



**National Park Service
Alaska Region
Fire Ecology Annual Report
Calendar Year 2008**

Summary

The purpose of the Alaska Region Fire Ecology program is to obtain baseline data on the natural variability of fire on the landscape, to monitor the effects of fire or mechanical treatments on vegetation, fuels and soil parameters, and to provide fire ecology information to fire managers, other park staff, and the public. During 2008 the NPS Alaska Fire Ecology program re-measured 7 permanent wildland fire use plots in Yukon-Charley Rivers NP, coordinated a JFSP research project to determine tundra fire regimes in Bering Land Bridge and Noatak National Preserves using lake cores, conducted validation of a NASA/NPS invasive plant spread model, and participated in several interagency projects and meetings. The science education program with the Community of Eagle School continued this year at the King Cr sites near Yukon-Charley Rivers NP. In addition a peer-reviewed manuscript titled “Assessing the differenced Normalized Burn Ratio’s ability to map burn severity in the boreal forest and tundra ecosystems of Alaska’s national parks” was published in the International Journal of Wildland Fire.



2008 Fire Season

A cold, wet summer in Alaska resulted in a slow fire year for 2008. Over all in Alaska there were 367 recorded fires with 103,649 acres burned. In 2008, Alaska NPS had a total of 8 wildland fires, with only 1,486 acres burned in five park units (DENA, GAAR, KATM, KOVA, and YUCH). Of the total area burned, 1,420 acres were designated as Wildland Fire Use and 66 acres were suppression fires. The Reed River fire shown in Figure 1, was used to test FSPro runs as part of the WFDSS pilot program in Alaska.

Monitoring

Woodchopper Fire Monitoring Plots at Coal Creek in Yukon-Charley Rivers NPr

2004 was a record fire year throughout interior Alaska and in Yukon-Charley Rivers NP. The Woodchopper Fire near the NPS summer operations base camp at Coal Creek burned 14,901 acres in 2004. During 2004 and 2005 we established 7 fire monitoring plots nearby. Pre-fire vegetation at 4 of the 7 plots was Black Spruce Woodland (conifer plots). The pre-fire vegetation at the remaining 3 plots was Closed Paper Birch Forest (deciduous plots). Two of the conifer plots were established ahead of the fire event. An unburned control plot was established for comparison to burned deciduous sites. Plot methodology at each site allows for categorization of fire severity as well as changes in vegetation community structure, physical site characteristics, fuel loading and herbivory. In 2008 data entry and transfer into the FFI Ecological Monitoring Utilities Database was completed and initial data analyses were performed. In deciduous stands seedling density (predominantly paper birch) increased 39% from pre-fire to 4 years post-fire (Fig. 2). Seedling density in 4-year-old stands was ~20 paper birch seedlings per square meter. Pre-fire trace cover of spruce seedlings in deciduous stands was completely absent 4 years later. In conifer plots spruce seedling density was low (< 2 spruce seedling per square meter) in both pre- and post-burn communities and did not significantly change from pre-fire conditions to 4 years post fire. Compared to deciduous stands, density of deciduous seedlings (paper birch and aspen) in 4-year-old conifer stands was low (< 1 seedling per square meter). However, even this low density represents a significant increase in deciduous seedling density in conifer stands since deciduous seedlings were absent prior to the fire event. Our result of increased deciduous seedling density in both plot types agrees with the current successional paradigm associated with boreal forests in interior Alaska. Continued monitoring of these plots will allow detection of biological and physical changes associated with post fire succession as well as provide insight into shifts in habitat use.

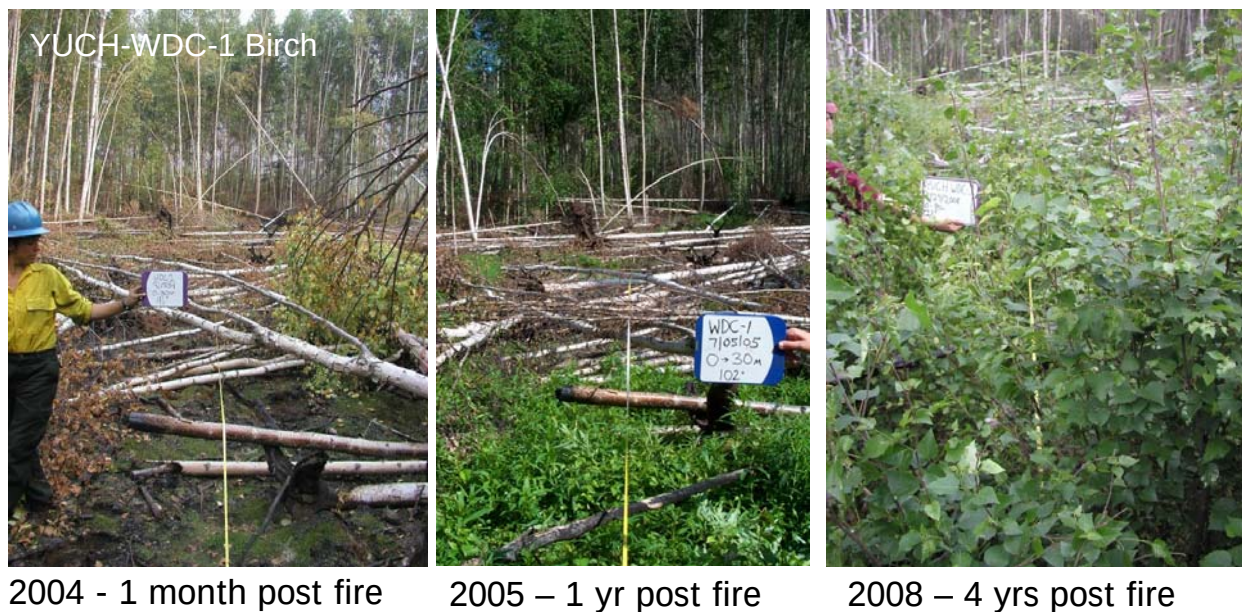


Figure 2. Yukon-Charley Rivers NP, fire effects monitoring Woodchopper Fire of 2004. Plot: WDC-1 Closed paper birch (*Betula papyrifera*) forest high severity burn, monitored in 2004, 2005 and 2008.

Inventory and Monitoring Networks & Fire

The Regional Fire Ecologist served as a Technical Committee member on the Arctic Network Inventory & Monitoring program (ARCN). She provided input and wrote sections of the Arctic Network I&M annual work plan and Phase 3 report. Prepared and wrote 'Protocol Development Summaries' for Fire Extent, Severity and Effects monitoring, and Vegetation Monitoring protocols for ARCN.

Work on developing a long term fire effects monitoring program that dove-tails with the Inventory & Monitoring Networks has been progressing along. In July, the assistant fire ecologist, Jennifer Mitchell, worked with the Central Alaska Network (CAKN) vegetation monitoring crew in Denali for one field stint. The purpose of her participation in their vegetation sampling was to assess methods used and determine whether additional "mini-grids" should be installed in some of the fire-prone areas of Denali that are currently not being monitored by CAKN. She participated in a week long training session and they installed 10 of the 25 mini-grid sample points in the Mid-McKinley grid, which fell within a 1986 fire. They utilized the CAKN vegetation mini-grid protocols to collect vascular and nonvascular plant, soils, and tree data from each plot.

Table 1. Fire Effects Plot Workload 2008

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-burn	Immed. Post	Postburn (1-20 yrs)	Total Plots
Yukon-Charley Rivers NP	2004 Woodchopper Fire – WDC	WFU - Other – AKFETG method			7	7
Denali	CAKN I&M Network	CAKN mini-grid vegetation monitoring			10	
Total					17	17

Table 2. Fire Ecology Staffing 2008

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
Jennifer Mitchell	5/25/08	12/31/08	16	No	FFI Training, S-290, issued FEMO taskbook
Forestry Tech – AWAFFM	6/23/08	7/04/08	1	No	

Collaboration

Alaska Fuel Model Guidebook

In 2008 the "Fuel Model Guide to Alaska Vegetation" was completed through a contract with SEM (Joe Scott). This guidebook was dedicated to Brad Cella *"In recognition of his leadership and contributions to the art and science of fire behavior and fuel modeling in Alaska..."*. In 2007, Brad Cella organized an interagency meeting of fire behavior, fuels, fire ecology and GIS specialists to develop a standard interagency fuels crosswalk that could be applied statewide by various disciplines. The crosswalk produced by the workshop includes 56 distinct fuel types.

The guidebook is available at the following website:
<http://fire.ak.blm.gov/administration/awfcg.php> (under Documents, Alaska Fuel Model Guidebook 062008). The guide was utilized to assign fuel model classes to the NLCD landcover maps in Alaska to run FSPRO during WFDSS testing in Alaska this summer.

Eagle School – Fire Ecology Program

We facilitated and continued a field based fire effects education program with the Eagle Community School from Eagle, AK. In September of 2008, a group of students and NPS fire ecology staff re-visited fire effects plots established in 2004 in the King Creek fire along the Taylor Highway. In the classroom a presentation and discussion about fire behavior was held. Video footage from a Joint Fire Science Program project (Huffman et al. 2008) documenting fire behavior from the 2004 King Cr fire was shown to the students.

King Creek Plot:	2004	2005	2006	2007	2008
1 High Severity					
2 Moderate Severity					
3 Low Severity					

Figure 3. Eagle Community School monitoring three different fire severity plots in the 2004 King Cr fire near Yukon-Charley Rivers NP.

Research

Lake Coring Tundra Fire History (NOAT, BELA)

Work continued on a Joint Fire Science Program (JFSP) research project to determine fire return intervals in tundra areas of Noatak NP and on the Seward Peninsula in Bering Land Bridge NP over the past 5,000 years, and how the occurrence of fire may relate to climate and vegetation changes. In a cooperative study with the University of Illinois (Dr. Feng Sheng Hu) and Montana State University (Dr. Phil Higuera) we are collecting lake sediment cores which can show charcoal deposits from past fires near the lakes. During 2007, we cored 4 small lakes in Noatak NP and our initial results indicate that tundra in Noatak can burn frequently and some areas have had short fire return intervals in the past (<100 years). During the summer of 2008 we worked in Bering Land Bridge National Preserve. We completed an aerial reconnaissance of

over 150 lakes using a fixed wing (Cessna 185) to select lakes that were greater than 5 m deep and smaller than 20 ha in size for coring. Photos and lake locations have been developed into a GIS photo-link product for future monitoring of small lakes. We cored 4 lakes in Bering Land Bridge. All lakes except one, were fairly shallow (<3 m deep) and resulted in shorter cores. Lake cores and water samples have been sent to University of Illinois for analysis. Data from the 2007 Noatak Lake coring has been analyzed. Results from the 2007 Noatak Lake coring indicate that the mean Fire Return Interval (mFRI) has varied from 131 -263 years during the period from 6000 yr BP to 2000 yrs BP. In the last 2,000 years the mFRI has varied from 112-260 years. It appears during the last 2000 years shrub dominated tundra has burned less frequently than graminoid dominated tundra. Two presentations and two posters have been presented at various scientific meetings.



NASA Invasives and Burned Lands

A project, entitled “Using NASA’s Invasive Species Forecasting System to support National Park Service decisions on fire management activities and invasive plant species control,” was initiated in FY2006 to investigate the relationship between invasive plants and fire for three NPS areas: Yellowstone/Grand Teton NPs, Sequoia/Kings Canyon NPs, and Alaska NPS units. Three Alaska parks were selected for this analysis – Denali NP&Pr, Gates of the Arctic NP&Pr, and Yukon-Charley Rivers NPr. The purpose of the project is to predict vulnerable burned lands and suitable habitat characteristics for white sweetclover (*Melilotus alba*) and narrowleaf hawksbeard (*Crepis tectorum*) susceptibility in Interior Alaska. Although fires regularly occur in these parks, due to the low level of propagule pressure (existing invasive plants) near the fires in these parks we needed to improve our field data to include areas that had propagule pressure from invasive plants. In 2007 we wrote a CESU agreement with the University of Alaska to survey along road systems that had recent fire activity. They have produced a final report on their findings which is available upon request. The results of this survey were used to generate new prediction models for invasives.

In 2008 the Alaska NPS Fire Ecology program worked on validating NASA’s preliminary model to predict invasive species spread into burned areas. NASA provided sample locations of 190 points that had varying potential for invasive plants (*Melilotus alba* and *Crepis tectorum*) along the Dalton Highway and Parks Highway. National park service personnel surveyed the points along the Parks Highway. BLM provided a field intern to survey the sites along the Dalton Highway. At each point the roadside was surveyed for invasive species presence and distribution (e.g. scattered, patchy, continuous). Then workers walked a 50 m transect set perpendicular to the road into natural vegetation and recorded the following: area burned, fire severity, vegetation community, as well as the presence and distribution of invasive species. 125 of the points were sampled on the Dalton Highway between Fairbanks and Coldfoot and 40 were sampled on the Parks Highway just south of Nenana. Narrowleaf hawksbeard was entirely

absent from Parks points, but present at 8% of the Dalton roadside areas (Table 3). A few scattered narrowleaf hawksbeard were found on 2 Dalton transects. White sweet clover was present at 59% of the Dalton roadside sites and 100% of the Parks roadside sites; however only one transect on the Dalton had sweet clover (Table 4). This suggests that native burned vegetation may be outcompeting the invasives that are found along the roadside.

Table 3. *Crepis tectorum* (Narrowleaf hawksbeard) along burned areas of Alaska Highways, 2008 NASA Validation survey.

Highway	Invasive Population Size	# Sites with Invasives on Road	# Sites with Invasives on Transect
Dalton	Continuous	2	0
	Patchy	0	0
	Scattered	8	2
	None	115	123
	# invasive sites/# sites visited	10/125	2/125
Parks Highway	Continuous	0	0
	Patchy	0	0
	Scattered	0	0
	None	40	40
	# invasive sites/# sites visited	0/40	0/40

Table 4. *Melilotus alba* (White sweet clover) along burned areas of Alaska Highways, 2008 NASA Validation survey.

Highway	Invasive Population Size	# Sites with Invasives on Road	# Sites with Invasives on Transect
Dalton	Continuous	38	1
	Patchy	11	0
	Scattered	25	0
	None	51	124
	# invasive sites/# sites visited	74/125	1/125
Parks Highway	Continuous	37	0
	Patchy	3	0
	Scattered	0	0
	None	0	40
	# invasive sites/# sites visited	40/40	0/40

Management Objectives and Monitoring Results 2008

The focus of the Alaska NPS Fire Ecology Program is to assess the condition of vegetation and fuels, and how they are affected by wildland fires, prescribed fires or mechanical treatments. Over the past 7 years, we have monitored both wildland fires and mechanical treatments within several parks. No prescribed fires have been implemented in any of the parks in the Alaska Region. Appendix A lists the monitoring and inventory projects that have been carried out since 2001 in the Alaska parks. It also provides the status of data entry (what type of database is being used), completion of data analysis, and whether reports or presentations have been completed for the project. During 2008, several presentations, posters, and reports were completed and are listed below:

- “Fire Ecology & Fuels Monitoring Program” Alaska Fire Seasonal Training. Denali Park, AK. May 2008.
- “NPS Alaska Region Fire Ecology Program” NPS Alaska Fall Fire Review. Anchorage, AK. September 2008
- “Fire in Alaska”. Presentation to Princess Bus Drivers, educational. Fairbanks, AK April 2008
- Allen, J., C. Racine and J. Dennis. 2008. Long-Term Monitoring of Vegetation Change Following Tundra Fires in Noatak National Preserve, Alaska (presentation). National Park Service, Arctic Park Science Symposium, Fairbanks, AK, October 2008.
- Chipman, M., P. Higuera, J.L. Allen, T.S. Rupp, F.S. Hu, M. Urban, and B.F. Clegg. 2008. Tundra fire regimes in the Noatak National Preserve, northwestern Alaska, since 6000 yr BP (poster). National Park Service, Arctic Park Science Symposium, Fairbanks, AK, October 2008.
- Allen, J.L. and B. Sorbel. 2008. Assessing the differenced Normalized Burn Ratio’s ability to map burn severity in the boreal forest and tundra ecosystems of Alaska’s national parks. International Journal of Wildland Fire 17: 463-475.
- Villano, K.L. and C.P.H. Mulder. 2008. Invasive plant spread in burned lands of interior Alaska. Final Report prepared under a NPS/NASA/UAF agreement. (Available as PDF)

Regional Fire Ecologist Focus Areas/Accomplishments

Tables 5 and 6 provide summaries of the Regional Fire Ecologists focus areas and accomplishments for the calendar year of 2008.

Table 5. Regional fire ecologist focus areas generalized.

Category	Percent Time	Focus Areas
Planning	12%	Fire monitoring plans, CE, Research Permits, Contracts/Agreements, Field Logistics
Presentations	14%	Presentations at scientific, park, and interagency meetings, Publications, Reports, Instructor for RX-510.
NPS Meetings/ task groups	13%	FESC, I&M tech committee & workshops, AKRO NPS Fire meetings
Interagency work	13%	LANDFIRE, AWFCG Research Committee, AWFCG Fire Effects Task Group, AK Fuel Model Guidebook production
Fire Assignments	10%	Wildland fire assignments – DMOB(t), CRWB(t); RX – Pile burns
Research	12%	JFSP Tundra Fire History, JFSP Fire History, NASA Invasives Project, JFSP proposals
Data entry	1%	Estimated amount of time spent entering data from paper to PC
Data conversion	6%	QC FEAT data and NPS AK Paired Plot data set conversions
Data analysis	3%	Fire succession matrix
Supervision/Admin	11%	Hiring, training field crew, field logistics, field work, hiring
Training	5%	Fire training, mandatory training

Table 6. Fire Ecologist Accomplishments/Focus Area

Category	Percent Time	Accomplishments and/or areas of activities
Planning	12%	- Submitted compliance and research permits for 2 projects - Fire effects monitoring - Logistics, compliance, planning, training, field work - I&M collaboration - Planning for vegetation and fire monitoring with ARCN I&M network - NASA Invasives field prep, BLM agreements, UAF agreement - Prepared draft of Fire Monitor Plan - YUCH - Compliance for Lake Coring JFSP research BELA, Logistics
Presentations	14%	- Burn Severity Manuscript - Revision of manuscript, published in International Journal of Wildland Fire - Eagle School Plots - Education program, poster - Reporting EAAR - Presentation of results to FMOs and area staff - AK Fire Management & Ecology presentation - Princess Bus Tour drivers - Tundra Fire Regimes- Lake Core JFSP - Alaska Park Science Symposium (Poster), FETG Tech Transfer presentation - RX-510 Instructor - Preparation and instructing - S-248 SCKN Instructor – Preparation and instructing
NPS Meetings/ task groups	13%	- NPS Fire Ecology Steering Committee - NPS Alaska Fire Management meetings - I&M Arctic Network technical committee - I&M Central Alaska Network – advisory role
Interagency work	13%	- AK Fuel Model Guidebook – meetings, contract follow-up, production of guidebook. - AWFCG Fire Research Committee – Revised research priorities for AK fire management, reviewed potential JFSP proposals - AWFCG Fire Effects Task Group – Presentations - LANDFIRE workshops
Fire Assignments	10%	- DMOB(t) with AK Type 1 team - CRWB(t) interagency type 2 crew WF, RX – pile burns in YUCH
Research	12%	- Federal lead on JFSP Tundra Fire History study (PI: Hu, Lake Coring) – Compliance, field work, meetings, CESU agreement and JFSP grant, analysis - NASA/NPS invasive plant modeling in Alaska – 1 CESU, 1 Interagency Agreement BLM written, field protocols, conference calls, data management - Rupp - Fire regime, climate modeling NPS - Meetings and cooperative agreement follow-up CESU - JFSP 2009 Proposals - 3 submitted

Category	Percent Time	Accomplishments and/or areas of activities
Data entry	1%	• Backlog data entry from 2007 plots into FFI
Data Conversion	6%	• Paired Plot Data (Fire effects 1980s) - Contract with SEM to import to FFI database, developed crosswalks, reviewed. • FEAT data conversion QC
Data analysis	3%	• Analyzed data to update landcover for Denali in preparation for FSPro/WFDSS • Analyzed tundra Paired Plot data for presentation at Alaska Park Science Symposium
Supervision/Admin	11%	• Hiring - Announcement and hiring of term position • Training field crews, oversaw data entry • Determined field logistics • Travel and time paperwork
Training	5%	• Fire – S-346 Situation unit leader, I-Suite Refresher • Other - Mandatory, Trimble • Instructor: RX-510, S-248 SCKN (time allocation shown under ‘presentations’)

Annual Report Supplement

Included with this report is the “2008 Annual Report Supplement.xls”. In appendix A of this report we have listed the fire effects monitoring and inventory projects that have occurred over the past 7 years in the Alaska Region and included what type of fire effects monitoring database is being used for each project.

The Alaska region has an annual fall fire review with our fire management staff. At this meeting each program area is provided time to discuss their program. At this meeting we have had the opportunity to present and discuss monitoring or research results. This meeting does not usually include non-fire park staff; however there are other avenues, such as the Alaska Park Science Symposiums, in which results of fire effects monitoring have been presented.

Appendix A. List of NPS AKRO Fire Ecology Projects completed from 2001-2008.

Park	Title	Project ID	Purpose	Year Started	Last Monitored	# Plots Total/Re-measured	Data-base	Analysis complete	Report	Repeat Monitoring
BELA	BELA Racine Fire Plots	BELA-Racine	Succession, WFU Tundra fire effects	1979	2002	8	Excel		Publication	Yes
DENA	DENA hazard fuels plots	DENA-HZF	Effectiveness and effects of fuels thinning	2003	2005	27	Access	Yes	Presentations	Yes
DENA	DENA fire effects & moose	DENA-VDM	Vegetation mapping, succession, moose browse	2005	2006	43/10	FFI	Yes	Presentations	Selected plots returned in 2005
DENA	DENA Landcover CBI plots	DENA-LC-CBI	Vegetation mapping, succession, CBI plots revisited 7-8 yrs post fire	2007		55	FFI	Partial		Possibly, not marked
DENA	DENA, CBI Burn Severity	DENA-CBI	Assess remote sensed dNBR severity	2002		84/55* see DENA LC-CBI	Access	Yes	Publication	No, see DENA LC-CBI plots
NOAT	NOAT pre/post fire effects	NOAT-PPF	Succession, WFU Tundra fire effects	2004	2007	6	FFI	Partial		Yes
NOAT	NOAT Racine fire plots	NOAT-Racine	Succession, WFU Tundra fire effects	1982	2005	8	Excel	Yes	Report/ Presentations	Yes
NOAT	NOAT (SewardP), CBI Burn Severity	NOAT-CBI	Assess remote sensed dNBR severity	2003		93	Access	Yes	Publication	No
WRST	WRST historic fire effects (Paired Plots)	WRST-PP	Succession, fire effects. 2006 - 2 plots re-measured	1980s	2006	85/2	FFI/Access			Selected plots
YUCH	YUCH hazard fuels plots	YUCH-HZF	Effectiveness and effects of fuels thinning	2005		42	Access	Partial	Presentations	No
YUCH	YUCH historic fire effects (Paired Plots)	YUCH-PP	Succession, fire effects, 2005 - 5 plots re-measured	1980s	2005	52/5	FFI/Access	Partial		Yes
YUCH	YUCH pre/post fire effects	YUCH-WDC	Succession, fire effects, fuel moisture	2004	2008	7	FFI	Partial	Presentations	Yes
YUCH	YUCH 1999 Fire Effects - B242	YUCH-1999-B242	Succession, burn severity	1999	2007	15	Excel	Partial		Yes, problems locating in 2007
YUCH	YUCH, CBI Burn Severity	YUCH-CBI	Assess remote sensed dNBR severity	2001		119	Access	Yes	Publication	No