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

- 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.
- 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.

- 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, POD's, Snag Hazard, PCL, Safe Separation Distance 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 probabilities of a fire or multiple fires to impact specific areas of concern given time of year and fire environment conditions.
  - WFDSS is also a place to evaluate Potential Operational Delineations (PODs), Snag hazards, Safe Separation Distance, fire history, fuel treatments, heat detections etc to obtain strategic awareness around the incident or incidents being supported.
    - Refer to seasonality and current fire environment utilizing tools highlighted above to further assess duration of the season, resource availability, timing for actions etc.
  - 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-lang-range forecasts and outlooks.

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

- WFDSS
  - FSPro Analysis – models a fire using historical weather, a forecast, and thousands of artificial seasons to create a fire probability output to aid in determination of intersection of probability and values of interest.
  - Short Term and Near Term Fire Analysis are being built for WFDSS Nextgen, these products are available as desktop applications (Farsite, FlamMap) in the meantime.
    - Short Term Fire behavior (FlamMap) – 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.
- Consider ordering a Long Term Analyst (LTAN), and/or Strategic Operational Planner (SOPL) to assist with decision documentation, and analytical support.
- Consider standing up a Decision Support Center (DSC) either interagency at the GACC, or more localized to support specific units; SOP's have been developed for the various GACC's. Work with one of the Geographical Area Editors's supporting your GACC to initiate a DSC.
- Consider utilizing a Remote Situation Unit Team (RIST). A Remote Incident Support Team (RIST) is designed to augment, support, and enhance Incident Management Team (IMT) capacity. The RIST is led by a Coordinator that brings in support staff from functional areas as needed to help serve incident needs. Support services include: SITL, GISS, PSC, SCKN, and many more. Preseason work should be completed at the GACC operations and coordination center level to develop SOPs for coordination, data standards, and utilization. See the RIST site for contact info and list of full support services.
- Coordinate with the Geographic Area Editors for your GACC. They can help with updating user profiles, assist with fire modeling and decision support documentation within the application along with many fire support questions.
- 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.
- Risk Management Assistance (RMA) – RMA Dashboard consists of websites hosted within a Storymap platform to aide fire managers, line officers, incident management teams etc with information gathering in one place. The following bullets represent some, but not all of the content hosted on the RMA site. This site is to be used for information gathering, to assist with conversations, and to help with strategic and operational awareness. If the content is used to support specific incident decision making be sure to provide that narrative within the associated decision documentation within WFDSS.
  - Map Viewer – is a comprehensive database including but not limited to: Perimeter data, detections, NWS data and warnings, housing density, POD's, Suppression Difficulty maps, fuels layers etc.
    - 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.

- 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.
- Potential Operational Delineations (PODs) are spatial fire management units developed collaboratively by fire, land and resource managers to align fire response and fire management opportunities.

- Map Viewer and ISAP, resource identification developed within the ISAP map platform can be viewed from RMA, in addition it is served up to WFDSS for use during the decision process.
- Timeline Generator –visual depiction of fire size, cost, personnel, percent containment, strategy, and other metrics for easy comparison during the life of the fire.
- Significant Fire Potential – Predictive Services 7-day forecast model for fire potential.
- 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.
- 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-slowing 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.
- Zoom to the fire area on the firelibrary.org and look at previous large fire history, fire progressions, long-term assessments, case studies and investigations, and critical fire weather information.

Additional information – Contact Morgan Pence – morgan.pence@usda.gov; Rick Stratton richard.stratton@usda.gov – If you need immediate assistance: 208-387-5253.