By KENDRICK FRAZIER

Portrait of a Strange Winter

Climatologists ponder the unprecedented combination of bitter, record-setting cold and heavy snow during January's blizzards that made the winter of 1982 memorable

Photos: Wide World

It was the winter when storm after storm sent bitter arctic air howling down out of Canada in a seemingly relentless series of assaults of cold, snow and raging winds. It was the winter that brought the coldest day of the century (Jan. 10, 1982) to much of the Midwest. On that memorable Sunday, the thermometer in Chicago plunged to −26°F, an all-time record low, and with high winds the wind-chill factor plummeted to −81°. The *high* temperature that day in Chicago was −14°, and in Minneapolis, Kansas City, Omaha, St. Louis and Des Moines the temperature never rose above −5°. That same frozen Sunday, the Cincinnati Bengals and the San Diego Chargers had to clash in the American Football Conference title game at Cincinnati's Riverfront Stadium in almost inhuman conditions for sport: −9° temperatures combined with wind gusts up to 35 miles per hour, for a wind-chill factor of −59°. The next Sunday, Jan. 17, the temperature was back down to −25° in Chicago. A station near Tower, Minn., reported −52°.

It was the winter that shut down much of the South for several days when a powerful snow, ice and sleet storm gave Atlanta its lowest temperature reading on record (−5°), and brought a devastating, hard freeze to Florida.

It was the winter that saw two snow-and-ice-related airliner crashes within eleven days — the plunge of an Air Florida 737 into Washington, D.C.'s Fourteenth Street Bridge and the Potomac River after a short-lived take-off during a snowstorm on Jan. 13, killing 78 persons, and the slide off an icy runway into Boston Harbor of a World Airways DC-10 on Jan. 24, with two passengers lost and presumed drowned.

Even after winter's official end, winter weather didn't depart without another blast of blizzards. During the first week of April storms struck from Iowa to the Atlantic Coast, socking parts of Michigan with conditions as bad as any they had experienced during the official winter and dumping up to two feet of snow on the cities of the Northeast. This occurred just after a Pacific storm buried California's Sierra Nevada in up to 16 feet of new snow. The strange winter of 1982 was not bowing out gracefully.

Just how bad was the winter of 1982? What were its impacts and what caused it? How well did the experimental climate forecasts for the winter, released late last November, stand up? And just how predictable are temperatures and precipitation in advance of a winter, or any other season, for that matter? Meteorologists and climatologists met at the end of March at the Scripps Institution of Oceanography in La Jolla, Calif., at a special workshop on the winter of 1982 to consider such matters. Some of the answers might seem surprising.

By one measure, the winter of 1982 was not extraordinary. Most of the winter's fury was concentrated in the six-week period from early January through mid-February. When averaged over the entire winter (climatologists define winter as the months of December, January and February for easier record comparisons), the winter of 1981-82 (termed the winter of 1982) does not particularly stand out. That's because December was fairly mild (if snowy) and the latter half of February was warm.

Averaged this way, the recent consecutive winters of 1977, 1978 and 1979 were each colder than 1982. Of course, those three were all very bad winters. The winters of 1977 and 1978 were the two coldest consecutive winters on record in the United States, and 1977, 1978 and 1979 were the three coldest consecutive winters on record, with the winters of 1903-1905 second and 1963-1965 a distant third.

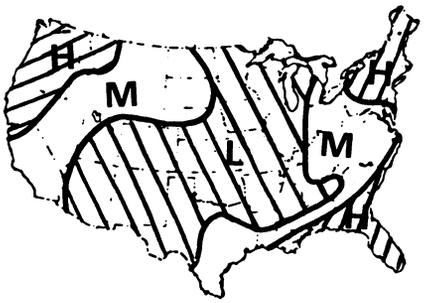
Yet the single month of January 1982 was indeed very cold across the central and eastern United States, according to Thomas R. Karl of the National Climatic Center, in Asheville, N.C. The zero-degree line of minimum temperatures penetrated far into the South, the −20° line went south of Chicago and the Great Lakes, and the −40° line embraced northern Minnesota and Montana.

There have been some colder months than January 1982, particularly the notorious February 1936, when there were −50s in the Dakotas and Montana and −30s in the upper part of the nation. The zero-degree line did not penetrate as far south in 1936, however. And this past January doesn't begin to compare with the almost legendary February 1899, when the −30° line went across Wyoming, Kansas, Iowa and southern Wisconsin, there were −50s in the upper Midwest, and the zero-degree line went all the way down to the Gulf Coast. "That month is the winner, as far as we can see," says Karl.

January 1982 was no piker, however. According to the figures and maps compiled by Karl going back 88 years to 1895, it was the coldest January on record in Maine, the second coldest in Minnesota, the third coldest in New Hampshire and North Dakota, the fourth coldest in Vermont and Massachusetts, fifth coldest in New Jersey, Pennsylvania and Michigan, and sixth coldest in half a dozen other states.

Many of these states also had abundant snowfall, among the top ten snowiest Januaries on record. In fact, this combination of intense cold and heavy snowfall (not to mention the bitter winds that sent the snow drifting and the wind-chill temperatures plummeting) is what made Jan-

Winter 1981-82
A Above normal
B Below normal
I Indeterminate
H High
M Medium
L Low



Predicted Temperature

Observed Temperature

Predicted Precipitation

Observed Precipitation

Gilman/Climate Assessment Ctr.

The National Weather Service's pre-season predictions of temperature and precipitation trends for the winter of 1982 matched against the actual trends. This forecast is given generally high marks, especially for temperature prediction.

uary 1982 so unusually harsh. "The coherence of such very cold weather and excessively high precipitation in many portions of the Midwest is unprecedented in the past century," says Karl. "Other Januaries have been colder in the Midwest, but they have not occurred simultaneously with as much precipitation as did 1982."

The raging blizzards and bitter cold of January and the first half of February took a heavy toll. Joan C. Hock, director of the Center for Environmental Assessment Services of the National Oceanic and Atmospheric Administration (NOAA) in Washington, reports that the severe winter weather through Feb. 15 (when milder weather began to set in) resulted in direct dollar losses of $7.8 billion, in addition to the more than 350 deaths directly attributable to the winter weather. The dollar loss breaks down this way: transportation losses in rail and truck traffic, damage to roads and bridges, and increased costs of snow removal, $1.8 billion; increased energy consumption, $1.7 billion; property damage, $1.5 billion; production losses, $1.5 billion; agricultural damage, $1.3 billion.

Devastating as that toll may be, it doesn't begin to compare with the impact of the horrible winter of 1977. That was the year that snow fell in southern Florida. It was the year that Buffalo, N.Y., experienced snowfall for 53 consecutive days on the way to 17 feet of snow for the entire winter and during one particularly bad blizzard was cut off from the outside world for more than three days. And it was the year the Potomac River froze over in Washington. That 1977 winter cost the nation $26.9 billion ($36.6 billion in 1980 dollars).

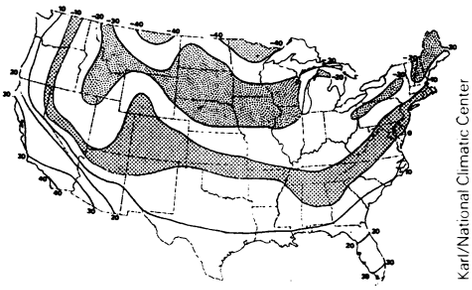
By the same kind of climate impact assessment, Hock says the 1980 summer heat wave and drought caused losses of $18 billion. Summer droughts primarily affect food production; severe winters directly affect the economy more broadly. One good point about the 1982 winter, says Hock: It came during a time when the nation was not suffering an energy shortage. That, she says, helped save us from more severe effects. Still, when the worst of the winter was over, Chicago's gas company reported that 34,000 customers either hadn't or couldn't pay their high heating bills.

What caused the early 1982 onslaught of severe cold, wind and snow?

The climatologists agree that no single cause brought all the winter grief. In fact, this past winter was notable for its chaotic variability of patterns. Every week or so brought a change in the general circulation over the Northern Hemisphere.

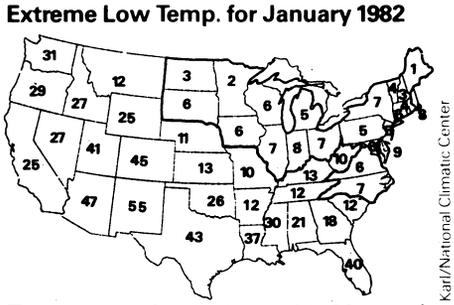
"We got the extreme cold by at least two different methods," says Donald L. Gilman of NOAA's Climate Analysis Center. "In January, there was a strong cyclonic [counterclockwise] circulation over Canada bringing cold air down over Newfoundland, across over the Yukon and down the Rockies. The air was getting cold very fast, and it went over a lot of snow, picking up more cold." The mass of cold air was "extremely wide and of great depth. The wind blew hard, and still the air didn't warm up. It was very dramatic how deep that cold air was." In contrast, says Gilman, the cold during the first half of February was more a "straight punch" south from Canada into the United States.

John J. Cahir of Pennsylvania State University has studied the January storms in some detail. The cold air — "a thick cold anomaly all the way from the ground to the middle of the atmosphere" — in Canada



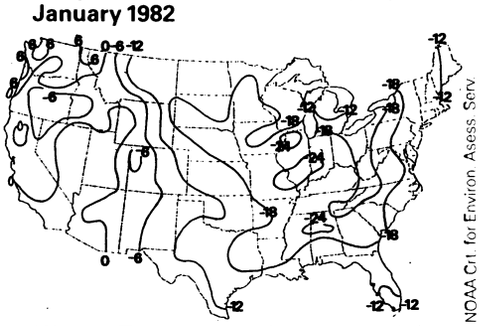
Karl/National Climatic Center

Extreme Low Temp. for January 1982



Karl/National Climatic Center

Temperature Rank 1895-1982 (88 years) January 1982



NOAA Crl. for Environ. Assess. Serv.

Weekly Temperature Departures (°F) from a 30-Year Mean Jan. 10-16, 1982

The face of January 1982 (from top): An extended zero-degree line; a ranking as one of the coldest Januaries in 88 years; a nation full of below normal temperatures for the week of January 10 to 16.

had become stalled there by a blocking ridge of high pressure over Greenland. He, Gilman and others agree that this cold mass was much deeper than normal, although they don't know why.

Then, says Cahir, two upper air disturbances developed over Canada — one over the eastern provinces and one over the western ones. Normally the mass of cold air would be expected to move slowly south out of Canada and weaken, warming up by its passage over warmer territory and also by compressional heating. But in this case the second storm over eastern Canada was amplifying at the same time that the cold air was moving south. The western storm's movement south and the Greenland blocking high both had the effect of turning the eastern storm inward toward central Canada where it intensified, becoming "an extremely intense storm, a tremendous storm." Its anomalously low pressures were now in very close proximity to the high pressures of the cold air mass.

"This big pressure difference over such short distance means the wind blows like crazy," says Cahir. "That produced the enormously strong north winds at the same time as we were getting the intense cold outbreak." And the winds caused the cold air to move southward faster than normal, "so the air didn't have time to warm up." That was the air that put much of the United States into a wind-blown deep freeze. Eventually a shallow wedge of it pushed all the way to Florida, sliding in eastward from the Gulf Coast side, an unusual route not seen since 1899, according to Hurd Willett of MIT.

How did the people issuing climate forecasts fare for the winter of 1982? It might first be well to take a cue from Alan D. Hecht, director of the National Climate Program Office, and recall the words of Niels Bohr: "Prediction is very hard, particularly of the future."

Actually, the long-range forecasts for the winter by the National Weather Service turned out to be quite accurate, especially for temperature. Relying primarily on observations of global atmospheric pressure patterns, the NWS had forecast below-normal temperatures in the eastern United States, above-normal in the West and indeterminate (no prediction) in a band down through the center. "We failed to pick up the cold in the Northwest," says Gilman, but that was about the only goof. "In hindsight I'm pleased with the success of most of the other regions. Only one out of five or six centers [regions] being wrong is better than usual."

The precipitation forecast wasn't as good, although it did pick up the high precipitation in the Northeast and the Northwest. Nevertheless, says Gilman, both the 90-day temperature and precipitation forecasts for the 1982 winter were better than usual. The National Weather Service also made six monthly forecasts at sliding intervals during the winter and had "about average success," says Gilman. "January was one of the good ones," he says. "Jan. 15 to Feb. 15 was best."

By contrast, the traditional pre-season winter forecast by Jerome Namias of Scripps's Climate Research Group "failed miserably," in Namias's own words. Namias has had some striking past successes, and last year the Scripps group was designated the nation's first non-governmental Experimental Climate Forecast Center.

No, folks, the ice age isn't upon us

Four of the past six winters have been harsh across large parts of the United States. Does that mean something dreadful is happening to the climate, the early signs of an impending ice age perhaps? Climatologists wince at such suggestions. Too many popular accounts of extreme weather events have flirted with sensationalized speculations, they feel. Those familiar with the weather know its main attribute is variability. It is misleading to generalize about climate trends from too-limited a viewpoint. It is true that the winters of 1977, 1978, 1979 and 1982 were colder than usual, but here are three reasons not to get worried about that:

- The winters of 1980 and 1981 were quite mild.
- Most of the springs and summers in these recent cold-winter years have been warm.
- While the higher latitudes across the United States and Europe were experiencing a cold winter of 1982 the lower latitudes (below 25°) around the globe were sweltering in unusual heat. "There has been a tendency of the low latitudes to be anomalously warm for some years," says Hurd Willett, a grand old man of meteorology, emeritus professor at MIT. San Juan, Puerto Rico, for example, has been systematically breaking its records for high temperatures. So the temperate-latitude cold is perhaps not even the most interesting aspect of the winter of 1982. "The outstandingly significant thing about this past winter," says Willett, "was this warmth at the low latitudes."

—K. Frazier

One of the main inputs to Namias's experimental forecasts has been sea-surface temperatures at key locations in the Pacific Ocean prior to winter. Sea-surface temperature (SST) anomalies tell something about the probable air circulation patterns above them, and that can theoretically give clues to weather conditions in the forthcoming season. But, says Namias, "This year the temperature patterns in the ocean were so weak and disorganized that we got zilch." With no clear pattern to guide him, Namias made certain assumptions to shape his forecast, and he says those choices were wrong.

At any rate, Namias is struck by the variability of the winter, which made it an especially difficult one to forecast as an entire season. "The inhomogeneity of the months during the winter was remarkable." Namias feels that three different "forcing functions" operated to influence North American weather patterns during the winter: the Arctic was forcing the pattern in December, North America itself (including a snowcover-albedo feedback effect caused by the early winter snowfalls in December) was forcing the pattern in January and conditions over the Aleutians and possibly the Atlantic Ocean were forcing patterns in February.

Rudy Preisendorfer of NOAA has devised an elaborate statistical technique to rate the accuracy of seasonal climate forecasts.

Using his data for the past eight years that way, Preisendorfer has produced some interesting conclusions:

- Winter 1982 *precipitation* was least predictable of the past five winters.
- Winter 1982 *temperature* was less predictable than in winter 1981, but more predictable than in winter 1980.
- Temperature is more predictable than precipitation, by either season or region, on the U.S. mainland.
- Both temperature and precipitation decrease in predictability through the seasonal sequence: winter, spring, summer, fall. (Winter conditions are easiest to forecast, problems though there may be; fall conditions are toughest.)
- Temperature is more predictable, as a rule, in the Pacific Coast, the Southwestern Desert and the Northern Plains, and less predictable in the Southern Plains, Gulf Coast and Atlantic Coast.
- Precipitation is more predictable in the Southwestern Desert, Great Northern Basin and Great Lakes.
- For all seasons, precipitation-prediction skill for the U.S. falls off from west to east.

William E. Riebsame, a geographer in the Climate and Society Research Group at Clark University, finds that at current skill levels it is premature to ask others to rely on 30- and 90-day climate forecasts for critical decisions (such as planting or fallowing, maintaining large gas reserves, or restricting water use). Nevertheless, he says, sets of incremental adjustments (such as scheduling planting, fertilizer application and harvesting) can effectively be tied to forecasts. He suggests more social science research is needed to see how people might actually use better climate forecasts.

"The routine use of climate forecasts is still a long way off," says Alan Hecht. But he adds, "It is not too soon to clearly define our objectives and needs for these forecasts, and point our research in that direction." □