

Northern Hemisphere Continental Snow Cover Extent: 2024 Update

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Annual snow cover extent (SCE) over Northern Hemisphere (NH) lands averaged 23.9 million km² in 2024. This was 1.0 million km² less than the 1991-2020 mean and 1.2 million km² below the full period of record (1967-2024) mean (Table 1). This ranks 2024 as having the 3rd least extensive cover on record. Twelve-month running mean SCE departures over all NH lands have not been as low as they were to end 2024 since June 2007 and before then July 1990 (Figure 1). Monthly SCE in 2024 ranged from 46.9 million km² in January to 2.6 million km² in August. Annual mean SCE in North America (NA) ranked 1st least extensive in 2024, just 0.1 million km² less than 1990, the 2nd least extensive year on record. In terms of twelve-month running means, the June 2024 value was the lowest since May 1968. Weekly NH SCE in 2024 was below long-term means for all but a few weeks from a winter maximum SCE in early January through the melt season. Fall SCE was close to normal to begin the season, later becoming more erratic week to week from November into December (Figure 2).

January 2024 saw NH SCE rank in the middle tercile of the 58-year record. From February onward through spring, NH rankings were in the lower tercile, sitting from 40th to 58th most extensive, with April a record low rank. NA, with a 16th most extensive ranking in January differed greatly from the 41st most extensive Eurasia (EUR) rank. Both continents ranked from 39th to 56th most extensive in each month from February to June. NA SCE achieving a 56th most extensive rank in February and April. The new snow season began with above average SCE over EU with a rank of 17th most extensive in September and 18th in October. Meanwhile, snow was slow to appear over NA, with ranks of 54th and 47th most extensive in, respectively, September and October. Given that NA climatologically averages greater SCE in September and EUR more in October, the NH rankings were 40th most extensive in September and 25th in October. November ranked 32nd most extensive and December 47th, when conditions across the continents balanced out, rankings for both falling between 30th and 44th most extensive.

The contiguous United States (US) SCE was above normal, ranking 16th most extensive, to start 2024, then rapidly fell to 57th most extensive in February. March through May ranked from 33rd to 45th most extensive. Over Canada (CAN), the highest ranking for the winter and spring was 37th most extensive in January, with each month from February through June ranking from 49th to 55th most extensive. Fall began with CAN ranked 55th most extensive and the US almost snow free. The US and CAN ranked, respectively, 42nd and 43rd most extensive in October. CAN kept the 43rd ranking in November, while the US rose to 24th most extensive. Conditions in of the two nations reversed in December, with the US falling to a 51st most extensive ranking and CAN rising to 15th.

SCE is calculated at the Rutgers Global Snow Lab (GSL) from daily SCE maps produced by meteorologists at the US National Ice Center, who rely primarily on visible satellite imagery to construct the maps (Estilow et al. 2015). Maps depicting daily, weekly, and monthly conditions, anomalies, and climatologies may be viewed at the GSL website (<https://snowcover.org>).

References

Blunden, J. and J. Reagan, Eds., 2025: "State of the Climate in 2024". Bull. Amer. Meteor. Soc., 106 (8), Si–S513
<https://doi.org/10.1175/2025BAMSStateoftheClimate.1>.

Estilow, T. W., A.H. Young, and D.A. Robinson (2015) A long-term Northern Hemisphere snow cover extent data record for climate studies and monitoring. Earth Syst. Sci. Data, 7, 137–142, doi:10.5194/essd-7-137-2015.

Figures

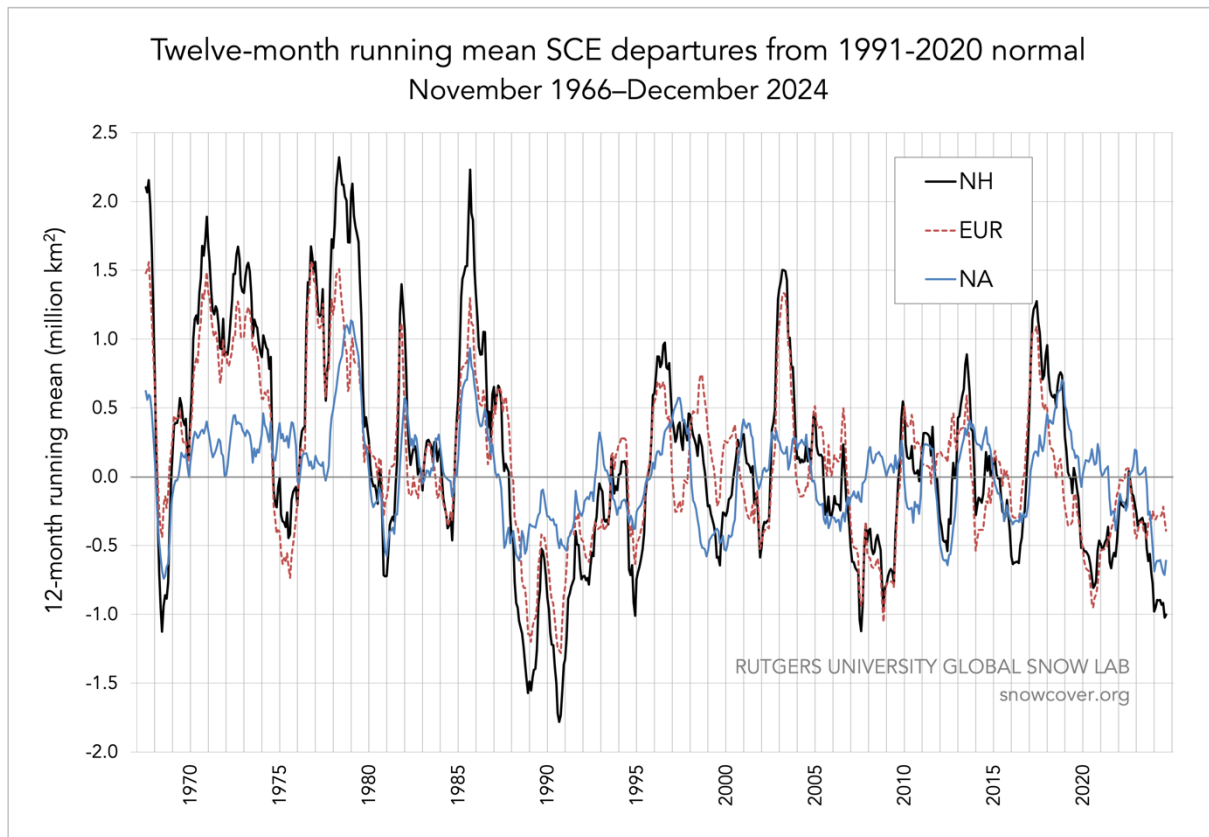


Fig 1. Twelve-month running anomalies of monthly SCE over NH lands as a whole and EUR and NA separately plotted on the 7th month using values from November 1966 to December 2024. Anomalies are calculated from NOAA snow maps. Mean NH SCE is 25.1 million km² for the full period of record. Monthly means for the period of record are used for 9 missing months during 1968, 1969, and 1971 to create a continuous series of running means. Missing months fall between June and October.

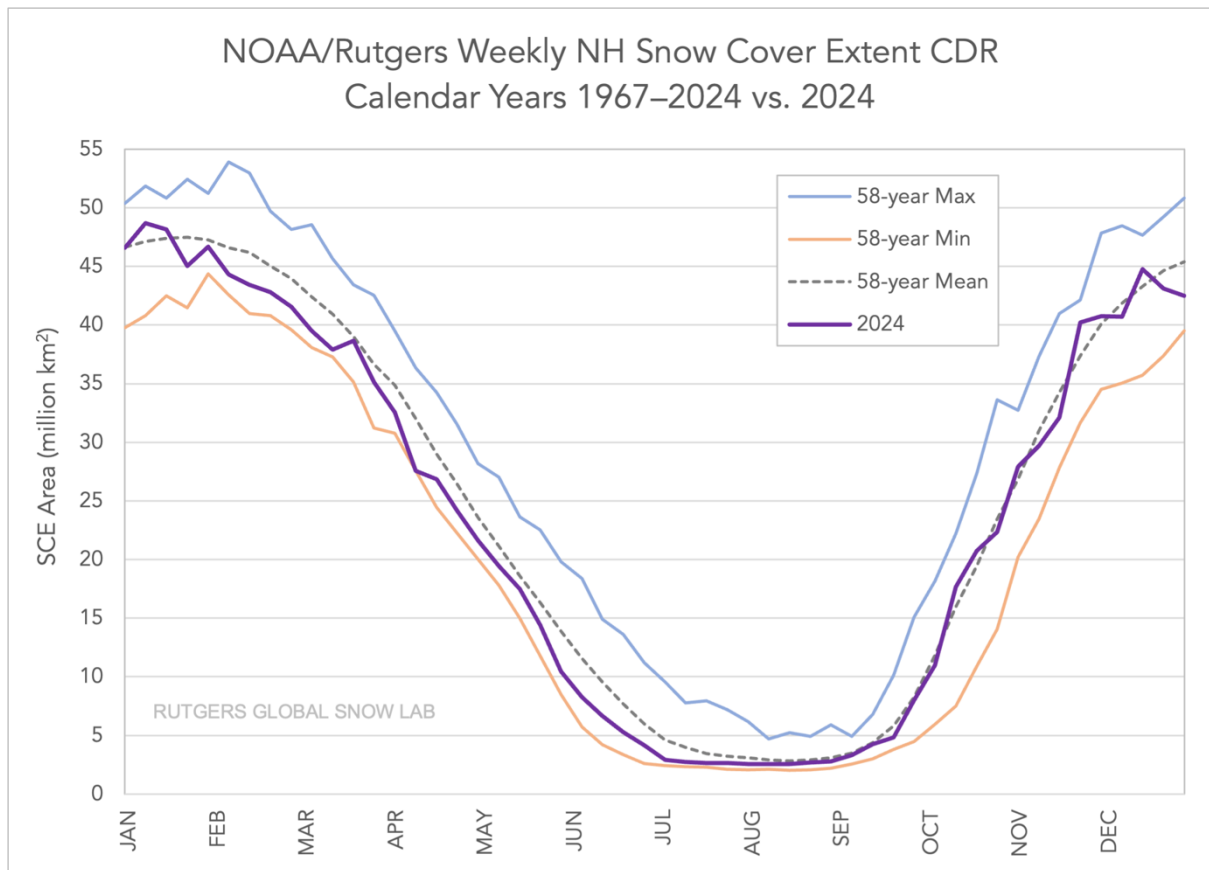


Fig 2. Weekly NH SCE for 2024 (purple) plotted with the mean (grey dashed line), maximum (blue), and minimum (orange) SCE for each week. Mean weekly SCE and extremes are calculated using the 58-year record from January 1967–December 2024. Weekly means for the period of record are used for 4, 21, and 12 missing weeks during 1968, 1969, and 1971 respectively. Weekly data granules represent SCE for each 7-day period ending on Monday.

Tables

	Yrs.	NH Anomaly	NH Mean	NH Std. Dev.	2024 NH rank	2024 EUR rank	2024 NA rank
Jan	58	-0.2	47.1	1.5	32 (27)	41 (18)	16 (43)
Feb	58	-2.1	45.9	1.8	50 (9)	39 (20)	56 (3)
Mar	58	-2.0	40.4	1.8	51 (8)	46 (13)	45 (14)
Apr	58	-2.6	30.4	1.7	58 (1)	49 (10)	56 (3)
May	58	-1.9	19.0	2.0	45 (14)	40 (19)	53 (6)
Jun	57	-2.6	9.2	2.5	46 (12)	44 (14)	48 (10)
Jul	55	-1.1	3.8	1.2	45 (11)	45 (11)	44 (12)
Aug	56	-0.3	2.9	0.7	33 (24)	51 (6)	23 (34)
Sep	56	-0.5	5.4	0.9	40 (17)	17 (40)	54 (3)
Oct	57	+0.3	18.6	2.6	25 (33)	18 (40)	47 (11)
Nov	59	0.0	34.4	2.1	32 (28)	30 (30)	33 (27)
Dec	59	-1.0	43.7	1.8	47 (13)	39 (21)	44 (16)
Ann	55	-1.2	25.1	0.8	53 (3)	47 (9)	55 (1)

Table 1. Monthly and annual climatological information on NH, EUR, and NA SCE between November 1966 and December 2024. Included are the numbers of years with data used in the calculations, NH anomalies, NH means, NH standard deviations, and rankings. Areas are in millions of square kilometers. 1968, 1969, and 1971 have 1, 5, and 3 missing months respectively, thus are not included in the annual (Ann) calculations. NA includes Greenland. Ranks are from most to least extensive (least to most in parentheses).

Datasets used and their URLs

Robinson, D.A., Estilow, T.W., and NOAA CDR Program, 2012: NOAA Climate Data Record (CDR) of Northern Hemisphere (NH) Snow Cover Extent (SCE), Version 1. NOAA National Centers for Environmental Information. doi:10.7289/V5N014G9.

<https://snowcover.org>

Acknowledgements

This work is funded in part by NOAA's Climate Data Record (CDR) Program at the National Centers for Environmental Information.

Summary bullet points

- Annual snow cover extent (SCE) over NH lands averaged 23.9 million km² in 2024. This is 1.0 million km² less than the 1991-2020 average and ranks as the 53rd most extensive cover on record during the satellite era.
- SCE continues a general trend of early spring melt, particularly at higher latitudes, while fall and early winter SCE continues a recent decadal run of above normal conditions.