

## Analytics – for Fire Support

What is available, where is it located, who can help provide support to the various requests that may come in for analytical support. Regional and National level coordination is occurring and being worked out on how mobilization will occur this field season. With that in mind those efforts could be changing throughout the season. This document provides reference to analytical information that can be used at various stages throughout the fire season to support decision making.

### Preseason –

Share information and technology with resources to gain familiarity of the products and how the mobile applications can assist field personnel when/if they are mobilized.

### Mobile Applications – load and familiarize

- [Fire Weather Calculator App](#) - weather calculation and archival system that allows multiple means of sharing data.
- [WindNinja mobile](#) – powerful mobile application for predicting wind fields in complex terrain.
- [Wildfire analyst](#) – mobile application with operational fire behavior tools for use in the field.
- [RealEarth mobile](#) – access to real-time imagery and data products, including global and regional remotely sensed atmospheric, terrestrial, and oceanographic imagery, observations of local meteorological parameters and short-range predictions of future conditions.
- [Fire Weather Alert System](#) – Experimental, could crash without more hardware. An alert system that sends text/email for specified weather conditions in a specific area.
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[Fire Behavior Field Reference Guide](#) – describes a range of practices by which fire behavior assessments are conducted for fireline leadership in the field including:

- [Drought Assessments](#)
- [Fire Season Climatology](#)
- [Fire Assessment](#)

### Seasonal Assessment Tools – short/mid and long term

- Long range – seasonal assessments or drought indicators
  - [Evaporative Demand Drought Index \(EDDI\)](#) – is an experimental drought monitoring and early warning guidance tool. It examines how anomalous the atmospheric evaporative demand (E0; also known as "the thirst of the atmosphere") is for a given location and across a time period of interest.
  - [Standardized Precipitation Evapotranspiration Index \(SPEI\)](#) – can measure drought severity according to its intensity and duration, and can identify the onset and end of drought episodes and allows comparison of drought severity through time and space, since it can be calculated over a wide range of climates.
  - [Evaporative Stress Index \(ESI\)](#) – describes temporal anomalies in evapotranspiration (ET), highlighting areas with anomalously high or low rates of water use across the land surface. Can capture early signals of “flash drought”, brought on by extended periods of hot, dry and windy conditions leading to rapid soil moisture depletion.

- [Standardized Precipitation Index \(SPI\)](#) – is the number of standard deviations that the observed value would deviate from the long-term mean. Since precipitation is not normally distributed, a transformation is first applied so that the transformed precipitation values follow a normal distribution.
  - [Quantitative Precipitation Estimate \(QPE\)](#) – shows spatial distribution of precipitation. Using a multi-sensor approach, it is one of the best sources of timely, high resolution precipitation information available.
  - [NOAA Climate.gov](#) – is a source of timely and authoritative scientific data and information about climate. It provides news items, maps and data, and teaching resources.
  - [Western Water Assessment](#) – Provides situational awareness of climate, drought, and water resources for the Intermountain West.
  - [Drought Monitor](#) – National Drought Mitigation Center - weekly assessment of drought conditions across the United States.
  - [National Integrated Drought Information System](#) – repository of drought related monitoring and forecasting tools.
  - [National Drought Mitigation Center](#) – repository of drought related monitoring and forecasting tools.
  - [River Forecast Centers](#) – NWS Advanced Hydrological Prediction Services provides depictions of river flows and flooding; rain and snow fall in graphic and digital formats.
  - [Climate Prediction Center](#) – NOAA - NWS CPC delivers real-time products and information that predict and describe climate variations on timescales from weeks to years thereby promoting effective management of climate risk and a climate-resilient society.
  - [Climate at a Glance](#) – NOAA's National Centers for Environmental Information Climate monitoring and assessment of the state of the Earth's climate in near real-time, trend following down to the state and county level.
- Mid-range assessments
    - [Wildland Fire Assessment System \(WFAS\)](#) – for a dynamic fire danger map, fuel moisture, and drought information. The “Severe Fire Weather Potential Mapping System” is a quick and easy way to see a spatial map of potential fire behavior across the Lower 48. Spatial representation of nation-wide indices (sorry Alaska and Hawaii) is handy and the color ramp is very intuitive.
      - Monitoring and tracking live and dead fuel moisture content on your unit provides daily, weekly, monthly, and seasonal tracking capabilities to support fire danger calculations and fire behavior predictions.
    - [National Predictive Services](#) – leads you to the GA Predictive Service Pages and outlooks.
    - [NWS/NOAA](#) provides access to a range of forecast and outlook products.
    - [Climate, Ecosystem and Fire Applications](#) – Repository for quick links to numerous short and long term assessment product of fire potential, risk and severity.
    - [ForWarn](#) - provides near-real-time tracking of vegetation changes across landscapes in the United States. Useful for both monitoring disturbance events as well as year-to-year variability, derived products can also be used to develop insights into seasonal and inter-annual dynamics.

- Short range assessments
  - The [Hot-Dry-Windy Index \(HDW\)](#) was designed to help users determine which days are more likely to have adverse atmospheric conditions that make it more difficult to manage a wildland fire. It combines weather data from the surface and low levels of the atmosphere into a first-look product.

### Initial Attack – Monitoring Initial Detection and Prioritization

- How to manage or gather intel beyond normal operations – such as lookouts, air attack, aerial recon flights, etc.?
  - [WFDSS](#) – Detailed incident content and regional intelligence information - Modis/VIIRS available within the application along with many other useful decision making resources
    - Fire history, fire location, values inventory, fuels profiles, costs, weather, etc.
    - Support to field operations specialist as intelligence and situation awareness platform could be bolstered pre-season.
  - Consider preemptively hosting single resource SOPL/LTANs at specific dispatch centers based on current or expected fire load to assist in localized prioritization and fire weather and behavior intelligence gathering.
  - [Fire Enterprise Geospatial Portal](#) – the authoritative source of standardized geospatial information for the full range of wildfire activities ranging from response to planning.
  - [MODIS, VIIRS, GOES](#), and Firehawk IgPoint – satellite derived Fire Detections (available outside of WFDSS).
  - [National Infrared Operations \(NIROPS\)](#) – Interpreted Infrared Products may be produced to support incident specific needs. Ordering process highlighted on NIROPS webpage.
  - [GOES 16/17 information](#) – Several NWS forecast offices have leveraged GOES-16 era technology to provide real-time notifications of emerging wildfires and is proving to be an invaluable asset in detecting wildfires and helping forecasters provide proactive tactical decision-support services. [An overview of how it can be used from 2016 fire season.](#)
- Multiple fire starts across your unit/Region – how to prioritize – what tools to use or other assessments to guide decision making
  - Use [FSPro](#) analysis with baseline information found in [WFDSS](#) to determine the probability given time of year and fire environment conditions.
    - Use additional tools to inform initial response
      - Potential Control Locations, Spatial Fire planning, Suppression Difficulty Index (see RMA discussion below)
    - Refer to seasonality and current fire environment utilizing tools highlighted above to further assess duration of the season, resource availability, timing for actions etc.
  - Use [WFDSS](#) to assess fire history in the area.
  - Consider preemptively hosting single resource SOPL/LTANs at specific dispatch centers based on current or expected fire load to assist in localized prioritization and fire weather and behavior intelligence gathering.
  - Work with National Weather Service / Predictive Services to assess current weather patterns and mid and long range forecasts and outlooks.

- Refer to Quantitative Risk Assessments to guide decision making processes (state portal examples [Oregon Explorer](#) and [CO-WRAP](#))

## Extended Attack – WFDSS Modeling and Team/Long-duration Fire Support

- WFDSS
  - [Short Term Fire behavior](#) – is a quick way to get an idea of potential fire spread from a point location starting with a single fuel moisture input and a static windspeed and direction (set by user and gridded by the model) for the user-defined burn period(s).
  - [Near Term Fire Behavior](#) – produces outputs that represent modeled growth in the form of a fire progression. Unlike Short-Term Fire Behavior, NTFB models fire behavior using inputs for weather and wind that change over the duration of the simulation.
  - [FSPro Analysis](#) – models a fire using historical weather, a forecast, and thousands of artificial seasons to create a fire probability surface to aid in determination of intersection of probability and values of interest.
- Consider ordering a Long Term Analyst (LTAN), and/or Strategic Operational Planner (SOPL) to assist with decision documentation, and analytical support.
- Refer to the standup Decision Support Center SOPs document for guidance on establishing a decision support center – Attached
- Consider concept of Remote Situation Unit establishment. Preseason work should be completed at the GACC operations and coordination center level to develop SOPs for coordination, data standards, and utilization. – contact Billy Phillips [william.a.phillips@usda.gov](mailto:william.a.phillips@usda.gov), Morganne Lehr [morganne.lehr@usda.gov](mailto:morganne.lehr@usda.gov)
- [Work with the Regional Geographical Area Editor](#) – Geographic Area Editors have author privileges and ownership of all WFDSS incidents within the geographic area (GA) he/she is assigned. Generally they are well versed in fire behavior modelling programs.
- [Wildland Fire Management Research and Development Program](#) – this program can assist with decision support, analytical support and help coordinate Regional or National Decision Support virtually or onsite as determined necessary. For assistance call: 208-387-5253.
- Zoom to the fire area on the [firelibrary.org](http://firelibrary.org) and look at previous large fire history, fire progressions, long-term assessments, case studies and investigations, and critical fire weather information.
- [Risk Management Assistance \(RMA\)](#) – assist line officers and incident commanders with the decision making tools, enhanced analytics, and alignment with response strategies needed for making risk informed choices when managing wildfires. For additional information contact:

Further information on RMA products and delivery mechanisms are available via the [RMA Dashboard](#) and [RMA Sharepoint Site](#).

- Incident Timeline –visual depiction of fire size, cost, personnel, percent containment, strategy, and other metrics for easy comparison during the life of the fire.
- Resource Timeline - similar to the incident timeline, but it visually depicts resource type by date. The product can be used by incoming teams and overhead to get a quick overview of the number and type of resources and how they trend with fire size, cost, etc.
- Management Direction Alignment Table - *Are the strategic objectives (from the L/RMP), incident objectives, WFDSS course of action, leader's intent, and the incident action plan in alignment?* - compares and highlights misalignment between direction provided in the L/RMP, Incident Objectives and Requirements, Delegation of Authority/Leader's Intent, Course of Action and the Incident Action Plan (IAP).

- Course of Action, Trade-off Analysis Exercise Template and/or Facilitation - *What is the best strategy or course of action (COA) for management of this fire?* - The intent of the TOA is to develop a range of potential Courses of Action (COA) representing a broad spectrum of potential response options and rate them regarding how well they addressed: a) firefighter exposure, b) public safety and c) values affected by the fire.
- Aviation Use Summary - *What is the exposure (accident expectation) related to this level of aviation engagement?* - intended to enhance decision makers' abilities to quantify and track aviation exposure through time, including the ability to account for accident expectation associated with relatively minor levels of repeated aircraft use over a long duration incident.
- Suppression Difficulty Index (SDI) - *Where on the landscape do opportunities exist to mitigate hazards to fire responders?* - a spatial representation of potential for wildfire exposure tempered by our ability to mitigate that hazard, taking into account potential fire behavior, accessibility (vehicular and on foot), fireline production rate, and availability of fuel breaks/fuel treatments.
- Potential Control Location (PCL) - shows where there is high or low landscape suitability for fire containment helping define where fires are most likely to be contained and where they are mostly to continue to spread.
- Season-ending Analysis (not available in Alaska) - *When will the fire season end?* - A season-ending event consists of a fire-stopping—sometimes referred to as a fire-slowng event(s)—followed by a persistent combination of environmental factors that mark the end of the fire season. Product uses 18 years of gridded weather data and instead of the nearest Remote Automated Weather Station, it is based on the most recent fire perimeter making much less subjective than the traditional approach.
- Snag Hazard Map - *Where can firefighters safely mop up with the least amount of exposure from dead trees?* - are intended to show areas of relative hazard from dead, standing trees utilizing a national dataset and mathematical relationship between actual plot data and landscape characteristics to produce a wall to wall dataset.
- Ground Evacuation Map (not available in Alaska) - *What is the evacuation time to evacuate resources by ground to a hospital?* - estimates include walking speeds when traveling off-road adjusted for slope and vegetation type, and driving speeds based upon estimated speeds for the roads traveled. The intent of this layer is to encourage thoughtful decisions about the risks being transferred to firefighters and how to mitigate those risks.
- Exceedance Probability Curves (available only if the geographic area has a quantitative wildfire risk assessment that can be combined with an adequate FSPro run) - *Is there a quantitative way for our Forest, area command, or geographic area to prioritize our limited resources based on values at risk?* - Exceedance Probability (EP) Curves allow for the comparison of incidents relative to one another with regard to likely outcomes (i.e., positive vs. negative). Information to develop the curves comes from regional Quantitative Wildfire Risk Assessments (QWRA) (where available) and Fire Spread Probability (FSPro) output.

Additional information – Contact Tami Parkinson – [tami.parkinson@usda.gov](mailto:tami.parkinson@usda.gov); Rick Stratton [richard.stratton@usda.gov](mailto:richard.stratton@usda.gov) – If you need immediate assistance: [208-387-5253](tel:208-387-5253).