the.Globe

“El Niño and its Impact on the World”
Language Arts and Social Studies/Science Lesson Plan

the.Globe
is a feature of

the.News
A daily news broadcast for High School and Middle School students now under development by MacNeil/Lehrer Productions
“El Niño and its Impact on the World”
Language Arts and
Social Studies/Science Lesson Plan

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Dear Educator,

*the.Globe* online video reports for *the.Globe* provide middle and high school students with a valuable exercise in science, social studies and language arts. This video report on the “El Niño and its Impact on the World” examines the effects of this periodic weather phenomenon on the people and places worldwide.

http://www.pbs.org/newshour/thenews/theglobe

This video report is supported by a science as well as a language arts/social studies curriculum. All videos and curricula have been informed by *the.News* instructional design that can be found on the website www.pbs.org/newshour/thenews. *the.Gov* is open-captioned. The curriculum includes content-based standards, discussion questions, student activities, vocabulary and primary reference sources. A complete transcript of each video report includes time codes to assist in isolating specific segments of the video. This material is presented as options to fit teachers’ instructional needs.

We welcome our new partners at the Omaha Public Schools who have joined *the.News* in a special pilot project during the 09-10 school year. We are also launching a new authoring tool for students called *YOU.edit*, to launch in early 2010. It will give students an online tool to remix the content of *the.Globe* reports (as well as all the other *the.News* videos), so they can create their own multimedia presentations. This editing tool will reside on our website so that it will be available to all students with an internet connection. It will be password protected so that it can serve as a viable educational asset that allows classroom teachers to assign multimedia projects within the security and content safety of *the.News* website.

For the first time we are now providing answers to our student “thought starter” questions found on the home page underneath the video.

#1 California and the states along the Gulf of Mexico
#2 Oyster. Oxygen level decreases and the oyster dies
#3 Agriculture, Forestry, Economics

For more information and questions about this material contact me at kjaffe@newshour.org

Sincerely,

Karen W. Jaffe
Manager, Education Projects, *the.News*
MacNeil/Lehrer Productions
2700 S. Quincy St., Suite 250
Arlington, VA 22206
“El Niño and its Impact on the World”
Language Arts and Social Studies/Science Lesson Plan

This lesson was designed to support theNews video “El Niño and its Impact on the World” The video can be found online at http://www.pbs.org/newshour/thenews/theglobe

Grade Level: Grades 7-12

Content Areas Language Arts and Social Studies/Science

Key Concept(s):
Students will examine the phenomenon of El Niño and develop a news story on past occurrences, its global effect on weather patterns, predictions for the current El Niño, and precautions to take at the national and local level.

Omaha Public Schools
http://www.ops.org/District/LinkClick.aspx?fileticket=Hbqyrrg2ydM%3d&tabid=912&mid=2006

Language Arts Standards Grades 7-8
- Students will extract and construct meaning using prior knowledge, applying text information, and comprehension while reading grade level text.
- Students will apply the writing process to plan, draft, edit and publish writing using correct spelling, grammar, punctuation, and other standard conventions appropriate for grade level.
- Students will research, analyze, and communicate information in a variety of media and formats (textual, visual, and digital).

Language Arts Standards Grades 9-12
- Students will extract and construct meaning using prior knowledge, applying text information, and comprehension while reading grade level text.
- Students will apply the writing process to plan, draft, edit and publish writing using correct spelling, grammar, punctuation, and other standard conventions appropriate for grade level.
- Students will research, synthesize, and communicate information in a variety of media and formats (textual, visual, and digital).
Key Vocabulary:

- **Atmospheric phenomenon**: an unusual condition or occurrence in the atmosphere and possibly a related water body.
- **Butterfly Effect**: the phenomenon whereby a small change at one place in a complex system can have large effects elsewhere.
- **Dead zones**: A condition of the ocean or large water body where all or most marine life is unable to survive because of low oxygen produced by extreme pollution.
- **Meteorologist**: a person who studies meteorology as a researcher, climatologist, or operational meteorologist.
- **Weather patterns**: the state of the atmosphere with respect to wind, temperature, cloudiness, moisture, air pressure at a given point in time.
- **Wind shear**: The rate at which wind velocity changes from point to point in a given direction and at a varying speed.

Source: National Weather Service Glossary and WordNet

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Omaha Public Schools
Information Technology Keyboarding/Computer Applications Standards Grades 7-8
- Use technology resources for communicating, problem solving, and making informed decisions.
- Use technology resources to locate, review, and collect information from a variety of sources.

Information Technology Multimedia Standards Grades 9-12
- Demonstrate the ability to create presentations using various presentation graphic software.
- Demonstrate knowledge of various graphic tools.

Materials:

- Internet access
- Student Handouts:
  - #1 Graphic Organizer
  - #2 Developing a News Story on El Niño
- Pens, paper, pencils

Time Frame:
- Opening Activity: 15-20 minutes
- Main Activity
  - Part 1: 20-30 minutes
  - Part 2: Two to three class periods with time for research and story production
Background:
The Butterfly Effect: The idea that the flapping of a butterfly’s wings in one part of the world, say Brazil, will ultimately create an atmospheric/weather effect in another part of the world, such as a tornado in Texas or a typhoon in the Pacific Ocean. While the butterfly does not directly cause the tornado or typhoon, the flapping of its wings represents a change in the initial conditions of the global weather system, which can cause a chain of events that lead to large scale alterations in different parts of the world. The atmospheric phenomenon known as El Niño is an example of the Butterfly Effect.

The term El Niño is Spanish for “the boy,” referring to Christ as a child. It is a term coined by Peruvian fisherman who noticed an unusual warming of the Pacific Ocean around Christmas time. El Niños are part of the regular cycle of ocean currents across the Pacific Ocean and are not related to human-caused climate change. Official weather records confirm El Ninos dating back hundreds of years, and most scientists believe there are indications that they have been around for a lot longer. The two most recent incidences of El Niño took place in 1982-83 and in 1997-98, which scientists believe was the strongest occurrence of the phenomenon since official tracking started in the late 1800s.

Due to its vast size, the Pacific Ocean is a breeding ground for El Niño. Changes in ocean temperature and movement interact with the atmosphere to impact weather around the globe. Normally, the

McRel ([www.mcrel.org](http://www.mcrel.org))

Language Arts
**Standard 1 Uses the general skills and strategies of the writing process**

**Level III (Grades 6-8)**
- Writes expository compositions (e.g., states a thesis or purpose; presents information that reflects knowledge about the topic of the report; organizes and presents information in a logical manner, including an introduction and conclusion; uses own words to develop ideas; uses common expository structures and features, such as compare-contrast or problem-solution)

**Level IV (Grades 9-12)**
- Writes expository compositions (e.g., synthesizes and organizes information from first- and second-hand sources, including books, magazines, computer data banks, and the community; uses a variety of techniques to develop the main idea [names, describes, or differentiates parts; compares or contrasts; examines the history of a subject; cites an anecdote to provide an example; illustrates through a scenario; provides interesting facts about the subject]; distinguishes relative importance of facts, data, and ideas; uses appropriate technical terms and notations)
The warmest waters in the Pacific occur in the western part of the ocean near Australia and Southeast Asia. Ocean and wind currents move from east to west (from South America to Indonesia) building up moisture which is then deposited in the western Pacific. But during a period of El Niño, the waters become warmer than normal in the central and eastern Pacific increasing the potential for rain. As the warm ocean current moves west, rain occurs in the eastern and central Pacific resulting in less rain in the west, potentially creating drought conditions.

Due to the change in ocean temperature, global ocean and wind currents are also affected altering the number and strength of storms around the globe. It is now well-accepted that El Niño reduces the number of hurricanes in the Atlantic Ocean and increases their numbers in the Pacific. This is due to increased wind shear (strong wind movement) in the Atlantic Ocean, Gulf of Mexico or Caribbean Sea which tends to spread a storm over a wide area preventing it from concentrating into a hurricane. In the Pacific, the wind shear is reduced and more storms and hurricanes will occur in that region.

[Illustration from the University of Illinois] http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/hurr/Enso.rxml

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**McRel (www.mcrel.org)**

**Standard 4 Gathers and uses information for research purposes**

**Level III (Grades 6-8)**

- Uses a variety of resource materials to gather information for research topics (e.g., magazines, newspapers, dictionaries, schedules, journals, phone directories, globes, atlases, almanacs, technological sources)
- Organizes information and ideas from multiple sources in systematic ways (e.g., time lines, outlines, notes, graphic representations)
- Writes research papers (e.g., asks research questions, defines a topic, organizes information into major components and examines relationships among these components, addresses different perspectives on a topic, achieves balance between research information and original ideas, integrates a variety of information into a whole, draws conclusions)

**Level IV (Grades 9-12)**

- Uses a variety of print and electronic sources to gather information for research topics (e.g., news sources such as magazines, radio, television, newspapers; government publications; microfiche; telephone information services; databases; field studies; speeches; technical documents; periodicals; Internet)
- Synthesizes information from multiple research studies to draw conclusions that go beyond those found in any of the individual studies
- Writes research papers (e.g., includes a thesis statement; synthesizes information into a logical sequence; paraphrases ideas and connects them to other sources and related topics; identifies complexities and discrepancies in information; addresses different perspectives; organizes and converts information into different forms such as charts, graphs, and drawings; integrates quotations and citations into flow of paper; adapts researched material for presentation to different audiences and for different purposes)
But the effects can be far more reaching than just in the Pacific or Atlantic regions. In some cases, floods, droughts and other weather disturbances in other parts of the world can be traced to El Niño. During the last El Niño in 1998, the dry weather conditions in Indonesia led to increased fires in the rain forest. More rainfall in central Africa led to an increase in mosquitoes and a large outbreak of malaria. The condition also temporarily ended the drought in California and Texas and negatively affected the oyster harvest in Chesapeake Bay.

Weather forecasters cannot accurately predict conditions more than a week or two ahead. However, during El Niño years they can say whether the next summer will be dryer or cooler or hotter than average. Because of the oceans capacity to hold huge amounts of heat and its slow movement, scientists can observe conditions this year and make reasonable predictions of what might happen next year.

Predicting the occurrence and intensity of El Niños has become vitally important. In the area of agriculture, observing the intensity of an El Niño occurrence can indicate whether the next year’s growing season will be wet or dry. This gives countries time to organize irrigation plans or even plant different crops in anticipation of the weather changes. An example was in 1997 when scientists were able to predict a dry season and farmers in Zimbabwe planted drought-resistant crops and were able to grow enough food to avoid a famine.

Using El Niño to predict warmer or cooler weather conditions can also help energy producers better prepare for summer and winter in the United States. Knowing that the North American continent may be warmer or cooler than normal due to El Niño helps utility companies plan ahead for more or less

McRel (www.mcrel.org)

Standard 7 - Uses reading skills and strategies to understand and interpret a variety of informational texts
Level III (Grades 6-8)
- Summarizes and paraphrases information in texts (e.g., arranges information in a chronological, logical, or sequential order; conveys main ideas, critical details, and underlying meaning; uses own words or quoted materials; presents author’s perspective and voice)
- Uses new information to adjust and extend personal knowledge base
- Differentiates between fact and opinion in informational texts

Level IV (Grades 9-12)
- Summarizes and paraphrases complex, implicit hierarchic structures in informational texts, including the relationships among the concepts and details of those structures
- Uses text features and elements to support inferences and generalizations about information (e.g. vocabulary, structure, evidence, expository, structure, format, use of language, arguments used)
than normal temperature season. They can purchase cheaper energy sources early to prepare for high demand. Consumers too can be better prepared for possible increases in energy prices in the summers and winters.

At present, all the El Niño forecast models are indicating that the sea surface temperatures in the western Pacific are getting warmer and that at least a mild El Niño is coming for 2009-2010. Though it’s too soon to tell whether it will be strong or light, scientists and meteorologists are working with national and local officials providing information to help them plan for the upcoming year.


**Creativity and Innovation**
- Use a wide range of idea creation techniques (such as brainstorming)
- Elaborate, refine, analyze, and evaluate their own ideas in order to improve and maximize creative efforts

**Critical Thinking and Problem Solving**
- Understanding the interconnections among systems
- Framing, analyzing and synthesizing information in order to solve problems and answer questions
- Make Judgments and Decisions

**Communication and Collaboration**
- Articulating thoughts and ideas clearly and effectively through speaking and writing
- Demonstrating ability to work effectively with diverse teams
- Assuming shared responsibility for collaborative work

**ICT Literacy**
- Using digital technology, communication tools and/or networks appropriately to access, manage, integrate, evaluate, and create information in order to function in a knowledge economy
Lesson Plan:
Opening Activity:
Begin the activity by explaining to students that 1997-1998 was the last period of El Niño. During this time, scientists and oceanographers recorded the highest sea-surface temperatures in the past fifty years. This change in ocean temperatures bought on severe weather changes for many areas globally.
1. Form students into small groups of 3-4.
2. Ask them to brainstorm what radical weather changes they think would likely accompany a rise in ocean temperatures (events such as floods, droughts, hurricanes, typhoons, and wildfires).
3. Have students write each of these terms on a piece of paper with several lines of space between them.*
4. Tell students to list adjectives and descriptive phrases below each of these natural disasters. Tell students that initially they are to just write whatever comes to mind.
5. Then have students review their lists and pick their five favorite words and/or statements.
6. Have them meet in their group and do a word association game with each student reading alternately from their list and the other students providing words that associate with the word spoken by the first student. Students should write down the words as quickly as they can. When all students have gone through their lists of five words, bring the class together to review.
7. Ask for student volunteers to relate some of their word association lists. Have students keep their lists for the main activity, Part 2.

* To have students go beyond their own mental pictures you could provide them with prepared images of these natural disasters or have them look them up on the Internet or from books in the library and run their brainstorming session from the pictures.

Main Activity Part 1: View the News Segment
1. Divide the class into small viewing groups of 3-4 students.
2. Distribute the student handout, “El Niño.”
3. Show the video “El Niño” from the News segment http://www.pbs.org/newshour/thenews/theglobe or have students watch the video and fill out the graphic organizer as homework.
4. Provide time for student groups to discuss information from their graphic organizers.
5. Then have students discuss the following questions in their groups and review as full class.
   • Explain how warm water shifts across the Pacific during an El Niño period? How does such a shift affect the weather in areas like Peru and Australia?
   • What might be some costs and benefits when large amounts of rainfall come to areas previously experiencing drought?
   • How does an El Niño affect the weather in North America?
   • Why is predicting the timing and intensity of an El Nino important?
   • Describe the connection between warmer water in the eastern Pacific Ocean and the shell fish industry in Chesapeake Bay.
Main Activity - Part 2
In this activity, students will work in production teams to develop a news story on El Niño, exploring past occurrences, predictions for 2009, and the outlook nationally and for your local area. The story can be produced in one of several different presentations and should be approximately 5 to 10 minutes in length.

1. Divide students into production teams (these can be the same groups from earlier activities or new groups).
3. Determine which method of presentation students will develop depending on your schedule and students’ ability.
4. Work with students to provide assistance in their research and production.
5. Provide time for students to present their productions.

For additional information on producing classroom documentaries and news stories, refer to the following sites:

- Terry Eisenberg’s Discovery Corner
- Creating a Classroom Newspaper

Extension Activities

- With hurricanes being more prominent in the news during El Niño periods, you can have students explore this phenomenon in greater depth. Have students go to Hurricaneville.com ([http://www.hurricaneville.com/historic](http://www.hurricaneville.com/historic)) and review the list of historic hurricanes. Students can conduct deeper research on any of these hurricanes and write short stories, news articles or on the scene reports.
- Students can create a “survival kit” pamphlet for understanding and living with the effects of El Niño. Pamphlet should contain basic facts of El Niño’s operation with charts and graphs. Also included should be information for farmers who might be most affected. Pamphlets can be made for different geographic locations.

Assessment:

- For Part 1, use the graphic organizer answer key.
- For Part 2, evaluate students' El Niño news story based on the content requirements listed in the student handout. Presentations should contain the following content:
  - Description of El Niño, its operation, and effects
  - Past El Niños
  - El Nino predictions for 2009
  - Presentations should contain appropriate charts, graphics, and pictures
Resources:

- **Atmospheric Sciences (University of Illinois) Interaction with El Niño**
  [http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/hurr/enso.rxml](http://ww2010.atmos.uiuc.edu/(Gh)/guides/mtr/hurr/enso.rxml)

- **Community Learning Network El Niño Theme Page**
  [http://www.cln.org/themes/el_nino.html](http://www.cln.org/themes/el_nino.html)

- **National Aeronautics and Space Administration (NASA) feature on El Niño**
  [http://www.nasa.gov/vision/earth/lookingatearth/elnino_split.html](http://www.nasa.gov/vision/earth/lookingatearth/elnino_split.html)

- **National Geographic feature on El Niño and La Niña**

- **National Oceanic and Atmospheric Administration (NOAA) Educational Sites**
  [http://www.elnino.noaa.gov/edu.html](http://www.elnino.noaa.gov/edu.html)

- **National Weather Service Climate Prediction Center El Nino/La Nina Home Page**

- **United States Geological Service (USGS) Climate Change Science site**

Activity Designer:
*Greg Timmons is a former social studies teacher now freelance writer and educational consultant.*
Student Handout 1: Graphic Organizer for News Segment “El Niño”

Directions: Answer the questions below from the news segment “El Niño” on the News website at http://www.pbs.org/newshour/thenews/theglobe

1. On the charts below, the arrows indicate the flow of ocean currents. In the large oval along the equator, shade in the areas of warm water temperature in an El Niño year (chart 1) and a non-El Niño year (chart 2). (map source CIA World Factbook)

<table>
<thead>
<tr>
<th>Region</th>
<th>Write W or D for Wetter (W) or Dryer (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td></td>
</tr>
<tr>
<td>Peru</td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td></td>
</tr>
<tr>
<td>Zimbabwe</td>
<td></td>
</tr>
<tr>
<td>Southern Africa</td>
<td></td>
</tr>
</tbody>
</table>

2. During an El Niño, the warm water of the Pacific shifts. On the chart below, describe how this shift can affect the weather in each of the regions.
3. Describe how changes in the weather led to problems in 1997 and 1998 for these countries:

Indonesia _______________________________________________________________
_______________________________________________________________________

Africa __________________________________________________________________
________________________________________________________________________

4. During an El Niño period, normally dry areas like California and Texas have wetter seasons and normally colder regions like the Northwest and North will experience milder temperatures.
   • Describe how these changes can affect farmers in the southern states: ________________
   __________________________________________________________________________
   
   • Describe how these changes can affect homeowners in the north: _________________
   __________________________________________________________________________

5. During an El Niño period, there can be more rainfall in various areas. One of these areas is the Chesapeake Bay. To understand the cause and effect of El Niño on the Chesapeake Bay seafood industry, fill out the cause and effect chart below. Select items from the Effects List and write them in the correct box next to the appropriate cause.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased rainfall on east coast of U.S.</td>
<td></td>
</tr>
<tr>
<td>More nutrients in water</td>
<td></td>
</tr>
<tr>
<td>Over population of plankton</td>
<td></td>
</tr>
<tr>
<td>Dead zones</td>
<td></td>
</tr>
<tr>
<td>Effect on Chesapeake Bay shellfish industry and consumers</td>
<td></td>
</tr>
</tbody>
</table>

Effects List
- Reduced number of shell fish means increase in prices
- Less oxygen
- Increased run-off of fertilizers (nutrients) into the bay
- Increased death of shell fish
- Increased population of algae

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**Student Handout 1: Graphic Organizer for News Segment “El Niño”**

**Answer Key**

**Directions:** Answer the questions below from the news segment “El Niño” on the News website at http://www.pbs.org/newshour/thenews/theglobe

1. On the charts below, the arrows indicate the flow of ocean currents. In the large oval in along the equator, shade in the areas of warm water temperature in an El Niño year (chart 1) and a non-El Niño year (chart 2). (map source CIA World Factbook)

![Chart 1](image1)

![Chart 2](image2)

2. During an El Niño, the warm water of the Pacific shifts. On the chart below, describe how this shift can affect the weather in each of the regions.

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<th>Region</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Indonesia</td>
<td>D</td>
</tr>
<tr>
<td>Peru</td>
<td>W</td>
</tr>
<tr>
<td>Australia</td>
<td>D</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>W</td>
</tr>
<tr>
<td>Southern Africa</td>
<td>D</td>
</tr>
</tbody>
</table>

© the.News
3. Describe how changes in the weather led to problems in 1997 and 1998 for these countries:

Indonesia  **The dryer weather led to massive forest fires in the rain forest**

Africa  **The increase in rainfall led to flooding which resulted in more mosquitoes and an outbreak of malaria**

- During an El Niño period, normally dry areas like California and Texas have wetter seasons and normally colder regions like the Northwest and North will experience milder temperatures. Describe how these changes can affect farmers in the southern states:  **More rain helps farmers in the drought areas providing more moisture for crops.**

- Describe how these changes can affect homeowners in the north:  **Milder temperatures in winter will lead to lower heating bills.**

4. During an El Niño period, there can be more rainfall in various areas. One of these areas is the Chesapeake Bay. To understand the cause and effect of El Niño on the Chesapeake Bay seafood industry, fill in the chart below. Select items from the Effects List and write them in the correct box next to the appropriate cause.

<table>
<thead>
<tr>
<th>Cause</th>
<th>Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increased rainfall on east coast of U.S.</td>
<td><strong>Increased run-off of fertilizers (nutrients) into the bay</strong></td>
</tr>
<tr>
<td>More nutrients in water</td>
<td><strong>Increased population of algae</strong></td>
</tr>
<tr>
<td>Over population of algae</td>
<td><strong>Less oxygen</strong></td>
</tr>
<tr>
<td>Dead zones</td>
<td><strong>Increased death of shellfish</strong></td>
</tr>
<tr>
<td>Effect on Chesapeake Bay shellfish industry and consumers</td>
<td><strong>Reduced number of shellfish means increase in prices</strong></td>
</tr>
</tbody>
</table>

Effects List
- Reduced number of shellfish means increase in prices
- Less oxygen
- Increased run-off of fertilizers (nutrients) into the bay
- Increased death of shellfish
- Increased population of algae
Student Handout 2: Developing a News Story on El Niño

Background: In this activity, your group will develop a news story on El Niño, exploring past occurrences, predictions for 2009, and the outlook for your local area. The story can be produced in one of several different presentations and should be approximately 5 to 7 minutes in length.

Directions:
1. Review the information you have developed from the previous activities in this lesson. Make sure everyone in the group has a firm understanding of what El Niño is and how it affects weather patterns in different parts of the world.
2. Determine the type of news story you want to produce, print article, PowerPoint Presentation, or mini-video documentary.
3. Divide the research responsibilities among members of the group. Research the following information from the sources below and other sources.
   - El Niño description, operation, and effects
   - Past El Ninos
     - Preparing for El Niño (from 1997-98)
     - Effects of El Niño (from 1997-98)
     - Aftermath of El Niño (from 1997-98)
   - El Niño 2009 Predictions
     - Weather predictions for different parts of the United States
     - Potential changes from previous years
     - Potential costs and benefits
     - Outlook for your local area
     - Recommended precautions
4. All group members should play a part in the production. Be sure to include words or phrases from the opening activity and any appropriate charts and illustrations.

Information Sources
Past El Ninos

El Niño 2009
- AP Report [http://www.google.com/hostednews/ap/article/ALeqM5hj3oes2OSlEaQtLZBApjPq610AD9BBNDH80](http://www.google.com/hostednews/ap/article/ALeqM5hj3oes2OSlEaQtLZBApjPq610AD9BBNDH80)
- Local effects [http://www.abc15.com/content/weather/stories/story/Why-El-Ni-o-could-mean-cooler-wetter-winter-in/31NZcy0uBkiFqyWkNroF.Mg.aspx](http://www.abc15.com/content/weather/stories/story/Why-El-Ni-o-could-mean-cooler-wetter-winter-in/31NZcy0uBkiFqyWkNroF.Mg.aspx)