Department of Commerce • National Oceanic & Atmospheric Administration • National Weather Service

NATIONAL WEATHER SERVICE INSTRUCTION 10-930
JANUARY 2, 2008

Operations and Services
Hydrologic Services Program, NWSPD 10-9

NATIONAL HYDROLOGIC PRODUCTS SPECIFICATION

NOTICE: This publication is available at: http://www.nws.noaa.gov/directives/

OPR: W/OS31 (J. Dionne) **Certified by:** W/OS3 (T. Graziano)
Type of Issuance: Routine.

SUMMARY OF REVISIONS: This directive supersedes NWS Instruction 10-930, "National Hydrologic Products Specification," dated August 25, 2006. The following revisions were made to this manual:

1) Renames Section 2 to NWS Hydrologic Services Program Web Presence. Expands the section to enhance descriptions of web page features, including the precipitation analysis, flood inundation map, and long-range exceedence probability graphics.
2) Deletes previous Section 3, National Hydrologic Summary, since that product has been discontinued. Renumbers subsequent sections to account for this deletion.
3) Modifies the section on the National Hydrologic Assessment (now section 3) to reflect changes in product content and issuance time.
4) Updates Section 13, Probability of Rainfall Exceeding Flash Flood Guidance to reflect refined probability categories for the Probability of Exceeding Flash Flood Guidance product as well as the new Day 2 and Day 3 products.
5) Adds appendices identifying information available for download and acronyms.
6) Incorporates minor editorial changes throughout the directive, including renumbered pages.
7) Updates graphics for several products to highlight new features and capabilities.

(Signed) December 19, 2007
James E. Hoke Date
Director, Office of Climate,
Water, and Weather Services

National Hydrologic Products Specification

Table of Contents: Page

1. Introduction. This directive describes issuance criteria, content, and format of hydrologic information that are national in scope. Products distributed over the Advanced Weather Interactive Processing System (AWIPS) follow standards for World Meteorological Organization (WMO) headings and AWIPS identifiers. Standards for text products distributed over AWIPS and other dissemination systems supported by NOAA's National Weather Service (NWS) are contained in NWSI 10-1701, *Text Product Formats and Codes*. Most AWIPS-distributed products are also available on the Internet.

2. NWS Hydrologic Services Program Web Presence. The NWS Hydrologic Services Program web presence is a suite of web pages providing access to a wide variety of hydrologic forecasts and information from weather forecast offices (WFO), river forecast centers (RFC), NWS headquarters, and the National Centers for Environmental Prediction (NCEP). The home page for the NWS Hydrologic Services Program web presence at http://www.weather.gov/ahps/ serves as the national portal to these forecasts and information. This portal can also be accessed through the NWS home page (http://www.nws.noaa.gov) by clicking on the Water tab. An example of the home page for the NWS Hydrologic Services Program web presence is shown below in Figure 1.

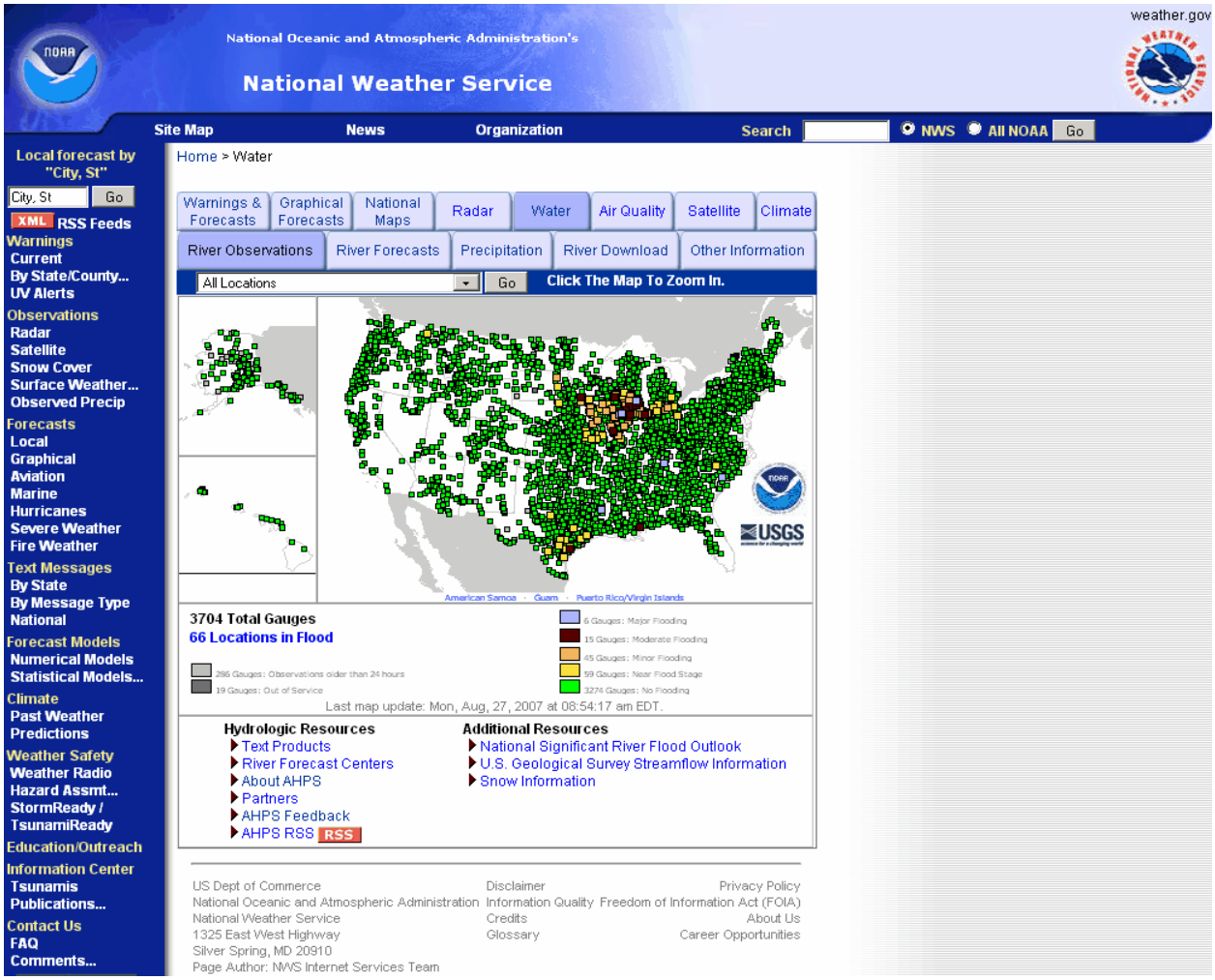

Figure 1. Sample home page for the NWS Hydrologic Services Program web presence.

2.1 Mission Connection. The NWS Hydrologic Services Program web presence helps the NWS meet its mission by providing hydrologic warning and forecast information in a variety of formats and time scales which meet the needs of a range of partners and other users from the layman to the technically advanced water manager. With access to graphical, text, and numerical products through the web, anyone concerned with current and future hydrologic conditions can make informed decisions on a timely basis to protect life and property and enhance the Nation's economy.

2.2 Issuance Guidelines.

2.2.1 Creation Software. The NWS Hydrologic Services web presence is developed and maintained using standard off-the-shelf software (both commercial and open source) for web page development. Users display or "create" their "products" through the use of standard browsers and/or internet bots.

2.2.2 Issuance Criteria. Traditional issuance criteria for NWS "push" products (e.g. forecasts or warnings) do not apply. The systems supporting the NWS Hydrologic Services Program web presence continuously ingest hydrologic information from WFOs, RFCs, NCEP, and national headquarters, perform necessary processing to create graphical, text, and data products for the web, and post them ready for use on demand.

2.2.3 Issuance Time. Products are available on demand through the web. Web pages are updated as new information becomes available. For example, an updated graphical hydrograph is produced after an additional forecast and/or observations are received. Long range products such as long-term exceedence probability graphics may only be generated once or twice a month.

2.3 Technical Description.

2.3.1 National Level Information. The entry point for the NWS Hydrologic Services Program web presence is the default of five displays linked to a second row of tabs which appear after a user clicks the "Water" tab on the NWS home page. The default display is a national map showing color coded locations of river/stream observations (Figure 1). This and the four other tabbed National-level displays are described in this section.

2.3.1.1 River Observations Tab. The river observations tab is associated with a national map depicting observed hydrologic conditions at river/stream locations. These locations are color coded according to their current status in reference to flood stage – no flooding, near flood stage, minor flooding, moderate flooding, or major flooding. Clicking on one of these locations brings up a map of the WFO hydrologic service area (HSA) containing that point which shows individual forecast points, rivers, and other information (see section 2.3.2.1).

2.3.1.2 River Forecasts Tab. The river forecasts tab is associated with a national map depicting forecast hydrologic conditions at river/stream locations. These locations are color coded according to the maximum forecast stage during the next 48 hours. Color codes are the same as those used for river observations. Clicking on one of these locations brings up a map of the HSA containing that point which shows individual forecast points, rivers, and other information (see section 2.3.2.2).

2.3.1.3 Precipitation Tab. The precipitation tab provides access to graphical/gridded observed precipitation information, which is initially set to display at the CONUS (CONterminous United States) scale (including Puerto Rico). When the precipitation tab is clicked, a third row of tabs appears immediately below and all graphics and data at all scales (e.g., National and state) are accessed through that same window. Observed precipitation can be displayed for the current day, fixed periods (e.g., 7 days) ending at the current day, current month to date, past months, and past dates. The observed precipitation map is derived from output from the 12 CONUS RFCs. Normal (average), departure from normal, and percent of normal precipitation can be displayed for current and past months. The PRISM analysis developed by Oregon State University was used in computations of normal precipitation to account for orographic (mountain) effects. Observed and average precipitation data can also be downloaded as gridded digital data in either shapefile or netCDF format. An example of a precipitation analysis display for the CONUS is provided in Figure 2. Section 2.3.2.4 describes features of the state scale display.

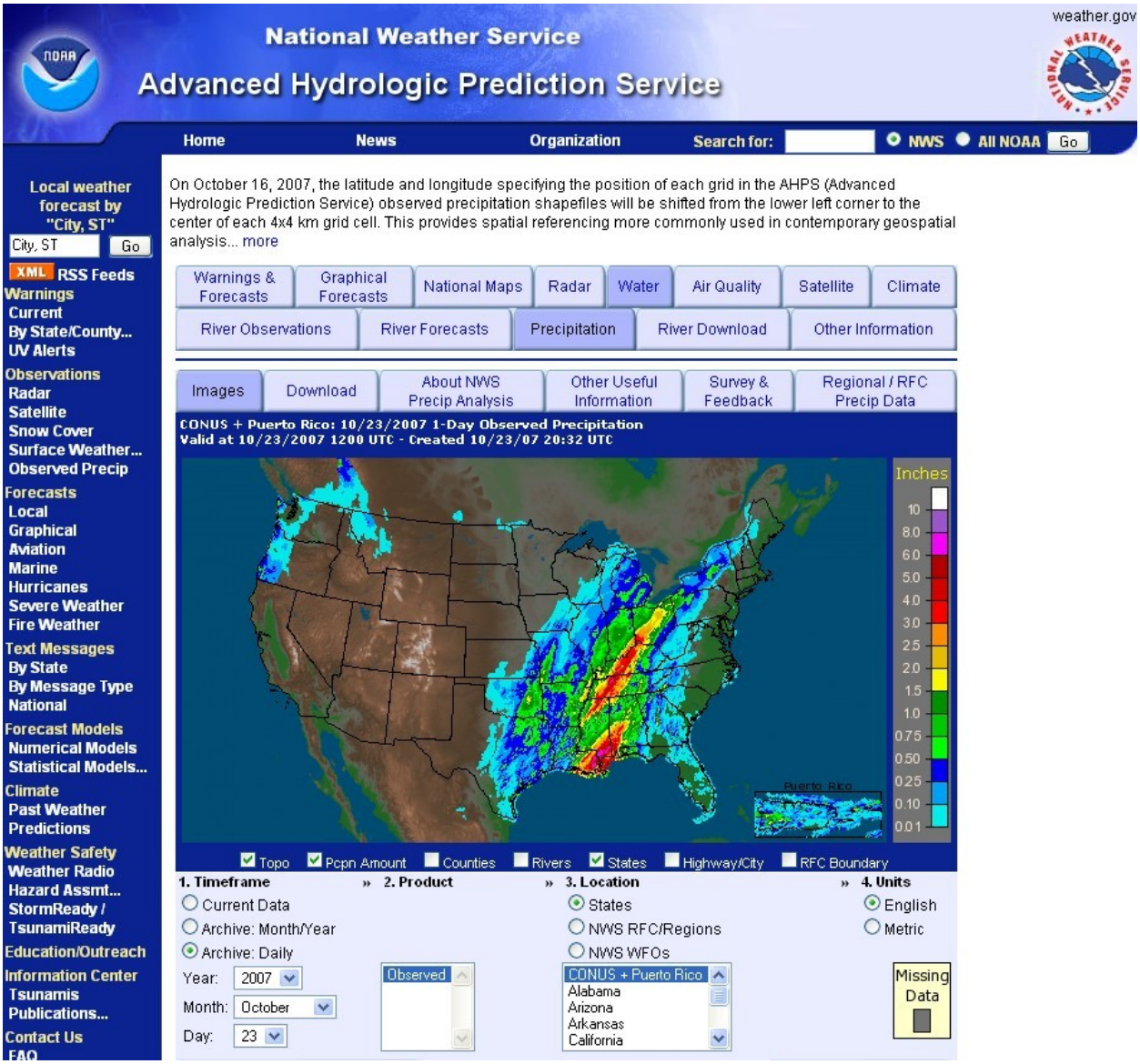

Figure 2. Sample national scale precipitation analysis page

2.3.1.4 River Download Tab. The River Download tab provides access to observed and forecast data for all locations in the CONUS and Puerto Rico in shapefile and KMZ formats as well as XML. Shapefile and netCDF formatted precipitation information is also available.

2.3.1.5 Other Information Tab. The Other Information tab provides links to a variety of other National Weather Service climate, water, and weather information, including water supply information, climatological information, snow information, and drought information.

2.3.2 HSA/State Level Information. The first three tabs at the second level of the Hydrologic Services Program web presence are associated with graphics and information at an HSA or state level. The information displayed when interacting with graphics associated with these tabs is described in this section.

2.3.2.1 River Observations Tab. If a user clicks on any location on the National River Observations map, a more detailed map of the HSA containing that point and the surrounding area will appear. This map shows individual river/stream locations, rivers, and other user-selectable information for the HSA (see Figure 3). River/stream locations are color coded according to their current status in reference to flood stage, using the same color codes as the National river observations map.

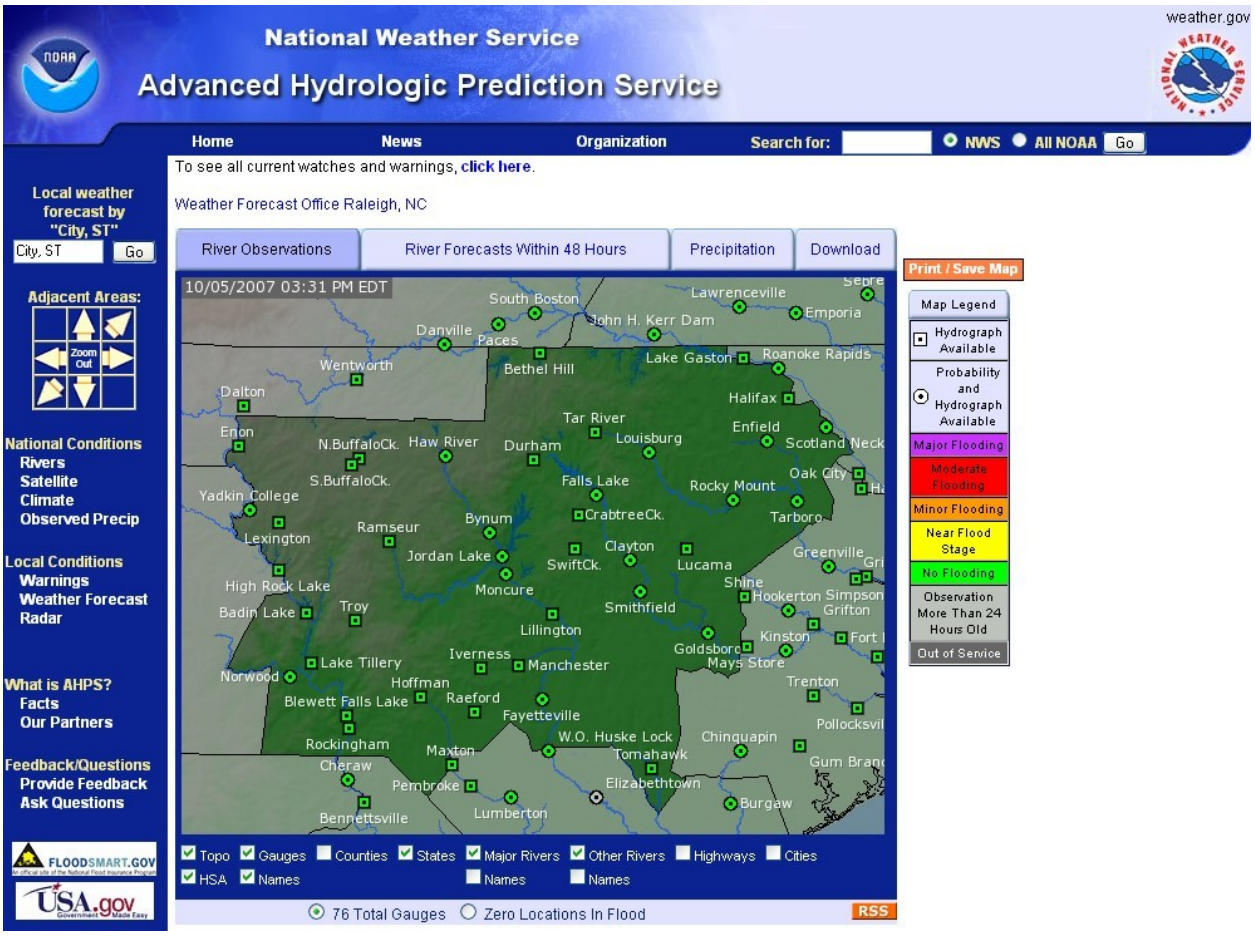

Figure 3. Sample web page depicting river observation information at the HSA level.

2.3.2.2 River Forecasts Tab. If a user clicks on any location on the National River Forecast map, a more detailed map of the HSA containing that point and the surrounding area will appear. This map shows individual forecast points, rivers, and other user-selectable information for the HSA. Forecast points are color coded according to the maximum forecast stage during the next 48 hours in reference to flood stage, using the same color codes as the National river observations map. The map has the same appearance and features as the river observations map, except only points where current river forecasts are available are shown.

2.3.2.3 Precipitation Tab. After clicking on a state on the national map, a precipitation analysis for the state and its surrounding area is displayed. The color scheme and user interface is the same as that provided for the national level. A precipitation analysis for an individual WFO area can also be displayed. A sample state-scale precipitation display is shown in Figure 4.

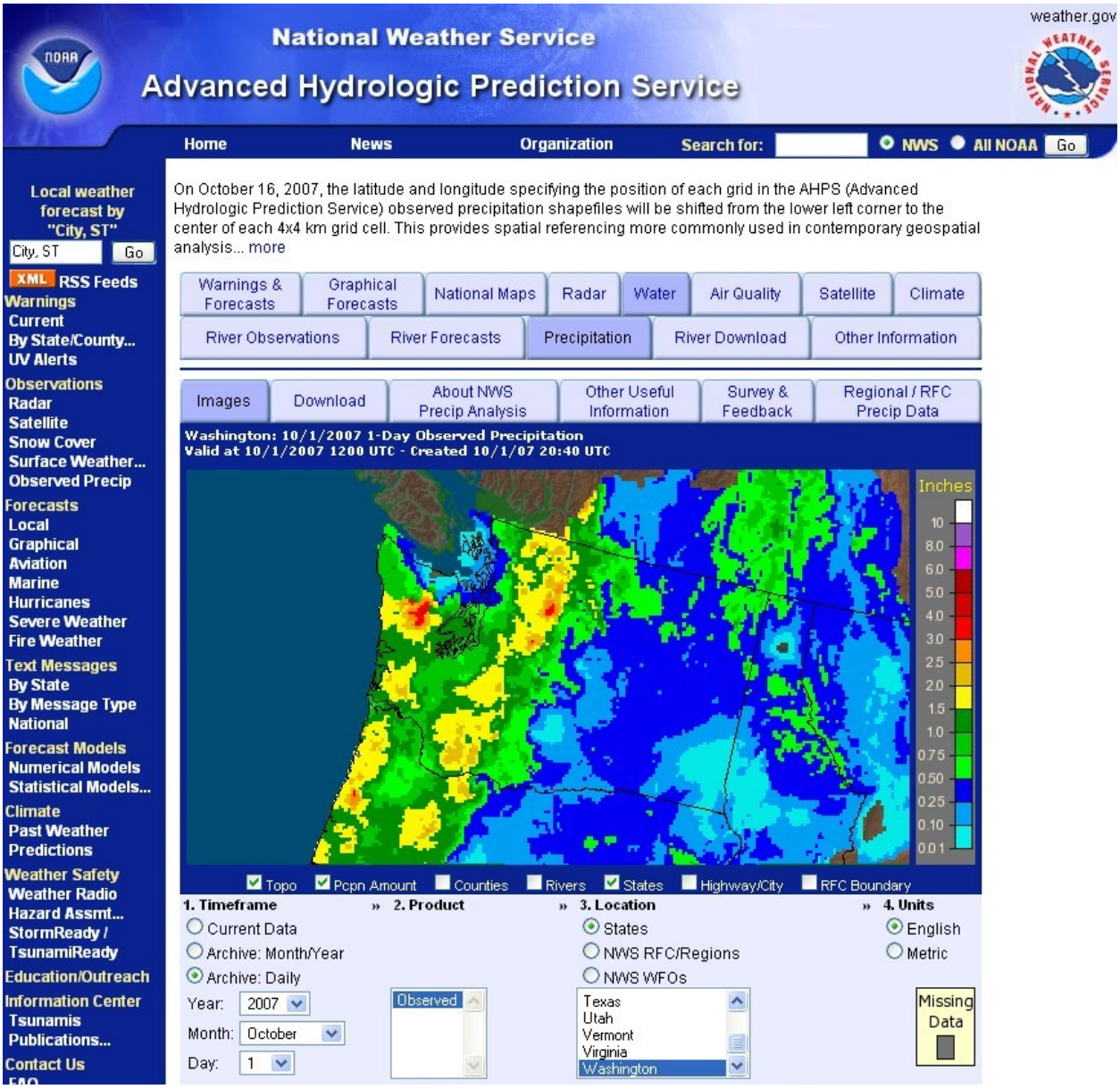

Figure 4. Sample state scale precipitation display.

2.3.3 Local Information. Clicking on a river/stream location depicted on the HSA-level river observation or river forecast maps provides access to several types of point-specific graphical products described in this section.

2.3.3.1 Hydrographs. The first graphic product displayed after clicking on a specific river/stream location on an HSA-level map is the observed/forecast hydrograph for that location. The hydrograph provides observed and forecast (if available) stage information. This page also provides for further access to a range of information for a river location through a series of tabs across the top of the hydrograph plot. A sample hydrograph product is shown in Figure 5. At the bottom of the hydrograph, a gage location map and list of historical crests are provided as well as tabbed sections with flood impact information for the forecast point, information about the point (e.g., datum), other resources for hydrologic information, collaborating agencies, and NWS-related information (Figure 6).

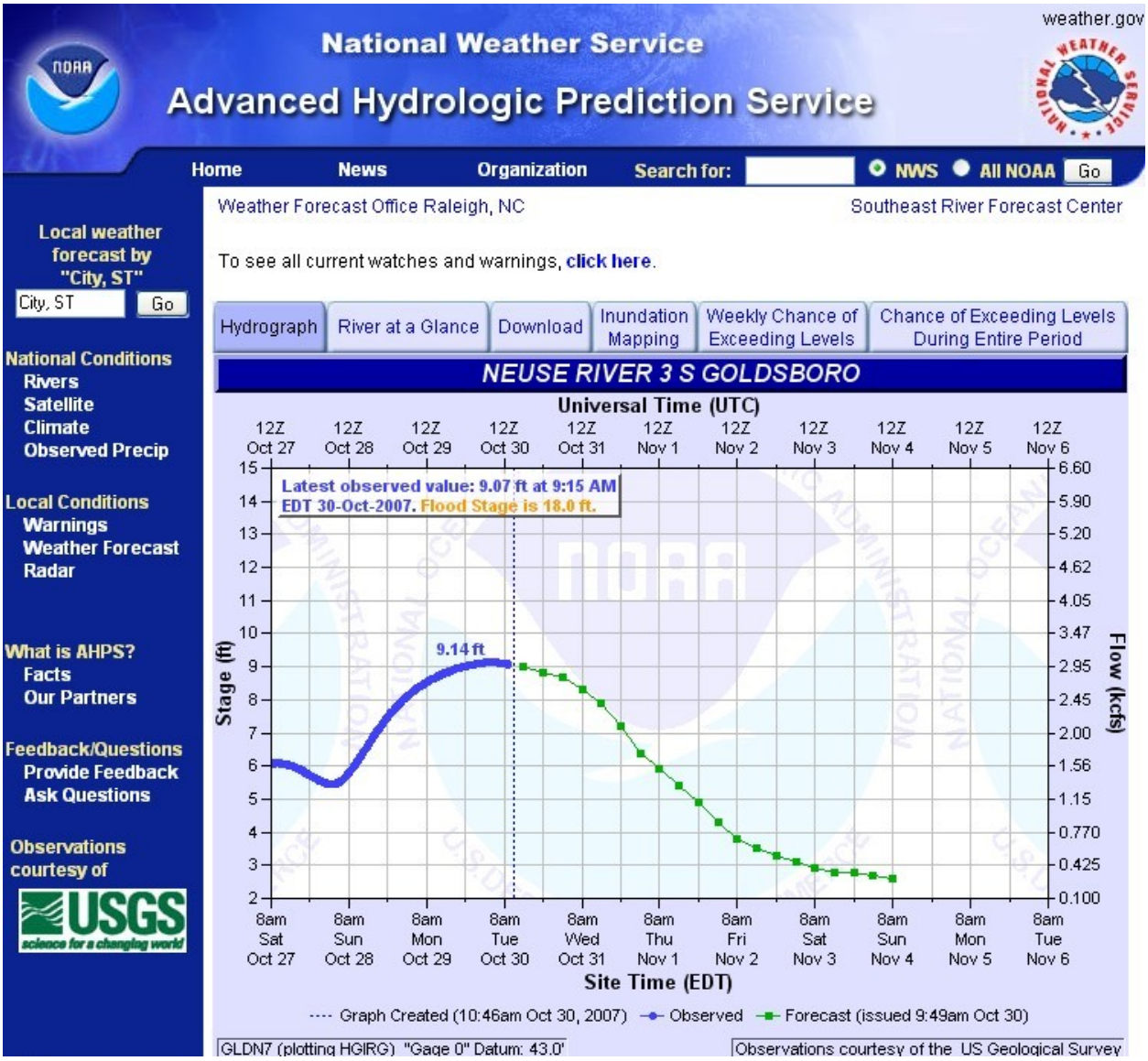

Figure 5. Sample observed/forecast hydrograph.

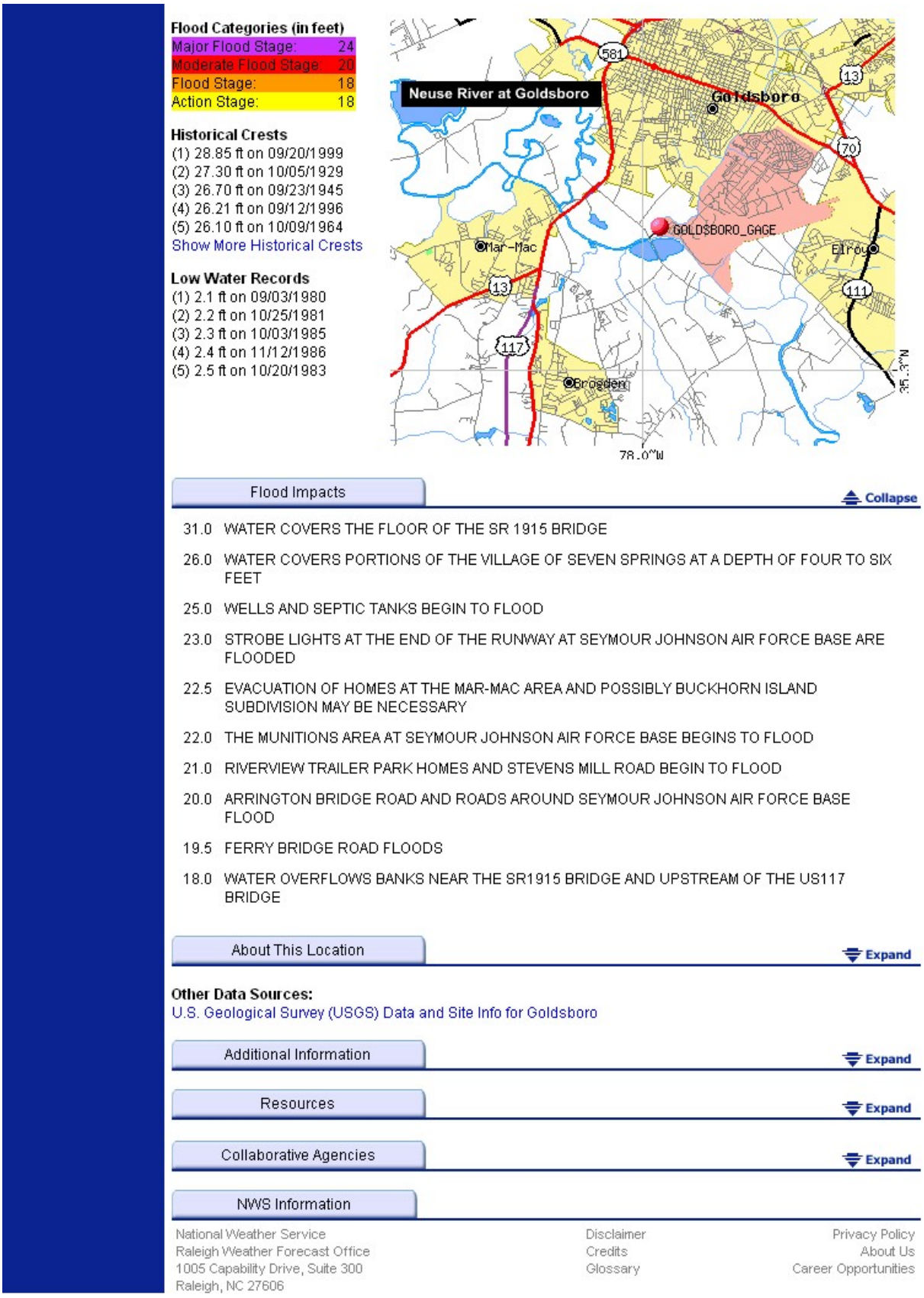

Figure 6. Flood impacts and resources information for a forecast point.

2.3.3.2 River at a Glance. Clicking on the River at a Glance tab allows a customized product to be created for all or a subset of locations along a given river. Content of this product is user selectable and includes one or more of the following: observed stage/flow and forecast hydrograph for the point; numerical observed stage/flow and forecast values; flood impact information; chance of exceeding stage, flow and/or volume levels during entire (long range) period graphic; weekly chance of exceeding stage, flow, or volume levels graphic, location map; historical crests; and downloadable XML or RSS files. Some of these items, such as the probabilistic products, are not available for all forecast points. Therefore, the menu provided for selecting items to include in a customized product is not identical for all areas of the country.

2.3.3.3 Download. Several products for a forecast point can be specified for download by clicking on this tab, including an observed/forecast hydrograph, observed/forecast data and metadata on the forecast point in XML, subscription to criteria-based RSS feed, location map of the forecast point, weekly chance of exceeding levels image, chance of exceeding levels during entire (long range) period image, inundation shapefiles, inundation KMZ files, and inundation map images.

2.3.3.4 Flood Inundation Mapping Interface. Clicking on this tab provides access to the flood inundation mapping interface (see Figure 7). This feature is available for specific NWS forecast points where a flood inundation library has been developed through a partnership with Federal, state, and/or local agencies. The flood inundation mapping interface provides information on the spatial extent and depth of flood waters in the vicinity of the forecast point. The interface provides the ability to view inundation levels at stages in the minor, moderate, and major flood categories. The 100-year flood zone, 500-year flood zone, and the floodway zone may be displayed. From this interface, the user can also view maps of observed or forecast inundation levels based on current NWS river forecasts. The user has the option to use either a standard map background showing basic features such as main roads and highways or a detailed background based on areal photography. Additional information on the inundation mapping interface is available at the following URL:

http://newweb.erh.noaa.gov/ahps2/inundation/inundation_mapping_user_guide.pdf

Currently, only a limited number of NWS forecast locations have a flood inundation mapping interface. These locations can be found at the following URL:

http://www.weather.gov/ahps/inundation.php.

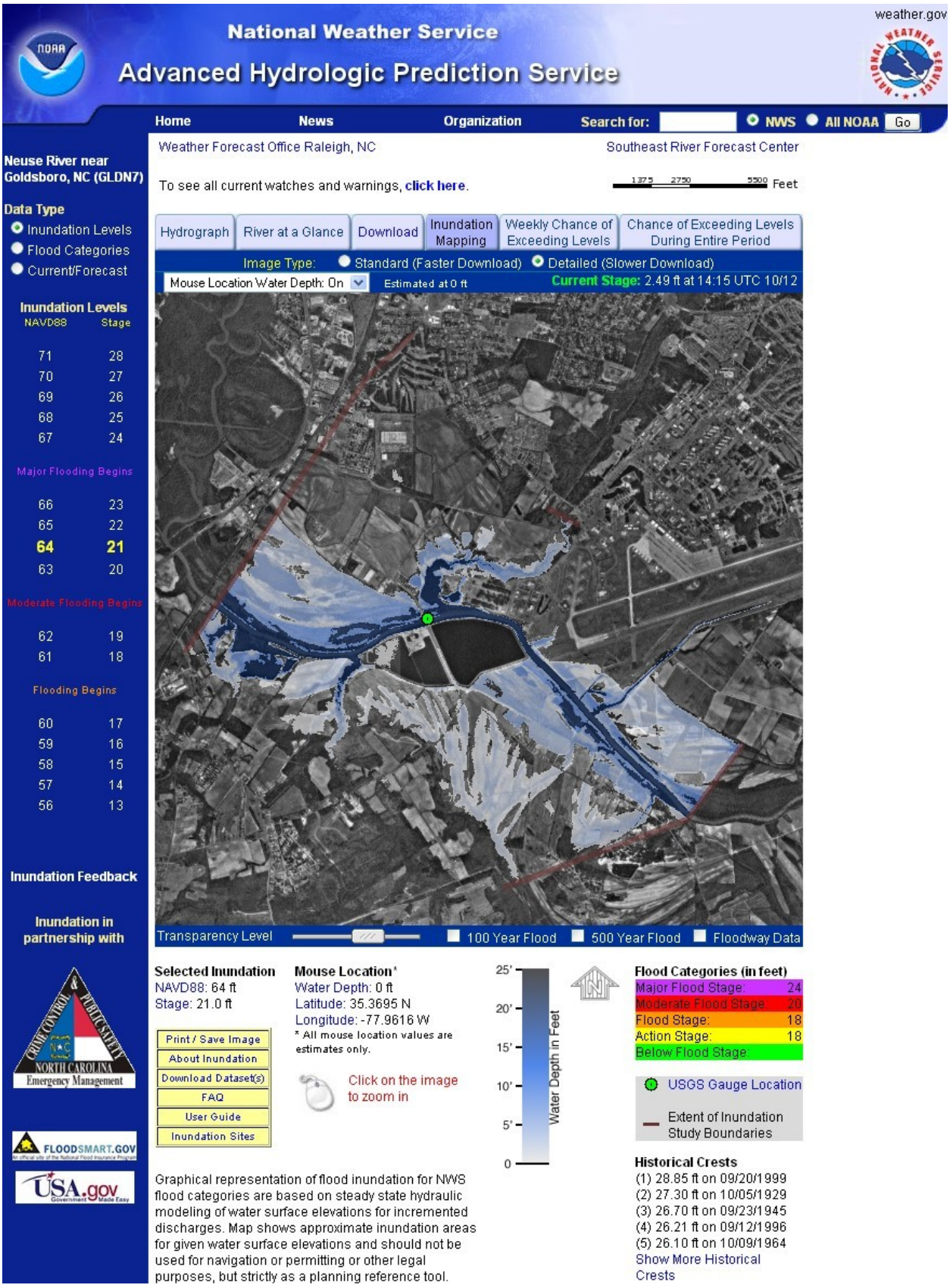

Figure 7. Sample Flood Inundation Mapping Interface.

2.3.3.5 Weekly Chance of Exceeding Levels Product. This product shows the probability or chance that the maximum stage, flow or volume at a point on a river will exceed a particular value for consecutive 7-day periods in a 90-day interval. The vertical axis shows river stage or level measured in feet (ft) and the horizontal axis shows time. Each vertical bar represents the probabilities for a 7-day period. Color is used to indicate probability levels on the graphic. A sample display is provided in Figure 8.

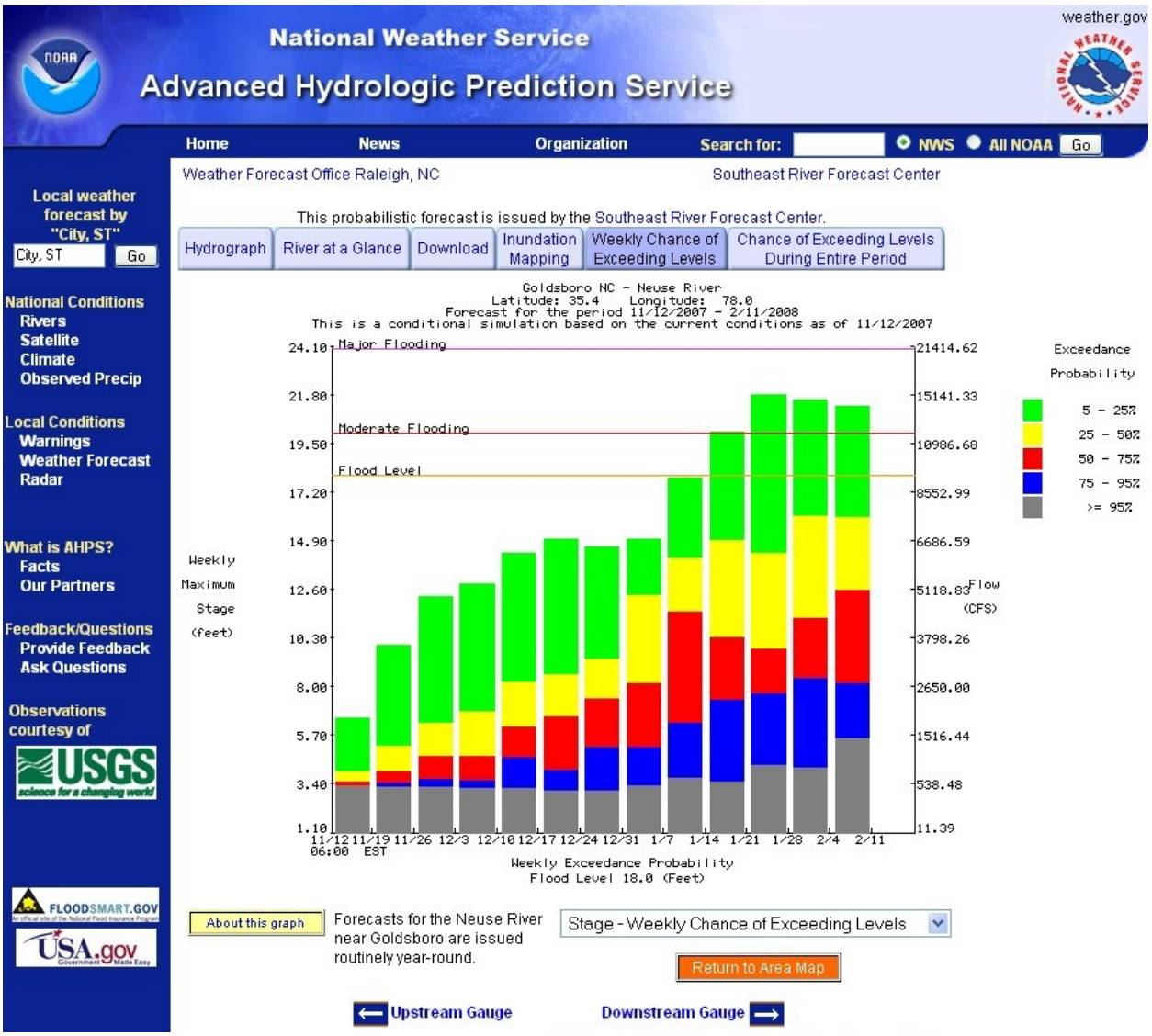

Figure 8. Sample Weekly Chance of Exceeding Levels Product.

2.3.3.6 Chance of Exceeding Levels During Entire Period Product. This graphic product shows probability of the river stage, flow, or volume (user selectable) going above various levels during the forecast period labeled above the graph (usually 30 or 90 days). The **conditional simulation (CS)** indicates chances of the river going above given levels based on current conditions. The **historical simulation (HS)** indicates the chances of the river going above given levels based on the total range of past levels (hydroclimatology). A sample display is provided in Figure 9.

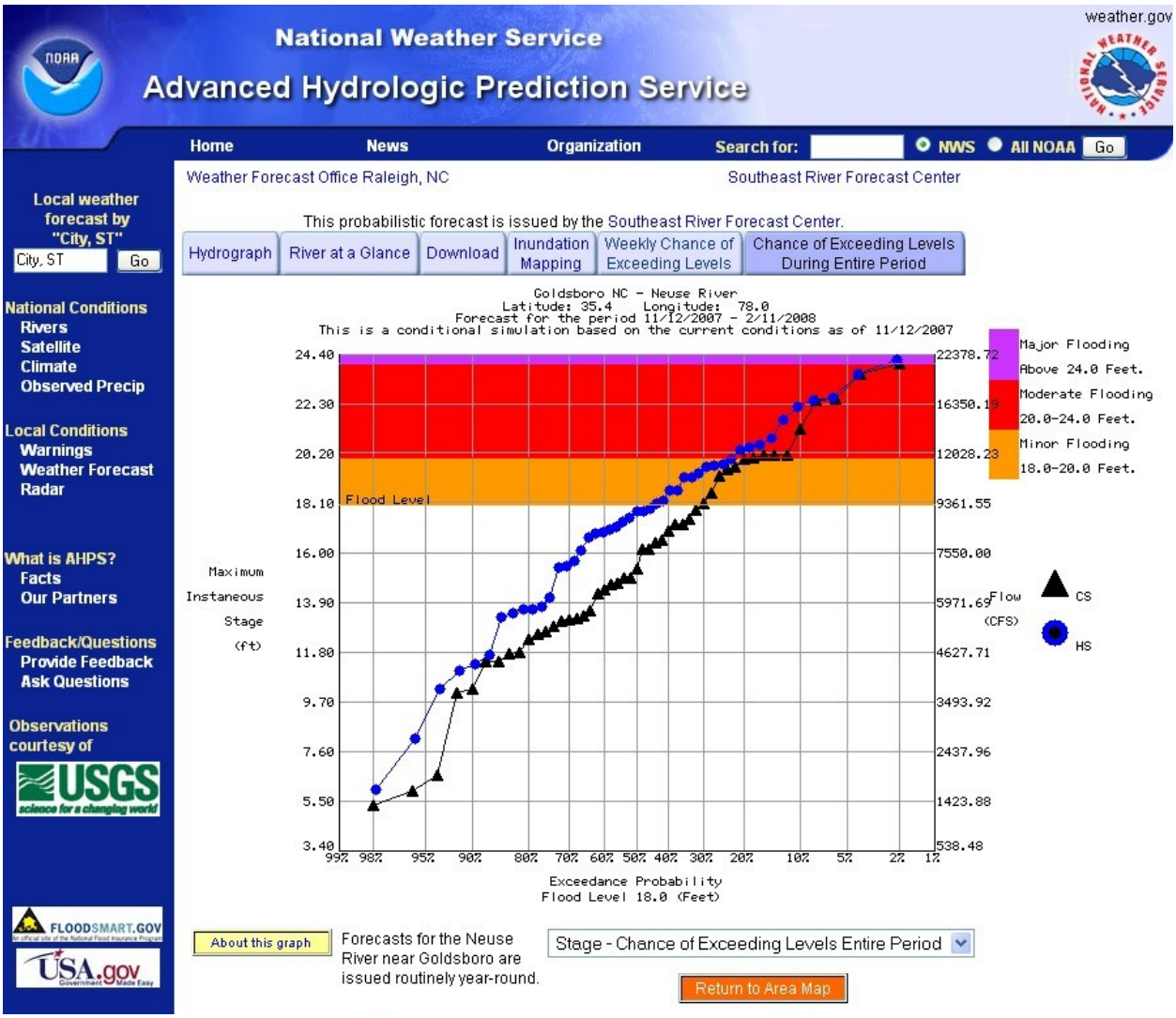

Figure 9. Sample Chance of Exceeding Levels During Entire Period Product.

2.3.4 Partner Attribution. Because of the importance of the strategic relationship between the NWS and the U. S. Geological Survey (USGS), all National Hydrologic Services web presence graphics involving stream gaging stations supported by the USGS will include attribution to the USGS. In many cases, other organizations are involved in cooperative arrangements with the USGS to support stream gaging stations. To the maximum degree possible, attribution should also be provided to these organizations, along with the USGS.

In cases where the USGS is not involved in supporting the stream gaging station, attribution may be provided to the appropriate organization(s).

Attribution should also be provided for cooperating technical partners who work with NWS in developing inundation map libraries.

2.4 Updates, Amendments, and Corrections. Web content is updated as new information becomes available.

3. National Hydrologic Assessment. Many parts of the U.S. experience late winter and spring flooding. Snow melt and ice jams can be important contributors to this flooding in northern areas. In early spring the Hydrologic Information Center integrates information from both WFOs and RFCs and prepares a National Hydrologic Assessment which summarizes potential for such flooding.

3.1 Mission Connection. The National Hydrologic Assessment helps the NWS meet its mission by highlighting areas of possible flooding during the late winter and spring months, thus providing an integrated assessment which can be used to initiate mitigation activities.

3.2 Issuance Guidelines.

3.2.1 Creation Software. The Hydrologic Information Center uses commercial off-the-shelf web authoring, graphics, and GIS (Geographic Information System) software.

3.2.2 Issuance Criteria. Issue on a schedule coordinated with RFCs and WFOs as well as the Climate Prediction Center to ensure that both local and national requirements can be met with minimum duplication of effort.

3.2.3 Issuance Time. Issued in mid to late March after the Climate Prediction Center's Spring Climate Outlook is issued. If conditions warrant, an updated National Hydrologic Assessment will be posted to the web.

3.3 Technical Description.

3.3.1 Dissemination. The National Hydrologic Assessment is provided exclusively on the Internet at: http://www.nws.noaa.gov/oh/hic/nho/index.shtml.

3.3.2 Content. RFCs issue Extended-Range Streamflow Prediction Products (see NWS Instruction 10-912, *River Forecast Center Products Specification*) which serve as guidance for Hydrologic Outlooks issued by WFOs (See NWS Instruction 10-922, *WFO Hydrologic Products Specification*). The Hydrologic Information Center uses these products as the basis for the National Hydrologic Assessment.

The main web page includes a map of expected hydrologic conditions and a text summary. It also includes links to information on factors that affect the assessment (e.g., snow cover, soil moisture, stream flow conditions, etc.)

3.3.3 Format. The National Hydrologic Assessment is web-based with a main page and links to supporting web pages.

3.4 Updates, Amendments, and Corrections. Typically issued once, under unusual hydrologic conditions, updates may be issued.

4. National Significant River Flood Outlook. This graphical product broadly identifies areas where potential exists for significant river flooding over a 5-day period. The term "significant flooding" includes flooding falling in the moderate and major categories as defined in NWS Manual 10-950 - *Definitions and General Terminology*. The product is assembled by

the NCEP Hydrometeorological Prediction Center as a mosaic of individual graphical outlooks from the CONUS RFCs (see NWS Instruction 10-912). A separate outlook is provided for Alaska by the Alaska-Pacific River Forecast Center.

4.1 Mission Connection. This information helps the NWS to meet its mission by graphically depicting areas of river flood potential over the entire Nation. This helps partners and other users focus and optimize their flood mitigation activities, thus protecting lives and property and enhancing the national economy.

4.2 Issuance Guidelines.

4.2.1 Creation Software. RFCs use GIS software and NCEP uses N-AWIPS (National Centers-AWIPS) software.

4.2.2 Issuance Criteria. Issue the outlook daily.

4.2.3 Issuance Time. Issue the outlook at approximately 4 p.m., Eastern Time.

4.2.4 Valid Time. The product is valid until updated or until the valid time is exceeded, whichever is sooner.

4.3 Technical Description.

4.3.1 Dissemination. Via AWIPS: Issue encoded product with contours used on the Web graphic on AWIPS using an AWIPS ID (identifier) of **GPHWNH** and WMO Header of **PENJ88 KWNH**. On the internet, the national web page provides links to individual RFC depictions and each RFC web page provides a link to the National Significant River Flood Outlook product. The national product can be found at:

http://www.hpc.ncep.noaa.gov/nationalfloodoutlook/index.html

4.3.2. Content. Using the color/patterns used in the sample product shown in section 4.3.3, characterize flood potential according to the following criteria:

a. Possible: Hydrometeorological conditions indicate that significant flooding could occur. Such flooding is neither certain nor imminent.

b. Likely: Hydrometeorological conditions indicate that significant flooding can be expected during the outlook period.

c. Occurring/Imminent: Significant flooding is already occurring or is imminent during the outlook period.

4.3.3 Format. A sample significant river flood potential outlook product is shown in Figure 10.

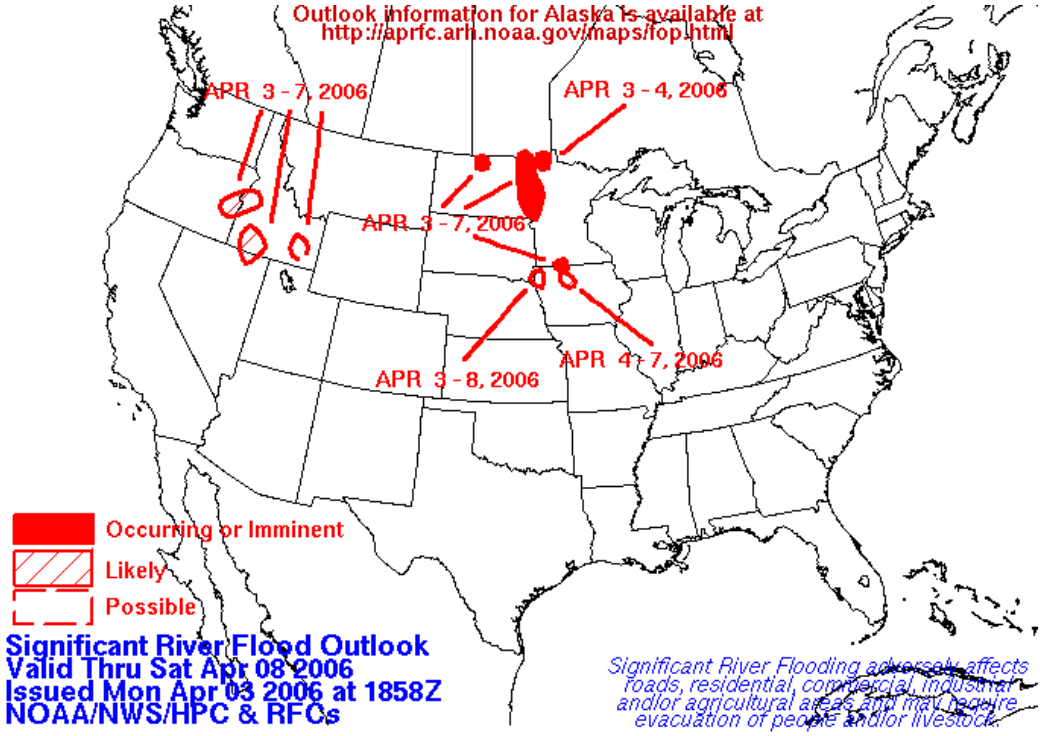

Figure 10. Sample significant river flood potential outlook product.

5. Precipitation Frequency Data Server. The Precipitation Frequency Data Server makes NWS precipitation frequency estimates available via the World Wide Web. NWS precipitation frequency estimates have traditionally been delivered in hard copy documents such as Weather Bureau Technical Papers and Memoranda as well as NOAA Atlases. These documents have been scanned and made available via web pages and updated estimates are provided in digital form. The NWS specifically developed the Precipitation Frequency Data Server as the primary web portal to precipitation frequency estimates and associated information.

Engineers use these probabilistic estimates of rainfall intensities to design a wide range of structures from urban storm water drainage systems to dams and spillways. Precipitation frequency estimates are also used in environmental management and analysis.

5.1 Mission Connection. The rainfall frequency atlases and technical papers published by the NWS serve as de-facto national standards for rainfall intensity at specified frequencies and durations in the U.S. They are provided in accordance with NOAA's Strategic Plan Mission Goal 2; "Understand climate variability and change to enhance society's ability to plan and respond."

5.2 Issuance Guidelines. The Precipitation Frequency Data Server is a delivery system in continuous operation. It provides the most currently available information. Updates to precipitation frequency estimates are made as reanalysis studies are completed by the Office of Hydrologic Development's Hydrometeorological Design Studies Center, http://www.weather.gov/oh/hdsc/

5.2.1 Creation Software. The Precipitation Frequency Data Server was developed using custom software running on a web server.

5.2.2 Issuance Criteria. Traditional issuance criteria for NWS "push" products do not apply.

5.2.3 Issuance Time. Products are available on demand through the web.

5.2.4 Valid Time. Not applicable.

5.3 Technical Description.

5.3.1 Dissemination. The Precipitation Frequency Data Server disseminates all available NWS precipitation frequency products and information provided to the public via the World Wide Web. This site home page is at: http://hdsc.nws.noaa.gov/hdsc/pfds/.

5.3.2 Content. All available NWS precipitation frequency products.

5.3.3 Format. The Precipitation Frequency Data Server is web-based with a map-based main page and links to supporting web pages (Figure 11).

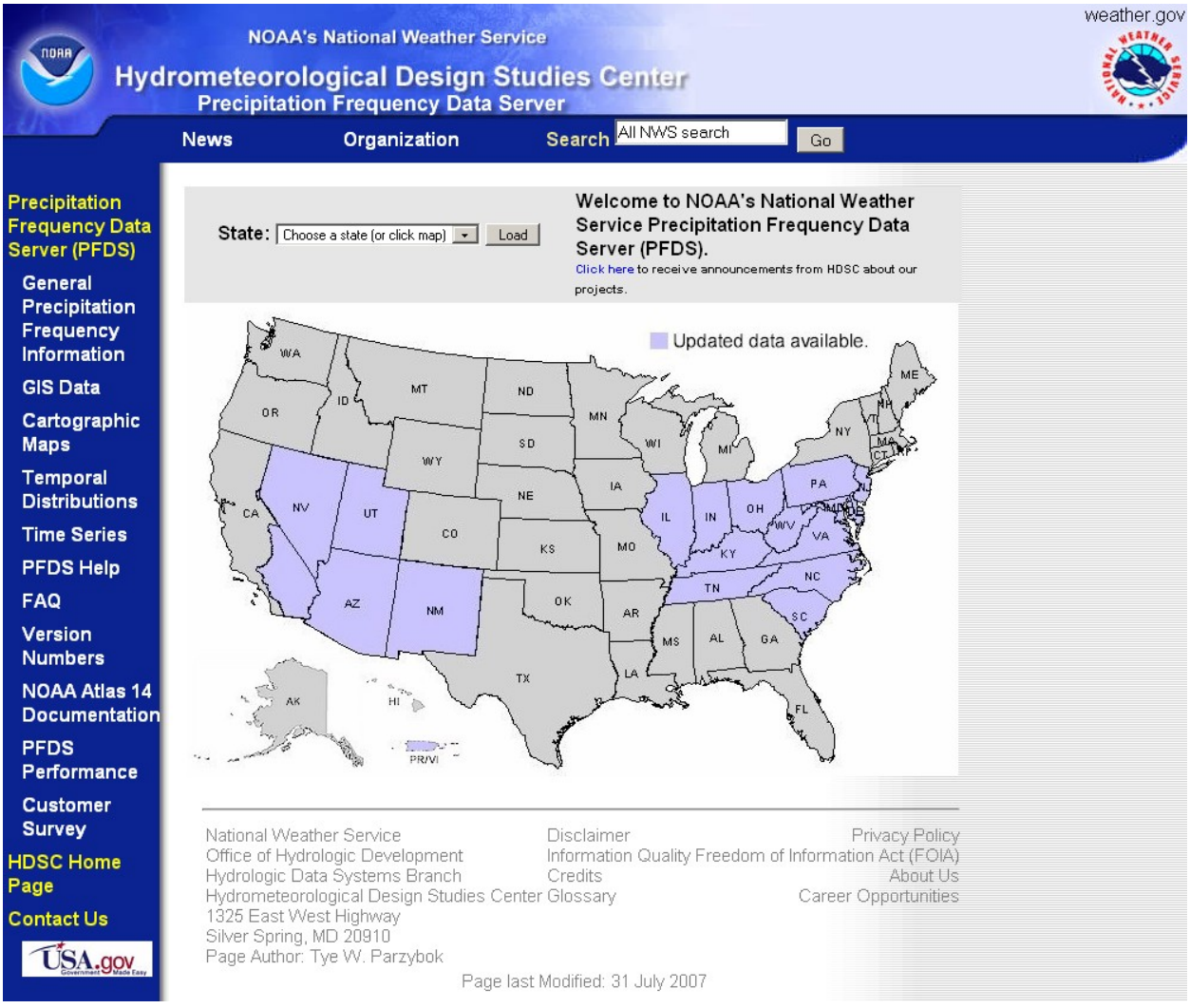

Figure 11. Home page for the Precipitation Frequency Data Server.

5.4 Updates, Amendments, and Corrections. New studies may be performed on an irregular basis to update precipitation frequency information for a designated region of the U.S. Upon completion of a study, the information on the Precipitation Frequency Data Server is updated.

6. Hydrometeorological Automated Data System Report (RRS). These products provide hydrometeorological observations in near real time to support NWS operations. These products are generated by the Hydrometeorological Automated Data System (HADS). The home page for HADS is: http://www.nws.noaa.gov/oh/hads/.

6.1 Mission Connection. HADS reports support the NWS mission by providing critical automated sensor data which is used in RFC operations, WFO hydrologic operations, fire weather operations, and other NWS operations which require near real-time hydrometeorological data.

6.2 Issuance Guidelines.

6.2.1 Creation Software. Custom software decodes telemetered data, stores it, provides for quality control, and encodes data in Standard Hydrometeorological Exchange Format (SHEF) (see NWS Manual 10-944, *Standard Hydrometeorological Exchange Format (SHEF) Manual*).

6.2.2 Issuance Time. Issued multiple times each day upon receipt of data.

6.3 Technical Description.

6.3.1 Dissemination. The headers used in the RRS product to support each individual WFO and RFC are contained in appendix A. WFO headers are also available on the Internet at: http://www.nws.noaa.gov/oh/hads/new_wmo_headers.html.

6.3.2 Content. Messages contain automated river, precipitation and temperature observations.

6.3.3 Format. Encode messages in SHEF using the generic format shown below in Figure 12.

```
SXUS37 KWOH ddhhmm
^NMCRRSxxx                                    (AWIPS ID, special format approved for HADS)

:
: && HADS SOR-xxx
<One or more lines of SHEF-encoded data>
```

Figure 12. Generic format for Hydrometeorological Automated Data System Report.

7. Daily SNOTEL Report (RSD). The SNOwpack TELemetry (SNOTEL) network operated by the Natural Resources Conservation Service (NRCS) provides automated snow water equivalent, precipitation, temperature, and other hydrometeorological data from high elevation areas of the western U.S. and Alaska. SNOTEL data are collected, processed, and inserted into RSD products by the NRCS and transferred to the NWS for dissemination in accordance with a cooperative agreement between the NWS and NRCS.

7.1 Mission Connection. SNOTEL data are obtained from high elevation areas of the western U.S. and Alaska and are used by WFOs and RFCs to monitor snow pack conditions in support of the NWS hydrology program.

7.2 Issuance Guidelines.

7.2.1 Creation Software. These products are created by the NRCS using appropriate software.

7.2.2 Issuance Time. The NRCS produces messages on both a daily and hourly basis. The NWS transmits messages as received.

7.3 Technical Description.

7.3.1 Dissemination. Headers for the western U.S. and Alaska are shown in Table 1.

State	WMO Header	AWIPS Header
Alaska	CXUS86 KSCS	RSD AK
Arizona	CXUS86 KSCS	RSD AZ
California	CXUS86 KSCS	RSD CA
Colorado	CXUS86 KSCS	RSD CO
Idaho	CXUS86 KSCS	RSD ID
Montana	CXUS86 KSCS	RSD MT
Nevada	CXUS86 KSCS	RSD NV
New Mexico	CXUS86 KSCS	RSD NM
Oregon	CXUS86 KSCS	RSD OR
South Dakota	CXUS86 KSCS	RSD SD
Utah	CXUS86 KSCS	RSD UT
Washington	CXUS86 KSCS	RSD WA
Wyoming	CXUS86 KSCS	RSD WY

Table 1. RSD product headers, by state.

7.3.2 Content. The product contains precipitation, snow, and temperature observations.

7.3.3 Format. Encode messages in SHEF (see NWS Manual 10-944) using the generic format shown below in Figure 13.

```
ZCZC NMCRSDxx
SRUW24 KSCS ddhhmm
 <.B format header>
:  U.S. DEPT. OF AGRICULTURE - Natural Resources Conservation Service.
:  PROVISIONAL DATA, SUBJECT TO REVISION.
:
 <SHEF-encoded SNOTEL data>
:
: <Comments if required>
.END
```

Figure 13. Generic format for Daily SNOTEL Report.

8. Monthly SNOTEL Report (RSM). Monthly SNOTEL Reports contain summaries of SNOTEL network observations which have been quality controlled by the NRCS. These quality controlled data are collected, processed, and inserted into RSM products by the NRCS and transferred to the NWS for dissemination in accordance with a cooperative agreement between the NWS and NRCS.

8.1 Mission Connection. Monthly SNOTEL Reports help the NWS meet its mission by providing data summaries which can be used in forecasting water supply and snow melt runoff.

8.2 Issuance Guidelines.

8.2.1 Creation Software. These products are created by the NRCS using appropriate software.

8.2.2 Issuance Time. Products are issued early in the month and in the middle of the month from January through May or June, depending on the duration of the snow melt season. NWS transmits messages when received.

8.3 Technical Description.

8.3.1 Dissemination. Table 2 identifies various headers used to provide data in the western U.S. and Alaska.

State	WMO Header	AWIPS Header
Alaska	CSUS86 KSCS	RSM AK
Arizona	CSUS86 KSCS	RSM AZ
California	CSUS86 KSCS	RSM CA
Colorado	CSUS86 KSCS	RSM CO
Idaho	CSUS86 KSCS	RSM ID
Montana	CSUS86 KSCS	RSM MT
Nevada	CSUS86 KSCS	RSM NV
New Mexico	CSUS86 KSCS	RSM NM
Oregon	CSUS86 KSCS	SM OR
South Dakota	CSUS86 KSCS	RSM SD
Utah	CSUS86 KSCS	RSM UT
Washington	CSUS86 KSCS	RSM WA
Wyoming	CSUS86 KSCS	RSM WY

Table 2. RSM product headers, by state.

8.3.2 Content. Messages contain precipitation and snow totals, as well as average temperatures.

8.3.3 Format. Encode messages in SHEF (see NWS Manual 10-944) using the generic format shown in Figure 14.

```
CSUS86 KSCS ddhhmm
RSMxx

 <.B Format header>
: U.S. DEPT. OF AGRICULTURE - Natural Resources Conservation Service
: PROVISIONAL DATA, MONTHLY CORRECTED SNOTEL PRECIPITATION ACCUMULATION
: DATA
 <SHEF-encoded data>
.END
```

Figure 14. Generic format for Monthly SNOTEL Report.

9. Airborne Survey Gamma Product (RRM). These products are prepared by the National Operational Hydrologic Remote Sensing Center (NOHRSC). They contain snow water

equivalent (SWE) data collected from aircraft during the January through April period. Products may also include remotely-sensed soil moisture information.

9.1 Mission Connection. These products help the NWS meet its mission by providing data over areas which may have little or no ground-based sensors measuring snow water equivalent. Data from these products allow snow accumulation and melt to be accounted for in river and flood forecasts, water supply forecasts, and spring flood outlooks for areas affected by snow.

9.2 Issuance Guidelines.

9.2.1 Creation Software. Use the Operational Product Processing System (OPPS).

9.2.2 Issuance Criteria. Issue when airborne data are processed and ready for distribution.

9.2.3 Issuance Time. Schedule times and areas for airborne surveys and subsequent product issuances based on national snow cover conditions and operational requirements of field offices. One consideration is the schedule for issuance of WFO spring snowmelt flood outlook products. This schedule can be found at: http://www.nohrsc.noaa.gov/snowsurvey/.

9.3 Technical Description.

9.3.1 Dissemination. Issue products over AWIPS based on Table 3 and post products to the NOHRSC web page at http://www.nohrsc.noaa.gov/snowsurvey/.

AWIPS ID	WMO Header	Description
MSPRRMASB	SRUS43 KMSR	Airborne Soil Moisture by Basin
MSPRRMASF	SRUS43 KMSR	Airborne Soil Moisture by Flight Line
MSPRRMASP	SRUS43 KMSR	Airborne SWE by Flight Line
MSPRRMASW	SRUS43 KMSR	Airborne Estimated SWE by Basin

Table 3. RRM product headers.

9.3.2 Content. Messages contain SWE and/or soil moisture information encoded in SHEF (see NWS Manual 10-944). Explanatory notes may also be included.

9.3.3 Format. Encode messages in SHEF, using generic format shown below in Figure 15.

```
SRUS43 KMSR ddhhmm
RRMxxx
 <.B Format header>
:TO ------ Service Hydrologist (Please give HARDCOPY to SH)
:FROM ---- Don Cline, (952) 361-6610 ext 252, Minneapolis, Minnesota
:Visit our web page at www.nohrsc.nws.gov
:SUBJECT - AIRBORNE SWE DATA 010218210638
:-------------------------------------------------------------------
: Total No. of flight lines sent = #
:-------------------------------------------------------------------
:Line Survey %SC SWE SWE %SM Est Fall %SM Pilot
:No. Date (in) (35%) (M) Type Date (F) Remarks
:===================================================================
 <One or more lines of SHEF-encoded flight line data>
.END
<Narrative summary, if required>
```

Figure 15. Generic format for NOHRSC Airborne Survey Gamma Product

10. Satellite Areal Extent of Snow Cover Product (SCV). These NOHRSC products contain satellite-based estimates of snow cover in the CONUS and adjacent portions of Canada.

10.1 Mission Connection. These products help the NWS meet its mission by providing spatial snow cover information for areas which may have limited or no other observation sources. This information is used by WFOs and RFCs when analyzing hydrologic conditions and preparing water supply forecasts, and spring flood outlooks for snow-affected areas.

10.2 Issuance Guidelines.

10.2.1 Creation Software. Use the Operational Product Processing System (OPPS).

10.2.2 Issuance Criteria. Issue products daily when there is significant snow cover.

10.2.3 Issuance Time. Issue products at approximately 1500 UTC.

10.3 Technical Description.

10.3.1 Dissemination. Issue SCV products over AWIPS using headers shown in Table 4 and post products on the NOHRSC web page at: http://www.nohrsc.noaa.gov/nh_snowcover/.

AWIPS ID	WMO Header	Description
MSPSCVACR	SRUS43 KMSR	Estimated SCV by Basin for APRFC
MSPSCVALR	SRUS43 KMSR	Estimated SCV by Basin for SERFC
MSPSCVFWR	SRUS43 KMSR	Estimated SCV by Basin for WGRFC
MSPSCVKRF	SRUS43 KMSR	Estimated SCV by Basin for MBRFC
MSPSCVMSR	SRUS43 KMSR	Estimated SCV by Basin for NCRFC
MSPSCVORN	SRUS43 KMSR	Estimated SCV by Basin for LMRFC
MSPSCVPTR	SRUS43 KMSR	Estimated SCV by Basin for NWRFC
MSPSCVRHA	SRUS43 KMSR	Estimated SCV by Basin for MARFC
MSPSCVRSA	SRUS43 KMSR	Estimated SCV by Basin for ABRFC
MSPSCVSTR	SRUS43 KMSR	Estimated SCV by Basin for CNRFC
MSPSCVTAR	SRUS43 KMSR	Estimated SCV by Basin for CBRFC
MSPSCVTIR	SRUS43 KMSR	Estimated SCV by Basin for NERFC
MSPSCVTUA	SRUS43 KMSR	Estimated SCV by Basin for OHRFC

Table 4. SCV product headers.

10.3.2 Content. Messages contain SWE and/or soil moisture information encoded in SHEF (see NWS Manual 10-944). Explanatory notes may also be included.

10.3.3 Format. Encode messages in SHEF. The generic format is shown below in Figure 16.

```
SRUS43 KMSR ddhhmm
SCVxxx

 <.B Format Header>
:------------------------------------------------------------------------
:NATIONAL WEATHER SERVICE - OFFICE OF CLIMATE, WATER, AND WEATHER SERVICES
:NATIONAL OPERATIONAL HYDROLOGIC REMOTE SENSING CENTER
:CHANHASSEN MINNESOTA                  (952) 361-6610
:------------------------------------------------------------------------
```

```
:SATELLITE AREAL EXTENT OF SNOW COVER (PERCENT) BY ELEVATION ZONES (1000FT)
:COMPOSITE ANALYSIS yymmddhh_start - yymmddhh_end
:
:BASIN      SA   NAME
:                          EZONE1  EZONE2  EZONE3  EZONE4  EZONE5  EZONE6

 <One or more lines of SHEF-encoded data>
.END
NNNN
```

Figure 16. Generic format for Satellite Areal Extent of Snow Cover product.

11. Estimated Snow Water Equivalent by Basin Product (SWE). These products are prepared by the NOHRSC from January through April. They contain estimated SWE amounts for the CONUS based on an integration of data assembled over the previous 24-hour period.

11.1 Mission Connection. These products help the NWS meet its mission by providing snow water equivalent data for individual stream basins. This allows snow accumulation and melt to be accounted for in river and flood forecasts, water supply forecasts, and spring flood outlooks issued for all basins affected by snow.

11.2 Issuance Guidelines.

11.2.1 Creation Software. Use the Operational Product Processing System (OPPS).

11.2.2 Issuance Criteria. Issue products for each RFC where snow is present.

11.2.3 Issuance Time. Issue products at approximately 1500 UTC.

11.3 Technical Description.

11.3.1 Dissemination. Issue SWE products over AWIPS using headers shown in Table 5 and post products to the NOHRSC web page.

AWIPS ID	WMO Header	Description
MSPSWEACR	SRUS43 KMSR	Estimated SWE by Basin for APRFC
MSPSWEALR	SRUS43 KMSR	Estimated SWE by Basin for SERFC
MSPSWEFWR	SRUS43 KMSR	Estimated SWE by Basin for WGRFC
MSPSWEKRF	SRUS43 KMSR	Estimated SWE by Basin for MBRFC
MSPSWEMSR	SRUS43 KMSR	Estimated SWE by Basin for NCRFC
MSPSWEORN	SRUS43 KMSR	Estimated SWE by Basin for LMRFC
MSPSWEPTR	SRUS43 KMSR	Estimated SWE by Basin for NWRFC
MSPSWERHA	SRUS43 KMSR	Estimated SWE by Basin for MARFC
MSPSWERSA	SRUS43 KMSR	Estimated SWE by Basin for CNRFC
MSPSWESTR	SRUS43 KMSR	Estimated SWE by Basin for CBRFC
MSPSWETAR	SRUS43 KMSR	Estimated SWE by Basin for NERFC
MSPSWETIR	SRUS43 KMSR	Estimated SWE by Basin for OHRFC
MSPSWETUA	SRUS43 KMSR	Estimated SWE by Basin for ABRFC

Table 5 SWE product headers

11.3.2 Content. Messages contain SWE and/or soil moisture information encoded in SHEF (see NWS Manual 10-944, *Standard Hydrometeorological Exchange Format (SHEF) Manual*). Explanatory notes may also be included.

11.3.3 Format. Encode messages in SHEF. The generic format is shown below in Figure 17.

```
SRUS43 KMSR ddmmhh
SWExxx

 <.B Format Header>
:------------------------------------------------------------------------
:NATIONAL WEATHER SERVICE - OFFICE OF CLIMATE, WATER, AND WEATHER SERVICES
:NATIONAL OPERATIONAL HYDROLOGIC REMOTE SENSING CENTER
:CHANHASSEN MINNESOTA                  (952) 361-6610
:------------------------------------------------------------------------
:ESTIMATED AIRBORNE SNOW WATER EQUIVALENT (INCHES) BY BASIN BY ELEVATION
ZONES (1000FT)
:ANALYSIS yymmddhh
:
:BASIN      SW   NAME
:                       EZONE1  EZONE2  EZONE3  EZONE4  EZONE5  EZONE6
 <One or more lines of SHEF-encoded data>
.END
NNNN
```

Figure 17. Generic format for Estimated Snow Water Equivalent by Basin product.

12. National Snow Analysis. The National Snow Analysis (NSA) is a web based suite of NOHRSC products providing comprehensive snow information for the CONUS.

12.1 Mission Connection. The NSA helps the NWS meet its mission making available analyses of snow conditions and data sets that are used by NWS field offices; other federal, state, and local agencies; and the private sector in a variety of applications including operational and research hydrologic modeling for snowmelt and water supply forecasting. This allows for better forecasting and management of increasingly scarce water resources, thus helping to protect life and property and enhance the national economy.

12.2 Issuance Guidelines.

12.2.1 Creation Software. The NSA is produced using output from appropriate snow models, observations and web applications. The web page is developed and maintained using the PHP architecture.

12.2.2 Issuance Criteria. The NSA is a “pull” product which is created and used on demand to contain the requested information. The data contained in the products are updated as operational observations become available and the NSA performs necessary processing to create graphical, text, and data products for the web, and posts them ready for use on demand.

12.2.3 Issuance Time. Snow summaries from the NSA are available daily (excluding weekends and holidays). Interactive, time series data plots and user-selected alphanumeric snow summaries are available on demand through the web.

12.3 Technical Description.

12.3.1 Dissemination. The NSA snow products are distributed primarily through the NOHRSC web page: http://www.nohrsc.noaa.gov. (In addition to the web-based products, 1 km^2, gridded, daily snow products for the CONUS are available from the National Snow and Ice Data Center in Boulder: http://nsidc.org/data/g02158.html.)

12.3.2 Content. The NSA uses daily ground-based, airborne, and satellite snow observations from all sources available electronically for the CONUS. These data are ingested into a physically-based snow model to generate estimates of snowpack characteristic. The NOHRSC snow model is an energy-and-mass-balance, spatially-uncoupled, vertically-distributed, multi-layer snow model run operationally at 1-km^2 spatial resolution and hourly temporal resolution for the nation. Ground-based and remotely-sensed snow observations are assimilated daily into the simulated snow-model state variables. Output is distributed in a variety of interactive map, text discussion, alphanumeric, time-series, and gridded formats. Information in the NSA includes:

a. Daily maps at the national or regional scale for the following nine snowpack characteristics: 1) snow water equivalent, 2) snow depth, 3) average snowpack temperature, 4) snow water equivalent change, 5) snow precipitation, 6) snow melt, 7) blowing snow sublimation, 8) surface sublimation, and 9) non-snow precipitation; with the option to display seasonal, two-week, and 24 hour movie-loop animations for the each of these characteristics.

b. Text summaries of 1) recent weather conditions affecting snowpack, 2) individual stations reporting the most significant snow amounts, 3) link access to all station reports, 4) areas where notable changes in snowpack were estimated by the model, and 5) notes on current/pending activity for the airborne snow survey program.

c. Interactive Snow Information, which allows the user to select the geographic region of interest, the period-of-record of interest, and the physical element of interest. The summary has pan, zoom, and query functionality. End-users can query on numerous physical elements including: snow water equivalent, snow depth, snowpack temperature, snow precipitation, non-snow precipitation, surface air temperature, solar radiation, relative humidity, daily change in snow water equivalent, daily change in snow depth, daily snowmelt, daily blowing snow sublimation, daily surface sublimation/condensation, daily average snowpack temperature, and daily snow precipitation.

d. Station time-series plots (graphic), which are a series of graphic plots using data from a selected reporting station for a selected period-of-record. The plots include line graphs of NOHRSC snow model output and point indicators for a variety of observed hydrometeorological variables.

e. Alphanumeric snow summaries (text) for snow water equivalent, snow depth, and areal extent of snow cover are available in SHEF (see NWS Manual 10-944) on a hydrologic basin-by-basin basis

12.3.3 Format. Examples of the National Snow Analysis and Interactive Snow Information web pages are shown in Figures 18 and 19.

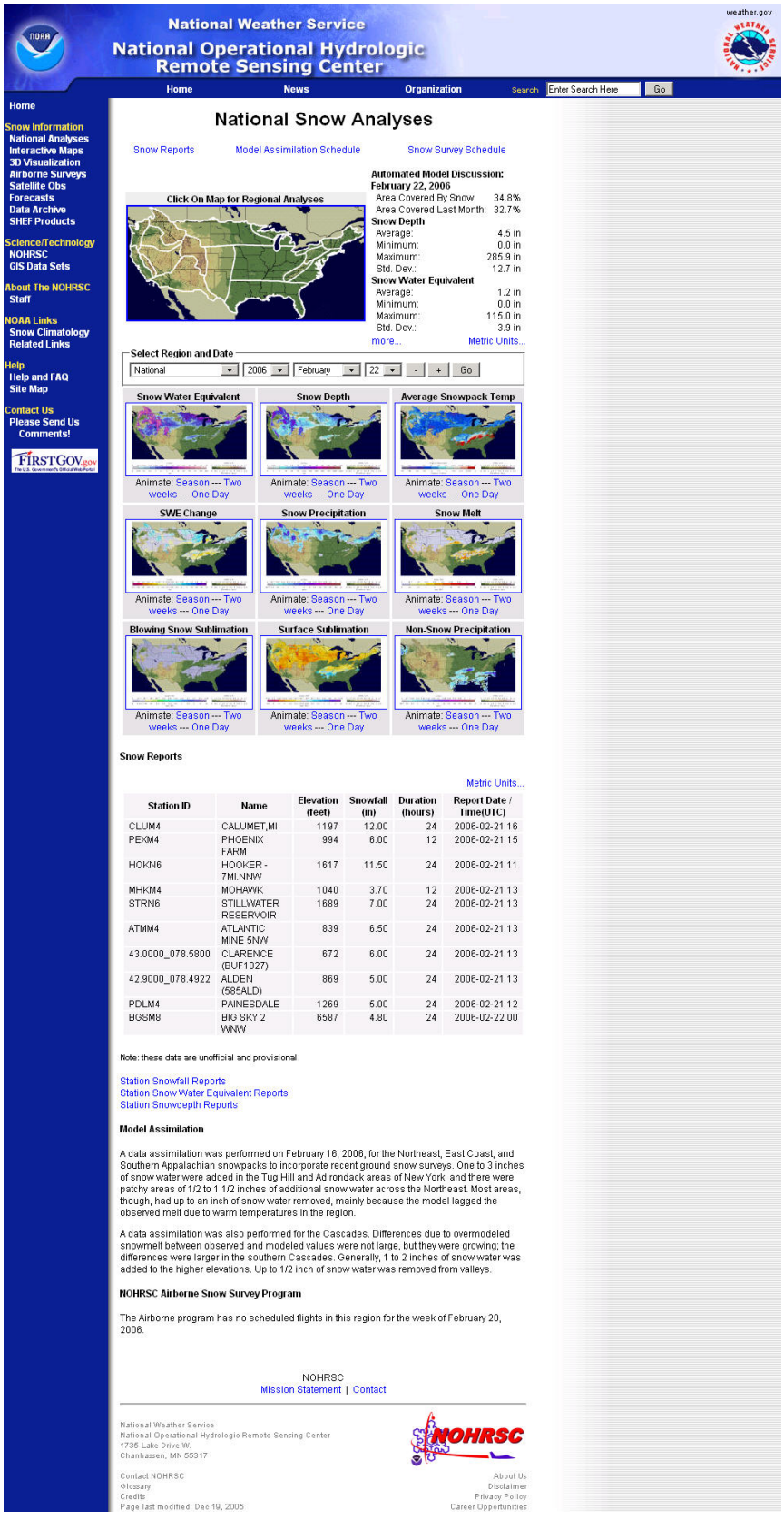

Figure 18. Example of National Snow Analysis web page.

Figure 19. Example of Interactive Snow Information web page

12.4 Updates, Amendments, and Corrections. Updates and corrections are made as needed.

13. Probability of Rainfall Exceeding Flash Flood Guidance (94E, 98E, 99E). These products are prepared by the National Center for Environmental Prediction's (NCEP) Hydrometeorological Prediction Center (HPC) for the CONUS. The products identify areas where rainfall exceeding RFC flash flood guidance (FFG) criteria is a concern.

13.1 Mission Connection. These products support the NWS mission by providing NWS field offices with graphical information showing the areas with forecast probabilities of flash flooding.

13.2 Issuance Guidelines.

13.2.1 Creation Software. Use N-AWIPS software or other applications as appropriate.

13.2.2 Issuance Criteria. Issue the products routinely.

13.2.3 Issuance Time. These products are issued at times indicated in Table 6.

HPC CONUS Graphical Flash Flood Guidance Product Schedule				
Issuance Time (UTC)	**Valid Time (UTC)**	**AWIPS ID**	**WMO Header**	**Product Description**
0000 (optional)	0000-0000	RBG94E	MENC98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5 inches during the 24 hours of forecast valid time
0300 (mandatory)	0300-0000	RBG94E	MENC98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5 inches during the 21 hours of forecast valid time
0600 (mandatory)	0600-1200	RBG94E	MENC98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5 inches during the 30 hours of forecast valid time
0630 (mandatory)	1200 Day 2 – 1200 Day 3	RBG98E	MENS98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values during the 24 - 48 hours of forecast time
0830 (mandatory)	1200 Day 3 – 1200 Day 4	RBG99E	MENU98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values during the 48 - 72 hours of forecast time
1200 (optional)	1200-1200	RBG94E	MENC98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5 inches during the 24 hours of forecast valid time
1500 (mandatory)	1500-0000	RBG94E	MENC98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5 inches during the 21 hours of forecast valid time
1800 (mandatory)	1800-0000	RBG94E	MENC98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5 inches during the 30 hours of forecast valid time
1830 (mandatory)	0000 Day 2 – 0000 Day 3	RBG98E	MENS98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values during the 24 - 48 hours of forecast time
2030 (mandatory)	0000 Day 3 – 0000 Day 4	RBG99E	MENU98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values during the 48 - 72 hours of forecast time
2100 (optional)	2100-0000	RBG94E	MENC98 KWNH	Rainfall Potential Exceeding Flash Flood Guidance Values and/or 5 inches during the 27 hours of forecast valid time

Table 6. Issuance time, valid time, product ID, and content of flash flood guidance products.

13.2.4 Valid Time. See Table 6.

13.3 Technical Description.

13.3.1 Dissemination. Issue these products on AWIPS using the identifiers and WMO headers in Table 6. URLs for products posted on the web are:
Day 1 - http://www.hpc.ncep.noaa.gov/qpf/94ewbg.gif
Day 2 - http://www.hpc.ncep.noaa.gov/qpf/98ewbg.gif
Day 3 - http://www.hpc.ncep.noaa.gov/qpf/99ewbg.gif

13.3.2 Content. These products depict areas that forecast the probability of rainfall exceeding FFG. These products use one-, three- or six-hour FFG as produced daily by the CONUS RFCs. The Day 1 product includes three categories of probability (Slight, Moderate and High) with areas of 5-inch QPF indicated. The Day 2 and Day 3 excessive rainfall products are based on Flash Flood Guidance for Day 1 and quantitative precipitation forecasts for Days 2 and 3. These include two categories (Slight and Moderate) with no 5-inch QPF delineated. There is no written discussion with the Day 2 and Day 3 products, but if an area is forecast, a text representation of the threat region is created and can be accessed at the link below the graphic.

13.3.3 Format. These products show areas with risk of exceeding RFC flash flood guidance values or a 5 inch threshold during the valid period for Day 1 products. The probability categories and associated color codes used in this product are shown below in Table 7. The "None Forecast" through "Moderate Risk" categories apply to the Day 2 and Day 3 products.

SEE TEXT <5%	Less than a 5% chance of exceeding FFG
SLIGHT RISK 5-10%	5-10% chance of exceeding FFG
MODERATE RISK 10-15%	10-15% chance of exceeding FFG
HIGH RISK >15%	Greater than 15% chance of exceeding FFG
RAINFALL GREATER THAN 5 INCHES	This is a deterministic forecast when it is believed there is a chance for rainfall exceeding five inches during the specified forecast period

Table 7. Threat levels for exceeding flash flood guidance and forecast probabilities along with associated color codes used in Probability of Rainfall Exceeding Flash Flood Guidance product.

If the potential exists for precipitation exceeding guidance values, but the expected probability is less than 5%, HPC will place the words **SEE TEXT** over the threat area. This area will then be referenced in the excessive rainfall discussion (see Section 14). In addition, areas where precipitation is expected to exceed five inches will also be indicated. If conditions are not favorable or are not expected to become favorable for excessive rainfall, then "No Organized Areas of Rainfall Exceeding Flash Flood Guidance are Expected" is appended to the graphic. The Slight, Moderate, and High Risk areas are delineated by an enclosed solid line (with arrowhead). The 5 inch area is delineated by an enclosed solid line with a hatched pattern filling the threat region. A sample Rainfall Potential for Exceeding Flash Flood Guidance product for Day 1 is shown below in Figure 20 and a product for Day 2 in shown in Figure 21.

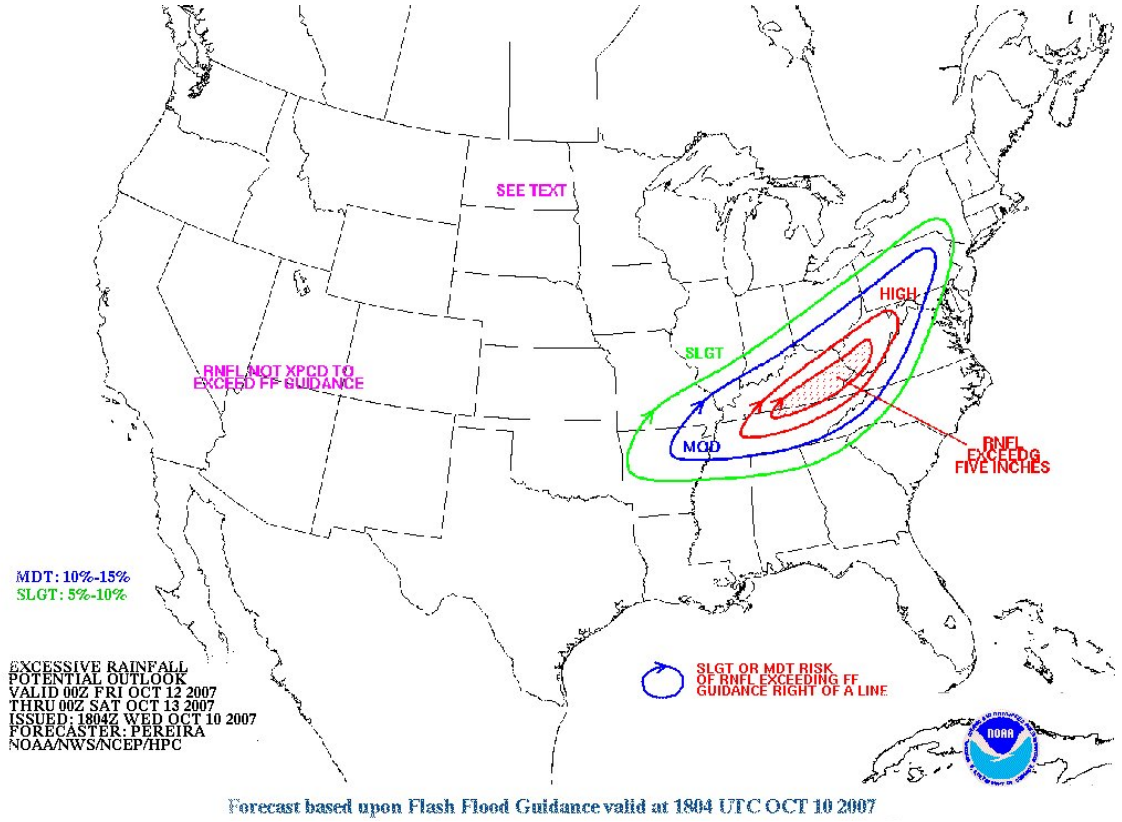

Figure 20. Sample Rainfall Probability for Exceeding Flash Flood Guidance Day 1 product.

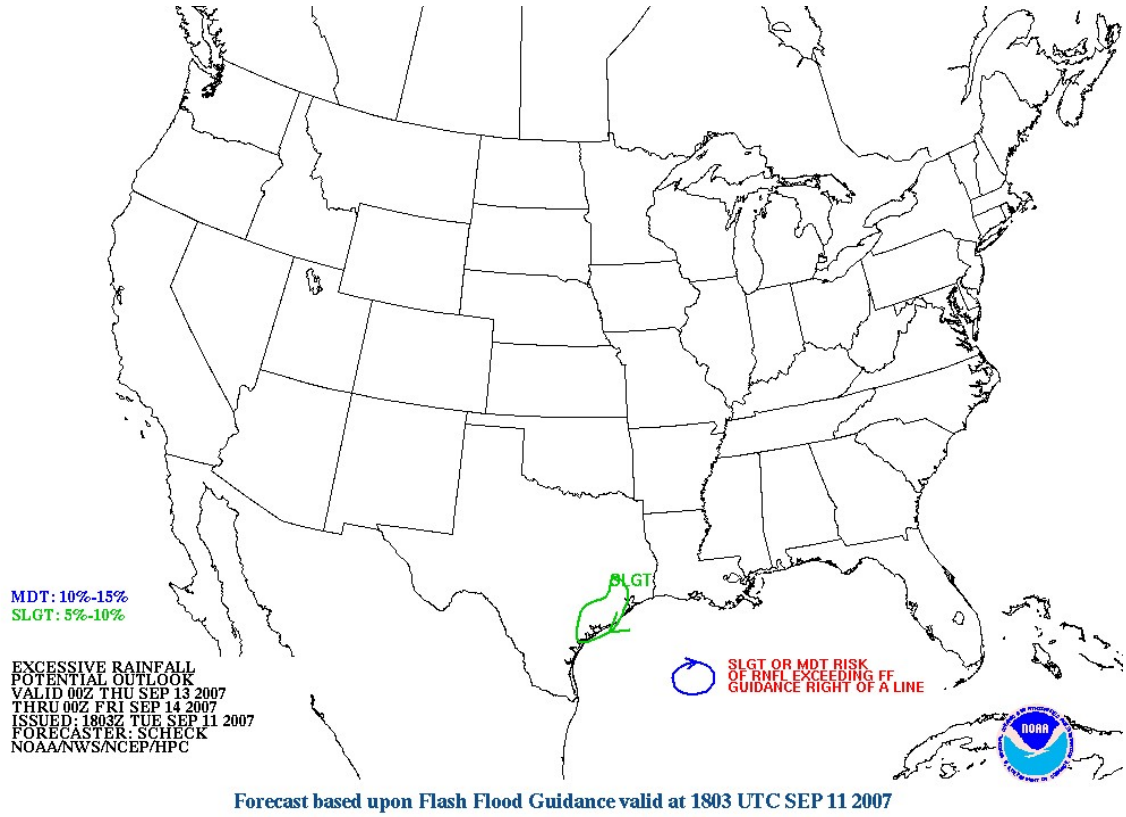

Figure 21. Sample Rainfall Probability for Exceeding Flash Flood Guidance Day 2 product.

13.4 Updates, Amendments, and Corrections. Update this product if meteorological conditions change or if corrections are needed.

14. Excessive Rainfall Discussion (ERD). This product is prepared by the HPC for the CONUS. The product provides explanation and interpretation of the Probability of Rainfall Exceeding Flash Flood Guidance graphics (see Section 13 above).

14.1 Mission Connection. This product supports the NWS mission by providing NWS field offices with information highlighting the areas with the greatest likelihood of flash flooding.

14.2 Issuance Guidelines.

14.2.1 Creation Software. Use appropriate COTS word processing software.

14.2.2 Issuance Criteria. Issue the product routinely.

14.2.3 Issuance Time. 0300, 0700, 1500, and 1900 UTC.

14.2.4 Valid Time. 0300 -1200 UTC, 1200-1200 UTC, 1500-1200, and 0000-0000 UTC.

14.2.5 Product Expiration Time. Product expires at the end of the valid time.

14.3 Technical Description. The excessive rainfall discussion should follow the format and content described in this section. It is published on the web at: http://www.hpc.ncep.noaa.gov/discussions/qpferd.html

14.3.1 MND Header. Use "EXCESSIVE RAINFALL DISCUSSION."

14.3.2 Content. The product is a text message providing an explanation and interpretation of the Rainfall Potential for Exceeding Flash Flood Guidance graphic.

14.3.3 Format. The generic format is shown in Figure 22.

```
FOUS30 KWBC ddhhmm
QPFERD

EXCESSIVE RAINFALL DISCUSSION
NWS HYDROMETEOROLOGICAL PREDICTION CENTER CAMP SPRINGS MD
time am/pm time_zone day mon dd yyyy
...VALID hhZ day mon dd yyyy - hhZ day mon dd yyyy
...REFERENCE AWIPS GRAPHIC UNDER...DAY 1 EXCESSIVE RAINFALL

 <discussion text>
<forecaster name>

GRAPHICS AVAILABLE ON THE WEB AT www.hpc.ncep.noaa.gov

$$
```

Figure 22. Generic format for Excessive Rainfall Discussion.

14.4 Updates, Amendments, and Corrections. Update under rapidly changing meteorological conditions. Correct for format and grammatical errors as required.

15. 6-Hour Quantitative Precipitation Forecasts (Day 1-3). These products, prepared by the HPC, delineate quantitative precipitation forecast (QPF) amounts for specified 6-hour periods. The products are available in both graphical and gridded format.

15.1 Mission Connection. RFCs use QPF as input to hydrologic forecast models. WFOs use QPF to support their river and flash flood warning programs. Graphical QPF products and their gridded versions are posted on the Internet for use by partners and the general public.

15.2 Issuance Guidelines.

15.2.1 Creation Software. Use N-AWIPS software or other applications as appropriate.

15.2.2 Issuance Criteria. Issue the product routinely.

15.2.3 Issuance Time. These products are issued at the times indicated in Table 8.

HPC CONUS 6-hr QPF Product Schedule

Issuance Time (UTC)	Valid Time (UTC)	Graphical		Gridded		Product Description
		AWIPS ID	WMO Header	AWIPS ID	WMO Header	
0600	0600 - 1200	RBG91E	PEIB40 KWNO	QPF91E	ZEXB98 KWNH	0 - 6 h liquid equivalent QPF
0615	1200 - 1800	RBG92E	PEIC43 KWBC	QPF92E	ZEXC98 KWNH	Preliminary 6-12 h QPF
	1800 - 0000	RBG93E	PEID44 KWBC	QPF93E	ZEXD98 KWNH	Preliminary 12-18 h QPF
	0000 - 0600	RBG9EE	PEIE40 KWNO	QPF9EE	ZEXE98 KWNH	Preliminary 18-24 h QPF
	0600 - 1200	RBG9FE	PEIF40 KWNO	QPF9FE	ZEXF98 KWNH	Preliminary 24-30 h QPF
0700	1200 - 1800	RBG9GE	PEII42 KWBC	QPF9GE	ZEXG98 KWNH	Preliminary 29 – 35 h QPF
	1800 - 0000	RBG9HE	PEBF98 KWNH	QPF9HE	ZEXH98 KWNH	Preliminary 35 - 41 h QPF
	0000 - 0600	RBG9IE	PEBG98 KWNH	QPF9IE	ZEXI98 KWNH	Preliminary 41 - 47 h QPF
	0600 - 1200	RBG9JE	PEBH98 KWNH	QPF9JE	ZEXJ98 KWNH	Preliminary 47 - 53 h QPF
1015	1200 - 1800	RBG92E	PEIC43 KWBC	QPF92E	ZEXC98 KWNH	Final 2 - 8 h QPF
	1800 - 0000	RBG93E	PEID44 KWBC	QPF93E	ZEXD98 KWNH	Final 8 - 14 h QPF
	0000 - 0600	RBG9EE	PEIE40 KWNO	QPF9EE	ZEXE98 KWNH	Final 14 - 20 h QPF
	0600 - 1200	RBG9FE	PEIF40 KWNO	QPF9FE	ZEXF98 KWNH	Final 20 - 26 h QPF
	1200 - 1800	RBG9GE	PEBF98 KWNH	QPF9GE	ZEXG98 KWNH	Final 26 - 32 h QPF
	1800 - 0000	RBG9HE	PEBG98 KWNH	QPF9HE	ZEXH98 KWNH	Final 32 - 38 h QPF
	0000 - 0600	RBG9IE	PEBH98 KWNH	QPF9IE	ZEXI98 KWNH	Final 38 - 44 h QPF
	0600 - 1200	RBG9JE	PEBI88 KWNH	QPF9JE	ZEXJ98 KWNH	Final 44 - 50 h QPF
	1200 - 1800	RBG9KE	PEBI98 KWNH	QPF9KE	ZEXK98 KWNH	50 - 56 h QPF**
	1800 - 0000	RBG9LE	PEBJ88 KWNH	QPF9LE	ZEXL98 KWNH	56 - 62 h QPF**
	0000 - 0600	RBG9OE	PEBJ98 KWNH	QPF9OE	ZEXM98 KWNH	62 - 68 h QPF**
	0600 - 1200	RBG9NE	PEBK98 KWNH	QPF9NE	ZEXN98 KWNH	68 - 74 h QPF**
1800	1800 - 0000	RBG91E	PEIB40 KWNO	QPF91E	ZEXB98 KWNH	0 - 6 h liquid equivalent QPF
1815	0000 - 0000	RBG94Q	PEIE41 KWBC	--------	----------	Preliminary 6-30 h (Day 1) QPF
	0000 - 0600	RBG92E	PEIC43 KWBC	QPF92E	ZEXC98 KWNH	Preliminary 6-12 h QPF
	0600 - 1200	RBG93E	PEID44 KWBC	QPF93E	ZEXD98 KWNH	Preliminary 12-18 h QPF
	1200 - 1800	RBG9EE	PEIE40 KWNO	QPF9EE	ZEXE98 KWNH	Preliminary 18-24 h QPF
	1800 - 0000	RBG9FE	PEIF40 KWNO	QPF9FE	ZEXF98 KWNH	Preliminary 24-30 h QPF

1900	0000 - 0600	RBG9GE	PEBF98 KWNH	QPF9GE	ZEXG98 KWNH	Preliminary 29 – 35 h QPF
	0600 - 1200	RBG9HE	PEBG98 KWNH	QPF9HE	ZEXH98 KWNH	Preliminary 35 - 41 h QPF
	1200 - 1800	RBG9IE	PEBH98 KWNH	QPF9IE	ZEXI98 KWNH	Preliminary 41 - 47 h QPF
	1800 - 0000	RBG9JE	PEBI88 KWNH	QPF9JE	ZEXJ98 KWNH	Preliminary 47 - 53 h QPF
2215	0000 - 0600	RBG92E	PEIC43 KWBC	QPF92E	ZEXC98 KWNH	Final 2 - 8 h QPF
	0600 - 1200	RBG93E	PEID44 KWBC	QPF93E	ZEXD98 KWNH	Final 8 - 14 h QPF
	1200 - 1800	RBG9EE	PEIE40 KWNO	QPF9EE	ZEXE98 KWNH	Final 14 - 20 h QPF
	1800 - 0000	RBG9FE	PEIF40 KWNO	QPF9FE	ZEXF98 KWNH	Final 20 - 26 h QPF
	0000 - 0600	RBG9GE	PEBF98 KWNH	QPF9GE	ZEXG98 KWNH	Final 26 - 32 h QPF
	0600 - 1200	RBG9HE	PEBG98 KWNH	QPF9HE	ZEXH98 KWNH	Final 32 - 38 h QPF
	1200 - 1800	RBG9IE	PEBH98 KWNH	QPF9IE	ZEXI98 KWNH	Final 38 - 44 h QPF
	1800 - 0000	RBG9JE	PEBI88 KWNH	QPF9JE	ZEXJ98 KWNH	Final 44 - 50 h QPF
	0000 - 0600	RBG9KE	PEBI98 KWNH	QPF9KE	ZEXK98 KWNH	50 - 56 h QPF**
	0600 - 1200	RBG9LE	PEBJ88 KWNH	QPF9LE	ZEXL98 KWNH	56 - 62 h QPF**
	1200 - 1800	RBG9OE	PEBJ98 KWNH	QPF9OE	ZEXM98 KWNH	62 - 68 h QPF**
	1800 - 0000	RBG9NE	PEBK98 KWNH	QPF9NE	ZEXN98 KWNH	68 - 74 h QPF**

Notes
* *Winter Issuance Only*
** *Only Oct 15 – Apr 15*

Table 8. Issuance time, valid time, product ID, and content of 6-hour QPF products.

15.2.4 Valid Time. See Table 8.

15.3 Technical Description.

15.3.1 Dissemination. Issue these products on AWIPS using the identifiers and WMO headers in Table 8. The URL for products posted on the web is: http://www.hpc.ncep.noaa.gov/qpf/qpf2.shtml.

15.3.2 Content. Products contain 6-hr isohyets depicting 0.01-, 0.25-, 0.50-, 1.0-, 2.0-, etc., inch QPF amounts over the CONUS.

15.3.3 Format. Sample graphical products are shown in Figures 23 and 24 (the latter is based on the gridded QPFs). Produce gridded products using the International GRIB (GRIdded Binary) format, the description of GRIB is at: http://www.nco.ncep.noaa.gov/pmb/docs/grib2/.

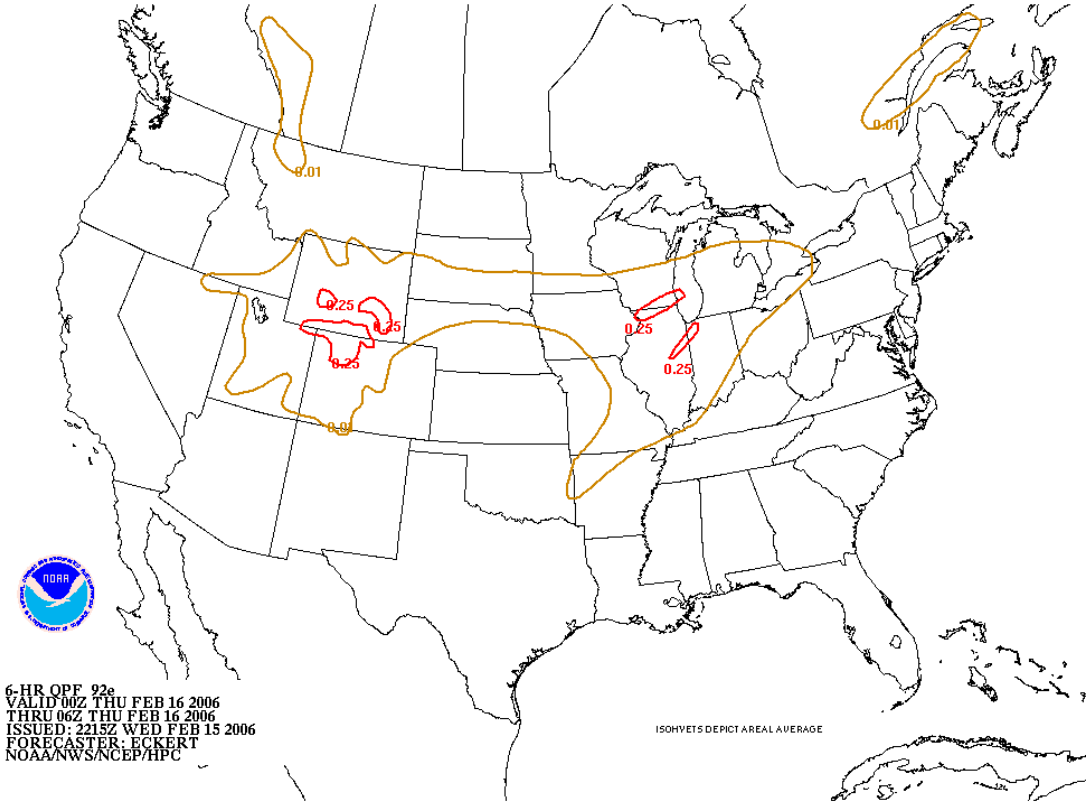

Figure 23. HPC 6-hr QPF graphic showing expected precipitation using predefined isohyets.

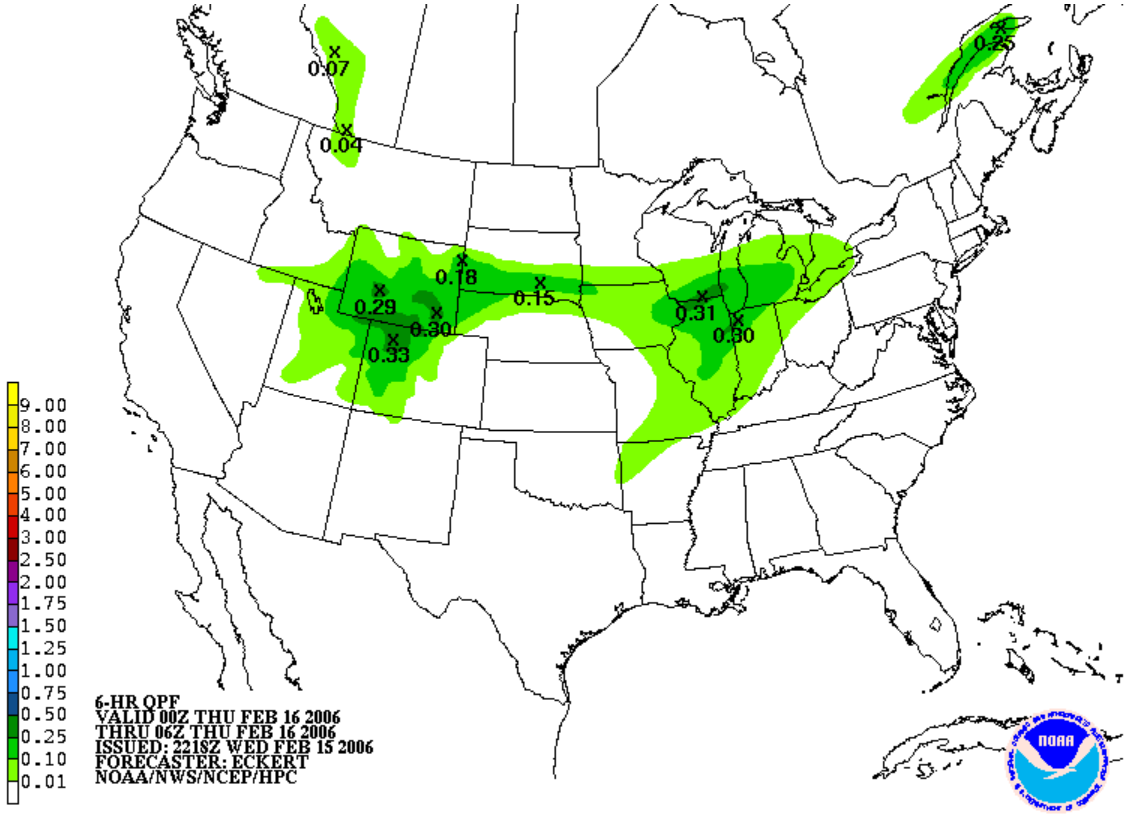

Figure 24. HPC 6-hr QPF graphic showing expected precipitation, based on gridded data.

15.4 Updates, Amendments, and Corrections. Update if requested by an RFC. Issue corrections when necessary.

16. 24-Hour Quantitative Precipitation Forecast (Day 1 - 3). These products, prepared by the HPC, delineate QPF amounts in the CONUS for specified 24-hour periods.

16.1 Mission Connection. These products help the NWS to meet its mission by providing RFCs with forecast precipitation information used in the river modeling and forecasting process. The product also supports WFO public weather programs.

16.2 Issuance Guidelines.

16.2.1 Creation Software. Use N-AWIPS software to generate these products.

16.2.2 Issuance Criteria. Issue the product routinely.

16.2.3 Issuance Time. Issue products according to the schedule indicated in Table 9.

16.2.4 Valid Time. See Table 9.

16.3 Technical Description. Products should follow the format and content described in this section.

16.3.1 Dissemination. Issue these products on AWIPS using the identifiers and WMO headers in Table 9. The URL for products posted on the web is: http://www.hpc.ncep.noaa.gov/qpf/qpf2.shtml.

HPC CONUS 24-h QPF Product Schedule				
Issuance Time (UTC)	**Valid Time (UTC)**	**AWIPS ID**	**WMO Header**	**Product Description**
0615	1200 – 1200	RBG94Q	PEIE41 KWBC	Preliminary 6 - 30 h (Day 1) QPF
0700	1200 – 1200	RBG98Q	PEII42 KWBC	Preliminary 29 - 53 h (Day 2) QPF
1015	1200 - 1200 1200 - 1200 1200 – 1200	94Q 98Q 99Q	PEIE41 KWBC PEII42 KWBC PEIK98 KWNH	Final 2 - 26 h (Day 1) QPF Final 26 - 50 h (Day 2) QPF 50 - 74 h (Day 3) QPF
1815	0000 – 0000	94Q	PEIE41 KWBC	Preliminary 6 - 30 h (Day 1) QPF
1900	0000 – 0000	98Q	PEII42 KWBC	Preliminary 29 - 53 h (Day 2) QPF
2215	0000 - 0000 0000 - 0000 0000 – 0000	94Q 98Q 99Q	PEIE41 KWBC PEII42 KWBC PEIK98 KWNH	Final 2 - 26 h (Day 1) QPF Final 26 - 50 h (Day 2) QPF 50 - 74 h (Day 3) QPF

Table 9. Issuance time, valid time, product ID, and content of 24-hour QPF products.

16.3.2 Content. These products represent 24-hr isohyets depicting 0.01, 0.25, 0.50, 1.0, 2.0, etc., -inch QPF amounts over the United States. The products also show the rain-snow line or areas of predominately snow, as appropriate for the season.

16.3.3 Format. A sample 24-hr QPF graphic using predefined isohyets is shown in Figure 25.

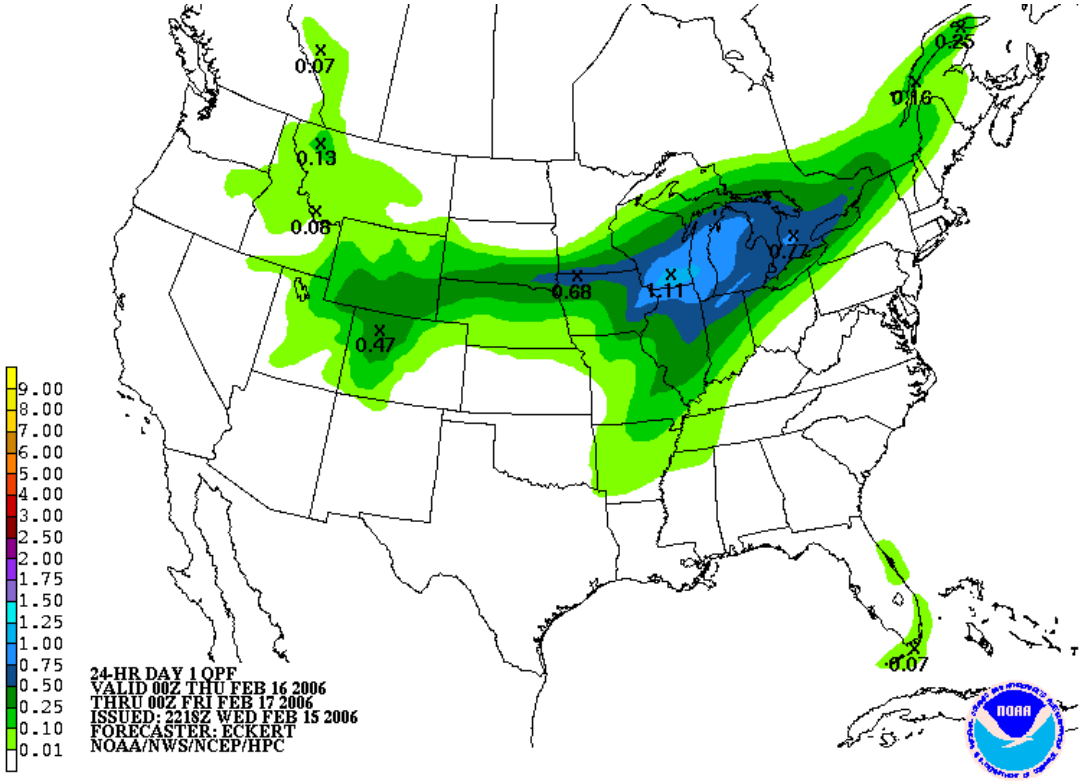

Figure 25. Example of a 24-hour QPF graphic.

16.4 Update, Amendments, and Corrections. Update this product if requested by an RFC. Issue corrections as needed.

17. Quantitative Precipitation Forecast Discussion (PFD). This product, prepared by the Hydrometeorological Prediction Center (HPC), provides a discussion supporting QPF products in the CONUS for days 1, 2, and 3 (94Q, 98Q, 99Q).

17.1 Mission Connection. This product helps the NWS meet its mission by maximizing forecaster understanding of QPF products, thus ensuring production of the best possible hydrologic forecast information for partners and other users.

17.2 Issuance Guidelines.

17.2.1 Creation Software. Use appropriate COTS word processing software.

17.2.2 Issuance Criteria. Issue the product routinely.

17.2.3 Issuance Time. 2300, 0700, 1100, and 1900 UTC.

17.2.4 Valid Time. 0000-0000 UTC and 1200-1200 UTC. The product expires after valid time.

17.3 Technical Description. The quantitative precipitation forecast discussion should follow the format and content described in this section. It is published on the web at: http://www.hpc.ncep.noaa.gov/discussions/qpfpfd.html .

17.3.1 MND Header. Use QUANTITATIVE PRECIPITATION FORECAST DISCUSSION.

17.3.2 Content. A text message describing the meteorological reasoning used to create the 94Q, 98Q, and 99Q products.

17.3.3 Format. The generic format is shown in Figure 26.

```
FXUS04 KWBC ddhhmm
QPFPFD

QUANTITATIVE PRECIPITATION FORECAST DISCUSSION
NWS HYDROMETEOROLOGICAL PREDICTION CENTER CAMP SPRINGS MD
Time am/pm time_zone day mon dd yyyy

FINAL DAY 1...DAY 2 AND DAY 3 QPF DISCUSSION
VALID mon dd/hhmm UTC THRU mon dd/hhmm UTC
REFERENCE AWIPS GRAPHICS UNDER...PRECIP ACCUM - 24HR
<Highlight(s) for all days>
DAY 1...

<Discussion for day 1>
DAY 2...

<Discussion for day 2>
DAY 3...

<Discussion for day 3
<forecaster name(s)>
GRAPHICS AVAILABLE ON THE WEB AT www.hpc.ncep.noaa.gov

<QPF vector coordinates>

$$
```

Figure 26. Generic format for Quantitative Precipitation Forecast Discussion.

17.4 Updates, Amendments, and Corrections. Do not issue updates. Correct for format and grammatical errors as required.

18. 5-Day Quantitative Precipitation Forecast (95E). This product, prepared by the HPC, provides a 5-day CONUS QPF total.

18.1 Mission Connection. This product helps the NWS to meet its mission by highlighting areas expected to receive significant cumulative precipitation over the five day forecast horizon, thus providing information which can be used in near-term flood outlooks such as the Significant River Flood Outlook (see Section 5, above, and NWS Instruction 10-912 - *River Forecast Center Products Specification*). In addition, this product is used by the general public, the media and other government agencies for planning purposes.

18.2 Issuance Guidelines.

18.2.1 Creation Software. Use N-AWIPS software.

18.2.2 Issuance Criteria. This product is issued on a regular schedule.

18.2.3 Issuance Time. 1815 UTC.

18.2.4 Valid Time. 1200 UTC on the day of issuance to 1200 UTC five days later.

18.3 Technical Description.

18.3.1 Dissemination. Disseminate on AWIPS. This product is available on the web at: http://www.hpc.ncep.noaa.gov/qpf/day1-5.shtml.

18.3.2 Content. This product depicts the 5-day total precipitation expected. It is produced by a simple arithmetic addition of the 94Q, 98Q, 99Q issued at 1015 UTC, and combined with a 48-hr QPF produced by the HPC medium range forecaster.

18.3.3 Format. A sample 5-day total QPF product is shown in Figure 27.

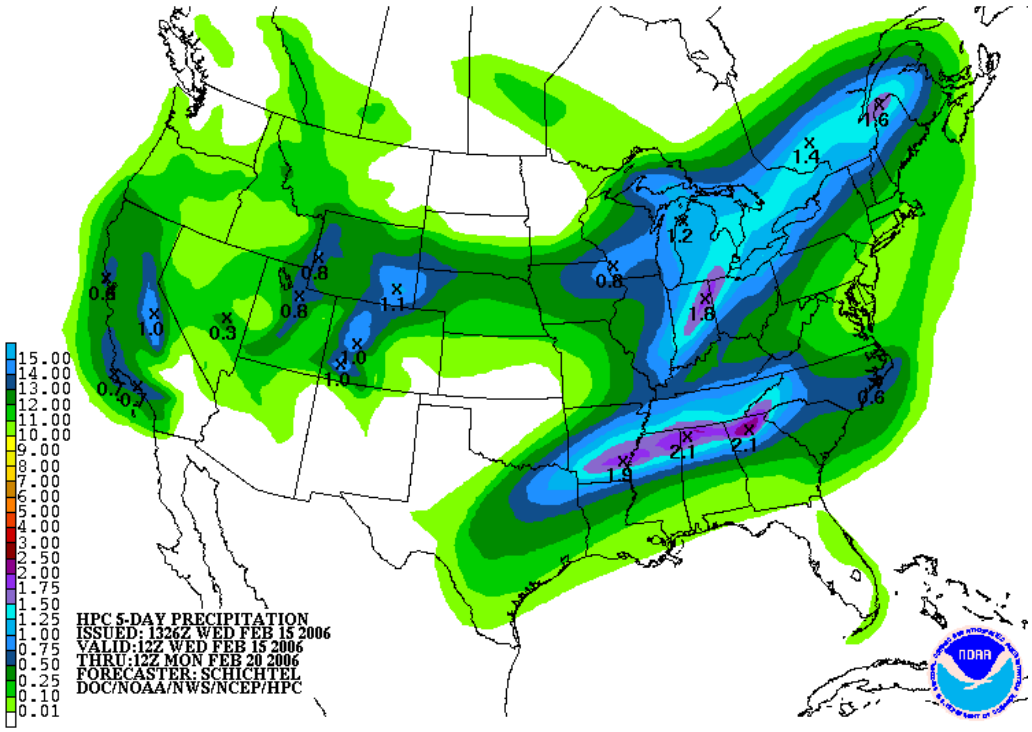

Figure 27. Example of a 5-day total QPF product.

18.4 Updates, Amendments, and Corrections. HPC will update this product if conditions warrant. Corrections are sent out as needed.

Appendix A

Hydrometeorological Automated Data System Report (RRS) Product Headers For Individual Weather Forecast Offices and River Forecast Centers

(Reference Section 6)

WFO	WMO Header	AWIPS Header
Aberdeen SD	SXUS42 KWOH	RRS ABR
Albany NY	SRUS38 KWOH	RRS ALY
Albuquerque NM	SRUS75 KWOH	RRS ABQ
Amarillo TX	SRUS76 KWOH	RRS AMA
Anchorage AK	SRAK40 KWOH	RRS AFC
Atlanta GA	SRUS59 KWOH	RRS FFC
Austin/San Antonio TX	SRUS82 KWOH	RRS EWX
Baltimore MD/Washington DC	SRUS47 KWOH	RRS LWX
Billings MT	SXUS58 KWOH	RRS BYZ
Binghamton NY	SRUS37 KWOH	RRS BGM
Birmingham AL	SRUS67 KWOH	RRS BMX
Bismarck ND	SXUS52 KWOH	RRS BIS
Boise ID	SXUS69 KWOH	RRS BOI
Boston MA	SRUS39 KWOH	RRS BOX
Brownsville TX	SRUS85 KWOH	RRS BRO
Buffalo NY	SRUS36 KWOH	RRS BUF
Burlington VT	SRUS35 KWOH	RRS BTV
Caribou ME	SRUS33 KWOH	RRS CAR
Central Illinois IL	SXUS30 KWOH	RRS ILX
Central Pennsylvania PA	SRUS42 KWOH	RRS CTP
Charleston SC	SRUS55 KWOH	RRS CHS
Charleston WV	SRUS46 KWOH	RRS RLX
Cheyenne WY	SXUS54 KWOH	RRS CYS
Chicago IL	SXUS31 KWOH	RRS LOT
Cincinnati OH	SRUS45 KWOH	RRS ILN
Cleveland OH	SRUS44 KWOH	RRS CLE
Columbia SC	SRUS54 KWOH	RRS CAE
Corpus Christi TX	SRUS84 KWOH	RRS CRP
Dallas/Fort Worth TX	SRUS80 KWOH	RRS FWD
Denver CO	SXUS55 KWOH	RRS BOU
Des Moines IA	SXUS40 KWOH	RRS DMX
Detroit MI	SXUS21 KWOH	RRS DTX
Dodge City KS	SXUS47 KWOH	RRS DDC
Duluth MN	SXUS35 KWOH	RRS DLH
Eastern North Dakota ND	SXUS41 KWOH	RRS FGF
El Paso TX	SRUS79 KWOH	RRS EPZ
Elko NV	SXUS68 KWOH	RRS LKN

Eureka CA	SXUS77 KWOH	RRS EKA
Fairbanks AK	SRAK41 KWOH	RRS AFG
Flagstaff AZ	SXUS64 KWOH	RRS FGZ
Glasgow MT	SXUS59 KWOH	RRS GGW
Goodland KS	SXUS48 KWOH	RRS GLD
Grand Junction CO	SXUS57 KWOH	RRS GJT
Grand Rapids MI	SXUS22 KWOH	RRS GRR
Great Falls MT	SXUS60 KWOH	RRS TFX
Green Bay WI	SXUS33 KWOH	RRS GRB
Greenville/Spartanburg SC	SRUS53 KWOH	RRS GSP
Guam PC	SRPA41 KWOH	RRS GUM
Hastings NE	SXUS49 KWOH	RRS GID
Honolulu HI	SRPA40 KWOH	RRS HFO
Houston/Galveston TX	SRUS83 KWOH	RRS HGX
Indianapolis IN	SXUS24 KWOH	RRS IND
Jackson KY	SXUS25 KWOH	RRS JKL
Jackson MS	SRUS68 KWOH	RRS JAN
Jacksonville FL	SRUS60 KWOH	RRS JAX
Juneau AK	SRAK42 KWOH	RRS AJK
Kansas City MO	SXUS39 KWOH	RRS EAX
Key West FL	SRUS63 KWOH	RRS EYW
Knoxville/Tri Cities TN	SRUS56 KWOH	RRS MRX
La Crosse WI	SXUS37 KWOH	RRS ARX
Lake Charles LA	SRUS69 KWOH	RRS LCH
Las Vegas NV	SXUS67 KWOH	RRS VEF
Little Rock AR	SRUS72 KWOH	RRS LZK
Los Angeles CA	SXUS80 KWOH	RRS LOX
Louisville KY	SXUS26 KWOH	RRS LMK
Lubbock TX	SRUS77 KWOH	RRS LUB
Marquette MI	SXUS34 KWOH	RRS MQT
Medford OR	SXUS74 KWOH	RRS MFR
Melbourne FL	SRUS61 KWOH	RRS MLB
Memphis TN	SRUS58 KWOH	RRS MEG
Miami FL	SRUS62 KWOH	RRS MFL
Midland/Odessa TX	SRUS78 KWOH	RRS MAF
Milwaukee WI	SXUS32 KWOH	RRS MKX
Minneapolis MN	SXUS36 KWOH	RRS MPX
Missoula MT	SXUS61 KWOH	RRS MSO
Mobile AL	SRUS66 KWOH	RRS MOB
Morehead City NC	SRUS51 KWOH	RRS MHX
Nashville TN	SRUS57 KWOH	RRS OHX
New Orleans/Baton Rouge LA	SRUS70 KWOH	RRS LIX
New York City NY	SRUS40 KWOH	RRS OKX
North Central Lower Michigan MI	SXUS20 KWOH	RRS APX

North Platte NE	SXUS50 KWOH	RRS LBF
Northern Indiana IN	SXUS23 KWOH	RRS IWX
Oklahoma City OK	SRUS74 KWOH	RRS OUN
Omaha NE	SXUS44 KWOH	RRS OAX
Paducah KY	SXUS27 KWOH	RRS PAH
Pendleton OR	SXUS72 KWOH	RRS PDT
Philadelphia PA./Mt Holly NJ	SRUS41 KWOH	RRS PHI
Phoenix AZ	SXUS66 KWOH	RRS PSR
Pittsburgh PA	SRUS43 KWOH	RRS PBZ
Pocatello/Idaho Falls ID	SXUS62 KWOH	RRS PIH
Portland ME	SRUS34 KWOH	RRS GYX
Portland OR	SXUS73 KWOH	RRS PQR
Pueblo CO	SXUS56 KWOH	RRS PUB
Quad Cities IA	SXUS38 KWOH	RRS DVN
Raleigh/Durham NC	SRUS50 KWOH	RRS RAH
Rapid City SD	SXUS51 KWOH	RRS UNR
Reno NV	SXUS75 KWOH	RRS REV
Riverton WY	SXUS53 KWOH	RRS RIW
Roanoke VA	SRUS49 KWOH	RRS RNK
Sacramento CA	SXUS76 KWOH	RRS STO
Salt Lake City UT	SXUS63 KWOH	RRS SLC
San Angelo TX	SRUS81 KWOH	RRS SJT
San Diego CA	SXUS81 KWOH	RRS SGX
San Francisco Bay Area CA	SXUS78 KWOH	RRS MTR
San Joaquin Valley CA	SXUS79 KWOH	RRS HNX
San Juan PR	SRUS86 KWOH	RRS SJU
Seattle/Tacoma WA	SXUS71 KWOH	RRS SEW
Shreveport LA	SRUS71 KWOH	RRS SHV
Sioux Falls SD	SXUS43 KWOH	RRS FSD
Spokane WA	SXUS70 KWOH	RRS OTX
Springfield MO	SXUS28 KWOH	RRS SGF
St. Louis MO	SXUS29 KWOH	RRS LSX
Tallahassee FL	SRUS65 KWOH	RRS TAE
Tampa Bay Area FL	SRUS64 KWOH	RRS TBW
Topeka KS	SXUS45 KWOH	RRS TOP
Tucson AZ	SXUS65 KWOH	RRS TWC
Tulsa OK	SRUS73 KWOH	RRS TSA
Wakefield VA	SRUS48 KWOH	RRS AKQ
Wichita KS	SXUS46 KWOH	RRS ICT
Wilmington NC	SRUS52 KWOH	RRS ILM

Table A-2. RRS product headers, by RFC.

RFC	WMO Header	AWIPS Header
Alaska-Pacific RFC	SRUS32 KWOH	RRS ACR
Arkansas-Red Basin RFC	SRUS26 KWOH	RRS TUA
California-Nevada RFC	SRUS30 KWOH	RRS RSA
Colorado Basin RFC	SRUS29 KWOH	RRS STR
Lower Mississippi RFC	SRUS24 KWOH	RRS ORN
Middle Atlantic RFC	SRUS21 KWOH	RRS RHA
Missouri Basin RFC	SRUS27 KWOH	RRS KRF
North Central RFC	SRUS28 KWOH	RRS MSR
Northeast RFC	SRUS20 KWOH	RRS TAR
Northwest RFC	SRUS31 KWOH	RRS PTR
Ohio RFC	SRUS22 KWOH	RRS TIR
Southeast RFC	SRUS23 KWOH	RRS ALR
West Gulf RFC	SRUS25 KWOH	RRS FWR

Appendix B

Summary of Information Available for Download

- Observed and forecast river conditions in shapefiles, KMZ files and via RSS/XML
- Gridded rainfall information in shapefiles and netCDF formats
- Inundation maps in shapefiles, KMZ files, and images.
- Output from the NOAA National Weather Service's National Operational Hydrologic Remote Sensing Center (NOHRSC) Snow Data Assimilation System (SNODAS). These are gridded data sets for the continental United States at 1-km spatial resolution and 24-hour temporal resolution.

Appendix C

Acronyms

ABRFC	Arkansas-Red Basin River Forecast Center
AHPS	Advanced Hydrologic Prediction Service
APRFC	Alaska-Pacific River Forecast Center
AWIPS	Advanced Weather Interactive Processing System
CBRFC	Colorado Basin River Forecast Center
CNRFC	California Nevada River Forecast Center
CONUS	Conterminous United States
COTS	Commercial Off the Shelf
ERD	Excessive Rainfall Discussion
FFG	Flash Flood Guidance
GIS	Geographic Information System
GRIB	Gridded Binary
HADS	Hydrometeorological Automated Data System
HPC	Hydrometeorological Prediction Center
HSA	Hydrologic Service Area
LMRFC	Lower Mississippi River Forecast Center
MARFC	Middle Atlantic River Forecast Center
MBRFC	Missouri Basin River Forecast Center
MND	Mass News Disseminator
N-AWIPS	National Centers- Advanced Weather Interactive Processing System
NCEP	National Centers for Environmental Prediction
NCRFC	North Central River Forecast Center
NOAA	National Oceanic and Atmospheric Administration
NOHRSC	National Operational Hydrologic Remote Sensing Center
NRCS	National Resources Conservation Service
NSA	National Snow Analysis
NWRFC	Northwest River Forecast Center
NWS	National Weather Service
OPPS	Operational Product Processing System
QPF	Quantitative Precipitation Forecast
RFC	River Forecast Center
RSS	Really Simple Syndication
SERFC	Southeast River Forecast Center
SHEF	Standard Hydrometeorological Exchange Format
SNOTEL	Snowpack Telemetry
SWE	Snow Water Equivalent
USGS	U.S. Geologic Survey
UTC	Coordinated Universal Time
WFO	Weather Forecast Office
WMO	World Meteorological Organization