



Fire Science: Quick Takes

Fire Behavior Modeling and Decision Support Systems

There are a variety of new powerful applications available for modeling fire behavior, planning fuel treatments, and supporting fire management decision-making. Below are brief descriptions of a few of the major programs or systems. Interested readers are encouraged to dig more into the resources listed at the end of this fact sheet.

ArcFuels

ArcFuels is used to rapidly design and test fuel treatments at the stand and landscape scale via linkages to models such as FVS-FFE, SVS, FARSITE, FlamMap, Nexus, and FVS within a spatial interface. The system was specifically designed to accelerate Fireshed/SPOTS analyses for fuel treatment planning. The ArcMap framework helps specialists leverage local data to address project-specific issues that typify many fuel treatment projects.

BEHAVE

BEHAVE is a system of interactive computer programs for modeling fuel and fire behavior. It has been in use since 1984 and was replaced by BehavePlus.

BehavePlus

The BehavePlus fire modeling system is a PC-based program that is a collection of models that describe fire behavior, fire effects, and the fire environment. It replaced BEHAVE. It is a flexible system that produces tables, graphs, and simple diagrams and can be used for a multitude of fire management applications. BehavePlus is the successor to the BEHAVE fire behavior prediction and fuel modeling system. It is called the BehavePlus fire modeling system to reflect its expanded scope.

FARSITE

FARSITE is a fire growth simulation model. It uses spatial information on topography and fuels along with weather and wind files. It incorporates the existing models for surface fire, crown fire, spotting, post-frontal combustion, and fire acceleration into a 2-dimensional fire growth model. FARSITE users must have the support of a geographic information system (GIS) to use FARSITE because it requires spatial landscape information to run.

FlamMap

FlamMap is a fire behavior mapping and analysis program that computes potential fire behavior characteristics (spread rate, flame length, fireline intensity, etc.) over an entire FARSITE landscape for constant weather and fuel moisture conditions. FlamMap can be thought of as a “spatial BehavePlus” because it simply makes BehavePlus-like fire calculations (for one instant in time) for all points on a

landscape or analysis area using one set of wind or fuel moisture conditions. FlamMap software creates raster maps of potential fire behavior characteristics (spread rate, flame length, crown fire activity, etc.) and environmental conditions (dead fuel moistures, mid-flame wind speeds, & solar irradiance) over an entire FARSITE landscape. These raster maps can be viewed in FlamMap or exported for use in a GIS, image, or word processor. FlamMap is not a replacement for FARSITE or a complete fire growth simulation model. There is no temporal component in FlamMap. It uses spatial information on topography and fuels to calculate fire behavior characteristics at one instant.

FlamMap Minimum Travel Time (MTT)

FlamMap's Minimum Travel Time (MTT) is a (PC-based) two-dimensional fire growth model that calculates fire growth and behavior by searching for the set of pathways with minimum spread times from a point, line, or polygon ignition source, keeping environmental (fuel moistures and winds) conditions constant for the duration of the simulation.

WFDSS - FSPRO – Fire Spread Probability Model.

WFDSS-FSPRO is a spatial model that calculates and maps the probability of fire spread, in the absence of suppression, from a current fire perimeter or ignition point for a specified time period. Combining data layers that include, the standard fuel models (13 or 40), current weather projections, historical weather scenarios, fuel moisture classifications, and wind speed and direction, FSPRO can project probabilities of fire spread in specified increments, 7, 10, 14, 30, 90 days. It is not a fire perimeter like a FARSITE map. FSPRO helps managers prioritize firefighting resources based on probabilities of fire spread. The model helps to assess a fire's growth potential. Managers can then match up appropriate strategy, tactics and resource allocations. It can also aid in communications with affected partners and the public.

WFDSS-RAVAR – Rapid Assessment of Values at Risk

WFDSS-RAVAR is also a spatial model, showing the primary resource values to be protected and/or at risk by ongoing large fire events. The program can be directly integrated with the WFDSS-FSPRO model to identify the likelihood of different resources being threatened. The most important data layer generated by the WFDSS-RAVAR model is the structure layer using local parcel records, but WFDSS-RAVAR is not limited to the assessment of threatened structures. Any resource value that has been spatially mapped may be included within a WFDSS-RAVAR assessment including power lines, road networks, gas pipelines, recreation facilities, sensitive wildlife habitat, cultural heritage sites and municipal water intakes. WFDSS-RAVAR assists fire managers in the prioritization of firefighting resources based on values to be protected segmented by the risk categories from WFDSS-FSPRO.

Resources

Western Wildland Environmental Threat Assessment Center – WWETAC has been at the forefront of developing ArcFuels and more information on the program can be found here.

<http://www.fs.fed.us/wwetac/arcfuels/index.html>

Fire.org – A website with comprehensive resources on programs such as FARSITE, BehavePlus, and FlamMap. <http://www.fire.org/>

Missoula Fire Sciences Laboratory – The Missoula Fire Lab website has great information on many fire science applications including many of the programs and systems described above.

<http://www.firelab.org/content/view/873/376/>

Advances in Fire Practice is a sub-site of wildfirelessons.net and is focused on bringing efforts and ideas to the forefront that leaders in the fire management, practice, and research communities have identified as innovative and widely applicable. It provides access to critical and proven fire information and resources. Advances in Fire Practice section can be reached directly by going to <http://www.wildfirelessons.net/AFP.aspx> or through the main Wildland Fire Lessons Learned Center website at www.wildfirelessons.net.

The Wildland Fire Lessons Learned Center actively promotes a learning culture for the purpose of enhancing safe and effective work practices in the entire U.S. wildland Fire community. It is located at the National Advanced Fire & Resource Institute in Tucson, Arizona.

