Ph.D., undersecretary of commerce for oceans and atmosphere and NOAA administrator. "Increasingly, observations of the Earth are demonstrating a remarkable impact on our understanding of human and natural systems. We are transitioning this understanding gained from intensive research into operations that benefit the environment and the economy."

CarbonTracker distills an accurate assessment of greenhouse-gas increases or decreases. The resolution will increase to observe differences in concentration on finer geographical scales over time as data become available. Using the limited data that currently exist, the model can characterize emissions each month among U.S. regions, such as the West or the Southeast. As the observation network becomes denser, however, policymakers will be able to check the CarbonTracker Web site to compare emissions from urban centers. For instance, the resolution will be fine enough to determine the difference in net emissions from Sacramento as compared to San Francisco.

CarbonTracker's initial applications are primarily for scientists, and to attract new partners in NOAA's efforts to expand greenhouse gas observations in the United States and globally. NOAA and its partners are encouraging the addition of new monitoring sites around the United States and around the world to increase the resolution of point sources. Ultimately the site will provide easy-to-use information on local scales for policymakers, business leaders, teachers, and the public.

"CarbonTracker's potential is enormous," said Pieter Tans, head of NOAA/ESRL's Carbon Cycle Greenhouse Gases group, who developed the tool. "We are moving into an era where emissions could have a price tag. If carbon trading, emissions reduction and sequestration schemes become more common around the globe, society will need the ability to compare their relative value. Accurate and objective information on changing atmospheric concentrations will be essential for both research and impact assessments."

Until now, scientists have relied on limited direct records of atmospheric carbon dioxide, mainly from remote locations. Also, previously available computer models could not maximize the utility of the information derived. Only analyses of very broad global patterns of carbon dioxide emissions and uptake were possible. Estimates of local carbon emissions have used proxy data, such as reported point-source inventories, gasoline sales records, and other tallies from energy organizations and nations monitoring greenhouse gases, but there has been no way to verify what was actually released into the atmosphere.

CarbonTracker uses many more continuous observations than previously taken. The largest concentration of observations for now is from within North America. The data are fed into a sophisticated computer model with 135 ecosystems and 11 ocean basins worldwide. The model calculates carbon release or uptake by oceans, wildfires, fossil fuel combustion, and the biosphere and transforms the data into a color-coded map of sources and storage "sinks." One of the system's most powerful assets is its ability to detect natural variations in carbon uptake and release by oceans and vegetation, which could either aid or counteract societies' efforts to curb fossil fuel emissions on a seasonal basis.

"Only the atmosphere itself can give us the real answer on all sources and sinks," said Wouter Peters, who led the development of CarbonTracker at NOAA/ESRL and also is affiliated with the Cooperative Institute for Research in the Environmental Sciences (CIRES). "This information will be critical. How atmospheric concentrations of greenhouse gases change in the future is one of the key uncertainties in the global climate models and the biggest driver behind climate change."

NOAA collaborates with partners in France, Australia, Brazil and other nations to measure greenhouse gases globally. Through a longstanding collaboration, Environment Canada has provided a quarter of the data for North America. However, the global network is still sparse. Using today's data, the system can distinguish surface emissions on a broad scale, but plans are underway to refine observations and modeling of carbon sources on much smaller scales.

NOAA's Earth System Research Lab is the only institution measuring atmospheric greenhouse gases globally and provides more than half of the world's data. The network includes individuals gathering air samples in flasks that

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Family Disaster Plan

Families should be prepared for all hazards that affect their area. NOAA's National Weather Service, the Federal Emergency Management Agency, and the American Red Cross urge each family to develop a family disaster plan.
Where will your family be when disaster strikes? They could be anywhere - at work, at school, or in the car. How will you find each other? Will you know if your children are safe? Disasters may force you to evacuate your neighborhood or confine you to your home. What would you do if basic services - water, gas, electricity or telephones - were cut off?

Follow these basic steps to develop a family disaster plan...

I. Gather information about hazards.
Contact your local National Weather Service office, emergency management or civil defense office, and American Red Cross chapter. Find out what type of disasters could occur and how you should respond. Learn your community's warning signals and evacuation plans.

II. Meet with your family to create a plan.
Discuss the information you have gathered. Pick two places to meet: a spot outside your home for an emergency, such as fire, and a place away from your neighborhood in case you can't return home. Choose an out-of-state friend as your "family check-in contact" for everyone to call if the family gets separated. Discuss what you would do if advised to evacuate.

III. Implement your plan.
- Post emergency telephone numbers by phones
- Install safety features in your house, such as smoke detectors and fire extinguishers Inspect your home for potential hazards (such as items that can move, fall, break, or catch fire) and correct them
- Have your family learn basic safety measures, such as CPR and first aid; how to use a fire
- extinguisher; and how and when to turn off water, gas, and electricity in your home
- Teach children how and when to call 911 or your local Emergency Medical Services number
- Keep enough supplies in your home to meet your needs for at least three days
- Assemble a disaster supplies kit with items you may need in case of an evacuation
- Store these supplies in sturdy, easy-to-carry containers, such as backpacks or duffle bags. Keep important family documents in a waterproof container. Keep a smaller disaster supplies kit in the trunk of your car7

A DISASTER SUPPLIES KIT SHOULD INCLUDE:
- A 3-day supply of water (one gallon per person per day) and food that won't spoil
- one change of clothing and footwear per person
- one blanket or sleeping bag per person
- a first-aid kit, including prescription medicines
- emergency tools, including a battery-powered NOAA Weather Radio and a portable radio, flashlight, and plenty of extra batteries
- an extra set of car keys and a credit card or cash
- special items for infant, elderly, or disabled family members.

IV. Practice and maintain your plan.
Ask questions to make sure your family remembers meeting places, phone numbers, and safety rules. Conduct drills. Test your smoke detectors monthly and change the batteries at least once a year. Test and recharge your fire extinguisher(s) according to manufacturer's instructions. Replace stored water and food every six months.

New Tool to Track Atmospheric Carbon Dioxide by Source (cont.)

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are then shipped to the Boulder lab for analysis, aircraft carrying automated samplers to grab air from higher altitudes, and sensors atop tall towers transmitting data via telephone.

CarbonTracker is a NOAA contribution to the North American Carbon Program, a multi-agency effort to quantify, understand, and predict the continent's carbon cycle. CIRES is a partnership between NOAA and the University of Colorado.

Further Information On the Web:
National Oceanic and Atmospheric Administration: www.noaa.gov
Carbon Tracker: http://www.esrl.noaa.gov/gmd/ccgg/carbontracker/
Carbon Cycle Science: http://www.esrl.noaa.gov/research/themes/carbon/
Earth System Research Laboratory: www.esrl.noaa.gov