NOAA TECHNICAL MEMORANDUM NWS SPC-1

SEVERE LOCAL STORM WARNING VERIFICATION FOR 1995

/JOHN HALMSTAD
/Storm Prediction Center
/Kansas City, Missouri 64106-2877

June 1996

U.S. DEPARTMENT OF COMMERCE / National Oceanic and Atmospheric Administration / National Weather Service

National Weather Service
National Severe Storms Forecast Center

The National Severe Storms Forecast Center (NSSFC) has the responsibility for the issuance of tornado and severe thunderstorm watches for the contiguous 48 states. Watches are issued for those areas where thunderstorms are forecast to produce one or more of the following: (1) hailstones of 3/4 inch diameter or greater, (2) surface wind gusts of 50 knots or greater, or (3) tornadoes.

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No. 2 A Subjective Assessment of Model Initial Conditions Using Satellite Imagery. John E. Hales, Jr., November 1978, 19 p., (PB-291593).

No. 3 Severe Thunderstorm Radar Identification Techniques and Warning Criteria. Leslie R. Lemon, April 1980, 60 p., (PB-231409).

No. 4 The Enhanced-V, A Satellite Observable Severe Storm Signature. Donald W. McCann, March 1981, 31 p., (PB-230336).

No. 5 The Operational Meteorology of Convective Weather Volume I: Operational Mesoanalysis. Charles A. Doswell III, November 1982, 160 p., (PB83-162321).

No. 6 Severe Local Storm Warning and Event Summaries Available in AFOS. Preston W. Leftwich, Jr. and Lawrence C. Lee, January 1984, 10 p., (PB84-150291).

No. 7 Severe Thunderstorm Cases of 1984. John E. Hales, Jr. and Hugh G. Crowther, May 1985, 88 p., (PB85-210748/AS).

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UNITED STATES DEPARTMENT OF COMMERCE
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SEVERE LOCAL STORM WARNING VERIFICATION: 1995

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ABSTRACT

Tornado and severe thunderstorm warnings are issued by local offices of the National Weather Service. Routine verification of these warnings is accomplished at the Aviation Weather Center/Storm Prediction Center(AWC/SPC). This report highlights verification procedures and summarizes national, regional and local verification results for the year 1995.

In the past, offices in Southern Region and Central Region have issued most of the warnings and experienced most of the severe local storm events. In 1995, local offices in those two regions accounted for more than 75 percent of the warnings and severe local storm events.

National verification scores for 1995 showed a mixed picture. The Probability of Detection increased over 1994, reaching the highest value on record. However, there was a slight increase in the False Alarm Ratio. Together, these trends resulted in a small increase in the Critical Success Index.

INTRODUCTION

Severe local storm warnings are issued to the public by more than 200 local offices of the National Weather Service (NWS). These warnings, which are typically based on radar information and/or storm spotter reports, alert the public to an imminent or existing severe thunderstorm or tornado.

Each designated area of warning responsibility is composed of counties in the vicinity of the local office. Locations of these offices are contained in "National Weather Service Offices and Stations" (NWS 1990). Areas of responsibility are defined in Chapter C-47 of the "Weather Service Operations Manual" (1986), with included revisions by the Office of Meteorology (OM).

Routine verification of all tornado and severe thunderstorm warnings issued by offices is accomplished at the Aviation Weather Center/Storm Prediction Center (AWC/SPC) in Kansas City, Missouri. This report summarizes these verification results for the year 1995. Detailed evaluation of the results, such as comparisons among individual offices, is beyond the scope of this report.

VERIFICATION PROCEDURES

Severe local storm warning verification began in 1979. Pearson and David (1979), and Kelly and Schaefer (1982), analyzed warning verification statistics back to 1976, and in 1982 a National Verification Plan (NWS 1982) was formulated to provide guidelines for verification of all products issued to the public. The severe local storm warning verification effort at AWC/SPC is an integral part of this national program. Monthly and year-to-date summaries are routinely provided to national headquarters, regional headquarters, and local offices.

The two elements necessary for verification are: (1) issued warnings, and (2) event reports. Initially, both warnings and event reports are collected in real time from the Automation of Field Operations and Services (AFOS) computer system. Event information is extracted from surface observations, warning messages, local storm reports (LSR's), statements, pilot reports, and state weather summaries. Additional reports may be received via newspaper articles and telephone conversations. These reports form a "rough log" of severe local storm events.

Each week, listings of warnings that have been logged and processed at the Aviation Weather Center/Storm Prediction Center, and the "rough log", are transmitted via the AFOS system to local offices for review. The role of these warning and event summaries in the verification process is discussed in detail by Leftwich and Lee (1984), and updated by Grenier and Halmstad (1986).

After reviewing warning lists, local offices send any warning corrections to the Verification Section. The "rough log" is an aid for the Warning Coordination Meteorologist (WCM), Warning Preparedness Meteorologist (WPM), or severe weather focal point at each forecast office to use in preparing "Storm Data and Unusual Weather Phenomena" (FORM F-8). These F-8 reports are the sole source of event reports used in the "smooth log" for official verification. After all sources of information have been compiled, the resulting "smooth log" and warning file become the data bases for official verification.

VERIFICATION PROCEDURES

General guidelines on event reporting may be found in Grenier and Halmstad (1986). For verification purposes, multiple reports of severe local storm events occurring within ten statute miles and fifteen minutes of each other, and in the same county, are recorded as one event, with the following exceptions:

(1) all distinct tornadoes are retained as separate events

(2) all wind events of 65 knots or greater are retained

(3) all reports of hail with a diameter of two inches or greater are retained

(4) all reports containing deaths, injuries, or more than half a million dollars damage are retained (Damage Category 6, or above)

Originally, a severe event was identified as a duplicate if it met the following criteria: (1) it was in the same county, (2) it was within ten statute miles and/or fifteen minutes of another report, and (3) it was the same type of non-tornadic phenomena, i.e. wind or hail (Leftwich and Lee, 1984). It was later noted that a severe wind and severe hail report from the same thunderstorm caused the storm to be counted twice. In an effort to focus on the thunderstorm cell, the "same type" requirement was dropped at the start of the 1986 severe weather year (Grenier and Halmstad, 1986).

CRITERIA FOR SEVERE LOCAL STORM EVENTS USED IN WARNING VERIFICATION

A. **TORNADO** - a rotating circulation touching the ground and associated with a convective cloud.

B. **HAIL** equal or greater than 3/4 inch (1.9 cm) in diameter.

C. **THUNDERSTORM WIND GUST** of 50 knots (93 km/h) or greater.

D. **THUNDERSTORM WIND DAMAGE** which implies the occurrence of a severe thunderstorm.

Any event that occurs within a county for which a warning was issued, and during the valid period of the warning, is considered a "warned event". Thus there can be multiple "warned events" during the valid time of a given warning. Also, any type of severe event can verify either a tornado warning or a severe thunderstorm warning.

In current verification procedures, the county is the basic unit of area. A warning in effect for three counties is counted as three "warned counties". At least one severe local storm event occurring during the valid period of a warning in a warned county produces a "verified county warning". In order to obtain perfect verification, at least one severe local storm event must occur in each warned county.

Sparseness of population can decrease the chances that a severe weather event is reported. Schaefer and Galway (1982) addressed biases reflected in the tornado climatology across the United States, and Hales and Kelly (1985) discussed possible effects of variations in reporting of hail and thunderstorm wind gust events upon verification results. More recently, Doswell and Burgess (1988) noted several problems relating to the F-scale tornado intensity rating system and the occurrence of very long track tornado events. Results of these studies demand that caution be exercised in comparing verification results among local offices, and among regions that have different population densities or different meteorological regimes.

VERIFICATION MEASURES

FALSE ALARM RATIO

The False Alarm Ratio **(FAR)** is the number of unverified county warnings **(UCW)** divided by the total number of county warnings issued **(TCW)**.

$$\frac{\text{UNVERIFIED COUNTY WARNINGS}}{\text{TOTAL COUNTY WARNINGS}}$$

PROBABILITY OF DETECTION

The Probability of Dectection **(POD)** is the number of warned severe local storm events **(WSE)** divided by the total number of severe local storm events reported **(TSE)**.

$$\frac{\text{WARNED SEVERE EVENTS}}{\text{TOTAL SEVERE EVENTS}}$$

CRITICAL SUCCESS INDEX

The Critical Success Index **(CSI)** is the number of warned severe local storm events **(WSE)** divided by the sum of the total number of severe local storm events **(TSE)** and the number of unverified county warnings **(UCW)**.

$$\frac{\text{WARNED SEVERE EVENTS}}{\text{TOTAL SEVERE EVENTS + UNVERIFIED COUNTY WARNINGS}}$$

NOTE: The CSI values which appear in this report for the nation, each region, and for each individual station were transcribed from the annual computer printouts. Values were computed according to the following formula:

$$CSI = [\ POD^{-1} + (1 - FAR)^{-1} - 1]^{-1}$$

VERIFICATION MEASURES

VERIFICATION EFFICIENCY

The Verification Efficiency **(VE)** is the sum of the verified county warnings **(VCW)** and the number of warned severe local storm events **(WSE)**, divided by the sum of the total number of county warnings **(TCW)** and the total number of severe local storm events **(TSE)**.

$$\frac{\text{VERIFIED COUNTY WARNINGS + WARNED SEVERE EVENTS}}{\text{TOTAL COUNTY WARNINGS + TOTAL SEVERE EVENTS}}$$

PERCENTAGE OF VERIFIED COUNTY WARNINGS

The Percentage of Verified county warnings **(PV)** is the number of verified county warnings **(VCW)** divided by the total number of county warnings issued **(TCW)**. The sum of the False Alarm Ratio **(FAR)** and the Percentage of Verified county warnings **(PV)** is equal to one.

$$\frac{\text{VERIFIED COUNTY WARNINGS}}{\text{TOTAL COUNTY WARNINGS}}$$

NATIONAL VERIFICATION STATISTICS

1995

There were 18,515 severe local storm events reported across contiguous United States in 1995. The previous highest total for the nation since records began in 1979 was 15,199 reports, in 1994.

The total of 18,515 severe local storm events was 3,316 more than that for 1994 (a 22 percent increase), and marked the seventh consecutive year with an increase in the total number of severe local storm events reported across the nation. Forty-six percent of the severe local storm events in 1995 were in the Southern Region states, and 28 percent were in the Central Region states.

Of the 18,515 severe local storm events in 1995, there were 13,991 within a severe thunderstorm warning or a tornado warning. It marked a 28 percent increase over the 10,900 verified severe local storm events in 1994.

The Probability of Detection (POD) of severe weather events thus improved between 1994 and 1995, increasing from .717 to .756. For comparison Figure 1 shows the trends in values of the False Alarm Ratio(FAR), the Probability of Detection(POD), the Critical Success Index(CSI) and the Verification Efficency(VE) for the period 1997 and 1995.

The total of 25,922 county warnings was 6,814 more than the previous record of 19,108 set in 1994. It was a 36 percent increase over 1994, and marked the seventh consecutive year with an increase. The average number of county warnings 1984 to 1994 is 14,091.

There were 12,326 verified county warnings across the nation in 1995, compared to the previous record of 9,322 in 1994, an increase of 3,004 verified warnings (32 percent).

Although the number of verified county warnings increased from 9,322 in 1994 to 12,326 in 1995, the much greater increase in total number of county warnings issued (from 19,108 in 1994 to 25,922 in 1995) resulted in an overall increase in the FAR from .512 in 1994 to .524 in 1995 (i.e. the number of severe thunderstorm warnings and tornado warnings without a verifying severe local storm event increased slightly from nearly 51 percent to 52 percent). The CSI, a blend of the FAR and the POD, increased slightly, from .409 in 1994 to .412 in 1995.

National Statistics
1979 Through 1995

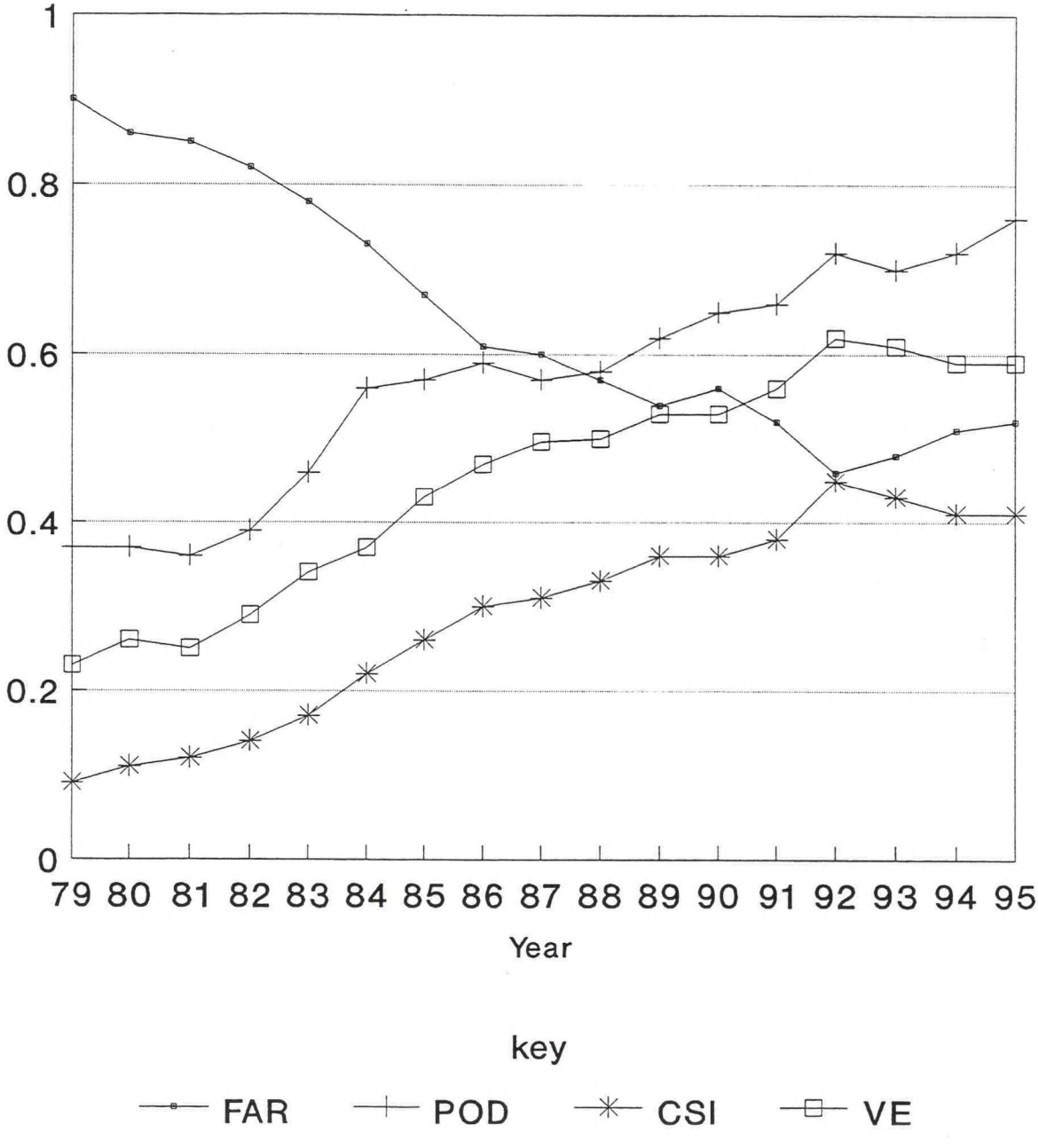

Figure 1.

TRENDS IN NATIONAL VERIFICATION STATISTICS

(1984-1995)

YEAR	TCW	VCW	TSE	WSE	FAR	POD	CSI	VE	PV
1984	12498	3316	7357	4095	.735	.557	.219	.373	.260
1985	10957	3607	7997	4555	.671	.570	.264	.431	.320
1986	10789	4155	8725	5118	.615	.587	.303	.475	.380
1987	9409	3739	7367	4228	.603	.574	.307	.475	.390
1988	8593	3675	7253	4232	.572	.583	.328	.499	.420
1989	11956	5459	10408	6468	.543	.621	.357	.533	.450
1990	13696	6085	10956	7085	.556	.647	.358	.534	.440
1991	14920	7097	12523	8358	.524	.667	.385	.563	.470
1992	15124	8168	13534	9730	.460	.719	.446	.625	.540
1993	16125	8436	14020	9835	.477	.701	.428	.606	.523
1994	19108	9322	15199	10900	.512	.717	.409	.589	.488
1995	25922	12326	18515	13991	.524	.756	.412	.592	.476

KEY TO ABBREVIATIONS

ST = STATE
WSO = WEATHER SERVICE OFFICE
TCW = TOTAL COUNTY WARNINGS
VCW = VERIFIED COUNTY WARNINGS
UCW = UNVERIFIED COUNTY WARNINGS
TSE = TOTAL SEVERE (LOCAL STORM) EVENTS
WSE = WARNED SEVERE (LOCAL STORM) EVENTS
FAR = FALSE ALARM RATIO
POD = PROBABILITY OF DETECTION
CSI = CRITICAL SUCCESS INDEX
VE = VERIFICATION EFFICIENCY
PV = PERCENTAGE OF VERIFIED COUNTY WARNINGS

NATIONAL AND REGIONAL VERIFICATION STATISTICS

1995

REGION	ERN	SRN	CEN	WRN	U.S.
TOTAL COUNTY WARNINGS	5129	12448	7210	1135	25,922
PERCENTAGE OF TOTAL	19.8	47.7	27.6	4.4	100.0
VERIFIED COUNTY WARNINGS	2738	6020	3331	237	12,326
PERCENTAGE OF TOTAL	22.2	48.4	26.8	2.0	100.0
UNVERIFIED WARNINGS	2391	6428	3879	898	13,596
PERCENTAGE OF TOTAL	17.6	47.0	28.4	6.6	100.0
TOTAL SEVERE EVENTS	4127	8590	5215	583	18,515
PERCENTAGE OF TOTAL	22.3	46.0	28.0	3.1	100.0
WARNED SEVERE EVENTS	3152	6775	3804	260	13,991
PERCENTAGE OF TOTAL	22.5	48.1	27.0	1.8	100.0
FALSE ALARM RATIO	.466	.516	.538	.791	.524
PROBABILITY OF DETECTION	.764	.789	.729	.446	.756
CRITICAL SUCCESS INDEX	.458	.428	.394	.166	.412
VERIFICATION EFFICIENCY	.636	.608	.574	.289	.592
PERCENT VERIFIED	.534	.484	.462	.209	.476

REGIONAL VERIFICATION STATISTICS

(1984-1995)

...EASTERN REGION...

YEAR	TCW	VCW	TSE	WSE	FAR	POD	CSI	VE	PV
1984	1022	344	988	505	.660	.510	.250	.420	.340
1985	1387	658	1528	906	.530	.590	.360	.530	.470
1986	1445	793	1627	952	.450	.590	.400	.570	.550
1987	1029	611	1291	722	.410	.560	.400	.580	.590
1988	1452	861	1752	1082	.410	.620	.430	.610	.590
1989	1983	1004	2171	1261	.490	.580	.370	.540	.510
1990	2488	1319	2412	1568	.470	.650	.410	.590	.530
1991	2046	1162	2237	1475	.432	.659	.439	.616	.568
1992	2377	1359	2314	1609	.428	.695	.457	.633	.575
1993	2833	1622	2792	1886	.427	.676	.449	.624	.573
1994	4082	1914	3212	2199	.531	.685	.386	.564	.469
1995	5129	2738	4127	3152	.466	.764	.458	.636	.534

...SOUTHERN REGION...

YEAR	TCW	VCW	TSE	WSE	FAR	POD	CSI	VE	PV
1984	5938	1628	3272	2005	.730	.610	.230	.440	.270
1985	4625	1596	3361	2066	.660	.600	.280	.470	.340
1986	4212	1715	3494	2195	.590	.630	.330	.520	.410
1987	3883	1486	2712	1630	.620	.600	.310	.490	.380
1988	4007	1848	3019	2040	.540	.680	.380	.570	.460
1989	6057	3088	5173	3608	.490	.700	.420	.600	.510
1990	5839	3062	4938	3552	.480	.720	.440	.620	.520
1991	6735	3476	5406	3978	.484	.736	.435	.614	.516
1992	7304	4360	6602	5169	.403	.783	.512	.685	.597
1993	6253	3636	5526	4237	.419	.767	.494	.668	.581
1994	8282	4435	6573	5185	.465	.789	.468	.648	.535
1995	12448	6020	8590	6775	.516	.789	.428	.608	.484

REGIONAL VERIFICATION STATISTICS

(1984-1995)

...CENTRAL REGION...

YEAR	TCW	VCW	TSE	WSE	FAR	POD	CSI	VE	PV
1984	5293	1319	2908	1553	.750	.530	.200	.390	.250
1985	4794	1324	2975	1612	.720	.540	.220	.410	.280
1986	4868	1623	3427	1948	.670	.570	.270	.450	.330
1987	4331	1614	3156	1847	.630	.590	.300	.480	.370
1988	2862	928	2235	1069	.680	.480	.240	.400	.320
1989	3694	1321	2845	1551	.640	.550	.280	.450	.360
1990	4987	1645	3375	1902	.670	.560	.260	.450	.330
1991	5690	2387	4558	2837	.580	.623	.334	.510	.420
1992	5029	2352	4266	2849	.532	.668	.379	.560	.468
1993	6571	3062	5309	3578	.534	.674	.380	.559	.466
1994	6334	2872	5036	3395	.547	.674	.372	.551	.453
1995	7210	3331	5215	3804	.538	.729	.394	.574	.462

...WESTERN REGION...

YEAR	TCW	VCW	TSE	WSE	FAR	POD	CSI	VE	PV
1984	245	25	189	32	.900	.170	.070	.140	.100
1985	151	29	133	31	.810	.230	.210	.120	.190
1986	264	24	177	23	.910	.130	.060	.110	.090
1987	166	28	208	29	.830	.140	.080	.150	.170
1988	272	38	245	41	.860	.170	.080	.150	.140
1989	222	46	218	48	.790	.220	.120	.210	.210
1990	382	59	231	63	.850	.270	.110	.210	.150
1991	449	72	324	68	.840	.210	.100	.181	.160
1992	397	80	346	91	.798	.263	.129	.230	.202
1993	468	116	352	134	.752	.381	.177	.305	.248
1994	410	101	378	121	.754	.320	.162	.282	.240
1995	1135	237	583	260	.791	.446	.166	.289	.209

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APPENDIX A

1995 VERIFICATION STATISTICS

...EASTERN REGION STATIONS...

WSO	ST	TCW	VCW	UCW	TSE	WSE	FAR	POD	CSI	VE	PV
AKQ	VA	324	167	157	219	173	.485	.790	.453	.626	.515
ALB	NY	132	97	35	190	157	.265	.826	.637	.789	.735
AVL	NC	100	9	91	35	9	.910	.257	.071	.133	.090
BDL	CT	0	0	0	1	1	.000	1.000	1.000	1.000	.000
BGM	NY	137	87	50	192	136	.365	.708	.503	.678	.635
BOS	MA	138	68	70	110	72	.507	.655	.391	.565	.493
BTV	VT	24	18	6	33	28	.250	.848	.661	.807	.750
BUF	NY	113	60	53	77	51	.469	.662	.418	.584	.531
CAE	SC	309	216	93	284	232	.301	.817	.604	.755	.699
CHS	SC	166	114	52	145	126	.313	.869	.622	.772	.687
CLE	OH	396	236	160	293	234	.404	.799	.518	.682	.596
CLT	NC	78	13	65	34	16	.833	.471	.140	.259	.167
CRW	WV	264	138	126	171	145	.477	.848	.478	.651	.523
CTP	PA	393	240	153	293	255	.389	.870	.560	.722	.622
GSO	NC	38	2	36	6	2	.947	.333	.048	.091	.053
GSP	SC	117	67	50	124	90	.427	.726	.471	.651	.573
HAT	NC	7	0	7	0	0	1.000	.000	.000	.000	.000
ILM	NC	198	109	89	194	139	.449	.716	.452	.633	.551
ILN	OH	515	274	241	345	277	.468	.803	.471	.641	.532
MFD	OH	0	0	0	1	0	.000	.000	.000	.000	.000
MHX	NC	120	80	40	121	104	.333	.860	.601	.763	.667
NYC	NY	118	74	44	128	89	.373	.695	.492	.663	.627

APPENDIX A

1995 VERIFICATION STATISTICS

...EASTERN REGION STATIONS...

WSO	ST	TCW	VCW	UCW	TSE	WSE	FAR	POD	CSI	VE	PV
ORF	VA	6	0	6	2	0	1.000	.000	.000	.000	.000
ORH	MA	0	0	0	1	1	.000	1.000	1.000	1.000	.000
PHL	PA	208	94	114	166	110	.548	.663	.367	.545	.452
PIT	PA	484	221	263	298	267	.543	.896	.434	.624	.457
PVD	RI	0	0	0	7	6	.000	.857	.857	.857	.000
PWM	ME	34	9	25	38	9	.735	.237	.143	.250	.265
RDU	NC	289	92	197	176	98	.682	.557	.254	.409	.318
RNK	VA	223	151	72	216	169	.323	.782	.570	.729	.677
ROA	VA	0	0	0	2	2	.000	1.000	1.000	1.000	.000
SYR	NY	0	0	0	31	25	.000	.806	.806	.806	.000
WBC	DC	198	102	96	194	129	.485	.665	.409	.589	.515

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APPENDIX A

1995 VERIFICATION STATISTICS

...SOUTHERN REGION STATIONS...

WSO	ST	TCW	VCW	UCW	TSE	WSE	FAR	POD	CSI	VE	PV
ABI	TX	208	71	137	112	78	.659	.696	.297	.466	.341
ABQ	NM	65	24	41	44	27	.631	.614	.300	.468	.369
AGS	GA	14	7	7	13	9	.500	.692	.409	.593	.500
AHN	GA	53	10	43	25	11	.811	.440	.152	.269	.189
AMA	TX	371	242	129	383	322	.348	.841	.581	.748	.652
AQQ	FL	12	1	11	1	1	.917	1.000	.083	.154	.083
ATL	GA	455	167	288	281	152	.633	.541	.280	.433	.367
AUS	TX	15	1	14	11	1	.933	.091	.040	.077	.067
BHM	AL	569	215	354	231	194	.622	.840	.352	.511	.378
BNA	TN	426	246	180	303	263	.423	.868	.531	.698	.577
BPT	TX	72	31	41	43	30	.569	.698	.363	.530	.430
BRO	TX	55	10	45	19	10	.818	.526	.156	.270	.182
BTR	LA	132	58	74	55	37	.561	.673	.362	.508	.439
CHA	TN	69	21	48	44	22	.696	.500	.233	.381	.304
CRP	TX	38	24	14	31	23	.368	.742	.518	.681	.632
CSG	GA	63	13	50	29	13	.794	.448	.165	.283	.206
DAB	FL	14	2	12	3	2	.857	.667	.133	.235	.143
DRT	TX	1	0	1	1	0	1.000	.000	.000	.000	.000
ELP	TX	21	0	21	7	0	1.000	.000	.000	.000	.000
EYW	FL	1	0	1	3	0	1.000	.000	.000	.000	.000
FMY	FL	0	0	0	12	7	.000	.583	.583	.583	.000
FTW	TX	752	511	241	796	679	.320	.853	.608	.769	.679
HOU	TX	464	185	279	233	200	.601	.858	.374	.552	.399
HSV	AL	193	82	111	131	104	.575	.794	.383	.574	.425
JAN	MS	818	359	459	441	390	.561	.884	.415	.595	.439
JAX	FL	360	110	250	155	107	.694	.690	.269	.421	.301
LBB	TX	213	128	85	185	143	.399	.773	.511	.681	.601
LCH	LA	390	212	178	318	244	.456	.767	.467	.644	.543
LIT	AR	492	393	99	474	444	.201	.937	.758	.866	.799
MAF	TX	391	155	236	215	170	.604	.791	.359	.536	.396
MCN	GA	30	22	8	57	39	.267	.684	.548	.701	.733
MEI	MS	67	36	31	41	36	.463	.878	.500	.667	.537
MEM	TN	407	206	201	344	218	.494	.634	.392	.565	.506
MGM	AL	70	15	55	89	58	.786	.652	.192	.459	.214
MIA	FL	75	23	52	46	24	.693	.522	.239	.388	.307
MLB	FL	72	31	41	51	35	.569	.686	.360	.537	.430
MOB	AL	332	175	157	246	200	.473	.813	.470	.649	.527

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1995 VERIFICATION STATISTICS

...SOUTHERN REGION STATIONS...

WSO	ST	TCW	VCW	UCW	TSE	WSE	FAR	POD	CSI	VE	PV
MRX	TN	168	93	75	140	98	.446	.700	.447	.620	.554
NEW	LA	667	120	547	224	150	.820	.670	.165	.303	.178
OKC	OK	1421	811	610	999	905	.429	.906	.539	.709	.569
PBI	FL	5	2	3	3	3	.600	1.000	.400	.625	.400
PNS	FL	52	1	51	4	1	.981	.250	.018	.036	.019
ROW	NM	1	0	1	8	3	1.000	.375	.000	.333	.000
SAT	TX	344	98	246	161	108	.715	.671	.250	.408	.285
SAV	GA	77	17	60	24	16	.779	.667	.199	.327	.221
SHV	LA	438	172	266	322	206	.607	.640	.322	.497	.393
SJT	TX	133	61	72	95	75	.541	.789	.409	.596	.459
TBW	FL	138	56	82	100	59	.594	.590	.317	.483	.401
TLH	FL	206	87	119	131	87	.578	.664	.348	.516	.422
TRI	TN	7	0	7	18	9	1.000	.500	.000	.363	.000
TUL	OK	797	637	160	766	687	.201	.897	.732	.847	.799
TUP	MS	30	7	23	13	6	.767	.462	.183	.302	.233
TYS	TN	167	69	98	97	63	.587	.649	.338	.500	.413
VCT	TX	17	3	14	12	6	.824	.500	.150	.310	.176

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1995 VERIFICATION STATISTICS

...CENTRAL REGION STATIONS...

WSO	ST	TCW	VCW	UCW	TSE	WSE	FAR	POD	CSI	VE	PV
ABR	SD	131	57	74	91	75	.565	.824	.398	.595	.435
ALO	IA	25	11	14	30	17	.560	.567	.329	.509	.440
ALS	CO	0	0	0	1	0	.000	.000	.000	.000	.000
APN	MI	38	17	21	28	19	.553	.679	.369	.545	.447
BIS	ND	160	71	89	96	78	.556	.812	.403	.582	.444
CHI	IL	108	42	66	101	45	.611	.446	.262	.416	.389
COS	CO	5	1	4	1	0	.800	.000	.000	.167	.200
COU	MO	82	28	54	40	32	.659	.800	.315	.492	.341
CPR	WY	32	11	21	19	10	.656	.526	.263	.412	.344
CYS	WY	83	21	62	60	27	.747	.450	.193	.336	.253
DBQ	IA	5	4	1	10	4	.200	.400	.364	.533	.800
DDC	KS	359	230	129	344	275	.359	.799	.552	.718	.641
DEN	CO	209	58	151	122	69	.722	.566	.229	.384	.278
DLH	MN	90	46	44	71	55	.489	.775	.445	.627	.511
DSM	IA	162	87	75	140	76	.463	.543	.370	.540	.537
DTX	MI	87	64	23	93	73	.264	.785	.612	.761	.736
EVV	IN	310	80	230	123	84	.742	.683	.230	.379	.258
FAR	ND	74	13	61	26	16	.824	.615	.158	.290	.176
FSD	SD	156	57	99	100	66	.635	.660	.308	.480	.365
FWA	IN	34	16	18	22	15	.529	.682	.386	.554	.470
GJT	CO	5	0	5	4	0	1.000	.000	.000	.000	.000
GLD	KS	230	144	86	186	166	.374	.892	.582	.745	.626
GRB	WI	139	74	65	125	94	.468	.752	.453	.636	.532
GRI	NE	152	79	73	120	95	.480	.792	.457	.640	.520
GRR	MI	18	4	14	16	6	.778	.375	.162	.294	.222
HON	SD	48	12	36	44	18	.750	.409	.184	.326	.250
HTL	MI	29	12	17	31	18	.586	.581	.319	.500	.413
ICT	KS	249	154	95	231	183	.382	.792	.532	.702	.618
IND	IN	103	49	54	105	55	.524	.524	.332	.504	.476
INL	MN	23	5	18	12	5	.783	.417	.167	.286	.217
ISN	ND	47	25	22	36	30	.468	.833	.481	.663	.532
JKL	KY	189	54	135	76	43	.714	.566	.234	.366	.286
LAN	MI	26	8	18	28	12	.692	.429	.218	.370	.308
LBF	NE	96	75	21	88	78	.219	.886	.710	.823	.781
LEX	KY	89	34	55	63	37	.618	.587	.301	.467	.382
LND	WY	4	0	4	7	0	1.000	.000	.000	.000	.000

APPENDIX A

1995 VERIFICATION STATISTICS

...CENTRAL REGION STATIONS...

WSO	ST	TCW	VCW	UCW	TSE	WSE	FAR	POD	CSI	VE	PV
LSE	WI	38	18	20	33	23	.526	.697	.393	.577	.474
MCI	MO	351	186	165	299	227	.470	.759	.454	.635	.530
MKE	WI	168	100	68	165	135	.405	.818	.526	.706	.595
MKG	MI	37	22	15	36	31	.405	.861	.543	.726	.595
MLI	IL	186	111	75	209	142	.403	.679	.466	.641	.597
MQT	MI	64	33	31	53	40	.484	.755	.442	.624	.516
MSN	WI	23	13	10	14	11	.435	.786	.490	.649	.565
MSP	MN	297	83	214	91	55	.721	.623	.239	.393	.279
OFK	NE	6	3	3	4	4	.500	1.000	.500	.700	.500
OMA	NE	217	70	147	133	90	.677	.677	.280	.457	.323
PAH	KY	334	170	164	233	173	.491	.742	.433	.605	.509
PIA	IL	97	45	52	59	51	.536	.864	.432	.615	.464
PUB	CO	221	111	110	130	116	.498	.892	.474	.647	.502
RAP	SD	71	12	59	34	11	.831	.324	.125	.219	.169
RFD	IL	0	0	0	1	1	.000	1.000	1.000	1.000	.000
RST	MN	46	8	38	20	10	.826	.500	.148	.273	.174
SBN	IN	28	0	28	3	0	1.000	.000	.000	.000	.000
SDF	KY	304	78	226	132	84	.743	.636	.224	.372	.257
SGF	MO	402	245	157	284	259	.391	.912	.576	.735	.609
SHR	WY	5	3	2	16	5	.400	.312	.259	.381	.600
SPI	IL	139	59	80	82	59	.576	.720	.364	.534	.424
SSM	MI	14	5	9	9	8	.643	.889	.342	.565	.357
STL	MO	326	188	138	273	224	.423	.821	.512	.688	.577
TOP	KS	239	125	114	157	133	.477	.847	.478	.652	.523

APPENDIX A

1995 VERIFICATION STATISTICS

...WESTERN REGION STATIONS...

WSO	ST	TCW	VCW	UCW	TSE	WSE	FAR	POD	CSI	VE	PV
BFL	CA	0	0	0	1	0	.000	.000	.000	.000	.000
BIL	MT	110	39	71	95	53	.645	.558	.277	.449	.035
BOI	ID	217	55	162	85	44	.747	.518	.205	.328	.253
EKA	CA	0	0	0	1	0	.000	.000	.000	.000	.000
EKO	NV	5	1	4	7	2	.800	.286	.133	.250	.200
FAT	CA	35	10	25	24	12	.714	.500	.222	.373	.286
FCA	MT	2	0	2	2	0	1.000	.000	.000	.000	.000
FLG	AZ	10	0	10	7	0	1.000	.000	.000	.000	.000
GEG	WA	16	3	13	4	3	.812	.750	.176	.300	.188
GGW	MT	59	19	40	43	25	.678	.581	.261	.431	.322
GTF	MT	150	27	123	71	34	.820	.479	.151	.276	.180
LAS	NV	6	0	6	5	0	1.000	.000	.000	.000	.000
LAX	CA	16	0	16	4	0	1.000	.000	.000	.000	.000
LWS	ID	7	0	7	14	8	1.000	.571	.000	.381	.000
MFR	OR	8	3	5	11	4	.625	.364	.226	.368	.375
MSO	MT	57	13	44	36	12	.772	.333	.157	.269	.228
PDT	OR	19	1	18	15	1	.947	.067	.030	.059	.053
PDX	OR	28	2	26	5	1	.929	.200	.056	.091	.071
PHX	AZ	110	25	85	53	27	.773	.509	.186	.319	.228
PIH	ID	101	10	91	27	9	.901	.333	.083	.148	.099
RNO	NV	32	5	27	10	4	.844	.400	.127	.214	.016
SAC	CA	12	0	12	2	0	1.000	.000	.000	.000	.000
SEA	WA	14	2	12	2	0	.857	.000	.000	.125	.143
SFO	CA	0	0	0	2	0	.000	.000	.000	.000	.000
SLC	UT	53	8	45	29	8	.849	.276	.108	.195	.151
TUS	AZ	67	14	53	28	13	.791	.464	.168	.284	.029
YKM	WA	1	0	1	0	0	1.000	.000	.000	.000	.000

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