Alaska Fire Science Research Topics Development Process **January 7, 2011**

The AWFCG (Alaska Wildland Fire Coordinating Group) Fire Research Development and Applications Committee originally generated the "Alaska Fire Research Needs List", which is updated every 1-3 years, as a way to organize and prioritize research needs in Alaska. This year the Consortium partnered with the Research Committee to help collect and consolidate research topics, create ranking surveys, and format selected topics for submission to the JFSP Board.

The Research Committee (which consists of representatives from the Alaska Department of Fish and Game, Chugachmiut, BIA, BLM, NPS, USFS, and USFWS) re-constructed the previous 2008 list to create a new and improved document for 2011. Fire research topics and questions were solicited from the fire management and research communities at the annual Interagency Fall Fire Review in October 2010. With the help of the Consortium, over 50 topics and questions were categorized and consolidated for preliminary presentation and further solicitation at the Alaska Fire Science Consortium Workshop, held immediately following the Fall Fire Review.

After collecting new research topics, the Research Committee began the overall organization process where questions were categorized, placed under a general topic, and given a description illustrating the importance and relevance to fire management in Alaska.

During the month of December, the 27 consolidated topics were ranked by the Research Committee based on 3 criteria: direct management application, data needs, and use to multiple agencies. Each committee member also had the option to utilize a survey developed by the Consortium to poll their agency/organization for input before making a final decision. The prioritized list was then submitted to the AWFCG in January for approval. After some final adjustments, the top 5 Alaska Fire Research Needs were given to the Consortium to format for submission to the JFSP Board. The Research Committee intends to have the entire "Alaska Fire Research Needs List" ready for distribution by spring of 2011.

The AWFCG Fire Research Development and Applications Committee took this entire process very seriously and put forth extensive efforts to re-build and rank a very comprehensive and multipurpose list for Alaska. We hope that the topics submitted can be incorporated into future JFSP requests for applications as they identify the gaps in fire science knowledge and research for our region.

JFSP Research Needs – Alaska Research Priority #1 **January 7, 2011**

Topic: ***Validation of Fuel Models and Fire Behavior Modeling Tools***

More information on the 40 Fuel Models and the Canadian Forest Fire Behavior Prediction (FBP) Fuel Models is needed both spatially and as they relate to fire behavior modeling. Numerous fire modeling tools are currently being utilized by fire managers, including Fire Spread Probability (FSPro) in the Wildland Fire Decision Support System (WFDSS), but the confidence level of model outputs for Alaska is unknown. Many of these modeling tools use elements from the NFDRS yet managers in Alaska use the CFFDRS for planning and strategic/tactical decision-making.

Extensive efforts have been made to relate ecotypes used in spatially explicit LANDFIRE products to Alaskan Fuel Models (e.g., Fuel Model Guide to Alaska Vegetation, 2008). However, questions remain about the accuracy of the LANDFIRE vegetation classifications and the crosswalks between LANDFIRE and Alaskan fuel types.

Fire managers continue to encourage empirical studies to validate these fuel models against actual fire behavior. Very little research on fuel models and associated fire behavior has been conducted in wetlands, shrublands, and non-forested tundra ecosystems. Similarly, minimal information is available for fire behavior in forested ecosystems with insect and disease damage. There is a substantial need for research that will improve the knowledge of fire behavior and appropriate fuel models for these unique fuel types.

Questions:

- Fire behavior validation of the 40 Fuel Models and Canadian Fuel Models used in Alaska.
- Which fuel models should be used for non-forested tundra ecosystems and forested ecosystems with insect and disease damage? Validate these fuel models against actual fire behavior.
- What are the appropriate fuel models for early successional fuel types?
- Are fire behavior modeling tools accurately capturing drought conditions? How well do the models correlate with CFFDRS indices, fuel moisture, and observed fire behavior?
- How accurate are the LANDFIRE vegetation classifications? How accurate are the crosswalks between LANDFIRE and Alaskan fuel types?

Products:

Some anticipated products could include a fuel model validation guide book, collection of fire behavior observations with corresponding fuel models and weather conditions, and validated fuel model spatial data layers that are compatible with LANDFIRE.

Name of individual or group: Fire Research Development and Applications Committee
Affiliation: Alaska Wildland Fire Coordinating Group

JFSP Research Needs – Alaska Research Priority #2 **January 7, 2011**

Topic: ***Canadian Forest Fire Danger Rating System (CFFDRS) Fire Weather Indices – Alaskan Evaluation***

The CFFDRS Fire Weather Indices are based on empirical data from eastern red and jack pine stands. Further empirical studies are needed to determine if Alaskan fuels should have modified algorithms to better relate observed data to the CFFDRS indices. Managers across the state of Alaska strongly encourage studies that will provide guidance and a mechanism for standardization of spring start-up values for the fire danger rating indices such that they adequately reflect the effects of over-winter drought conditions, snowmelt date, and soil thaw. Calibration of the CFFDRS indices for Alaskan boreal fuel types is essential to ensure that they accurately represent duff moisture changes throughout the season.

Planners, fire managers, and firefighters heavily utilize the CFFDRS indices for prescribed burn planning, daily resource availability and allocation, and operational strategies and suppression tactics. These indices are also incorporated into daily weather briefings, daily index maps (showing values from remote weather stations), the Fire Weather Index Seasonal Tracking Tool (FWIST), and other statewide products provided by the Alaska Interagency Coordination Center – Predictive Services Branch.

Questions:

- Evaluate the CFFDRS fire weather indices and drying trends across Alaska. Are there variations across regions?
- Evaluate the relationship between CFFDRS indices and probability of ignitions, rate of spread, duration, and depth or organic fuel consumption in black spruce and other Alaskan fuel types.
- Are indices calculated from remote automated weather stations (RAWS) accurately representing duff moisture? Do they adequately reflect the effects of over-winter drought conditions, snowmelt date, and soil thaw?
- Should over-winter drying values or default startup values be utilized for drought codes, particularly in relation to the occurrence of fires that overwinter? Can these codes be tied to early season fire danger predictions?
- How does soil moisture fluctuate throughout spring melts and summer drying? How accurately are these fluctuations represented by the moisture codes?

Products:

Anticipated products include improved algorithms for the CFFDRS Fire Weather Indices based on Alaskan fuel types, a guide to standardize the startup of fire weather indices calculated from remote automated weather stations, and other documentation evaluating the CFFDRS. Published research findings are expected as technical reports and other formats that can be utilized by fire managers.

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Joint Fire Science Program RESEARCH SUPPORTING SOUND DECISIONS

JFSP Research Needs – Alaska Research Priority #3 **January 7, 2011**

Topic: ***Climate impacts on fire regimes; past, present, and future***

Fire and land managers along with policy makers seek research that will support a clear understanding of climate linkages to past and present natural fire regimes *and* aid in the ability to assess current and future departures from historic conditions. A concerted effort is needed to document and model future fire regimes in response to climate change across all vegetation cover types in Alaska. These scenarios will be used to inform fire and land managers on potential changes in fire intervals, fire extent, seasonality, and severity and allow for a planned response to predicted changes in fire activity.

Recent syntheses, which incorporated records from the last decade along with historical data, have improved our understanding of past and present fire regimes but are not yet comprehensive, are limited in scale, and do not clearly illustrate potential for future regime shifts.

Supported studies may include any one or a combination of the following:

1. Syntheses of existing fire data to expand on known fire regimes or assign new fire regime classifications to unassigned vegetation cover types.
2. Field studies to document past and present fire regimes in vegetation types that do not have sufficient historical fire records.
3. Utilization of current modeling tools (e.g., ALFRESCO) to model potential fire regime changes by vegetation cover type.

All studies must include linkages to climate impacts on fire regime and provide data that can be incorporated into existing modeling tools.

Questions:

- What are the historical departures from current fire regimes?
- What changes in fire size, return interval, intensity, and severity can we expect under a warming climate scenario? How will changes in these elements differ between vegetation types?
- How will climate change impact the frequency, extent, or seasonality of fires?
- What are the feedback mechanisms that alter the probability of future fires?
- How will possible changes in future fire regimes impact management strategies and suppression tactics?

Products:

Desired products include documentation of past and present fire regimes by vegetation cover types and modeling scenarios illustrating climate impacts on future fire regimes.

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Joint Fire Science Program RESEARCH SUPPORTING SOUND DECISIONS

JFSP Research Needs – Alaska Research Priority #4 **January 7, 2011**

Topic: ***Fuel Treatment Effectiveness***

Information on fuel treatment effectiveness continues to be a top research priority as managers face more implementation and maintenance decisions related to treatment planning and application. Monitoring of existing fuel breaks needs to continue beyond initial installation to determine short-term and long-term effectiveness in reducing fire risk and smoke emissions. Post-treatment vegetation recovery could result in different types of fuel loading and variations in seasonal fire risks. It is essential for managers and planners to understand vegetative succession within fuel treatments to avoid promotion of undesirable species, insect infestations, and highly flammable surface fuels.

Managers and planners seek studies that will investigate various types of *existing* fuel treatments in different successional stages across the state of Alaska and evaluate and/or model treatment effectiveness over time.

Questions:

- How long are various fuels treatments effective, what types of fuels regenerate, and what are the associated fire risks?
- What are the financial costs of maintaining effective fuel treatments?
- What alternative treatments should be tested to maintain fuel breaks (e.g., domestic livestock for foraging on grass regeneration, planting/seeding of desirable species)?
- Should post-fuels treatment reforestation be considered? What landscapes would be most suitable?
- Should desirable vegetation establishment be considered in planning operations?
- What treatment methods and timing can be used to minimize bark beetle infestations?
- Are fire risk and smoke emissions actually reduced by fuel treatments?

Products:

Potential products include:

1. Consolidation and synthesis of existing fuels treatment monitoring data and observations to document vegetation recovery and evaluate effectiveness.
2. Guide (based on Alaska specific information) for managers/community planners with various treatment methods, best practices for implementation, cost comparisons, maintenance potential , and short and long-term effectiveness expectations.

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Joint Fire Science Program RESEARCH SUPPORTING SOUND DECISIONS

JFSP Research Needs – Alaska Research Priority #5 **January 7, 2011**

Topic: ***Successional Pathways***

Fire and land management agencies are in need of better information on post-fire successional pathways. Although recent studies have been conducted on successional trajectories in black spruce forests, there is limited information on pathways for tundra (tussock, shrub, bryophyte, and lichen dominated tundra), shrub thickets, tree-line forests, and other fuel types. Additional research is needed to expand our knowledge to include a greater variety of vegetation types and identify factors that contribute to post-fire stand conversion.

Managers are also interested in: 1) the impacts of permafrost degradation on fire incidence and succession, 2) how future climate change scenarios will influence pathways, and 3) how shortened fire return intervals are affecting fuels and vegetation regeneration (particularly where recently burned areas in the early stages of succession are no longer acting as fuel breaks and burning again). A better understanding of these concepts can provide managers with the planning tools needed to assess and predict fire effects and flammability.

Supported studies should include field/site monitoring for additional data collection, utilization of existing vegetation and fire severity information and products, and use of modeling tools to exhibit projected pathways.

Questions:

- What are the successional pathways, based on fire severity and seasonality, for different primary vegetation types (e.g. white spruce, broadleaf, shrub, and tundra)? How will climate change impact these pathways?
- What characteristics result in post-fire conversion, especially from forest to grasslands, in future fire/climate scenarios?
- How does fire effect permafrost degradation and what are the subsequent impacts on vegetation species composition and structure?
- In light of recent fire seasons where past burn scars are no longer acting as fuel breaks, how are shorter fire return intervals impacting fuels, flammability, and vegetation regeneration/succession?
- What are the characteristics (age, fuel load, vegetation type, moisture, etc.) that allow some older fires to act as fuel breaks for new fires?

Products:

Potential products include published documentation addressing one or more of the above questions and a field guide *designed for managers*. Proposals should include multiple platforms for technology transfer opportunities including a field site visit to demonstrate usage of the guide. All technology transfer products should be user friendly and designed for direct management application.

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