

Accomplishments 2010

Vital sign: Fire extent, severity, and effects

ARCN FY10 Work Plan: Finalize and publish the results from the Joint Fire Science Program Lake Coring project. The following tasks will be completed: 1) finalize development of new tundra frames for Boreal ALFRESCO using existing data on climate and vegetation in study regions, 2) submit fire-history records from the BELA and NOAT to NPS and agency cooperators and International Multiproxy Paleofire Database, and 3) complete final report for Joint Fire Science and prepare professional manuscripts for project. Data generated by this project will be archived on the ARCN network drive.

Tundra fire regime accomplishments 2010:

- The results of the lake-sediment 6000 yr tundra fire history study in Noatak have been finalized. A final report was completed for the Joint Fire Science Program in March, 2010. A peer-reviewed publication is in preparation.
- Analyses of charcoal and pollen records from sediment cores from the Noatak National Preserve were completed. Samples from the Seward Peninsula (BELA) lake-sediment cores indicate signs of sediment mixing, and the maximum age of these records is younger than desired (e.g. 1000-2000 yr old, vs. 6000 yr old). Due to the sediment mixing, we were unable to use this data.
- Developed modern relationships between tundra fires, climate, and vegetation to facilitate the improvement of ALFRESCO, a landscape level model used to predict future fire and vegetation regimes using IPCC climate prediction models.

Public Interest Highlights:

Tundra fire regimes: Tundra fire regimes are a poorly understood component of the Arctic, but ongoing environmental change could cause increased burning in the future. Tundra fires have important consequences for land managers and global change scientists, through their impacts on carbon cycling, vegetation change, wildlife resources, and human livelihoods. In 2007 we began a study funded by the Joint Fire Science Program to document fire history and vegetation in areas of Noatak National Preserve over the past 6,000 years. The goals of the study were to understand how and why fire regimes in the region varied in relation to climate and vegetation. Our study capitalized on the ability to reconstruct both vegetation and fire history using lake-sediment records, a tool particularly well suited for studying fire history in treeless tundra ecosystems. This study provides estimated fire return intervals (FRIs) for one of the most flammable tundra ecosystems in Alaska and provides valuable for the context for ongoing and future environmental change. At most sites, FRIs varied through time in response to changes in climate and vegetation, and thus an individual mean FRI does not capture the true range of variability in tundra fire regimes. For the past 2000 years the median fire return intervals varied from 113 yr FRI at Uchugrak Lake to 240 yr FRI at Little Isac Lake. The two down-valley sites had similar and shorter FRIs than the two up-valley sites. Long-term mean FRIs in many periods were both shorter than estimates based on the past 60 years of fire records and statistically indistinct from mean FRIs found in similar studies in Alaskan boreal forests (Higuera et al., 2009; Lynch et al., 2002). These results imply that tundra ecosystems have been resilient to relatively frequent burning over the past 6000 years, which has implications for both managers

and scientists concerned about carbon cycling in tundra ecosystems. For example, while increased tundra fire occurrence is a management concern for the Western Arctic Caribou Herd (Joly et al. 2009), the data presented here suggest that caribou utilizing the study area over the past 6,000 years successfully co-existed with fire.

Collaborators:

P. Higuera – University of Idaho, Moscow, Assistant Professor

F.S. Hu – University of Illinois, Champaign-Urbana, Professor

M. Chipman – University of Illinois, Champaign-Urbana, PhD candidate

S. Rupp – University of Alaska, Fairbanks, Professor

Reports/Presentations:

Hu, F.S., Higuera, P., Barnes, J.L., Rupp, T.S., Chipman, M., and Duffy, P.A. (2010) Reconstructing fire regimes in tundra ecosystems to inform a management-oriented ecosystem model. Final Report, JFSP Project Number 06-3-1-23, CESU Agreement J979106K153/001, April 2010. https://www.firescience.gov/projects/06-3-1-23/project/06-3-1-23_hu_et_al_finalreport_jfsp_06-3-1-23.pdf

Chipman, M, PE Higuera, JL Allen, MA Urban, S Rupp, and FS Hu (2009) Tundra fire-regime response to late-Holocene climate and vegetation change in the Alaskan Arctic. Annual meeting of the Ecological Society of America, Albuquerque, NM. (Oral presentation)

Higuera, PE, M Chipman, JL Allen, LB Brubaker, C Whitlock, M Urban, and FS Hu (2009) Holocene climate-vegetation-fire interactions: lessons from high-latitude and high-elevation ecosystems. Proceedings of the American Geophysical Union annual meeting, San Francisco, CA. (Oral presentation)

ARCN FY10 Work Plan: Assess datasets for long-term monitoring of fire extent, frequency and burn severity in ARCN in Cooperation with NPS Fire Management program. During FY10, we will finalize Standard Operating Procedures and Protocols.

Fire Extent Monitoring Accomplishments 2010:

- 47 fires occurred within ARCN parks during 2010 (see table below). This is the largest number of fires to have occurred in the last 60 years of records (1950-2010). Noatak National Preserve had a record breaking 37 fires with at least 106,000 acres burned within the preserve. Fire crews mapped and monitored the fires in Noatak.
- Data sets have been identified for developing SOPs and Protocols for the fire extent and frequency vital sign for ARCN. The primary dataset is contained within the WFMI (Wildland Fire Management Information) fire reporting module. The WFMI Fire Reporting module is the official system-of-record for the fire occurrence data for all DOI agencies including the National Park Service. It allows authorized users to enter (create), edit, and view fire reports. Since only authorized users may access the data, we are working on an export database to house the data for general use. This database is also used to generate the GIS layers for the AK NPS fire location database. In the past there have been two separate databases, the fire reporting database (WFMI) and a locally used

Access database that was maintained by the fire staff at the regional office. However, this required tracking in two different systems.

Network	Park	Year	Number of Fires	Sum Acres	Largest Fire 2010	Mean Acreage Burned 2010	Sum Acres Burned 1950-2010
ARCN	NOAT	2010	37	106,696	23,269	2,884	481,777
ARCN	GAAR	2010	8	1,470	1,258	184	313,416
ARCN	BELA	2010	1	4	4	4	137,189
ARCN	KOVA	2010	1	350	350	350	109,784
ARCN	CAKR	2010	0	0	0	0	901

