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IOWA TORNADOES: MOTIVATORS FOR SCIENCE TEACHING

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Iowa is located in the northern portion of the Midwestern "tornado belt." Students' natural interest in tornadoes and thunderstorms provide the alert teacher a ready-made introduction to science and the environment. The new paperback *TORNADO - Accounts of Tornadoes in Iowa* (1) provides a wealth of information for the teacher, as well as reading material appropriate for students from upper-elementary through college.

Iowa Tornado Characteristics

An average of about 30 tornadoes are reported in Iowa each year. Careful investigation shows that as many as three times this number actually occur but do not make it into official tabulations (2). The Iowa tornado season peaks in May and June, although tornadoes have occurred in all months of the year. One of the more unusual cases involved the only *January* Iowa tornadoes since records have been kept. January 24, 1967 saw a large tornado outbreak (14 in all) in Iowa during spring-like conditions ahead of an advancing cold front. The conditions surrounding this winter outbreak are detailed in (1), along with a discussion of the more usual spring atmospheric situations which produce the majority of our tornadoes.

Fig. 1 shows that tornadoes occur predominantly in the late afternoon and early evening, with supper time being the most probable time of day. While the majority of Iowa twisters come from the southwest, Fig. 2 reveals the surprising fact that nearly 1 in 3 come from the *northwest*. This can be a surprise if a person sees a tornado in the northwest and thinks it could not be coming his way! The "northwest" tornadoes occur predominantly during late June and July, while the more usual variety moving from the southwest are more likely in the spring. While it may be a coincidence, it is an interesting fact that the three greatest tornado disasters in Iowa history all approached from the northwest: Camanche (1860), Grinnell (1882), and Pomeroy (1893). Many details and personal experiences from these storms are found in (1).

The earliest record of tornado damage in what is now Iowa was made in 1804. In that year the Lewis and Clark expedition paddled up the Missouri River on the historic journey that would take them all the way to the Pacific Ocean. Along the banks of western Iowa they observed the

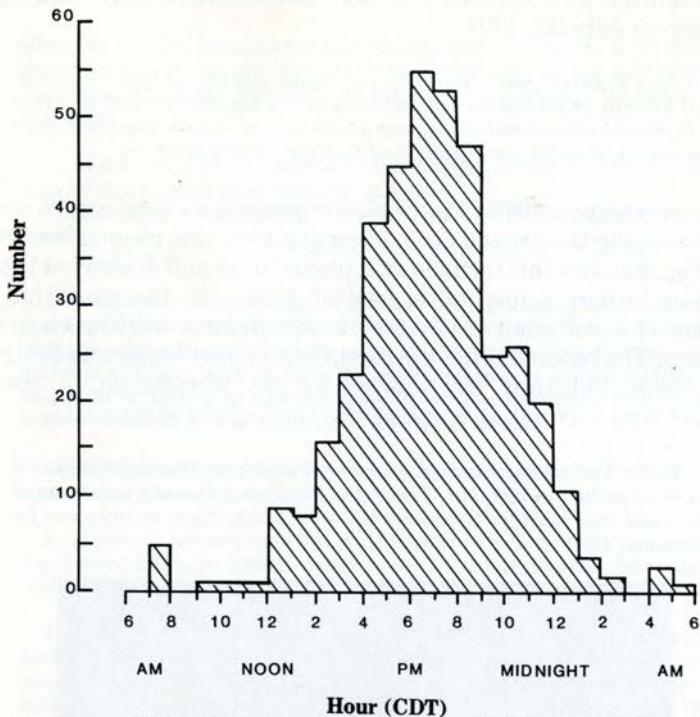


Fig. 1. Number of Iowa tornadoes reported during the 13-year period 1959-1971 (1).

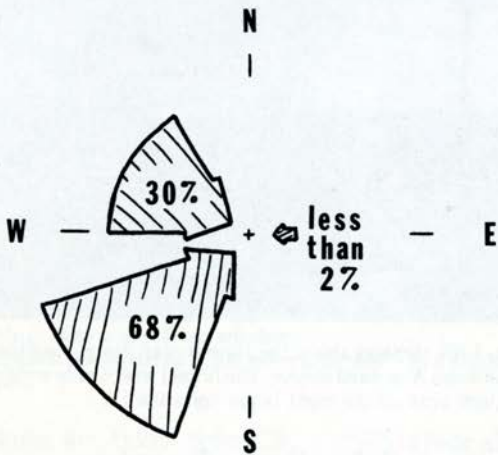


Fig. 2. Directions from which tornadoes approach in Iowa (1).

destruction left by a tornado. Captain Clark recorded these impressions in his log on July 29, 1804:

On the S.S. passed much falling timber apparently the ravages of a Dreddfull harican which had passed oblequely across the river from N.W. to the S.E. about twelve months Sinc, many trees were broken off near the ground the trunks of which were sound and four feet in Diameter.

More recently, a 1976 twister slowly ground its way across central Iowa, sweeping the ground clean like a giant vacuum cleaner for over an hour. Fig. 3 shows this tornado as it passed over and destroyed the tiny hamlet of Jordan, a few miles west of Ames. As the storm hit, five members of one Jordan family took cover under a workbench in their basement. The basement filled with rubble as their home was destroyed above them, but they were saved by the workbench. A teenage daughter who was not at home at the time of the storm said,

At first I wondered why I wasn't home. I wondered why God had spared me from going through that. Then later I was glad I wasn't here because there was only room for five under that workbench. There wasn't room for one more" (1).

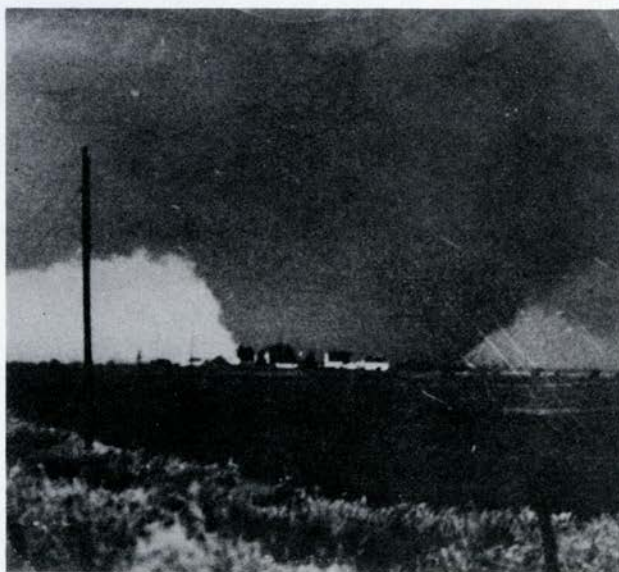


Fig. 3. June 13, 1976 tornado about the time it was destroying the hamlet of Jordan, Iowa, between Ames and Boone. The funnel was $\frac{1}{2}$ mile wide at the ground at this stage. Dark area on the right is precipitation (1).

Safety During Tornadoes

1. *In a house with a basement*, seek shelter in the basement under some sturdy object (such as a workbench or pool table). The sturdy object is required because concrete blocks, boards, and other debris

often fall into the basement of a home destroyed by a tornado. Persons under such an object are more likely to escape injury. Any part of the basement is usually adequate so long as a workbench or table is available.

2. *In a house with no basement*, seek shelter on the first floor in an interior room, such as a closet or bathroom

Small rooms with a small floor area tend to be more structurally sound.

In addition to this, studies of tornado damaged buildings in recent years have shown that the side of a house first hit by a tornado is more likely to receive damage than the opposite side of the house. For example if a tornado is approaching from the southwest toward a home without a basement, a person should seek shelter on the first floor in a small interior room or on the northeast side of the house.

In addition to these rules, it is important to stay away from windows, since flying glass may cause injuries.

3. *If caught in open country*, seek shelter as a last resort in a small depression, ditch, or culvert under a road. The missiles and debris carried by the rapidly rotating winds of a tornado are very destructive.

4. *Buildings with large, poorly supported roofs are not safe areas during a tornado*. An auditorium or gymnasium are examples of such structures. In a school or church building, the safest areas are in interior hallways, in small rooms opposite to the approach direction of the tornado, in bathrooms or closets, or under tables or chairs in basement areas. The latter would be preferable.

5. *Modern concrete reinforced buildings, such as large institutional or office buildings, are usually not heavily damaged by a tornado*. While major structural damage or collapse of such buildings may not occur, windows can be blown out (or in), along with other minor damage. These structures will generally provide relatively safe areas during a tornado, providing persons stay away from windows. Hallways on lower floors or in the basements of such buildings are the preferred safety areas. It is also not advisable to use elevators during a severe thunderstorm or tornado warning, since the electrical power may go off.

Summary of Safety Rules

1. Seek shelter under a sturdy table in the basement.
2. If no basement is available, go to a small interior room on the first floor or to a first floor room on the *opposite* side from which the tornado is approaching. Stay away from windows.
3. If caught in the open, as a last resort, lie down in a ditch or crawl into a culvert.

These guidelines are taken from Ch. 4 of (1) which also has many interesting and instructive damage photos. A picture (Fig. 4) is worth a thousand words and students will most easily get the basics of tornado safety from such photos.



Fig. 4. "My family was busy carrying important papers and belongings out of the house and I pointed my camera at the big black twister," Mrs. Dwayne Grau explained about this photo taken north of Ireton, Iowa in 1966 (1).

Tornado Stories

Many unusual events have been reported after tornadoes. After investigating many twisters, one begins to suspect that most such "impossible" happenings are true! Many such happenings are discussed in (1), from a rooster crowing without feathers to the 2500 bushels of shelled corn that absolutely disappeared in a tornado (lots of volunteer corn in surrounding areas that year?). Also a photograph of some children that was found in a corn field after it had floated down from the sky some 50 miles from where it had hung on the wall of a home. The human-interest aspect of storms is a fascinating subject.

Humor is important in retaining perspective in times of stress. Like the child who said on the day following the tornado, "House all broke; toys all broke; but birds all working."

By taking advantage of natural interest in storms, one can not only teach science, but also help others to be less frightened, more able to survive, and even on occasion to smile a bit at nature's most concentrated knock-out punch: the tornado.

Literature Cited

¹John L. Stanford, *TORNADO — Accounts of Tornadoes in Iowa*, Iowa State University Press, Ames, 1977. 109 pages, paperback.

²Steve Eshelman and John L. Stanford, Tornadoes, funnel clouds, and thunderstorm damage in Iowa during 1974, *Iowa State J. Res.*, 51, 327-361 (1977).

A brief guide to the use of clouds and storms as motivators for science teaching is available free of charge. Send self-addressed, stamped large envelope to John Stanford, Physics Department, Iowa State University, Ames 50011.

Dr. Stanford received the 1978 Public Service Award from the National Weather Service for writing and speaking activities relating to tornado safety.

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Tornado Warning

Tornado Warning, a 15-page booklet concerning tornadoes, is available upon request from the U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Washington, D.C.

Free Films

The following films are available from the E. I. DuPont De Nemours & Co., Inc., Advertising Department, Audio Visual Section, Wilmington, Delaware 19898.

The Light In The Shadows (25 min., color) About x-rays and Roentgen.

The Haskell Lab. (13 min., color) An inside look at an unusual laboratory.

The Way It Is With Man Made Fibers (27 min., color) Fibers and Textiles.

The Wonderful World of Nylon (13 min., color) A 25 year history of

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