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SUMMARY OF 1969 AND 1970 PUBLIC SEVERE THUNDERSTORM AND TORNADO WATCHES WITHIN THE NATIONAL WEATHER SERVICE, EASTERN REGION

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EASTERN REGION
Garden City, NY

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UNITED STATES DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE EASTERN REGION
Garden City, New York

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SUMMARY OF 1969 AND 1970 PUBLIC SEVERE THUNDERSTORM AND TORNADO WATCHES WITHIN THE NATIONAL WEATHER SERVICE, EASTERN REGION

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SCIENTIFIC SERVICES DIVISION
EASTERN REGION HEADQUARTERS
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SUMMARY OF 1969 AND 1970 PUBLIC SEVERE THUNDERSTORM AND TORNADO WATCHES WITHIN THE NATIONAL WEATHER SERVICE, EASTERN REGION

INTRODUCTION

The Severe Local Storms (SELS) Unit, within the National Severe Storms Forecast Center (NSSFC), Kansas City, Missouri, has the responsibility for issuing and canceling public severe thunderstorm and tornado watches and preparing other appropriate material which is essential to the severe local storms warning service (National Weather Service Operations Manual, C-40, 2.4). Upon receipt of a SELS watch, the appropriate Weather Service Forecast Office(s) (WSFO) redefines the areal coverage likely to be affected by the severe thunderstorms or tornadoes in terms of whole counties, towns, or well-known geographical landmarks. Weather Service Offices (WSOs) are not required to further redefine the areal watch statement issued by the WSFO. After receiving a SELS watch, WSFOs and WSOs must make arrangements for adequate personnel staffing when the watch is in, or within, about 100 miles of the respective offices' area of county responsibility (National Weather Service Operations Manual, C-40, 8.14).

The purpose of this report is to summarize, by area of responsibility, the SELS watches issued within the National Weather Service (NWS), Eastern Region, during 1969 and 1970. Only watches which affected the assigned area of responsibility were used in making each station's tabulation. Watches outside of the assigned area, but within 100 miles, were not included in the station tabulations.

PROCEDURES AND RESULTS

Data for this project were provided by the NSSFC. The data were in the form of a listing and included endpoints together with widths for all watches whose easternmost endpoint was east of the 89 degrees longitude line.

After preparing a large map which identified each WSFO's or WSOs county area of responsibility, a plastic overlay was constructed showing latitude and longitude markings. Plastic rectangles were prepared with scaled widths of 60, 80, 100, and 120 nautical miles. These items were used to prepare the tabulations shown in this report.

Table 1 lists the monthly number of tornado and/or public severe thunderstorm watches within the NWS's Eastern Region during 1969 and 1970. This table also shows the number of hours under watch conditions each month of 1969 and 1970. There were approximately twice as many watches and hours under watch conditions during 1970 than 1969. More than 80 percent of all SELS watches within the NWS's Eastern Region occurred in the months April

through July during these two years.

In an attempt to determine whether this increase in the number of watches from 1969 to 1970 was meteorological in origin, the number of observed tornado days was examined. Tornado days were considered to be a good indicator of meteorological conditions which would generate both tornado and severe thunderstorm watches. The data in Table 2 shows a slight increase in the number of tornado days from 1969 to 1970; however, this increase was not large enough to explain the doubling of the number of watches from 1969 to 1970. Thus, it would appear that the increased number of watches was due largely to non-meteorological causes.

Beginning times of tornado and/or public severe thunderstorm watches within the NWS's Eastern Region during 1969 and 1970 are listed in Table 3. The information contained in this table may be of assistance to individuals assigned to scheduling. For example, the Columbus WSO has for years operated a shift from 0600-1400 local time. During the severe weather season, this meant a man was going home (at 1300 EST from April-October) just when the majority of the severe weather was beginning. By changing the 0600-1400 shift to 0900-1700 local time, the Columbus WSO can be reasonably sure of double coverage during the 3-hour period (1300-1600 EST) when about 45% of all SELS watches begin. This change was made without major loss to early morning station operations. It should be noted that the workload generated by severe weather watches extends beyond the time of issuance and receipt of the watch. There is heightened weather monitoring during the watch period and post-episode statements after the watch period.

Of particular interest is the tabulation contained in Table 4. This table gives the monthly occurrences (broken into 6-hour time periods) of public severe thunderstorm and/or tornado watches within each of the Eastern Region's WSFO or WSO areas of responsibility during 1969 and 1970. Duration in hours under watch conditions for each month of 1969 and 1970 are also given for each station in Table 4. The annual summations of SELS watches within each WSFO or WSO area of responsibility for 1969 are given in Figure 1. Similar information for 1970 is contained in Figure 2. Inspection of Table 4, Figure 1 and Figure 2 shows that the "lion's share" of SELS watches within the Eastern Region occurs in Ohio. For the two years, 1969 and 1970, the ten stations with the most watches within their areas of responsibility were: Columbus with 58; Dayton, 51; Toledo, 46; Cincinnati, 42; Cleveland, 39; Akron, 38; Pittsburgh, 38; Harrisburg, 32; Youngstown, 31; and Mansfield, 29. Such information supports the fact of Ohio's being on the eastern edge of the most severe thunderstorm and tornado belt in the entire world. The heart of this thunderstorm and tornado belt runs from Oklahoma to southeastern Iowa.

Figures 3 and 4 show, respectively, the duration (in hours) that Eastern Region WSFOs and WSOs were under SELS tornado or public severe thunderstorm watches during 1969 and 1970. Values given in these figures were

abstracted from Table 4. In the NWS's Eastern Region, the average duration of SELS watches during 1969 and 1970 was slightly more than four hours.

Data collected in this study suggest severe thunderstorm type weather is common in Ohio and rare in New England and along the Atlantic Coast north of Norfolk, Virginia. The data also show the heart of the Eastern Region's severe thunderstorm belt to be from Ohio through Pennsylvania. Within this two state area, the frequency of severe thunderstorm type weather decreases from west to east. Any conclusions, drawn from the data presented in this study, should be rather tentative. The sample size is too small to guarantee statistical stability, and no measure of the independence of watches affecting neighboring areas is presented. In effect, some watches tallied in this study could have affected several warning areas (and would have been counted several times) and others may have affected only one warning area.

Comparisons are inevitable and the following restraints on comparability should be noted. The number of watches affecting a warning area is a function of:

a. Meteorological potential for severe weather in a given geographical area.

b. Area size.

c. Geometrical shape. (Long narrow areas would extend thru several weather regimes and, thus, should experience a greater exposure to severe weather than a nearly circular area, of the same areal size.)

Items a. and b. above are readily measured and described. Item c. is more difficult to assess and is not discussed here.

The meteorological potential for severe weather can be implied from the data provided in Table 2, or better yet from a longer-period climatology. The effect of areal size is presented in Table 5. Here, the size of the Columbus warning area is taken as the standard, and all other warning areas are expressed as a factor in terms of that area.* If the frequency of severe weather watches was independent from warning area to warning area, and the meteorological potential was the same for all warning areas, the frequency of watches for all warning areas could be compared with each other by dividing the frequencies in Table 4 by the areal size factor in Table 5, (ignoring any effect of geometrical shape). Obviously, these conditions do not hold here and comparisons should only be made with a full knowledge of their limitations.

*Areal size factor is defined as: $\frac{\text{Each WSO or WSFO Area}}{\text{WSO, Columbus, Area}}$

SUMMARY

Using SELS watch data provided by the NSSFC, tabulations listing the monthly number of tornado and/or public severe thunderstorm watches within the NWS's Eastern Region during 1969 and 1970 were prepared for each WSFO and WSO's area of county responsibility. For this two year period, eight of the ten Eastern Region stations with the greatest number of watches within their assigned areas of responsibility were located in Ohio.

In 1970 there were nearly twice as many public severe thunderstorm and/or tornado watches within the NWS's Eastern Region as compared to 1969. Nearly forty-five percent of all SELS watches during 1969 and 1970 had beginning times of 1300 to 1600 EST.

Notwithstanding considerations of meteorological potential, areal size, and geometric shape, the data presented here demonstrates the exposure to severe weather watches of the various offices in the Eastern Region. This could be useful information for scheduling and staffing considerations, and the assignment of priorities for receipt of communications systems. The various factors that determine exposure to severe weather watches could serve as guidance in a reconfiguration of warning areas or the designation of new areas in the future.

ACKNOWLEDGEMENT

The authors are indebted to Mr. John T. Curran* of the National Severe Storms Forecast Center in Kansas City, Missouri, for providing a complete computer listing of all 1969 and 1970 tornado and/or public severe thunderstorm watches issued by SELS.

* now at WSFO Sioux Falls, South Dakota

	1969		1970	
	Watches	Duration (hours)	Watches	Duration (hours)
January	0	0	0	0
February	0	0	2	9
March	0	0	4	17
April	5	25	17	77
May	5	20	18	78
June	23	95	18	89
July	11	48	24	117
August	7	28	5	23
September	2	7	6	22
October	0	0	1	2
November	0	0	2	5
December	0	0	3	14
Total	53	223	100	453

TABLE 1. Number of tornado and/or public severe thunderstorm watches within the NWS's Eastern Region during 1969 and 1970.

	1969	1970
Connecticut	0	1
Delaware	0	0
District of Columbia	0	0
Maine	1	1
Maryland	2	0
Massachusetts	1	5
New Hampshire	2	4
New Jersey	0	2
New York	6	4
North Carolina	4	2
Ohio	10	14
Pennsylvania	2	7
Rhode Island	0	0
South Carolina	5	1
Vermont	1	1
Virginia	5	3
West Virginia	3	4
	42	49

NOTE: These frequencies show considerable variation within the states, especially along the coast.

SOURCE: Climatological Data, National Summary, Annual Summary 1969, Volume 20, No. 13.

Climatological Data, National Summary, Annual Summary 1970, Volume 21, No. 13.

TABLE 2. Tornado Days - Eastern Region

Hour Ending at (EST)	1969 Watches	1970 Watches
01	1	1
02		2
03		3
04		
05		
06		
07		
08		
09	1	1
10		2
11		2
noon	1	3
13	6	7
14	11	15
15	6	14
16	5	18
17	4	10
18	5	13
19	6	3
20	1	0
21	0	3
22	3	1
23	2	1
00	1	1
Total	53	100

TABLE 3. Beginning time of tornado and/or public severe thunderstorm watches within the NWS's Eastern Region during 1969 and 1970.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
AKRON, OH																										
00-06							2			1	1														1	3
06-12							1																		0	1
12-18							1	2		7	4	3	1	4		2	1	2							7	20
18-00							1		1	1		1	2												3	3
																									11	27
Duration (Hours)							6	25	3	39	17	19	18	18		9	4	7							48	117
ALBANY, NY																										
00-06																									0	0
06-12											1														1	0
12-18											1	2	2	6		2		1							3	11
18-00											1		2												3	0
																									7	11
Duration (Hours)											11	12	19	29		8		5							30	54
ALLENTOWN,PA																										
00-06																									0	0
06-12											1														1	0
12-18											2	2	3	5											5	7
18-00																									0	0
																									6	7
Duration (Hours)											9	10	14	25											23	35
ASHEVILLE, NC																										
00-06							1																		0	1
06-12							1																		0	1
12-18						1	1	1			2	1		2											3	5
18-00																									0	0
																									3	7
Duration (Hours)						5	6	15			10	5		8											16	33

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
ATLANTIC CITY, NJ																										
00-06																									0	0
06-12							1																		0	1
12-18							2				1	2	2	4			1								3	9
18-00																									0	0
																									3	10
Duration (Hours)							16				3	10	8	19			3								11	48
BALTIMORE, MD																										
00-06																									0	0
06-12							2																		0	2
12-18							1	2		3	3	4	3	6			1				1				7	17
18-00												1		1	1										1	2
																									8	21
Duration (Hours)							6	20		14	13	25	11	32	3		3				2				33	96
BECKLEY, WV																										
00-06																									0	0
06-12																									0	0
12-18										1	1	1		1			3								1	6
18-00												1			1										1	1
																									2	7
Duration (Hours)										5	6	7		6	3		10								9	28
BINGHAMTON, NY																										
00-06																									0	0
06-12											1														1	0
12-18										2	2	2	2	2		1	1								4	8
18-00											1		3												4	0
																									9	8
Duration (Hours)										10	15	12	22	11		3	5								37	41

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
BOSTON, MA																										
00-06																									0	0
06-12																									0	0
12-18														4				1		1					0	6
18-00																									0	0
																									0	6
Duration (Hours)														17				3		2					0	22
BRIDGEPORT, CT																										
00-06																									0	0
06-12																									0	0
12-18													1	5				1							1	6
18-00																									0	0
																									1	6
Duration (Hours)													4	23				3							4	26
BUFFALO, NY																										
00-06																									0	0
06-12							1				1														1	1
12-18								2			4		2	1		1		2							6	6
18-00											1														1	0
																									8	7
Duration (Hours)							4		10		22		10	3		5		8							32	30
BURLINGTON, VT																										
00-06																									0	0
06-12																									0	0
12-18											1	1	1	3		2				1					2	7
18-00																									0	0
																									2	7
Duration (Hours)											3	6	6	12		9				2					9	29

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
CARIBOU, ME																										
00-06																									0	0
06-12																									0	0
12-18																									0	0
18-00																									0	0
																									0	0
Duration (Hours)																									0	0
CHARLESTON, SC																										
00-06																									0	0
06-12			1					1				1												1	0	4
12-18			1		4		3		1		1	3		3		2		1							7	12
18-00																									0	0
																									7	16
Duration (Hours)			9		17		13	4	5		5	20		16		12		4						5	35	75
CHARLESTON, WV																										
00-06																									0	0
06-12								1																	0	1
12-18							1	1		2	1	3		2		2		3							2	13
18-00												1			2										2	1
																									4	15
Duration (Hours)							6	10		10	6	18		9	6	9		10							18	66
CHARLOTTE, NC																										
00-06																									0	0
06-12								1				1													0	2
12-18					2		2				2	3		3		2		1							6	9
18-00																									0	0
																									6	11
Duration (Hours)					9		12	4			10	18		13		12		4							34	48

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
CINCINNATI, OH																										
00-06							2														1				0	3
06-12													1												0	1
12-18							1	2		7	5	3	1	3	1	2	2	3							10	20
18-00							1			1	2	2		1	1										3	5
																									13	29
Duration (Hours)							6	23		31	29	23	3	25	7	9	7	10			3				52	124
CLEVELAND, OH																										
00-06							1			1			1												1	2
06-12							1																		0	1
12-18							2		2	6	8	2	2	3			2	2							14	15
18-00							1		1	1			1	1											2	3
																									17	21
Duration (Hours)							21		10	33	30	11	18	18			7	7							65	90
COLUMBIA, SC																										
00-06																										
06-12		1						1				1													0	0
12-18						4	2			1		2	3		4	2		1							0	3
18-00											1														7	12
																									1	0
Duration (Hours)																									8	15
		6		17	12	4	5		15	18		18	12			4									44	67
COLUMBUS, OH																										
00-06							2			1			1												1	3
06-12							1																		0	1
12-18							1	3	2	11	7	5	1	6	1	3	2	3							14	31
18-00									1	2		1	1	1	2										4	4
																									19	39
Duration (Hours)							6	25	10	63	26	29	15	31	9	15	7	10							73	173

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
CONCORD, NH																										
00-06																									0	0
06-12																									0	0
12-18													3			1			1						0	5
18-00																									0	0
																									0	5
Duration (Hours)													12			5			2						0	19
DAYTON, OH																										
00-06							2						1												1	2
06-12																									0	0
12-18							1	4	3	10	9	2	2	6	1	1	2	1							18	24
18-00							1			1		1	1	1	1										2	4
																									21	30
Duration (Hours)							6	30	12	52	37	14	18	33	7	4	7	4							87	137
ELKINS, WV																										
00-06																									0	0
06-12							1																		0	1
12-18							1	2		5	1	4	1	2		1		2							3	16
18-00												1	1		2										3	1
																									6	18
Duration (Hours)							6	15		24	6	23	7	9	6	5		6							25	82
ERIE, PA																										
00-06										1															0	1
06-12							1																		0	1
12-18							1			5	3	2	2	2		1		3							5	14
18-00							1		1	1	1	1	2												4	3
																									9	19
Duration (Hours)							12		3	30	15	14	16	6		5		12							34	79

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
GREENSBORO, NC																										
00-06																									0	0
06-12							1					1													0	2
12-18					2		2				4	1		3		1		1							7	7
18-00																									0	0
																									7	9
Duration (Hours)					9		12	4			20	10		13		6		4							38	40
GREENVILLE-SPARTANBURG, SC																										
00-06																									0	0
06-12							1					1											1		0	3
12-18					2		2				3	2		3		1									6	7
18-00																									0	0
																									6	10
Duration (Hours)					11		12	6			15	14		13		6							5		33	49
HARRISBURG, PA																										
00-06																									0	0
06-12											1														1	0
12-18							3		3		2	4	5	6		1		2			1				7	20
18-00											2	1			1										3	1
																									11	21
Duration (Hours)							16		14		17	25	21	28	3	5		8			2				41	98
HARTFORD, CT																										
00-06																									0	0
06-12																									0	0
12-18											1		1	4				1		1					1	7
18-00																									0	0
																									1	7
Duration (Hours)											6		4	17				3		2					4	28

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
HATTERAS, NC																										
00-06																									0	0
06-12																									0	0
12-18												1		1		1									1	2
18-00																									0	0
																									1	2
Duration (Hours)												5		6		6									6	11
HUNTINGTON, WV																										
00-06								1														1			0	2
06-12																									0	0
12-18								1		2		1		4		3		2		3					2	14
18-00														1				2							2	1
																									4	17
Duration (Hours)								6		4		10		6		24		15		6		9		10		3	18	75
LYNCHBURG, VA																										
00-06																									0	0
06-12								1														1			0	2
12-18						1		2		1		3		1		2				2					5	7
18-00														1											0	1
																									5	10
Duration (Hours)						4		12		10		16		11		11				7		2			28	45
MANSFIELD, OH																										
00-06								1		1				1											1	2
06-12																									0	0
12-18								2		6		4		3		3				2					4	16
18-00									1	1				3				1							5	1
																									10	19
Duration (Hours)								14		3		34		16		17		18		14		4		7	41	86

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
NEW YORK, NY																										
00-06																									0	0
06-12							1																		0	1
12-18											1	2	2	4			1								3	7
18-00																									0	0
																									3	8
Duration (Hours)							6				3	12	10	19			3								13	40
NORFOLK, VA																										
00-06																									0	0
06-12							2					1													0	3
12-18					2	1	1	1		1	2		4		1		1				1				4	11
18-00											1				1										1	1
																									5	15
Duration (Hours)					6		6	14	5		6	21		22	9		4				2				26	69
PARKERSBURG, WV																										
00-06							1																		0	1
06-12							1																		0	1
12-18					1	1		7			5			2		2	3								1	20
18-00											1		1		2										3	1
																									4	23
Duration (Hours)							6	13		29		29	3	8	6	9	10								15	98
PHILADELPHIA, PA																										
00-06																									0	0
06-12							1																		0	1
12-18							2				2	3	4	5			1				1				6	12
18-00															1										1	0
																									7	13
Duration (Hours)							16				7	16	17	22	3		3				2				27	59

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
PITTSBURGH, PA																										
00-06									1																0	1
06-12							1				1														1	1
12-18							1	2		6	3	4	4	4		1		3				1			8	21
18-00									1		1	1	2		1										5	1
Duration (Hours)							6	14	3	28	21	23	25	18	3	5	11				2				14	24
																									58	101
PORTLAND, ME																										
00-06																									0	0
06-12																									0	0
12-18													1						1						0	2
18-00																									0	0
Duration (Hours)													5						2						0	7
PROVIDENCE, RI																										
00-06																									0	0
06-12																									0	0
12-18													2				1		1						0	4
18-00																									0	0
Duration (Hours)													7				3		2						0	12
RALEIGH, NC																										
00-06																									0	0
06-12							1					1													0	2
12-18					3	2	1	1		4	2		4	1			1								8	11
18-00													1												0	1
Duration (Hours)					11	12	8	5		20	14		28	6			4								8	14
																									43	65

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
RICHMOND, VA																										
00-06							1																		0	1
06-12							1				1														0	2
12-18					2		2	2	1	1	3	2	2	4			2				1				8	14
18-00												1			2										2	1
																									10	18
Duration (Hours)					6		12	20	5	4	16	21	8	23	6		7				2				47	83
ROANOKE, VA																										
00-06							1																		0	1
06-12																									0	0
12-18							1	1			2	1		1		2		1							3	6
18-00												1													0	1
																									3	8
Duration (Hours)							6	10			10	7		6		9		3							16	35
ROCHESTER, NY																										
00-06																									0	0
06-12											1														1	0
12-18											2	2		3	2		1		2						5	7
18-00											1														1	0
																									7	7
Duration (Hours)									10		18		16	9		3		8							34	30
SYRACUSE, NY																										
00-06																									0	0
06-12											1														1	0
12-18									1		1	1		3	1		2		1						4	6
18-00											1														1	0
																									6	6
Duration (Hours)									4		11	6	16	6		8		5							27	29

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
TOLEDO, OH																										
00-06							1					1	1												1	2
06-12																									0	0
12-18							5		2	7	7	2	1	6	2		1						1		13	21
18-00							2			1	2	1	2	1											4	5
																									18	28
Duration (Hours)							33		7	39	35	20	18	34	8		4						6		72	132
TRENTON, NJ																										
00-06																									0	0
06-12							1																		0	1
12-18											1	2	2	4			1								3	7
18-00																									0	0
																									3	8
Duration (Hours)							6				3	12	10	19			3								13	40
WASHINGTON, DC																										
00-06																									0	0
06-12							2																		0	2
12-18							1	1		1	3	4	3	5			1				1				7	13
18-00												1			2										2	1
																									9	16
Duration (Hours)							6	16		4	16	25	11	30	6		3				2				39	80
WILKES-BARRE, PA																										
00-06																									0	0
06-12											1														1	0
12-18									1		1	3	3	5			1								4	10
18-00											1														1	0
																									6	10
Duration (Hours)									6		11	17	14	22			5								25	50

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
WILLIAMSPORT, PA																										
00-06																									0	0
06-12											1														1	0
12-18									3		2	2	5	3		1		1							7	10
18-00											1														1	0
																									9	10
Duration (Hours)									14		15	12	23	12		5		5							38	48
WILMINGTON, DE																										
00-06																									0	0
06-12							1																		0	1
12-18							2				2	2	1	3											3	7
18-00															1										1	0
																									4	8
Duration (Hours)							16				10	10	4	16	3										17	42
WILMINGTON, NC																										
00-06																									0	0
06-12							1					1													0	2
12-18					3	2	1	1			3	2	1	3	1			1							8	10
18-00														1											0	1
																									8	13
Duration (Hours)					11	10	8	5			14	14	4	23	6			4							39	60
WORCESTER, MA																										
00-06																									0	0
06-12																									0	0
12-18														4				1		1					0	6
18-00																									0	0
																									0	6
Duration (Hours)														17				3		2					0	22

*Watches which overlap two time periods are counted in only the initial time period.

TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

TIME (EST)*	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		TOTAL	
	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70	69	70
YOUNGSTOWN, OH																										
00-06									1				1												1	1
06-12							1																		0	1
12-18							1	1		5	4	2	1	3		1		1	2						7	14
18-00							1		1	2		1	2												3	4
																									11	20
Duration (Hours)							6	12	3	33	17	15	18	12		5		4	7						48	84

*Watches which overlap two time periods are counted in only the initial time period.

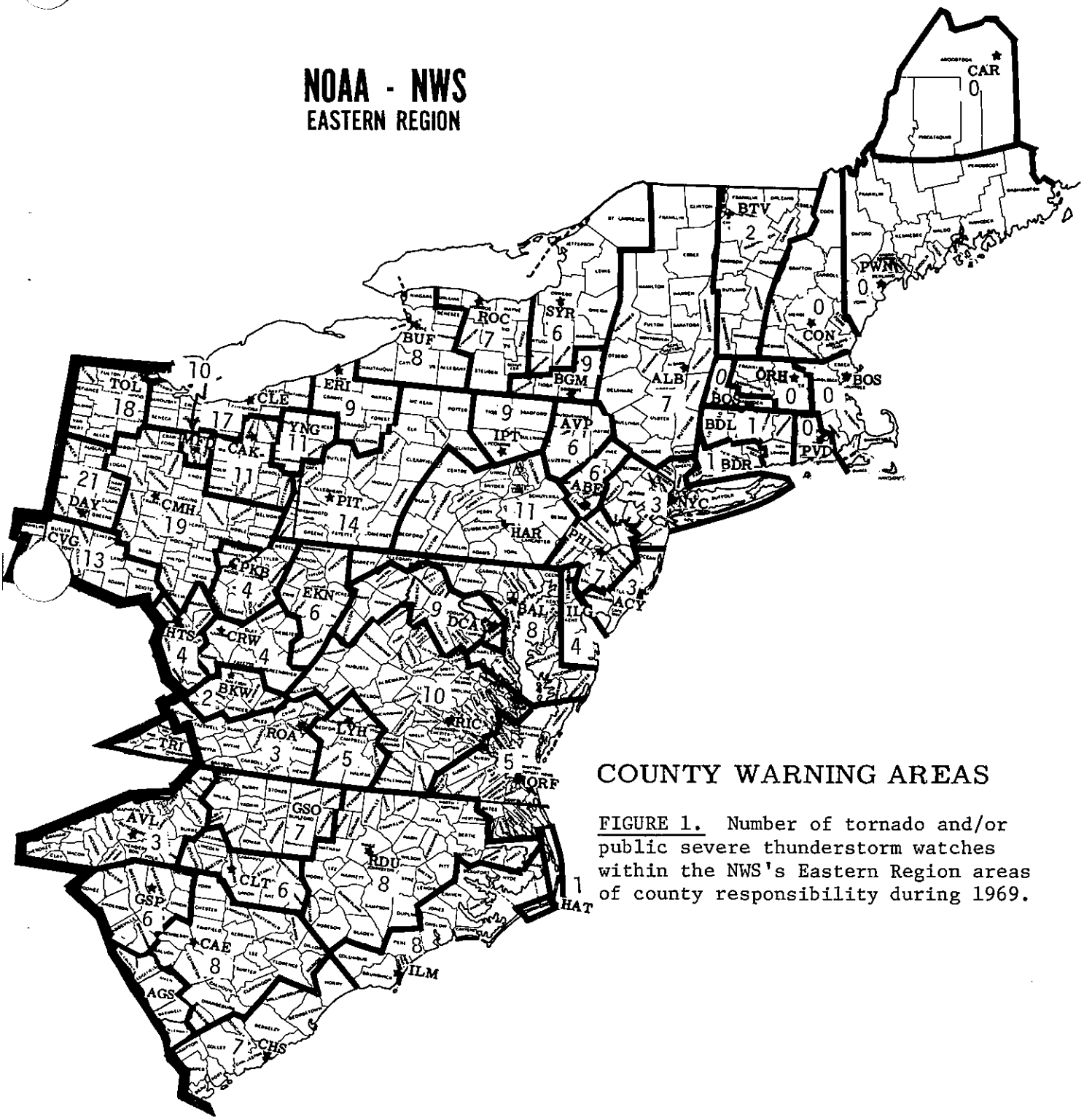
TABLE 4. 1969 and 1970 occurrences of severe thunderstorms and tornado watches in the Eastern Region.

Office	Areal Size Factor	Office	Areal Size Factor
Akron, OH	0.36	Harrisburg, PA	1.00
Albany, NY	1.67	Hartford, CT	0.20
Allentown, PA	0.17	Hatteras, NC	0.08
Asheville, NC	0.67	Huntington, WV	0.25
Atlantic City, NJ	0.21	Lynchburg, VA	0.33
Baltimore, MD	0.67	Mansfield, OH	0.07
Beckley, WV	0.26	New York, NY	0.45
Binghamton, NY	0.19	Norfolk, VA	0.45
Boston, MA	0.37	Parkersburg, WV	0.32
Bridgeport, CT	0.17	Philadelphia, PA	0.29
Buffalo, NY	0.45	Pittsburgh, PA	1.11
Burlington, VT	0.71	Portland, ME	1.67
Caribou, ME	1.43	Providence, RI	0.08
Charleston, SC	0.63	Raleigh, NC	1.43
Charleston, WV	0.38	Richmond, VA	1.25
Charlotte, NC	0.37	Roanoke, VA	0.56
Cincinnati, OH	0.48	Rochester, NY	0.40
Cleveland, OH	0.36	Scranton, PA	0.25
Columbia, SC	1.00	Syracuse, NY	0.77
Columbus, OH	1.00	Toledo, OH	0.36
Concord, NH	0.67	Washington, DC	0.56
Dayton,OH	0.33	Williamsport, PA	0.29
Elkins, WV	0.40	Wilmington, DE	0.15
Erie, PA	0.33	Wilmington, NC	0.56
Greensboro, NC	0.56	Worcester, MA	0.20
Greenville, SC	0.45	Youngstown, OH	0.20

TABLE 5. Size of County Warning Areas in the Eastern Region Expressed as a Factor in Terms of the WSO Columbus, OH, Area Size*

*NOTE: WSO, Columbus, county warning area size = 13,388 square miles.

Areal size factor is defined as: $\frac{\text{Each WSO or WSFO Area}}{\text{WSO, Columbus, Area}}$



COUNTY WARNING AREAS

FIGURE 1. Number of tornado and/or public severe thunderstorm watches within the NWS's Eastern Region areas of county responsibility during 1969.

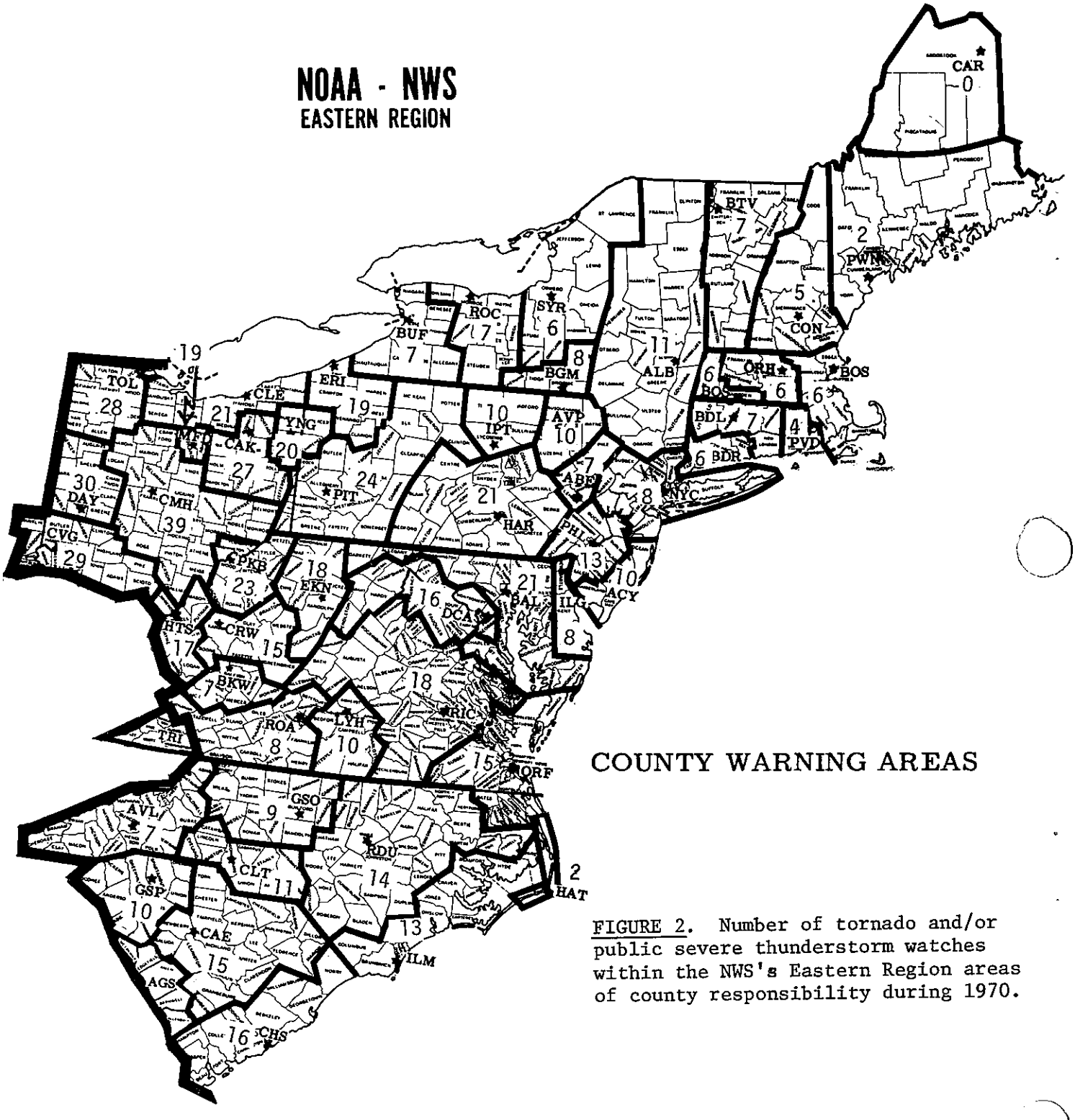


FIGURE 2. Number of tornado and/or public severe thunderstorm watches within the NWS's Eastern Region areas of county responsibility during 1970.

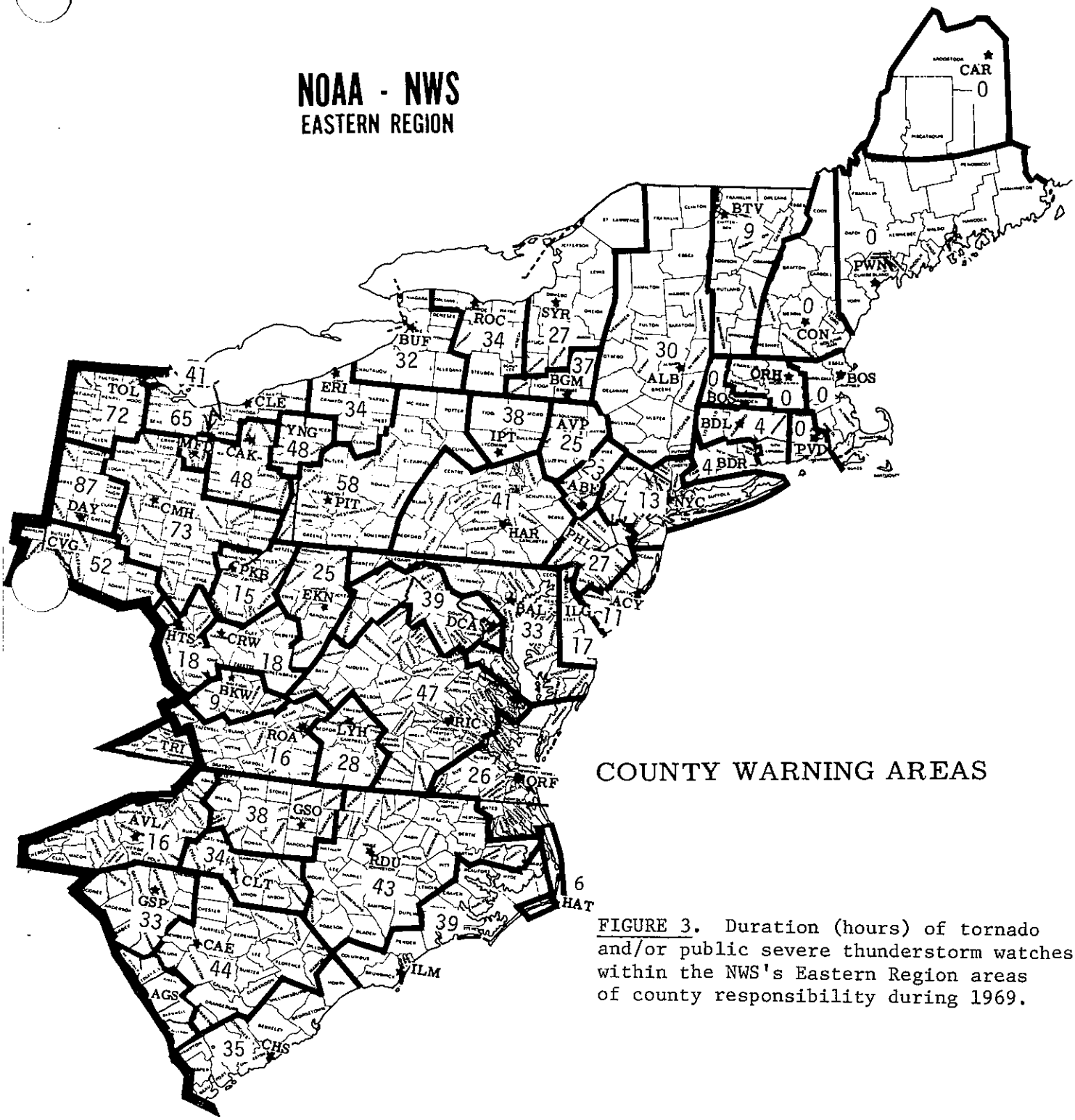
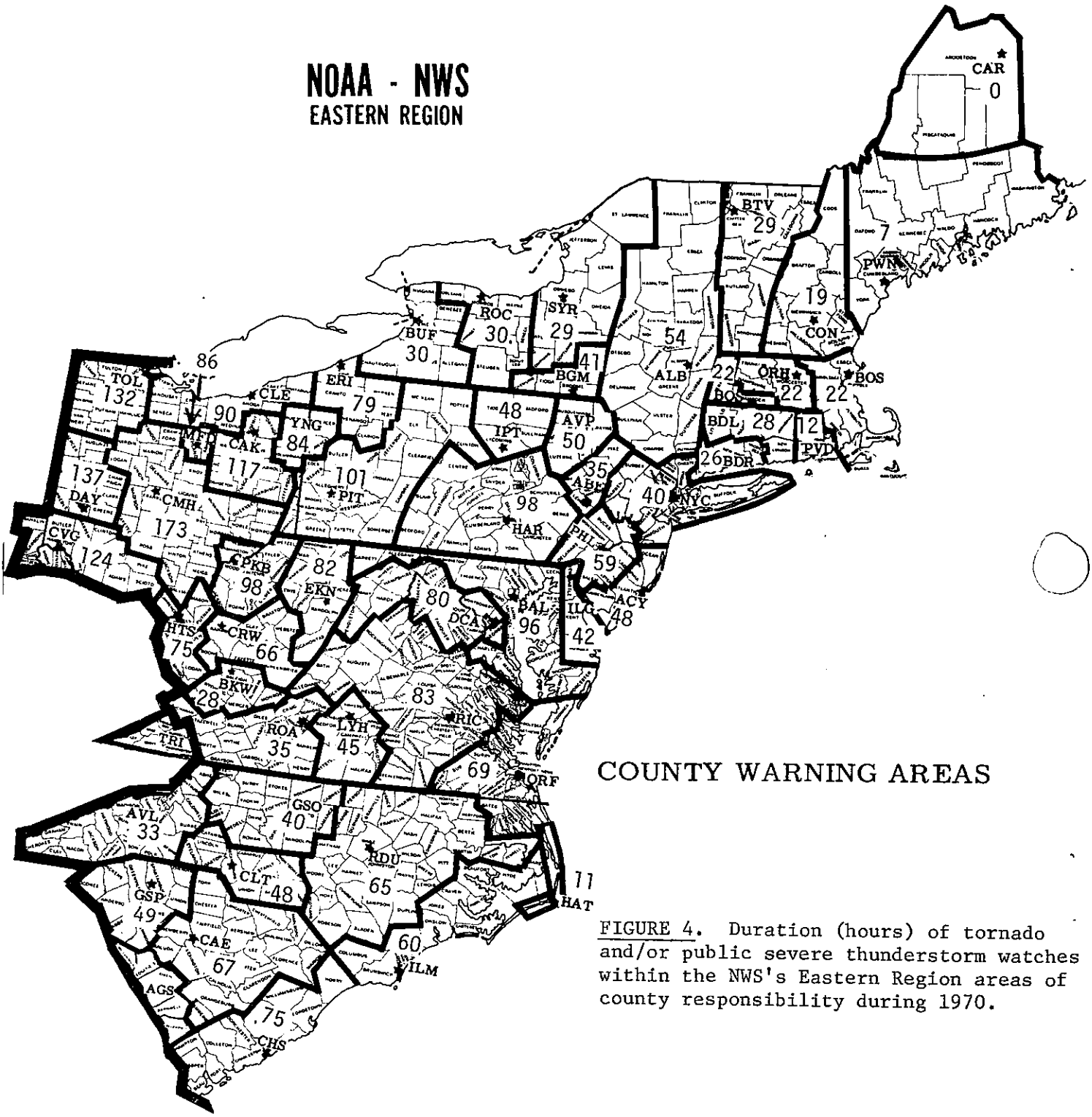


FIGURE 3. Duration (hours) of tornado and/or public severe thunderstorm watches within the NWS's Eastern Region areas of county responsibility during 1969.



COUNTY WARNING AREAS

FIGURE 4. Duration (hours) of tornado and/or public severe thunderstorm watches within the NWS's Eastern Region areas of county responsibility during 1970.

LIST OF EASTERN REGION TECHNICAL MEMORANDA

(Continued from inside front cover)

NWS ER 40 Use of Detailed Radar Intensity Data in Mesoscale Surface Analysis. Robert E. Hamilton. March 1971 (COM-71-00573)

NWS ER 41 A Relationship Between Snow Accumulation and Snow Intensity as Determined from Visibility. Stanley E. Wasserman and Daniel J. Monte. May 1971 (COM-71-00763)

NWS ER 42 A Case Study of Radar Determined Rainfall as Compared to Rain Gage Measurements. Martin Ross. July 1971 (COM-71-00897)

NWS ER 43 Snow Squalls in the Lee of Lake Erie and Lake Ontario. Jerry D. Hill. August 1971 (COM-71-00959)

NWS ER 44 Forecasting Precipitation Type at Greer, South Carolina. John C. Purvis. December 1971 (COM-72-10332)

NWS ER 45 Forecasting Type of Precipitation. Stanley E. Wasserman. January 1972 (COM-72-10316)

NWS ER 46 An Objective Method of Forecasting Summertime Thunderstorms. John F. Townsend and Russell J. Younkin. May 1972 (COM-72-10765)

NWS ER 47 An Objective Method of Preparing Cloud Cover Forecasts. James R. Sims. August 1972 (COM-72-11382)

NWS ER 48 Accuracy of Automated Temperature Forecasts for Philadelphia as Related to Sky Condition and Wind Direction. Robert B. Wassall. September 1972 (COM-72-11473)

NWS ER 49 A Procedure for Improving National Meteorological Center Objective Precipitation Forecasts. Joseph A. Ronco, Jr. November 1972 (COM-73-10132)

NWS ER 50 PEATMOS Probability of Precipitation Forecasts as an Aid in Predicting Precipitation Amounts. Stanley E. Wasserman. December 1972 (COM-73-10243)

NWS ER 51 Frequency and Intensity of Freezing Rain/Drizzle in Ohio. Marvin E. Miller. February 1973 (COM-73-10570)

NWS ER 52 Forecast and Warning Utilization of Radar Remote Facsimile Data. Robert E. Hamilton. July 1973 (COM-73-11275)