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***Operations and Services
Public Weather Services, NWSPD 10-5***

DIGITAL DATA PRODUCTS/SERVICES SPECIFICATION

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Digital Data Products/Services Specification

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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 National 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 \(TIN\)](#). Since the gridded forecast database (some of which is experimental) and digital forecast process will continue to evolve over time, NWSI 10-506 will be periodically updated to ensure consistency between it and the Digital Forecast Database.

1.

2. Mission Connection. The digital forecast database is the first step in providing a means to utilize digital technology to its fullest, and is designed to provide NWS forecasts in an efficient, convenient, versatile, and detailed form to best meet customer and partner needs for accurate weather forecast information. In support of the mission described in the *National Weather Service Strategic Plan*, the NDFD is a “. . . national information database and infrastructure that can be used by other governmental agencies, the private sector, the public, and the global community.”

3. 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. Local offices can determine the optimal spatial resolution needed for their area, of which may differ from that of the NDFD. NWS products (digital, text, and graphic) will be automatically formatted from these local databases using AWIPS software. Forecasters have the opportunity to quality control and post-edit products, if necessary, before distribution.

3.1 WFO Initial Operating Capability (IOC) Grid Production. The minimum threshold for IFPS IOC grid production 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.

3.2 Local Digital Forecast Database Update Guidelines. Local grids should be updated when the forecast team believes the forecast is no longer representative of current or expected weather conditions, with particular emphasis on periods of high impact weather. Well-coordinated local or regional update criteria 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 and the enhancement of the National economy. WFOs shall effectively manage grid production during severe weather such that it does not interfere with critical warning operations. 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 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 allow links to view and use the digital database on finer scales.

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. Digital Forecast Collaboration A key component of the digital forecast process is to mosaic local digital forecasts into a near-seamless set of forecast grids for the entire nation (i.e., NDFD). To attain this goal, local offices and national centers should strive to achieve meteorological consistency among weather elements and meet collaboration thresholds along office boundaries. As a result, “ownership” of the NDFD is 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 collaboration

not only creates an effective digital forecast database, but it also facilitates the exchange of scientific information. Forecasters are expected to convey their professional judgment and interpretation through meteorological discussions available to partners and customers.

4.1 Operational Collaboration Responsibilities

4.1.1 National Centers for Environmental Prediction (NCEP).

The roles and requirements of each NCEP center providing NDFD support is listed in terms of general collaborative actions and deliverable grids, and relative to NDFD Initial Operating Capability (IOC). However, it should be noted that some center's roles and requirements have evolved differently than documented at NWS NDFD summit meetings (late summer 2001). Further, the dynamic nature of the post IOC NDFD increases the likely hood future roles and requirements will differ dramatically from that listed below.

Environmental Modeling Center (EMC) and NCEP Central Operations (NCO) – EMC will continue to develop and improve model output of which NCO will continue to make available for use in IPFS GFE.

Climate Prediction Center (CPC) – CPC will provide directly to the NDFD precipitation and temperature grids of probability for lead times ranging from 8 days out to 12.5 months.

Hydrometeorological Prediction Center (HPC) – HPC will provide guidance grids of short range QPF and medium range sensible weather parameters to WFOs and RFCs. Collaboration over these grids, model diagnostics (short and medium range) and winter weather will occur with WFOs, RFCs and other NCEP centers as needed primarily on 12 Planet or by voice communications.

Ocean Prediction Center (OPC) - OPC will provide analysis grids to coastal WFOs of winds and wave heights within 1000 miles of the both the Atlantic and Pacific Coasts to between 25 and 30 degrees north latitude (excluding the Gulf of Mexico and Great Lakes). Collaboration will occur with coastal WFOs and other NCEP Centers on an event driven basis primarily by voice communications or on 12 Planet.

Storm Prediction Center (SPC) – SPC will provide extensive collaboration with WFOs over convective watches by voice communications or on 12 Planet. Collaboration with other NCEP centers will occur as needed. Fire weather is also collaborated in a chat room with WFOs.

Tropical Prediction Center (TPC) – TPC will provide extensive collaboration with WFOs, RFCs, and other National Centers over tropical systems potentially impacting the U.S. Guidance grids of wind will also be provided to impacted WFOs. Collaboration with impacted entities will occur primarily via the Hurricane Hotline and may be supplemented by use of 12 Planet.

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 necessary given the size and scope of the event being addressed. Tools, including chat rooms, voice communication, and exchange of graphics in AWIPS and other commonly used formats will support the collaboration effort.

4.1.3 River Forecast Centers (RFCs). RFC collaboration occurs with those weather elements that 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 a variety of events (e.g., receipt of new observational data, forecast discontinuities, extreme weather events, etc.). However, new model data are the most common trigger of changes to the database beyond the first period. To collaborate effectively, forecasters will keep collaboration tools open, and be actively involved in collaboration as soon as possible after new model information is available (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 conterminous U.S.

4.4 Collaboration Thresholds. WFOs should adhere to a standard set of collaboration thresholds to ensure NDFD coherency, while not sacrificing forecast accuracy. These thresholds were developed for all NWS forecast offices. Refer to Appendix A for the standardized collaboration thresholds for 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 (GIS compatible) 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 NDFD. The digital forecast process represents a substantial change for forecasters. Instead of manually typing a myriad of products, forecasters use IFPS to create high resolution digital 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 and experimental weather, water, and climate information generated at WFOs and NCEP, and provides digital forecast information to serve national, regional, and local users. In addition, the private development of forecast graphics and decision tools from the NDFD is encouraged. NDFD plans include digital watch, warning, and advisory information, as well as other new elements.

5.4 NDFD Consistency and completeness.

The NDFD will incorporate forecast information prepared at NCEP service centers and forecast offices nationwide. Digital forecast information from local databases will be uploaded to a central server to mosaic into regional and national grids, thus forming the NDFD. As such, the contents of the NDFD must be complete and meteorologically consistent in time and space to be of greatest benefit to NWS customers and partners. WFOs are responsible for the accuracy and consistency of the forecast database, and are to further ensure to the best of their ability the timeliness and upload of required grids to the central server. In order to reduce forecast database discontinuities between CWA boundaries, WFOs should following the existing collaboration guidelines and thresholds as listed in Appendix A.

6. NDFD Specifications.

6.1 Base Digital Forecast Data. Base digital data are 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 as official or experimental 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 science, computer capabilities and web service technologies, as well as NWS software, have allowed 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 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 are 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 are transferred to the NDFD server and made available at the top of each hour. At a minimum, the base digital data are updated daily at 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

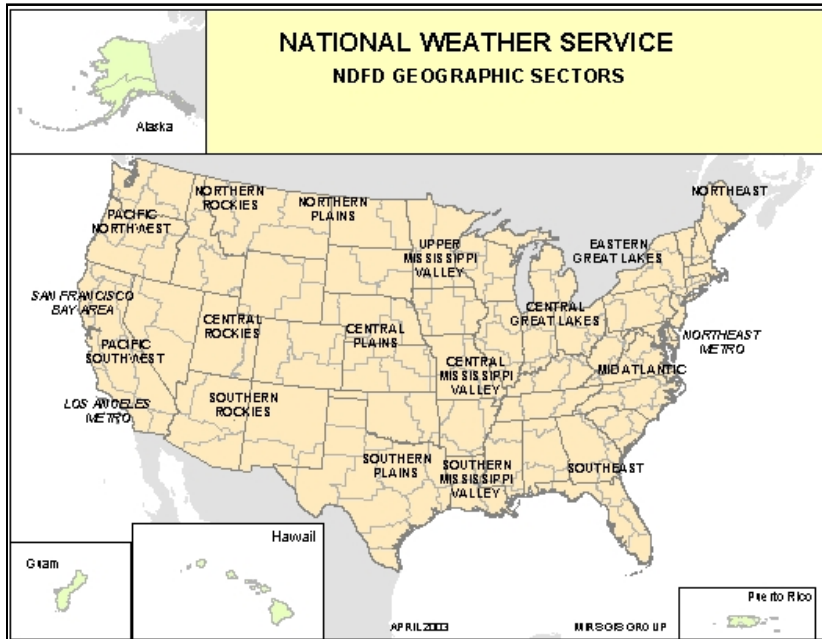


Figure 1. NDFD Geographic Sectors Map.

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 graphic products are derived from a prescribed set of data contained within the NDFD. These graphics are representations of the official NWS digital forecast. The graphics 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 a central server where the NDFD mosaic is created. The official graphic forecasts display weather parameters for a defined temporal resolution out to the maximum time projection specified in Section 6.1.6.

7.1.1 Purpose. NDFD Graphic Forecast Displays are a means to utilize science and technology to the fullest, and make a near-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 forecasts satisfy the weather information needs of 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 forecasts 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 graphics are generated by the top of each hour. At a minimum, revised graphics will be updated daily at 1800 UTC.

7.1.4 Graphic Forecast Content. The NDFD graphic forecasts 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, tropical weather, severe weather, fire weather, marine, aviation, hydrologic, and climate 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 forecasts are displayed at a spatial 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 Forecast Access 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, but are not limited to, surface temperature, dew point, wind speed and direction, weather, sky cover, and probability of precipitation.

8.2.2 Purpose. Advances in science, computer capabilities and web services technologies, as well as NWS software, have allowed the NWS to create customer-based web services.

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 forecasts are made as often as necessary and posted once an hour from the local office digital database. These updates are available at the top of the hour.

8.2.5 Presentation Format. The web forecasts are presented for display as HyperText Markup Language (HTML) in graphic, 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. NDFD digital data are available at a spatial resolution of 5 km. Local Digital Forecast Databases may be at higher resolutions.

8.2.7 Temporal Resolution. Temporal resolutions vary depending upon forecast type. Text forecasts provide information within 12 hour diurnally defined time blocks (e.g., Today, Tonight, Tomorrow, Tuesday Night, Saturday, etc) out to 7 days; meteograms (hourly weather graph) provide information at 1 hour intervals to 48 hours; and digital/tabular forecasts at 3 hour intervals to 120 hours.

8.2.8 Multi-Format Forecast Web Page Access. The multi-format forecasts are available on many WFO web pages across the NWS. 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](#).

8.2.9

8.3 Local Web-based Services. Local web-based services created by individual WFOs are 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.

- An element value should be assumed representative of the conditions expected across the prescribed grid box, and should not be interpreted as an exact point forecast in time or space.
- Element forecasts should be complete in time and space and are sampled at the prescribed times as defined by the NDFD Grid Availability for the individual elements.
- Collaboration thresholds are not valid for adjacent grid box elevation differences greater than 1000 feet.
- Grid boxes that lie on opposite sides of a coastal (i.e., land/water) boundary are excluded from collaboration threshold requirements.

B. Common Forecast Elements.

Max/Min Temp – the maximum daytime temperature or minimum overnight temperature in °F. Daytime is defined as **0700-1900 Local Standard Time**, and overnight is defined 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.

- **NDFD Grid Availability:** *A Maximum and Minimum Temperature grid will be available 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, i.e., greater than 500 ft. differences in elevation between adjacent grid points).*

Temperature - temperature in °F.

- **NDFD Grid Availability:** *Temperature grids will be available 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 - dew point temperature in °F.

- **NDFD Grid Availability:** *Dew Point grids will be available 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 – relative humidity in percent derived from the associated Temperature and Dew Point grids.

- **NDFD Grid Availability:** *Relative Humidity grids will be available 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). Apparent temperature grids will signify the Wind Chill when temperatures fall to 40F or less, and the Heat Index when temperatures rise above 80F. Between 41 and 80F the Apparent Temperature grids will be populated with forecast temperature.

- **NDFD Grid Availability:** *Apparent temperature grids will be available in 3 hour increments out to 72 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *N/A.*

6-hour Probability of Precipitation (PoP6) - the probability, expressed in percent, of measurable precipitation (at least 0.01 inch) valid for the specified 6-hour time period. Trace events are excluded. Valid periods begin at 0000, 0600, 1200, and 1800 UTC.

- **NDFD Grid Availability:** *PoP6 grids will be available each 6-hour period out to 72 hours from 0000 UTC Day 1.*
- **Collaboration Threshold:** *20%.*

12-hour Probability of Precipitation (PoP12) - the probability, expressed in percent, of measurable precipitation (at least 0.01 inch) valid for the specified 12-hour period. Trace events are excluded. Valid periods begin at 0000 UTC and 1200 UTC. Through 72 hours, the PoP12 element shall be derived from the PoP6 element.

- **NDFD Grid Availability:** *PoP12 grids will be available each 12-hour period out to 168 hours from 0000 UTC Day 1.*
- **Collaboration Threshold:** *20%.*

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

- **NDFD Grid Availability:** *Sky Cover will be available 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 10 meter wind direction using 36 points of a compass. **Wind Speed** - the sustained 10 meter wind speed (in knots). For information regarding WFO-generated wind forecasts grids for tropical cyclones refer to [NWSI 10-601, Tropical Cyclone Weather Services Program](#), Section 9.

- **NDFD Grid Availability:** *Wind Direction and Wind Speed grids will be available 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 within the indicated hour (i.e., the peak wind).

- **NDFD Grid Availability:** *Wind Gust grids will be available in 3 hour increments out to 72 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *None.*

Weather - the weather (precipitating or non-precipitating) valid for the specified time period. **Precipitating Weather** (e.g. rain, freezing rain, ice pellets, snow, etc.) is described as the type of precipitation accompanied by descriptors of intensity, coverage, or likelihood. Precipitating Weather shall be indicated for at least one hour of the PoP time increment whenever the probability for that time increment (PoP6 or PoP12) is 15 percent or more. **Non-Precipitating Weather** (e.g. fog, haze, smoke, etc.) is described as the type of obstruction to vision (non-precipitating variety) accompanied by descriptors of intensity or coverage. Non-Precipitating Weather shall be indicated whenever the expected visibility is 6 statute (5 nautical) miles or less. Fog shall be indicated as being dense whenever the expected visibility is 1/4 statute mile or less over land (and 1 nautical mile or less over water).

- **NDFD Grid Availability:** *Weather grids will be available in 3 hour increments out to 72 hours and then 6 hour increments out to 168 hours from 0000 UTC Day 1.*
- **Collaboration Threshold:** *N/A (discrete element).*

6-hour Quantitative Precipitation Forecast (QPF6) - the deterministic (i.e., non-zero QPF when the PoP6 is 50 percent or greater) 6-hour total amount of liquid precipitation (in hundredths of inches). A non-zero QPF may be present when the PoP6 is between 15 and 50 percent, at the forecaster's discretion (i.e., for cases when the likelihood of precipitation occurrence is high, but with limited coverage – e.g., scattered showers, the forecaster may want to include a non-zero QPF). Valid periods for the NDFD begin and end at 0600, 1200, 1800, and 0000 UTC.

- **NDFD Grid Availability:** *QPF grids will be available each 6-hour period out to 72 hours from 0000 UTC Day 1.*
- **Collaboration Threshold:** *0.25 in/6 hr.*

6-hour Maximum Quantitative Precipitation Forecast (MQPF6) - the conditional maximum 6 hour total amount of liquid precipitation at a 90% confidence of non-exceedance (in hundredths of inches). A non-zero MQPF6 will be present when the PoP6 is 15 percent or greater. Valid periods for the NDFD begin and end at 0600, 1200, 1800, and 0000 UTC.

- **NDFD Grid Availability:** *QPF grids will be available each 6 hour period out to 72 hours from 0000 UTC Day 1.*
- **Collaboration Threshold:** *0.25 in/6 hr.*

Snow Accumulation – 6 hour (SnowAmt6) - the 6 hour total accumulation of new snow (in tenths of 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.

- **NDFD Grid Availability:** *Snow Accumulation grids will be available 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.

- **NDFD Grid Availability:** *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.

- **NDFD Grid Availability:** None (experimental grid).
- **Collaboration Threshold:** 2 (except for discrepancies between wet and dry thunderstorms.).

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 #3-5, but dry thunderstorms	

Table 3. Lightning Activity Level (LAL) Categories.

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

- **NDFD Grid Availability:** 20 ft. Wind will be available at 3 hour increments out to 48 hours from 0000 UTC Day 1.
- **Collaboration Threshold:** N/A (derived element)

D. Marine Forecast Elements.

Significant Wave Height - the average height in feet (trough to crest) of the one-third highest waves valid for the indicated 12 hour period. Wave height is the combination of Wind Waves and Swell.

- **NDFD Grid Availability:** Significant Wave Height will be available in 12 hour increments out to 120 hours from 00 UTC Day 1.
- **Collaboration Threshold:**
 - For wave heights forecast to be 6 feet or less, a threshold of 2 feet.
 - For wave heights forecast to be greater than 6 ft, a threshold of 25% of the greatest 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.

- **NDFD Grid Availability:** None (experimental grid).
- **Collaboration Threshold:** 5 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.

General 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	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8			
UTC Day	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	7	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	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 temperature				A				A				A				A				A				A			A			A			A			A			A			A			A			A			A			A						
temperature	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A				
dew point	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
apparent temperature*	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
relative humidity*	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
probability of precip. (12h)*				A				A				A				A				A				A				A				A				A				A				A				A				A				A				
sky cover	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
wind direction and speed	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
wind gust	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
weather (type, intnsty,prob/cvrg)	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
quantitative precipitation			A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A			
snow amount			A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A		A	

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

| 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	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	2	2	2	2	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				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



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	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

Appendix D - Glossary of Terms

BUFR	Binary Universal Form for the Representation 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.
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.