**TFRSAC Breakout Session – “Futuring”  
May 2016**

**Group 1 – Pre-Fire / Fire Behavior Modeling**

Sean Triplett (lead)

**Key data inputs for Pre-Fire**

* **Weather**
  + Wind
  + Solar Radiation (how much is the sun drying out the fuels)
* **Fuels**
  + Need higher resolution on fuels (higher granularity)
  + Increased temporal Frequency

**Other things to consider**

* **Culture**
  + Retirement (?)
  + Public
  + Prevention
  + Cohesive strategy
  + Long term view
  + Performance metrics
  + Smokey Message

**Key data inputs for Fire Behavior**

* **Physics**
  + 72 Spread
  + Weather
  + Calibration
  + Validation
* **Real-time Empirical Updates**

**Three R&D Objectives / Improvements**

1. Verify and calibrate models w/ empirical real-time updates
2. Long term objective thinking / views
3. Increased observation with requirements
   1. M.E.D. (?)
   2. N.E.X. (?)
   3. Collaboration (?)

Serving ~~all~~ critical data for use

**Group 2 – Active Fire**

Tom Mellin (lead)

**Talking points**

**In General**

* What is not seen with a given sensor? Sensor limitations need to be communicated to the field uses.
* Need improved locational accuracy/resolution of satellite sensor mapping products – rivers/ridges/roads
* Synthesis of various sensors (Sensorweb?) – reduce the time lag and effort required to integrate information from different sensors to accommodate: diff resolutions – spatial, spectral, temporal and provide in a single access point easy to get (e.g., EGP)
* Political issues regarding different acreages and perimeters. How do we overcome this?
* Target audience Ops vs Plans, maps, GIS data vs images  
  *Need to understand the target audience to tailor information (products and decision support tools)*
* Data/sensor fusion – apply machine learning to resolve discrepancies between sensors and leverage synergies from combining sensors. Then customize products for different users (bandwidth to the field). Not just automation but decision support. Needs to be scalable to all incidents.

**Terrestrial –based sensors and change detection**

* Increase frequency of information/repeat observations increased temporal resolution to support fire modeling and calibration as well as fire growth
* Sensors using the 1-2 µm band – better location of fire, and ability to detect smaller fires. Why not use this in addition to 3-5 µm

**Unmanned Aircraft Systems (desired improvements)**

* Safe integration into fire operations.
* Technology – collision avoid/see & avoid (ADSB) as well as improved regulatory guidelines and ease of access to National Air Space.
* Increase duration and range
* payload configurations – 1-2 and 3-5 µm and others
* start with night ops to reduce conflicts
* day/night operations

**Spaceborne Assets**

* geo-synchronous high resolution satellite(s) configured for fire mapping – technology vs budget limitations
* Or large constellation (like Skybox) geared towards fire mapping. Partnerships with Google or Apple

**Airborne Assets**

* Civil air patrol – add sensors for fire mapping

**Group 3 – Post-Fire**

Lorri Peltz-Lewis and Susan Goodman (co-leads)

**Ecological Context/Climate Change Research:**

Where we should go is an ecological context – severity in one region is vastly different from another. Fire Ecology and Remote Sensing needs to be cross walked to support this analysis further. Species integration – Sage Grouse, etc.

**Degradation of the site** – health hazards, mud flows, etc. how can remote sensing be used.

**Climate change** – post fire what does this do on the ground? Challenges there.

**Suppression** – accurate fire history – final perimeter and severity within (Todd Hawbaker USGS study – get from Susan), need additional data on this, changing fire regimes 20 years ago, 5 years ago. Todd’s analysis is good to look back.

**Decision Support/Modeling Improvement**: RS for DS – any time we detect fire we suppress it and put it out. When a prescribed or controlled burn can be positive.

**Effectiveness** - fuels treatment (prescribed fire), effectiveness of the rehab of the fire; suppression and how it impacts the rehab.

**Sensitivity analyses** on how well a model did – is it the data, fuels, weather that impacted the outputs – did they match what we observed in the field?

**Values at Risk** – is there something we can do post fire

**What is the correct model to use** – who is comparing these, what models work where, how do they work, what are the unique problems with those models? Where did the models come from, what algorithms were used, identify tools to fix or update the models,

**BAER team work** – fire and fuels datasets from coast to coast, once it burns then it is out of date. We have ignition points – we know where they started, but we don’t know where they burned.

**Technology Options:**

**Platforms UAV and small satellites** – how can you use large numbers of small satellites to observe the earth for every 15 mins or hourly? Can get 25 m resolution – better than this would be a UAV.

**Hawkeye Program** – post incident forensic analysis quality of the data, false positives, what caused it, size of fire when report went out, some analysis is high, needs to know minimum fire size. Susan – analysis on the coast lines is good, but internal country is problematic, topography, ground truthing, world-wide applications exist as well.

**Sensing modalities** – spectral, spatial, designing processing chips for nats (SP?), UAS development – 30 m vs 3 cm. Now we have millions of leads – lots of spectral and spatial.  Timeliness associated with UAV – controlling the sensor. Sage Grouse applications – and ecological context of fire.

**Burn Severity remote sensing** – NASA intern – damage assessment (Chris Cole BLM),

**Suppression** – accurate fire history – final perimeter and severity within (Todd Hawbaker USGS study – get from Susan), need additional data on this, changing fire regimes 20 years ago, 5 years ago. Todd’s analysis is good to look back.

**Group 4 – Fire Detection & Reporting**

Jana Luis (lead)

**Current capabilities**

* Detection methods includes lookouts, cameras, phones, Hawkeye and classified information from DOD.
* Reporting methods same as above plus notifications from Igntion Point database to those who have access to Hawkeye (detection & reporting)

The consensus of the group is that the current method for detecting and reporting fires works for urban areas. Improved technology is needed in the rural and wildland areas. The current Hawkeye detection and reporting program is distributed to several agencies, **however, the program needs to receive feedback from the users to better the services.**

The focus for TFRSAC for the next three years depends, in part, on user feedback on Hawkeye. Once feedback is received, and if it is determined that the program has value, then improvements or adjustments to Hawkeye can be made. This breakout group felt that once the detection and reporting system was well established, that the focus should then be on monitoring. **Monitoring should consist of near real-time fire perimeters.**

The group did chase rabbits on technology and classified versus unclassified information and tried very hard to stick to the purpose of breakout for wildfire detection and reporting.