The FUTURES Channel®

MOVIE GUIDE

MOVIE NUMBER 3002

Tornado Chase

The Movie:

Tornado-chasing meteorologists do research in the path of the storm's edge as they strive to better understand tornados for more accurate, faster forecasting. Featured: Jeff Trapp, Research Meteorologist, National Center for Atmospheric Research; Sarah Tessendorf, intern, National Center for Atmospheric Research. *(Movie length: 2:45)*

Background:

With an average energy of roughly 1 million pounds of TNT, tornados are one of nature's most powerful phenomena. And while atmospheric scientists know a great deal about tornados, such as the conditions in which they are most likely to form, no one yet understands exactly what makes a tornado or how to accurately predict their creation.

But, to a scientist, the phrase "no one yet understands" is an opportunity and a challenge, and many researchers are contributing to the effort to better understand tornados. Helping to lead this research is the National Severe Storms Laboratory (NSSL), one of the laboratories of the United States National Oceanographic and Atmospheric Association (NOAA). With state-of-the-art detection and measurement equipment, and access to some of the world's most powerful computers, NSSL is continually improving our ability to predict and pinpoint the times and locations of violent storms.

Curriculum Connections:

Measurement (area)

1

This table shows the typical range of path widths and lengths of tornados according to their Fujita Scale* rating:

Fujita scale	Path width	Path length
0	0.3 to 0.9 miles	6 to 17 yards
1	1.0 to 3.1 miles	18 to 55 yards
2	3.2 to 9.9 miles	56 to 175
3	10 to 31 miles	176 to 566 yards
4	32 to 99 miles	0.3 to 0.9 miles
5	100 to 315 miles	1.0 to 3.1 miles

Assume that the average path width for each type of tornado is halfway between maximum and minimum, and similarly for the average path length. Then find the minimum, average, and maximum area of destruction for each type of tornado.

*see problem #2

Percents, Statistics (graphs) 2

1. This scale, called the Fujita Scale, is one way that tornados are measured and described.

F0	< 73	Light damage. Some damage to chimneys; branches broken off trees; shallow-rooted trees pushed over; sign boards damaged.
F1	73-112	Moderate damage. Peels surface off roofs; mobile homes pushed off foundations or overturned; moving autos blown off roads.
F2	113-157	Considerable damage. Roofs torn off frame houses; mobile homes demolished; box-cars overturned; large trees snapped or uprooted; light-object missiles generated; cars lifted off ground.
F3	158-206	Severe damage. Roofs and some walls torn off well-constructed houses; trains over-turned; most trees in forest uprooted; heavy cars lifted off the ground and thrown.
F4	207-260	Devastating damage. Well-constructed houses leveled; structures with weak founda-tions blown away some distance; cars thrown and large missiles generated.
F5	261-318	Incredible damage. Strong frame houses leveled off foundations and swept away; auto-mobile-sized missiles fly through the air in excess of 100 meters (109 yds); trees debarked; incredible phenomena will occur.

2. This table gives the speeds measured (in miles per hour) for 40 different tornados. Use it to answer the questions below.

45	38	132	72	83	51
22	83	63	98	112	42
104	178	101	32	38	136
36	243	52	195	49	73
157	102	31	102	79	62
64	74	145	59	24	
204	49	107	65	118	

a) What percentage of the tornados were F0 or F1? F2 or F3? F4 or F5?

b) Based on this information, out of 1,071 tornados reported in the year 2000, how many of them would you expect to have speeds in the range of 30 – 60 miles per hour? To have speeds in the range of 100 – 150 miles per hour? To have a strength of F4 on the Fujita scale?

Probability 3

Suppose you live in a state with these average yearly tornado statistics:

Strength	# of tornados per year
F0	18
F1	5
F2	3
F3	2
F4	1
F5	.1

Use the information in problem #1 to determine, on average, the area of destruction for all of these tornados together.

If your state has an area of 600,000 square miles, what is the probability that any specific location will be hit by a tornado?

Graphs 4

Using the information in problem #2, draw a bar graph which shows clearly the number of F0 tornados, F1 tornados, F2 tornados, F3 tornados, F4 tornados, and F5 tornados.

Statistics, Percents 5

This table summarizes the frequency of tornados by month in the United States over a three-year period. Use this data to answer the following questions:

Based on this data, in which month of 2003 would you expect to have the most tornados? About how many would you expect? Why do you think so?

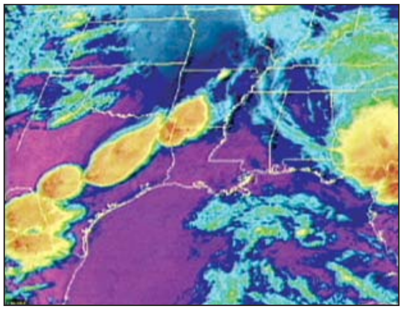
What percent of the tornados in the year 2003 would you expect to occur during the summer months of June, July, and August? Why do you think so?

Would it surprise you if the total number of tornados in the year 2003 turned out to be 502? Why or why not?

	2002	2001	2000
JAN	3	5	16
FEB	2	30	56
MAR	47	34	103
APR	118	135	136
MAY	204	240	241
JUN	97	248	135
JUL	68	120	148
AUG	86	69	52
SEP	62	84	47
OCT	57	117	63
NOV	98	112	48
DEC	99	22	26
	941	1216	1071

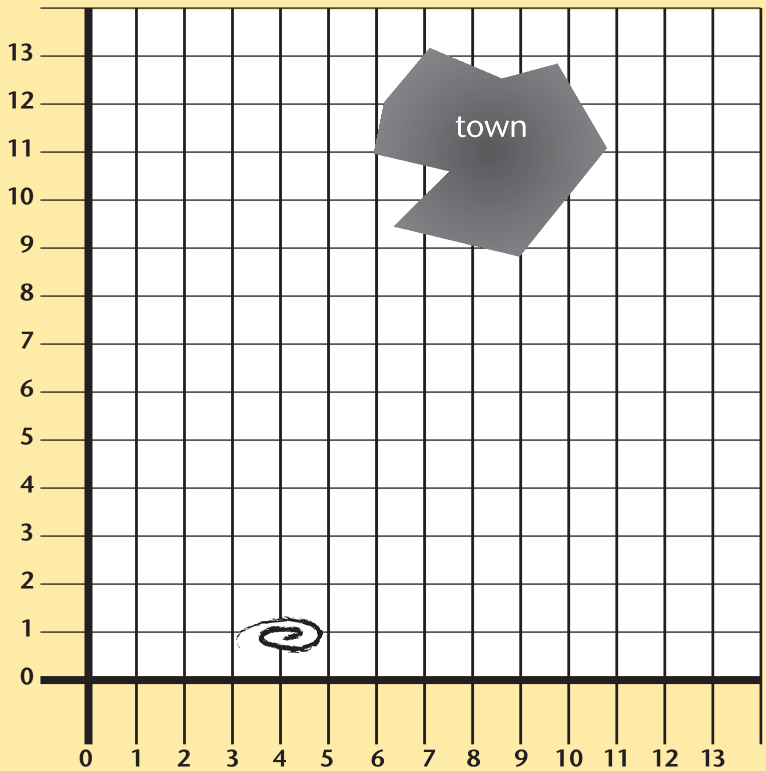
Ratios 6

The state of Texas has an average of 124 tornados a year, and has an area of 267,277 square miles. Oklahoma has an average of 52 tornados a year, with an area of 69,903 square miles. Kansas has an average of 47 tornados a year, with an area of 82,282 square miles. In which state would a resident be most likely to see a tornado?



Algebra (coordinates, slope, distance formula)

On the map below, in which the units of the grid are "miles", the tornado at coordinates (4,1) is spotted at 2:00 PM, moving at a heading of 63˚ 26' (slope = 2/1) with a velocity of 12 miles per hour. If it continues at that direction and velocity, at what point will it strike the town, and when?



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