ASSIGNMENT AS A FIRE BEHAVIOR ANALYST IN ALASKA

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INTRODUCTION

In early July of 1997, I was assigned to the Inowak Fire in southwest Alaska as a Fire Behavior Analyst (FBAN). The fire started late in June in a Limited Suppression Zone southwest of McGrath, but on July 4 & 5 it made major runs toward three native villages on the Kuskokwim River. On July 6th, a short Type II team was put together from the overhead pool at Ft. Wainwright and arrived in the village of Red Devil on July 7th. The fire was then over 100,000 acres, but was at least 20 miles from any of the villages. Over the next 20 days, the fire grew to almost 500,000 acres, and the original 12-person team expanded to 300 firefighters in 3 camps.

All firefighters from outside Alaska are initially sent to the "pool" at Ft. Wainwright to await assignment and receive an excellent "Alaska briefing". This briefing covers everything from local culture to fire behavior, suppression strategy, and tactics. We were also issued a "Handy-Dandy", a fireline handbook for Alaska, which proved to be invaluable. The following are some of the interesting and essential parts of the assignment from my view as an FBAN on the Inowak Fire.

TERRAIN

The fire occurred in rolling hill terrain, with the lowest elevations at 200-feet along the Kuskokwim River and the higher ridges approaching 2000 feet. The black spruce/feathermoss and hardwood fuel types were found on the well-drained slopes up to approximately 1000-foot elevations and occurred in pure stands or in various mixtures. The shrub tundra occupied the ridges above 1000-foot while white spruce existed almost exclusively in the poorly drained flats along the major rivers.

FUELS

The black spruce fuel type in Alaska by far provides the region's most spectacular fires, and over 95% of the Inowak fire's spread occurred in fuels where black spruce was present. Pure stands of black spruce were modeled using NFFL model 9 adjusted by 1.21 for ROS and NFFL model 5 for flame length. In the Canadian Fire Behavior Prediction System (FBP), it is represented by fuel model C-2.

Shrub tundra that occurred on the ridgetops consisted of a thick mat of low shrubs & mosses. Walking across these areas felt like walking on a mat of 12" foam rubber. FBP fuel model C-1 predicted ROS very well even though the tundra lacked the scattered black spruce in the fuel model.

Upland Hardwoods were still green and would not carry fire unless there was a component of black spruce in the stand. The mixed hardwood/black spruce stands were modeled very well by the FBP model M2, Boreal Mixedwood - Green. This model was convenient because it allows one to change the proportions of black spruce. There is a linear relationship between the ROS and proportion of black spruce in the stand so calibrating this model can be easily done from aerial reconnaissance.

White spruce stands were present along the Kuskokwim River but did not contribute to the fire's behavior. Some spotting did occur into the edge of this fuel near the village of Stony River, but the spot fires would not sustain their activity.

WEATHER

Southwest Alaska was experiencing a severe drought because of low winter snow pack and below-average spring rains. Typical burning conditions were temperatures in the 65-75°F range and relative humidities (RH) of 35-50%. Gradient winds were almost always moderate, seldom exceeding 10 mph at the ridgetop Micro-RAWS station. However the occasional thunderstorm downdrafts did cause some spectacular runs for several hours.

THE SCALE OF THINGS

Time and space in Alaska are different. Being the first resources on a fire that is already over 100,000

acres can be overwhelming. Our team was responsible for one flank of the fire that encompassed over 60 miles of perimeter, but the fire was 20 to 30 miles from any areas of concern when we arrived. Rates of spread can be equally large, and in black spruce my predictions were usually measured in miles per day and fuel types were mapped in blocks of tens of thousands of acres. Of course, because of the vast distances involved, any travel is very time-consuming and is usually done by air. So in addition to the travel time, you need to account for the planning, organization, and delays involved in aircraft use. One might say an FBAN in Alaska needs to avoid getting wrapped up in details, but I would say that the details are just bigger. The FBAN job is not all that different, but the scale is.

FIRE BEHAVIOR

The live component of the flammable mosses is extremely responsive to changes in RH because of its high surface area/volume ratio. Moisture content time lags are very short and fire behavior reacts almost immediately to drops of RH. The drought situation also affected fire behavior; as significant activity continued to occur as humidities recovered to over 50%, which is not typical.

The major fire behavior was found in fuel types that contained black spruce. The live needle moisture content in the black spruce stays between 65% to 110%, the tree is constantly moisture-stressed and ready to burn. In a black spruce/feathermoss fuel type a ROS of 40 chains/hour was observed on July 20 with 50% RH and 6 mph eye level winds. That run ended with an hour-long rain shower. Two days later, we observed a run at the same location with ROS of 80 chains/hour and 50-100 foot flame lengths.

Even with the severe drought conditions, pure hardwood stands were not burning and served as natural barriers.

In the shrub tundra, fire spread was typically slow and often occurred by smoldering, ROS was usually 1-2 chains per day. Under these moderate conditions, this fuel could be considered a fuel break. But with drier conditions, ROS would increase and carry the fire over the narrower sections of tundra into black spruce fuels in adjacent drainages. With some moisture, the overhead team that followed was able to do suppression action in some of these "choke points" and contain large portions of the fire's perimeter with a minimum of effort.

Because of the short, moderate slopes, large ROS, and long projection times, slope did not have a significant influence on fire behavior. With daytime high temperatures seldom above 70° and short "nights", topographic and diurnal winds were not significant contributors to fire behavior.

SUPPORT

The base camp was fortunate to be located in one of the villages we were assigned to protect, and so we had limited electricity and telephone service. Because all telecommunications must go through several satellites, with modem speeds under 4800 baud and unreliable. Even voice traffic was limited because of the long delay times and limited numbers of phone lines, and I found well-composed faxes to be the best form of telecommunication.

RAWS and historic weather information were also difficult, even though the Red Devil camp had about the best facilities one can expect in Alaska. All the RAWS stations use satellite uplinks and have no radio or phone access, so access was over the Internet. Real-time data were not available because of the 3-hour uplink cycle. Soon after arriving on the fire I ordered a Micro-RAWS which was set up on a ridge at about 1000-foot elevation. This was invaluable for getting real-time weather observations outside the river bottom. Historic weather data is spotty. The RAWS in Alaska were installed in the early 1990's; manual stations prior to that were few and the data collection spotty. For the RERAP runs I made, I pieced together data from 3 different stations for 21 years of information to develop the Critical Spread and Fire Ending Event curves. After the assignment I found long term precipation data was available for many airports in Alaska through the Western Regional Climatic Center. The real trick is getting the data to a remote location in a timely manner.

WEATHER FORECASTS

Having an Incident Meteorologist (IMET) attached to the fire would have been terrific, but I'm pretty sure it would have been impossible to support an IMET in camp. Because there are only two Fire Weather Forecast offices for a state the size of the entire western US, the spot forecasts were not much better than the general fire weather forecasts. The size of the project created problems never dreamed of "down south", such as not knowing what factors caused miles of the fire perimeter to behave the way it did because no one saw it happen. Large parts of the fire would see different fire behavior at the same

time, yet from the air you couldn't discern why. Here again I think the FBAN has to learn to use less accurate weather information and forecasts.

THE ROLE OF THE FBAN

The objectives given the team from the local agency consisted of protecting the private and native property along the river corridor and only taking suppression action when necessary to protect those properties. Since the villages were not immediately threatened the overhead team had the luxury of time to evaluate the situation before taking any action. The team of twelve arrived to establish fire camp in one helicopter and began planning, prioritizing, and ordering resources.

Early in the assignment the planning chief and I realized this assignment was more like a prescribed natural fire than a wildfire and some long-range projections would be useful for logistical planning and setting priorities. So another FBAN was ordered to do the daily chores of briefings, team meetings, & weather messenger, leaving me available to take on some RERAP runs and long range issues.

While the briefing did include lots of logistics issues, it in no way prepared the team for the huge logistical undertaking that dominated the workload of all overhead on the fire. Because of logistic and travel issues, planning needed to be 5-7 days out, with everyone looking to the FBAN to predict where the fire will be and what it will be doing that far in the future. Logistics consume everyone's time and energy because that is the controlling factor in getting anything done. No one gets everything or even enough of what they need to do the job, with priorities being set and everything from firefighters to JET-A to hose needing to be planned out days ahead.

Besides predicting fire behavior, you need to stay on top of flying conditions. Since doing almost anything requires flying, inability to predict a smoke-in or low ceiling condition will really foul up things for everyone.

OBSERVING FIRE BEHAVIOR

Flying, flying, flying. With 60 miles of perimeter and no roads, it was the only way to see the fire. I spent 3-4 hours a day in an aircraft always grabbing the front seat when I could get away with it. The first week of the assignment, I also did the mapping portion of the situation unit leader job, which meant I was the only person on the fire who had the perspective of the team's entire responsibility. This really helped with the longer-term projections I had to make. Sometimes I had to settle for a fixed wing ride, which was fine for seeing which portions of the fire were active and where it had spread. But for looking at fire behavior and mapping fuels, a helicopter was the only solution. Very seldom did I get to look at the entire 60 miles of perimeter in one day, but we were getting infrared flights or military satellite information every day, which kept the surprises to a minimum. I kept a nightly standing request for a reconnaissance flight at 2200 hours to view the peak of fire activity and present an up-to-date situation report at our morning briefing.

CANADIAN FIRE BEHAVIOR PREDICTION SYSTEM

Alaska agencies use the Canadian Forest Fire Danger Rating System (CFFDRS) for fire danger rating and Canadian Fire Behavior Prediction System (FBP) for fire behavior prediction. Luckily I had used FBP93 on my FBAN training assignment the previous season in Minnesota and had a fair knowledge of how to use it. However, I didn't have any formal training in FBP, and thus lacked most of the theory behind the model. Some of the things I liked about FBP:

- The integration of the danger rating and fire prediction systems;
- putting daily weather into FBP93 then calibrates the model to the local conditions,
- effects of long term drought are modeled;
- the variable fuel models (M2, Mixedwood-Green on this fire) simplify or eliminate the need to calibrate;
- FBP has some fuel models (i.e. C2; boreal spruce, M3 and M4; dead balsam fir) which don't have any obvious NFFL counterparts;
- Drought is modeled in the fire behavior predictions.

SUMMARY

This assignment as a FBAN in Alaska provided a unique opportunity to observe and predict fire behavior, and to hone skills as an FBAN on a large, free-burning fire for almost three weeks. Live fuels are the primary carrier of fires and weather forecasts are more uncertain than in the "lower 48." One has to get used to the scale of time and space. Fire activity can be tremendous and can happen quickly, yet firefighting efforts are slow and prone to all sorts of delays. Travel is difficult, so you can't always observe the fire when you need to nor can you rely on others for information. Thinking

logistically is an important job for everyone on the fire; you can't get everything you'd like. All these things make the job frustrating and difficult, yet I found the assignment the most complex and interesting of my firefighting career.

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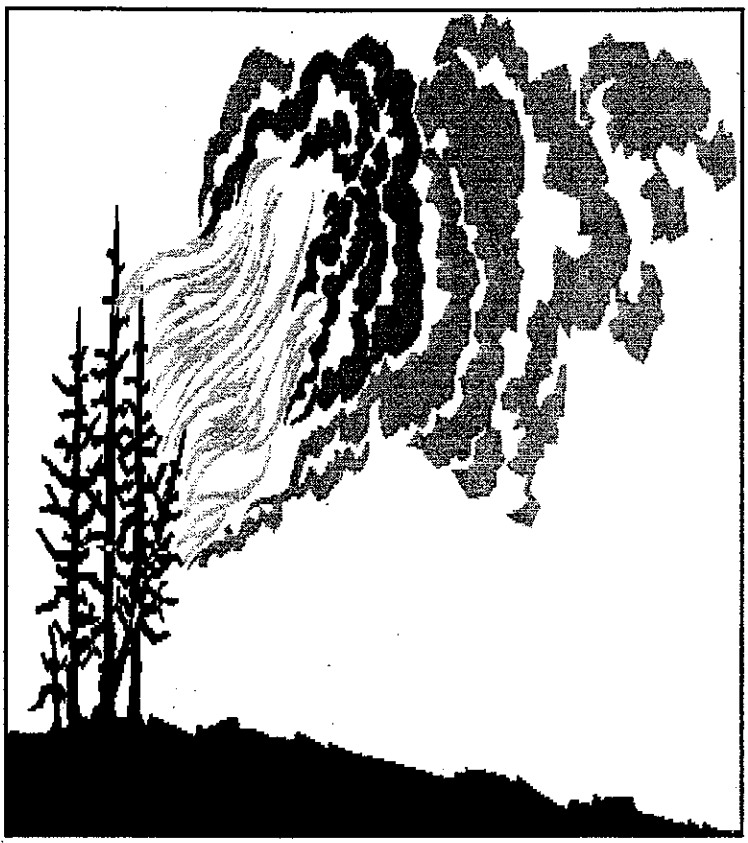

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