Alaska Interagency Fire Research Needs September 2005
AWFCG - Alaska Wildland Fire Coordinating Group

The following list of research topics was generated by agencies within AWFCG during 2005. The topics were ranked originally by the AWFCG Fire Research and Development Committee (FRDAC) and finally by the AWFCG members. Ranking was as follows: 3= high, 2 = medium, 1= low (or H, M, L). The averages were calculated for AWFCG and are presented below. List is sorted by highest ranking by AWFCG.

AWFCG Rank Avg	ID#	Category	Topic	Research Need	On-going projects/Comments
2.8	21	Fuels Treatment	Fuel Break effectiveness: empirical testing	The effectiveness of various fuel treatments has been modeled but no trials have been done in Alaska for the vegetation types in Alaska. Fire managers have recommended and funded fuel treatments, including shaded fuel breaks, without demonstrable evidence that they work. A series of fuel treatments could be combined into a larger scale experimental burn program to verify fire behavior models and increase the body of knowledge about fire behavior in Alaska and the adjacent Yukon Territory.	Northway Fuel Break Long-term monitoring; ALCAN Fuel Break long-term monitoring.
2.7	5	Fire Danger	Validate the Canadian Forest Fire Danger Rating System (CFFDRS) indices in Alaska	Fire management decisions in Alaska are based on the ability to predict fire risk and burning conditions. Most fire management agencies in Alaska have adopted the Canadian Forest Fire Danger Rating System (CFFDRS) as a method for predicting fire danger, behavior, and severity. The original fuel moisture drying algorithms were developed in eastern red pine and jack pine stands, which do not occur in Alaska and there is some question whether the CFFDRS indices adequately and accurately address drying trends in continuous and non-continuous permafrost laden organic soils. Results from Ottmar's work closely links duff moisture with forest floor consumption. Some investigations have been done, but research is needed to: 1) evaluate CFFDRS indices and drying trends in different geographic regions across Alaska, 2) evaluate the use of weather station and soil moisture probes data to adequately represent duff moisture, 3) determine whether overwinter drying values or default startup values should be utilized, 4) evaluate the relationship between CFFDRS indices and probability of ignitions, rate of spread, duration and depth of organic fuel consumption.	Wilmore, B. 2000. Graduate thesis at UAF; Jandt, R. et al. 2004 Duff moisture report - BLM Tech Report; Ottmar et al. 2003 Joint fire science project: Fuel moisture and duff consumption.

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2.5	3	Fire Behavior	Model Verification	The current fire behavior models for Alaska fuels have not been empirically tested in Alaska. There was enough anecdotal evidence of their effectiveness that they were adopted in the late 1980's and early 1990's, but since that time no formal case studies or field trials have been documented. There is a continuing need for field verification of the predicted spread rates, fireline intensities and mortality as currently modeled by the CFFDRS or other models.	--Omi & Camp JFSP 2004 (Huffman) addresses some of this.
2.3	17	Fire Regimes	Fire Return Intervals/Fuels	The large fire history database includes many occurrences where old fires stop the progression of new fires across the landscape. What are the characteristics (age, fuel load, vegetation type, moisture, etc.) that allow these older fires to act as fuel breaks for new fires?	Rupp & Mann's JFSP 2005 addresses some of this. Omi & Camp JFSP 2004 (Cronan) addresses some of this.
2.3	27	Smoke Management	Smoke transport models	The existing smoke transport models available for use in Alaska are all developed for the Lower 48 states. Different terrain, weather and jet stream dynamics in Alaska potentially will alter the models' effectiveness. Computer simulation techniques can be used to provide an assessment of how well the models capture the important characteristics of smoke transport in Alaska. Understanding how well the models function for Alaska will enable fire managers to make better predictions and provide better capabilities for smoke management.	
2.2	4	Fire Danger	Fire risk modeling	Fire managers in Alaska need to be able to identify the potential for spread of wildland fires to prioritize location of fuel reduction projects near communities. The development of fire risk models at a local level using GIS data sets is needed for communities in northern forests. Model components may include fuel types, risk of ignition, values at risk, and potential fire behavior. Model simulations would enable managers to develop risk assessments and evaluate the effectiveness of small acreage fuel treatments and prescribed burns in reducing fire risk and enhancing other values, such as wildlife habitat. Development of an approach that would assign a probability of burning to unburned areas in Alaska would enable managers to develop risk assessment models for communities, establish long-term monitoring and research sites to gather integrated baseline data related to wildland fires.	

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2.2	16	Fire Regimes	Fire Return Intervals	Across Alaska the diversity of vegetation/fuel types, topography and microsite climate all influence the fire return intervals. Relatively few studies have been conducted to determine the fire return intervals in Alaska. Most of these studies are small and localized, or have been based on a relatively short fire history record (50 yrs). A compilation of return intervals for the entire state would enable fire managers and resource managers to make more informed decisions about fire and fuels management.	Rupp & Mann's JFSP project addresses some of this.
2.2	19	Fuels	Fuel typing	The natural fuels photo series provides an important land management tool that can be used to assess the fuel loading and stand characteristics of fuel types throughout the United States. Within Alaska we have two photo series, but are lacking in basic data on the fuel loading for the following important fuel types: shrubs, tussock tundra, and white spruce with bark beetle.	
2.2	23	Fuels Treatment	Type Conversion	Fuel breaks are an option to reduce continuity in flammable vegetation, to potentially reduce risk of spreading both ground and crown fires, and to provide application sites for aerial retardant or water. Type conversion from black spruce to deciduous shrubs or hardwoods is desirable to maximize the time interval before further maintenance is required. Research should define operational factors of disturbance that enhance type conversion while avoiding dense grass, particularly on cold wet sites (e.g., fire vs. mechanical scarification, debris shading, proximity of seed source, sprouting potential).	
2.2	20	Fuels Treatment	Ecological effects	Several projects are underway to reduce fire hazard or fire risk in Alaska using various fuel treatments. Some studies are assessing the impacts of fuel treatments on forest condition (vegetative response) and fire risk mitigation (fuel loading and fire weather indices). Research is needed on the second order effects on biological diversity (species presence and relative abundance) have implications for wildlife viewing, hunting opportunity, and ecosystem function near the urban interface. Research topics include success of stand-level type conversion (including retention of late-seral features like snags), loss of fire disturbance, landscape-level fragmentation of forest canopy, and potentially increased access.	USFWS: Northway Fuel Break Long-term monitoring; ALCAN Fuel Break long-term monitoring. NPS: Denali Front Country; BLM: Tanacross

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2.2	25	Invasive Plants	Rapid response	Perform a vector analysis for the risks of invasive weed entry into Alaska. Identify the geographic sources of equipment and personnel involved in fighting fires in Alaska; analyze how they are transported to Alaska; assess the known/suspected invasive weeds associated with these locations; and compile information on effective IPM rapid response techniques for these species.	Determine if this is a significant issue that we can affect.
2.2	26	Prevention	Identifying incentives to Firewise compliance	The cost and landscape tradeoff borne by homeowners, businesses, and municipalities in complying with Firewise guidelines may be partly offset with reduced rates on fire insurance. A review of site factors used in setting rates by insurance companies would be instructive to Firewise program trainers and consumers. This type of review may have been conducted a few years ago for the Matanuska-Susitna Borough following the Millers Reach fire, but it needs to be broadened to the major municipalities statewide for which insurance coverage exists.	
2.0	15	Fire Operations	Dozer line effectiveness	The effectiveness of dozer lines versus natural barriers as firing breaks as well as the long-term effects of dozer lines needs to be redocumented. Older studies dating back to the Chicken fire of 1967(?) and other work on dozer lines in unstable soils could be brought into one document for current fire managers and the public.	
2.0	28	Social Science	Risk Assessments	Several projects are currently underway to model fire risk associated with different intensities, techniques and frequencies of fuel treatments. In these current assessment efforts, primary emphasis has been placed on predicting the physical effects of fuel treatment implementation and hazardous risk mitigation. However, risk assessment should also include risks to values derived from recreation opportunities, subsistence participation, and symbolic relationships between communities and forested landscapes. Rapid Appraisal and GIS mapping techniques applied in different settings have proven useful for describing how potential fuel treatments affect these values. This could also include wildland fire and the ability of fires to act as fuel breaks in the future.	The Bitterroot Ecosystem Management Research Project is referenced Combine with other risk project - NPS

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1.8	1	Climate	Primary and Secondary Order Fire Effects and Climate Change	Climate strongly influences the occurrence and extent of fires in Alaska. Climate models project that rapid Arctic warming will continue. For Alaska, the Hadley and Canadian models project 1.5-5°F (1-3°C) more warming by 2030, and 5-12°F (3-6.5°C) (Hadley) or 7-18°F (4-10°C) (Canadian) by 2100. It remains unclear what effects climate change will have on fuels, burn severity, intensity, natural ignition sources (lightning frequency and temporally) and how these parameters will impact plant and wildlife ecology. Information on the potential changes in fire behavior and fuels under changing climate scenarios is needed for fire management to respond to the predicted changes in fire activity.	Rupp & Mann, 2003 & 2005 Joint fire science projects (JFSP).
1.8	9	Fire effects	Subsistence Resources	Alaskan residents depend heavily on fish and wildlife resources found near their communities. Some villages in Alaska have expressed concerns about a cumulative effect from recent (< 25 years) large fires around their communities that is limiting their ability to access subsistence resources. When fires alter the landscape there is often concern over the fire effects on these resources. Requests for increased suppression in these areas are common. Integrated research that documents short and long-term effects of fire and suppression on subsistence resources and their habitats would improve the ability of land managers to respond to these concerns. Frequent concerns raised at public meetings include habitat utilization relative to vegetation succession for moose or caribou, salmon and fire interactions, fur bearer response, berry productivity, and the cumulative effects of all recent (< 25years) fires combined.	
1.7	2	Economics	Tool to measure the current cost of taking action against the net value lost	Cost plus net value lost are used for decision making within Wildland Fire Situation Analyses in the Lower 48. At the current time, land managers do not have a good tool to measure the current cost of taking action against the net value lost, future cost of action or the deferred cost of action. This ties with effectiveness of various fuel treatments, the fire return intervals across the state and the effectiveness of old fires as barriers to the spread of new fires.	

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1.7	12	Fire Effects	Response to burn severity over time.	Vegetation in the boreal forest is rejuvenated largely by stand-replacement fires. The burn severity of a fire strongly influences vegetation patterns and succession after fire. Burn severity and the resulting changes in vegetation can influence wildlife distribution and site utilization. Models that predict vegetative response across habitat types over time based on pre-burn conditions and burn severity will allow managers to develop prescriptions that directly address habitat goals instead of goals based on fire behavior outputs. In addition, research is needed to understand the effects of burn severity on permafrost, nutrient cycling, water quality, erosion potential and emissions.	Hollingsworth, Johnstone et al – 2005 Joint fire science project; NPS and USFWS burn severity validation projects ongoing.
1.7	30	Social Science	Public Perceptions	Previous research has shown that public attitudes and responses toward fire management activities (fire use, suppression, fuels management) are closely linked to public perceptions of agency purposes, the relationship of those purposes to public interests, and trust in the agency to fulfill those purposes. Little scientific information about the Alaskan public's relationship(s) with the land management agencies in the context of fire management is available.	Previous proposal by scientists from the USFS RMRS and the inter-agency Aldo Leopold Wilderness Research Institute on Kenai Peninsula.
1.5	8	Fire Effects	Landscape Ecology, Wildlife	Wildland fire management decisions can have a major influence on the distribution and productivity of wildlife habitat. Current fire management allows prescriptive constraints to be imposed upon wildland and prescribed fire that to some extent will control fire size, location, frequency, rate of spread, and burn severity patterns. However, the large-scale spatial correlation between these activities and the distribution of wildlife and wildlife habitat across the landscape needs to be evaluated and used to inform managers and the public.	Fire occurrence and associated elements are constrained in Full and Modified – research should address those area is extent is large enough.

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1.5	22	Fuels Treatment	Social effects	Projects are underway to model fire risk associated with different types of fuel treatments. Primary emphasis has been on predicting the effects of fuel treatments on forest condition (vegetative response) and fire risk mitigation (fuel loading and fire weather indices). Fuel treatments will also influence values associated with recreation, subsistence lifestyles, and other human dimensions in forested landscapes. Spatial simulation of future landscapes under different treatment scenarios may prove useful in land use planning and measuring human response to proposed changes.	A Kenai Peninsula project similar to the one described here has been previously proposed by scientists from the USFS Rocky Mountain Research Station and the inter-agency Aldo Leopold Wilderness Research Institute
1.3	11	Fire Effects	Vegetation: post-fire succession in tundra and tree-line communities in NW Alaska	Most post-fire successional studies are for boreal forest types. Very few studies pertain to the effects of fire on tundra and tree-line ecosystems in the western and northwestern regions of Alaska. Information on post-fire recovery is needed for tundra habitats (tussocks, shrub, bryophyte, and lichen dominated tundra), shrub thickets, and tree-line forests. Some species of lichens are critical winter range forage for caribou, and caribou migration patterns can be modified by fire disturbance (Joly et al 2003). Understanding the relationship between fire severity and recovery time for these lichen fields is critical to management needs. In addition, the prediction of tree-line expansion due to warming climate and fires needs to be verified, as this will impact fuel types in the future. This information will assist fire managers in making decisions about fire suppression management options in Alaska and provide guidelines for future prescribed fire or hazard fuel removal projects. National fire initiatives such as Landfire and Fire Regime Condition Class both require an understanding of the distribution of successional seres and fire return intervals to make decisions about fire management at the landscape level. We lack knowledge about successional relationships, fire return intervals and expected distribution of these community types.	Joly et al. 2003. Winter habitat use of female caribou and fire. Canadian Journal of Zoology 81: 1192-1201; Racine et al. 2004. Tundra fire and vegetation – Seward. Arctic, Antarctic and Alpine Research 36: 1-10; Jandt and Meyers, 2000. Recovery of lichen in tussock tundra following fire. BLM AK Open Fire Report 82.

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1.3	10	Fire Effects	Effects of repeated fire on biota	Some sites in boreal forest have had multiple fires over prolonged periods (e.g., 40 years). Few studies have focused on effects of repeated fires, and it is a topic of public concern in rural areas. Research is needed about changes to upland, wetland and other habitats from frequent fires over prolonged periods and corresponding effects to wildlife/fisheries and how those habitats are utilized.	Would like to know if frequency, size, severity is outside natural variability (Cella)
1.3	24	Invasive Plants	Prevention	Investigate existing methods (Standard Operating Procedures, Hazard Analysis and Critical Control Points [HACCP] plans, etc.) for the prevention of spread of weeds in the fighting of fires, particularly in the Western U.S. (or wherever most of the fire fighters & equipment come from) and analyze their likely efficacy for preventing weed invasions associated with fire fighting in Alaska.	
1.2	13	Fire Effects	Wetlands	The direct and indirect contributions of fire to the hydrology of boreal forest wetland habitats are poorly understood. One assumption is that fires in wetlands contribute and/or free up important nutrients needed for plant growth, which in turn enhances growth of invertebrates. There may then be indirect benefits to waterbirds and other wetland dependent species as a result of fire. Baseline limnological data has been collected across wetlands in interior Alaska in the last 20 years. Evaluation of these sites that recently burned could be identified and resampled or new sites could be established prior to prescribed burns. What are the relationships with burn severity and nutrient transport? Further understanding of these relationships would assist land managers to better predict the benefits of fire to wetland dependent species.	

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1.2	6	Fire Effects	Hydrology/Wetlands	How fire alters hydrological characteristics in the boreal forest is poorly documented. The relationships between fire severity, size, season and hydrology characteristics such as permafrost changes, lake drying patterns, water budgets, sediments, temperature, debris, subsidence, nutrients and aquatic organisms in stream drainages and wetlands would provide valuable insights for managers. These data could also be integrated to fish, wildlife and climate change studies to respond to subsistence and resource concerns.	