NOHRSC Interactive Snowfall Maps

National Operational Hydrologic Remote Sensing Center
Office of Climate, Water, and Weather Services
National Weather Service, NOAA

Minneapolis, Minnesota

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Background

The National Operational Hydrologic Remote Sensing Center (NOHRSC) creates a large number of daily, operational, snow map products for the CONUS used by the NWS and other Federal, state, local, private-sector, and public users. See www.nohrsc.noaa.gov and specifically, the NOHRSC Overview on the side-bar menu on the homepage for more information on the NOHRSC map and gridded snow products.

Because the NOHRSC attempts to ingest all available ground-based snow data available in SHEF over AWIPS for the CONUS, it was agreed at the NWS 2004 Cold Regions Hydrology Workshop (Kansas City, 2004 November 15-19) that the NOHRSC would develop web-based, real-time, automated, interactive, snowfall maps for the CONUS. This document discusses the current status of that effort and contains sections titled:

1. NOHRSC Interactive Snowfall Maps
    a. Constrained Spatial Interpolation over High Elevations
    b. Raw Snowfall Data for Download
2. Interpolation of Snowfall Observations
    a. Temporal Interpolation
    b. Spatial Interpolation
    c. Timing and Latency of Interactive Snowfall Map Products
3. Snowfall Observation Data Provided in SHEF over AWIPS
    a. Recommendations for NWS Field Offices
4. APPENDIX
    a. Examples of Correct and Incorrect SHEF-Encoded Snowfall Data
    b. Examples of Snowfall Data Products That Cannot be Used at the NOHRSC

Please review this document and provide your comments and suggestions for improving the NOHRSC interactive snowfall maps to Tom.Carroll@noaa.gov by 2005 June 30. We will incorporate all useful suggestions and generate operational, interactive snowfall maps for the CONUS starting in water year 2006.

1. NOHRSC Interactive Snowfall Maps

We have added six (6) new snowfall maps to the NOHRSC selection of Physical Elements on the NOHRSC Interactive Snow Information page. They are:

1. Daily total snowfall observations (for previous 24 hours)
2. 2-day total snowfall observations (for previous 48 hours)
3. 3-day total snowfall observations (for previous 72 hours)
4. Daily total snowfall interpolation (for previous 24 hours)
5. 2-day total snowfall interpolation (for previous 48 hours)
6. 3-day total snowfall interpolation (for previous 72 hours)

No NOHRSC simulated energy-and-mass-balance snow model information (i.e., SNODAS) is included in the snowfall maps—only observed snowfall data received in SHEF over AWIPS. Examples of each of the six maps are given below with additional variations on the theme. The above snowfall maps can be accessed for the CONUS from the NOHRSC web site for any date after 2005 April 23. Note that we opted to display reported zero snowfall observation values on the maps. Consequently, the plotted zero snowfall values displayed on small scale maps overplot and obscure the underlying image. Zooming to a larger map scale eliminates the problem. We will change the depth scale intervals on all interactive snow maps before the next snow season.

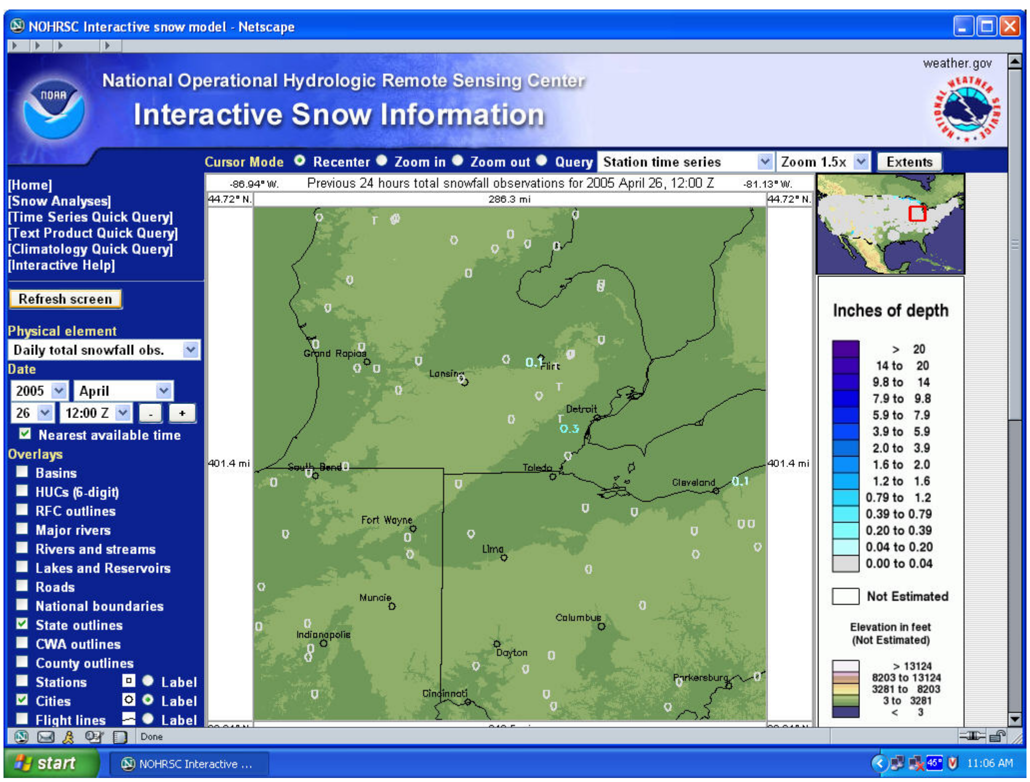

Figure 1. Snowfall observations for previous 24 hours plotted on digital elevation data. Note: Observations of zero snowfall are reported. T equals "trace". (Detroit, Michigan: 2005 April 26)

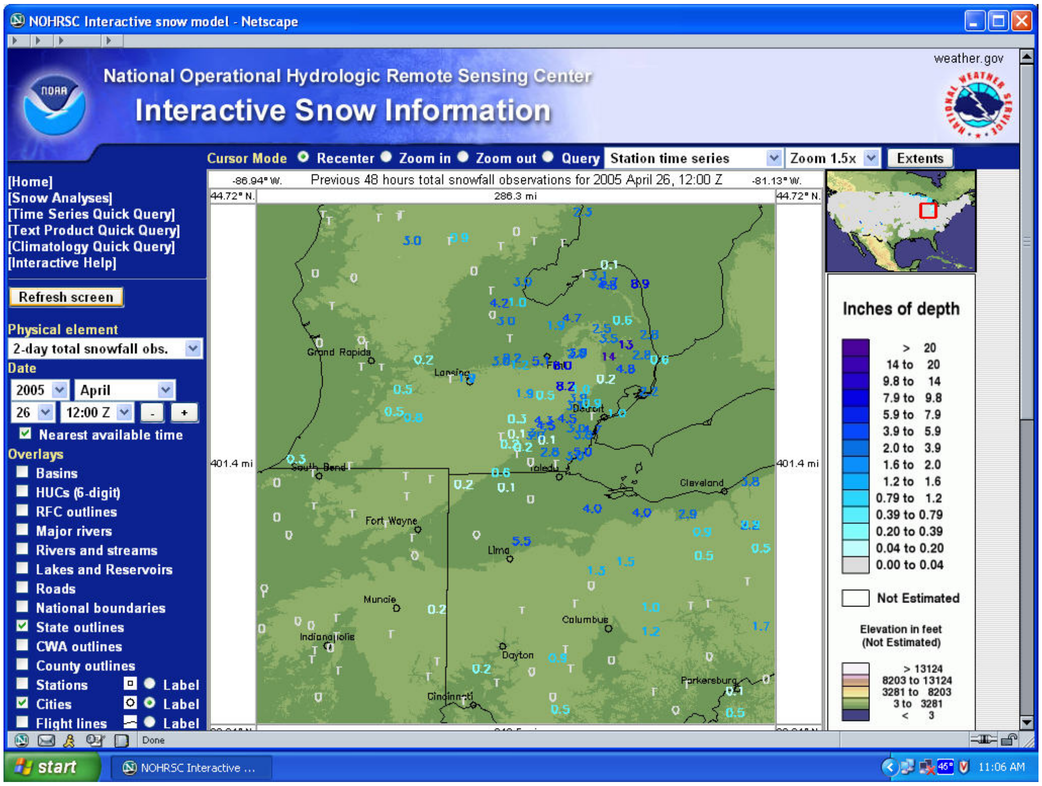

Figure 2. Snowfall observations for previous 48 hours.

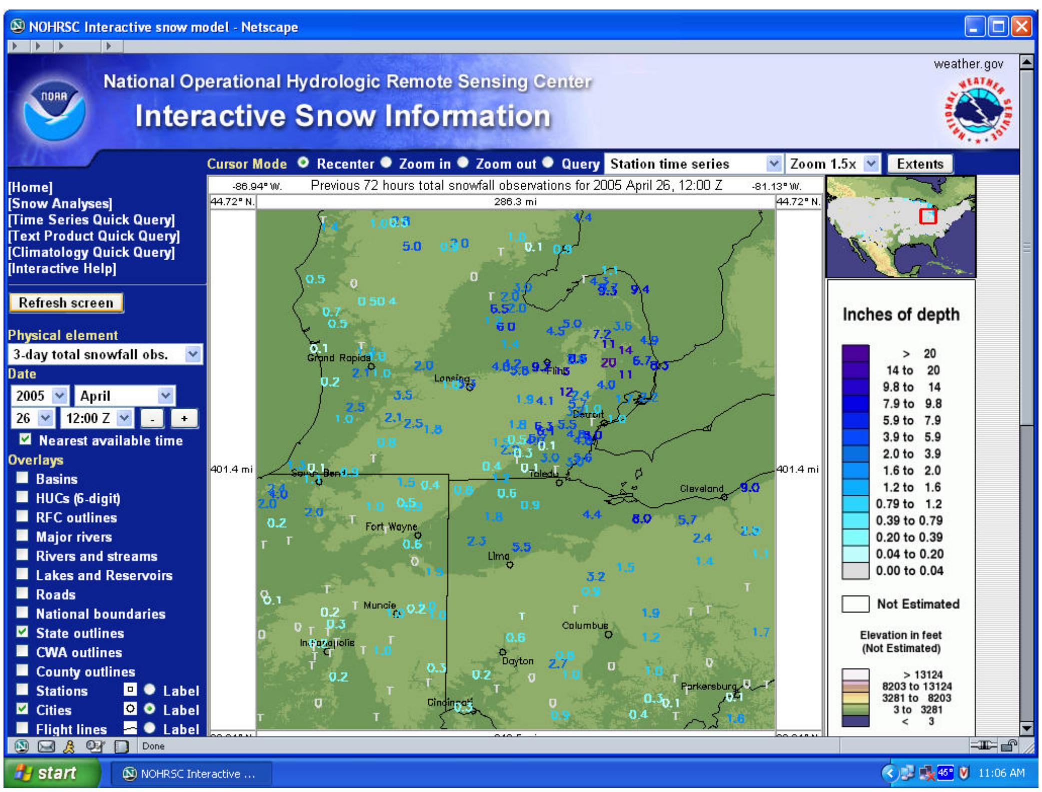

Figure 3. Snowfall observations for previous 72 hours.

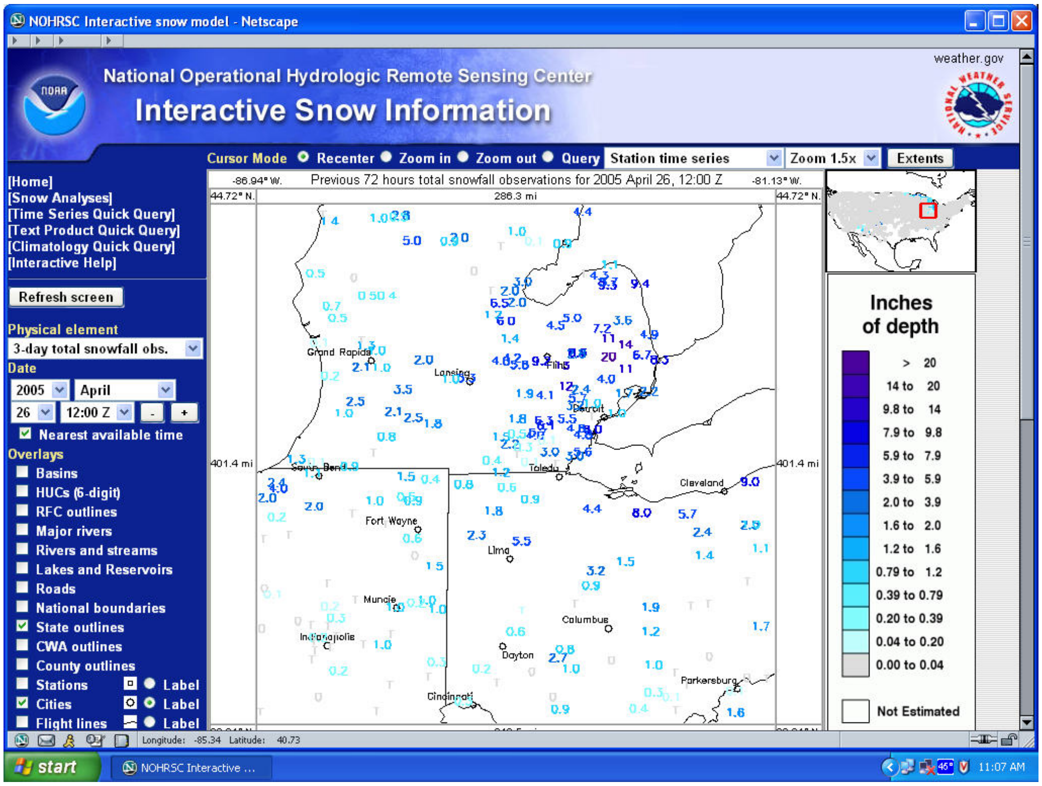

Figure 4. Snowfall observations for previous 72 hours; no DEM background.

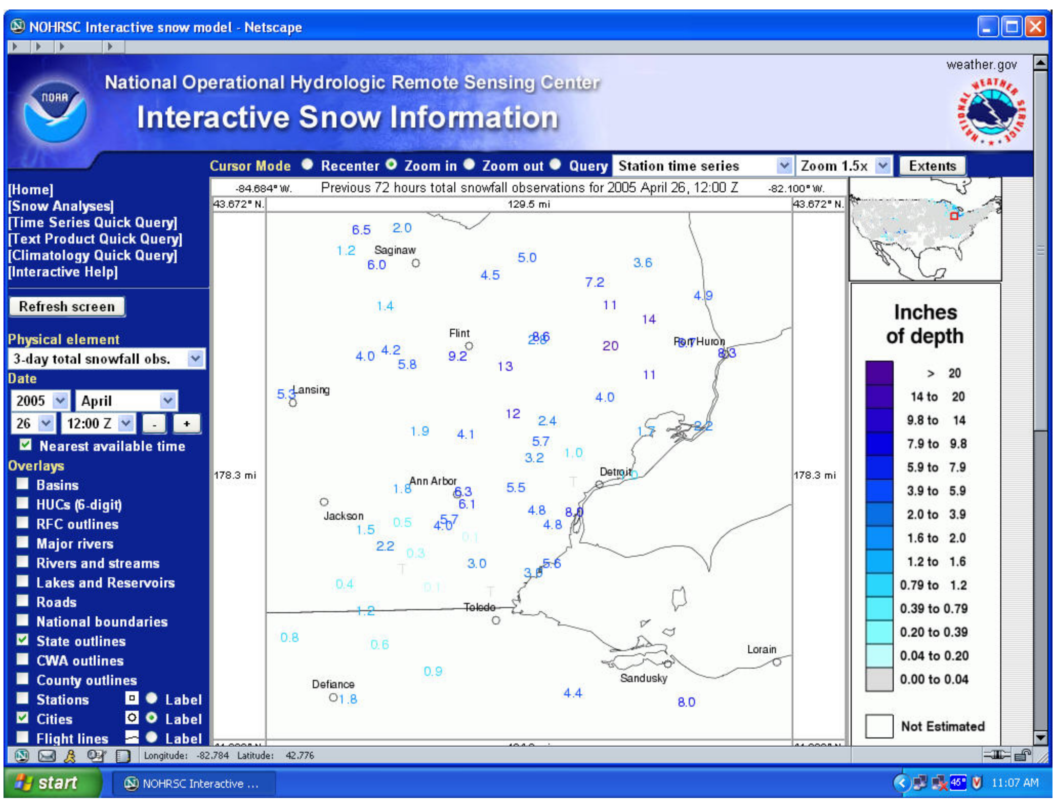

Figure 5. Snowfall observations for previous 72 hours, zoomed in on Detroit.

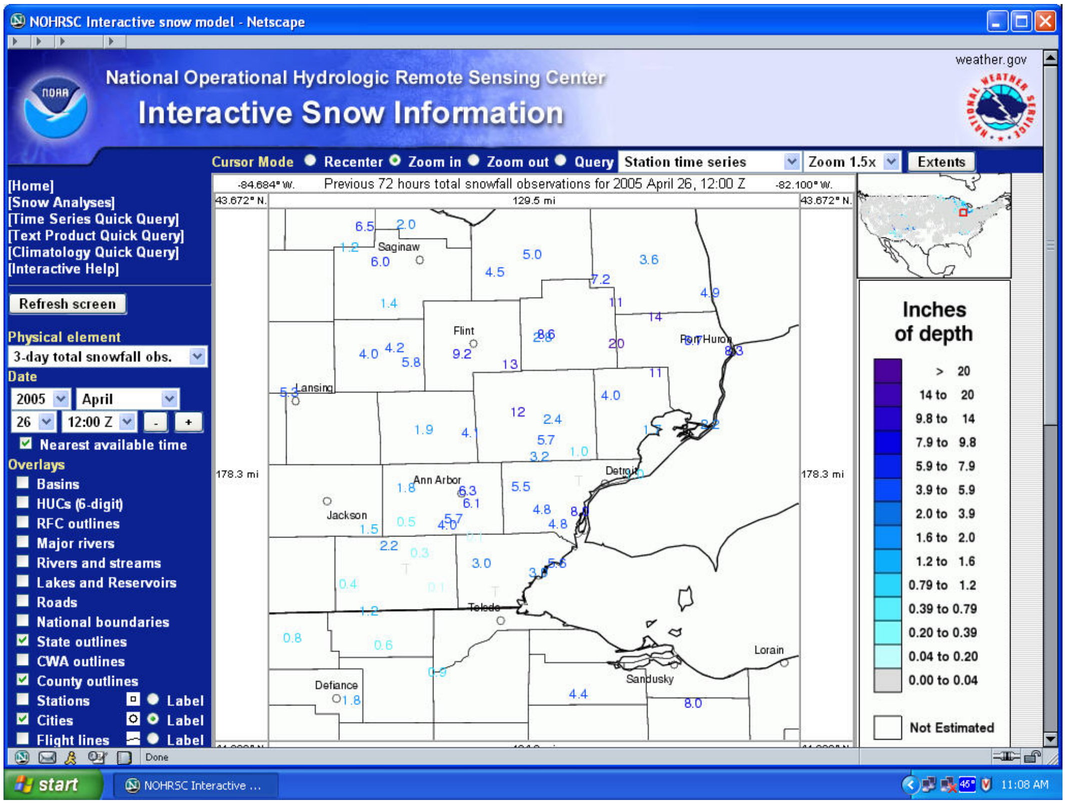

Figure 6. Snowfall observations for previous 72 hours, with county overlays.

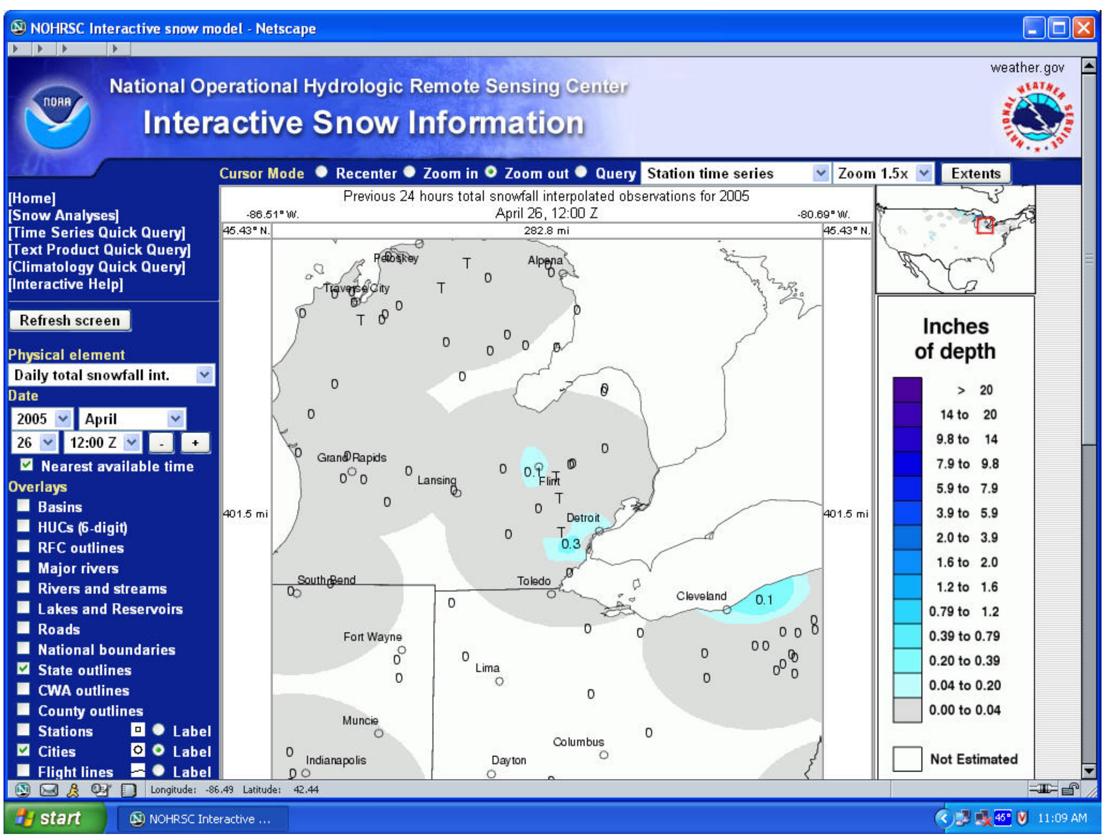

Figure 7. Snowfall observations for previous 24 hours, interpolated.

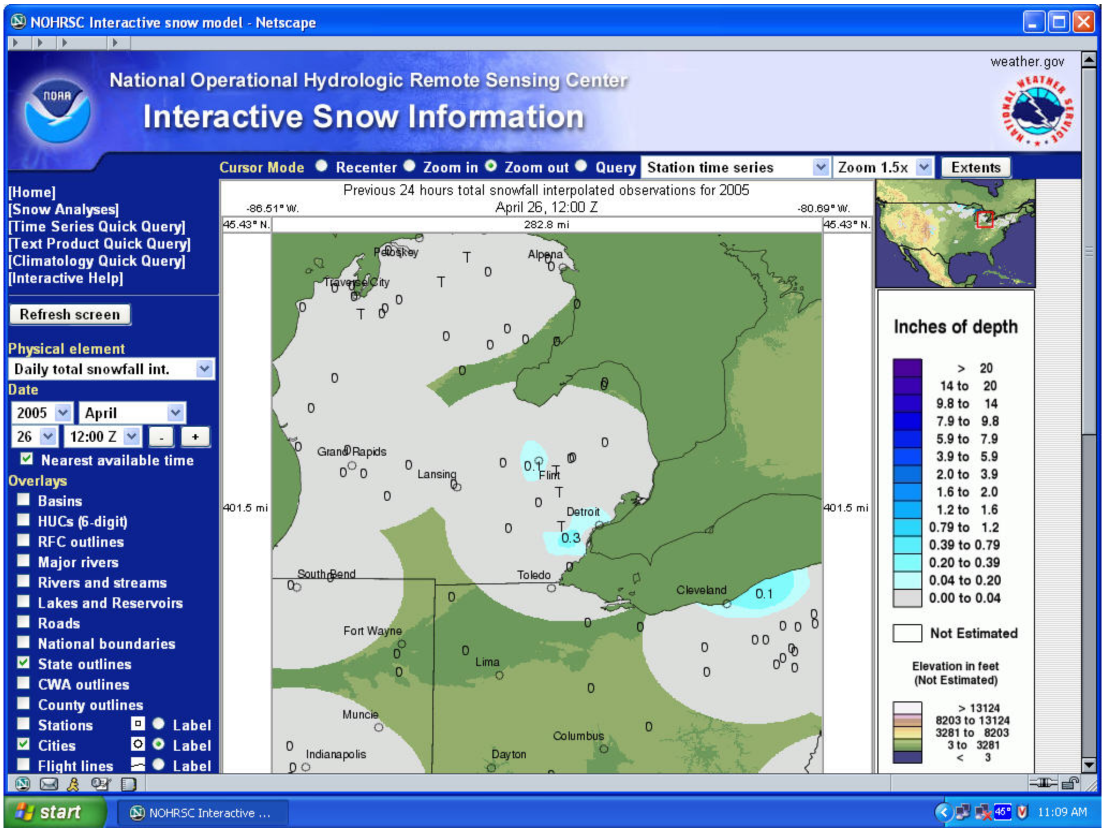

Figure 8. Snowfall observations for previous 24 hours, interpolated with DEM background.

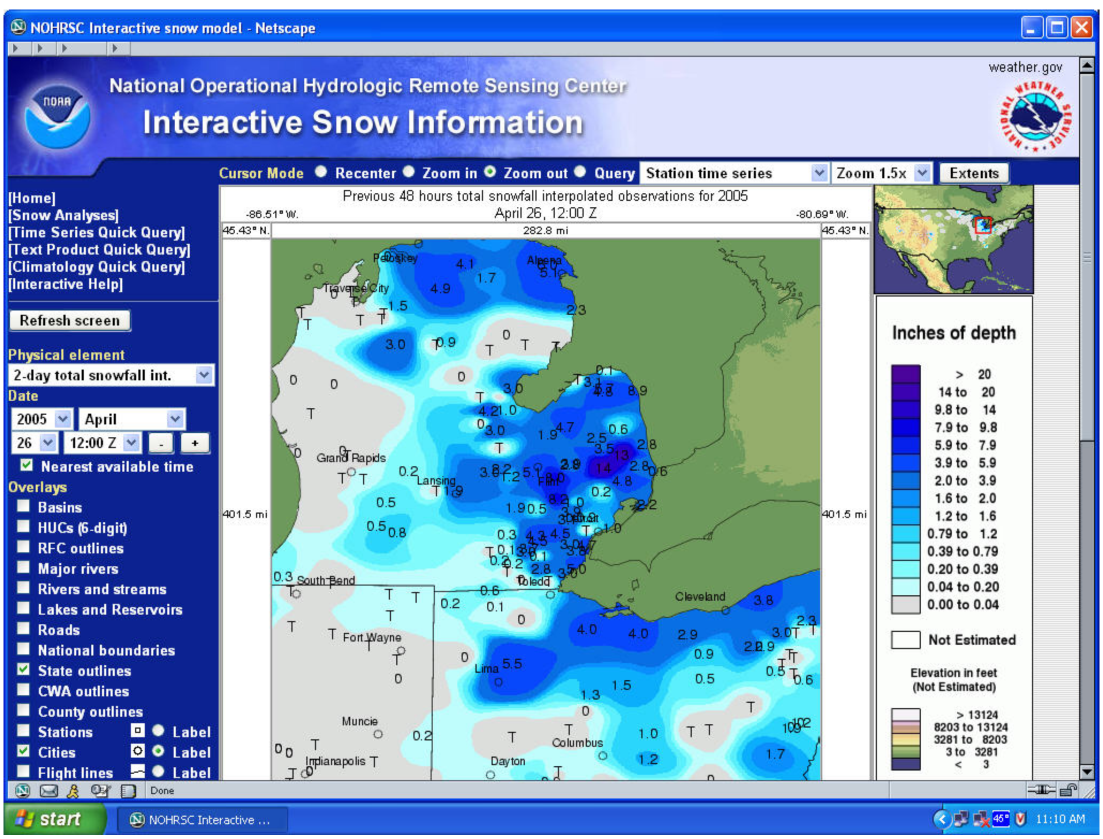

Figure 9. Snowfall observations for previous 48 hours, interpolated.

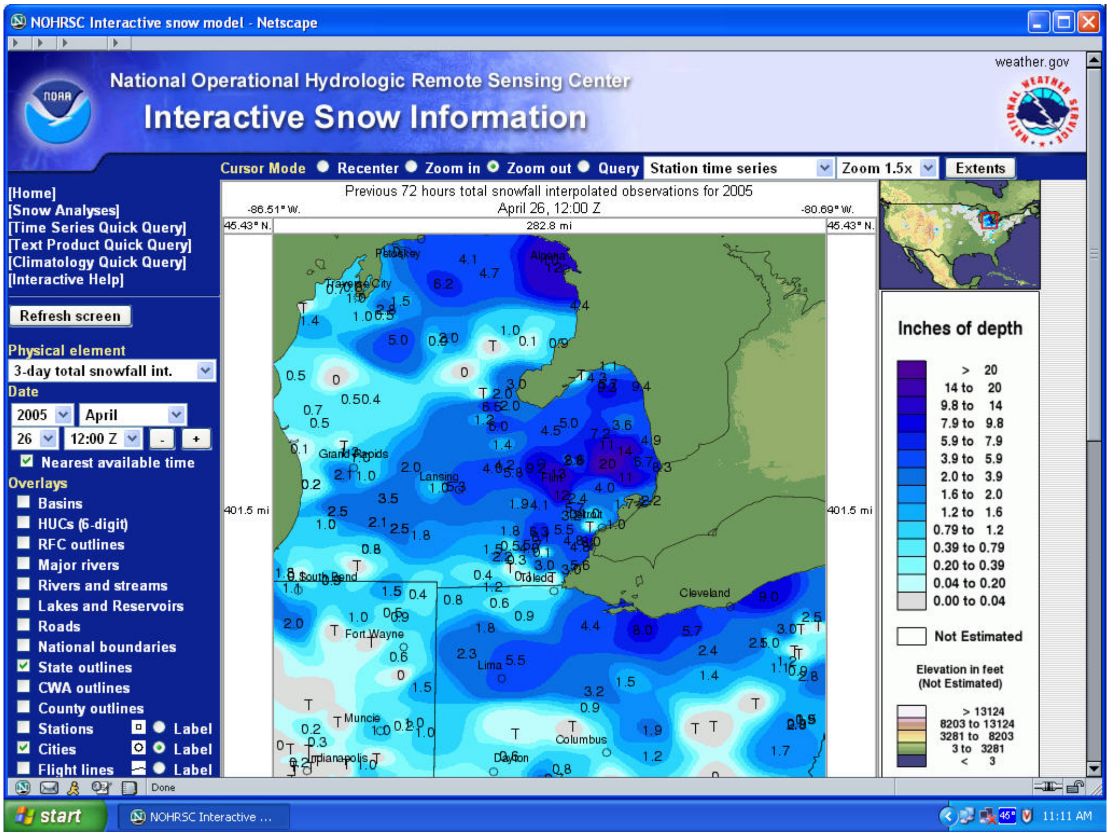

Figure 10. Snowfall observations for previous 72 hours, interpolated.

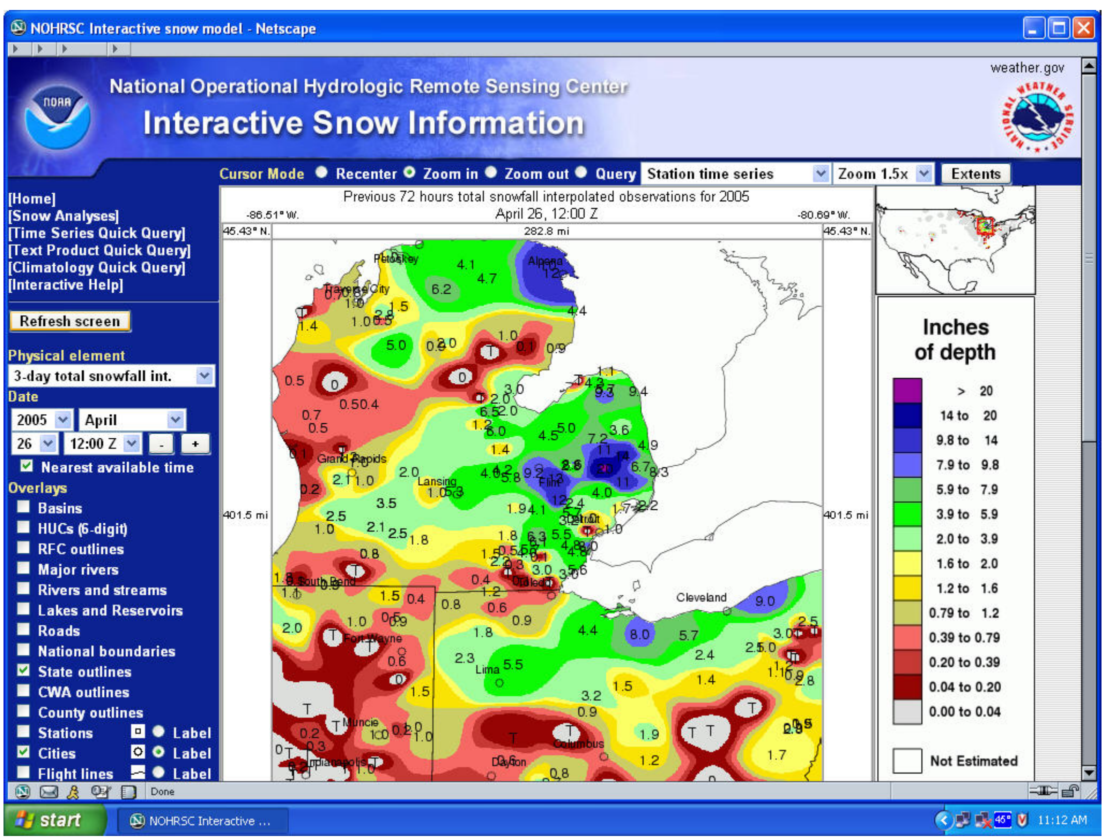

Figure 11. Snowfall observations for previous 72 hours, interpolated, with high-contrast color palette.

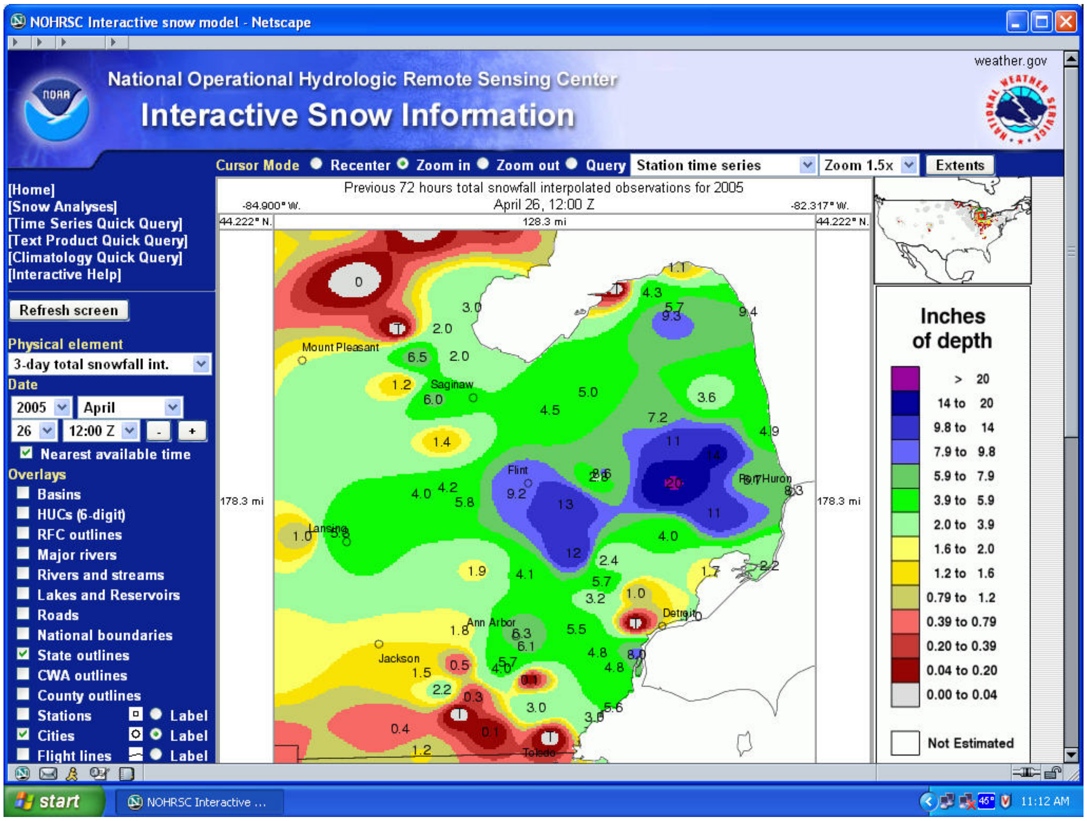

Figure 12. Snowfall observations for previous 72 hours, interpolated, with high-contrast color palette, zoomed in.

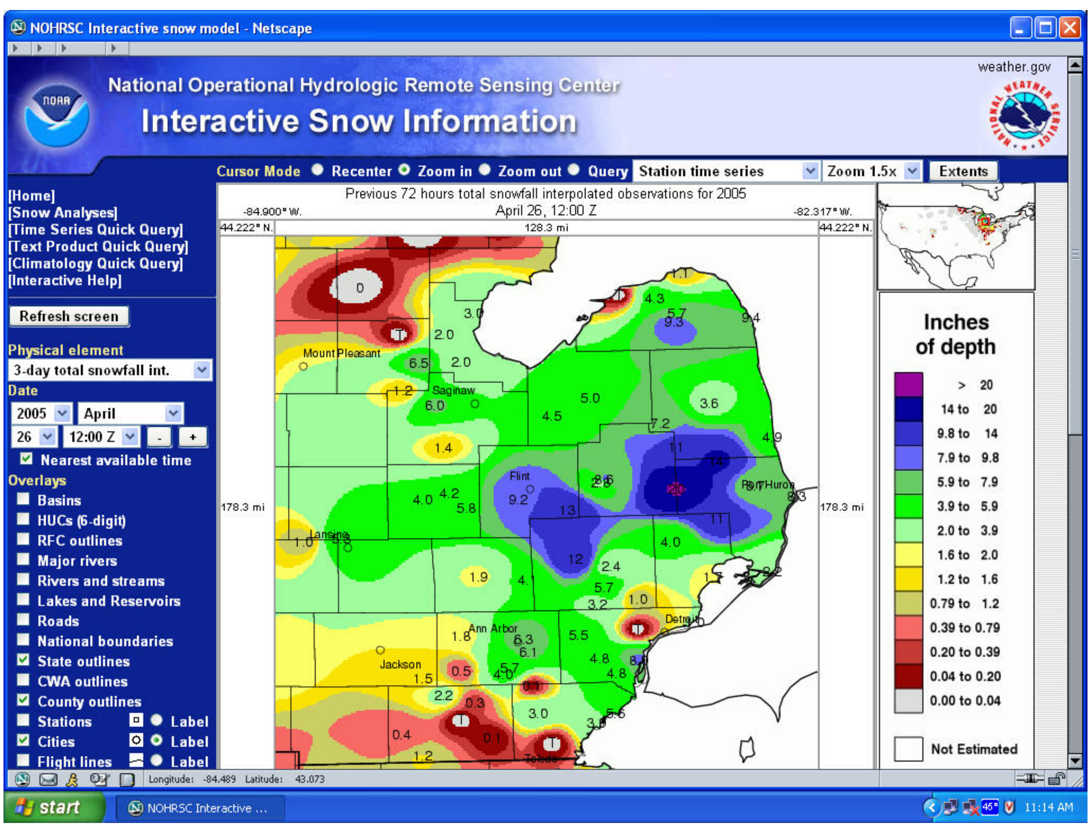

Figure 13. Snowfall observations for previous 72 hours, interpolated, with high-contrast color palette, zoomed in, with county boundaries.

1a. Constrained Spatial Interpolation Over High Elevations

The spatial interpolation process used to create the interpolated snowfall maps is discussed in detail below. We do not, however, spatially interpolate the snowfall data for the entire CONUS. Because spatial interpolation of any snow data is much more problematic in regions of high relief, we plot snowfall observation values but do not interpolate snowfall data in the Eastern U.S. over terrain above 1,640 feet (500 meters). In most of the West, we do not interpolate snowfall data over terrain above 5,741 feet (1,750 meters) or in the nearby valley bottoms. In northern Idaho, Washington, and Oregon, we do not interpolate snowfall data over terrain above 2,625 feet (800 meters) or in the nearby valley bottoms. The two maps below for portions of Montana and Wyoming illustrate the constrained interpolation over terrain of higher elevation.

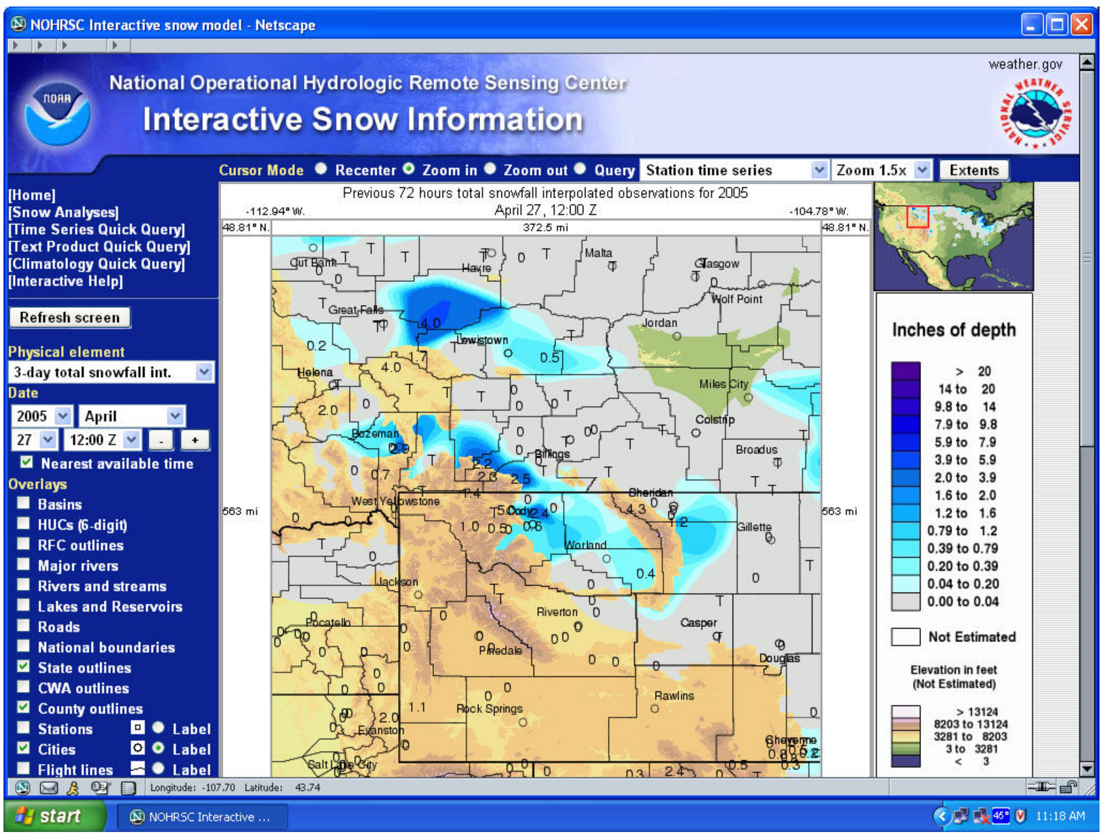

Figure 14. Snowfall observations for previous 72 hours, interpolated in low elevations only, with DEM background and county boundary overlay.

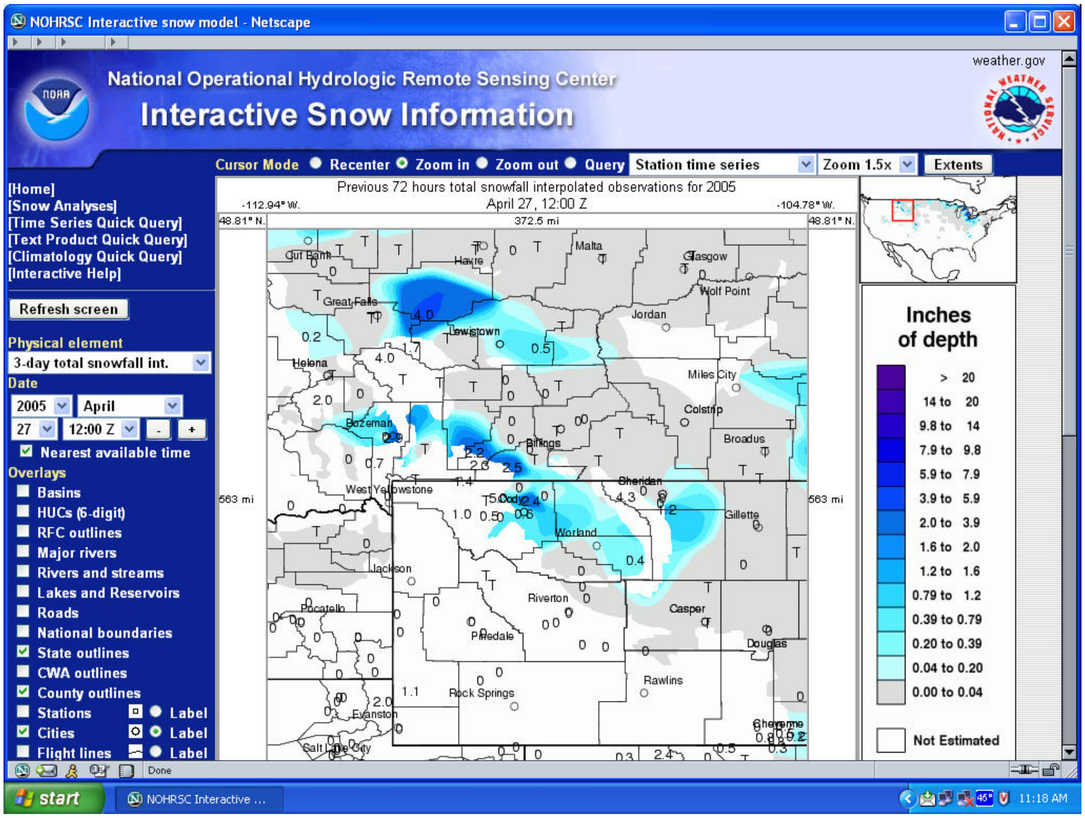

Figure 15. Snowfall observations for previous 72 hours, interpolated in low elevations only, with county boundary overlay and no DEM background.

1b. Raw Snowfall Data for Download

In addition to providing a variety of map, time-series, SHEF, and gridded snow products, we also make available for download the raw reporting station snowfall, snow water equivalent, and snow depth data used to create the NOHRSC snow products. Figure 16 is an example of the daily snowfall data available for download from the NOHRSC Snow Analyses web page.

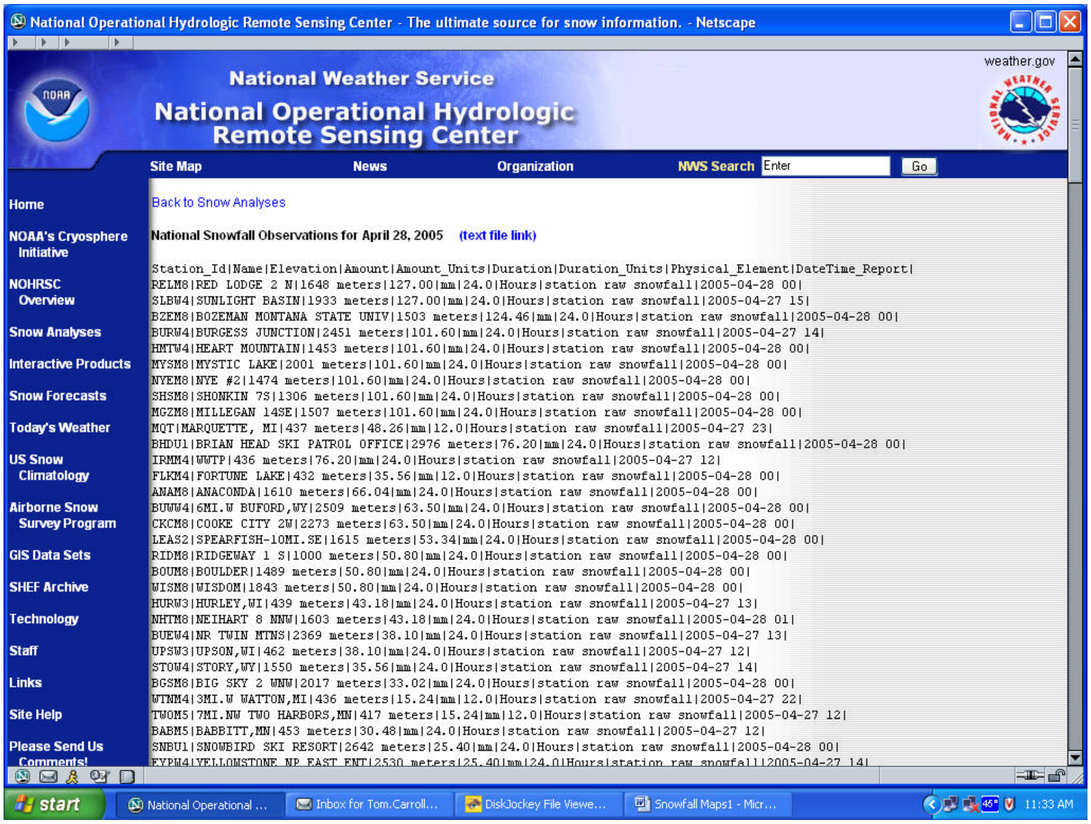

Figure 16. Text summary of daily snowfall observations in NOHRSC database for the selected date and available for download.

2. Interpolation of Snowfall Observations

2a. Temporal Interpolation

The NWS reports snowfall as an observed depth (storm total) for a specified length of time (duration) ending at a specified date and time at a given location (station). For example, 16 inches of snowfall over a 24-hour period ending at 16:33 GMT is reported for station ABC. Depending upon the frequency and duration with which measurements are taken at a given station, it is possible for snowfall observations to overlap one another in the temporal domain.

The NOHRSC interpolates snowfall observations into a variety of gridded products. Because the interpolation relies on hourly snowfall values, snowfall observations at a station that: (1) exceed a one-hour duration, (2) do not end at the top of the hour, or (3) overlap one another in the temporal domain require preprocessing before they can be used.

Preprocessing time series of snowfall observations into hourly estimates is a two-phase process involving quantization and integration. During the quantization phase, each snowfall observation is broken into one-minute time steps. This allows the NOHRSC to calculate hourly estimates of snowfall ending at the top of the hour during the integration phase. The snowfall depth assigned to each one-minute time step is a function of the storm total, duration, and hourly RADAR signals (i.e., NCEP Stage 2 RADAR-only precipitation raster). Time steps associated with stronger RADAR returns are assigned a relatively higher proportion of the depth associated with the original observation. For example, if the 24-hour, 16-inch storm total mentioned above actually occurred during an eight-hour period, the RADAR data indicates which eight of the 24 hours are assigned snowfall depth and their relative amounts and which 16 hours are assigned zero snowfall. In the absence of RADAR data, the storm's depth is distributed uniformly over its duration.

Hourly estimates of snowfall are calculated by integrating the quantized depths from minute-one through minute-60 for each hour in the time series. Because it is possible for snowfall storm totals to overlap one another in the temporal domain, there may be multiple depth estimates for a given one-minute time step. In those instances, the depth estimate associated with: (1) the shortest storm duration, or (2) (in the event of a tie) the most recently observed storm total will prevail. The process conserves mass across overlapping storm totals.

Integration proceeds from the most recent snowfall observation through past observations until either (1) storm totals no longer overlap, or (2) an observed value of zero is encountered.

The NOHRSC applies this temporal interpolation technique to precipitation observations in exactly the same manner.

2b. Spatial Interpolation

The interpolated snowfall maps on the NOHRSC interactive web site cover the CONUS, as well as parts of southern Canada, at a spatial resolution of 30 arc-seconds (approximately 1 km). Certain high-elevation areas are excluded from the processing region as described above. Point snowfall observations are spatially interpolated to a regular grid using an inverse-distance weighting function. For any given pixel, all point snowfall observations that are within a search radius of 75 km and also within the processing region are used in the interpolation. If there are fewer than two qualifying points within range, no value is interpolated for that given pixel. The value of each point snowfall observation is weighted by a modified inverse-distance weighting function. The weighting function trends toward zero as the distance between the center of the pixel to be interpolated and the point snowfall observation approaches the search radius.

For each point snowfall observation, the:

$$\text{weighting factor} = \left(\left(\text{search radius} - \text{distance} \right) / \left(\text{distance} \right) \right) ^\wedge \text{power}$$

where the power equals 3.

The NOHRSC currently generates interpolated snowfall products (and point snowfall observation products) for three different mapping periods: one each for the past 24, 48, and 72 hours. All of the temporally interpolated, hourly snowfall observations for each mapping period (i.e., 24, 48, 72 hours) are summed into an observation for each snowfall reporting station as described in the Temporal Interpolation section above. These summed, temporally interpolated snowfall values are, in turn, used in the spatial interpolation for each of the three mapping periods.

2c. Timing and Latency of Interactive Snowfall Map Products

The process to generate automated snowfall maps is run four times each day: at 6Z, 12Z, 18Z, and 24Z. Each six hours, six new snowfall maps are created for the three mapping periods (i.e., previous 24, 48, and 72 hours; point and interpolated). Each new map contains the snowfall data received by the NOHRSC for the previous 24, 48, and 72 hour mapping periods. Additionally, newly received snowfall data observed during the previous mapping periods are used to update the snowfall maps for those previous mapping periods. For example, six new snowfall maps are generated at 18Z using snowfall data received and observed during the 12Z to 18Z interval. Six new maps are generated at 24Z using data received and observed during the 18Z to 24Z interval. At the same time, the snowfall data received during the same 18Z to 24Z interval, but observed during the 12Z to 18Z interval or before, are used to update the six snowfall maps originally generated at 18Z. Each six hours, six new snowfall maps are created; at the same time, the six originally generated snowfall maps for each of the previous 15 six-hour periods are updated (90 maps updated for the last 4 days) using all of the newly available snowfall data as they become available for the 4-day, look-back period.

3. Snowfall Observation Data Provided in SHEF over AWIPS

Rule No. 1: Garbage in—garbage out.

We generate the NOHRSC Interactive Snowfall Maps in a totally automated process that uses snowfall data encoded in SHEF and received at the NOHRSC over AWIPS for the CONUS. The NOHRSC performs only a "reasonable range" quality-control test on the snowfall data. As a result, essentially any "reasonable" snowfall observation received will be used in the automated snowfall map generation process. Attached is an Appendix that gives Examples of Correct and Incorrect SHEF-Encoded Snowfall Data. Additionally, we suggest the following recommendations to help improve the quality of all snowfall observation map products that use NWS snowfall data.

3a. Recommendations for NWS Field Offices

Before the NOHRSC can ingest and process snowfall observations to create accurate, reliable snowfall map products:

1. The snowfall observations must be quality controlled by the originating field office,

2. All snowfall reporting station IDs (except stranger-stations) need to be in the NWSLI with accurate latitude and longitude information to four decimal degrees,

3. All snowfall data must be properly encoded in SHEF by the originating field office.

    a. Snowfall observations distributed using Local Storm Reports (LSR), Public Information Statements (PNS), or other non-SHEF products must be converted to SHEF and re-distributed over AWIPS before the data can be used at the NOHRSC (see Example 1 in Appendix).

    b. Regional Temperature and Precipitation (RTP) products frequently contain snowfall observation data that were originally sent in SHEF over AWIPS (e.g., in RR products), decoded, and posted to databases. Consequently, RTP products sent after the original RR product and that contain the original snowfall observation data must also use the original snowfall observation times contained in the original RR products that were used to create the later RTP product. If a default observation time is used for all observations in the RTP product (as it frequently is), that default observation time must also be the original observation time for all the snowfall observations contained in the original RR product. Otherwise, the same snowfall observation originally sent in an RR product with the original observation time and later re-sent in an RTP product with a different (e.g., default) observation time will get decoded as two different snow observations. That's a bad thing. Duplicate and blundered snow observations contaminate databases and corrupt resulting products (see Example 8, 8a, and 9 in Appendix).

4. All snowfall observations using "stranger-station" IDs should include internal SHEF comments to identify the station's latitude and longitude to four decimal degrees of precision (see Example 7 in Appendix).

When the above recommendations are not followed, the quality of the NOHRSC Interactive Snowfall Map products is severely and unavoidably compromised.

Please provide any comments or suggestions for improvement to me by 2005 June 30. Many thanks—and we appreciate your support.

Tom Carroll

APPENDIX

Examples of Correct and Incorrect SHEF-Encoded Snowfall Data

When using the Standard Hydrologic Exchange Format (SHEF), there is virtually an infinite number of ways to encode snowfall observations; some are right and some are wrong. See both below.

Examples of Correctly SHEF-Encoded Snowfall Data

<u>Example 1.</u> Public Information Statements (PNS) can be converted to a properly encoded SHEF Hydrometeorological Data Report #2 (RR2) product using the recently developed Eastern Region Hydromet Software.

Original PNS statement

```
PUBLIC INFORMATION STATEMENT
SPOTTER REPORTS
NATIONAL WEATHER SERVICE PITTSBURGH PA
1003 PM EST SAT APR 2 2005

THE FOLLOWING ARE UNOFFICIAL OBSERVATIONS TAKEN DURING THE PAST 24
HOURS FOR THE STORM THAT HAS BEEN AFFECTING OUR REGION.
APPRECIATION IS EXTENDED TO HIGHWAY DEPARTMENTS...COOPERATIVE
OBSERVERS...SKYWARN SPOTTERS AND MEDIA FOR THESE REPORTS.  THIS
SUMMARY IS ALSO AVAILABLE ON OUR HOME PAGE AT WEATHER.GOV/PITTSBURGH

********************STORM TOTAL SNOWFALL********************

LOCATION           STORM TOTAL    TIME/DATE    COMMENTS
                      SNOWFALL       OF
                      (INCHES)    MEASUREMENT

PENNSYLVANIA

ARMSTRONG COUNTY

   FREEPORT                5.5    958 PM   4/2

BUTLER COUNTY

   CABOT                   5.0   1001 PM   4/2
   SARVER                  5.0   1001 PM   4/2

***********************SNOW ON GROUND***********************

LOCATION                  SNOW    TIME/DATE    COMMENTS
                     ON GROUND       OF
                      (INCHES)    MEASUREMENT

PENNSYLVANIA

ARMSTRONG COUNTY

   FREEPORT                4.0    958 PM   4/2

BUTLER COUNTY

   CABOT                   4.0   1001 PM   4/2
   SARVER                  4.0   1001 PM   4/2
```

Above PNS statement converted to SHEF product by the ER Hydromet software using .A and providing internal comments to define the stations' latitude, longitude, and name.

```
925
SRUS51 KPBZ 030304
RR2PBZ
HYDROLOGIC OBSERVATIONS
NATIONAL WEATHER SERVICE PITTSBURGH, PA

.A 50FREE 0403 Z DH0258/DVH24/SFV 5.5"LAT=40.67389 LON=-79.685  FREEPORT"/
.A 281CAB 0403 Z DH0301/DVH24/SFV 5.0"LAT=40.76472 LON=-79.76667  CABOT"/
.A 674SAR 0403 Z DH0301/DVH24/SFV 5.0"LAT=40.73139 LON=-79.74611  SARVER"/
.A 50FREE 0403 Z DH0258/SD/ 4.0"LAT=40.67389 LON=-79.685  FREEPORT"/
.A 281CAB 0403 Z DH0301/SD/ 4.0"LAT=40.76472 LON=-79.76667  CABOT"/
.A 674SAR 0403 Z DH0301/SD/ 4.0"LAT=40.73139 LON=-79.74611  SARVER"/
```

<u>Example 2.</u> SCD Supplementary Observations

```
000
CXUS63 KDTX 250555 CCA
SCDDTW

KDTW SCD 0600 8////// 931006 4/002
```

<u>Example 3.</u> SCD Reports from Snow-Paid Stations

```
KABC SCD 1150 931003
KABC SCD 1754 931044 4/005 933041
KABC SCD 2353 931023 4/006
KABC SCD 0557 931031 4/008 24/931101
```

<u>Example 4.</u> RR2 Product Using .A SHEF

```
044
SRUS51 KBUF 051537
RR2BUF

HYDROLOGIC OBSERVATIONS SHEF
NATIONAL WEATHER SERVICE BUFFALO NY

.A NY0613 0405 E DH0523/SFV 2.5/:4318 7603
.A NY1106 0405 E DH0700/SFV .25/:4255 7759
.A NY0305 0405 E DH0755/SFVRZ 5/:4304 7723
.A NY0805 0405 E DH0913/DVH24/SFVRZ 3/:4309 7737
```

<u>Example 5.</u> RR3 Product from WXcoder

```
SRUS55 KGJT 071411
RR3GJT
WxCoder

.A FTAC2 0407 M DH0800/PP 0.00/SD 0/SF 0.0/TA 47/TN 33/TX 69
.A DLTC2 0407 M DH0800/PP 0.00/TA 34/TN 29
.A1 TX 66 : Observer remark - A Few high clouds
```

```
.A GUNC2 0407 M DH0800/PP 0.00/SD 0/SF 0.0/TA 26/TN 17/TX 57
.A MNTC2 0407 M DH0800/PP 0.00/TA 39/TN 30/TX 64
```

Example 6. RR1 Product Using .B SHEF

```
331
SRUS55 KBYZ 071410
RR1BYZ

TONGUE RIVER DRAINAGE/BIG HORN N.F. REPORTS
NATIONAL WEATHER SERVICE BILLINGS MT
810 AM MDT THU APR 7 2005

.B BIL 0407 DH14/TX/TN/TA/PPD/SFD/SD
:                          MAX    MIN   7 AM    24 HR    24 HR    SNOW   SKY/
:ID    STATION      ELEV  TEMP   TEMP   TEMP     PCPN     SNFL   DEPTH    WX
BLNM8: BALLANTINE  3000 :  72 /  32 /  35 /      0 /      0 /    0 :CLEAR
BHRW4: BIG HORN    4040 :   M /   M /   M /      M /      M /    M :
BDGM8: BRIDGER 2N  3583 :   M /   M /   M /      M /      M /    M :
BURW4: BURGESS JCT 8040 :  58 /  29 /  34 /      0 /      0 /   10 :CLEAR
DYTW4: DAYTON      4060 :  69 /  23 /  25 /      0 /      0 /    0 :CLEAR
SBRM8: HUNTLEY     3000 :  75 /  25 /  30 /      0 /      0 /    0 :CLEAR
WGSW4: SHERIDAN    3964 :  68 /  28 /  31 /      0 /      0 /    0 :CLEAR
STOW4: STORY       5083 :  62 /  34 /  44 /      0 /      0 /    0 :
BHRM8: YELLOWTAIL  3305 :   M /   M /   M /      M /      M /    M :
.END
```

Example 7. Using Stranger-Stations

While it is possible to encode latitude/longitude information for stranger-stations in the station ID, it is not possible to provide the latitude/longitude information in the station ID with sufficient precision. A tenth of a degree permitted in the stranger-station ID is greater than 10 km and, consequently, is not sufficiently precise to permit the use of the reported snow data in any NOHRSC snow analysis or map product. As a result, field offices should include internal SHEF comments to identify the station's latitude and longitude to four decimal degrees of precision which is currently not possible when using the stranger-station identifier alone. Internal comments containing latitude/longitude information could be modeled after the format used in the Hydromet software from Eastern Region. (See Example 1 above.)

```
350
SRUS55 KCYS 061506
RR2CYS

SUPPLEMENTAL PRECIPITATION OBSERVATIONS
NATIONAL WEATHER SERVICE CHEYENNE WY
905 AM MST WED APR 06 2005

24 HOUR PRECIPITATION AMOUNTS AS OF 900 AM MST

.B CYS 0406 M DH0900/PPD/SF/SD
:
:                    ***WYOMING STATIONS***
:                         SNOW
:ID       PCPN   SNOW   DEPTH     COUNTY        LOCATION
X4141056    M  /   M  /    M     :ALBANY        LARAMIE 8N
X4131056    T  /   M  /    M     :ALBANY        LARAMIE 1SE
X4121059    M  /   M  /    M     :ALBANY        LARAMIE 22SW
X4141055    M  /   M  /    M     :ALBANY        LARAMIE 6NNW
X4111071    M  /   M  /    M     :CARBON        ENCAMPMENT 22WSW
X4131065    M  /   M  /    M     :CARBON        SARATOGA 16ESE
```

```
X4201041    M  /   M  /    M     :GOSHEN          TORRINGTON 8ESE
X4121044    M  /   M  /    M     :LARAMIE         BURNS
X4121044    M  /   M  /    M     :LARAMIE         BURNS 3S
X4111044    M  /   M  /    M     :LARAMIE         BURNS 7S
X4121044    M  /   M  /    M     :LARAMIE         BURNS 3SW
X4111044    M  /   M  /    M     :LARAMIE         BURNS 5SW
X4121044    M  /   M  /    M     :LARAMIE         BURNS 2W
```

<u>Example 8.</u> Regional Temperature and Precipitation Summary (RTP)

The RTP products are typically the source of major snow data errors that can get unwittingly incorporated into NOHRSC snow analyses and map products. The RTP source data can be derived from a collection of RR products. The RR data are originally broadcast with the correct observation time. The RTP product is later generated by a program run at each WFO and gives a summary of the original RR data. The RTP generation program allows the operator substantial flexibility in selecting which of the RR records to include in the output. Careless user selection of the parameters may, however, cause problems: specifically, the reassignment of an incorrect, default observation time to the original snowfall observation being re-sent in the RTP product. Some WFOs are more conscientious than others in preserving the correct and original observation times from the RR products in their subsequent RTP products. Blundered, default snowfall observation times in the RTP products can result in the same observation being sent across NOAAPORT, in SHEF, twice—first in the original RR product and again in an RTP product—each with a different observation time. Consequently, the same observation will get posted to an end-user's database twice: first using the original observation time from the original RR product, and second using the blundered, default observation time of the later RTP product. That's not good.

After reviewing numerous WFOs' RTP products, it is clear that not all WFOs are coding the correct observation time in the RTP SHEF message (see Examples 8a and 9 below). This difficulty seriously compromises the value of all observations sent using RTP products that use incorrect, default observations times:

1. Some WFOs may vary the SHEF definition to account for the correct observation times in RTP products,
2. Some WFOs may limit the observation window to the current hour,
3. Some WFOs allow a time window that spans many hours,
4. Some WFOs include the observation time in the comment section of the SHEF message that cannot, in turn, be decoded,
5. Some WFOs issue their RTP products properly, and
6. Some WFOs don't.

Blundered, default snowfall observation times in RTP products cause discrepancies in the duration and mass of the snowfall data. The NOHRSC has no way to identify or correct these errors; from the SHEF decoder perspective, there is no way to distinguish the original RR data from the retransmitted RTP data. Sadly, these snowfall data errors get incorporated ineluctably into the NOHRSC snowfall maps.

Example 8a. **RTP Product Containing Snow Data Using Default Observation Time. Data in this product are valid *only if* the default observation time of DH07 is, in fact, the original observation times use for all the snowfall observations in the original RR products used to create this RTP product. But this is unknowable from the product; the resulting uncertainty of the original observation times renders these data questionable.**

```
ASUS63 KLSX 261522
RTPLSX
MAX/MIN TEMPERATURE AND PRECIPITATION TABLE FOR
CENTRAL AND EASTERN MISSOURI AND WESTERN ILLINOIS
NATIONAL WEATHER SERVICE ST LOUIS MO
ISSUED BY NATIONAL WEATHER SERVICE KANSAS CITY/PLEASANT HILL MO
1022 AM CDT TUE APR 26 2005
.
.
.
.BR LSX  0426  C DH07/TX/TN/PP/SF/SD

:COOPERATIVE OBSERVATIONS
:VALUES ARE FOR THE PREVIOUS 24 HOURS ENDING AT 7 AM
:................................................................
:       STATION                | MAX | MIN  | 24-HR  | SNOW | SNOW  |
:        NAME                  | TEMP| TEMP | PRECIP | FALL | DEPTH |
:................................................................
:
:IN NORTHEAST MISSOURI...
:
BWLM7: BOWLING GREEN 2NE    :  59 / 36  / 0.18   /      /
CANM7:  CANTON L/D20        :  64 / 33  / 0.11   /      /
CDAM7:  CANNON DAM          :     /     / 0.22   /      /
CLKM7:  CLARKSVILLE L/D     :     /     / 0.15   /      /
EDNM7:  EDINA               :     /     / 0.11   /      /
HNNM7:  HANNIBAL MO         :  63 / 40  / 0.22   /      /
LUSM7:  LOUISIANA           :     /     / 0.14   /      /
NLDM7:  NEW LONDON          :     /     / 0.27   /      /
PMYM7:  PALMYRA             :     /     / 0.18   /      /
SVRM7:  SAVERTON L/D        :     /     / 0.27   /      /
SLBM7:  SHELBINA            :  64 / 36  / 0.20   /      /
TAYM7:  TAYLOR 5SW          :     /     / 0.30   /      /
VNDM7:  VANDALIA            :  62 / 39  / 0.18   /      /
:
OFLM7:  O FALLON MO         :  65 / 40  / 0.23   /      /
OLNM7:  O FALLON 2 S        :     /     / 0.21   /      /
SPEM7:  ST PETERS 2SSE      :  64 / 39  / 0.24   /      /
SSCM7:  STL SCIENCE CENTER  :  65 / 44  / 0.30   /  0.0 /     0
UCTM7:  UNIVERSITY CITY MO  :  63 / 39  / 0.24   /      /
```

Example 9. **RTP Products Containing Significant Snow Data Using Incorrect Default Observation Time. The default time, DH09, is incorrectly used (i.e., decoded) for all data while the correct day/hour observation time is reported in the comment field and is not, therefore, decoded.**

```
887
ASUS65 KBOU 051621
RTPBOU

REGIONAL TEMPERATURE AND PRECIPITATION SUMMARY
NATIONAL WEATHER SERVICE DENVER CO
1021 AM MDT TUE APR 05 2005

MOST REPORTS ARE FOR THE 24 HOURS ENDING AT OBSERVATION TIME.
```

```
AIRPORT LOCATIONS ARE YESTERDAY'S HIGHS AND LAST NIGHT'S LOWS.

.BR DEN  0405  M DH09/TX/TN/PP/SF/SD

:      STATION                    ELEV  DAY/                        SNOW SNOW
:      NAME                       FEET  HOUR   HIGH   LOW   PCPN   FALL DEPTH

NORTHERN COLORADO FRONT RANGE

CSRC2: CASTLE ROCK 1ESE    ::           0509:  68 / 32 / 0.47 / 1.0 /  3
CSLC2: CASTLE ROCK 1NE     ::           0507:  73 / 37 /  .15 /   T /  T
CASC2: CASTLE ROCK 3NE     ::           0507:  67 / 30 /  .10 /  .3 /  T
ELIC2: ELIZABETH 2NW       ::           0506:  67 / 32 / 0.01 /   T /  T
SIAC2: SEDALIA 5SSE        ::           0507:  70 / 33 /    T /   T /  0
MRSC2: MORRISON 3SSE       ::           0507:  70 / 38 /    T /   T /  0

NORTHEAST COLORADO

GEYC2: GREELEY 6NW         ::           0507:  73 / 30 /  .02 /   0 /  0
MTHC2: MATHESON 8SE        ::           0507:  72 / 37 / 0.01 /   M /  M
KRVC2: KARVAL              ::           0507:  69 / 43 /    0 /   M /  T
CRKC2: CROOK               ::           0506:  75 / 36 /    0 /   0 /  0

NORTH CENTRAL COLORADO

KMMC2: GREEN MOUNTAIN DAM ::    7740   0507:  54 / 27 / 0.08 / 1.0 /  1
WIFC2: WILLIAMS FORK DAM  ::    7650   0508:  53 / 27 / 0.13 / 1.0 /  2
GCRC2: CABIN CREEK        ::   10000   0506:  47 / 25 / 0.11 / 1.5 /  1
DLLC2: DILLON 1E          ::    9100   0507:  49 / 22 / 0.15 / 2.0 /  2
BUC  : BUCKHORN MTN 1E    ::    7400   0508:  62 / 33 / 0.41 / 2.8 /  1
RLVC2: ROLLINSVILLE       ::    8400   0507:  54 / 30 /    T /   T / 14
RUTC2: RUSTIC 9WSW        ::    7750   0507:  58 / 27 /    0 /   0 /  0
VDAC2: VIRGINIA DALE 7ENE ::    7000   0508:  62 / 32 /    T /   0 /  0
ASIC2: ASPEN SPRINGS      ::    9000   0507:  53 / 26 /    T /   T /  T
BLYC2: BAILEY             ::    7732   0508:  60 / 28 /    T /   T /  4
CHEC2: CHEESMAN           ::    6800   0507:  61 / 20 / 0.10 /   0 /  0
CRHC2: CROW HILL          ::    8600   0507:  63 / 28 /    T /   T /  T
EVGC2: EVERGREEN          ::    7000   0507:  62 / 37 /    0 /   0 /  0
GEOC2: GEORGETOWN         ::    8500   0508:  55 / 29 / 0.04 / 0.1 /  T
GRTC2: GRANT              ::    8700   0507:  55 / 26 /    0 /   0 /  3
DCRC2: INDIAN HILLS 3SE   ::    7100   0507:  67 / 28 /    0 /   0 /  T
ITRC2: INTERCANYON        ::    7000   0507:   M /  M /    T /   M /  1
ANTC2: ANTERO RESERVOIR   ::    8900   0507:  53 / 30 /    0 /   0 /  0
FRPC2: FAIRPLAY           ::   10000   0508:  49 / 24 /    0 /   0 /  0
TCPC2: HARTSEL 12SW       ::    9500   0507:  57 / 29 /    0 /   0 /  T
LGEC2: LAKE GEORGE        ::    8000   0507:  53 / 27 /  .53 / 4.5 /  3
LGRC2: LAKE GEORGE 8SW    ::    8500   0507:  54 / 27 / 0.40 / 1.5 /  1

.END
```

Examples of Snowfall Data Products That Cannot be Used at the NOHRSC

Valuable snow data reported in the following formats cannot be used at the NOHRSC for any snow analyses or snow map products (see Examples 10 and 11). Without properly SHEF-encoded station ID and latitude/longitude information, these snow data cannot be decoded, ingested into the NOHRSC database, or used in any NOHRSC snow analysis or map products. They fall unceremoniously on the floor only to be swept out each night with the other office debris.

<u>Example 10.</u> AWIPS Product Not in SHEF with No Station ID

```
489
NWUS55 KPUB 051854
```

```
LSRPUB

PRELIMINARY LOCAL STORM REPORT
NATIONAL WEATHER SERVICE PUEBLO CO
1254 PM MDT TUE APR 05 2005

.TIME...    ...EVENT...       ...CITY LOCATION...      ...LAT.LON

.DATE...    ....MAG....       ..COUNTY LOCATION..ST.. ...SOURCE.

            ..REMARKS..

1210 PM     HEAVY SNOW        N BLACK FOREST            39.05N 104.67W
04/05/2005  5.0 INCH          EL PASO             CO    TRAINED SPOTTER

1235 PM     HEAVY SNOW        2 W BLACK FOREST          39.05N 104.71W
04/05/2005  13.0 INCH         EL PASO             CO    TRAINED SPOTTER

            STILL SNOWING
```

Example 11. AWIPS Product Not in SHEF with No Station ID or Lat/Long Information

```
617
NOUS43 KDTX 250256
PNSDTX

PUBLIC INFORMATION STATEMENT
SNOWFALL REPORTS
NATIONAL WEATHER SERVICE DETROIT/PONTIAC MI
1100 PM EDT SUN APR 24 2005

THE SNOWFALL TOTALS LISTED BELOW INCLUDE THE OFFICIAL CLIMATE DATA
FOR DETROIT...FLINT...SAGINAW AND THE NATIONAL WEATHER SERVICE
OFFICE IN WHITE LAKE. PLEASE NOTE THAT NEW SNOWFALL LISTED DOES NOT
REPRESENT ACTUAL SNOW DEPTH AS THE WARM GROUND CONTINUES TO MELT THE
SNOW.

                          STORM  PERIOD    LIQUID    SNOW
LOCATION                  TOTAL  (HRS)     PRECIP    DEPTH

WAYNE

DETROIT METRO             3.9    30         0.46     2.0

GENESEE

FLINT                     9.4    36         0.92
GOODRICH                  8.3    36

SAGINAW

SAGINAW                   6.0    36         0.59     3.0

OAKLAND

WHITE LAKE NWS            14.3   36         1.35    11.0
ORTONVILLE                11.3   36
HIGHLAND                  12.0   36                  8.0
```

END