

# Think Climate Change is not Happening? Think Again!

## BACKGROUND

The country is awash in the so-called climate change controversy in which political opinions are being invoked to pass judgement on what should be a purely scientific endeavor. This state of affairs would not exist if the scientific underpinnings of the reports on climate change were more understandable by everyone.

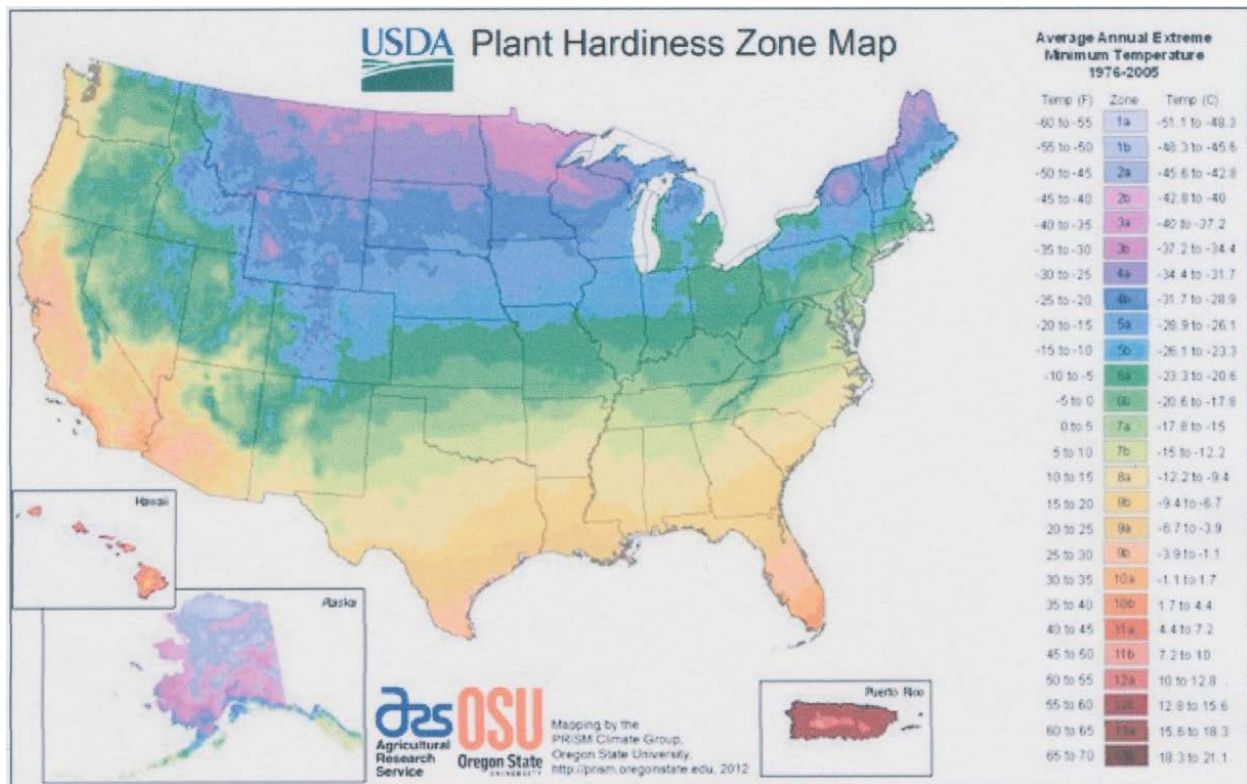
A major part of this non-acceptance by the, primarily, non-science based community may be partially understood by considering the large volumes of highly technical scientific publications on climate change which, in large part, rely on very complex modeling calculations. In the lead here would be the Intergovernmental Panel on Climate Change (IPCC). This organization employs many 1,000's of highly regarded scientists/authors.

With that many authors, one should expect that the reports would be thorough and lengthy. Boy, are they. The last report, AR5, was released in 4 sections over the time period of 2013-2104 (<http://www.ipcc.ch/report/ar5/>). As an example, the first part, covering the physical science basis of the whole report comes in at over 1,500 pages (<http://www.ipcc.ch/report/ar5/wg1/>). A document of that size is large enough to intimidate all but the most dedicated climatologists. There is, however, a much smaller, more easily understood, database which can be used to visually establish the existence of climate change.

## THE SELF-EVIDENT DEMONSTRATION OF CLIMATE CHANGE

It turns out that the best data set for ready demonstration of the existence of ongoing climate change is supplied by the US Department of Agriculture (USDA). The USDA publishes a map of the hardiness zones for the US which is used by gardeners, horticulturists and farmers to allow them to determine which plants are most likely to be viable at their location. The map charts winter coldness zones and is divided in 10 degree (F) intervals.

The USDA Map with 2012 data is shown on the next page. The 2012 map is an interactive map which allows users to get their hardiness zone by entering their ZIP code. The map is at: (<http://planhardiness.ars.usda.gov/PHZMWeb/>).



The USDA Plant Hardiness Zone Map for 2012

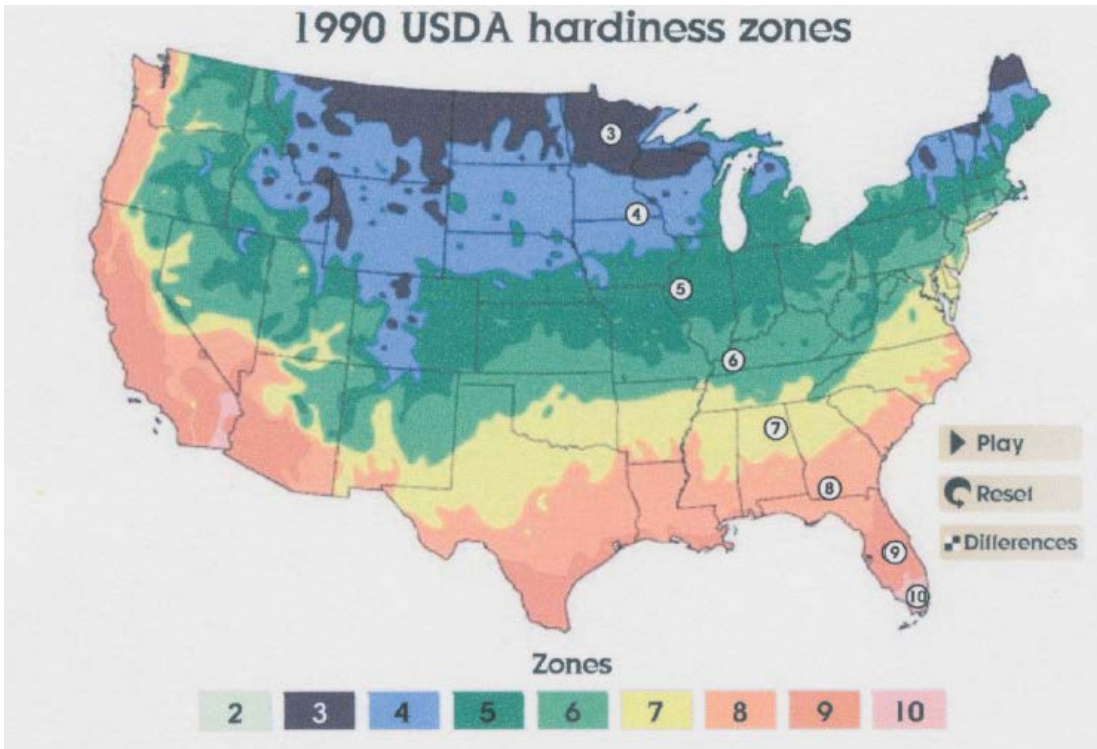
Hardiness Zone Maps for other years were not available from USDA the last time I looked. However, 2 maps for 1990 and 2006 are available on the [arborday.org](http://www.arborday.org) website. What is interesting about the zone maps presented on this website is that they are dynamic and can be used to illustrate the differences in hardiness zones between 1990 and 2006 (<https://www.arborday.org/media/mapchanges.cfm>).

The map showing the hardiness zones for 1990 is shown next. This map is followed by the 2006 hardiness zone map. The differences are immediately apparent upon cursory examination. For example, the area of Zone 3 temperatures along the northern US border has significantly decreased in the 1990-2006 time span. In like manner, both zones 5 and 6 slid northward with a fairly large movements.

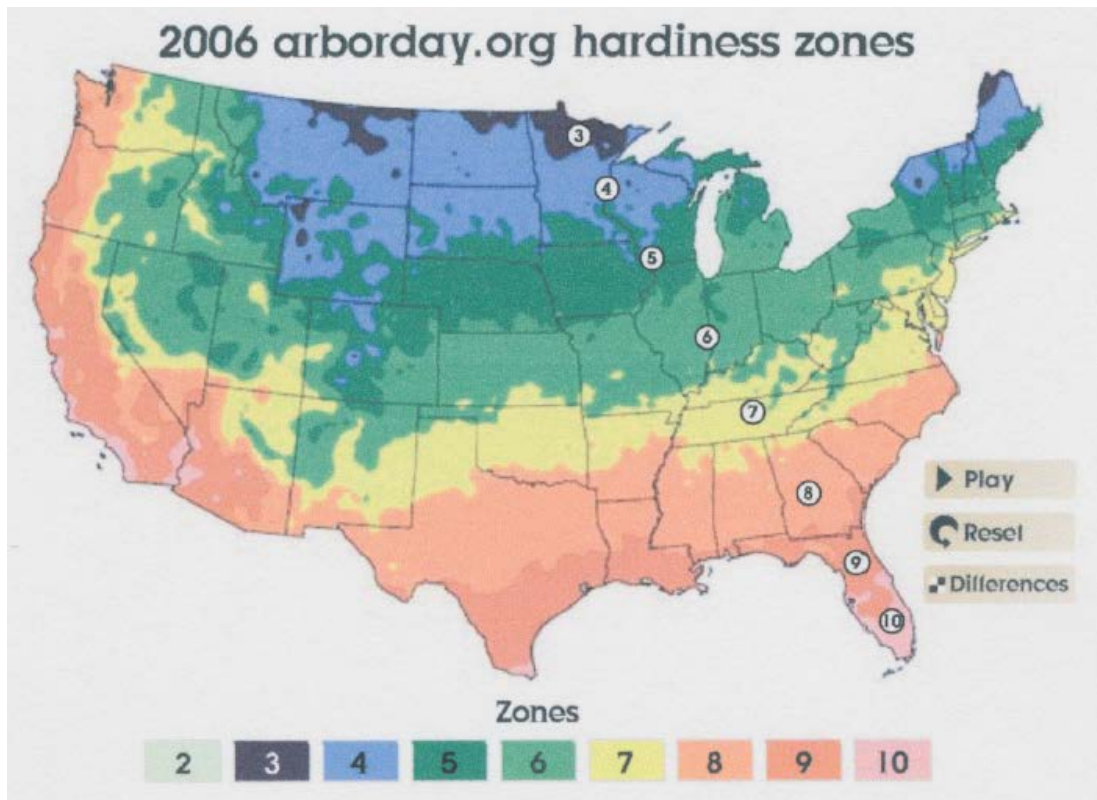
The folks at [arborday.org](http://www.arborday.org) assisted in this visualization by calculating a difference map. This map is shown as the 3<sup>rd</sup> figure down below. This map does indicate the the hardiness zone shift certainly was not uniform over the country. However, the significant hardiness zone shifts occurred across the the country's "Breadbasket".

Farmers in these regions are quite cognizant of these shifts as they watch the northward march of prime corn growing regions moving from Iowa and Illinois towards Minnesota and Nebraska and even a bit into Canada.

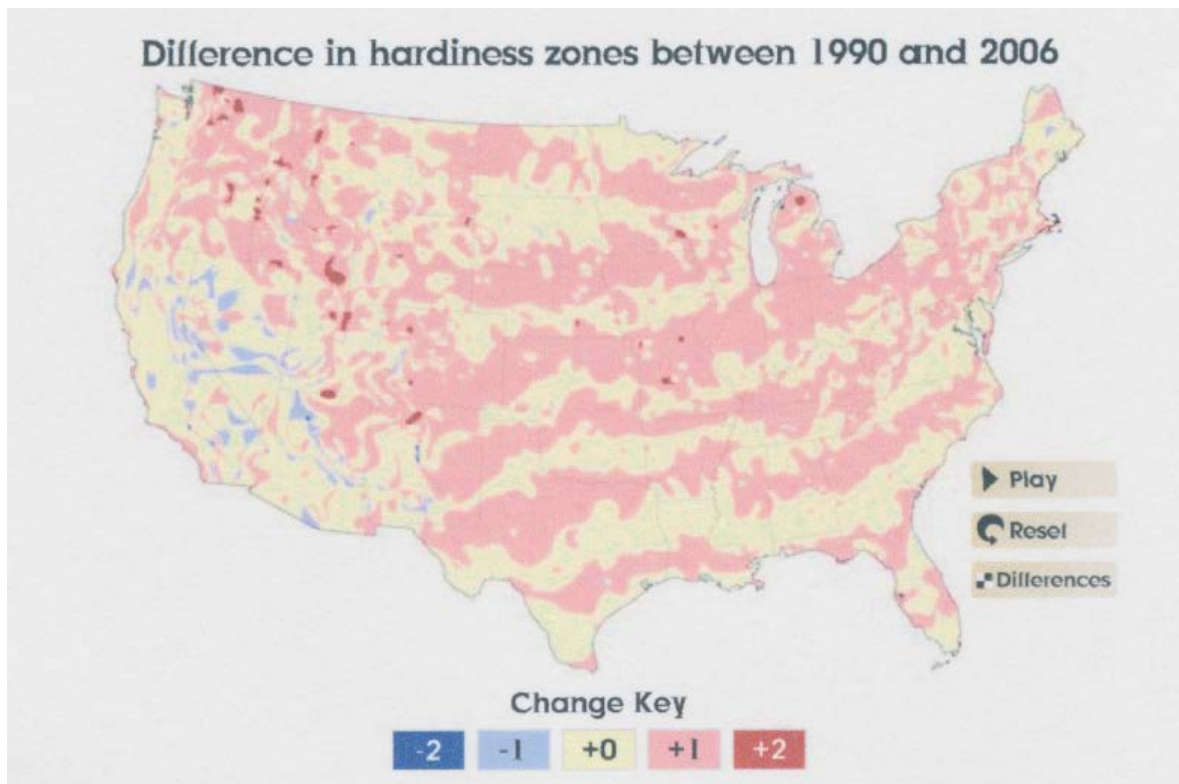
Corn, like the 2 other major grains, rice and wheat, has a fairly narrow temperature band for optimal growth, as do wheat and rice. Rice, the world's major food grain,



The USDA Hardiness Zone Map for 1990



The USDA Hardiness Zone Map for 2006



has the narrowest optimal growing temperature range having marked yield reductions when ambient temperatures rise above 83 F. This topic will be the subject of another short white paper.

This northerly march of growing zones has not gone unnoticed by another set of growers, the wine makers of Napa Valley. The Napa vintners are finding that their vineyards are getting to summer temperatures that are not optimal for the grape quality that they want for their wines. In response, they are going about getting additional grape crops from Mendocino and Lake Counties. (Private Communication expressed by the wine maker at Handley Cellars, Philo, Mendocino County, California.)

So, in the words spoken by Sgt. Joe Friday of *Dragnet* fame, "Just the facts, ma'am...just the facts". There they are, as shown above; it can readily be seen that the climate, she is a-changing.

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