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Your 24 hour a day source for weather information across Central Indiana



# Sky Watch

Volume 10 Issue 2

## Severe Weather Strikes Back

By Jason Puma, Senior Meteorologist



*Above: A wall cloud near Morgantown on June 3 2008. It is possible that a tornado is on the ground in this photo, but it is obscured by the trees. Photo by Greg Rader.*

When we first started putting together this newsletter in May, this article was going to be about the lack of severe weather across Central Indiana this Spring. We even had a nice map to show you how other weather service offices had to issue many severe weather warnings for their area, while the Indianapolis office had very few. Well, the last week of May arrived, and all of that changed. Severe Weather began and continued through the first part of June.

Our first significant severe weather event of the season occurred on the night of May 30th. A warm frontal boundary was in place across Central

*(Continued on page 2)*





# Severe Weather Strikes Back— Continued



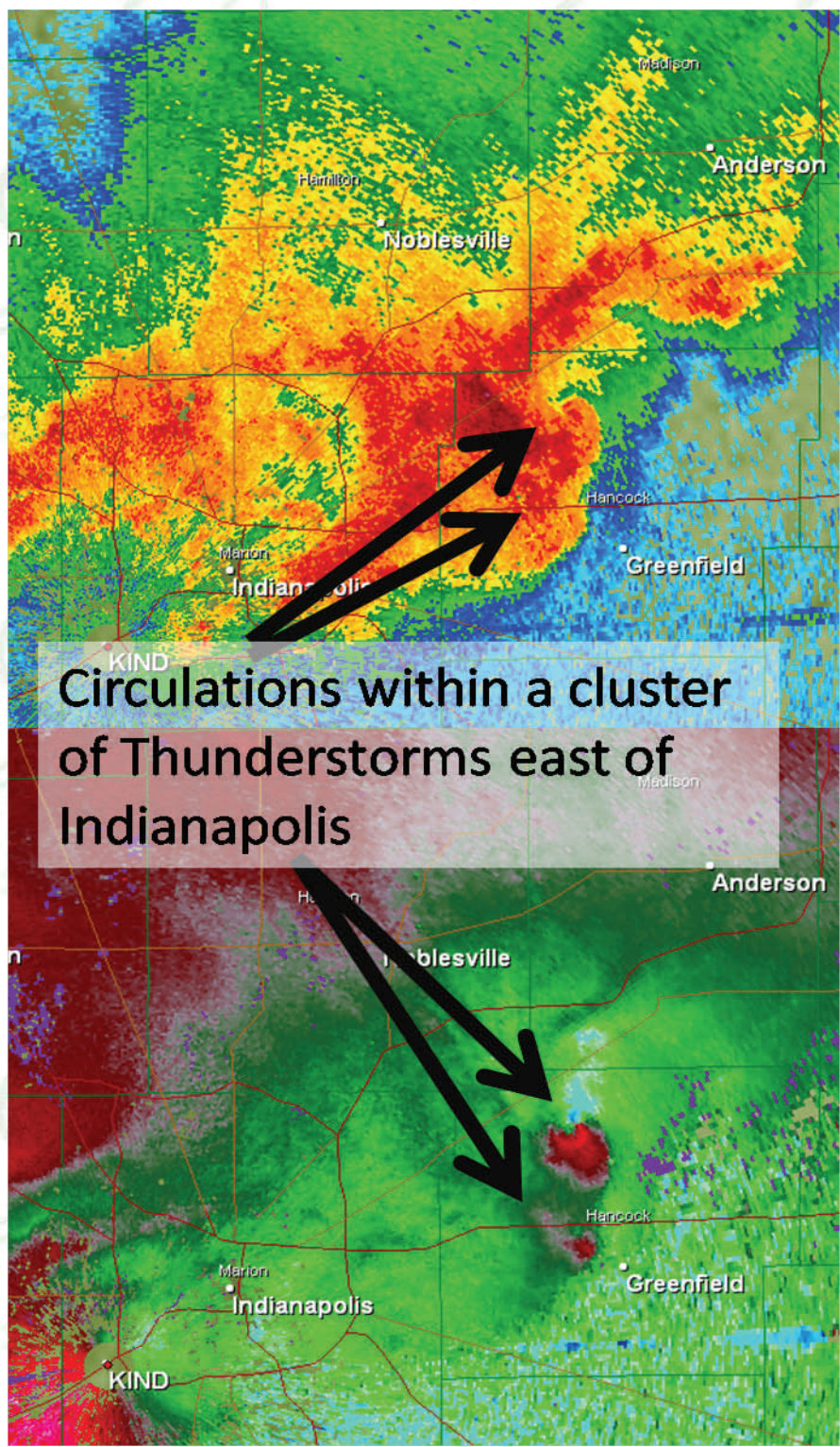
*(Continued from page 1)*

Indiana and thunderstorms formed along this front. As one of the storms pushed through the northeast side of Indianapolis, it spawned a tornado. This storm caused major damage at the Falcon Point Apartments and ended up being rated an EF2, with wind speeds up to 125 mph. As these storms progressed eastward, circulations within this storm surged across Hancock and Henry counties, producing another tornado as well as straight line wind damage. This was the beginning of what was going to be a very stormy week for Central Indiana.

The boundary that helped to trigger these storms would linger across Indiana and the Great Lakes region through the next week. South of the boundary, a southerly flow of warm gulf air was in place, providing moisture for the thunderstorms. This in combination with a strong jet stream in the upper levels of the atmosphere provided ideal conditions for thunderstorms. This was quite different from the first part of Spring as for much of the month a cooler northwest surface flow was in place across the region and storms had difficulty developing due to a lack of moisture.

Storms continued on June 3rd as three more tornadoes occurred across Central Indiana. The strongest tornado occurred

*(Continued on page 3)*



*Above: Reflectivity and Storm Relative Velocity Images (SRM) from the Indianapolis WSR-88D show a thunderstorm cluster east of Indianapolis on Friday, May 30th. The Blue/Green next to Red in the SRM image show strong rotations that are capable of producing a tornado.*





# Severe Weather Strikes Back—Continued



in Rush County near Moscow. This tornado was rated an EF3 as it destroyed a well known and historic covered bridge and damaged many homes in the Moscow community. One woman was thrown from her home and later found by rescuers. Later that night another tornado touched down near Camp Atterbury in Barthlowmew county. This tornado produced maximum winds of 130 mph, and was rated an EF2 and damaged nearly 40 buildings on the base. Finally, a third tornado struck in Decatur County, near Clarksburg. This tornado was rated



*Above: This home in Rush county was severely damaged by EF3 tornado winds.*



*Above: A metal sign pierces a tree. The sign was blown by strong tornadic winds. Most people that are killed during a tornado are struck by flying debris. This picture shows how dangerous flying debris can be.*

an EF1. All of these storms also dropped some heavy rains across Central Indiana, saturating the ground.

The next round of severe weather occurred on Friday night, June 6th. A line of strong thunderstorms pushed across central Indiana producing hail and damaging straight line winds. The storms left a boundary across the south central part of central Indiana and this acted as a focal point for thunderstorm development that night. Storms redeveloped along this line and produced an incredible amount of rainfall.

*(Continued on page 4)*





# Severe Weather Strikes Back—Continued



*(Continued from page 3)*

Over 10 inches of rain fell in Edinburg, and several other locations received over 9 inches, including Spencer, Paragon and Center Point. This resulted in major Flooding on Saturday June 7th in the Princes Lakes area, as well as the Spencer and Paragon areas. Many residents stated that they had never seen water this high. Dams in the Princes Lakes area were breeched as all of this water ran off. Many people were



Above: Flood waters flow out of the river and over a road near Elnora IN.



Above: Water flows over a road near Columbus IN. Driving through flood waters is extremely dangerous. Turn around, Don't Drown!

evacuated. All of this water then resulted in river flooding along the Wabash, East Fork of the White and White rivers during the early part of June.

The NWS would like to thank all of our spotters, amateur radio operators, law enforcement, public safety officials and media for providing detailed weather observations and spotter reports as well as passing along life saving warning information. Without your help, it would be impossible to achieve our mission. The mission of the National Weather Service is to protect lives and property in the United States.





# Effects of Flood Waters on Clouds

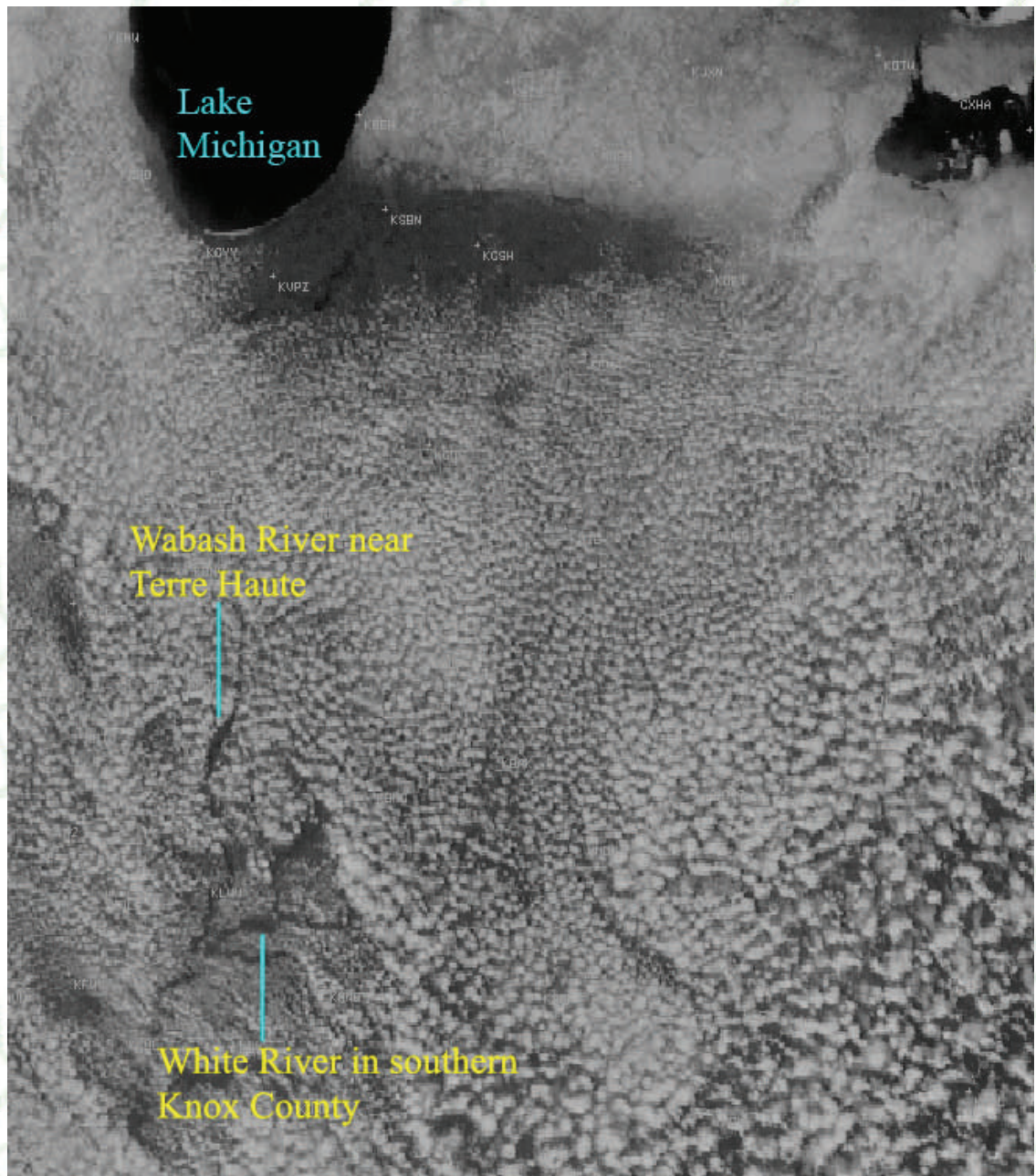


By Chad Swain, Meteorologist



Extensive flooding occurred during the latter half of March across much of Central Indiana. In fact, the flooding was visible from the satellites orbiting the Earth. Visible satellite images are basically photographs taken from space.

The first image below is a visible satellite picture taken on March 24. The image does not have any geographical boundaries indicated. The smallest items visible on the image have a diameter of 1 kilometer (about 2/3 of a mile). You can see the Wabash River near Terre Haute, as well as the Wabash River and White Rivers in Knox County (near Vincennes). The rivers stand out because most of the surrounding area is hidden by cumulus clouds. Cumulus clouds form after the ground reaches a certain



*Above: A visible satellite picture of Indiana on March 24th 2008. Flood waters along the Wabash and White rivers in southwest Indiana have cooled the adjacent air and prevented cloud formation.*

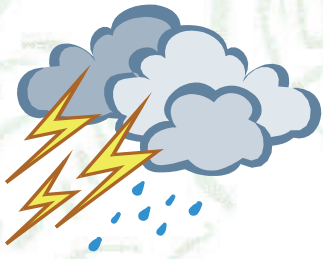
temperature. Dry land warms up faster than water, and consequently the clouds formed above the dry land first. Thus there is a clear area along the path of the flooded Wabash River near Terre Haute and along the other flooded rivers.



# Indiana Storms and the Kingdom of the Polar Front

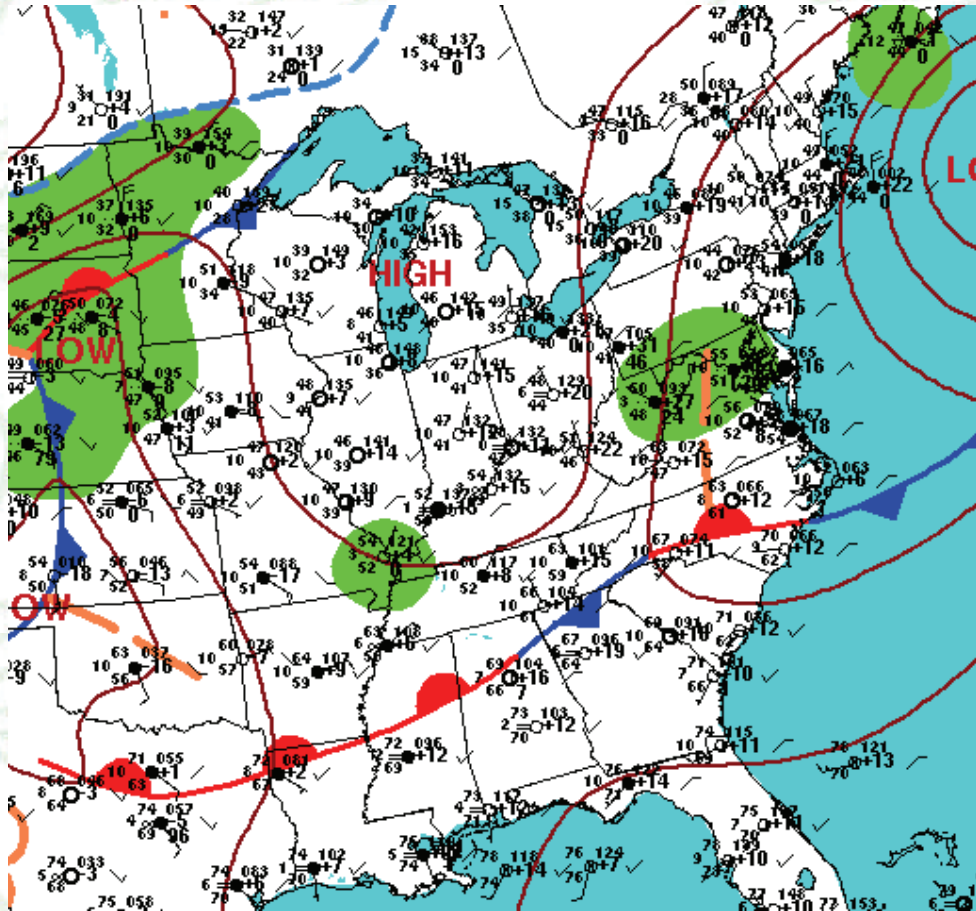


By John Kwiatkowski, Science and Operations Officer



Severe weather can occur at any time of year in Indiana. However *most* severe weather is in April, May and June, making that period a prime candidate for the title of “severe weather season”.

For a while this year, it seemed severe weather season was going to be “sleepy weather season” instead. There was plenty of rain, but the damaging winds, large hail, or tornadoes that constitute severe weather were few and far between. In March and April, no severe weather at all was reported to the National Weather Service in Indianapolis—one of the few times this has happened. Most of May wasn’t much better. Before the last few days of the month, we got exactly one severe report—a tiny tornado in Madison County.



Above : The surface plot for May 10th 2008, at 7:00 AM. Notice the “Polar Boundary” across the southeastern states, separating the cold air mass from the tropical. Notice the temperature at Indianapolis was a chilly 47, while on the south side of the front it was a balmy 73 in Birmingham Alabama.

The reason for the quiet period is the “polar front” remained south of our area. The polar front is where tropical air from equatorial regions meets cold air from polar districts. When the two types of air encounter each other, they don’t blend in gradually. They remain distinct and try to push each other out of the way. In a way, the polar front can be said to have its own kingdom—the area where it directly affects the weather. This is only a few hundred miles wide, but it’s one of the most critical areas in the atmosphere.

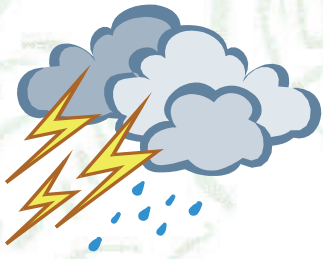
Stormy weather often occurs near the front since the collision of the different air masses causes rising motion, which in turn leads to precipitation. Central Indiana had lots of rain early in the spring due to the proximity of the front. However, since we were mostly on its *north* side, we also had a lot of cool weather. While cool conditions are no handicap to wet spells, they do suppress severe storms.



# Lightning Safety Awareness Week



By Joe Nield, Meteorologist



**“When thunder roars, go indoors!”** June 22-28 is Lightning Safety Awareness Week nationwide. As we begin the peak season for one of nature’s deadliest phenomena, it is important to review basic safety rules regarding lightning.

When outdoors...

- Seek shelter in a sturdy, fully enclosed building. Small or partially open buildings such as picnic shelters and sheds are NOT safe.

- If a building is unavailable, seek shelter in a hard topped vehicle. Do not touch metal or anything connected to frame of the vehicle.



*Above: A Bolt of dangerous lightning in Greenwood Indiana on June 6 2008. More lightning pictures can be found at: <http://www.lightningsafety.noaa.gov/photos.htm>  
Photo courtesy of Tim Sullivan*

- Remain in shelter for 30 minutes after the last thunder is heard.

- Remember that it does not have to be raining for you to be struck by lightning. Lightning can strike more than 25 miles away from the parent thunderstorm.

- Stay away from water, as well as trees and other tall objects. As a last resort, sit or crouch on the ground to make yourself as low an object as possible.

When indoors...

- Stay away from corded appliances and phones.

- Stay away from windows, doors, and walls that may have metal reinforcement, pipes, or wires running through them.

- Remember to bring in your pets.

- Avoid contact with plumbing.

Around 60 people each year are killed by lightning, and 8 deaths have already been recorded in 2008. The vast majority of strike victims survive, however. The bad news is that almost all are left with long term effects ranging from minor pain and fatigue to debilitating physical and mental changes. It is estimated that over 500 lightning injuries occur each year.

*(Continued on page 9)*





# Ask a Meteorologist about NWS Services



By Jason Puma, Senior Meteorologist



Have you ever had a question about the weather? I'll bet that you have! Isn't there an old saying that goes there's never a meteorologist around when you need one? Well, now here is your chance. In this section of the newsletter, our staff of meteorologists will try our hardest to answer any and all of your questions concerning Meteorology. I can tell you now that

we will not have all the answers, but we will certainly try our best. If you have a question, please send it to our [Editor](#). We will try to answer all questions, and some of the most interesting or common questions and answers will be printed in the next newsletter.

Now, on to this editions question...

**Question:** I was reviewing the “basics” and was reminded that the troposphere had an average height of 10-11 km (7 mi); 15-16 km at the *equator*; 5-6 km at the *poles*. ([http://weather.cod.edu/sirvatka/1110/Unit1\\_1110.pdf](http://weather.cod.edu/sirvatka/1110/Unit1_1110.pdf))

A 10 km difference from pole to equator seems rather substantial so out of curiosity I checked web sites for current atmospheric pressures. The numbers I found were much more similar that I had expected: Alert, Nunavut, Canada showed 30.40 inches of mercury, Doral,

Florida 30.15, Santo Domingo de los Colorados, Ecuador 30.39. Temperatures raged from -20C to 27.7C

It may be too much of a generalization to ignore local conditions, but how can atmospheric surface pressures be so similar with such differences in tropospheric depths?

**Answer:** The important point here is the temperatures. The temps at the equator are much

(Continued on page 9)

Above: The National Weather Service Office in Indianapolis





## Ask a Meteorologist about NWS Services - continued



*(Continued from page 8)*

warmer than the temps at the poles. Now remember, warm air expands and is less dense, while cold air compresses and is more dense.

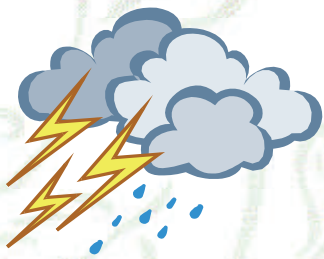
Now think of pressure as the weight of a column of air above a certain point. Lets examine two points, Point EQ (at the equator) and Point P (at the pole).

The pressure at these two points can be equal, or very similar because the weight or mass of the air particles are similar over both spots.

However, the temperatures are very different! Point P is cold, thus the air is compressed leading to thinner or shorter column. Point EQ is much warmer. The air there has expanded, and thus leads to a thicker and taller column.

The effect that we are seeing here is the Ideal Gas law,  $PV=nRT$ .  $P$ = Pressure,  $V$ =volume,  $T$ =Temperature.  $n$  and  $r$  are constants. Assume a constant or similar pressure.  $V$  and  $T$  are directly related. In order to complete the equation, if  $T$  increases,  $V$  must also increase. Conversely, if  $T$  decreases,  $V$  must also decrease.

To learn more about the Ideal Gas Law, check out : <http://en.wikipedia.org/wiki/Pv%3Dnrt>



## Lightning Safety Awareness Week - Continued



*(Continued from page 7)*

On June 25, 2008, from 10 am to 2 pm, National Weather Service meteorologists, along with representatives from the Indiana Department of Environmental Management and the Marion County Emergency Management Agency, will distribute lightning and weather safety information in front of the WIBC studios on Monument Circle in downtown Indianapolis. Come by to ask questions, pick up some information, and learn more about staying safe during thunderstorms. For more information on Lightning Safety Awareness Week, visit <http://www.lightningsafety.noaa.gov/>.



# Weather Safety Word Find



By Ashlee Moore, Indiana Department of Homeland Security

EASY



FIND THE WORDS LISTED BELOW IN THE PUZZLE ABOVE.  
WORDS CAN BE FOUND UP AND DOWN OR ACROSS. GOOD LUCK!

BOAT  
BRIDGE  
CAR  
CREST  
DAM  
FEMA

FLOOD  
INDIANA  
LAKE  
LEARN  
LEEVE  
MAP

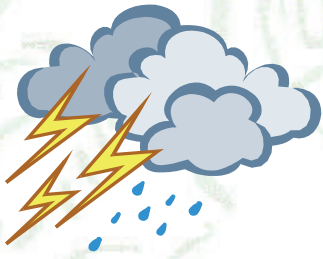
PLAN  
PETS  
POND  
RADIO  
RAIN  
RUNOFF

SAFETY  
SHELTER  
STREAM  
WARNING  
WATCH  
WATER

Find the answers on [Page 13](#)



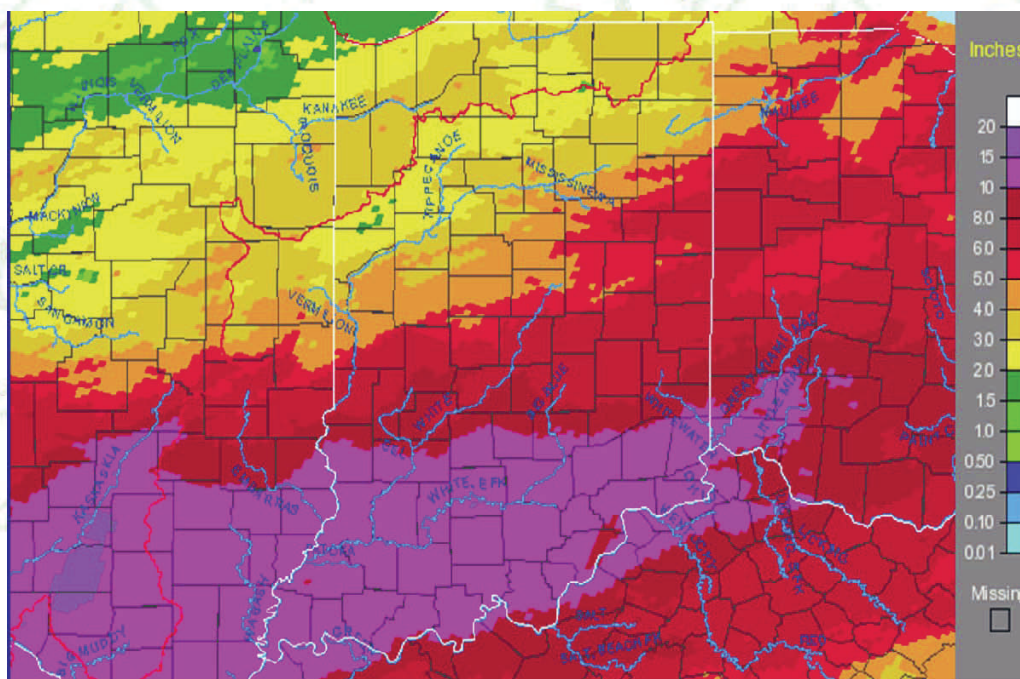
# March 2008 Flooding



By Ashley Brooks, Meteorologist & Al Shipe, Service Hydrologist

Old man winter seemed to save his best for last. During March, Indiana experienced heavy snow and significant rainfall. Both of these factors contributed to relentless flooding. A few observers in south central and southeast Indiana received more than a foot of snow and a foot of rain during March. During the month, the focus for the heavy rain and snow events shifted from northern Indiana to southern Indiana. For the third consecutive month, widespread flooding struck portions of Indiana. Rain of one to three inches fell on the third and the fourth causing widespread lowland flooding across central and southern Indiana. The heaviest of this rainfall fell across southern Indiana.

March had started the same as January and February, however this is where the similarities ended. As the lowland flooding was beginning to subside, a snowstorm struck portions of Indiana, Kentucky, and Ohio on the seventh and eighth. There was a very sharp gradient with the snowfall in Indiana. Snow of one to nearly fifteen inches fell in Indiana south and east of Indianapolis. While the Indianapolis airport measured slightly over an inch, the Columbus area received over nine inches of snow and in Seymour eleven inches covered the ground. The heaviest snowfall fell in the Columbus, Ohio area where over twenty inches of snow fell. Spring is full of change and the snow that fell on the seventh and eighth, began melting on the ninth and was completely gone by the thirteenth. The melting snow in southeast and south central Indiana caused a slight rise in the East Fork White River.



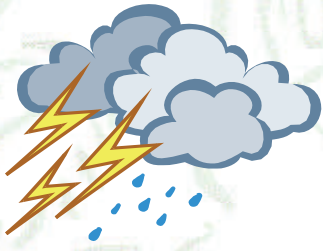
Storm clouds were gathering again after St. Patrick's Day and once again southern Indiana would feel the brunt of the weather with five to more than eight inches of rain falling in southern Indiana near and south of U.S. Highway 50. Many areas of southern Indiana were paralyzed for two or more days as a result with many state roads flooded. Martin County declared an emergency and told drivers to stay off the roads until flood waters

Above: March 2008 Estimated Rainfall. Estimated rainfall totals are affected by atmospheric conditions and topography.

(Continued on page 12)



# March 2008 Flooding - Continued



By Ashley Brooks, Meteorologist & Al Shipe, Service Hydrologist

receded. Many roads were flooded in southwest and southern Indiana. Rainfall in central Indiana on the eighteenth and nineteenth was not quite as heavy as that in southern Indiana. Rain of two to over four inches fell south of I-70 and north of U.S. 50. Rainfall amounts north of I-70 were even less, where only one half inch to three inches of rainfall was measured.

The ensuing flood along the East Fork White, White, and Wabash Rivers in southern Indiana was very similar to March 2006. Flooding along the Muscatatuck River was near levels seen in January 2005. Flooding along the Lost River was higher than January of 2005 and similar to levels in May of 1990. What differed for this March 2008 flood along the White, East Fork White, and Wabash Rivers was the duration of the extensive flooding. Just as the crest was reaching the Hazleton and Mount Carmel areas on the twenty-seventh, rain of one to nearly six inches fell from the evening of the twenty-sixth through the night of the thirty-first in southern Indiana. This additional rain caused a slight increase in the crests at Hazleton and Mount Carmel and prolonged the extensive flooding. Rain that fell during the first ten days

*Flooding near Devil's Backbone Road outside of Tunnelton, Indiana. Comparison photo of the East Fork White River at a lower river level (left) and during the flood of March 2008 (right)*



of April continued the flooding in portions of southern Indiana for seven weeks.

As part of the big picture, central and southern Indiana were on the northeast fringe of a large, heavy rain area that caused major flooding on portions of the Mississippi River during April. Rain of an inch or more fell on four days in many areas of southern Indiana, while in central and northern Indiana this ranged from one to three days. Some areas in northern Indiana did not even receive an inch of rain during March.





# Hurricane Outlook 2008

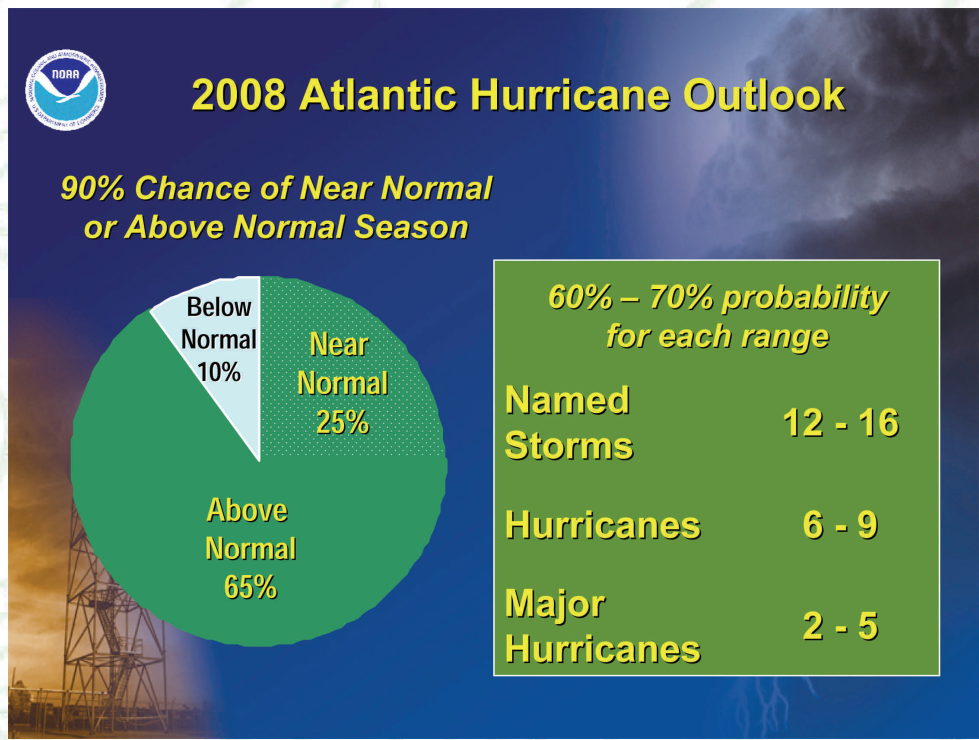


By Jason Puma, Senior Meteorologist



Hurricane Season in the Atlantic Ocean runs from June 1st through November 30th. NOAA's [Climate Prediction Center \(CPC\)](#) has issued their Hurricane forecast for 2008. The outlook calls for better chances of a normal or above normal hurricane activity this year. The CPC is calling for a 60 to 70 percent chance of 12 to 16 named storms, including 6 to 9 hurricanes and 2 to 5 major hurricanes (Category 3, 4 or 5 on the Saffir-Simpson Scale).

An average season has 11 named storms, including six hurricanes,



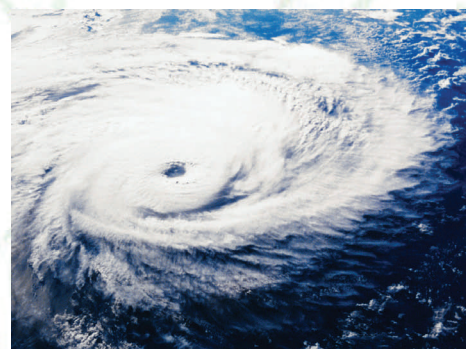
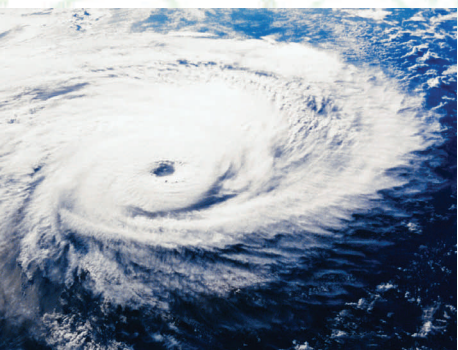
of which two reach major status. Remember this outlook does not forecast how many hurricanes will strike land. Tracking and forecasting hurricanes once they form is the Job of the [National Hurricane Center](#) in Miami, Florida.

Hurricane winds rarely impact Indiana. However, sometimes a Hurricane in the Gulf of Mexico that tracks into the Ohio valley will bring windy conditions, weak tornadoes and heavy rainfall to the Hooiser state. These rains can be a good thing if we have been experiencing a drought, or they can also hinder things resulting in flooding if the summer has been wet. The full Hurricane prediction forecast can be found at:

[http://www.noaanews.noaa.gov/stories2008/20080522\\_hurricaneoutlook.html](http://www.noaanews.noaa.gov/stories2008/20080522_hurricaneoutlook.html)

## 2008 Hurricane Names

- |           |           |         |
|-----------|-----------|---------|
| Arthur    | Hanna     | Omar    |
| Bertha    | Ike       | Paloma  |
| Cristobal | Josephine | Rene    |
| Dolly     | Kyle      | Sally   |
| Edouard   | Laura     | Teddy   |
| Fay       | Marco     | Vicky   |
| Gustav    | Nana      | Wilfred |

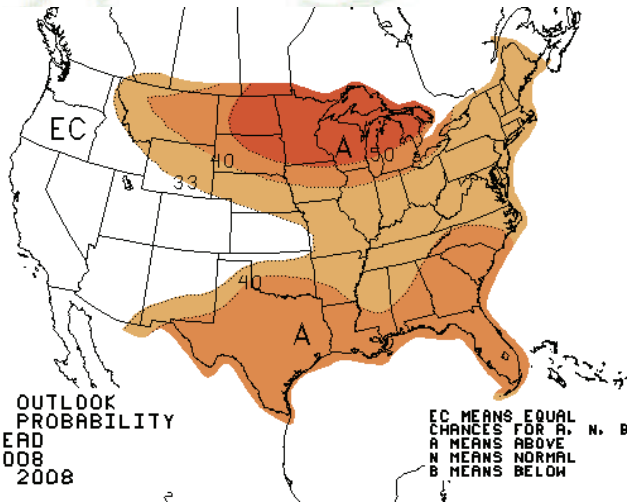




# Winter Weather Outlook



By Jason Puma, Meteorologist

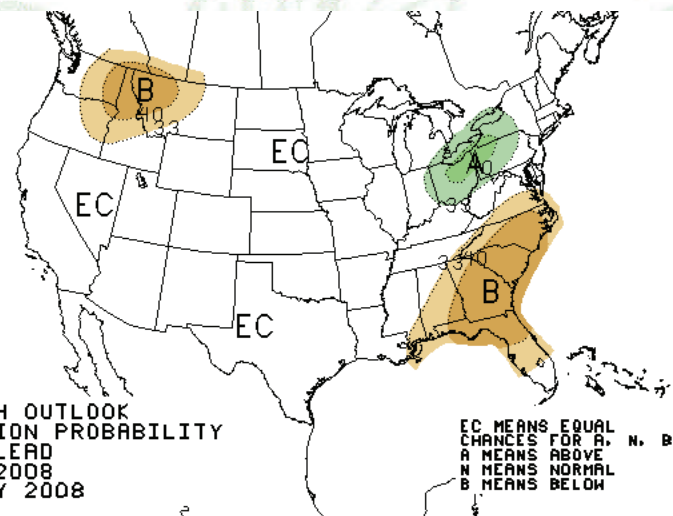


It seems like summer has just started, but just in case you are looking forward to hot cocoa, wind chill and snow shoveling, here is the outlook for winter 2008-2009.

As of early this summer the climate prediction center is forecasting better chances for above normal temperatures across Central Indiana. The map at the upper left shows the best chances for above normal temperatures across the upper Midwest and Great Lakes. The rest

of the eastern half of the United States still has better chances for above normal temperatures. The normal winter high temperature in Indianapolis is 37.8 degrees Fahrenheit and the normal low is 21.6 degrees Fahrenheit.

The map at the middle right shows Equal chances for above, below or normal amounts of precipitation for most of Indiana, as well as for much of the country. The eastern Great Lakes region is the only part of the country that has



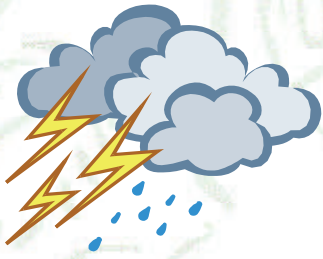
better chances for above normal precipitation. The normal amount of precipitation 7.92 inches, with 21.8 inches of snowfall.

These forecasts are updated around the 15th of every month. Many factors are considered when the forecasts are made, including trends in El Nino and La Nina, pattern recognition with historical occurrences, and numerous long range computer models. You can check for the latest forecast at:

[http://www.cpc.noaa.gov/products/predictions/long\\_range/index.php](http://www.cpc.noaa.gov/products/predictions/long_range/index.php)



# News and Notes



Spotters! Remember, this newsletter is for you! You could be a guest columnist in our next issue



of "SKYWATCH". If you have an interesting weather story or storm chasing experience to share with the other spotters, submit it to our webmaster at [w-ind.webmaster@noaa.gov](mailto:w-ind.webmaster@noaa.gov).

Please keep any submissions to one page of typewritten text. We are also always looking for pictures of hail, tornados and storm damage that occurred in Central Indiana. Feel free to send those items also. Any photos submitted may be included in the next edition of Skywatch. We try to give credit for photo submissions where possible. The next issue of "SKYWATCH" is planned for fall.

## EASY WORD SEARCH



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- Ashley Brooks - Meteorologist
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