

AN UNUSUALLY COOL BUT VERY PLEASANT SUMMER IN SOUTHEAST LOWER MICHIGAN CONTAINS A RECORD COLD JULY

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The summer of 2009 will go down in climate history as an exceptionally cool but also comfortable for most people. Few days contained the heat and humidity usually associated with a typical summer in these parts. The region saw less than a third 1/2-4/ of the usual 1/8-12/ of 90 degree days. Ironically, none of the 90 degree days fell in what is normally our hottest month...July. There was a welcome surplus of comfortable pleasant days due to lower heat and humidity, many of which were accompanied by brilliant sunshine. All of Southeast Michigan averaged at least a solid 2 degrees below normal, something seen quite infrequently; maybe 10-15% of the time since records began. So cool was the summer, many of the hot and humid weather lovers would call "2009" the year without the summer. With an average of 69.3 /normal 71.4/, Detroit just missed the 20th coldest /69.1/ summer on record, while Flint with an average of 66.1 /normal 68.4/ secured 2nd coldest spot and Saginaw with 66.4 /normal 68.9/, came in 8th coldest. Interestingly, Saginaw's cool average tied with a summer not too long ago, 2004. Take away Saginaw's fleeting tie, this basically was the coldest summer since the other cold summer of 1992.

	TEMPERATURE			SUMMER AVERAGE	SUMMER NORM	TWENTY COOLEST SUMMER RANK
	JUN	JUL	AUG			
DETROIT	67.8	68.9	71.2	69.3	71.4	-
DEPART	-1.2	-4.7	-0.6	-2.1		
Normal	69.0	73.5	71.8	71.4		
FLINT	64.9	65.6	67.6	66.1	68.4	2ND
DEPART	-1.3	-5.0	-0.9	-2.3		
Normal	66.2	70.6	68.5	68.4		
SAGINAW	65.3	66.0	67.8	66.4	68.9	8TH
DEPART	-1.5	-5.2	-0.9	-2.5		
Normal	66.8	71.2	68.7	68.9		
SE MI AV	66.0	66.8	68.9	67.2	69.5	
				-2.3		
WHITE LK	64.0	65.0	67.2	65.4		
	RAIN			SUMMER TOTAL	SUMMER NORM	WETTEST SUMMER RANK
	JUN	JUL	AUG			
DETROIT	5.28	2.56	2.76	10.60	9.81	
DEPART	1.73	-0.64	-0.34	0.79		
FLINT	6.57	2.64	5.47	14.68	9.67	4TH
DEPART	3.5	-0.53	2.04	5.01		
SAGINAW	3.60	1.95	2.78	8.33	8.94	
DEPART	0.5	-0.55	-0.6	-0.61		
SE MI AV	5.2	2.38	3.67	11.20	9.47	
				1.73		
WHITE LK	4.08	1.37	4.09	9.54		
	Temps	Degrees		Rain	Inches	
	Below	1.0>		Below	1.00>	
	Normal	0.0-1.0		Normal	0.00-1.00	
	Above	1.0>		Above	1.00>	

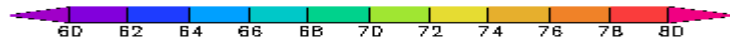
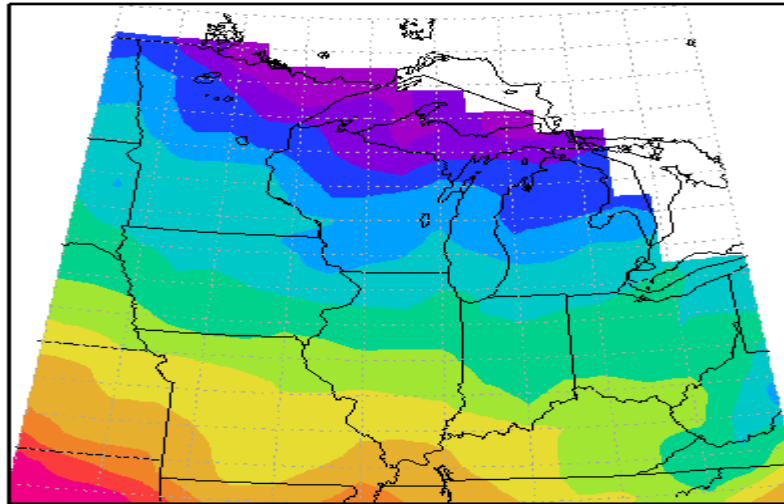
Heat Island Helps Take the Chill off Summer

Looking one step further into Detroit's 20 Coolest Summer placement (or non-placement in this case) when compared to Flint and Saginaw, one gets the idea just how the heat island has swallowed up the Detroit Metro area, extending well out over Metro Airport). Back in 1992, Detroit placed at second for coldest summer, Flint placed first and Saginaw placed second. Now, assuming a bit less general cold affected all regions again in 2009 (though cloud cover and other variables may contribute small differences), Flint places second, Saginaw places 8th and Detroit never even makes the list. One has to wonder just how much the metro heat island has affected Detroit's average and climate records in general. Back in 1992, Detroit averaged 67.0 degrees, Flint 65.4 and Saginaw 65.1. Therefore, at that time there was about a degree and a half /1.6/ difference between Detroit and Flint and 0.3 between Flint and Saginaw. Now this past summer, Detroit averages 69.3 degrees, Flint 66.1 and Saginaw 66.4. Interestingly, Flint and Saginaw again came up 0.3 of a degree difference (however, this time Saginaw is warmer). The big difference, however, shows up when comparing Detroit to Flint and Saginaw. In fact, in Detroit, the temperature averaged over three degrees /3.2/ warmer than Flint (remember in 1992 there was a 1.6 degree difference, so basically double that of 1992).

[Impressive July Cold](#)

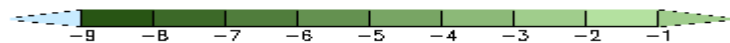
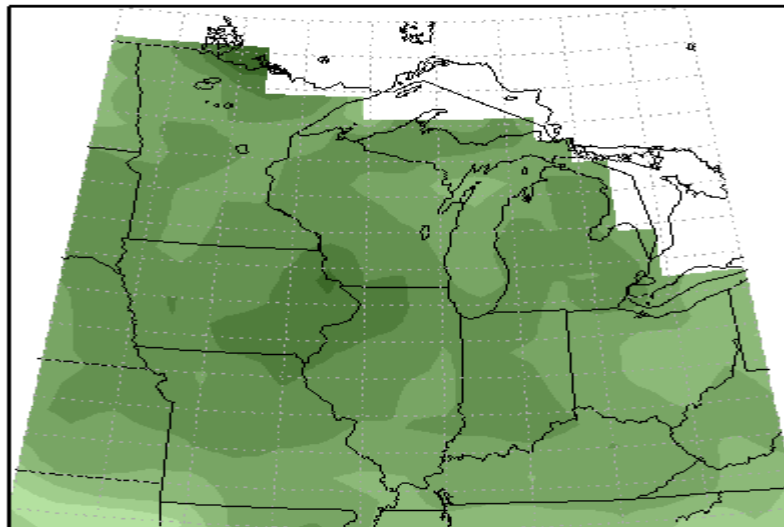
The most outstanding summer month in our cool summer goes to July with temperatures averaging some five degrees below normal. Southeast Lower Michigan's average temperature was 66.8 (when the three main climate stations are used). Throw in the NWS here in White Lake and the average drops to 66.4...a month when the temperature ought to average about 71.8 and normally, our warmest month. Again, there were no 90 degree days in July, a month that typically has a good proportion of the summer 90s. A good testament for the persistence and resiliency of the cool (or below normal) weather in July was the large amount of below normal departure days. Detroit recorded just two days that the temperature averaged above normal in July, while Flint and Saginaw each had just one! The coolest of the weather came around the 4th of July holiday weekend and the middle of the month. At least the rainfall dropped off in July (all main climate stations reported below normal) and that, along with several nice fair weather days helped salvage the a-typical cool summer month. Check out the cool average temperatures and temperature departures (below) across the Upper Midwest and Great Lakes in July.

Average Temperature in Degrees F
July 1, 2009 to July 31, 2009



NOAA Midwestern Regional Climate Center
Illinois State Water Survey
Champaign, Illinois

Average Temperature Departure from Mean in Degrees F
July 1, 2009 to July 31, 2009

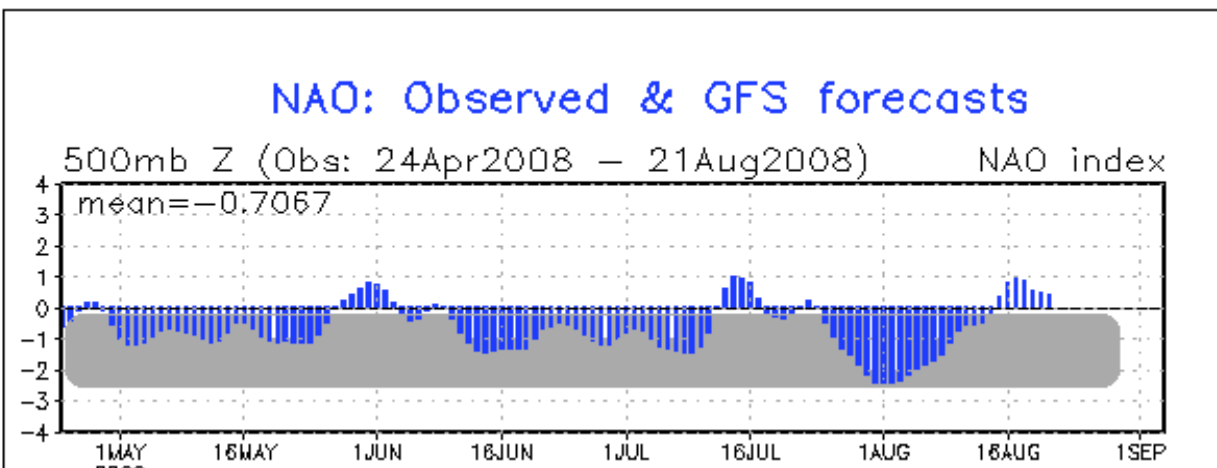


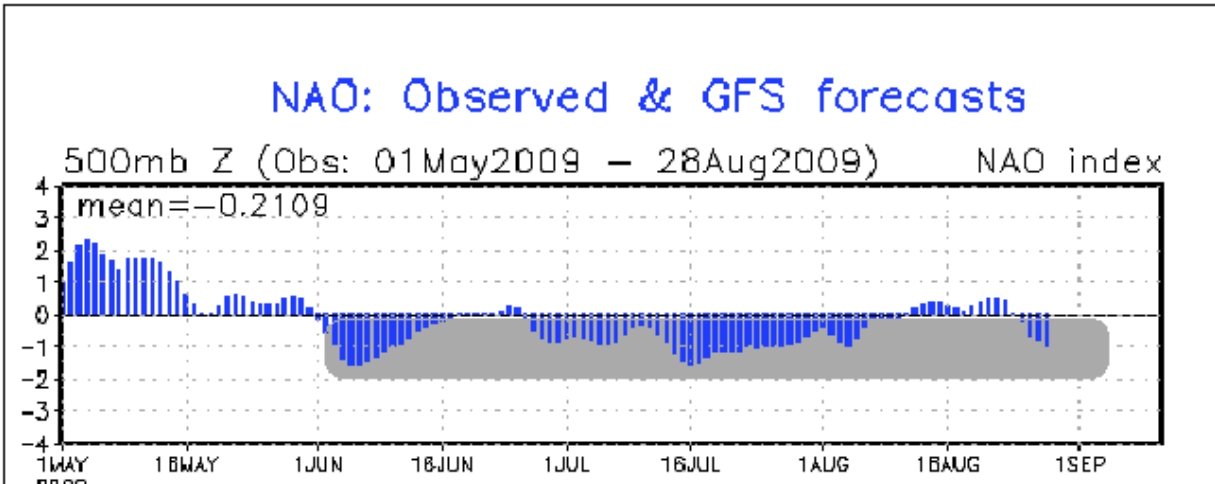
NOAA Midwestern Regional Climate Center
Illinois State Water Survey
Champaign, Illinois

If you think our summers have been gradually getting cooler and more comfortable lately, you're right. The Summer of 2007 was warmer than the past few summers (but nothing extreme) with the area averaging about a degree above the normal /69.5/ with 70.6 degrees. The Summer of 2008 was an also a comfortable summer over Southeast Lower Michigan with the average temperature just a half degree above the normal at 70.0. Then, of course this past summer the entire region averaged a chilly 67.2 degrees or better than two degrees /-2.3/ below normal. Ironically, near the same amount of 90 degree days occurred both summers in spite of this past summer being notably cooler but that's where the similarity ends. Last summer's temperature scenario unfolded completely opposite of this summer's. The highest temperature departure of the Summer of 2008 occurred early summer /June/ when temperatures averaged 1½ to 2½ degrees above normal. July and August normal to below temperatures ruled. This summer's temperature pattern was basically reversed, starting out with a below normal departure June (which only got worse in July) but with closer to normal readings in August (albeit, still on the negative side).

The lack of 90s and resultant cool but comfortable summer was caused by our prevailing northwesterly flow aloft due to the predominance of a negative North Atlantic Oscillation /NAO/. Yes, that same North Atlantic Oscillation that brings us bitter cold northwesterly winds when negative in the winter can also bring some refreshingly temperate and agreeable weather during the summer. Check out the dominant phase of the NAO these past several months, from May to late August...almost exclusively negative.

Looking back at the NAO trace the two summers shows the very similar dominant negative NAO pattern.





Rainfall and Severe Weather

Overall, rainfall was plentiful while severe weather was not. The summer started out on the wet side with all regions seeing above normal rain in June. The problem was (and a problem seen many summer months), the majority of the rain that fell in June, fell on a couple of days. As an example, Flint received 3.46" of its 6.57" of rain on one day /17th/ with another 1.76" on the 8th. Therefore, 5.22" of rain fell on just two days...or about 80% of the month's rain. It wasn't quite as dramatic at Detroit but still notable, where out of the 5.28" of rain that fell, 2.59" fell on the 19th and another nine tenths of an inch / .90"/ was measured on the 11th therefore, 66% of June's rain in Detroit fell on two days. As of the end of June, many areas across Southeast Lower Michigan saw rainfall amounts of four to as much as six inches above the norm for the first six months of the year. The precipitation slacked off in July with all regions seeing below average rainfalls, though not terribly so. The main dry streak came early-mid July with just a couple of days of rain. More generous rains returned in August with most areas seeing normal to above rain.

Severe weather actually was limited during the summer with one of our worst outbreaks (if not the worst) coming late April when the biggest weather maker came in the form of a very potent severe weather outbreak on the 25th. Severe storms organized in lines and surged across Southeast Michigan. For the first outbreak of the season these lines of storms had a strong punch. This was almost exclusively a wind event with numerous reports of 50 to 70 mph wind gusts. Strongest storms moved across central and northern Oakland, Macomb and St Clair Counties. Some of the same areas hit with last summer's June 8th derecho were under the gun this time too.

Moving to June 2009, severe weather visited occasionally during the month with the best events being; one for heavy rain on the 19-20th and the other for severe storms with wind and hail damage on the 25th. First off, impressive widespread torrential rains accompanied storms that moved over the region late on the 19th into early

morning hours of the 20th causing lowland and river flooding. Some of the higher rainfall amounts included over three and a half inches /3.59"/ that drowned the Belleville area (southwest of Detroit) while 3.40" deluged portions of Allen Park. In addition, 3.48" clobbered downtown Ann Arbor, 2.90" of rain filled the rain buckets in Canton and Grosse Pointe, 2.85" of rain was dumped just west of the town of Plymouth, 2.40" was measured at both Pinckney and Monroe, 2.35" near Rockwood, 2.28" at Woodhaven and 2.16" in Howell.

Then later in the week on the 25th, severe weather rocked the area with many reports of wind gusts between 60 and 75 mph across the region (especially the north-northeast suburbs). Macomb County saw the worst of the windstorm damage. A 75 mph wind gust estimated at Fraser resulted in numerous trees and power lines knocked down. In addition, 70 mph winds in St Clair Shores and Shelby Twp saw caused considerable damage to trees with some trees/branches blocking roads. Powerful winds of 65 mph uprooted a couple of trees and slammed them onto roofs of homes in Sterling Heights, while up to golf ball size hail pounded the Oxford/Lake Orion area with localized damaged to vehicles.

What Are The Chances...Slim and None?

Flint Gets Blasted Twice with Torrential Rains in the Summer of '09

As mentioned above, Flint got hit with extremely heavy rain in June with 3.46" in "cloudburst" on June 17th. Basically, the storm continued to generate over the same region (Flint area) dumping copious amounts of rain. By the way, never was a thunderstorm recorded during this "shower". Then, less than two months later on August 17th, thunderstorms with tropical-like rains dumped nearly four inches /3.89"/ of rain over the same general location, Flint Bishop Airport. Therefore, the rainfall total from these two days is an unprecedented 7.35"!

Checking back over Flint's records for the summer months /since 1921/ only six times had that much rain fallen (over three inches) on a single day and NEVER had that much rain fallen TWICE in the same SUMMER. In fact, never has there been two days in any YEAR when over three inches of rain fell.

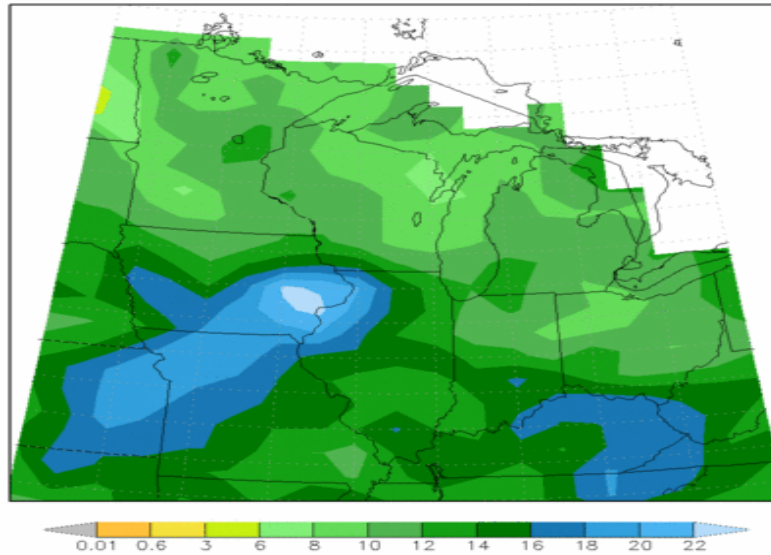
It must be noted that this again is Flint, moving north to Saginaw tells a different story in history. Most in these parts remember [the Flood of 1986](#) and during that flood, Saginaw was deluged with 5.51" on 10th and 4.55" on the 11th for a flooding total of 10.06" for the 48 hour period (16.16" was the monthly total).

While on a wet subject, let's look at several of our helpful co-operative weather observer's rainfall reports for summer.

RAIN	JUN	JUL	AUG	TOTAL	NORM
ADRIAN	4.34	1.12	3.50	8.96	10.60
ANN ARBOR	6.71	2.47	3.83	13.01	10.25
BAD AXE	3.38	4.48	1.24	9.10	9.63
CARO	4.94	3.15	2.75	10.84	9.46
CHELSEA	6.85	0.94	3.91	11.70	10.27
DET CTY	3.93	4.25	3.27	11.45	9.81
GRSS PTE	4.85	3.24	4.24	12.33	10.44
H BEACH	2.59	2.73	1.49	6.81	9.25
HOWELL	4.76	1.42	3.79	9.97	9.32
LAPEER	5.18	1.48	6.65	13.31	10.34
MIDLAND	4.81	1.70	3.48	9.99	10.04
MILFORD	3.02	0.99	3.26	7.27	8.59
MORENCI	3.19	1.51	3.66	8.36	10.54
OWOSSO	4.30	2.70	4.91	11.91	9.74
P HURON	4.10	2.85	5.32	12.27	9.29
SANDUSKY	4.37	4.26	3.05	11.68	9.65
YALE	4.38	2.37	3.71	10.46	9.55
AVERAGE	4.45	2.45	3.66	10.65	9.81
Color Legend:	Rain	Inches			
	Below	1.00>			
	Normal	0.00- 1.00			
	Above	1.00>			

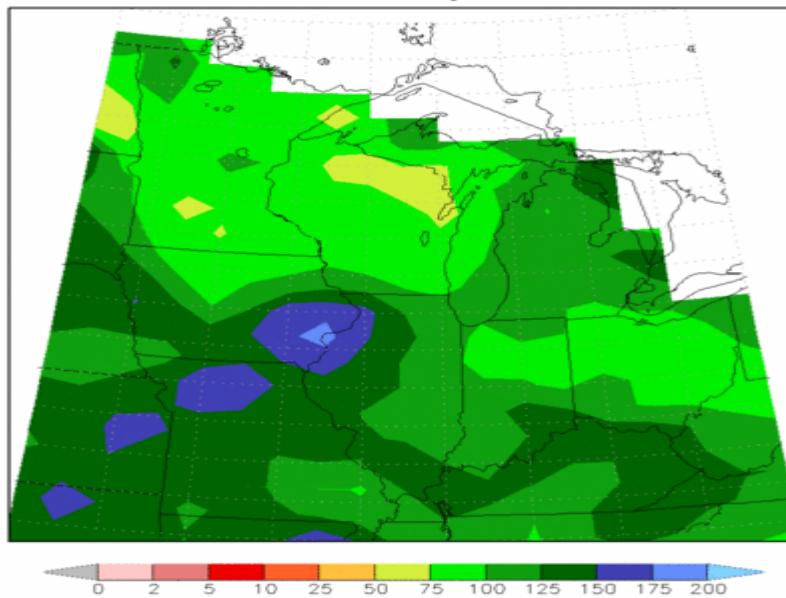
Rainfall and Departure maps for the larger Region

Total Precipitation (inches)
June 1, 2009 to August 31, 2009



NOAA Midwestern Regional Climate Center
Illinois State Water Survey
University of Illinois at Urbana-Champaign

Total Precipitation: Percent of Mean
June 1, 2009 to August 31, 2009

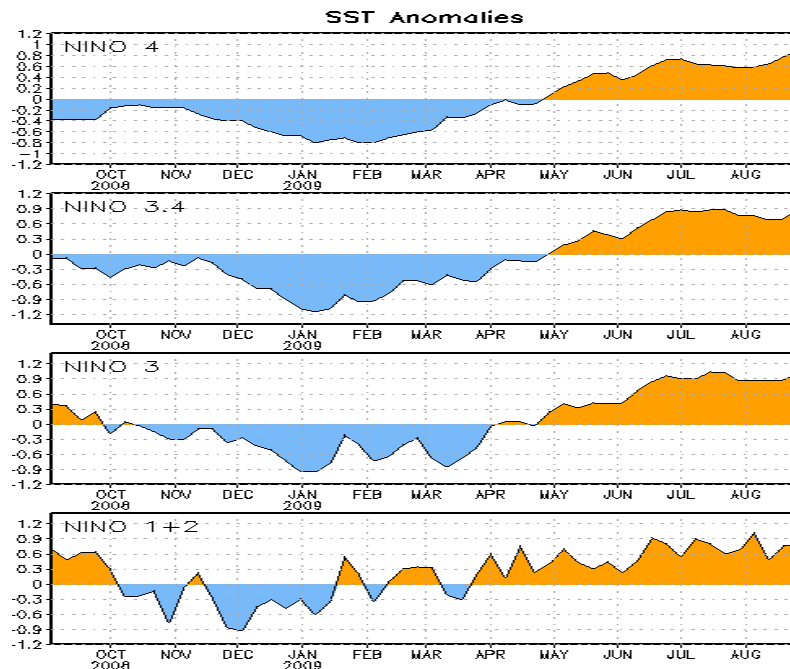


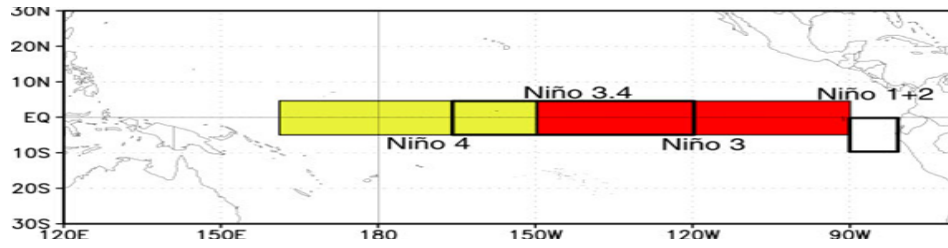
NOAA Midwestern Regional Climate Center
Illinois State Water Survey
University of Illinois at Urbana-Champaign

Southeast Lower Michigan Autumn 2009 Outlook

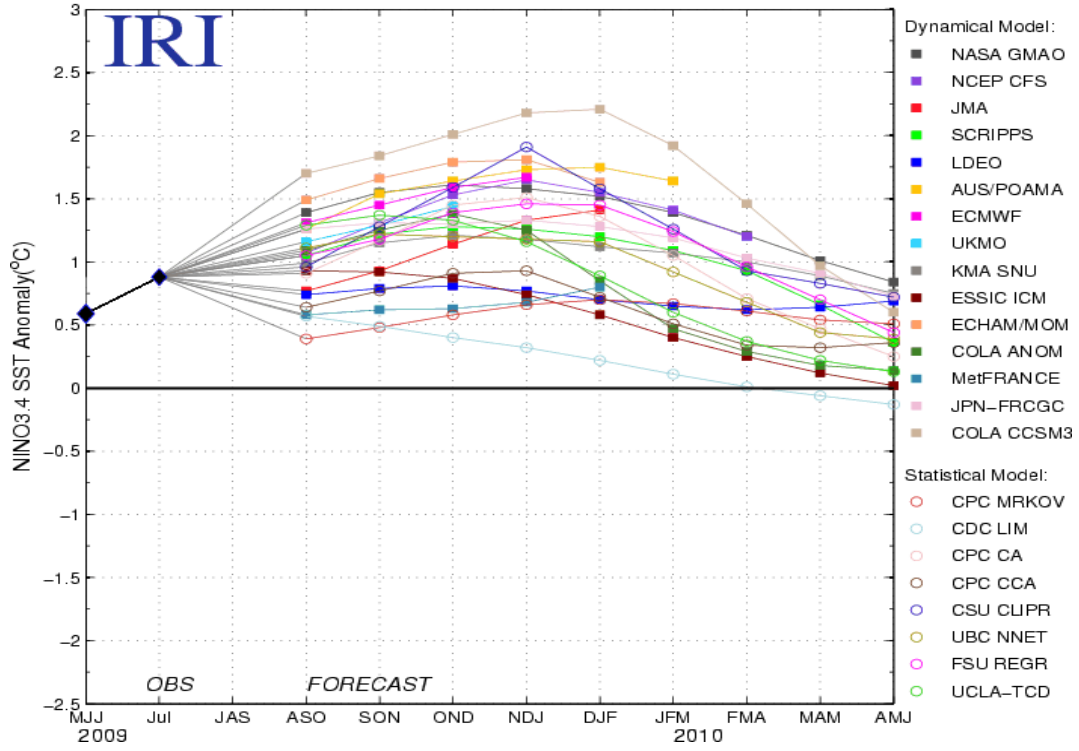


An El Niño continues to evolve over the central Pacific with the average ONI (May through July) of +0.6 (whereas the most recent weekly Niño 3.4 SST has risen to +0.9 as of Aug 31st, see below). This shows a healthy El Niño continues to form and will be with us into the winter months of 2009-10. The majority of model forecasts confirm at least a weak to moderate El Niño into winter.





Model Forecasts of ENSO from Aug 2009



The following analogue years were chosen with the idea of a resurgence of El Nino immediately following significant La Ninas and thus, were not preceded by another El Nino or Neutral pattern.

2009 ANALOGUE AUTUMN SEASONS													
DETROIT													
YEAR	Sep	Oct	Nov	Fall		YEAR	Sep	Oct	Nov	Fall			
1896	59.6	47.7	40.5	49.3	1	1896	4.23	1.65	1.72	7.60	1		
1911	64.5	50.9	35.6	50.3	2	1911	4.32	4.30	3.58	12.20	1		
1918	57.4	55.6	42.3	51.8	1	1918	4.10	1.87	2.12	8.09	2		
1925	66.1	44.5	38.1	49.6	3	1925	4.54	4.35	3.52	12.41	2		
1957	62.9	50.8	41.0	51.6	2	1957	2.91	4.83	3.28	11.02	3		
1965	66.2	51.3	42.7	53.4	1	1	1965	4.15	2.88	1.20	8.23	3	
1972	63.0	47.3	37.4	49.2	4	1972	3.40	2.24	3.19	8.83	4		
1976	62.1	47.4	33.5	47.7	5	5	1976	3.66	2.01	0.79	6.46	1	
1986	65.9	52.6	37.3	51.9	3	1986	7.52	3.05	1.88	12.45	4	5	
1991	63.1	54.8	38.5	52.1	4	1991	0.90	4.14	2.61	7.65	5	5	
2002	68.9	50.0	39.2	52.7	5	5	2002	1.99	1.15	2.72	5.86	2	2
Ave	63.6	50.3	38.7	50.9		Ave	3.8	3.0	2.4	9.16			
Norm	63.9	51.9	40.7	52.2		Norm	3.27	2.23	2.66	8.16			
FLINT													
YEAR	Sep	Oct	Nov	Fall		YEAR	Sep	Oct	Nov	Fall			
1925	65.3	42.5	36.1	48.0	1	1925	4.60	3.08	2.69	10.37	1		
1957	59.2	47.4	38.6	48.4	1	1957	0.94	3.65	2.07	6.66	1		
1965	62.5	49.4	40.9	50.9	1	1965	2.90	1.06	2.35	6.31	2		
1972	61.1	46.2	36.9	48.1	2	1972	4.54	3.73	2.33	10.60	1	1	
1976	60.6	46.8	33.3	46.9	3	3	1976	2.66	3.17	1.22	7.05	3	
1986	63.0	50.5	35.5	49.7	2	1986	10.86	1.96	0.94	13.76	2	2	
1991	59.6	52.8	36.2	49.5	3	3	1991	0.63	3.52	3.01	7.16	4	
2002	66.6	47.7	37.6	50.6	2	2	2002	0.29	1.27	1.38	2.94	5	5
Ave	62.2	47.9	36.9	49.0		Ave	3.4	2.7	2.0	8.10			
Norm	60.7	49.2	38.1	49.3		Norm	3.76	2.34	2.65	8.75			
SAGINAW													
YEAR	Sep	Oct	Nov	Fall		YEAR	Sep	Oct	Nov	Fall			
1911	61.5	48.4	35.0	48.3	1	1911	4.14	5.98	2.76	12.88	1		
1918	54.9	53.0	41.1	49.7	1	1918	2.06	2.75	3.05	7.86	1		
1925	63.9	40.6	35.1	46.5	2	1925	3.12	2.47	2.71	8.30	1		
1937	59.4	48.0	38.2	48.5	2	1937	4.90	4.11	2.53	11.54	2		
1965	61.7	49.6	40.3	50.5	1	1	1965	4.84	1.52	2.66	9.02	2	2
1972	59.3	43.7	35.7	46.2	3	1972	1.50	3.66	1.25	6.41	2		
1976	60.8	46.4	33.3	46.8	4	1976	1.55	2.53	0.84	4.92	3		
1986	60.9	49.3	34.4	48.2	5	1986	16.16	2.38	0.51	19.05	3	3	
1991	58.5	50.9	35.5	48.3	6	6	1991	0.91	3.61	3.25	7.77	4	
2002	64.7	46.2	35.5	48.8	3	3	2002	0.39	1.82	1.23	3.44	5	5
Ave	60.6	47.6	36.4	48.2		Ave	3.96	3.08	2.08	9.12			
Norm	60.7	49.5	38.0	49.4		Norm	3.95	2.49	2.65	9.09			

Interestingly, these set of analogues actually mimic the summer analogues where generally normal to below normal weather prevailed. Actually, inspecting the individual months closer, shows more typical fairly nice early autumn weather with around normal temperature (but with the risk of earlier frosts/freezes). Actually, a

decent amount of Septembers /5/ show above normal temperatures. Later, the preference turns toward normal to below normal mid or late autumn. On the whole, however, the Autumn looks to be around normal temperatures-wise.

Rainfall from the analogues was quite variable from extremely wet to very dry (especially monthly). Drier autumns were more prevalent to the north with rainfall in the analogue Septembers misleading and skewed much higher due to the flooding rains of 1986 in the Saginaw Valley, Flint area and Thumb Region. Take out just that one year at Detroit, Flint and Saginaw, and average rainfall drops considerably. Our wet/dry pattern is still there, but less skewed on the high side. Detroit shows more wet falls simply because more years were available (and those contained mainly normal to above normal rain). With such a wide range, there is little preference here and thus will keep it around normal.

Earlier Frost and/or Freeze?

Every Outlook I scan each year for similarities and trends relating to the present. Probably one of the most anticipated trend I expected to find was the likelihood of an earlier frost and or freeze this year. Why? Simply put, the aggressiveness and persistence of the Polar Jet stream this past summer over Eastern Canada can't be ignored. This pattern is also reflected in the dominant negative NAO seen this summer (and last winter). So then, when did this set of data project the frost and freeze estimated dates? Where they earlier than average?

First off, I used only Detroit's set since it went back the furthest (but this shouldn't hinder the frost/freeze results, since they were estimates on Detroit's low temperatures and only a slight urban heat island prevailed most years). This should be helpful across the entire region. In addition, this is the kind of research too much data will "cloud" the issue more since low temperature due to terrain can be quite variable. I checked for dates in the autumns where the temperatures fell to the 34-37 degree range at Detroit Metro Airport or Detroit for estimated first or generally light to moderate frost dates, of course the colder /34/ the heavier the frost and possible vegetation damage. Chances are very good if Metro or the Detroit city falls into the mid 30s, much of the region will see this condition (of course, providing weather conditions are conducive for the formation of frost). The freeze dates were estimated from when the temperature first fell to the 32-33 degree area at Detroit Metro Airport. Obviously, if the temperatures falls to freezing at Metro, chances are excellent much of Southeast Lower Michigan will see a hard freeze with readings down as low as the 20s, commonplace. The exceptions are generally right near the Great Lakes and from Detroit south along the Lake Erie shoreline. Generally, it was found the frost and freezes occurred roughly about a week earlier. The fall of 1918

was really an outlier with a late frost and freeze with the October averaging a mild 55.5 /+3.6/. At the same time, late September frost and freezes popped up enough to get our attention. Some areas had freezes when reading at Detroit was around 35-34, so it's location location. I've also added the snowfalls for October and November each year for Detroit. The snowfalls also reflect the colder than normal weather late fall and in some years /three/, over seven inches fell in November /normal 2.7/.

<u>FROST/FREEZE</u>			<u>SNOW</u>		
	frost	freeze	YEAR	Oct	Nov
1896	20-Sep	23-Sep	1896	T	T
1911	27-Oct	28-Oct	1911	0.0	7.0
1918	1-Nov	Nov-14	1918	0.0	T
1925	9-Oct	10-Oct	1925	2.0	7.8
1957	28-Sep	12-Oct	1957	T	1.7
1965	27-Sep	5-Oct	1965	T	0.2
1972	9-Oct	9-Oct	1972	T	7.1
1976	24-Sep	16-Oct	1976	T	1.4
1986	7-Oct	16-Oct	1986	T	3.3
1991	27-Sep	28-Sept	1991	T	2.2
2002	13-Oct	14-Oct	2002	0.0	1.6
			Ave	T	3.6

frost	freeze
37-34	33-32
Med	Med
lws-fwo	sw0

Norm T 2.7

lws=ave last week of Sep-first week Oct / sw0=by the second week of Oct

Some notable Autumn Dates:

Autumn begins: 518PM EDT, Sep 22nd, 2009 Harvest Moon: Oct 4th, 2009
 Halloween: Saturday Oct 31st, 2009 Thanksgiving: Nov 26th 2009

Enjoy the fall, and take advantage of the Indian Summer(s) (which look likely, especially with the risk of earlier frosts/freezes). Look for the Winter 2009-10 Outlook due out late October-early November.