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Operations and Services

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***NATIONAL DIGITAL FORECAST DATABASE and LOCAL DATABASE
DESCRIPTION and SPECIFICATIONS***

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

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signed
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Date

National Digital Forecast Database and Local Database Description and Specifications

| <u>Table of Contents:</u> | | <u>Page</u> |
|---------------------------|--|-------------|
| 1. | Introduction..... | 2 |
| 2. | Mission Connection | 3 |
| | Mission Connection | 3 |
| 3. | Local WFO Digital Forecast Database Description..... | 3 |
| | 3.1 Description..... | 3 |
| | 3.2 Purpose of the Local Database beyond Digital Data | 3 |
| | 3.3 Local Digital Forecast Database Update Guidelines | 3 |
| | 3.4 Priority of Local Grids during Active Hazardous Weather | 3 |
| | 3.5 Local Grid Dissemination | 3 |
| | Local Grid Dissemination | 3 |
| | 3.6 Local Grid Upload to NDFD Central Server | 4 |
| | Local Grid Upload to Central Server | 4 |
| 4. | National Digital Forecast Database (NDFD)..... | 4 |
| | 4.1 Description Definition | 4 |
| | Definition | 4 |
| | 4.2 NDFD Contents | 4 |
| | NDFD Contents | 4 |
| | 4.3 Availability, Timeliness, and Completeness..... | 4 |
| | Availability | 4 |
| | 4.3.1 NDFD Monitoring of WFO Grids | 4 |
| | 4.3.2 NDFD Consistency of WFO Grids..... | 4 |
| | 4.4 Format..... | 4 |
| | Format..... | 4 |
| | 4.5 Spatial Resolution..... | 5 |
| | 4.6 Temporal Resolution..... | 5 |
| | 4.7 NDFD Gridded Data Access..... | 5 |
| | 4.8 NDFD Graphic Forecast Displays | 5 |
| 5. | Digital Forecast Collaboration..... | 6 |
| | 5.1 Collaboration Technology | 6 |
| | Collaboration Technology | 6 |
| | 5.2 Collaboration Thresholds..... | 6 |
| | Collaboration Thresholds..... | 6 |
| | 5.3 Collaboration Times..... | 6 |
| | 5.4 Collaboration Roles and Responsibilities | 6 |
| | 5.5 Digital Forecast Process Diagram..... | 7 |
| <u>Appendices</u> | | |
| | NDFD Element Definitions | 8 |
| | NDFD Weather Element Tables | 19 |
| 1. | <u>Introduction</u> . This procedural directive describes the National Weather Service’s (NWS) | |

digital data infrastructure, which is comprised of local digital forecast databases found at Weather Forecast Offices (WFOs), and the National Digital Forecast Database (NDFD) comprised of WFOs, River Forecast Centers and the National Centers for Environmental Prediction's (NCEP) digital forecasts. Implementation details for evolving specific products and services from these databases are described in the NWS Product Description Documents (PDD) in accordance with [NWSI 10-102, New or Enhanced Products and Services](#).

2. Mission Connection. Creating and maintaining local and national digital forecast databases are the first steps in utilizing digital technology to provide NWS forecasts in an efficient, convenient, and versatile form to meet user needs for accurate weather forecast information.

3. Local WFO Digital Forecast Database Description.

3.1 Description. Forecasters at each WFO use the Interactive Forecast Preparation System (IFPS) software on the Automated Weather Interactive Processing System (AWIPS); to prepare a local, geospatial referenced (Geographic Information Systems [GIS] compatible) digital forecast database. The local database is comprised of gridded weather elements for their geographic area of responsibility. WFOs and/or Regions determine the optimal spatial resolution for their area which may be finer than the NDFD.

3.2 Purpose of the Local Database beyond Digital Data. From this local digital database, WFO forecast products are composed, formatted, and distributed via text formatters and other applications. Applications take the data and generate local products which are distributed to users through web pages and other means. The common database helps generate a more consistent suite of local forecast products which are easily monitored and maintained. Also, forecasters still have the capability to quality control and post-edit those products, if necessary, before distribution.

3.3 Local Digital Forecast Database Update Guidelines. The local database should be updated at least once a day to include new Day 7 grids. The WFO's local database should also be updated whenever the gridded forecast elements are no longer representative of current or expected weather conditions, especially during periods of high impact weather. Specific local or regional update criteria may be established.

3.4 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. WFOs effectively manage grid production during high impact events such that it does not interfere with critical warning operations.

3.5 Local Grid Dissemination. Digital forecast information from WFO 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 user needs.

3.6 Local Grid Upload to NDFD Central Server. Digital forecast information from local databases will be uploaded to a central server (NDFD) and pieced together into a mosaic of regional and national grids.

4. National Digital Forecast Database (NDFD).

4.1 Description Definition. The NDFD is a central database storing geospatially referenced (GIS compatible) digital forecast elements from WFOs and NCEP. The NDFD is a repository of both official and experimental (as defined in [NWSI 10-102, New or Enhanced Products and Services](#)) grid fields. The NDFD provides a foundation for the development of new grid-based NWS products, including the forecast digital database itself.

The NDFD is the primary means by which grids will be made available to users. Users can transform the NWS digital data into a wide range of text, graphic, image products and services.

4.2 NDFD Contents. The NDFD contains base digital data for a variety of official and experimental weather, water, and climate elements generated at WFOs and NCEP. The experimental NDFD data is not an official NWS forecast product. Detailed information can be found at the NDFD resource page at <http://www.weather.gov/ndfd/index.htm>. The status of these grid fields will be clearly denoted as official or experimental within the file or product. The specific grids (and associated resolutions) available in the NDFD are available via the following link: <https://ocwws.weather.gov/formatter/index.shtml>.

4.3 Availability, Timeliness, and Completeness. The NDFD is a dynamic forecast database. Forecast grids are generated and revised on an event-driven basis at WFOs and on a scheduled basis with updates as needed from NCEP. Any new and revised digital data from a WFO or NCEP are sent to the NDFD and made available at the top of each hour. At a minimum, the digital database is updated once a day.

4.3.1 NDFD Monitoring of WFO Grids. The NDFD routinely monitors for missing or out of date grids from the WFOs and notifies WFOs of the old or missing grids. For a limited subset of those grids, the NDFD will replace the missing or old grid with an equivalent Model Output Statistics (MOS)-generated grid until the local WFO can refresh the database. A list of the monitored subset of grids can be found at the following link: <https://ocwws.weather.gov/formatter/index.shtml>.

4.3.2 NDFD Consistency of WFO Grids. WFOs are responsible for the inter-office consistency of their local database as well as their portion of the NDFD. In order to reduce forecast database discontinuities along WFO county warning area (CWA) boundaries, WFOs follow collaboration guidelines through established thresholds as shown at the following link: <https://ocwws.weather.gov/formatter/index.shtml>.

4.4 Format. The NDFD data are presented in [GRIdded Binary \(GRIB\), Edition 2, format](#). The NDFD data are also available via web services (e.g, Simple Object Access Protocol (SOAP) and Extensible Markup Language (XML)). Details can be found at: <http://www.nws.noaa.gov/ndfd/technical.htm>.

4.5 Spatial Resolution. Spatial resolution of the NDFD grids will be 6 kilometers (km) or finer.

4.6 Temporal Resolution. The temporal resolution of forecast elements varies by forecast projection. The detailed projections can be found at the following link:
<https://ocwws.weather.gov/formatter/index.shtml>.

4.7 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. There are separate sectors for Puerto Rico, Hawaii, Guam, and Alaska. 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](#)

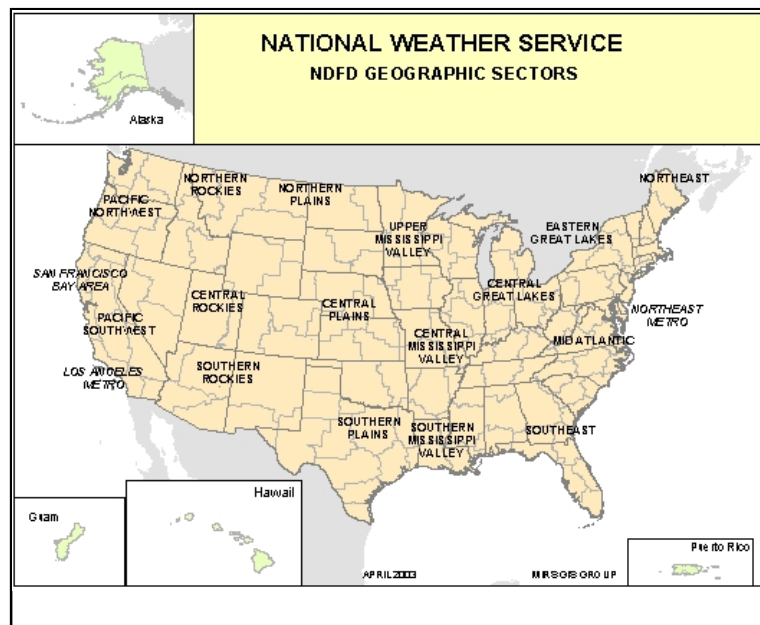


Figure 1. NDFD Geographic Sectors Map.

The data can be accessed from the NDFD File Transfer Protocol (FTP) server by following the instructions provided via the active web link below:

[NDFD GRIB2 Data Access](#)

4.8 NDFD Graphic Forecast Displays. 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 users. The data originates from the WFO, NCEP, or centrally derived databases. <https://ocwww.weather.gov/formatter/index.shtml>.

5. Digital Forecast Collaboration. A key component of the digital forecast process is to mosaic digital forecasts into a near seamless set of forecast grids for the entire nation (i.e., NDFD). To attain this goal, local offices and NCEP strive to achieve meteorological consistency among weather elements and meet collaboration thresholds along WFO boundaries. As a result, “ownership” of the NDFD is shared among all those involved in the collaborative process. Appendix A describes the NDFD element definitions. Appendix B describes the NDFD weather element tables.

5.1 Collaboration Technology. All NWS offices and NCEP 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. Tools, including chat rooms, voice communication, and exchange of graphics in AWIPS and other commonly used formats support the collaboration effort.

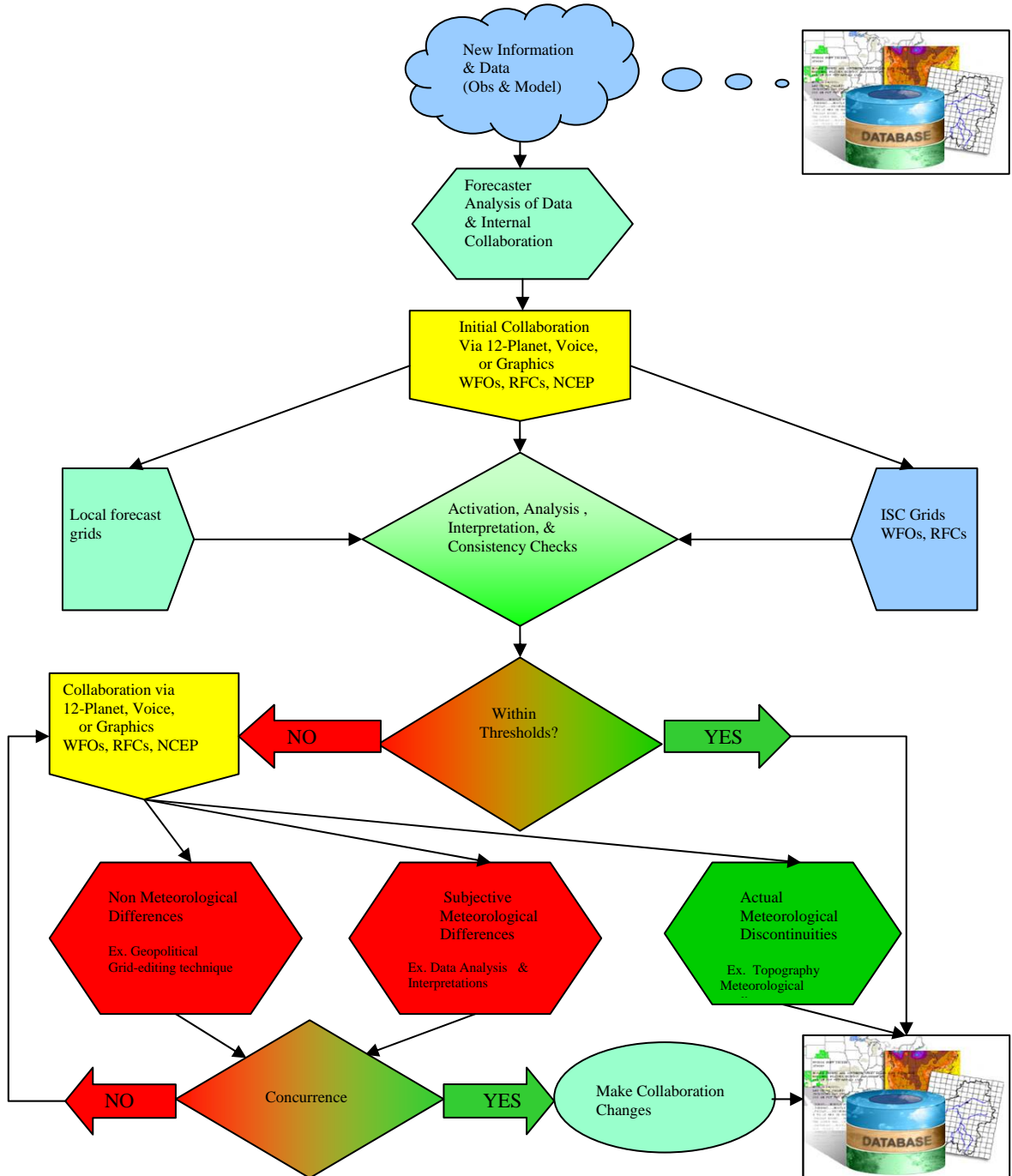
5.2 Collaboration Thresholds. WFOs should adhere to a standard set of collaboration thresholds to ensure NDFD coherency, while not sacrificing forecast accuracy. Refer to the following link: <https://ocwww.weather.gov/formatter/index.shtml>, for the standardized collaboration thresholds for various weather elements.

5.3 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 triggers of changes to the database beyond the first period. To collaborate effectively, forecasters will keep collaboration tools open at all times.

5.4 Collaboration Roles and Responsibilities. Effective collaboration not only creates a consistent 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 users.

Each WFO collaborates with NCEP and adjacent WFOs 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 Inter-site Coordination (ISC) grids to reduce discontinuities before the grids are released to users. Additionally, WFOs collaborate on regional and national scales (i.e., with NCEP) as necessary given the size and scope of the event being addressed. Figure 2 illustrates how the digital forecast process works.

5.5 Digital Forecast Process Diagram



Appendix A- NDFD Element Definitions

1. **Introduction:** This appendix provides descriptions and definitions for all experimental and operational grid elements in the national databases. The grid elements may originate at the Weather Forecast Offices (WFOs), the National Centers for Environmental Prediction (NCEP), or be derived centrally from the NDFD.

2. Overarching Grid Element Concept and Guidelines

- Element values represent conditions of meteorological fields at the resolution of the grid. They should not be interpreted as exact point forecasts in time and space.
- Individual elements are sampled at the times defined in the NDFD Grid Availability Table found at the end of this appendix.
- Collaboration thresholds are not calculated for an adjacent grid if elevation differences are greater than 1,000 feet. In the Alaska Region, collaboration thresholds are not calculated across the Alaska and Kuskokwim mountain ranges.
- Grids that lie on opposite sides of a coastal (i.e., land/water) boundary are excluded from collaboration threshold requirements.

3. Grid Element Definitions (General)

Max/Min Temp - The maximum daytime temperature or minimum overnight temperature in degrees Fahrenheit (°F). Daytime is defined as **0700 -1900 Local Standard Time** and overnight is defined as **1900-0800 Local Standard Time**. The 1 hour overlap helps cover situations when minimum temperatures occur just after sunrise. In the Alaska Region, daytime is defined as 0500-2000 Local Standard Time and overnight is defined as 1700-1100 Local Standard Time, to account for extended/decreased hours of daylight in the region.

- **NDFD Grid Availability:** *A Maximum or Minimum Temperature grid will be valid for each 12 or 13 hour period (15 or 18 hour period in Alaska Region) out to 168 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *5 degrees (7 degrees in complex terrain, i.e., greater than 500 foot differences in elevation between adjacent grid).*

Temperature - Temperature in °F valid at the top of the indicated hour.

- **NDFD Grid Availability:** *Temperature grids will be valid at the top of the hour every 3 hours out to 72 hours, then every 6 hours out to 168 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *5 degrees (7 degrees in complex terrain, i.e., greater than 500 foot differences in elevation between adjacent grid).*

Dew Point - Dew point temperature in °F valid at the top of the indicated hour.

- **NDFD Grid Availability:** *Dew Point grids will be valid at the top of the hour every 3 hours out to 72 hours, then every 6 hours out to 168 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *5 degrees (7 degrees in complex terrain, i.e., greater than 500 foot differences in elevation between adjacent grid).*

Relative Humidity (RH) - Relative humidity in percent derived from the associated Temperature and Dew Point grids for the top of the indicated hour.

- **NDFD Grid Availability:** *Relative Humidity grids will be valid at the top of the hour*

every 3 hours out to 72 hours from 00 UTC Day 1.

- **Collaboration Threshold:** 5% difference when relative humidity values are < 20%; 10% difference when relative humidity values are between 20% and <25%; 15% difference when relative humidity values are between 25% and < 50%; 20% difference when relative humidity values are between 50% and < 75%; 25% difference when relative humidity values are between 75% and 100%.

Apparent Temperature - The perceived temperature derived from either a combination of temperature and wind (Wind Chill), or temperature and humidity (Heat Index) for the top of the indicated hour. Apparent temperature grids will signify the Wind Chill when temperatures fall to 40°F or less, and the Heat Index when temperatures rise above 80°F. Between 41°F and 80°F, the Apparent Temperature grids will be populated with forecast temperature.

- **NDFD Grid Availability:** Apparent temperature grids will be valid at the top of the hour every 3 hours out to 72 hours from 00 UTC Day 1.
- **Collaboration Threshold:** 7 degrees (9 degrees in complex terrain, i.e., greater than 500 foot differences in elevation between adjacent grid).

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.

Hazard Grids - Long-fused watches, warnings, and advisories issued by the WFOs and National Centers in effect at the appropriate valid time will be included in this *one* grid element. The complete list of Hazards can be found at:

<http://www.weather.gov/ndfd/technical.htm>

The PDD is located at: <http://products.weather.gov/PDD/HazardGrid0608.pdf>.

- **NDFD Grid Availability:** Hazard grids will be valid at 1 hour increments out to 72 hours when weather warrants the issuance of this grid.
- **Collaboration Threshold:** N/A (discrete element).

Probability of Precipitation (PoP) - 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.

- **NDFD Grid Availability:** PoP12 grids will be valid for each 12hour period out to 168 hours from 00 UTC Day 1.
- **Collaboration Threshold:** 20 percent.

Sky Cover - The expected amount of opaque clouds or other opaque phenomena that might be aloft such as elevated smoke layers from wildfires or volcanic ash (in percent) covering the sky valid for the top of the indicated hour.

- **NDFD Grid Availability:** Sky Cover grids will be valid at the top of the hour every 3 hours out to 72 hours, then every 6 hours out to 168 hours from 00 UTC Day 1.
- **Collaboration Threshold:** 25% (35% in complex terrain).

Wind Direction - The 10 meter wind direction using 36 points of a compass valid at the top of the indicated hour. **Wind Speed** – the sustained 10 meter wind speed (in knots) valid at the top of the indicated hour. For information regarding WFO-generated wind forecast grids for tropical cyclones refer to *NWSI 10-601, Tropical Cyclone Weather Services Program*, and Section 9.

- **NDFD Grid Availability:** Wind Direction and Wind Speed grids will be valid at the top of the hour every 3 hours out to 72 hours, then every 6 hours out to 168 hours from 00 UTC Day 1.
- **Collaboration Threshold (Wind Direction):** 45 degrees regular, 90 degrees complex terrain. Enforce if both WFOs have forecast wind speed ≥ 12 knots (kt).
- **Collaboration Threshold (Wind Speed):** 10 kt difference for speeds > 12 kts and < 20 kts; 15 kt difference for speeds ≥ 20 kts. Enforce if at least one WFO has forecast wind speed > 12 kts.

Wind Gust - The maximum 3 second wind speed (in knots) forecast to occur within a 2 minute interval at a height of 10 meters. Wind gust forecasts are valid at the top of the indicated hour. When a wind gust is not forecasted for the top of the indicated hour, the wind gust grid will assume the value of the sustained wind forecast.

- **NDFD Grid Availability:** Wind Gust grids will be valid at the top of the hour every 3 hours out to 72 hours from 00 UTC Day 1.
- **Collaboration Threshold:** 10 kt difference for gusts > 12 kts and < 20 kts; 15 kt difference for gusts ≥ 20 kts. Enforce if at least one WFO has forecast wind gust > 12 kts.

Weather - The weather (precipitating or non-precipitating) valid at the top of the indicated hour. **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. **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 is indicated whenever the expected visibility is 6 statute (5 nautical) miles or less. Fog is indicated as being dense whenever the expected visibility is 1/4 statute mile or less over land. All forecasters should use "light" as the default intensity on the Weather grid for Days 1-7 unless the predicted meteorological situation warrants a different intensity. The exception is Pacific Region as their tropical location supports a consistently higher probability of moderate or heavy rainfall events and therefore "moderate" default intensity will be assigned.

- **NDFD Grid Availability:** Weather grids will be valid at the top of the hour every 3 hours out to 72 hours, then every 6 hours out to 168 hours from 00 UTC Day 1.
- **Collaboration Threshold:** N/A (discrete element).

6-Hour Quantitative Precipitation Forecast (QPF6) - The expected amount of liquid precipitation (in hundredths of inches) accumulated over a six hourly period. NDFD valid

periods are six hours in length beginning and ending at 0600, 1200, 1800, and 0000 UTC.

- **NDFD Grid Availability:** *QPF grids will be valid each 6-hour period out to 72 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *0.25 difference for precipitation amounts < 1.5, 0.50 difference for precipitation amounts < 3.0, and 1.0 difference for precipitation amounts >= 3.0. Enforce if at least one WFO has forecast >0.25 inches.*

6-Hour Snow Accumulation - The expected total accumulation of new snow (in inches) during a 6 hour period. A snow accumulation grid will be specified whenever 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 inch difference for snowfall amounts < 6 inches, 4 inch difference for snowfall amounts < 12 inches; and 6 inch difference for snowfall amounts >= 12 inches. Enforce if at least one WFO has forecast >2 inches.*

4. Grid Element Definition (Fire Weather)

Min/Max Relative Humidity - Maximum RH is the highest humidity value for the overnight period defined as **1900-0800 Local Standard Time**. The Minimum RH is the lowest humidity value for the daytime period defined as **0700 -1900 Local Standard Time**.

- **NDFD Grid Availability:** *Maximum and minimum RH grids are valid at 12 hour intervals for 72 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *Same as for RH.*

20 Foot Winds - Sustained winds averaged over a 10 minute period, and measured 20 feet above the average height of nearby vegetation. This is the standard reported by the automated weather stations owned by the land management agencies and used in the National Fire Danger Rating System (NFDRS).

- **NDFD Grid Availability:** *20 foot wind grids will be valid at the top of the hour every 3 hours out to 72 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *Same as public surface wind threshold.*

Haines Index - Lower Atmospheric Severity Index (LASI) is used to quantify the atmosphere's contribution to the growth potential of wildland fires. LASI is commonly called the "Haines Index," or HI. The HI gives fire managers another tool for evaluating fire danger by combining two atmospheric factors that are known to have an effect on wildfires. The two components are stability and moisture. The calculation is based on the elevation of the site.

The chart below shows how to calculate each term. To get the HI, add the two terms together. This number can range from 2 to 6, depending upon the severity of the weather situation:

- 2 = Fire Growth Potential Very Low (airmass very moist and stable)
- 3 = Fire Growth Potential Very Low (airmass moist and stable)

- 4 = Fire Growth Potential Low
- 5 = Fire Growth Potential Moderate
- 6 = Fire Growth Potential High (airmass very dry and unstable)

HI values above are determined using the calculations below:

| | | |
|---|---|---|
| Low Elevation (Below 1,000' MSL) | Stability Term (Temp at 950 mb -Temp at 850 mb) 1 = 1 to 3 deg C or less 2 = 4 to 7 deg C 3 = 8 deg C or greater | Moisture Term (Temp at 850 mb – Dewpoint at 850 mb) 1 = 1 to 5 deg C or less 2 = 6 to 9 deg C 3 = 10 deg C or greater |
| Mid Elevation (Between 1,000' and 3,000' MSL) | Stability Term (Temp at 850 mb -Temp at 700 mb) 1 = 1 to 5 deg C or less 2 = 6 to 10 deg C 3 = 11 deg C or greater | Moisture Term (Temp at 850 mb -Dewpoint at 850 mb) 1 = 1 to 5 deg C or less 2 = 6 to 12 deg C 3 = 13 deg C or greater |
| High Elevation (Above 3,000' MSL) | Stability Term (Temp at 700 mb -Temp at 500 mb) 1 = 1 to 17 deg C or less 2 = 18 to 21 deg C 3 = 22 deg C or greater | Moisture Term (Temp at 700 mb - Dewpoint at 700 mb) 1 = 1 to 14 deg C or less 2 = 15 to 20 deg C 3 = 21 deg C or greater |

WFO GFE edit areas will be assigned a level that will determine how the HI will be calculated for that zone (Low, Moderate or High, as above). HI element is the value at the top of the indicated hour.

- **NDFD Grid Availability:** *HI grids will be valid at the top of the hour every 6 hours out to 72 hours from 00 UTC Day 1. This grid is not available in the Alaska Region.*
- **Collaboration Threshold:** *2 category difference or more.*

Mixing Height (MH) - MH is a forecast parameter defined as the height to which the air near the Earth's surface is well mixed through turbulence caused by the interaction between the surface and the atmosphere. The MH is typically located at the base of a capping temperature inversion, or at the base of a statically stable layer of air. The MH is quite variable in space and time, and in fair weather, typically rises from a few tens of meters at sunrise, to 1 to 4 km at the time of maximum temperature. Because of its typically low altitude under an early morning surface inversion, the MH is frequently assumed to fall to near zero overnight.

Calculating MH: On a chart of height or pressure versus temperature, the surface temperature at the time of interest, typically the forecast afternoon maximum temperature, is reduced dry adiabatically until the temperature sounding is intersected. The point of intersection

establishes the depth of the mixed layer. The temperature sounding can either be an observed or forecast sounding, whichever the user feels is more representative. For most wild land applications, the rural minimum temperature itself would be more appropriate. Model output grids and GFE tools are used to produce MH grids. All MH grids are displayed using feet Above Ground Level (AGL) calculations. The MH grid value is for the top of the indicated hour.

- **NDFD Grid Availability:** *MH grids will be valid at the top of the hour every 3 hours out to 72 hours from 00 UTC Day 1. This grid is not available in the Alaska Region.*
- **Collaboration Threshold:** *500 feet.*

Transport Winds (TW) - TW is a calculated parameter defined as the average wind speed and direction of all winds in the mixed layer (the surface to the mixing height level). Once a mixing height had been determined, the transport wind speed and direction can be calculated by averaging the observed or forecast wind information from the surface to the mixing height. If the mixing height is zero, the transport wind is generally assumed to be zero as well. Model output grids and GFE tools are used to produce TW grids. TW is displayed in knots and compass point directions. The TW values are top of the hour.

- **NDFD Grid Availability:** *TW grids will be valid at the top of the hour every 3 hours out to 72 hours from 00 UTC Day 1. This grid is not available in the Alaska Region.*
- **Collaboration Threshold:** *10 knot difference for speed. 45 degree differences in regular terrain and 90 degree difference in complex terrain. Enforced if both WFOs have forecast wind speed ≥ 12 kts.*

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. LAL is expressed as a discrete element category with values from 1 to 6. Displayed value is the maximum during the 3 hour valid period.

- **NDFD Grid Availability:** *The LAL grids are valid in 3 hour increments through 72 hours from 00 UTC Day 1. This grid is not available in the Alaska Region.*
- **Collaboration Threshold:** *2 (except for discrepancies between wet and dry thunderstorms.)*

| LAL Category | 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 | |

5. Grid Element Definitions (Marine)

Significant Wave Height - Significant wave height is defined as the average [wave height](#) ([trough](#) to [crest](#)) of the one-third largest [waves](#) valid for the top of the designated hour.

Wave Height is the combination of Wind Waves and Swell.

- **NDFD Grid Availability:** *Significant Wave Height is valid at the top of the hour every 6 hours out to 132 hours from 00 UTC Day 1.*
- **Collaboration Threshold:** *>2 and <6 feet (2), <12 (3), <16 (4), <20 (5), <24 (6), < 28 (7), <32 (8). Enforce if both WFOs have forecast >0 feet and at least one WFO has forecast >2 feet.*

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:** *Availability of this grid is determined by Region.*
- **Collaboration Threshold:** *3 nautical miles.*

6. Grid Element Definitions (National Centers for Environmental Prediction Produced for CONUS)

8 to 14 Day Average Temperature above Normal is the probability, expressed as a percent, of above normal (median) categories of 7-day mean temperature at a lead-time of 1 week PoP.

- **NDFD Grid Availability:** *8 to 14 Day Outlook grids are available at 3:00 p.m. Eastern local time each day with one week lead time. The grid is one projection out to 14 days at a resolution of 5 km.*
- **Collaboration Threshold:** *N/A.*

8 to 14 Day Average Temperature below Normal is the probability, expressed as a percent, of below normal (median) categories of 7-day mean temperature at a lead-time of 1 week.

- **NDFD Grid Availability:** *8 to 14 Day Outlook grids are available at 3:00 p.m. Eastern local time each day with one week lead time. Grid is one projection out to 14 days at a resolution of 5 km.*
- **Collaboration Threshold:** *N/A.*

8 to 14 Day Total Precipitation above Normal is the probability, expressed as a percent, of above normal (median) categories of 7-day total precipitation at a lead-time of 1 week.

- **NDFD Grid Availability:** *8 to 14 Day Outlook grids are available at 3:00 p.m. Eastern local time each day with one week lead time. The grid is one projection out to 14 days at a resolution of 5 km.*
- **Collaboration Threshold:** *N/A.*

8 to 14 Day Total Precipitation below Normal is the probability, expressed as a percent, of below normal (median) categories of 7-day total precipitation at a lead-time of 1 week.

- **NDFD Grid Availability:** *8 to 14 Day Outlook grids are available at 3:00 p.m. Eastern local time each day with one week lead time. The grid is one projection out to 14 days at a*

resolution of 5 km.

- **Collaboration Threshold:** *N/A.*

Categorical Convective Hazard Outlook (Day 1, Day 2, and Day 3) is a categorical forecast (slight, moderate, or high risk) that specifies the perceived level of threat of thunderstorms, severe thunderstorms, hail, damaging winds, and tornadoes.

- **NDFD Grid Availability:** *Day 1 grids are produced by the Storm Prediction Center (SPC) at 0600 UTC, 1300 UTC, 1630 UTC, 2000 UTC, and 0100 UTC. Day 2 grids are produced by SPC at 0700 UTC (0600 UTC during Daylight Savings Time) and 1730 UTC. Day 3 grids are produced by SPC at 0830 UTC (0730 UTC during Daylight Savings Time). The grid is composed of three projections.*
- **Collaboration Threshold:** *N/A.*

One-Month Average Temperature above Normal is the probability, expressed as a percent, of above normal (median) categories of one-month mean temperature at a lead-time of ½-month.

- **NDFD Grid Availability:** *One-Month Outlook grids are available twice a month; at around 8:30 a.m. Eastern local time on the third Thursday of the month (about 0.5 month lead time) and 3:00 p.m. Eastern local time on the last day of the month (“zero lead” time). The grid is one projection with a resolution of 5 km.*
- **Collaboration Threshold:** *N/A.*

One-Month Average Temperature below Normal is the probability, expressed as a percent, of below normal (median) categories of one-month mean temperature at a lead-time of ½-month.

- **NDFD Grid Availability:** *One-Month Outlook grids are available twice a month; at around 8:30 a.m. Eastern local time on the third Thursday of the month (about 0.5 month lead time) and 3:00 p.m. Eastern local time on the last day of the month (“zero lead” time). The grid is one projection with a resolution of 5 km.*
- **Collaboration Threshold:** *N/A.*

One-Month Total Precipitation above Normal is the probability, expressed as a percent, of above normal (median) categories of one-month total precipitation at a lead-time of ½-month.

- **NDFD Grid Availability:** *One-Month Outlook grids are available twice a month; at around 8:30 a.m. Eastern local time on the third Thursday of the month (about 0.5 month lead time) and 3:00 p.m. Eastern local time on the last day of the month (“zero lead” time). The grid is one projection with a resolution of 5 km.*
- **Collaboration Threshold:** *N/A.*

One-Month Total Precipitation below Normal is the probability, expressed as a percent, of below normal (median) categories of one-month total precipitation at a lead-time of ½-month.

- **NDFD Grid Availability:** *One-Month Outlook grids are available twice a month; at around 8:30 a.m. Eastern local time on the third Thursday of the month (about 0.5 month lead time) and 3:00 p.m. Eastern local time on the last day of the month (“zero lead” time).*

The grid is one projection with a resolution of 5 km.

- **Collaboration Threshold:** N/A.

Probabilistic Tropical Cyclone Surface Wind Speed (Cumulative) is the probability (in percent) of sustained surface wind speed greater than 34-, 50- and 64-knots (3 separate elements) sometime during the specified cumulative forecast period (0 – 6 hours, 0-12, 0-18, etc.) at each specific point. NOTE: This element is provided for coastal and inland points as well as offshore locations (e.g., buoys).

- **NDFD Grid Availability:** *These grids are available no earlier than 15 minutes following the issuance deadlines for routine tropical cyclone advisories (03, 09, 15, and 21 Coordinated Universal Time – UTC) and after special advisories for all tropical and/or subtropical cyclones. The grid increment is every 6 hours out to 120 hours.*
- **Collaboration Threshold:** N/A.

Probabilistic Tropical Cyclone Surface Wind Speed (Incremental) is the probability (in percent) of sustained surface wind speed greater than 34-, 50-, and 64-knots (3 separate elements) sometime during the specified forecast period (0 - 6 hours, 6 -12, 12 -18, etc.) at each specific grid. These values are incremental since they can increase in value by accounting for the possibility the event might start in an earlier period and still be occurring in the specified period. NOTE: This element is provided for coastal and inland points as well as offshore locations (e.g., buoys).

- **NDFD Grid Availability:** *These grids are available no earlier than 15 minutes following the issuance deadlines for routine tropical cyclone advisories (03, 09, 15, and 21 Coordinated Universal Time – UTC) and after special advisories for all tropical and/or subtropical cyclones. The grid increment is every 6 hours out to 120 hours.*
- **Collaboration Threshold:** N/A.

Probability of damaging Thunderstorm Winds (Day 1) is the probability (in percent) of winds greater than 58 miles per hour occurring within 25 miles of any point during the outlook period. The higher the probability, the higher the threat of severe thunderstorm winds occurring.

- **NDFD Grid Availability:** *These grids are produced by SPC at 0600 UTC, 1300 UTC, 1630 UTC, 2000 UTC, and 0100 UTC. The grid is composed of one projection.*
- **Collaboration Threshold:** N/A.

Probability of Extreme Hail (Day 1) is the probability (in percent) of hail greater than 2 inches in diameter within 25 miles of any point during the outlook period. The higher the probability, the higher the threat of extreme hail occurring.

- **NDFD Grid Availability:** *These grids are produced by SPC at 0600 UTC, 1300 UTC, 1630 UTC, 2000 UTC, and 0100 UTC. The grid is composed of one projection.*
- **Collaboration Threshold:** N/A

Probability of Extreme Thunderstorm Winds (Day 1) is the probability (in percent) of winds greater than 75 miles per hour occurring within 25 miles of any point during the outlook period. The higher the probability, the higher the threat of extreme thunderstorm winds occurring.

- **NDFD Grid Availability:** *These grids are produced by SPC at 0600 UTC, 1300 UTC, 1630 UTC, 2000 UTC, and 0100 UTC. The grid is composed of one projection.*
- **Collaboration Threshold:** *N/A.*

Probability of Extreme Tornadoes (Day 1) is the probability (in percent) of [Enhanced Fujita scale 2](#) (EF2) tornadoes occurring within 25 miles of any point during the outlook period. The higher the probability, the higher the threat of extreme tornadoes occurring.

- **NDFD Grid Availability:** *These grids are produced by SPC at 0600 UTC, 1300 UTC, 1630 UTC, 2000 UTC, and 0100 UTC. The grid is composed of one projection.*
- **Collaboration Threshold:** *N/A.*

Probability of Hail (Day 1) is the probability (in percent) of hail greater than three-quarters of an inch in diameter (size of a penny) occurring within 25 miles of any point during the outlook period. The higher the probability, the higher the threat of severe hail occurring.

- **NDFD Grid Availability:** *These grids are produced by SPC at 0600 UTC, 1300 UTC, 1630 UTC, 2000 UTC, and 0100 UTC. The grid is composed of one projection.*
- **Collaboration Threshold:** *N/A.*

Probability of Tornadoes (Day 1) is the probability (in percent) of a tornado occurring within 25 miles of any point during the outlook period. The higher the probability, the higher the threat of tornadoes occurring.

- **NDFD Grid Availability:** *These grids are produced by SPC at 0600 UTC, 1300 UTC, 1630 UTC, 2000 UTC, and 0100 UTC. The grid is composed of one projection.*
- **Collaboration Threshold:** *N/A.*

Three-Month Average Temperature above Normal is the probability, expressed as a percent, of above normal categories of 3-month mean temperature at lead-times ranging from ½-month to 12-1/2 months.

- **NDFD Grid Availability:** *The Climate Prediction Center (CPC) issues these 13 outlooks simultaneously once a month on the third Thursday of the month at around 8:30 a.m. Eastern local time. CPC will issue the 13 outlooks with lead times from 0.5 months to 12.5 months. For example, in mid-January, CPC will issue Three-Month Outlooks for February through April, March through May, April through June, and so on to February through April of the following year.*
- **Collaboration Threshold:** *N/A.*

Three-Month Average Temperature below Normal is the probability, expressed as a percent, of below normal categories of 3-month mean temperature at lead-times ranging from ½-month to 12-1/2 months).

- **NDFD Grid Availability:** *CPC issues these 13 outlooks simultaneously once a month on the third Thursday of the month at around 8:30 a.m. Eastern local time. CPC will issue the 13 outlooks with lead times from 0.5 months to 12.5 months. For example, in mid-January, CPC will issue Three-Month Outlooks for February through April, March through May, April through June, and so on to February through April of the following year.*
- **Collaboration Threshold:** *N/A.*

Three-Month Total Precipitation above Normal is the probability, expressed as a percent, of above normal categories of 3-month total precipitation at lead-times ranging from ½-month to 12-1/2 months.

- **NDFD Grid Availability:** *CPC issues these 13 outlooks simultaneously once a month on the third Thursday of the month at around 8:30 a.m. Eastern local time. CPC will issue the 13 outlooks with lead times from 0.5 months to 12.5 months. For example, in mid-January, CPC will issue Three-Month Outlooks for February through April, March through May, April through June, and so on to February through April of the following year.*
- **Collaboration Threshold:** *N/A.*

Three-Month Total Precipitation Below Normal is the probability, expressed as a percent, of below normal categories of 3-month total precipitation at lead-times ranging from ½-month to 12-1/2 months.

- **NDFD Grid Availability:** *CPC issues these 13 outlooks simultaneously once a month on the third Thursday of the month at around 8:30 a.m. Eastern local time. CPC will issue the 13 outlooks with lead times from 0.5 months to 12.5 months. For example, in mid-January, CPC will issue Three-Month Outlooks for February through April, March through May, April through June, and so on to February through April of the following year.*
- **Collaboration Threshold:** *N/A.*

Total Probability of Extreme Severe Thunderstorms (Day 2 and Day 3) is the probability in percent of EF2 ([Enhanced Fujita scale 2](#)) tornadoes, damaging winds with speeds greater than 75 miles per hour, or large hail two inches or greater in diameter occurring within 25 miles of any point during the outlook period.

- **NDFD Grid Availability:** *Day 2 grids are produced by SPC at 0700 UTC (0600 UTC during Daylight Savings Time) and 1730 UTC. Day 3 grids are produced by SPC at 0830 UTC (0730 UTC during Daylight Savings Time). The grid is composed of two projections.*
- **Collaboration Threshold:** *N/A.*

Total Probability of Severe Thunderstorms (Day 2 and Day 3) is the probability in percent of tornadoes, damaging winds with speeds greater than 58 miles per hour, or large hail three quarters of an inch in diameter (penny-size) occurring within 25 miles of any point during the outlook period.

- **NDFD Grid Availability:** *Day 2 grids are produced by SPC at 0700 UTC (0600 UTC during Daylight Savings Time) and 1730 UTC. Day 3 grids are produced by SPC at 0830 UTC (0730 UTC during Daylight Savings Time). The grid is composed of two projections.*
- **Collaboration Threshold:** *N/A.*

Appendix B - 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 requirement needed in the local WFO database for the production of the local text products (requiring local time). Derived fields are indicated by the “*” symbol.

NWSI 10-201 OCTOBER 23, 2009

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 | 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 | 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 temperature | | | | A | | | | A | | | | A | | | | A | | | A | | | A | | 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 |
| Dewpoint | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | 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 | | | | | | | | | | | | | | | | | | |
| 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 | | | | | | | | | | | | | | | | | | |
| Probability of Precipitation (12h)* | | | | A | | | | A | | | | A | | | | A | | | | A | | | | A | | A | 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 |
| 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 |
| 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 | | | | | | | | | | | | | | | | | | |
| Weather (type, intensity, 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 |
| Quantitative Precipitation | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | | | | | | | | | | | | | | |
| Snow Amount | | A | | A | | A | | A | | A | | A | | A | | | | | | | | | | | | | | | | | | | | | | | | | | | |

A - Required minimum threshold for NDFD

NWSI 10-201 OCTOBER 23, 2009

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 | 2 | 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 | | | | X | | | X | | | | X | | | | | | | | | | | | | | | | | | | |
| 20 Foot Wind* | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | A | | | | | | | | | | | | | | | | | | |
| Haines Index (HI) | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | X | | | | | | | | | | | | | | | | | | |
| Mixing Height (MI) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | |
| Transport Wind (TW) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | |
| Lightning Activity Level (LAL) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | | | | | | | | | | | | | | | |

A - Required minimum threshold for NDFD Initial Operating Capability (IOC)

X - Proposed for experimental dissemination

* Derived field

NWSI 10-201 OCTOBER 23, 2009

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 | 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 | 102 | 108 | 114 | 120 | 126 | 132 | 144 | 156 | 168 | | | | |
| Significant Wave Height | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | A | | | | | |
| Visibility | | | | X | | | | X | | | | X | | | | X | | | | X | | | | X | | X | | X | | X | | X | | X | | | | | | | |

A - Required minimum threshold for NDFD IOC (Note: in AR, Significant Wave Height grid availability is every 12 hrs)

X - Proposed for experimental dissemination