LA NINA SETTLES IN FOR THE WINTER OF 2007-08

ACTIVE STORM TRACK SHOULD MAKE FOR ONE CHANGEABLE WINTER

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Local Data suggests:

Temperatures:

Look for temperatures during the winter to be quite variable (more than usual) due to a rather strong and oscillating southwest to northwest jet stream, guided by La Nina in conjunction with the North Atlantic/Arctic Oscillation /NOA, AO/. In the final analysis, look for temperatures to average around normal /-1.0 to +1.5/ of the 30 year normal (see charts for cities further down).

Expanding further on this "normal" idea, it is interesting to note that the 100 year winter mean temperature for Detroit is approximately 26.7 degrees with a one standard deviation spread of 3.5 degrees either side of that 26.7. Statistically speaking, based on this data the temperatures could average as low 23.2 degrees or as high as 30.2 and still be considered within a "normal" range of the mean. Basically, this just supports the idea that winter temperatures in these parts, by nature, have a wide statistical range and this winter should be no exception!

Snowfall and Rainfall:

Because of the variability of the temperatures seen in many of our analogue winters, snowfall ranged from above normal to below. The best chance for above snow obviously will lie just north of the main storm tracks in the colder air (see more in storm tracks section). Therefore, taking the estimated storm tracks into account, it appears much of the area will see at least near normal snowfall. Obviously, more fluctuations of the storm track could lead to below to above the mean snowfall for the area. Overall, above normal precipitation (rain and melted snow) is forecast across the entire region.

The official national winter/monthly outlooks from the Climate Prediction Center is updated regularly, that is available at: http://www.cpc.ncep.noaa.gov/index.html

Broad Scale Discussion

An interesting and another challenging winter is ahead of us with two main weather features, La Nina and the NAO, working together (and apart) to bring Southeast Lower Michigan a rather diverse but fairly busy winter.

1 - La Nina

Originally, it looked as though La Nina (and its associated pattern) would arrive in the summer but since then, it has developed nicely and is on track to influence the upcoming winter weather patterns. Checking out the Pacific water temperatures in Nino 1+2, 3 and 4 (Fig-1a, b), shows the distinctive and fairly rapid cooling of the areas of the Pacific Ocean used in determining the pattern. For scientific purposes, Nino 3.4 is used to determine officially, whether or not a La Nina is in effect. The temperature in Nino 3.4 has slipped to approximately 1.4C below normal in October which denotes a La Nina state. To officially be classified as a full-fledged La Nina, the temperature must average at/or below -0.5C for a period of at least 5 consecutive overlapping 3-month seasons. La Nina "conditions" are considered to be occurring when the SST departure of area Nino 3.4 are at/below -0.5C along with La Nina-type atmospheric conditions. Below are the October SST anomalies in all areas denoted.

Fig-1a

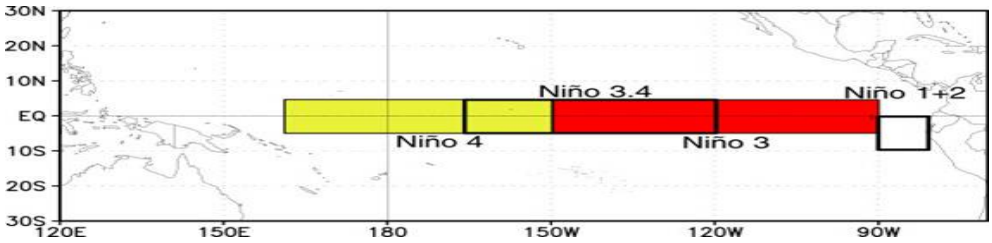
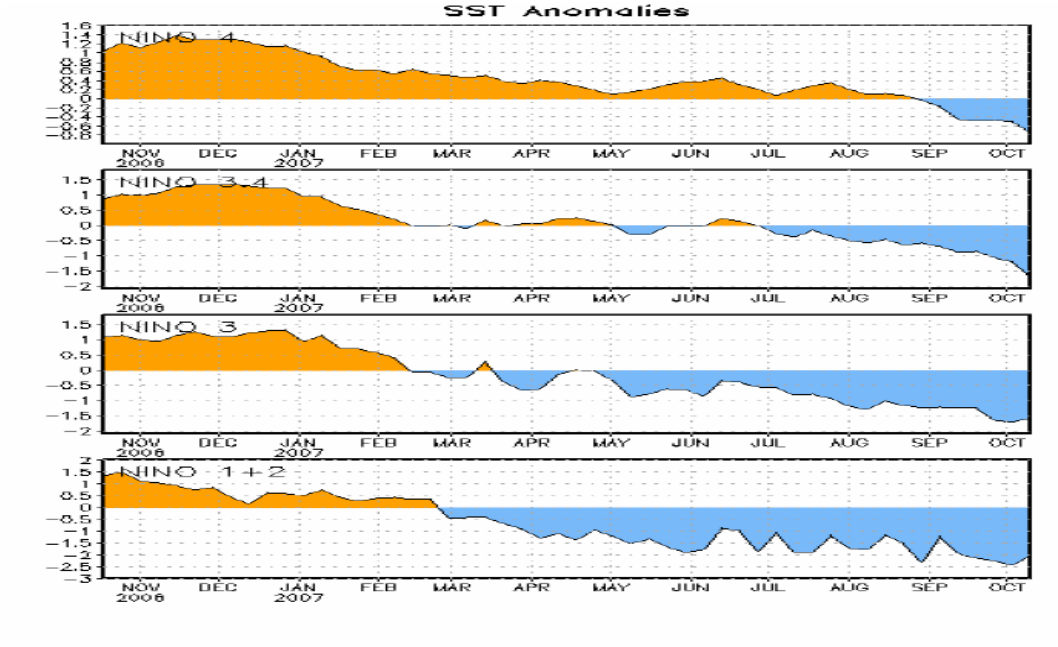


Fig-1b



The latest computer projections (as of October, Fig-2) shows that La Nina is expected to max-out late this year. This latest projection intensifies La Nina to at least a moderate state off the coast of South America (Fig-3).

Fig-2

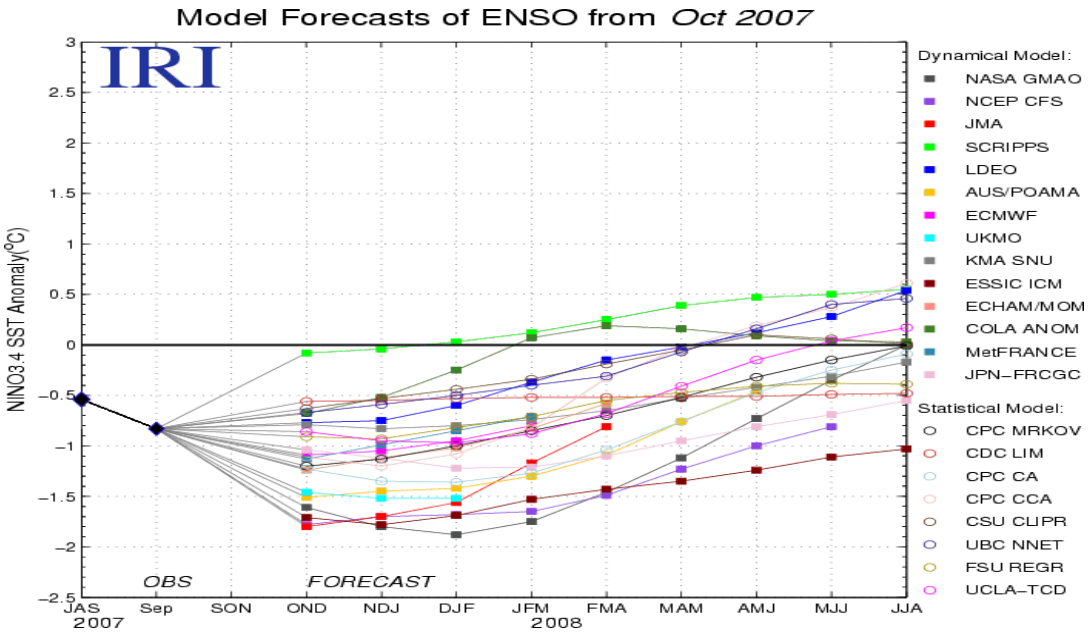
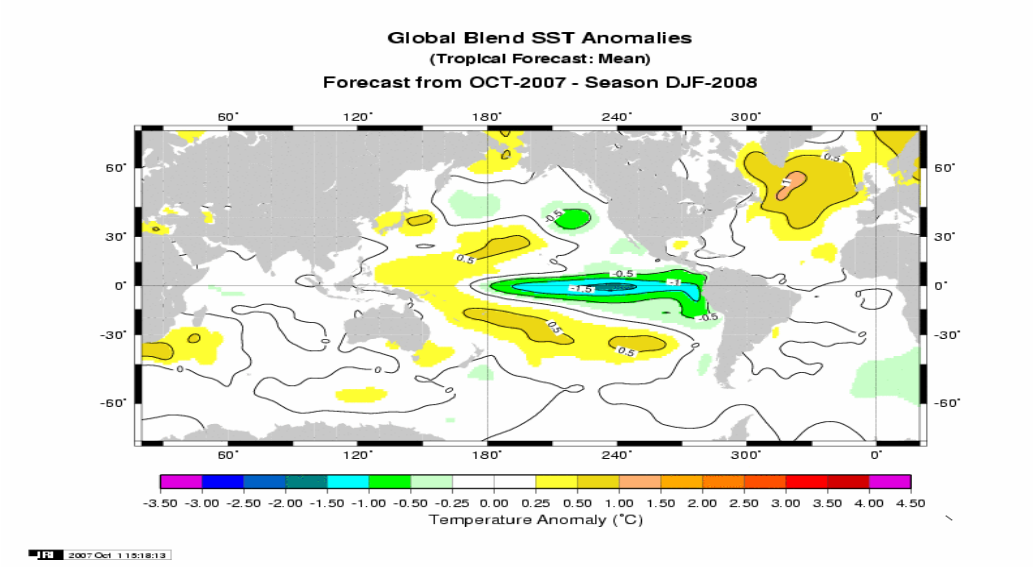


Fig-3



NAO/AO

The other main ingredient in this winter's weather (like any other) is of course, the trend of the North Atlantic Oscillation/Arctic Oscillation throughout the winter. Of course, this is the biggest challenge to the forecast and potentially, has the biggest bust potential. While trends with La Ninas and El Ninos are seen (and these are not always consistent, either) the NAO is highly elusive and generally trends are seen only a week or two out. Generally, our colder winters in the study reflect a predominately negative NAO. The winter of 1903-04 in our La Nina list below was a brutal winter with cold and snow. This remains our coldest winter to date on record since 1870 at Detroit. However, in that same list, the Winter of 1920-21 (is the 12th warmest winter on the list in the last 136 years with a relatively balmy average of 31.2 degrees). In long term trend of the NAO (Fig-4 a, b) clearly shows the oscillations long and short term from positive to negative and back to positive. As one can see, the predominant relatively recent positive trend has been comparatively strong and resilient.

Fig-4a

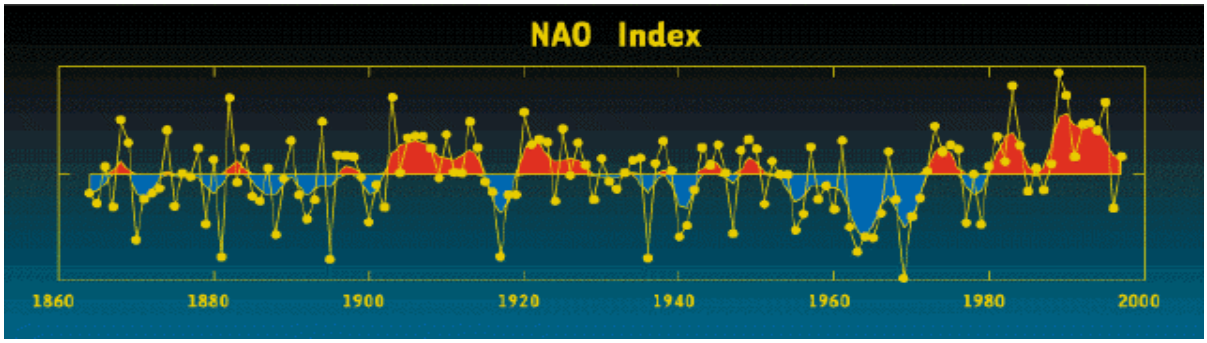
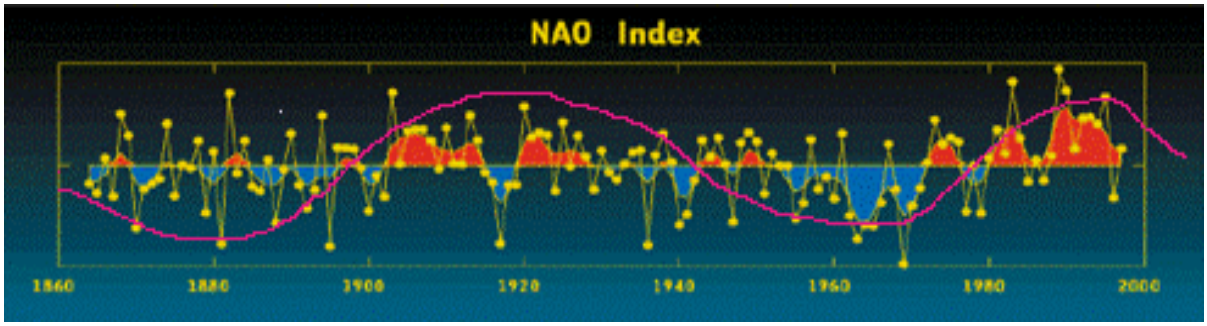


Fig-4b



The relatively shorter time span below of the NAO for basically the winter months (JFM)is seen below (Fig-4c) since the 1950s. All graphs show the recent decline toward possibly an overall, more neutral period (maybe similar to that of the mid 1930 into the 1940s, if history repeats itself. The latest trace of NAO (Fig-4d) reflects the past four months. The NOA oscillations have for the most part, remained in a neutral phase with short term projections toward the negative.

Fig-4c

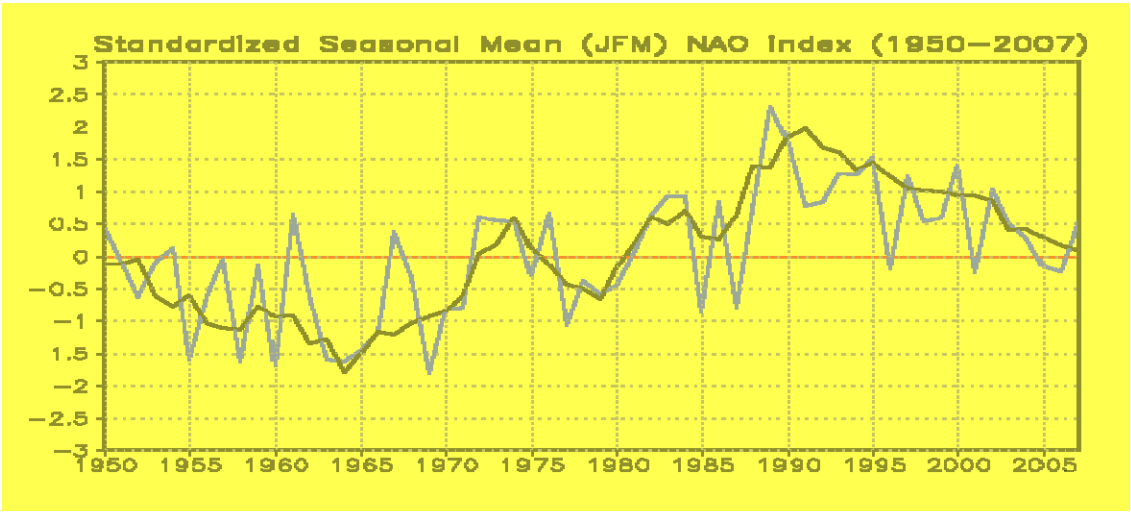
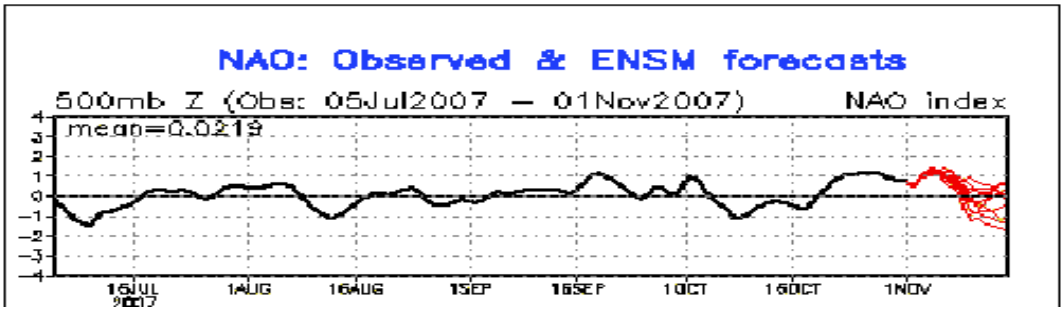


Fig-4d



2007-08 Analogue Winters

Researching locally as far back as the late 1800s, 15 winters were chosen for our analogue winters this go around (see: Analogue Winters 2007-08 charts for Detroit, Flint and Saginaw below). Several of these selected winters followed a similar sequence of events recently observed over the Eastern Pacific the past few seasons. El Nino prevailed during much of the previous winter, which then faded to Neutral conditions in the spring and early summer, only to be followed by a weak to moderate La Nina in the later half of the year.

DETROIT

ANALOGUE WINTERS 2007-08

DETROIT	T	E	M	P	S		P	C	P	N
SEASON	DEC	JAN	FEB	WNT AVE	WINTER	WIN TOT	SEASON	DEC-FEB	WINTER	WIN TOT
1886-87	23.9	23.0	28.2	25.0	1		1886-87	7.68	1	
1903-04	22.5	17.6	16.1	18.7	2		1903-04	7.72	2	
1906-07	29.0	26.0	21.2	25.4	3		1906-07	8.25	3	
1909-10	23.0	25.1	22.4	23.5	4		1909-10	7.57	4	
1920-21	32.8	30.5	30.4	31.2	1		1920-21	4.66	1	
1924-25	23.2	22.5	30.8	25.5	5		1924-25	6.72	1	
1947-48	29.0	19.6	24.4	24.3	6		1947-48	5.60	2	
1954-55	29.7	26.3	26.4	28.1	1		1954-55	5.90	3	
1964-65	30.4	25.5	26.6	27.5	2		1964-65	8.42	5	
1970-71	29.0	20.7	27.4	25.7	7		1970-71	5.32	4	
1973-74	28.7	26.5	23.6	26.3	3	3	1973-74	9.14	6	
1983-84	20.8	18.0	33.3	24.0	8		1983-84	5.87	5	
1984-85	34.0	20.3	23.4	25.9	9		1984-85	9.36	7	7
1995-96	25.6	24.3	26.0	25.3	10	10	1995-96	4.46	2	2
1998-99	35.3	23.1	32.7	30.4	2	2	1998-99	6.14	6	6
Ave	27.8	23.3	26.3	25.8			Ave	6.85		
NORM 30Y	29.6	24.5	27.2	27.1	100YR -	26.7	Norm	6.30		
Dep	-1.2	-1.2	-0.9	-1.3		5	Dep	0.55		

DETROIT	S	N	O	W	F	A	L	L		
SEASON	OCT	NOV	DEC	JAN	FEB	MAR	APR	SEA TOT	SEASON	SEA TOT
1886-87	0.0	0.6	20.8	12.8	6.9	9.3	2.5	52.9	1	
1903-04	T	2.3	12.3	20.1	5.8	14.7	1.8	57.0	2	
1906-07	T	1.2	7.1	12.7	5.8	3.2	0.8	31.0	1	
1909-10	0.4	0.3	14.7	22.2	9.1	0.1	T	46.8	1	1
1920-21	0.0	5.4	7.3	0.8	14.2	3.8	4.6	36.1	2	
1924-25	0.0	1.0	7.4	10.5	2.7	8.4	0.0	30.0	3	
1947-48	0.0	3.1	9.4	5.0	4.6	4.5	T	26.6	4	
1954-55	T	0.7	6.6	2.9	10.9	6.2	T	27.3	5	
1964-65	T	2.6	8.4	7.1	15.8	12.9	2.4	49.2	3	
1970-71	0.0	1.7	9.8	8.7	5.9	8.7	0.6	35.4	6	
1973-74	0.0	0.1	16.4	14.1	11.2	5.7	1.7	49.2	4	
1983-84	0.0	3.5	19.9	9.9	8.7	9.7	0.1	51.8	5	
1984-85	0.0	4.1	6.2	20.9	16.9	6.1	0.9	55.1	6	
1995-96	0.0	1.3	4.5	6.3	3.6	11.8	0.1	27.6	7	7
1998-99	0.0	0.0	1.2	27.3	7.8	13.2	0.0	49.5	7	7
Ave	0.0	1.9	10.1	12.1	8.7	7.9	1.3	41.7		
Norm	0.3	2.7	11.1	11.9	9.3	7.0	1.7	44.0		
Dep	-0.3	-0.8	-1.0	0.2	-0.6	0.9	-0.4	-2.3		

Color	Temps	Degrees		Rain	Inches		Snow	Inches
Legend	Below	1.0>		Below	1.00>		BELOW	<5.0
	Normal	0.0-1.0		Normal	0.00-1.00		Normal	>-5.0<5.0
	Above	1.0>		Above	1.00>		Above	>5.0

FLINT

ANALOGUE LA WINTERS 2007 I 08

FLINT	T	E	M	P	S		P	C	P	N
SEASON	DEC	JAN	FEB	WNT AVE	WINTER		SEASON	DEC-FEB	WINTER	WNT TOT
1903-04	20.7	13.1	11.4	15.1	1		1903-04	4.84	1	
1906-07	26.3	21.8	20.1	22.7	2		1906-07	7.02	1	
1909-10	23.5	22.8	21.9	22.7	3		1909-10	4.19	2	
1920-21	31.2	28.7	27.4	29.1	1		1920-21	4.84	3	
1924-25	23.6	19.2	28.0	23.6	1		1924-25	4.70	4	
1947-48	26.7	16.5	21.8	21.7	4		1947-48	4.99	5	
1954-55	25.3	23.2	24.2	24.2	2		1954-55	5.45	6	
1964-65	27.6	22.1	24.8	24.8	3		1964-65	6.18	2	
1970-71	26.8	19.6	26.3	24.2	4		1970-71	4.02	1	
1973-74	28.2	24.8	20.9	24.6	5		1973-74	7.55	3	
1983-84	20.1	14.4	31.2	21.9	5	5	1983-84	2.93	2	2
1984-85	33.4	19.8	22.7	25.3	2		1984-85	8.83	4	4
1995-96	23.0	21.9	23.7	22.9	6	6	1995-96	4.42	7	
1998-99	32.3	20.6	31.0	28.0		3	1998-99	5.58	8	8
Ave	26.3	20.6	24.0	23.6			Ave	5.40		
Norm	26.7	21.3	23.8	23.9			Norm	5.10		
Dep	-0.4	-1.3	0.2	-0.3			Dep	-0.3		

FLINT	S	N	O	W	F	A	L	L		
SEASON	OCT	NOV	DEC	JAN	FEB	MAR	APR	SEA TOT	SEASON	SEA TOT
1903-04	0.0	1.5	6.7	13.7	6.1	8.5	8.5	45.0	1	
1906-07	3.0	2.5	5.1	8.5	1.5	3.0	0.5	24.1	1	
1909-10	0.0	1.0	8.5	4.5	6.0	0.0	0.0	20.0	2	
1920-21	0.3	9.1	10.7	8.8	1.5	0.1	0.0	30.5	3	
1924-25	0.0	1.4	4.4	7.8	5.4	9.2	0.0	28.2	4	
1947-48	0.0	6.8	8.2	12.4	6.4	10.4	T	44.2	2	
1954-55	0.0	1.0	10.1	3.1	13.6	5.3	T	33.1	5	
1964-65	T	4.7	10.0	13.3	19.7	19.4	5.8	72.9	1	
1970-71	0.0	1.5	19.9	9.7	6.1	16.8	0.9	54.9	2	2
1973-74	0.0	T	18.3	9.3	14.2	6.0	0.4	48.2	3	
1983-84	0.0	2.4	20.0	9.0	3.6	6.5	0.5	42.0	6	
1984-85	0.0	1.1	11.0	15.3	14.4	6.4	1.2	49.4	4	
1995-96	T	3.5	7.1	4.9	5.4	17.7	1.2	39.8	7	7
1998-99	0.0	0.2	3.4	24.9	6.0	14.4	T	48.9	5	5
Ave	0.3	2.8	10.2	10.4	7.9	8.8	1.7	41.5		
Norm	0.3	3.5	11.6	13.2	9.4	7.7	2.6	48.3		
Dep	0	-0.7	-1.4	-2.8	-1.5	1.1	-0.9	-6.8		

	Temps	Degrees		Rain	Inches		Snow	Inches
Color	Below	1.0>		Below	1.00>		BELOW	<5.0
Legend	Normal	0.0-1.0		Normal	0.00-1.00		Normal	>-5.0<5.0
	Above	1.0>		Above	1.00>		Above	>5.0

SAGINAW

ANALOGUE LA WINTERS 2007 I 08

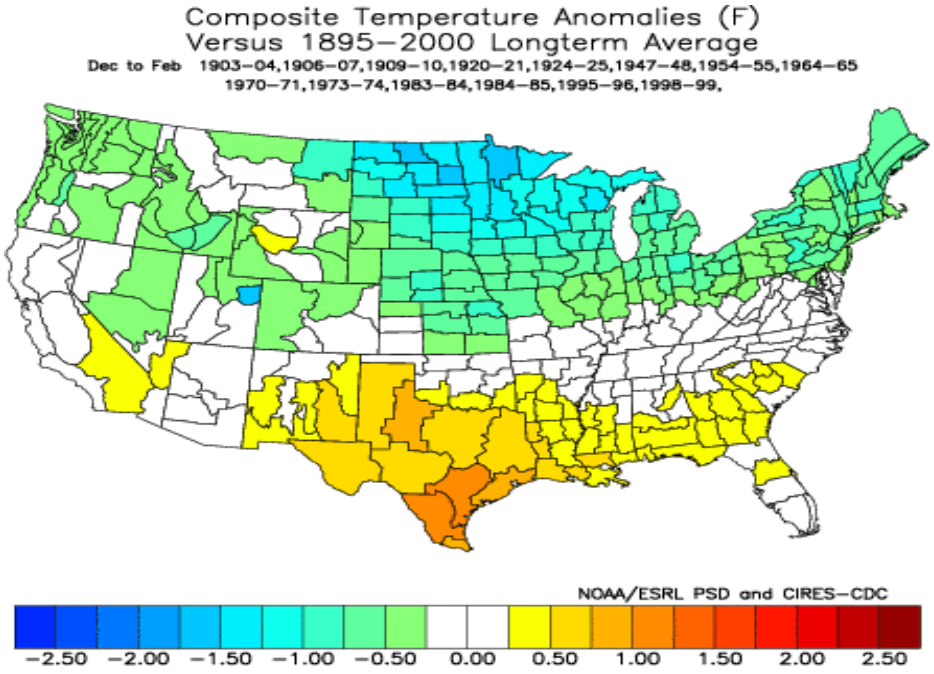
SAGINAW	T	E	M	P	S		P	C	P	N
SEASON	DEC	JAN	FEB	WNT AVE	WINTER		SEASON	DEC-FEB	WINTER	WNT TOT
1903-04	22.3	14.6	11.8	16.2	1		1903-04	5.33	1	
1906-07	26.3	23.5	19.9	23.2	1		1906-07	6.71	1	
1909-10	24.1	23	21.6	22.9	2		1909-10	5.65	2	
1920-21	31.4	28.7	28.3	29.5	1		1920-21	5.31	3	
1924-25	21	18.9	26.8	22.2	3		1924-25	4.08	1	
1947-48	26.3	15.9	19.9	20.7	4		1947-48	4.64	4	
1954-55	25.7	21.9	22.4	23.3	2		1954-55	5.17	5	
1964-65	25.7	20.7	22.8	23.1	3		1964-65	8.39	2	
1970-71	26.6	20	24.7	23.8	4		1970-71	4.85	6	
1973-74	26.1	24.6	19.8	23.5	5		1973-74	7.53	3	
1983-84	18.8	18.9	31.5	23.1	6	6	1983-84	3.15	2	2
1984-85	29.4	16.9	22.2	22.8	5		1984-85	7.39	4	4
1995-96	22.9	21	23.6	22.5	6	6	1995-96	5.58	7	
1998-99	32	19.4	30.5	27.3	2	2	1998-99	5.82	8	8
Ave	25.6	20.6	23.3	23.2			Ave	5.69		
Norm	27	21.4	23.8	24.1			Norm	5.45		
Dep	-1.4	-0.8	-0.5	-0.9			Dep	0.24		

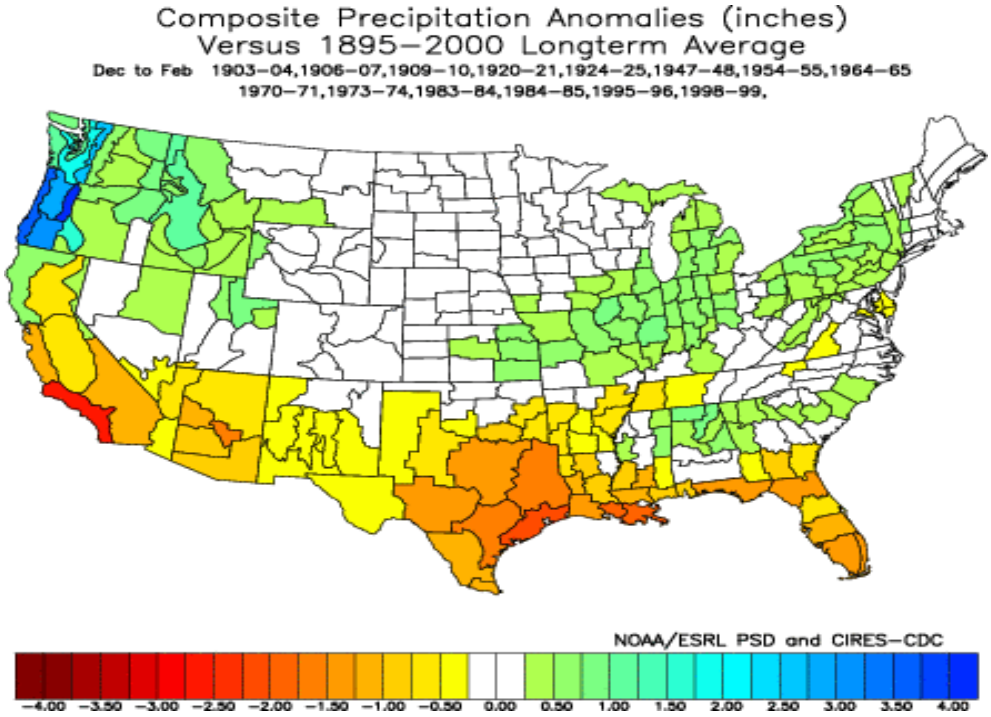
SAGINAW	S	N	O	W	F	A	L	L		
SEASON	OCT	NOV	DEC	JAN	FEB	MAR	APR	SEA TOT	SEASON	SEA TOT
1903-04	0.0	2.2	11.2	12.5	18.9	0.5	2.5	47.8	1	
1906-07	3.7	0.5	7.3	10.4	3.7	7.6	4.0	38.0	1	
1909-10	0.8	2.0	20.0	6.5	7.8	0.2	0.0	37.3	2	
1920-21	0.0	0.9	7.0	0.9	10.7	1.0	0.5	21.0	3	
1924-25	0.0	0.5	4.5	8.8	5.6	13.5	0.0	32.9	4	
1947-48	0.0	12.3	19.9	11.6	8.0	8.8	0.0	60.6	1	
1954-55	0.0	1.0	19.3	4.8	13.1	6.5	0.0	44.7	2	
1964-65	0.0	1.9	10.5	10.6	20.3	11.8	6.0	61.1	2	
1970-71	0.0	0.1	11.5	8.2	7.8	27.5	0.4	55.5	3	
1973-74	0.0	0.0	11.6	8.3	10.1	12.3	0.0	42.3	3	3
1983-84	0.0	1.8	11.8	7.5	0.1	4.4	0.0	25.6	5	5
1984-85	0.0	1.0	11.6	15.8	19.8	13.0	1.0	62.2	4	
1995-96	0.0	23.0	14.2	12.4	5.9	10.3	2.6	68.4	5	
1998-99	0.0	T	4.8	29.0	6.0	14.2	T	54.0	6	6
Ave	0.3	3.6	11.8	10.5	9.8	9.4	1.3	46.5		
Norm	0.2	3.8	10.2	11.8	8.3	8.0	2.2	44.5		
Dep	0.1	-0.2	1.6	-1.3	1.5	1.4	-1.1	-2.0		

	Temps	Degrees		Rain	Inches		Snow	Inches
Color	Below	1.0>		Below	1.00>		BELOW	<5.0
Legend	Normal	0.0-1.0		Normal	0.00-1.00		Normal	>-5.0<5.0
	Above	1.0>		Above	1.00>		Above	>5.0

COMPOSITE MAPS OF ANALOGUE WINTER YEARS

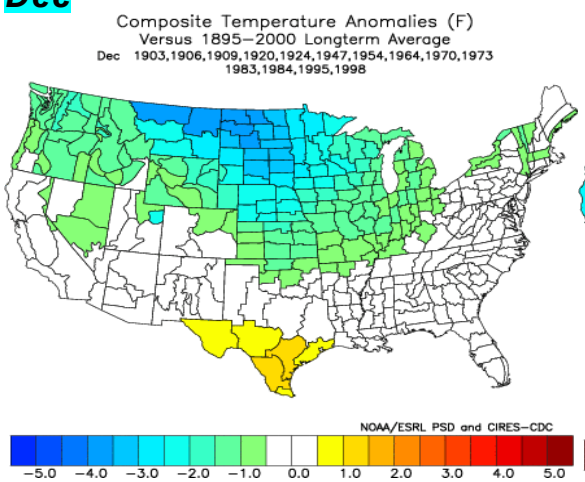
Below are the composite maps for the analogue years in the local study. Remember these maps average what <u>happened</u> over the region and do not take into account any recent trend observed over the region. They are only a "guidance tool" to past La Nina winters.

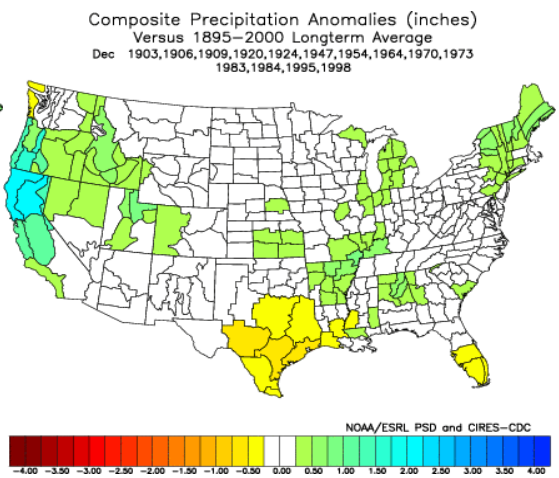




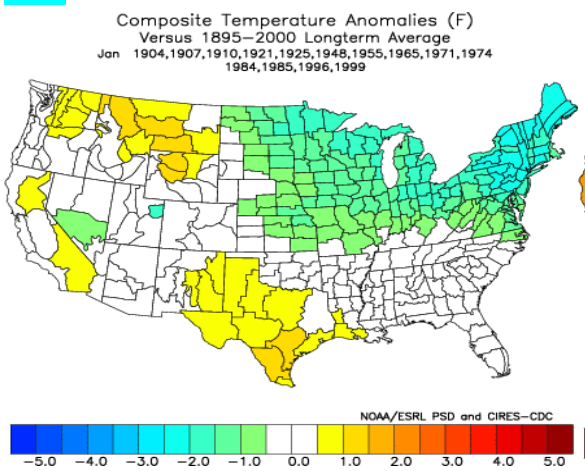
Month by Month

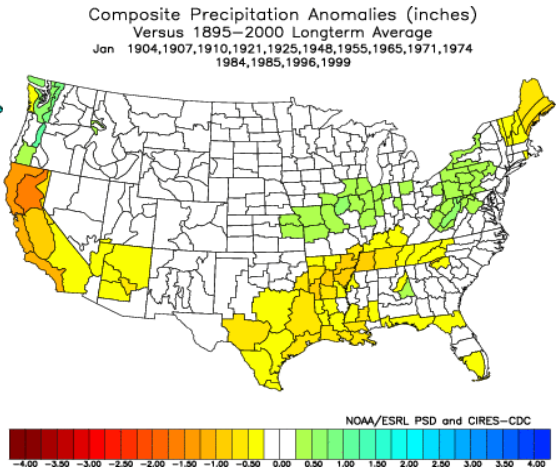
Dec



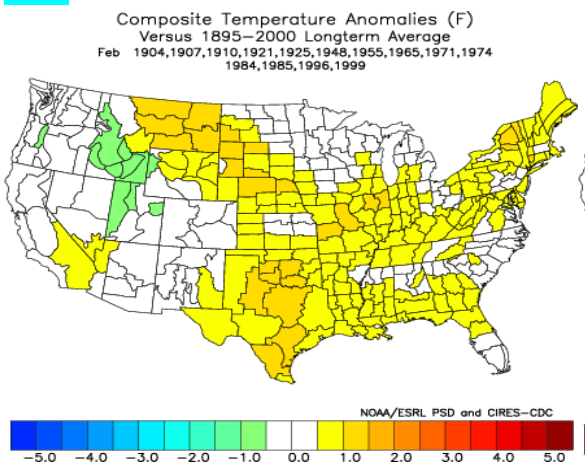


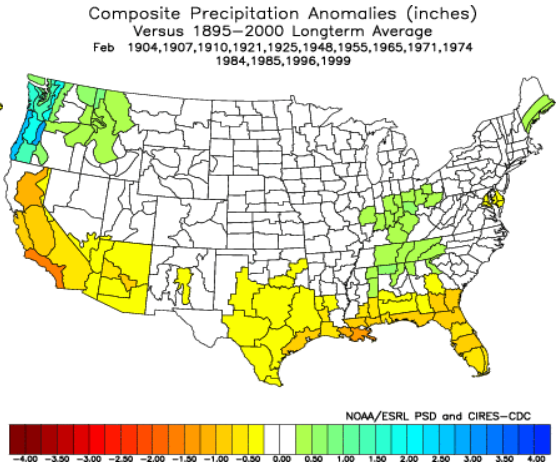
Jan





Feb





Local Comparisons/Results:

Many of our earlier winters (before 1950) indicate colder than normal temperatures across Southeast Lower Michigan. In the later years (after 1950), generally more of a mixed picture is seen with below, above and normal (or average) winters. Season snowfall totals were all over the board, which really isn't surprising if one considers the jet stream and storm tracks associated with these years - where just a variation of 50 miles or so can make all the difference in the world.

As far as comparison to normals (color coded), Detroit's comparison to its recent normals has to taken with a grain of salt since the normals were raised in the 1971-2000 data. This was primarily on account of the heat-island effect seen out at Detroit Metro Airport. It is the main reason Detroit having more colder winters (relatively speaking) than Flint and Saginaw since the normals for Detroit were raised higher. The best way is to look at Detroit is to use the 100 year normal (or mean) of 26.7 degrees which brings the long term normal down a bit /-0.4/ and more in line with the remainder of Southeast Lower Michigan. When that normal is used, Detroit's winter ratio changes with 5 near normal rather than just 3 (it also drops the colder winters to 8).

Note that both Flint and Saginaw each have 5 or 6 winters that averaged normal or below from the data set. That is a large chunk of the data with the remaining 2 or 3 winters only above normal. Overall, our 15 winters averaged near to slightly below normal, but this is without the recent above normal temperature trend. It is more important how the winter temperatures arrived at that point. As stated in the opening, the winter temperatures fluctuations are expected to be noteworthy.

STORM TRACKS

Jet axis holds the one of the keys to this winter

The interaction between La Nina influenced Pacific jet stream and the North Atlantic Oscillation will hold the key to this winter's storm tracks and what type of storms develop over the country. The interaction of the two, whether it be by phasing or split flow will, to a large extent, layout a pattern.

On the left (Fig-7/8) is the composite of the 500 MB Heights from Nov-Mar during many La Nina seasons. On the right is the 500 MB composite anomaly which shows the difference from the norm. Note the cold below normal heights focused over Northwest Canada and the streak of above average heights/winds from the southern Rockies into the Ohio Valley and Mid Atlantic Region in a rather tight temperature gradient over the mid part of the country. Below that, (Fig-9) is the mean (or average 500 MB flow) projected by six experimental models for this winter.

Fig-7

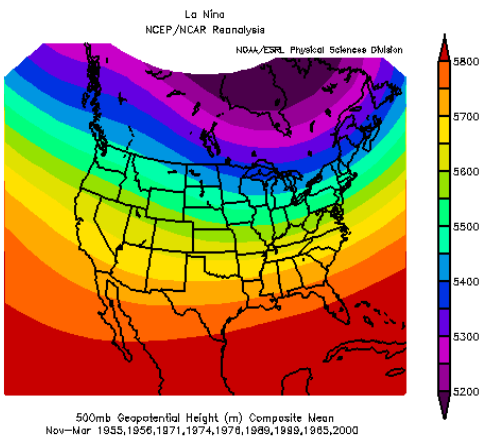
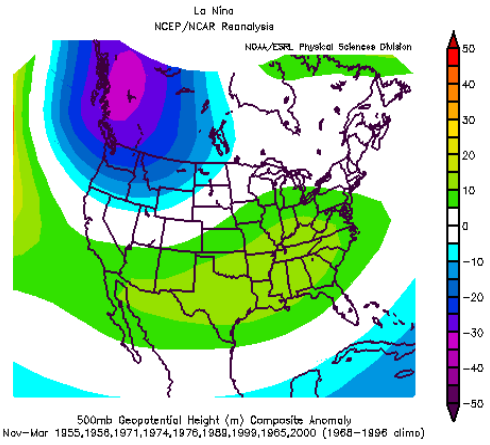
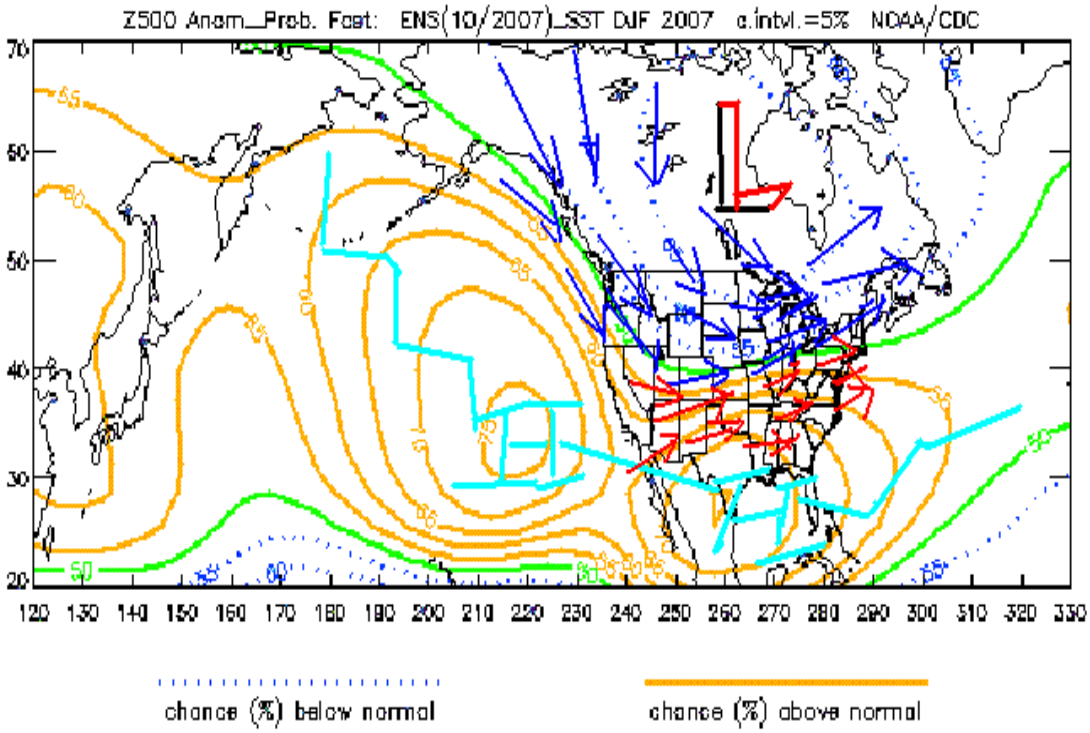


Fig-8



Here is the mean (or average 500 MB flow) projected by six experimental models for this winter. I have annotated the mean wind flow and pressure patterns. Again, here a rather tight north-south temperature gradient (or baroclinic zone) is implied and is accompanied by a rather strong jet stream over the mid part of the country. Along with the resultant snow and rain, mixed precipitation would also be a more of a concern.

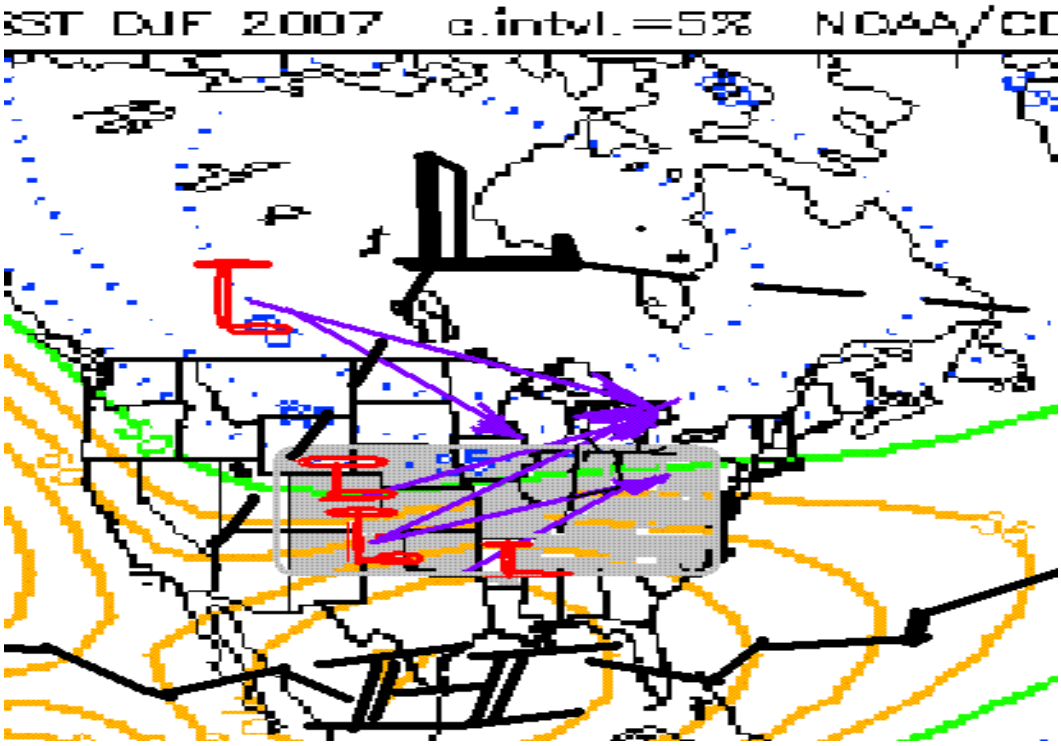
Fig-9



The estimated storm tracks (Fig-10) could be quite interesting, especially when phasing occurs. Note the most likely storm tracks over the country and Great Lakes. Storm tracks are in purple, while the main convergence between

the two jets is shown in gray-scale along with the mean 500 MB pattern in black.

Fig-10

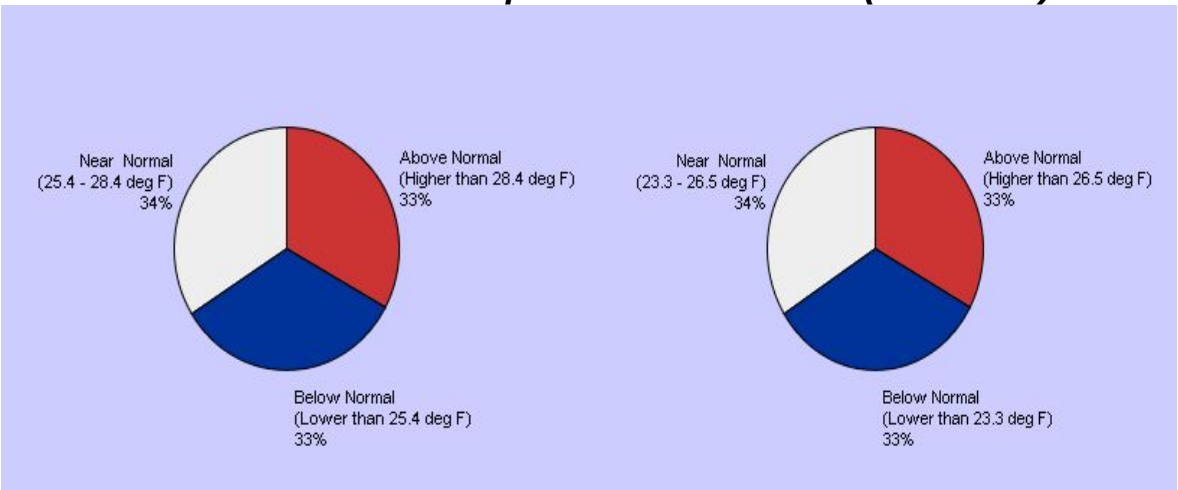


Local 3 Month Outlook Statistical Pie Charts
Dec-Feb 2007-08
By Karen Kahl

Pie Charts

The first set of images below illustrates chances for above normal, near normal, and below normal conditions as a percentage of a pie chart. In the past, the national outlook has given the probability of falling in the highest category, but the pie charts now give the chances of falling in each category. These charts also provide temperature data so the above normal, near normal, and below normal ranges are explicitly defined. The data obtained from these pie charts should be interpreted very carefully and evaluated on an individual site by site basis to make correct use of the information. Data at each site is highly dependent on both the climatology and spread of the observed data from the 1971-2000 period.

Winter 2007-08 Temperature Pie charts (as of Oct)



Detroit Metro Area ***Flint/Saginaw Region***

For more information, see

http://www.nws.noaa.gov/om/brochures/climate/L3MTO_PFS1.pdf

Some Winter Dates:

Winter Begins very early on December 22nd at 108 AM EST
Holiday Full Moon: Monday December 24th, 2007
Christmas : Tuesday December 25th 2007
New Years: Tuesday January 1st 2007

Try to get out and enjoy some outdoor winter activites this season and look for possible updates as the winter pattern unfolds. Look for a complete winter review after the snow ceases to fly.