



In December, the pattern has moved east and the warm air has surged north over the Atlantic while cold air repeatedly plunged deep into the Great Plains.

The first big snowstorm of the season began the last week of November, as 60 – 70 mph winds ripped through the Great Plains from North Dakota to Texas. In the Northern Rockies, the cold Canadian air collided with a wandering Pacific low-pressure system, creating a record-breaking

as northern Missouri and the central Appalachians.

As December progressed, more Arctic air poured into the nation. Temperatures dropped as much as 24°F below normal in the Midwest and spread throughout the nation. Storm after storm swept through the US as far south as Texas and Kentucky. Up to 10 inches of heavy lake effect snow buried the Midwest.

## Optimal Climate Normals

A method of forecasting based on averaging the prior decade's (or more) temperature and precipitation levels.

snowstorm. Up to 20 inches of snow fell in the north while further south the cold air collided with warm stagnant air creating fierce storms and three dozen tornadoes in the Eastern Plains. High winds swept massive grass fires through Texas and

When the frigid air reached the Northeast, it mingled with the warm moist Atlantic air triggering snowfall along the East Coast as far south as Washington DC and Virginia. The storm, dumped up to 14 inches of snow in parts of New

Hampshire; a foot in portions of Massachusetts and New York; and 10 inches in northwest New Jersey. The heavy snow fell so rapidly that snow crews could barely keep up, with parts of Maine receiving 4 inches an hour.

Altogether, the early December storms killed 13 people, with the most spectacular in Chicago, where a jet landing in heavy snow slid off a runway

Meanwhile a separate storm system finally began the delayed rainy season on the West Coast.

Storms pounded Oregon and Northern California, including rare thunderstorms and widespread power outages. However, as the season has continued, most of the precipitation is concentrated in a relatively small area, leaving Washington State, the Northern Rockies and most of the Southwest in intensifying drought conditions. Instead the coastal storms have funneled into the Central Rockies and Plains. Hurricane-force winds have ripped through Colorado, burying the mountains in snow. It's wonderful news if you love the pow-

dered ski slopes of Utah and Colorado. (Vail had received a RECORD 141 inches of snow for the season.) It's not good news for the Columbia and Missouri Rivers, which depend on snow melt from the Northern Rockies for hydroelectricity and river transportation.

By mid-December, the Midwest was experiencing weather more typical of Mid-January. Massive snowfalls swept through Eastern Canada as well as the Midwest, Northeast and Mid-Atlantic states. Cold temperatures plunged deep into the South, through Georgia, the Carolinas and Virginia, with a deadly ice storm leaving over half a million customers without power. As the storm became a Nor'easter and rolled north, hurricane force winds swept coastal New England. (Nantucket was raked by 90mph winds.) Massachusetts was pummeled by a rare "thundersnow" with thousands losing power and a lightning bolt blasting off the tip of a wing on a Canada Air plane just before it landed.

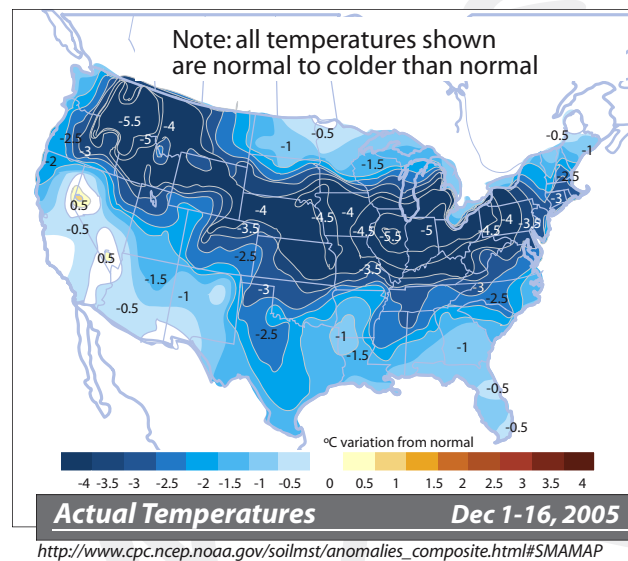
It really doesn't sound like the cozy winter that the US Climate Prediction Center forecast, does it?

The problem is that the government scientists use *Optimal Climate Normals* - a forecast based on utilizing the average of the last 10 years for temperature and the last 15 years for precipitation. This has led them to project that this winter will be very warm. Unfortunately for their accuracy, the Pacific has undergone a large long-term change, evolving from the warm to the cool phase of the Pacific Decadal Oscillation (PDO) and has behaved differently over the last few years than it did in the previous three decades.

According to last month's **BROWNING NEWSLETTER**:

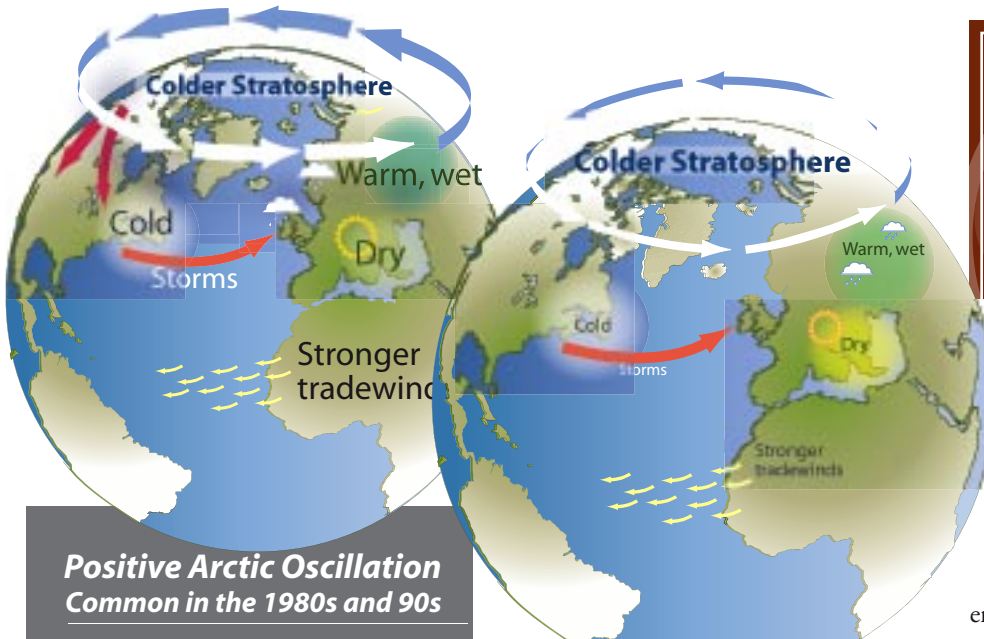
"Overall, while we agree that the West, particularly the Southwest should average above average temperatures, we expect that the Midwest and Northeast will have a very cold midwinter."

In both the North Atlantic and North Pacific, the waters are unusually warm this winter. The Arctic Ocean is also warmer than normal. These warm temperatures have changed the air masses above them, warming them and slowing down their winds. These polar vortex winds help trap the Arctic air. When they slow down, the cold air masses escape south.



Oklahoma. With thousands of stranded travelers and hundreds of families evacuating their homes during the fires, it was a memorable storm.

Following the storms, cold Arctic air settled in the Northern and Central Plains, spreading to the Midwest. Early December temperatures averaged 5 – 15°F below normal, with record-breaking freezes in Texas, Colorado, Montana, Wyoming, Nebraska, Iowa and Illinois. The cold air was swept east, and snow blanketed much of the Midwest and Northeast as far south



**Positive Arctic Oscillation  
Common in the 1980s and 90s**

**Negative Arctic Oscillation  
Shaping the winter of 2006**

*...Canada will be a skier's paradise, with an early opening in the Canadian Rockies and great cross country conditions in Southern Ontario and Quebec.*

The Arctic goes through phases or oscillations. When the Arctic Oscillation (AO) is positive, as it has been for most winters since the late 1970s, the polar vortex is strong. The cold Arctic air is trapped and the US and Canada enjoy relatively warm winters. Unfortunately this year the Arctic Oscillation is negative and the polar vortex is weak. The cold air masses have surged south and will continue to do so until the AO reverses. Most scientific analysis seems to indicate that the AO, which has been negative since mid-November will continue to be strongly negative through the rest of December into early January. Informal discussions with many experts suggest that the AO will probably be negative most of the winter.

It all sounds very theoretical, but for the US it translates into cold temperatures,

miserable storms and higher gas. Canada, it means that most northern regions will be much warmer than usual, but southern regions will be normal to colder than normal. If this year follows a regular negative AO pattern, it also means that Canada will be a skier's paradise, with an early opening in the Canadian Rockies and great cross country conditions in Southern Ontario and Quebec.

So far, the winter of 2005 – 2006 is following the pattern

the Browning Newsletter expected although the cold is settling a bit earlier than projected. In most years with similar climate conditions, the Arctic air masses arrived later, towards middle or late December. If the future resembles the past, January will see very cold weather but the weather will ease up towards the end of the month. February should bring milder weather and some drought relief to the South and Southwest.

- Wet**  
125% or more of normal moisture
- Dry**  
75% or less of normal moisture
- Warm**  
2-4°C or more higher than normal temperatures
- Cool**  
2°C or more lower than normal temperatures
- Cold**  
5°C or more lower than normal temperatures



**February**



**January**



**Spring**



**THE UNITED STATES** – A negative NAO is bad news for the US. Typically temperatures are lower in the Midwest and along the East Coast. Cold Arctic air masses descend deeper into the Midwest. (There seems to be a connection with a negative NAO and a negative Arctic Oscillation, both of which correlate with cold Midwest winters.) When the cold front reaches the East Coast, it clashes with the warm air over the Atlantic and results in heavy snows and frequent Nor'easter storms. The central continental area is usually colder and drier, leading to less precipitation and run-off in the Mississippi River and Southern Plains. Typically, but not always, springtime around the Great Lakes is cool and rainy, upsetting the planting season. At the same time, spring and summertime precipitation along the Southeast coast usually declines.

**CANADA** – As the cold air and storminess sinks into the US, Northern Canada becomes warmer. Only Southern Ontario and Quebec become cooler and stormier. (Unfortunately, that's where about half of Canada's population lives. C'est la vie!) Typically these are fairly good conditions for Canada's economy, as it's crops experience longer growing seasons and it finds lots of southern customers for its gas and oil exports.

**EUROPE** – The most radical impact of the NAO is on Europe. Typically the negative NAO allows North American winter storms to sweep directly into Southern Europe. The warm Atlantic waters enhance the storms, strengthens winds and increases precipitation. As Southern Europe endures more winter rainfall and flooding, Northern Europe becomes cold and relatively dry. Scandinavia's hydroelectric system suffers from low run-offs. In the summertime, heat waves become more frequent and, historically, Spain and Portugal have improved wine and olive production.

**AFRICA** – The negative NAO has its most beneficial impact on Africa. In wintertime, the same North American storms that reach Southern Europe rain on North Africa. Tropical Storm Delta, for example, became an extra-tropical storm when it moved too far north and brought much needed rainfall to Morocco. There also seems to be a correlation with a negative NAO and strong monsoonal rains in Sub-Saharan Africa. These regions, which have seen decades of drought, are finally turning green again.

**THE MIDDLE EAST** – When the NAO is negative, Turkey gets more

rainfall. The levels of the mighty Tigris and Euphrates rise, providing more water for the regions farmers. Unfortunately, the northward movement of the precipitation means that there is less scattered rainfall further south, bad news for the regions Bedouin populations and their livestock.

**Warm waters fuel storms and this year's warm waters will linger through 2006.**

**We are looking at another 12 months of stormy weather**

The impact of the warm Atlantic waters will linger into next year's hurricane season. Expect another busy season. The only good news will be for the Western Gulf and American refineries. It already looks as if the main warmth of the Tropical Atlantic will be slightly further south next year. Instead of leading directly to the Gulf, the path will head more towards the Caribbean Sea. This typically keeps major storms from hitting the drilling regions of the Gulf but causes more hurricanes in Florida and the East Coast.

## The Wandering Pole

It is one of life's most reassuring facts. Compasses point north. If you are lost, pull out your compass and like a good Boy Scout, you'll be able to find where you are.

It is one of life's most unsettling facts. Next year, that compass of yours will be pointing someplace else. And, according to the latest science, within fifty years, your compass will be pointing straight to Siberia.

Scientists have known for over a century that the North Magnetic Pole moves. James Ross first discovered the pole in 1831, but the isolated site was not visited again until 1904. To everyone's surprise, the pole had moved 31 miles (over 50 km).

Since then, the Geological Survey of Canada service has made a point of visiting the pole every few years and examining how much it has moved. What they have found has created headlines. The pole used to move 10km (6 miles) per year and had been moving steadily at that rate for about four centuries. Now it is moving 40 km per year. At this rate, it will be out of Canadian waters and in Russian territory in 50 years.

The pole is changing in other ways as well. It is now 10% weaker than it was 150 years ago.

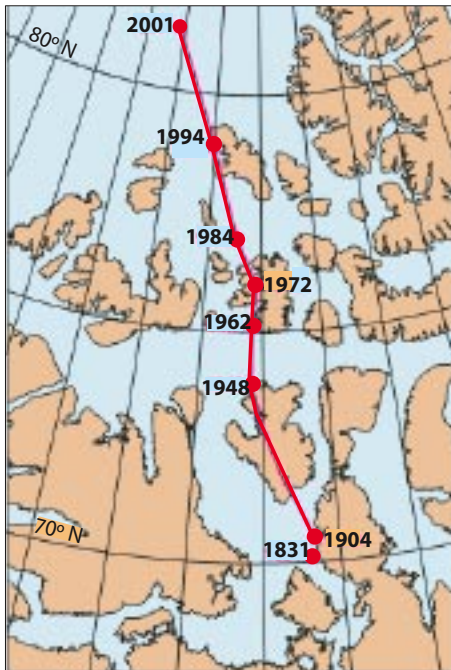
Scientists don't really understand why this is happening. We are only beginning to understand the behavior of the magnetic

**The (North) Pole is now 10% weaker than it was 150 years ago.**

**Scientists really don't understand why.**

poles and the Earth's magnetic field. We do know some basics:

- The magnetic poles are part of the magnetic field generated by the rotating liquid iron at the Earth's core. They are different from the planet's



**Movement of the North Magnetic Pole**

[http://science.nasa.gov/headlines/y2003.29dec\\_magneticfiled.htm](http://science.nasa.gov/headlines/y2003.29dec_magneticfiled.htm)

geographic poles which are the surface points marking the axis of the planet's rotation. Currently the earth's magnetic field is tilted 11° from the spin axis of the Earth.

- Because the core is liquid, it sloshes and spins at a different rate than the solid outer crust. The axis of the spinning liquid shifts around and sometimes even reverses itself, as the liquid ball turns upside-down. During these times, the north magnetic pole is at the south geographical pole and visa-versa.

**On the average, the Earth's magnetic field reverses approximately (every) 250,000 years...  
...this last occurred some 780,000 years ago.**

- We can track how the magnetic pole has moved in the past by looking at lava. The liquid lava contains

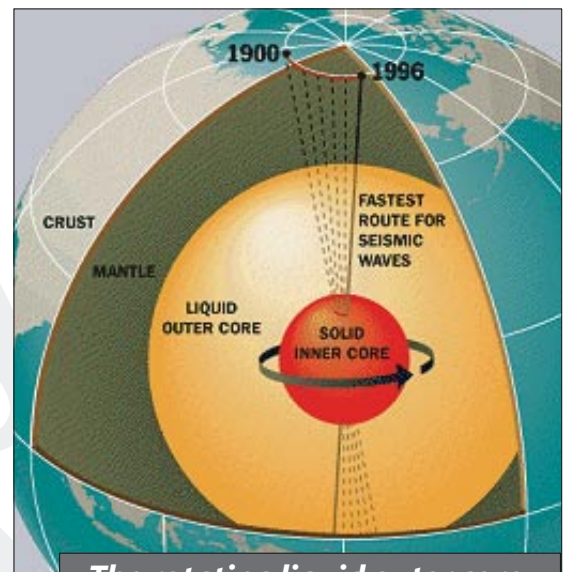
magnetite, a strongly magnetic mineral. While the lava is liquid, the tiny mineral grains act like compasses, or miniature magnets, pointing towards the north magnetic pole. When the lava cools, the tiny compasses freeze in place. In some regions, like the center of the Atlantic, lava has been flowing for millions of years, leaving a record of the movement of the Earth's magnetic field. It shows the field has been in constant motion and has flipped 171 times during the past 71 million years.

- The magnetic field generated by the spinning mass of the world's liquid core is huge. It extends over 37,000 miles beyond the earth's surface. The field, called the magnetosphere, shields the Earth from the radiation and charged particles of the solar wind and solar storms.
- During a major solar storm, charged particles enter the Earth's upper atmosphere through the poles. We see these charged particles as "northern lights" or aurora. (The southern hemisphere also has aurora.) These plasma storms interfere with radio transmission, satellite communication (including cell phones and Global Positioning System [GPS] navigation signals) and can endanger northern power grids and pipe lines.

Because the protection of the Earth's magnetic shield is so important, there was quite a bit of alarm when it was discovered that the field was weakening. Indeed, a headline like "Is Earth's magnetic field collapsing?" was typical. Scientists suggested that, with its more rapid movement, the earth's field might be about to flip again, and that prior to flipping the Earth's field would weaken, almost disappearing. Alarmists even suggested that this would allow massive solar radiation to destroy the ozone layer and allow a massive and deadly influx of ultraviolet rays. Scientists began to research whether mass extinctions coincided with the times that the earth's poles flipped. (They haven't.)

What they have discovered is that currently the earth's magnetic field is weakening, but it is increasing and decreasing all the time. The present field is much stronger than average, according to some measurements almost double its normal strength for the past million years.

The question remains, are the present changes that we see a sign that the Earth's magnetic field is about to reverse? And the answer is --- we don't know. On the average, the Earth's magnetic field reverses at intervals, with an average interval of approximately 250,000 years. It is believed that this last occurred some 780,000 years ago, so we may be overdue. However, the Earth has sometimes gone millions of years without reversing.



**The rotating liquid outer core is the source of the Earth's magnetic field**

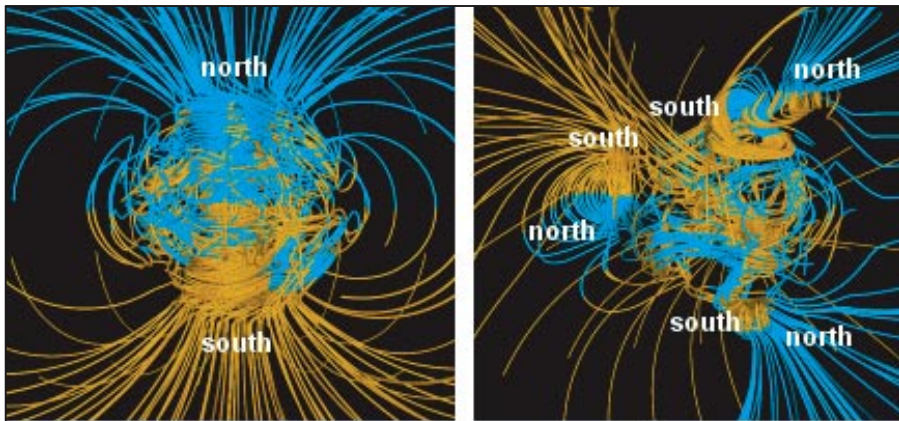
[http://science.nasa.gov/headlines/y2003.29dec\\_magneticfiled.htm](http://science.nasa.gov/headlines/y2003.29dec_magneticfiled.htm)

Initially scientists believed that the magnetic field faded before each flip. Some still believe this theory, especially in Europe, and say that if the magnetic field continues to weaken at its present rate, the entire field will be gone by 3000 – 4000 AD. There has been enough concern that Europeans are launching 3 satellites next year that will study the Earth's changing field.

More recent research has suggested an even more complex process. According to

this theory, prior to a flip, the Earth's magnetic field doesn't fade. It just becomes more complicated – really, really complicated.

by Gary Glatzmaier and Paul Roberts of the University of California show this happening repeatedly.



**Earth's poles normally & during reversals**

[http://science.nasa.gov/headlines/y2003.29dec\\_magneticfield.htm](http://science.nasa.gov/headlines/y2003.29dec_magneticfield.htm)

The newest theory is based on the fact that the Earth's outer core is liquid. The movement of the whirling ball of molten metal is complex, with different layers moving at different speeds. There is sloshing about and whirls and eddies. As these metallic whirlpools spin, they generate their own magnetic fields, literally fields within a global field. On the surface of the Earth we see these as magnetic field irregularities and weak spots.

The Earth is covered with these. One, recently discovered by Peter Olson, a geophysicist at Johns Hopkins University, in Baltimore, Maryland, is swirling like a little hurricane through the Atlantic towards the Caribbean and the East Coast. Another region, where the magnetic field is almost half as strong as it is elsewhere on the globe, covers most of South America and parts of the South Atlantic. Yet another spot below South Africa, observed by Dr. Hulot of the Institut de Physique du Globe de Paris, is so weak that some satellites passing over it have already suffered electronic malfunctions when highly charged particles from the sun were able to penetrate the weakened magnetic shield!

Computers, modeling this activity, have shown how these smaller fields weaken the greater global magnetic field. Most eventually die off, but occasionally a field grows and overwhelms the Earth's entire field, reversing the north and south magnetic poles. A super computer model designed

So the Earth is probably in the process that eventually results in a flip of the magnetic poles. However, when the reversal occurs, it usually takes between 5000 and 7000 years.

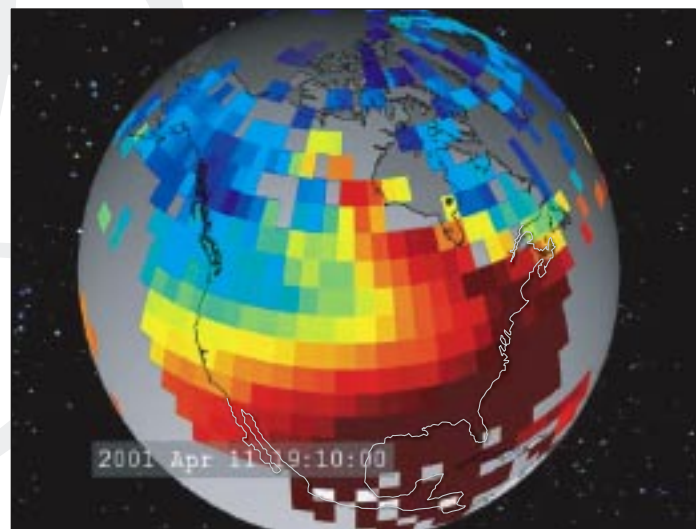
Meanwhile, the north magnetic pole is drifting out of Canada towards Russia. This will not result in the ozone disappearing and mass extinctions. Nor will the results be as mild as the oft-repeated quote that "Alaska might lose its spectacular Northern Lights in the next 50 years."

Solar storms have become an increasing problem, since the inrush of charged particles affect radio signals, satellite transmissions, electrical grids and pipelines. Recent photos show the plasma storms entering through the poles and pouring south, like a cold front. During the recent high point of the solar cycle, the disruptions caused by these "cold fronts" have reached as far as Texas, Florida and Arizona.

**Recent research has suggested (that) prior to a flip the Earth's magnetic field doesn't fade before a flip. It just becomes more complicated-really, really complicated.**

With the rapid movement of the north magnetic pole, this entry point of charged particles is moving further away. Alaska may lose the lovely vision of northern lights, but its pipelines will be safer. Canada may lose the distinction of being the home of the magnetic north pole, but in turn it might avoid another massive blackout from a solar storm, like Hydro-Quebec experienced in 1989.


Despite the increased security to our electrical and communications systems, it's a little sad watching our old Canadian friend drifting off to an exile in Siberia. But as history shows, it won't stay there. For all we know, its next stop may be Tahiti.



**Satellite photo of a spreading plasma storm**

*As investments become more international, the international news has become more unreliable*

# NEWS NOTES

 What if the United States had its biggest wild fire season in history and nobody noticed? That's just what happened this year.

The problem this year was that over half the fires were in Alaska. Fires in California are dramatic and easy to cover. When the remote Alaskan wilderness burns, it's a non-story. During 2000, when the old record was set, 8.4 million acres burned, but over 7 million were in the lower 48 states. This year over 8.5 million acres went up in smoke, but over half of those were in Alaska.

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**This newsletter will not contain**

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This year's wildfires, like this year's hurricanes have lingered beyond their season. Normally the wildfire season ends in November but this year huge fires burned in Oklahoma, Kentucky, Virginia, West Virginia and the Southwest US in early December, driving hundreds from their homes. Surveillance shows that the dry fuel conditions and potential for wild fires has continued to increase from California to the Southern Plains.


 When is a La Niña not a La Niña?


The answer is -- now. Scientists monitoring the Tropical Pacific have announced that the Pacific is neutral or slowly evolving towards a weak La Niña. Despite this, parts of Southeast Asia and South America are enduring severe La Niña-like weather conditions.

Typically in a La Niña, Southeast Asia has heavy flooding and the western republics in South America have drought. That is what is happening for the last 2 months. In South America, Ecuador has suffered \$65 million worth of damages from drought and frost and its president Alfredo Palacio has declared a state of emergency. The nation's food supply is at risk. Similarly Peru is warning that there will be almost no precipitation until February, and its farmers are already experiencing water shortages. In Paraguay, the harvests are dropping due to drought. Meanwhile, Vietnam, Thailand, Malaysia and the Philippines have been reporting heavy floods.

Closer to home, Western and Central Mexico and the US Southwest have been suffering increasingly severe drought conditions. Typically, this triggers an increased influx of illegals as Mexican farmers attempt to recoup their losses with temporary jobs in the US.

 If you are in Russia, DON'T FEED THE SQUIRRELS! Drought conditions in the Far Eastern Maritime Territory (along China's Manchurian border) have led to a pinecone shortage and the rodents are getting mean. There have been numerous reports of chipmunks terrorizing cats. In Lazo, there has even been a report, witnessed by several people, of a pack of black squirrels attacking and killing a stray dog.

 Earlier this year, the Newsletter reported on the severe drought in the Amazon jungle. The river dried up in several regions killing millions of fish and leaving tens of thousands of river dwellers stranded and starving. The good news is that the rains have returned and the basin's worst drought in more than 40 years is ending. There is still a high risk of diseases like hepatitis, as rising rivers stir up muck from stagnant pools of contaminated water, but the worst of the drought is over and the Brazilian military can now reach the isolated villages with food and medical supplies.

 Provincetown, the tip of Massachusetts' Cape Cod is a truly funky little town, but on December 16, it got a bit stranger than usual. While the rest of the state was enduring rare "thundersnows" when two low pressure systems met and created a Nor'easter, Provincetown's storms were interrupted by a lull of sunshine, calm and rainbows. Then "all hell broke loose." Hurricane force winds and waterspouts, tornadoes that form at sea, lashed the coast. Snow fell and dozens of people witnessed pink lightning. Strong winds and tidal surges stranded 24 pilot whales and 15 dolphins. As a finishing touch, the town had a rain of fish as storm surges and the waterspouts dropped fish far inland.



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