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DIGITAL DATA PRODUCTS/SERVICES SPECIFICATION

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Digital Data Products/Services Specification

Table of Contents: Page

- 1. Introduction 4
- 2. Mission Connection 4
- 3. Preparation of the local Digital Forecast Databases 4
 - 3.1 WFO Initial Operating Capability (IOC) Grid Production. 4
 - 3.2 Local Digital Forecast Database Update Criteria 5
 - 3.3 Priority of Local Grids during Active Hazardous Weather. 5
 - 3.4 Local Grid Upload to Central Server 5
 - 3.5 Local Grid Dissemination 5
- 4. Intersite Coordination and Collaboration 5
 - 4.1 Operational Collaboration Responsibilities 5
 - 4.1.1 National Centers for Environmental Prediction (NCEP) 6
 - 4.1.2 Weather Forecast Offices (WFOs) 6
 - 4.1.3 River Forecast Centers (RFCs) 6
 - 4.2 Collaboration Technology 6
 - 4.3 Collaboration Times. 7
 - 4.4 Collaboration Thresholds 7
- 5. National Digital Forecast Database (NDFD) Description 7
 - 5.1 Definition 7
 - 5.2 NDFD Preparation 7
 - 5.3 NDFD Contents 7
 - 5.4 NDFD Consistency 8
- 6. Digital Forecast Products Specification 8
 - 6.1 Base Digital Forecast Data 8
 - 6.1.1 Purpose 8
 - 6.1.2 Audience 8
 - 6.1.3 Availability 8
 - 6.1.4 Format 9
 - 6.1.5 Spatial Resolution 9
 - 6.1.6 Temporal Resolution 9
 - 6.1.7 NDFD Gridded Data Access 9
- 7. NDFD Graphic Forecast Displays Specification 10
 - 7.1 National and Regional Forecast Mosaics 10
 - 7.1.1 Purpose 10

- 7.1.2 Audience 11
- 7.1.3 Availability and Timeliness 11
- 7.1.4 Graphic Mosaic Content 11
- 7.1.5 Presentation Format 11
- 7.1.6 Spatial Resolution 11
- 7.1.7 Temporal Resolution 11
- 7.1.8 NDFD Graphic Mosaic Access 11
- 8. Interactive Web-based Services 11
 - 8.1 National Web-based Services 11
 - 8.2 Regional Web-based Services 12
 - 8.2.1 Multi-Format Forecast Information Web Page 12
 - 8.2.2 Purpose 12
 - 8.2.3 Audience 12
 - 8.2.4 Availability and Timeliness 12
 - 8.2.5 Presentation Format 12
 - 8.2.6 Spatial Resolution 12
 - 8.2.7 Temporal Resolution 12
 - 8.2.8 Multi-Format Forecast Web Page Access 13
 - 8.3 Local Web-based Services 13

Appendices

- A. NDFD Element Definitions A-1
- B. Grids Required for the Production of 10 NWS IOC products B-1
- C. NDFD Weather Element Tables C-1
- D. Glossary of Terms D-1

1. Introduction. This procedural directive provides a framework for products and services generated from the digital forecast database prepared by the National Weather Service (NWS). This document also describes the basic digital data infrastructure including the National Digital Forecast Database (NDFD), locally prepared digital forecast databases, and associated NWS collaboration to enable the production of a seamless suite of digital forecast data. Implementation details for evolving specific products and services from experimental to official are described in NWS Product Description Documents (PDD) in accordance with [NWSI 10-102, *New or Enhanced Products and Services*](#). Digital data service change notifications are made available through NWS [Technical Implementation Notices \(TIN\)](#).

2. Mission Connection. NDFD is a means to utilize digital technology to the fullest, and make a seamless suite of NWS information available efficiently, and in a convenient and understandable form to best meet customer and partner needs. In support of the mission described in the *National Weather Service Strategic Plan*, the NDFD is a “. . . national information database and infrastructure which can be used by other governmental agencies, the private sector, the public, and the global community.”

3. Preparation of the local Digital Forecast Databases. Forecasters at each weather forecast office (WFO) will use the Interactive Forecast Preparation System (IFPS) software on the Automated Weather Interactive Processing System (AWIPS) to prepare digital forecast databases for their geographic area of responsibility. NWS products (digital, text, and graphic) will be automatically formatted from these local databases using AWIPS software.

3.1 WFO Initial Operating Capability (IOC) Grid Production. The minimum threshold for IFPS/NDFD IOC grid production throughout the conterminous United States includes the generation of all grid fields necessary to support the production of the 10 text-based products listed in Table 1. Refer to Appendix B, Table 4 for the grids required to produce these products.

Zone Forecast Product (ZFP)
Coded Cities Forecast (CCF)
Tabular & Narrative Fire Weather Forecasts (FWF)
Fire Danger Rating System Forecast (FWM)
Coastal Waters Forecast (CWF)
Great Lakes Open Lakes Forecast (GLF)
Nearshore Forecast (NSH)
Marine Verification Forecast (MVF)
Service Area Forecast (SAF)
Tabular State Forecast (SFT)

Table 1. Ten Base IFPS IOC Text Products.

Exception: The Tabular and Narrative Fire Weather Forecasts (FWF) and the Fire Danger Rating System Forecast (FWM) in Table 1 may be composed manually until text formatters are fully mature, as long as the minimum required grid elements are created to produce these products in digitally derived formats.

3.2 Local Digital Forecast Database Update Criteria. Local grids should be updated when the on-duty forecast team believes the forecast is not representative of current or expected weather conditions. Reaching or exceeding collaboration thresholds (shown in Appendix A) may be used as a guide to initiate updates for particular gridded fields. Well-coordinated local or regional update thresholds may be developed until standardized national update criteria are established.

3.3 Priority of Local Grids during Active Hazardous Weather. The first priority of every WFO is to sustain office warning operations to protect life and property. If the forecasting or updating of routine gridded fields interferes with these efforts during active hazardous weather, the affected WFO may coordinate a transfer of local digital database maintenance to their assigned service backup office. See NWSI 10-2201 and associated regional supplements for specific service backup responsibilities.

3.4 Local Grid Upload to Central Server. Digital forecast information from local databases will be uploaded to a central server (i.e., NDFD) and mosaicked into regional and national grids. The NDFD is a single source of weather forecast information for customers who desire large scale products; it will also include links to WFO servers for smaller scale needs.

3.5 Local Grid Dissemination. Digital forecast information from local digital databases will be displayed graphically on WFO web sites in standardized formats. WFOs may use other means of disseminating digital data to meet local customer needs.

4. Intersite Coordination and Collaboration. The NWS goal is to provide customers and partners with a seamless set of digital forecast weather fields for the entire nation. To attain this goal, local offices and national centers should strive for more than simple forecast coordination. Instead, offices should collaborate to achieve meteorological consistency among the various weather elements and along office boundaries. As a result, “ownership” of the NDFD will be shared among all local offices and national centers involved in the collaborative process.

This section contains roles and responsibilities among offices and national centers for collaboration of forecast information associated with gridded data fields. Effective collaborative sessions will create an effective digital forecast database, and can facilitate the exchange of scientific information throughout the meteorological community. Forecasters are expected to use initiative and professional judgment in conjunction with these guidelines and convey this information through meteorological discussions.

4.1 Operational Collaboration Responsibilities.

4.1.1 National Centers for Environmental Prediction (NCEP). The Hydrometeorological Prediction Center (HPC) collaborates with WFOs to facilitate agreement in forecast grids among neighboring offices. This involves the evolution of weather systems and associated sensible weather in the conterminous U.S. beginning at 12 hours into the forecast cycle and extending out through seven days.

The Storm Prediction Center (SPC) collaborates with WFOs concerning both science and service needed to create optimal NWS products concerning mesoscale weather hazards and in particular severe convective storms, thunderstorms, and fire weather. Focused collaboration between the SPC and WFOs will occur prior to the issuance of convective watches. The Tropical Prediction Center (TPC), SPC, and WFOs collaborates on SPC's issuance of tornado watches associated with hurricanes and tropical storms.

TPC collaborates with WFOs and some U.S. Naval bases for tropical weather in the North Atlantic, Caribbean, Gulf of Mexico, and eastern North Pacific east of 140W longitude, including the development, movement, and intensification of tropical storms and hurricanes. TPC also collaborates with coastal forecast offices and HPC before the issuance of hurricane and tropical storm watches and warnings. TPC, the Ocean Prediction Center (OPC), and/or WFO Honolulu collaborates as necessary when issuing high seas and offshore forecasts for their neighboring areas of responsibilities. TPC and WFO Honolulu collaborate as necessary when issuing tropical cyclone forecasts/advisories for their neighboring areas of responsibilities. OPC and TPC collaborate with the WFOs as necessary when issuing their high seas and offshore forecasts for their neighboring areas of responsibilities.

4.1.2 Weather Forecast Offices (WFOs). Each WFO collaborates with adjacent WFOs and National Centers on factors affecting their forecast area of responsibility. WFOs collaborate among neighboring offices to ensure consistency on spatial and timing issues affecting their geographic area of responsibility. WFOs exchange preliminary Intersite Coordination (ISC) grids to reduce discontinuities before the grids are released to customers. Additionally, WFOs collaborate on regional and national scales (i.e., with NCEP) as required by the size and scope of the event being addressed. Tools, including chat rooms, voice communication, and exchange of AWIPS graphics will support the collaboration effort.

4.1.3 River Forecast Centers (RFCs). RFC collaboration occurs with those weather elements which impact hydrologic modeling (e.g., temperature, quantitative precipitation forecasts {QPF}, snow accumulation, freezing levels). RFCs collaborate with the HPC and WFOs regarding these elements when necessary. RFCs have access to tools, including chat rooms, voice communication, and exchange of products over AWIPS.

4.2 Collaboration Technology. All NWS offices will use the same software for collaborating. Technical information and procedures for using the most recent software can be obtained from the AWIPS/IFPS program manager at each regional headquarters.

4.3 Collaboration Times. Collaboration may be triggered by various weather and non-weather related events (e.g., receipt of new observational data, forecast discontinuities, extreme weather events, etc.). However, new model data is the most common driver of changes to the database beyond the first period. To collaborate effectively, forecasters should always keep collaboration tools open, and be actively involved in collaboration as soon as possible after, or during analysis of the new model information (See Table 2).

04 UTC - 06 UTC	predominantly short range (Days 1 - 3)
12 UTC - 15 UTC	predominantly long range (Days 4 - 7)
16 UTC - 18 UTC	predominantly short range (Days 1 - 3)
22 UTC - 00 UTC	predominantly short range (Days 1 - 3) based on 18 UTC runs

Table 2. Model driven Peak Collaboration Times for the Continental U.S.

4.4 Collaboration Thresholds. WFOs should adhere to a standard set of collaboration thresholds to ensure a coherent and high quality National Digital Forecast Database. These thresholds were developed for all NWS forecast offices. Refer to Appendix A for the standardized collaboration thresholds for the various weather elements.

5. National Digital Forecast Database (NDFD) Description.

5.1 Definition. The National Digital Forecast Database (NDFD) is a central database storing geospatially referenced digital forecast information. The NDFD houses both *official* and *experimental* (as defined in [NWSI 10-102, New or Enhanced Products and Services](#)) grid fields. Forecasts produced at individual WFOs are mosaicked into national and regional products, forming national and regional grids. The NDFD is the primary means by which grids will be made available to customers and partners.

5.2 NDFD Preparation. The implementation of digital forecast preparation capability at WFOs is necessary to create a National Digital Forecast Database. Interactive Forecast Preparation represents a substantial change for forecasters. Instead of manually typing a myriad of products, forecasters use interactive model interpretation and editing techniques to create high resolution information. This information forms a common digital database from which forecast products will be automatically composed, formatted and transmitted. The common digital database used to generate these products will allow for more consistent forecasts over time and among products, and for easier monitoring and maintenance of those forecasts. NDFD provides a foundation for the development of a new generation of grid-based NWS products, including the forecast digital database itself.

5.3 NDFD Contents. The NDFD contains digital forecasts of official weather, water, and climate forecast information generated at WFOs and NCEP. NDFD will provide baseline elements that primarily serve national and regional users. In addition, NDFD will include digital

watch, warning, and advisory information, and other elements that attract the private development of graphics and decision tools.

5.4 NDFD Consistency. The NDFD will include forecasts prepared at NCEP service centers and forecast offices nationwide. It will be a “mosaic” in the sense that the grids from individual WFOs and NCEP will appear together on a master grid; therefore, the contents of the NDFD must be consistent in time and space to be of greatest benefit to NWS customers and partners. In addition, the base digital data and other representations of the data should have an interface with a standardized look and feel for ease of use and understanding.

WFOs are responsible for the accuracy, timeliness and meteorological consistency of forecast data as established in [Policy Directive 10-5, Public Weather Services](#). NDFD grid fields should be meteorologically continuous from hour to hour and from grid point to grid point, especially along County Warning and Forecast Area (CWFA) boundaries. To reduce CWFA boundary discontinuities, WFOs should follow existing collaboration guidelines and thresholds.

6. Digital Forecast Products Specification.

6.1 Base Digital Forecast Data. Base digital data is available in NDFD for a variety of official and experimental grid fields originally generated at WFOs and NCEP (Refer to Appendix A - NDFD Element Definitions). The status of these grid fields will be clearly denoted within the file. The specific grids (and associated resolutions) available in the NDFD are shown in Appendix C-NDFD Weather Element Tables. Data will be periodically added to this database based on internal and external requirements. Files will eventually contain forecast data for several public, winter weather, severe weather, fire weather, marine, aviation, hydrologic, and climatic elements for time projections out to a maximum of 168 hours from 00 UTC Day 1.

6.1.1 Purpose. Advances in computer capabilities and web services technologies, as well as scientific advances in NWS software, have prompted the NWS to create products and services to meet new customer and partner requirements. The NDFD base digital data will allow the NWS to provide near-real time, collaborated forecasts that are widely accessible in digital formats. Customers and partners can transform the NWS digital data into a wide range of text, graphic, and image products and services.

6.1.2 Audience. Base digital data is primarily provided for large volume users of forecast information, but also for anyone interested in using software to explore various means to manipulate and utilize digital forecast information.

6.1.3 Availability and Timeliness. The NDFD is a dynamic forecast database. Forecast grids are generated and revised at the local WFOs and NCEP on an event-driven basis. The revised digital data is transferred to the NDFD server and made available shortly after the top of each hour. At a minimum, the base digital data is updated daily around 1800 UTC to extend the forecast database by 24 hours.

6.1.4 Format. A primary means for providing forecasts from the NDFD is through File Transfer Protocol (FTP) in [GRIB, Edition 2, format](#). Initially, these grids will contain surface areal dimensions (i.e., length, width) plus time. The grids will have sufficient temporal and spatial detail to support automatic product formatters.

6.1.5 Spatial Resolution. Spatial resolution of the NDFD grids will be 5 kilometers (km) for the conterminous United States, and as appropriate for locations outside the conterminous United States.

6.1.6 Temporal Resolution. The temporal resolution of forecast elements varies, but is generally 3 hours through 72 hours, and 6 hours for the period beyond 72 hours out to a maximum of 168 hours from 00 UTC Day 1 (see Appendix C - NDFD Weather Element Tables).

6.1.7 NDFD Gridded Data Access. NDFD forecast data can be obtained for the entire conterminous United States, or for 1 of 16 CONUS overlapping geographic sectors and Puerto Rico. See Figure 1 for a general depiction of sector locations. Click on the active web link below to access an interactive map clearly depicting the boundaries of the NDFD data sectors.

[*NDFD Geographic Sectors Coverage*](#)

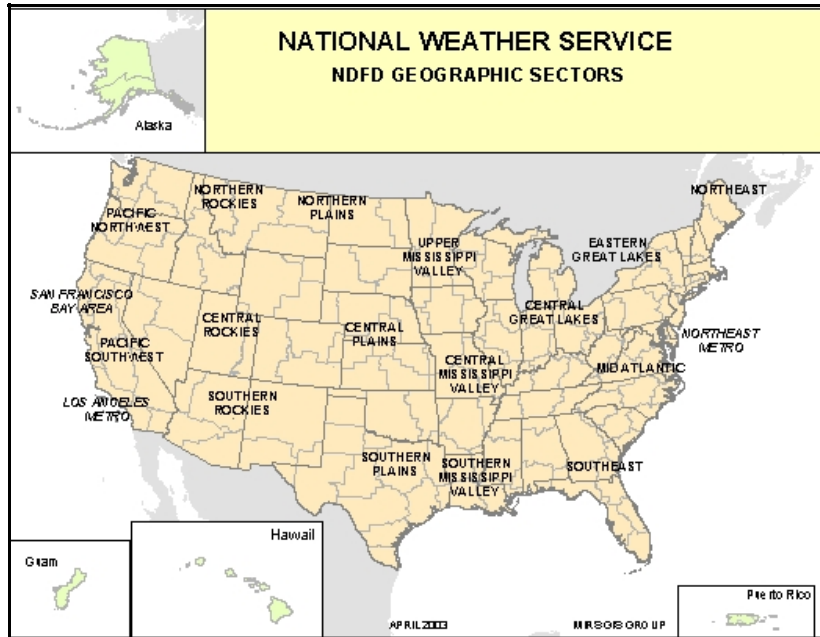


Figure 1. NDFD Geographic Sectors Map.

Sectors will also become available for Alaska, Hawaii, Guam, and other areas of the Pacific Region. The data can be accessed from the NDFD FTP server by following the instructions provided via the active web link below:

[NDFD GRIB2 Data Access](#)

7. NDFD Graphic Forecast Displays Specification.

7.1 National and Regional Forecast Mosaics. The National Weather Service’s NDFD mosaic products are a collage of a prescribed set of data contained within the NDFD. These images are the graphic representations of the official NWS digital forecast. The mosaics are created on national and regional scales and will follow a standardized format prescribed by the NWS to best meet the needs of its customers and partners. The data originate from the WFO local databases and are uploaded to the NDFD server where the mosaic is created. The official mosaicked graphic images display weather parameters for a defined temporal and spatial resolution out to a maximum time projection of 168 hours from issuance (7 days).

7.1.1 Purpose. NDFD Graphic Forecast Displays are a means to utilize technology to the fullest, and make a seamless suite of NWS information available efficiently, and in a convenient and understandable form to best meet customer and partner needs. The NDFD graphic forecasts fulfill NWS objectives for improving the accessibility and availability of weather information by posting NWS products and data on the Internet in graphic-oriented formats.

7.1.2 Audience. NDFD graphic mosaics satisfy a wide range of customers and partners including the general public, emergency managers, private sector and the media.

7.1.3 Availability and Timeliness. The NDFD web-based graphic mosaics are continuously available on the NDFD web page. Forecast grids are revised at the local WFOs on an event-driven basis. The revised grids are uploaded to the NDFD server and new graphic mosaics are generated shortly after the top of each hour. At a minimum, revised mosaics will be updated daily around 1800 UTC.

7.1.4 Graphic Mosaic Content. The NDFD graphic mosaics will contain a combination of clearly labeled *official and experimental* (see [NWSI 10-102, New or Enhanced Products and Services](#)) grid fields in a nationally standardized format. The specific grids (and associated resolutions) available in the NDFD are shown in Appendix C-NDFD Weather Element Tables. Data will be periodically added to the displays based on internal and external requirements. Graphic displays of NDFD will eventually contain forecast data for several public, winter weather, severe weather, fire weather, marine, aviation, hydrologic, and climatic elements for time projections out to a maximum of 168 hours from 00 UTC Day 1 issuance.

7.1.5 Presentation Format. The NDFD graphic mosaic provides weather forecast information for the conterminous United States, while the NDFD regional mosaics provide images for 16 slightly overlapping geographic sectors throughout the conterminous United States. Additionally, geographic data sectors are available for Puerto Rico. Locations outside the conterminous United States including, Alaska, Hawaii, and Guam will also become available in the future. To serve users with requirements for high density population centers, graphic displays for various major metropolitan areas, e.g., San Francisco Bay Area, Los Angeles Metro, and Northeast Metro have been provided (see Figure 1).

7.1.6 Spatial Resolution. NDFD graphic mosaics will be displayed at a grid resolution of 5 km for the conterminous United States, and as appropriate for locations outside the conterminous United States.

7.1.7 Temporal Resolution. The temporal resolution of forecast elements varies, but is generally 3 hours through 72 hours, and 6 hours for the period beyond 72 hours out to a maximum of 168 hours from 00 UTC Day 1 (see Appendix C - NDFD Weather Element Tables).

7.1.8 NDFD Graphic Mosaic Access. NDFD graphic mosaic images can be viewed by clicking the active web link below:

[View NDFD Graphic Mosaics](#)

8. Interactive Web-based Services.

8.1 National Web-based Services. National web-based services should meet national customer requirements for digital services which are widespread (multi-regional or national) in scope or coverage. Services should be timely, accurate, and consistent (meteorologically, functionally, and aesthetically) with other NWS web-based digital services.

8.2 Regional Web-based Services. Regional web-based services should meet customer requirements for digital services covering multi-state, or multi-WFO geographic areas of responsibility. Services should be timely, accurate, and consistent (meteorologically, functionally, and aesthetically) with NWS national web-based digital services.

8.2.1 Multi-Format Forecast Information Web Page. This service is an interactive forecast information web page allowing users to access forecast information that is always current with higher resolution than is possible in traditional text forecast products (which may be averaged over time and space). Customers can view forecast information retrieved directly from locally prepared forecast grids in a variety of formats, including icons, text, tabular and graphic. Data fields include, surface temperature, dew point, wind speed and direction, weather, sky cover, and probability of precipitation.

8.2.2 Purpose. Advances in computer capabilities and web services technologies, as well as scientific advances in National Weather Service (NWS) software, have prompted the NWS to create customer-based web services. Information dissemination via the world wide web (www) allows customers to obtain higher resolution forecast information in a variety of formats on-demand.

8.2.3 Audience. The current audience for the forecast information web page consists of the general public and partners such as emergency management, other government agencies, universities, media, and private companies.

8.2.4 Availability and Timeliness. Data are routinely extracted from WFO digital databases, then processed and sent to NWS regional web servers. Updates to grid point forecasts are made as often as necessary and posted once an hour from the local office digital database. These updates are available shortly after the top of the hour.

8.2.5 Presentation Format. The web grid point forecasts are presented for display as HyperText Markup Language (HTML) in text, hourly meteogram, and digital/tabular format. The forecasts can be viewed using a web browser, and then selected on a map location or by entering specified latitude and longitude coordinates.

8.2.6 Spatial Resolution. Digital data are available at spatial resolutions of 5 km.

8.2.7 Temporal Resolution. Temporal resolutions vary depending upon forecast type. Text forecasts are available out to 7 days; meteograms to 48 hours; digital/tabular forecasts to 120 hours.

8.2.8 Multi-Format Forecast Web Page Access. The multi-format forecasts are available on many WFO web pages in Central, Southern and Eastern regions. Access to these forecast offices' web pages can be made by navigating from the National Weather Service web page: www.weather.gov and from the regional web sites. The forecasts can be viewed using a web browser, and then selected on a map location or by entering specified latitude and longitude

coordinates. A real-time example of this web page can be found by clicking on the following active web link: [*Multi-Format Forecast Web Page*](#).

8.3 Local Web-based Services. Local web-based services created by individual WFOs should be designed to meet local customer requirements for digital weather information in multiple forms (e.g., text, graphics, interactive services). Products and services should be timely, accurate, and consistent (meteorologically, functionally, and aesthetically) with NWS national and regional web-based products/services.

Appendix A - NDFD Element Definitions

A. General Forecast Elements.

- All element forecasts are created as geospatially referenced fields and then sampled at grid points, which are defined by the resolution of NDFD. Any necessary basin or zone averaging will be performed by product generation software. Therefore, except where zone boundaries naturally correlate to weather features, zone product boundaries should not be evident in the underlying forecast grids.
- Element forecasts should be continuous in time and space.
- All forecasts are valid at the top of the specified hour and are applied to the next 59 minutes.
- Local forecast grids will have continuous coverage in time so that grids can be sampled at any hour. At extended forecast ranges, time periods may be stretched over multiple hours from which snapshot values for any hour could be taken. Time interpolation tools may also be used for this purpose.
- The distribution of forecast values for any NDFD element should be continuous. It is not desirable to categorize (or round) forecasts on grids according to that element's use in NWS text products (e.g., PoPs by values of 10). If forecasts are categorized, it makes intersite coordination, forecast mosaicking, and the use of many smart tools more difficult.
- High resolution terrain effects should be included in all grids (e.g., temperatures that reflect lapse rates).
- Collaboration thresholds are only valid for grid points within 1000 feet elevation of each other.
- Grid points that lie on opposite sides of a coastal (i.e., land/water) boundaries are excluded from collaboration threshold requirements.

B. Common Forecast Elements.

The following list contains the definitions, **minimum** requirements for NDFD grid production, and collaboration thresholds for the primary Public, Marine, and Fire Weather elements produced at NWS Weather Forecast Offices in the conterminous United States. **However, many grids should be populated in the local database at each hour to support both UTC sampling intervals for NDFD and Local Time (LT) sampling intervals for local products.**

Max/Min Temp - the maximum daytime temperature or minimum overnight temperature in degrees Fahrenheit (°F). Verifying observations are deduced via a comprehensive algorithm that examines reported max/min and hourly temperatures. Daytime is defined as **0700-1900 Local Standard Time**, and overnight as **1900-0800 Local Standard Time**. The 1 hour overlap was introduced by the NWS in the mid-1980s to include mins that occur just after sunrise.

- **Grid Production Requirement:** *A Maximum Temperature grid and a Minimum Temperature grid will be produced for each 12 or 13 hour period out to 168 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *5 deg (7 deg in complex terrain complex terrain, i.e., greater than 500 ft. differences in elevation between adjacent grid points).*

Temperature - the expected temperature in °F valid for the indicated hour.

- **Grid Production Requirement:** *Temperature grids will be produced at a minimum in 3 hour increments out to 72 hours, then 6 hour increments out to 168 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *5 deg (7 deg in complex terrain).*

Dew Point - the expected dew point temperature in °F valid for the indicated hour.

- **Grid Production Requirement:** *Dew Point grids will be produced at a minimum in 3 hour increments out to 72 hours, then 6 hour increments out to 168 hours from 00 UTC Day 1. Collaboration Threshold: 5 deg (7 deg in complex terrain).*

Relative Humidity - derived from the associated Temperature and Dew Point grids for the indicated hour.

- **Grid Production Requirement:** *Relative Humidity grids will be produced at a minimum in 3 hour increments out to 72 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *N/A .*

Apparent Temperature - the perceived temperature derived from either a combination of temperature and wind (Wind Chill), or temperature and humidity (Heat Index) for the indicated hour. Apparent temperature grids will signify the Wind Chill when temperatures fall to 50 °F or less, and the Heat Index when temperatures rise above 80 °F. Between 51 and 80 °F the Apparent Temperature grids will be populated by the ambient air temperature.

- **Grid Production Requirement:** *Apparent temperature grids are routinely produced year round at a minimum in 3 hour increments out to 72 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *N/A.*

12-hour Probability of Precipitation (PoP12) - the likelihood, expressed as a percent, of a measurable precipitation event (1/100th of an inch) at a grid point during the valid period. The 12-hour periods in NDFD begin and end at 0000 and 1200 UTC. PoP12 should be derived from floating PoP12 values.

- **Grid Production Requirement:** *PoP 12 grids will be produced at a minimum each 12-hour period out to 168 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *20%.*

Floating PoP12 - an NWS internal index from which a PoP12 for any 12-hour period can be derived by taking the maximum floating PoP12 value within the desired period. A floating PoP12 should be considered as that hour's contribution to the PoP12, not as a 1 hour PoP, which has different statistical characteristics. Floating PoP12 values are best stretched over time ranges consistent with other precipitation related elements--ultimately resulting in complete coverage at every hour. Floating PoP12 grids support the generation of PoP12s in both UTC and LT.

- **Grid Production Requirement:** *Floating PoP12 grids will be produced in 1 hour increments out to 168 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *N/A.*

Sky Cover - the expected amount of opaque clouds (in percent) covering the sky valid for the indicated hour.

- **Grid Production Requirement:** *Sky Cover will be produced at a minimum in 3 hour increments through 72 hours, then 6 hour increments out to 168 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *30% (40% in complex terrain).*

Wind Direction - the expected 10 meter wind direction using 36 points of a compass valid at the indicated hour. **Wind Speed** is the expected sustained 10 meter wind speed (in knots) valid at the indicated hour. Refer to [NWSI 10-601, Tropical Cyclone Weather Services Program](#), Section 9, for procedures to populate WFO-generated wind forecasts grids for tropical cyclones.

- **Grid Production Requirement:** *Wind Direction and Wind Speed grids will be produced at a minimum in 3 hour increments through 72 hours, then 6 hour increments out to 168 hours from 00 UTC Day 1.*
- **Collaboration Threshold (Wind Direction):** *90 degrees.*
- **Collaboration Threshold (Wind Speed):** *10 kts (15 kts in complex terrain).*

Wind Gust - the maximum 10 meter wind speed (*in knots*) expected at the indicated hour when that maximum is at least 10 kts greater than the lowest speed used in determining the sustained wind speed. If the gust criterion is not expected, the database will be populated with "zero" values and nothing will be displayed in graphic representations. Speeds are converted to mph, as appropriate, by product generation software.

- **Grid Production Requirement:** *Wind Gust grids will be produced on a routine basis at a minimum in 3 hour increments out to 72 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *None.*

Weather - the expected weather (precipitating or non-precipitating) valid at the indicated hour. **Precipitating Weather** includes type, probability or coverage, and intensity information for precipitation (e.g., rain, ice, snow). Precipitating weather should have a non-null value at any grid point with a corresponding floating PoP12 value of at least 15 percent. **Non-precipitating Weather** includes obstructions to vision (e.g., fog, haze, smoke) elements. Obstructions to vision should have a non-null value at any grid point when obstructions are forecast to reduce visibility to 5 nautical (6 statute) miles or less. Dense fog should be included when visibility is reduced to 1 nautical mile or less (over water) and 1/4 statute mile or less (over land). Apply coverage terms (i.e., widespread, areas of, patchy) in accordance with definitions in [NWSI 10-503, WFO Public Weather Forecast Products Specification](#).

- **Grid Production Requirement:** *Weather Grids will be produced at a minimum each hour (as necessary) out to 168 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *N/A (discrete element).*

Quantitative Precipitation Forecast (QPF) - the total amount of expected liquid precipitation (in hundredths of inches). A QPF will be specified when a measurable (0.01") precipitation type is forecast for any hour during a QPF valid period. Valid periods for the NDFD begin and end at 0600, 1200, 1800, and 0000 UTC.

- **Grid Production Requirement:** *QPF grids will be produced at a minimum for each 6 hour period out to 72 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *0.25 in/6 hr.*

Snow Accumulation - the expected total accumulation of new snow (in inches). Snow accumulation will be specified when a measurable snowfall is forecast for any hour during a valid period. Valid periods for the NDFD begin and end at 0600, 1200, 1800, and 0000 UTC.

- **Grid Production Requirement:** *Snow Accumulation grids will be produced for each 6 hour period out to 48 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *2 inches/ 6 hr.*

C. Fire Weather Forecast Elements

Min/Max Relative Humidity - the daytime minimum and the nighttime maximum relative humidity for the same valid times used for Max/Min temperature.

- **Grid Production Requirement:** *None (experimental grid).*
- **Collaboration Threshold:** *N/A (derived element).*

LAL (Lightning Activity Level) - a measurement of the cloud-to-ground lightning activity observed (or forecast to occur) within a 30-mile radius of a grid point. LAL is expressed as

discrete element categories with values from 1 to 6 (see Table 3). Value is the max during the 6 hour valid period.

- **Grid Production Requirement:** *None (experimental grid).*
- **Collaboration Threshold:** *2 (except for discrepancies between wet and dry tstms.).*

LAL	Storm Development	Coverage
1	No thunderstorms	
2	Isolated thunderstorms	1-14%
3	Widely scattered thunderstorms	15-24%
4	Scattered thunderstorms	25-54%
5	Numerous thunderstorms	> 54%
6	Same as #3, but dry thunderstorms	

Table 3. Lightning Activity Level (LAL) Categories.

20 ft. Wind - the expected 20 foot, 10 minute average wind speed (*in mph*) derived from the wind speed grid and valid at the indicated hour.

- **Grid Production Requirement:** *20 ft. Wind is produced at a minimum in 3 hour increments out to 48 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *N/A (derived element).*

D. Marine Forecast Elements.

Significant Wave Height - the average height (trough to crest) of the one-third highest waves. valid for the indicated 12 hour period.

- **Grid Production Requirement:** *Significant Wave Height will be produced at a minimum in 12 hour increments out to 120 hours from 00 UTC Day 1.*
- **Collaboration Thresholds:**
 - a. *For wave heights forecast to be 6 feet or less, a threshold of 2 feet.*
 - b. *For wave heights forecast to be greater than 6 ft, a threshold of 25% of the forecast significant wave height.*

Visibility - the maximum number of nautical miles an object can be seen and identified in the horizontal. The maximum distance is determined for a minimum area of one half of the horizon circle. Visibility greater than six nautical miles is unrestricted.

- **Grid Production Requirement:** *None (experimental grid).*
- **Collaboration Threshold:** *3 nautical miles.*

Appendix B - Grids Required for the Production of 10 NWS IOC products.

GRIDS	ZFP	CCF	SAF	SFT	FWF	FWM	CWF	GLF	NSH	MVF
max/min temp	X	X	X	X	X	X				
temperature	X		X		X	X				
dew point	X		X							
relative humidity*						X				
max/min RH *					X					
heat index*	X		X							
wind chill*	X		X							
floating PoP12	X				X	X				
prob of precip. (12h)*	X	X	X	X	X					
sky cover	X	X	X	X	X	X			X	
wind direction and speed	X		X		X		X	X	X	X
wind gusts (>10 kts over sustained)	X		X		X					
20 ft. wind * (NWS regional option)					X	X				
Lightning Activity Level (LAL)						X				
weather (type, intnsty, prob/covrg)	X	X	X	X	X	X	X	X	X	
snow amount	X		X							
significant wave height							X	X	X	X
visibility							X	X	X	
* Indicates a derived element										


Table 4. WFO Local Grid Elements Necessary to Produce the 10 NWS base products for IOC.

Appendix C - NDFD Weather Element Tables

The following tables show forecast projection times at which samples for the NDFD are taken. These projection times equate to the minimum grid production requirements for the NDFD. All tables begin at 00 UTC, Day 1 and extend out to a maximum of 168 hours. For some fields, this is a subset of the hourly grid requirements needed in the local database for the production of the local text products (requiring local time). Derived fields are indicated by the "*" symbol.

NWSI 10-506 JANUARY 2, 2004

Fire Weather Element Grid Availability

Time Projections from 00 UTC, Day 1 

Diurnal Day (CONUS)	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7		
UTC Day	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8
UTC Hour	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00	
Hours	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	78	84	90	96	108	120	132	144	156	168							
max/min relative humidity*				X				X					X																												
20 ft wind*	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A																									
lightning activity level		X		X			X	X			X	X		X	X																										

A - Required minimum threshold for NDFD IOC
 X - Proposed for experimental dissemination
 * derived field

NWSI 10-506 JANUARY 2, 2004

Marine Element Grid Availability

Time Projections from 00 UTC, Day 1 

Diurnal Day (CONUS)	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	
UTC Day	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8
UTC Hour	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	03	06	09	12	15	18	21	00	06	12	18	00	06	12	18	00	06	12	18	00	06	12	18	00		
Hours	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	78	84	90	96		108		120		132		144		156		168		
wave height (significant)				A				A				A				A				A			A		A		A		A		A											
visibility	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X																										

A - Minimum threshold for NDFD IOC

X - Proposed for experimental dissemination

* derived field

NWSI 10-506 JANUARY 2, 2004

Appendix D - Glossary of Terms

BUFR	<u>B</u>inary <u>U</u>niversal <u>F</u>orm for the <u>R</u>epresentation of meteorological data – World Meteorological Organization standard binary code designed to represent any meteorological data.
Collaboration Threshold	A value specific to each weather element that should not be exceeded along WFO boundaries unless it is meteorologically reasonable. If upon exchange of the grids the value for a particular element is exceeded, the affected offices should collaborate to bring the discrepancy below the threshold using the best scientific reasoning possible.
Digital Data	Numerical or other information represented in a form suitable for processing by computer.
Digital Forecast	A forecast represented by digital data--not words, phrases, or sentences.
Digital Forecast Database	A database containing digital forecasts
Digital Forecast Product	A formatted, usually graphical, representation of digital forecasts.
Forecast Element	A component of a weather forecast (e.g., temperature, wind, cloud).
Forecast Collaboration	The act of 2 or more forecasters working together through a process to reach a consensus on hydrometeorological forecast information.
Forecast Coordination	The exchange of hydrometeorological forecast information.

NWSI 10-506 JANUARY 2, 2004

Forecast Mosaic	A composite of gridded forecasts
Graphical Forecast Editor (GFE)	A graphical user interface that allows forecasters to modify gridded forecast fields using a variety of tools.
GRIB	<u>GR</u>Idded <u>B</u>inary, World Meteorological Organization standard binary code to represent gridded data.
Gridded Forecast	Forecasts at regularly spaced points on a surface
Interactive Forecast Preparation (IFP)	Concept where a forecaster edits, or interacts with, forecast elements in a digital database from which user products are generated
Interactive Forecast Preparation System (IFPS)	An interactive computer system that assists in the development of digital forecasts.
IFPS Initial Operating Capability (IOC)	The condition in which all WFOs are able to produce the grids necessary to automatically compose <u>ten base NWS text products</u> and will produce those products with software (formatters).
Intersite Coordination (ISC)	A technique employed within IFPS to exchange digital forecast grids from each WFO to other WFOs for the express purpose of coordinating the forecasts.
National Digital Forecast Database (NDFD)	A composite of official and experimental NWS digital forecasts (as distinct from guidance). It will house these forecast grids from all operational elements of the NWS.
Text Forecast Product	A forecast represented by formatted text.