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Winter 2020-2021 Preview

Forecast Updated: November 6, 2020

Winter 2020-2021 Highlights

- ENSO conditions are expected to be a weak La Nina
- The Quasi-Biennial Oscillation (QBO) will be switching to westerly with the continuation of low solar activity. This configuration typically favors a stronger Polar Vortex depending on strength of +QBO.
- Current top analogs are generally associated with the current SST anomalies and projections with solar/QBO.
- Slight decrease in the weight of the 2016-17 analog and introduced 2010-11 and 1967-68 as an analog.

ENSO

- Current projections favor a moderate La Nina as we head into Winter with weakening as we end Winter.
- Current ENSO readings from NOAA continue to show a moderate La Nina as of this week. Latest values in the 3.4 region were -1.7C.



Sea Surface Temperature Anomalies

- SST Anomalies show La Nina continuing to strengthen.
- SST Anomalies show warm water west of Greenland, which is usually promising for high latitude blocking. The SST anomalies over Northern Pacific remain supportive of +PNA and cooler intrusions. However, if we see cooler water develop from the Bering Sea to Northern Gulf of Alaska, this could favor a strong polar jet with fewer colder intrusions.



Analogs

 2016-17: This winter is currently still one of the analogs given the match up to the SST anomalies and the similar low solar/westerly QBO. However, we are starting to see discrepancies show up with this analog resulting in a slightly less weight. The winter featured a sharp north to south gradient of below normal to above normal temperatures with a sharp cutoff in average-above average snow and below average.



Top Analogs (cont.)

- 1985-86: SST anomalies are not a great match outside of the Atlantic. The QBO/solar do match with this winter having a cool-neutral ENSO. The blocking showed up in February resulting in many Eastern US cities seeing the most snow during this month.
- 2013-14: A very active winter for many with the main factor being a warm pool of water in the Northern Pacific. The +QBO/neutral-high solar configuration supported the high latitude blocking this winter.
 SST anomalies are a good match at this time. La Nina will be much stronger than this winter.

Analogs (cont.)

- 2010-11 Is rising on the analog list given the similarities to the SST, QBO trends, and low Solar. This winter was a snowy one for most with early season cold. The La Nina was moderate to start the winter, which is stronger than most guidance projections for this upcoming winter. As a result, we will only give this analog a low weight. Hurricane season was also very active with above average major hurricanes during 2010.
- 1967-68 A weak La Nina signal during the winter. High solar/easterly QBO are the opposite of what is expected, but do usually support a stronger polar vortex similar to low solar/westerly QBO.

2016-17 Snowfall in Inches by Month

City	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Boise, ID	0	0	14	21.5	3.3	0.2	0.1	39.1
Philadelphia, PA	0	0	0.3	5.7	2	7	0	15
Denver, CO	0	1.7	9.7	6.3	1.6	0	2.5	21.8
Flint, MI	0	0	20.2	10.4	1.9	5.4	1.5	39.4
Boston, MA	0	0	5.9	8.9	21.5	10.1	1.2	47.6
Salt Lake City. UT	0	5.7	11.1	23.2	6.7	3.6	1	51.3
Spokane, WA	0	3.3	19	13.5	19.8	5.4	0.5	61.5
New York, NY	0	0	3.2	7.9	9.4	9.7	0	30.2
Wilmington, DE	0	0	0	4.5	1.1	3.4	0	9
Cleveland, OH	0	0.9	9.6	11.5	3.2	9.3	2.8	37.3
Buffalo, NY	0	0.9	30.1	11	5	26.8	2.3	76.1
Green Bay, WI	0	0.9	23.1	14.6	5.6	9	0	53.2
Minneapolis, MN	0	2.3	15.8	8.4	0.3	4.7	0.5	32
Augusta, ME	0	0.1	20.6	8.4	41.4	16.3	4.3	91.1
Oklahoma City, OK	0	0	0.4	1.7	0	0	0	2.1
Kansas City	0	0	2.3	2.2	0	0.4	0	4.9
Raleigh, NC	0	0	0	0.5	0	0.3	0	0.8
Louisville, KY	0	0	0.1	2.6	0	0	0	2.7
St. Louis, MO	0	0	0.2	1	0.2	1.8	0	3.2
Chicago, IL	0	0	17.7	0.6	0	7.8	0	26.1
Allentown, PA	0	0	0.7	2.2	7.1	18.3	0	28.3

1985-86 Snowfall in Inches by Month

City	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total
Boise, ID	0	18.6	12.6	3.9	4.4	0	0	39.5
Philadelphia, PA	0	0	1.5	3.4	11.5	0	0	16.4
Denver, CO	1.9	17	10.3	2.4	6.2	2.6	14	54.4
Flint, MI	0	3.4	13.2	11.2	20.6	4.3	0.6	53.3
Boston, MA	0	3	1.3	0.8	10.4	2.6	0	18.1
Salt Lake City. UT	0	27.2	14.7	3.9	1.7	1	5.5	54
Spokane, WA	0.4	23.7	8.3	14.7	13.8	0	0.2	61.1
New York, NY	0	0	0.9	2.2	9.9	0	0	13
Wilmington, DE	0	0	1.4	3.1	9.7	0	0	14.2
Cleveland, OH	0	0	23.4	17.2	10.8	6.7	0.2	58.3
Buffalo, NY	0	5.2	68.4	17.3	17.3	4.8	1.7	114.7
Green Bay, WI	0	16.5	22.7	6.8	9.9	6.8	0.5	63.2
Minneapolis, MN	0	23.9	13.5	10.3	12.3	8.7	0.4	69.1
Augusta, ME	0	0	3.8	10	8.5	10	0	32.3
Oklahoma City, OK	0	0	2.9	10.9	0	0	0	13.8
Kansas City	0	3.5	5.4	0	4.5	0	0	13.4
Raleigh, NC	0	0	0	0	0.9	0	0	0.9
Louisville, KY	0	0	1.6	1.1	8.8	0.1	0	11.6
St. Louis, MO	0	0	5.7	1	6.1	0.2	0	13
Chicago, IL	0	1.1	5.2	6.9	10.9	4.1	0.8	29
Allentown, PA	0	0	2.7	5.7	16.5	0	1.1	26

2013-14 Snowfall in Inches by Month

City	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total	2013-14
Boise, ID	0	2	4.9	3.3	4.2	0	0	14.4	
Philadelphia, PA	0	0	11.2	25.9	22.4	8.5	0	68	
Denver, CO	1.4	2	4.7	14.3	3.3	6	5.6	37.3	
Flint, MI	0	1.6	16.9	32.9	21.8	9.4	1.3	83.9	
Boston, MA	0	0	11.7	21.8	22.9	2.2	0.3	58.9	
Salt Lake City. UT	0	3.5	19.2	10.1	2.2	0.5	0	35.5	
Spokane, WA	0	3.1	3.7	7.1	17.9	5.8	0	37.6	
New York, NY	0	0	8.6	19.7	29	0.1	0	57.4	
Wilmington, DE	0	0	11.9	17.5	19	7.7	0	56.1	
Cleveland, OH	0	4.7	17.5	23.7	23.8	15.1	1.3	86.1	
Buffalo, NY	0	10	28.5	42.4	23.3	24.5	1.2	129.9	
Green Bay, WI	0	1.2	26.4	17	17.7	6.1	3.7	72.1	
Minneapolis, MN	0	1.1	15.9	22.7	18.4	4.7	7	69.8	
Augusta, ME	0	1	29	9.5	29.2	5.5	1	75.2	
Oklahoma City, OK	0	0.6	3.5	0.6	4	1.5	0	10.2	
Kansas City	0	0	5.7	5.6	11.3	3.4	0.1	26.1	
Raleigh, NC	0	0	0	1.9	3.7	0.2	0	5.8	
Louisville, KY	0	0.5	5.3	8.3	7.7	4.1	0.1	26	
St. Louis, MO	0	0	5.6	15.8	5.8	1.6	0	28.8	
Chicago, IL	0	0.9	14.2	33.7	19.5	12.3	1.4	82	
Allentown, PA	0	0	13.7	16.5	36.5	1.1	0.3	68.1	

2010-11 Snowfall in Inches by Month

City	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total	2010-11
Boise, ID	0	7.8	7.7	0.2	5	1.1	0	21.8	
Philadelphia, PA	0	0	12.7	25.2	6.1	0	0	44	
Denver, CO	0	1.5	3.3	8	5.3	2.5	1.2	21.8	
Flint, MI	0	0.2	12.1	17.3	31.7	8.6	2.2	72.1	
Boston, MA	0	0	22	38.3	18.5	1.3	0.9	81	
Salt Lake City. UT	1.8	20.9	11.5	5.9	11	9.1	8.2	68.4	
Spokane, WA	0	25.9	17.4	7	14.3	3.3	1.1	69	
New York, NY	0	0	20.1	36	4.8	1	0	61.9	
Wilmington, DE	0	0	4	18	5	0	0	27	
Cleveland, OH	0	0	12.7	21.5	23.3	11.8	0	69.3	
Buffalo, NY	0	1.6	32	29.8	34.1	13.3	1	111.8	
Green Bay, WI	0	0.3	22.2	19.1	17.8	22.3	10.9	92.6	
Minneapolis, MN	0	9.8	33.6	17	16.1	8.2	1.9	86.6	
Augusta, ME	0	0	23.5	29.6	32.8	12	6	103.9	
Oklahoma City, OK	0	0	0	0.7	18.9	0	0	19.6	
Kansas City	0	0	2.9	17.3	16.2	0.5	0	36.9	
Raleigh, NC	0	0	8.3	0.3	0.4	0	0	9	
Louisville, KY	0	0.1	6.2	10	1.1	0.3	. 0	17.7	
St. Louis, MO	0	0.2	7.9	14.7	6.5	7.5	0	36.8	
Chicago, IL	0	0	16.2	11.1	29	1	0.6	57.9	
Allentown, PA	0	1.4	3.6	26.5	4.5	2.9	0	38.9	

1967-68 Snowfall in Inches by Month

City	Oct	Nov	Dec	Jan	Feb	Mar	Apr	Total	1967-68
Boise, ID	0	1.3	4.3	3.3	0.1	0.8	0.3	10.1	
Philadelphia, PA	0	4.9	5.6	1.5	1.7	2.2	0	15.9	
Denver, CO	1.7	9.4	13.1	3	7.3	9.2	15.1	58.8	
Flint, MI	2.6	3	2.4	14.1	7.1	11.4	0.2	40.8	
Boston, MA	0	2.2	14.7	17.7	3.4	6.8	0	44.8	
Salt Lake City. UT	0	4.2	27.1	6.8	13.6	8.4	14.2	74.3	
Spokane, WA	0	4.8	12.7	11.8	0.4	0	0	29.7	
New York, NY	0	3.2	5.5	3.6	1.1	6.1	0	19.5	
Wilmington, DE	0	6.8	4	1.6	0.9	1.3	0	14.6	
Cleveland, OH	0.1	9.1	2.8	14.5	8.9	7.7	0.2	43.3	
Buffalo, NY	0	19.7	10.4	19.1	11.7	10.6	0.1	71.6	
Green Bay, WI	0.5	2.9	3.7	9.2	3	0.6	0.7	20.6	
Minneapolis, MN	0.3	0.8	2.4	10.6	2.2	0.8	0.4	17.5	
Augusta, ME	0	3.9	17.5	25.2	5.1	17.5	0	69.2	
Oklahoma City, OK	0	1.2	1.2	0.4	7.7	13.9	0	24.4	
Kansas City	0	0.2	7	2.8	2.7	0	0	12.7	
Raleigh, NC	0	0	1.4	3	1.3	0	0	5.7	
Louisville, KY	0	0	2.7	13.8	1.8	12.7	0	31	
St. Louis, MO	0	1.6	4.2	6.9	0.4	7.7	0	20.8	
Chicago, IL	6.6	2.4	2.9	10.4	3.8	1.5	0.1	27.7	
Allentown, PA	0	7.8	8.4	3	0.6	0.1	0	19.9	

Nov-Mar Temperature Anomaly based on Analogs



Summary

- Analogs show two different outcomes for winter in the Eastern US. The first set favors an early arrival in December-January and moderation Feb-Mar. The other set shows a late arrival winter as La Nina weakens.
- The current soil moisture anomalies and SST anomalies would support a +PNA pattern where cold extends south into the Southeastern US. However, if we see cooling in the Bering Sea/Northern Gulf of Alaska this could lead to a prolonged period of a stronger Polar Jet resulting in a warmer outlook.
- Northern areas in the CONUS remain on track for snowier/colder than average with the main question remaining on how far the gradient extends south. This will be decided on the aforementioned factors. Analogs provide a wide range of possibilities.

Early Projected Snowfall Amounts

City	▼	Average		Projection 20-21	▼	19-20	▼
Boise, ID		19	9.2	20-2	25"		
Philadelphia, PA		2	2.4	16-2	20"		
Denver, CO		50	6.5	40-4	45"		
Flint, MI		4	7.4	50-5	55"		
Boston, MA		43	3.8	50-5	55"		
Salt Lake City. UT		50	6.2	40-4	45"		
Spokane, WA		44	4.9	50-5	55"		
New York, NY		2	5.8	20-2	25"		
Wilmington, DE		20	0.2	14	18		
Cleveland, OH		6	8.1	60-6	55"		
Buffalo, NY		94	4.7	90-10	00"		
Green Bay, WI		5:	1.4	50-9	55"		
Minneapolis, MN		54	4.4	55-6	50"		
Augusta, ME		7:	1.3	70-7	75"		
Oklahoma City, O	K		7.6	5-:	10"		
Kansas City		10	8.8	15-2	20"		
Raleigh, NC			6.1	3	-6"		
Louisville, KY		13	2.5	10-1	14"		
St. Louis, MO		1	7.7	15-2	20"		
Chicago, IL		3	6.3	40-4	45"		
Allentown, PA		33	2.9	25-3	30"		