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WINTER AND SUMMER VERIFICATION PROCEDURES

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SUMMARY OF REVISIONS: This supplement replaces Regional Operations Manual Letter C-06-02, "Winter Storm Warning/High Wind Warning Verification Program" filed with WSOM C-75; Policy Memorandum "Commencement of Winter Storm Warning and High Wind Warning Verification", dated December 2, 1998 and filed with WSOM Chapter C-72; and Policy Memorandum "Corrected Policy Memorandum - Refresher Information for Winter Storm Warning (WSW) and High Wind Warning (NPW) Verification", dated February 3, 2000 and filed with WSOM Chapter C-72.

(Signed by Dennis H. McCarthy) September 23, 2003
Dennis H. McCarthy Date
Director, Central Region

WINTER AND SUMMER VERIFICATION PROCEDURES

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1. Introduction. The purpose of verification is to assess National Weather Service (NWS) warning performance and identify areas for improvement in service to NWS customers.

This supplement will specify additional instructions which Central Region Weather Forecast Offices (WFOs) will follow for winter storm, high wind, tornado, and flash flood warning verification.

2. Winter Storm and High Wind Warnings. For verification of winter storm and high wind warnings, Central Region WFOs will follow instructions in NWSI 10-1601, section 1.2, except for as follows in this supplement. Central Region Headquarters (CRH) will verify winter storm and high wind warnings. Outlooks, watches, and advisories, as well as wind chill warnings, may be verified at the local WFO, if desired.

Central Region WFOs will enter the following winter weather statistics via the Central Region intranet site: http://crh-1.crh.noaa.gov/verification/index.html .

WFOs will enter the following statistics for winter storm events/warnings and high wind events/warnings:

Number of Winter Storm Warnings/High Wind Warnings issued;

Number of Winter Storm Warnings/High Wind Warnings issued, which verified;

Number of Winter Storm/High Wind events for which no warning was issued. These are also called missed events;

Number of Winter Storm Warnings/High Wind Warnings issued, which did not verify;

Number of Winter Storm Warnings/High Wind Warnings, which verified, and were preceded by a watch;

Total Lead Time for all Winter Storm Events, and for all High Wind Events.

The number of winter storm/high wind events will be considered the sum of the number of winter storm/high wind warnings verified plus the number of missed events. The number of winter storm/high wind events verified, Average Lead Time, Probability of Detection (POD), False Alarm Ratio (FAR), and Critical Success Index (CSI) will be calculated at CRH for each WFO and for the entire Central Region. WFOs may compute these statistics for their own use.

Subjective judgment, common sense, and integrity will be the guiding factors in determining winter storm events and lead times. Some points WFOs should consider when deciding whether or not a warning verified:

Thresholds are locally determined by criteria posted on the Central Region server's N drive under the directory, wac .

Snow amounts are mean values in a zone.

WFOs should consider areal extent. Was the event over a large enough area that the WFO should have issued a warning?

WFOs in Colorado and Wyoming as well as Jackson, Kentucky will consider elevation. Criteria for mountain zones areas in Colorado and Wyoming are posted on the Central Region server's N drive under the directory, wac .

WFOs should verify winter storm and high wind warnings using quality assessed surface observations and reports.

For zones with insufficient surface observations and reports, WFOs may use information from radar or satellite precipitation estimates, extrapolation of surface observations and reports, and knowledge of local effects, to verify winter storm and high wind warnings.

WFOs should consider whether or not the storm created a life threatening hazard due to snow or ice accumulation/wind, or in combination with such other parameters as blowing snow or wind chill. Forecasting such a life threatening situation is the mission of the winter storm and high wind warning program as indicated in NWSI 10-513, section 5.1 and NWSI 10-515, section 5.1.

Events beginning after a warning has been downgraded to an advisory will count as missed events.

Events beginning after the warning expires, is cancelled, or ending before the warning is issued will count as missed events.

Written instructions cannot address every situation which will arise. The final determination will reside with the WFO Meteorologist in Charge as to whether or not an event occurred or a warning verified.

For local application and to build a suitable archive of a WFO verification efforts, CRH strongly encourages all WFOs to complete a very brief account of the observations or data which verified each zone.

To avoid a "last minute" rush to complete winter storm and high wind verification, CRH strongly recommends WFOs perform verification soon after each storm.

These winter storm and high wind statistics will be due at CRH according to the following table.

WINTER WEATHER VERIFICATION DUE DATE

FISCAL YEAR QUARTER	VALID PERIOD	DUE DATE AT CRH
1	OCTOBER - DECEMBER	JANUARY 30
2	JANUARY - MARCH	APRIL 29
3	APRIL - JUNE	JULY 30
4	JULY - SEPTEMBER	OCTOBER 30

3. Tornado Warnings. For verification of tornado warnings, Central Region WFOs will follow instructions in NWSI 10-1601, section 2, except for as follows in this supplement.

Central Region WFOs will enter preliminary tornado verification statistics via the Central Region intranet site: http://crh-1.crh.noaa.gov/verification/index.html . WFOs will enter statistics by 10:00 a.m. Central Time one day prior to the date stated in NWSI 10-1601, section 2.1.5 unless otherwise instructed by CRH. CRH will fill out table 2 in NWSI 10-1601.

National Weather Service Headquarters requires tornado statistics in Table 2 of NWSI 10-1601. Central Region WFOs will enter the following statistics for tornadoes:

Number of tornado warnings issued;

Number of tornado warnings issued, which verified;

Number of tornado events;

Number of warned tornado events;

Total lead time for **all** tornado events including missed events.

CRH will calculate the number of tornado warnings not verified, number of unwarned tornado events, average lead time, POD, FAR, and CSI for each WFO and for the entire Central Region. WFOs may compute these statistics for their own use.

Lead time used here is event lead time. Event lead time is the time the event occurs minus the issuance time of the tornado warning valid, or in effect, at the time of the event. All reported tornado events have a lead time. Events without a warning have an event lead time of zero. More than one event can use the same tornado warning for calculating lead time. A tornado, which crosses from one county into another county, creates another tornado event. To match tornado events with tornado warnings, use criteria in NWSI 10-1601, section 2.1.1. Average lead time is the sum of all tornado event lead times divided by the number of tornado events.

4. Flash Flood Warning. For verification of flash flood warnings, Central Region WFOs will follow instructions in NWSI 10-1601, section 4, except for as follows in this supplement. Central Region guidelines for flash flood warning verification can be found in Appendix A.

Central Region WFOs will enter preliminary flash flood verification statistics via the Central Region intranet site: http://crh-1.crh.noaa.gov/verification/index.html . WFOs will enter statistics by 10:00 a.m. Central Time one day prior to the date stated in NWSI 10-1601, section 4.1.5 unless otherwise instructed by CRH. CRH will fill out table 8 in NWSI 10-1601.

National Weather Service Headquarters requires statistics in Table 8 in NWSI 10-1601. Central Region WFOs will submit the following statistics for flash floods:

Number of flash flood warnings issued;

Number of flash flood warnings issued, which verified;

Number of flash flood events;

Number of warned flash flood events;

Total lead time for **all** flash flood warnings including missed events.

CRH will calculate the number of flash flood warnings not verified, number of unwarned flash flood events, average lead time, POD, FAR, and CSI for each WFO and for the entire Central Region. WFOs may compute these statistics for their own use.

Lead time used here is event lead time. Event lead time is the time the flash flood event first occurs in a county minus the issuance time of the flash flood warning valid, or in effect, for the same county at the time of the event. Flash flood events without a warning have an event lead time of zero. To match flash flood events with flash flood warnings, use criteria in NWSI 10-1601, section 4.1.1 Average lead time is the sum of flash flood event lead times divided by the number of these flash flood events.

Appendix A - Central Region Flash Flood Verification Criteria

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1. Guidelines for Central Region. The criteria listed below can be used to verify a flash flood warning if one or more occur as a result of flooding that meets the definition of Flash Flood: a short-term flood event (typically within 6 hours of the cause) which requires immediate action to protect lives and property, such as dangerous small stream flooding or urban flooding, and dam or levee failures.

When to warn? Basically, if water is forecast to, or already is, rising rapidly in places that are normally dry, or normally at a much lower level, and pose a threat to life or property; people should be warned. For example, water moving over a road causing a car to be swept into a swollen creek (above or within banks) which is rushing and rising rapidly, is a flash flood. Depth of approximately six inches of moving water was chosen for verification as it will knock a person off his/her feet and begin to cause some cars to move out of control. There may also be cases where a lesser amount of swiftly moving water results in impact criteria described below, and would also verify a flash flood occurred.

It can be difficult to ascertain, whether or not, a flash flood has occurred without accurate reports. Questions for observers are provided below that may help with this effort.

The flash flood criteria are guidelines and may not be all-inclusive. National Weather Service staff should use professional judgement in issuing and verifying flash flood warnings, keeping in mind the ultimate goal: warn the public of rising water that will inundate an area to the degree of threatening life or property.

Flash Flood Verification Criteria is as follows: Usually within 6 hours of causative event such as heavy rain, dam break, or ice jam release, one or more of the following occurs:

- River or stream flows out of banks and is a threat to life or property.
- Person or vehicle swept away by flowing water from runoff that inundates adjacent grounds.

- A maintained county or state road closed by high water.

- Approximately six inches or more of flowing water over a road or bridge. This includes low water crossings in a heavy rain event that is more than localized (i.e., radar and observer reports indicate flooding in nearby locations) and poses a threat to life or property.

- Dam break or ice jam release causes dangerous out of bank stream flows or inundates normally dry areas creating a hazard to life or property.

- Any amount of water in contact, flowing into, or causing damage of an above ground residence or public building and is runoff from adjacent grounds.

- Three feet or more of ponded water that poses a threat to life or property.

2. Nuisance Flooding vs. Threat to Life or Property. Nuisance flooding would not meet the flash flood criteria outlined above and would not pose a threat to life or property. Examples of nuisance flooding include:

- Urban/Small Stream flooding (conditions that do not pose a threat to life or property). Urban and small stream flooding is entered as a heavy rain event in storm data.

- Minor ponding of water during or after a heavy rain event or flood. (Significant ponding may pose a threat to life and property. A 1988 United States Bureau of Reclamation (USBR) study indicates 3 feet or more as a danger to people and vehicles.)

- High stream levels due to steady or slowly rising/receding creeks/streams that do not pose a threat to life or property.

There may be times when fatalities or damage occur due to a heavy rain event that does not meet the flash flood criteria above, or the event may be so isolated that it was not determined to be a danger to life or property. These are entered in storm data in the heavy rain category. A few examples would be the weight of heavy rain collapsing a roof on a single building, and a fatality in a storm drain due to minor urban flooding.

There may be times when fatalities occur well after the flood is over. An example would be someone who drives into a receding stream at high levels but within banks, or drives into a flooded underpass that has been barricaded and high for an extended period of time after the flood. These would be recorded as indirect flood or flash flood fatalities.

3. Questions to Ask. Questions should be posed in such a way as to determine whether or not the criteria were met. Example questions are given below. These questions could also be used in real time as the heavy rain event becomes a flood.

- Was the river/stream flowing out of banks and a danger to life or property?
- Were any roads or bridges closed?
- Was water rapidly flowing over the road or land surface (yard, field, etc)?
- Can you estimate the maximum depth of the water? (May ask to compare to car tires)
- Did water inundate any houses or buildings?
- Were there any evacuations due to flood waters?
- Can you estimate the beginning and ending time of the flood that created impacts?