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An Upside-Down Winter: The 2009-2010 Snow Report

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UPSIDE AN UPSIDE-DOWN WINTER: DOWN

WOODLEY WONDERWORKS



Washington, D.C.'s Woodley Park neighborhood was inundated with snow in a once-in-a-hundred-year event.

The 2009-2010 Snow Report

by David A. Robinson

The 2009-2010 snow season will long be remembered as one with unusual patterns of snowfall and snow cover across the United States. February snows were several feet deep in the Mid-Atlantic states while, simultaneously, bare ground was exposed in the Champlain Valley of New York and Vermont. Heavy October snows fell from the Plains to the Northeast, while Fairbanks, Alaska, waited until October 26th to receive its first inch-plus snowfall. As reported in *Weatherwise* each year since 1955, here is a month-by-month summary of notable snow events, totals, and oddities from this topsy-turvy season.

July 2009

The previous snow season continued at higher elevations, with 16 inches of snow remaining on the ground at Rainier Paradise, Washington, on the 16th. Additional observations were missing later in the month, though it is likely the snow disappeared within the following week. The only official snowfall reports across the nation were traces observed atop Mount Washington, New Hampshire, on the 13th and 14th.

August 2009

Unofficial reports of 1.0 to 2.0 inches of snow falling above the 8,000 foot level in western Montana and north-central Idaho on the 14th to 15th were accompanied by traces (less than 0.1 inch) observed at Grant and Cooke City, Montana. Barrow, Alaska, reported traces of snowfall on five days, and on the 31st was dusted with 0.1 inch, while Chandalar received 0.5 inches.

September 2009

Things were quiet in the snow department until the last week of the month. Central Alaska was whitened on the 25th to 26th, with as much as 7.5 inches at Kobe Hill and 6.0 inches in Ester Dome. Heavy snow fell in portions of the West on the 30th, with 12.5 inches at Alta, Utah; 10.0 inches in Wilsall, Montana; and 5.5 inches at elevations as low as Bozeman, Montana (4810 feet).

Light snow began accumulating in the mountain, interior, and North Slope regions of Alaska during the last 10 days of the month. The 22nd through 24th brought Delta 3.4 inches, Colville Village 3.1 inches, and Circle Hot Springs 2.6 inches. Snowfall from the 25th through 27th included 7.5 inches at Kobe Hill, 6.0 inches at Ester Dome, and 3.5 inches in Port Alsworth.

October 2009

What proved to be an unusually snowy October for the United States got underway on the

4th and 5th, with 14.4 inches in Lander, Wyoming; 4.6 inches at Billings, Montana; and 1.0 inches in Pocatello, Idaho. Several days later, record snows blanketed the northern Plains and Midwest. North Platte, Nebraska, received 13.8 inches on the 9th to 10th, a record October two-day total. Mason City, Nebraska, received 18.0 inches; Underwood, Iowa, 6.7 inches; and Minneapolis-Saint Paul, Minnesota, 2.5 inches. The 1.1 inches at Des Moines, Iowa; on the 10th tied a record for the earliest measurable snowfall in this city and broke the record for first snowfall of 1.0 inches or more by 9 days.

A major mid-month snowmaker began its trek across the country on the 13th-14th, with 6.0 inches falling in Mammoth Lakes, California. The 15th to 16th brought 9.0 inches to Litchville, North Dakota, and 3.6 inches to Dalton, Minnesota. Once into the Northeast, snows fell in Pennsylvania (Clermont 9.8 inches, State College 4.8 inches), New Jersey (Vernon 4.0 inches, High Point 3.0 inches), New York (Wellsville 5.5 inches, Binghamton 2.0 inches), and points north. This was the second consecutive October with a tree-damaging snow event in the Northeast.

A final storm came out of the Rockies during the last week of the month. Massive totals from the 25th through 30th included 46.0 inches and 38.4 inches in Coal Creek Canyon and Buckhorn Mountain, Colorado, respectively; 30.0 inches in Millegan, Montana; and 15.7 inches at both Cheyenne, Wyoming, and Denver, Colorado.

For the month, North Platte received a record 30.3 inches, or 2755 percent of average. Its annual average is 28.4 inches. Cheyenne's 28.0 inches was the greatest on record for what was also its coldest October.

A warm October kept Alaska mainly snow-free until the 26th, when a multi-day event brought Fairbanks 5.3 inches. Dry Creek received 10.1 inches on the 29th to 30th. This interior station's 16.0 inches for the month and 12 inches on the ground on the 30th and 31st were state maximums.

November 2009

Snowfall was not nearly as plentiful across the nation in November as it had been in the previous month, being mainly confined to higher elevations in the lower 48 states and Alaska. Kicking things off was Rainier Paradise, Washington, which was buried under 50.0 inches from the 5th through 8th. The first major storm of the month brought Bozeman, Montana, 24.0 inches and Ennis, Montana, 9.8 inches on the 12th, the snowiest November day on record for the latter community.



...r event in December 2009.

KEN DEWEY



A snowplow tries to clear deep drifts on the outskirts of Lincoln, Nebraska, following the December 25, 2009, blizzard.

Snow returned to the Northwest on the 17th through 22nd, with impressive totals at Government Camp, Oregon (23.0 inches); Holden Village, Washington (44.6 inches); and Rainier Paradise (56.5 inches). By the end of this event, Rainier Paradise had 69 inches on the ground, while the snowpack at Timberline Lodge, Oregon, on the slopes of Mount Hood, was 91.0 inches deep.

The only significant snow in the East this month fell at higher elevations from the 27th through 29th. Impressive totals included 20.0 inches atop Mount Mansfield, Vermont, and 24.4 inches on Mount Washington, New Hampshire. A storm over the Southwest from the 29th to December 3rd caused El Paso, Texas, to collect 7.8 inches; Fort Davis, Texas, 9.3 inches; and Cloudcroft, New Mexico, 13.5 inches.

In Alaska, snowfall totals from the 10th through 17th included 29.5 inches at Haines 40NW (situated at an elevation of 820 feet, 40 miles northwest of Haines), 22.0 inches at Cordova, and 5.2 inches in Fairbanks. Bettles received 23.7 inches on the 11th to 12th, their second earliest foot-plus event. Daily records included 8.2 inches in Kotzebue on the 11th and 5.3 inches in Juneau on the 14th. Fairbank's 12.9 inches was 45 percent of average. Haines 40NW took monthly top honors with a snowfall of 101.8 inches and a maximum depth of 43 inches. Nine days saw 5.0 inches or more fall at this location.

December 2009

Snow fell throughout the Great Lakes region from the 1st through the 6th, with totals of 26.0 inches in Petoskey, Michigan; 8.9 inches at Grand Rapids, Michigan; and 6.4 inches in Buffalo, New York.

The snow scene shifted to the Deep South on the 4th to 5th, with 1.0 inches at Houston, Texas, and 0.2 inches in Lake Charles, Louisiana, establishing records for the earliest measurable snowfall. Each surpassed records established just the previous year. Other southern totals included 4.0 inches in both Bogie Chitto, Mississippi, and Boling, Texas, and 2.0 inches at Leesville, Louisiana. These locations experienced measurable snow earlier than Burlington, Vermont, which received its first snow on the 7th.

DBKING



The Blizzard of 2009 produced record 24-hour snowfalls across the Mid-Atlantic, including in Washington, D.C., on December 19, 2009.

A major storm moved out of the Intermountain West into the Great Lakes from the 7th through 9th. Snowfall in its path included: Flagstaff, Arizona (20.1 inches); Glenbrook, Nevada (44.0 inches); Reno, Nevada (9.0 inches); and Crested Butte, Colorado (46.0 inches). Lake-effect snows followed this strong, windy low, with accumulations by the 11th reaching 53.0 inches in Ontonagon, Michigan; 45.0 inches at Greenland, Michigan; and 34.3 inches in High-market, New York.

The first of many memorable East Coast 2009-2010 snowstorms impacted the area from the 18th through 20th. Asheville, North Carolina, received a daily record 10.1 inches on the 18th, and Mount Mitchell, North Carolina, reported 27.0 inches. The 19th was the snowiest December day on record for locations such as Washington, D.C.; Baltimore, Maryland; and Philadelphia, Pennsylvania, with snows of 16.4 inches, 21.1 inches, and 23.2 inches, respectively, at these locations. Other impressive totals were reported in Mount Nebo and Pickens, West Virginia (31.0 inches and 27.0 inches); Folsom and Swedesboro, New Jersey (25.7 inches and 25.0 inches); and Hampton, Connecticut (18.0 inches).

A major storm developed over the Southwest on the 22nd, with daily records of 4.8 inches in Ely, Nevada and more than a foot in Williams, Arizona. Wichita Falls, Texas, received 7.8 inches on the 24th. This day was the snowiest on record in Oklahoma City, Oklahoma, with 13.5 inches falling amidst gusts as high as 62 mph. By the 26th, totals reached 10.6 inches in Topeka, Kansas; 20.7 inches in Sioux City, Iowa; and 25.8 inches in Two Harbors, Minnesota. As the storm headed into Canada, lake-effect snow amounted to 15.6 inches at Marquette, Michigan, and 14.7 inches at Buffalo, New York, ending on the 28th.

Snow again visited Texas on the 29th to 30th, with 4.5 inches in Denver City and 4.0 inches at Olton. Alta (23.0 inches) and Salt Lake City (7.1 inches), Utah, also were whitened during this period.

December snowfall records fell in Grand Island (26.5 inches) and Lincoln (24.3 inches), Nebraska; Huron, South Dakota (26.0 inches); and Sioux City, Iowa (32.4 inches). It was the snowiest of any month at Sioux City and second snowiest in Grand Island.

The 49th state saw heavy snow from the 1st through 3rd at Big River Lakes (33.8 inches), Amber Lake (23.5 inches), and Valdez (12.8 inches). This was just a tease in Valdez, where the 14th through 17th buried the south coastal town under 77.0 inches.

January 2010

While this was not an abundantly snowy month, on occasion shovels had to be used in a variety of locations. New England received what was to be their heaviest snowfall of the season from the 1st through 4th. Burlington, Vermont was buried under 35.4 inches on the 2nd and 3rd. Other totals included 29.0 inches in Essex Junction, Vermont, and 10.1 inches in Boston, Massachusetts. The cold air made it into the Southeast by the 8th, accompanied by 2.5 inches of the white stuff at Independence, Mississippi, and 1.0 inches at Owens Cross Roads, Alabama, on the 8th, as well as traces at Daytona Beach and Orlando, Florida, on the morning of the 9th.

The far southwest and northeast corners of the nation were impacted by heavy snows from the 18th through 22nd. The Flagstaff, Arizona, five-day total of 52.3 inches was the third largest for such an interval. Elsewhere, Bellemont, Arizona, received 52.5 inches and Lodgepole, California, 76.5 inches. There were reports of more than 100.0 inches from Kaiser Point and Horse Meadow, California.

Blizzard conditions pummeled northeast Minnesota from the 23rd through 25th, with 19.0 inches at Adolph and 15.7 inches in Superior. A larger storm traversed portions of the southern Plains, Southeast, and Mid Atlantic from the 28th through 30th. Along the way, Gruver, Texas, received 14.0 inches; Richmond, Virginia, 10.0 inches; and Cape May, New Jersey 9.9 inches.

As in the rest of the United States, January snow was not abundant in Alaska. Interior locations saw only several inches accumulate, with



JEFF BOYNE

Sumac riming in La Crosse, Wisconsin, on January 17, 2010.



An unusual snow storm in Columbia, South Carolina, allowed children to build a snowman on February 13, 2010.

Fairbanks receiving a scant 1.0 inches. Annex Creek was buried under 39.6 inches from the 10th through 13th, and with 70.0 inches had the largest monthly total.

February 2010

A rather shy January in the snow department blossomed into an overbearing February. When all was said and done, monthly snowfall records were shattered in several Mid-Atlantic states. The first storm of the month delivered moderate snow to wide-ranging portions of the central United States on the 3rd and 4th, including 9.0 inches at Perryton, Texas, and 3.7 inches in Rapid City, South Dakota. The storm exploded over the Mid Atlantic on the 5th and 6th, with many daily and two-day records broken. Higher elevations of the central Appalachians-Allegheny Plateau region were buried under more than 30.0 inches, including Buckston, Pennsylvania (36.0 inches); Catocin Mountain Park, Maryland (33.0 inches); and Mount Weather, Virginia (31.0 inches). Windblown accumulations paralyzed lower elevation locations too. This

included Pittsburgh, Pennsylvania (21.1 inches); Baltimore, Maryland (24.8 inches); and Estell Manor, New Jersey (24.0 inches).

A broad portion of the central United States was covered with moderate snow on the 7th and 8th. Totals included 10.0 inches in Kingston, Arkansas; 3.8 inches at Anderson, Alabama; and 13.0 inches in Willmar, Minnesota. Snow continued on the 9th and 10th across the Midwest and again reached the Mid Atlantic. Chicago, Illinois, with 12.6 inches on the 9th saw its record snowiest February day. Other totals west of the Appalachians included Muscle Shoals, Alabama (3.1 inches), and Angola, Indiana (11.9 inches). Farther east, accumulations included Vienna, Virginia (14.0 inches); Hanover, Pennsylvania (23.2 inches); and Ewing, New Jersey (18.7 inches).

The Deep South was again visited by uncommon snow from the 11th through 13th. Dallas-Fort Worth received 11.2 inches on the 11th, making this the snowiest of any calendar day on record. This was also achieved in Jackson, Mississippi, with 4.1 inches on the 12th. For Columbia, South Carolina, the 8.6-inch total was its 6th largest since 1878.

Following this event, portions of every state in the nation were covered by snow. This included a small patch of snow photographed high on Mauna Kea in Hawaii. Areas of bare ground were exposed in the Champlain Valley of New York and Vermont, with stations reporting depths of a trace to several inches. Meanwhile, in central regions records for extended periods of snow cover over certain depths were being established. For instance, Des Moines, Iowa, with at least 5 inches on the ground for 90 days, ending on March 8th, shattered the former record of 54 days in 1961-1962.

From the 17th through 21st, the scene shifted west, with a series of events depositing heavy snow from Reno, Nevada (25.6 inches), to Greenland, Michigan (17.2 inches).

The final eastern storm of the month deposited the heaviest snow from the New York metropolitan area through the higher elevations of New Jersey and north to Vermont. Accumulations from the 24th through 26th included 21.4 inches in Tenaflly, New Jersey; 50.0 inches at Slide Mountain, New York; and 31.0 inches at Waitsfield, Vermont. Combined totals from this event and one earlier in the week resulted in 4- to 6-day totals of 57.4 inches at Platte Clove, New York; 49.8 inches in Bloomingburg, New York; and 32.8 inches atop Mount Washington, New Hampshire.

Monthly snowfall records for any winter month were shattered in the Mid Atlantic. A

sampling includes 50.0 inches in Baltimore, Maryland; 46.9 inches in Wilmington, Delaware; 33.1 inches at Pittsburgh, Pennsylvania; and 36.9 inches at Central Park, New York. Impressive state records for any month have been certified by state climatologists and the National Climatic Data Center for West Virginia (158.2 inches at Bayard) and Pennsylvania (113.5 inches at Laurel Summit). The latter breaks the 90.0-inch December 1890 accumulation at Blue Knob, Pennsylvania. Meanwhile, February 2010 brought only 7.0 inches to Boston, Massachusetts—yet another example of this upside-down winter.

March 2010

It seems only fitting that in this crazy year, March came in with a storm in the Southeast. Snowfall on the 2nd included 4.5 inches at Valley Head, Alabama; 9.0 inches in Dillard, Georgia; 5.5 inches in Jocassee, South Carolina; and 8.8 inches at Asheville, North Carolina. This was a month in which LaCrosse, Wisconsin, and both Rochester and Minneapolis-Saint Paul, Minnesota failed to receive even a trace of snowfall. Boston, Massachusetts only received 0.2 inches. Record early dates for the last measurable snowfall of the season were established in LaCrosse (February 20) and Rochester (February 23).

Generally, the entire nation experienced a snow drought in March. The 13th-14th saw 6.0 inches in Eureka, Nevada and 6.8 inches at Winchester, Idaho. A moderate storm came out of the Rockies on the 18th and 19th, when Ouray, Colorado, picked up 29.6 inches. Elsewhere, the 19th through 21st brought Frisco, Texas, 8.0 inches; Stockton Dam, Missouri 11.5 inches; and Indianola, Iowa, 8.0 inches.

A series of three storms impacted the Intermountain West from the 22nd through 31st. The first brought 18.0 inches to Casper Mountain, Wyoming, on the 22nd and 23rd, and 10.5 inches in Denver, Colorado on the 23rd and 24th. Snow resumed in the mountains, with 26th to 27th totals of 15.5 inches at Ouray, Colorado, and 8.0 inches in Pahaska, Wyoming. The third storm, from the 28th through 31st, dumped 29.0 inches on Alta, Utah, along with Silver City, Idaho (17.0 inches), and Lake Yellowstone, Wyoming (16.0 inches).

Alaskan snowfall picked up in March, especially in southern coastal locales. Main Bay received 127.1 inches for the month, including 36.0 inches on the 7th and 8th and 26.1 inches on the 13th and 14th. The Aleutian island town of Dutch Harbor received an unusually large 56.5 inches during the month. This included a 13-day stretch from the 2nd through 14th when

each day saw 2.0 to 6.0 inches fall. Again, the interior was drier than average, with Fairbanks receiving 1.6 inches.

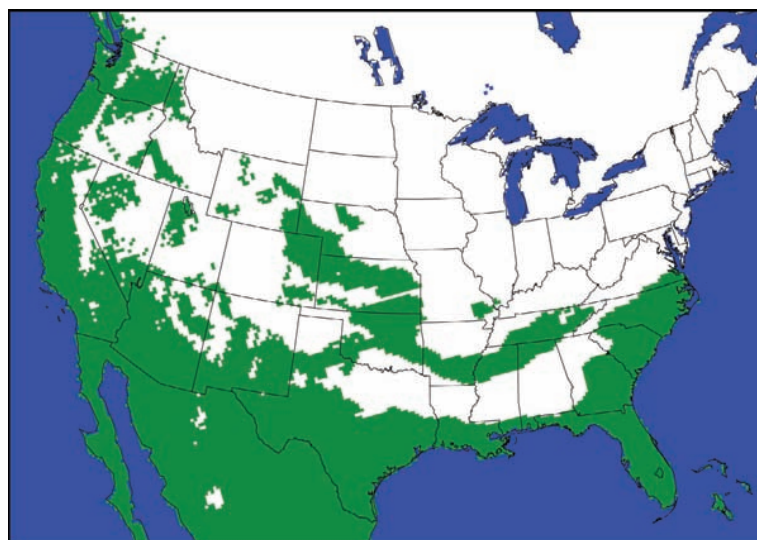
April 2010

A storm moved out of the western mountains into the northern Plains on the 2nd-4th. Ely, Nevada, picked up 4.9 inches, Hebegan Dam, Montana, 14.0 inches, Flasher, North Dakota, 10.0 inches, and Bismarck, North Dakota, 8.0 inches. On the heels of this storm, another developed in the Intermountain West, with Riverton, Wyoming, receiving 9.6 inches and Ennis, Montana, 7.2 inches from the 5th through 7th. Lingering snowfall in the Wasatch Mountains of Utah resulted in Alta collecting 50.0 inches and Brighton 44.0 inches from the 4th through 10th.

Montana was the place to be for snow from the 13th and 14th, with accumulations reaching 25.0 inches at Warrick, 22.0 inches in Shonkin, 13.2 inches at Great Falls, and 10.0 inches at East Glacier. The scene shifted to the Great Basin in Nevada on the 22nd, when Elko, Dyer, and Virginia City each received 6.9 inches or 7.0 inches.

An impressive late-season event on the 27th and 28th deposited heavy snow in Vermont and New Hampshire. Lower-elevation totals included 5.5 inches in Burlington, Vermont, and 10.0 inches at Benton, New Hampshire.

The snowiest interval of the month over Alaska occurred from the 11th through 14th, with 18.5 inches accumulating at Amber Lake. Valdez received 18.1 inches on the 13th and 14th, bringing the final seasonal total to 318.7 inches. Mild conditions produced early snowmelt in



Snow lying over all or portions of each of the U.S. lower 48 states, Mexico, and Canada on February 12, 2010 is depicted by an Interactive Multisensor Snow and Ice Mapping System (IMS) map. Mapped grids are approximately 14 miles on each side.

Annual snowfall totals

Table 1. 2009-2010 snowfall for select United States cities.

City	Snowfall Total (inches)	Average Snowfall (inches)
Marquette, Michigan	163.1	184.5
Cheyenne, Wyoming	104.8	60.3
Burlington, Vermont	96.5	83.1
Rochester, New York	90.1	100.3
Philadelphia, Pennsylvania	78.7	19.3
Anchorage, Alaska	74.4	69.5
Buffalo, New York	74.1	97.0
Des Moines, Iowa	69.0	36.4
Duluth, Minnesota	65.8	83.1
Charleston, West Virginia	61.3	38.4
Cleveland, Ohio	59.5	63.1
Sioux Falls, South Dakota	57.1	40.6
Washington, D.C. (Reagan)	56.1	15.2
Bismarck, North Dakota	55.4	50.3
Chicago, Illinois (O'Hare)	54.2	38.0
Barrow, Alaska	53.3	29.0
Billings, Montana	52.1	59.0
New York City (Central Park)	51.4	22.4
Denver, Colorado	45.8	61.0
Kansas City, Missouri	44.3	20.1
Detroit, Michigan	43.7	44.0
Lincoln, Nebraska	41.6	26.3
Rapid City, South Dakota	40.8	40.9
Minneapolis, Minnesota	40.7	55.9
Milwaukee, Wisconsin	38.3	52.4
Portland, Maine	37.1	66.4
Salt Lake City, Utah	36.4	62.7
Reno, Nevada	34.8	23.5
Indianapolis, Indiana	33.0	27.0
Amarillo, Texas	28.9	17.8
Richmond, Virginia	28.0	12.4
Fairbanks, Alaska	24.9	67.4
Boise, Idaho	19.9	19.5
St. Louis, Missouri	14.5	22.5
Spokane, Washington	14.4	47.4
Raleigh-Durham, North Carolina	8.0	7.1
Seattle, Washington	0.0	8.1

Note: Averages are based on the 1971-2000 period.

interior regions. The snow depth at Fairbanks dropped below an inch on the 16th, six days prior to this occurring in Anchorage. Winter continued in Barrow, with 8.1 inches falling during the month. Whittier with 15.5 inches on the 4th through 6th and 35.7 inches for the month took top honors for snowfall.

May 2010

On several occasions, flakes flew in the Great Basin, Rockies, and some northern states. Blizzard conditions impacted locations in Montana on the 5th and 6th, with totals up to 24.0 inches at Norris and at Shonkin.

New England locations observed traces of snow as far south as northwest Connecticut on the 8th through 10th. In Vermont, Mount Mansfield received 11.0 inches, Jeffersonville 6.0 inches, and South Lincoln 1.0 inches. Snow cover at Mount Mansfield declined from 56 inches on the 1st to only traces on the ground come the 23rd. Mount Washington's cover melted out on the 18th.

A significant spring storm impacted the Great Basin on the 10th and 11th. Ely, Nevada, received 8.4 inches; Riverton, Wyoming, 12.8 inches; and Cheyenne, Wyoming, 10.2 inches. Reports indicated that locations within the Wind River Range of Wyoming totaled more than 3 feet. Yet another storm deposited 6.0 to 12.0 inches in the Rockies of Idaho and Montana on the 23rd and 24th.

Most of Alaska was quite mild, limiting any late-season surprise snows. A colder-than-average May in the north led to 10 inches remaining on the ground at Barrow on the 31st. Elsewhere, Main Bay's state maximum depth of 58 inches on the 1st disappeared by the 30th. Haines lost its cover on the 15th, while Whittier finished the month with 19 inches on the ground.

June 2010

A few higher elevation sites in the lower 48 reported June snowfall. They included Mount Washington, New Hampshire (0.4 inch on the 8th), and Crater Lake, Oregon (5.0 inches on the 10th). The depth of snow on the ground at Rainier Paradise shrank from 140 inches on the 1st to 77 inches at month's end, while at Crater Lake the 50-inch depth at the start of the month fell below an inch on the 30th.

In Alaska, Whittier's snow cover fell below an inch on the 9th. Barrow's snow of May 31st continued on into the 1st, when 1.3 inches fell. The 12th was the last day with an inch or more on the ground. A trace fell at this location on the 27th to finish the U.S. snow season.

Seasonal Snowfall

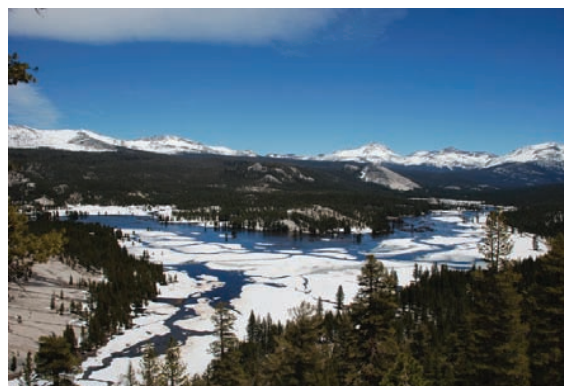
Totals for the 2009-2010 snow season are reported for 37 stations across the nation in the accompanying table. Seasonal totals exceeded 120 percent of average at 15 stations and were less than 80 percent of average at 10 others. As

in the previous winter, five locations had twice their average snowfall, with Philadelphia, Pennsylvania, reigning supreme at 408 percent, a record for this city. So, too, did Washington, D.C., establish a record. After two very snowy years, the Pacific Northwest had well below average snowfall in 2009-2010. Fairbanks, Alaska, with a seasonal snowfall that was 42.5 inches less than average (37 percent), also experienced a snow drought.

Seasonal Snow Cover

Unlike the previous two years, the 2009-2010 snow cover season in the lower 48 states got off to a rapid start. Only extent, not depth, is considered in these analyses. September cover was the fifth most expansive since nationwide satellite monitoring began in the late 1960s. October had the most extensive cover of the past 44 years. November warmth put the brakes on expanding cover, ranking sixth least extensive and, at 226,000 square miles, just 33,000 square miles more than the previous month's coverage.

The widespread snows of December led to a remarkable turnaround back to a first-place standing. Unusually extensive cover continued into January (6th) and February (3rd). Snows quickly melted in March, with a ranking of 28th most extensive extent, with April (37) and May (35) continuing a hemispheric pattern of early snow melt that commenced in the late 1980s. **W**



Snow remained on June 6, 2010 at Tuolumne Meadows in Yosemite National Park, California.

JIM ROCHE

DAVID A. ROBINSON is chairman of the Department of Geography at Rutgers University and the New Jersey State Climatologist. He would like to thank colleagues in a number of state climate offices, regional climate centers, the National Climatic Data Center, National Weather Service offices, and especially Mathieu Gerbush, Jacob Carlin, Tom Estilow, and Gina Henderson at Rutgers University for assisting with information gathering.