



National Park Service Interior Region 11 (Alaska) Fire Ecology Annual Report Calendar Year 2019

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A. Summary

Overview

The National Park Service (NPS) Interior Region 11 (Alaska) fire ecology program provides science-based information to guide fire and land management planning, decisions and practices in order to maintain and understand fire-adapted ecosystems in Alaska.

During the 2019 field season, the Alaska NPS fire ecology program conducted monitoring in Yukon-Charley Rivers NPr (Figure 1) and Bering Land Bridge NPr. The

regional fire ecologists were involved with preparing monitoring protocols, research reports, instructing classes, and participating on several agency and interagency committees. This annual report provides a brief summary about the NPS Alaska 2019 fire season, fire ecology monitoring results, fire research projects, and fire ecology program activities and outreach.



Figure 1. A smoky evening in July along the Yukon River based field camp in Yukon-Charley Rivers National Preserve (NPS/Seth Adams).

2019 Fire Season

The 2019 fire season was very active in Alaska, beginning with record-breaking warm spring temperatures, followed by a large lightning “bust” through the interior in mid-June, and continued with drought conditions in the southcentral from mid-August through mid-September. Fire activity

peaked in early July with 18 days at planning level 5 and an additional 21 days at planning level 4. By the end of the season, a total of 742 fires were reported with 2,585,625 acres burned, falling above the ten year average of approximately 1.26 million acres. The 2019 fire season ranked 8th in the number of ignitions and 10th in number of acres burned since 1940. The fire history map below highlights the 2019 fires (Figure 2).

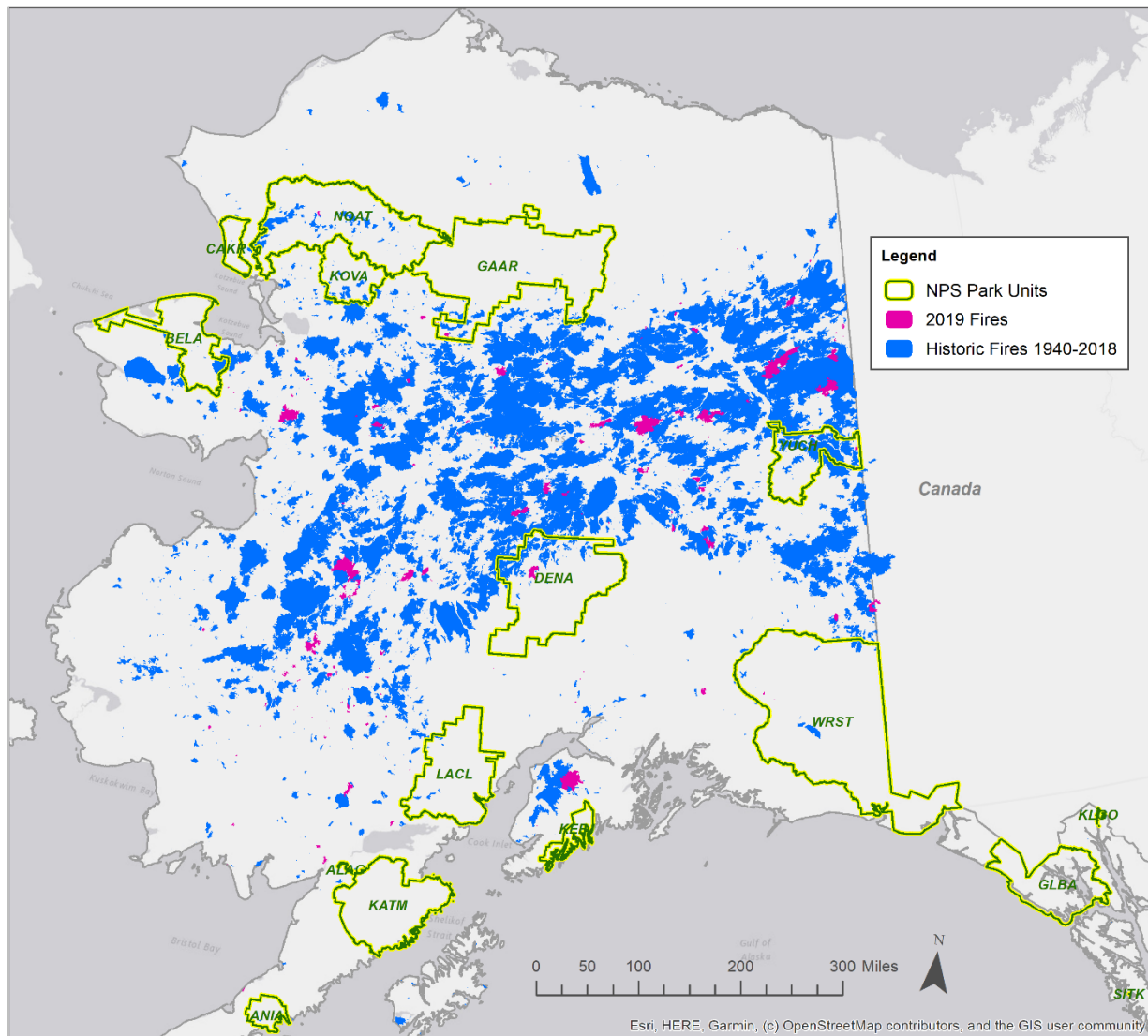


Figure 2. Alaska fire history map with National Park Service units shows perimeters from 1940-2019, highlighting the 2019 fire season.

The National Park Service in Alaska had a relatively busy fire season as well. Overall, 31 wildfires spanned across eight park units for a total of 84,131 acres that burned within and adjacent to park boundaries with 76,869 acres burned on NPS owned lands (Table 1). Bering Land Bridge National Preserve, which averages less than one fire per year, had five lightning starts that were quickly extinguished by rain. The largest fire within park boundaries was the Foraker fire in Denali National Park and Preserve that burned 49,528 acres

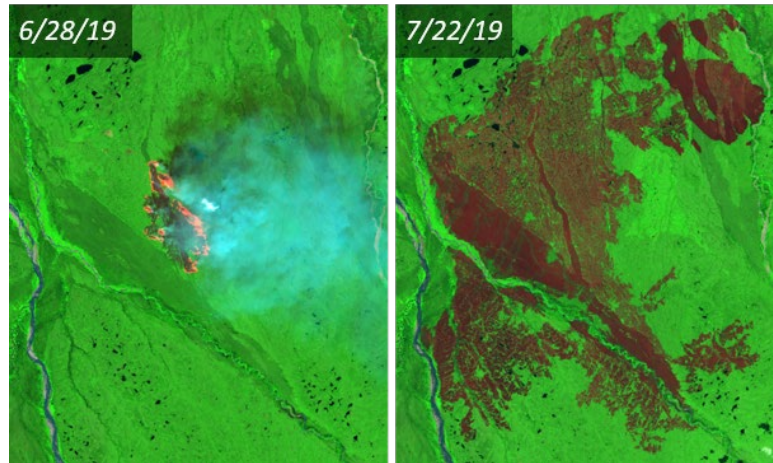


Figure 3. Sentinel 2 satellite image showing approximately 47,500 acres of fire growth between June 28th and July 22nd, 2019 on the Foraker Fire in Denali National Park and Preserve.

(Figure 3). In 2019, the Western Area fire management staff accomplished fuels reduction projects at 20 sites and burned 15 acres of debris piles across four units in Denali. The Eastern Area fire management staff accomplished fuels reduction projects at 7 sites (Table 1).

Table 1. Wildfires, fuels treatments and prescribed fires in Alaska park units from 2019.

Park Unit	Number of Wildfires ¹	Total Acres Burned ¹	Number of Wildfires started on NPS Lands ²	Acres Burned NPS Lands ²	Number of Fuels Treatment Sites	Acres of Prescribed Fires
Bering Land Bridge	5	55	5	54	-	-
Denali	1	49,528	1	49,528	20	15
Gates of the Arctic	3	11,738	3	11,614	-	-
Klondike Gold Rush	1	0.1	0	0	-	-
Lake Clark	2	329	2	329	-	-
Noatak	5	7,158	5	7,157	-	-
Wrangell-St. Elias	5	2,337	2	1,281	4	-
Yukon-Charley Rivers	9	12,986	6	6,906	3	-
Total for Region	31	84,131.1	24	76,869	27	15

¹ Includes total number of fires and acres of all wildfires that burned within or partially within the boundaries of the park unit. NPS boundaries include inholdings of lands not owned or managed by NPS. ² Number of wildfires started and acres burned on NPS owned lands (WFMI stats).

B. Monitoring & Inventory

Monitoring and inventories are utilized by the fire ecology program to provide feedback to the NPS fire management program on activities such as fuels treatments and to continue to gain a better understanding of the effects of wildfire on the landscape. Table 2 provides a list of the number of plots measured in 2019 and the total number of fire/fuels monitoring or inventory plots established in Alaska parks since 2001. These plots are also shown on the NPS Alaska – Fire Ecology Plots Map (Figure 4), including the number of plots by park and type.

During 2019 the NPS Alaska fire ecology program measured plots in Yukon-Charley Rivers National Preserve and Bering Land Bridge National Preserve. A brief description and preliminary results from the monitoring project are provided below.

Table 2. Fire effects and fuels treatment (TX) plot workload (2019) and total monitoring plots Installed 2003-2019.

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-burn/TX 2019	1yr Post 2019	2-42 yrs Post 2019	Annual Total	Total Plots
Lake Clark	2013 Currant Cr Fire	CBI & Cover					33
	2013 Currant Cr Fire	AKR Fire & Fuels Plots					10
	2013 Kristin Cr Fire	CBI & Cover					7
Wrangell-St. Elias	Carl Cr RX	AKR Carl Cr Plots					29
	2009 Chakina Fire	CBI & Cover					39
	2009 Chakina/2016 Steamboat Fires	CBI, AKR Fire & Fuels Plots					49
	Susan Smith Hazard Fuels Plots - TX	AKR Hazard Fuels Plots					13
	Headquarters – TX	AKR Hazard Fuels Plots					19
	Fire Effects – Paired Plots	AKR Paired Plots					2
	McCarthy University Subdivision - TX	AKR Hazard Fuels Plots					27
Yukon-Charley Rivers	2004 Woodchopper/ Edwards Ck Fires	AKR Fire & Fuels Plots					8
	1999 Witch Fire	Fire Effects (Other)					15
	Fire Effects – Paired Plots	AKR Paired Plots					6
	1999 Fires Landcover-CBI	CBI					88
		CBI, AKR Fire & Fuels Plots					31
	2005 Backcountry Cabins - TX	AKR Hazard Fuels Plots					42
	2018 Andrew Cr Fire	CBI & CAKN Vegetation ¹		28		28	28
Denali	Headquarters – TX	AKR Hazard Fuels Plots					28
	VDM	AKR Fire & Fuels Plots					43
	Landcover-CBI	AKR Fire & Fuels Plots					55
	2013 Beaver Log Fire	CBI & Cover					13
	2013 Toklat River East Fire	CBI & Cover					25
Noatak	2010 Fires	CBI & Cover					34
	2004 Uvgoon Fire	AKR Fire & Fuels Plots					6
	2012 Uvgoon/ Kungiakrok Fires	CBI & Cover					22
	1977 Fires Racine Plots	Racine Plots					8
Bering Land Bridge	1977 Fire Racine Plots	Racine Plots			8	8	8
	Fairhaven Ditch Cabins- TX	AKR Hazard Fuels Plots					4
Total			0	28	8	36	692

¹ Plots were sampled in collaboration with the Central Alaska Inventory & Monitoring Network (CAKN).

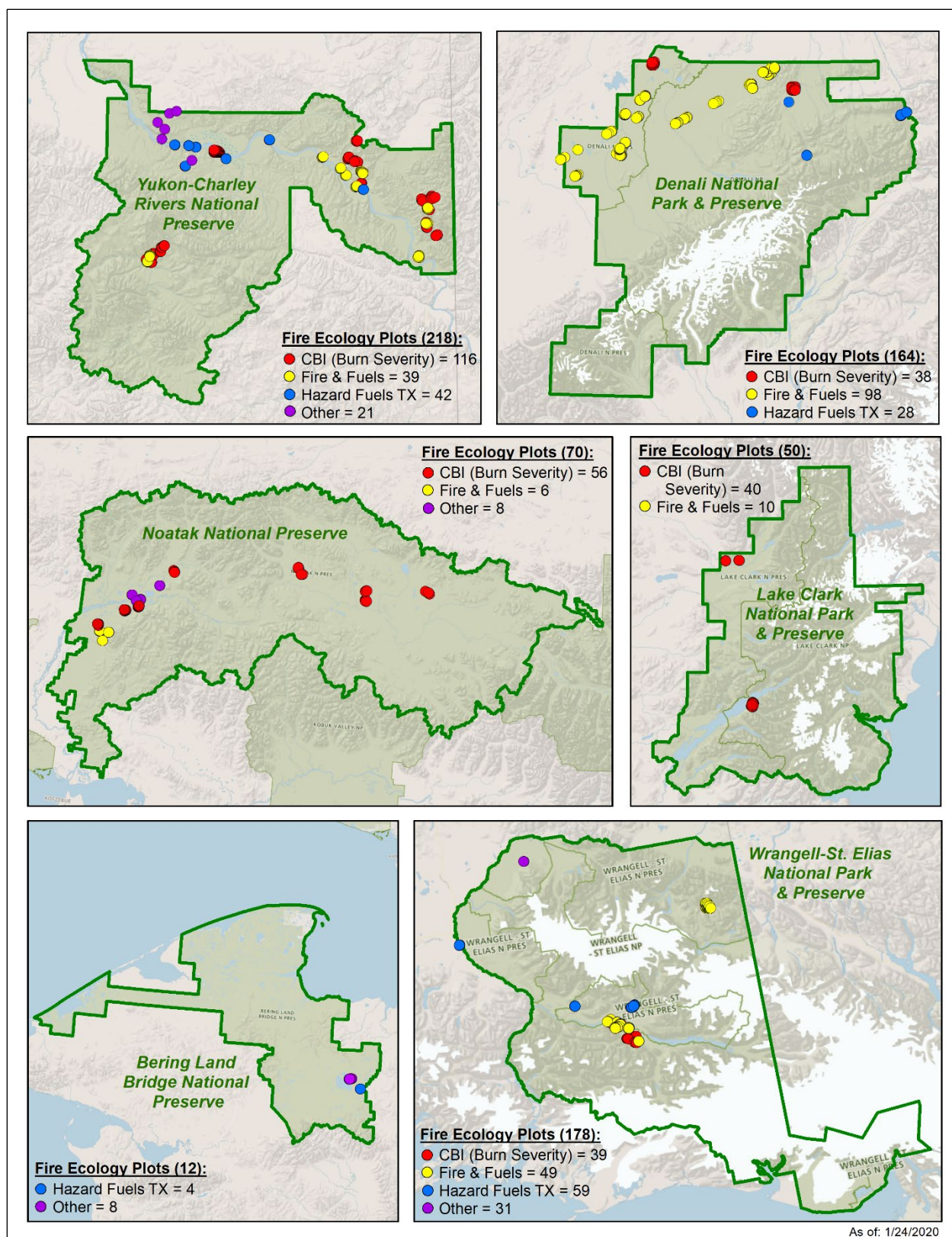


Figure 4. Map of fire monitoring plots (by type) installed since 2001 within Alaska NPS park units.

Yukon-Charley Rivers – Fire & Ice Integrated Fire Research Project

The 2018 Andrew Creek Fire in Yukon-Charley Rivers National Preserve provided an ideal location to investigate the short- and long-term impacts of fire and climate on permafrost, soils, water quality, vegetation and wildlife habitat. This 7,800 acre fire burned through vegetation (Ben Creek Grid) and lake monitoring sites previously established by the Central Alaska Inventory and Monitoring Network (CAKN). CAKN also maintains a nearby weather station that captured pre- and post-fire conditions along with soil temperatures. The first year of this project was funded in part through the NPS Reserve Fund.

This study has multiple objectives, organized by topic and primary resource/program investigators below.

1. Post-fire Vegetation (CAKN/DENA Botanists & Plant Ecologists)

- What are the spatial and temporal patterns in post-fire tree recruitment and seedling establishment and other vegetation, and how do these relate to fire effects and the other ecological gradients that influence vegetation in the study area?
- How does the relative importance of different modes of recruitment vary in relation to burn severity, location, microclimate and other gradients?
- Detect how changes in seasonal weather are affecting phenology of plants in Alaska.

2. Water Quality – Shallow Lakes and Streams (CAKN & YUGA Aquatic Ecologists)

- How will burn severity and potential permafrost thaw change shallow lake and stream ecosystems? How are these changes, and subsequent recovery trajectories affected by ecological gradients known to influence stream ecosystem structure and function?
- How will specific conductance and DOC in shallow lakes change in relation to seasonal active layer depth changes?

3. Permafrost and Soils (ARCN Ecologist)

- How has the fire affected soil temperatures and active layer depths compared to pre-fire data?
- What extent of thermokarsting and/or erosion will occur as a result of the fire?
- What will the fate of permafrost in this burn be under a warming climate?

4. Wildlife – Small Mammals & Birds (YUGA & DENA Wildlife Biologists)

- Determine which species of small mammals recolonize burned areas as plant succession proceeds.
- Quantify if and how temporal changes in post-fire vegetation structure predict changes in bird occurrence in the study site. What species of birds recolonize and this a direct effect of time since fire or temporal changes in vegetation?
- Quantify post-fire colonization by post-fire specialists, such as the black-backed woodpecker, northern flicker, and mountain bluebird. Their persistence can also affect colonization of other bird species.

5. Burn Severity/Fire Behavior/Changes in Fuel Structure (Fire Ecology Program)

- Assess burn severity relationships to dNBR MTBS datasets and correlate variables such as vegetation type, slope, aspect, and soils.
- Determine how existing pre-vegetation mosaic affects (or interacts with) the rate and manner of fire spread and the spatial variation of burn severity.
- Assess changes in post-fuels treatment vegetation characteristics and identify parameters that lead to successful structure protection.

6. *Integration (All)*

- Analyses of relationships among topography/habitat/soils/vegetation/aquatic and fire effects to identify important relationships in combined data sets.

In July of 2019, the Fire Ecology Program worked with CAKN and DENA plant ecologists and botanists to collect 1 year post-fire vegetation data including vegetation cover/density, tree and seedling densities, soil depths and consumption, active layer depths and soil temperature, site descriptions, NDVI values, and burn severity (Figure 5). The field crews re-measured 9 original Ben Creek mini-grid plots (last sampled in 2008) and established an additional 19 supplemental plots within the grid. The pre-fire vegetation in the sampling area was primarily open/closed black spruce forest, with some mixed spruce/birch and mixed black spruce/white spruce stands along the northern edge of the fire, paralleling the Yukon River.



Figure 5. Measuring 1 year post-fire vegetation cover and seedling density (left) and collecting soil samples (right) within the Andrew Creek Fire in Yukon-Charley Rivers National Preserve (NPS/Seth Adams).

Burn severity was collected in the field using the Composite Burn Index (CBI) method which assesses fire effects by strata (e.g., ground, herbaceous, shrub, and tree layers if present). The severity of each strata is rated from 0-3 where 0 is unburned and 3 is the highest severity. Of the 28 total plots, only one was unburned (BEN-CR-07). Preliminary burn severity results show the ground-truth assessments matched only moderately well with the initial satellite assessment produced by the USGS Monitoring Trends in Burn Severity (MTBS) program (Figure 6, $r^2 = 0.63$).

CBI scores ranged from 0 to 2.83 but the distribution was skewed heavily towards moderate-high to high severity (2.0-2.83) with no CBI scores between 1.0 and 2.0 and only one plot rated < 1.0. This was expected given the relatively homogenous pre-fire vegetation type (black spruce) and the dNBR values indicated by the MTBS map. Examples of pre- and post-fire vegetation/burn severity are shown in Figure 7.

An additional 33 potential CBI plots were identified to increase the number of plots sampled and range of pre-fire vegetation types and dNBR values. Due to limited helicopter availability, those plots could not be reached. There may be opportunities for further burn severity sampling in 2020.

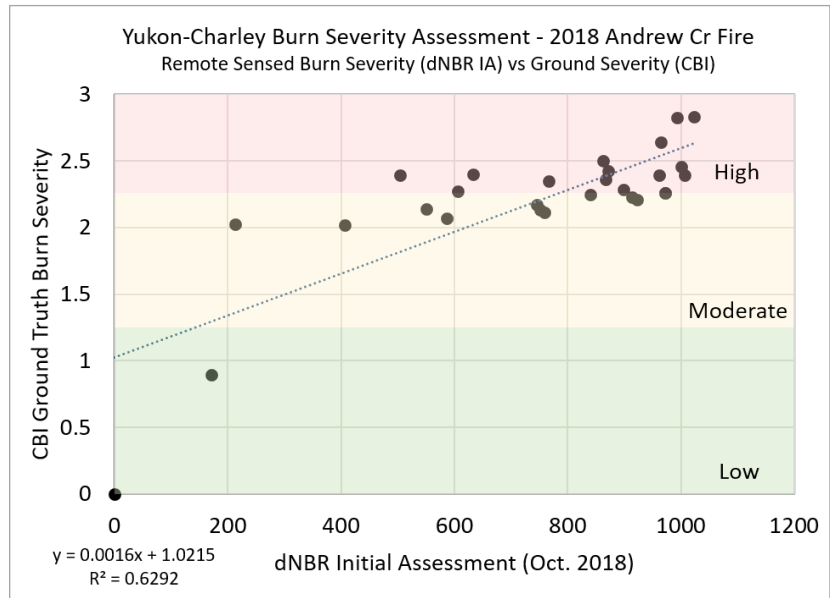


Figure 6. Comparison of remote sensed burn severity values (dNBR) to ground based burn severity measures (CBI) for the Andrew Creek Fire of 2018 in Yukon-Charley River NPr, Alaska. CBI values are stratified by burn severity class; low, moderate and high.



Figure 7. Comparison of pre-fire vegetation of black spruce with thick feathermoss ground cover (left) to one year post-fire after a high severity crown fire occurred (right). Photos show Ben-Cr-04 plot in 2008 and then in 2019 (NPS/CAKN).

All vegetation and site data collected at the Ben Creek mini-grid was entered into the CAKN Long-Term Monitoring Database and will be analyzed by CAKN in collaboration with the Fire Ecology program. The burn severity data was entered into FFI.

Project Accomplishments (2018-2019):

- Immediate (Sept 2018) and one year post-fire (Aug 2019) Structure from Motion imagery was collected over the fire area.
- Seven soil temperature sensors and two air temperature sensors installed at permanent grid plots (to remain for up to 5 years) (Sept 2018).
- Installation of Campbell Scientific weather station and phenology camera with burn area (May 2019).
- Vegetation/burn severity sampling at Ben Creek mini-grid plots plus installation of supplemental grid plots (July 2019)
- SMR acoustic recorder installed May through August (2019) to capture bird songs.
- Continuously monitoring water stations installed in two shallow lakes (July 2019).

More information on this project can be found in the High Latitude Highlights Newsletter (fall 2019 edition) and online at <https://www.nps.gov/articles/ice-birds-streams-amidst-fire.htm>.

Bering Land Bridge Tundra Fire Long-Term Monitoring

During the very warm, dry summer of 1977, several large tundra wildfires occurred in northwest Alaska, including the 258,000 acre Kugruk Hi Fire (BLM #8623) in Bering Land Bridge National Preserve. A set of eight permanent monitoring plots (transects) were established in 1978 by Chuck Racine (and colleagues). They are located along the southwest facing slope of Nimrod Hill, on the east side of Imuruk Lake where tundra vegetation and soils were sampled before the fire in 1973. The permanent plots have been monitored one year post-fire in 1978, followed by sampling in 1979, 1980, 1983, 2001, 2009 and 2019 at 42 years post-fire. This site has provided one of the longest records of post-fire vegetation recovery in tundra in Alaska.

The purpose of these fire effects plots were to detect major changes in structure and composition of vegetation. This includes changes in the cover of vascular and non-vascular plants by species and lifeform, heights of shrubs, and active layer depth over time. For this study area, eight transects were measured with ten 1-m x 1-m quadrats per transect. Data collected within the quadrats included: ocular estimates of vascular and non-vascular species cover, shrub heights, active layer depth measurements, site descriptions, and photographs.

The data was initially summarized by average cover by functional lifeform for sample years (excluding 1979) across all transects (Table 3 and Figure 8). The unburned sites (1973) had the highest lichen cover (11.2%) which has not recovered by 42 years post fire (1.6%). The grasses and forbs peaked 6 years after the fire, started to decline 24 years post fire, and have continued to decline.

Shrubs were broken into functional types of evergreen and deciduous following other papers (Racine et al. 2004). Evergreen and deciduous shrubs increased 24 years after the fire and had recovered to pre-fire levels of shrubs. Thirty-two years after the fire (2009) the shrubs reached their maximum cover. However, by 2019 there was a decrease in the evergreen shrubs, dropping from 21% cover in 2009 to 13.6% in 2019. The tussock forming sedges (*Eriophorum vaginatum* and *Carex bigelowii*) have continued to increase with the maximum cover of sedges measured in 2019 (61%), 42 years after the fire.

Table 3. Average percent cover of vascular plants by functional types for sites by sample year over the past 46 years at the Bering Land Bridge Nimrod Hill Racine plots. Fire occurred in 1977. The number of plots are shown as “n” in the table. The 80% confidence intervals are shown in parentheses.

Year Sampled / Time Since Fire	n	Lichens	Forb Herbs	Grasses	Sedges	Evergreen Shrubs	Deciduous Shrubs
1973 (Pre-Fire)	3	11.2 (6.4 - 16.1)	2.3 (1.2 - 3.4)	0	27.8 (9.6 - 46.0)	14.7 (7.9 - 21.5)	17.5 (6.0 - 29.0)
1978 (1 year post)	8	0.6 (-0.2 - 1.3)	1.6 (0.9 - 2.3)	0.7 (0.1 - 1.2)	11.8 (7.2 - 16.5)	2.5 (0.5 - 4.5)	0.6 (0.3 - 0.8)
1980 (3 years post)	8	0.01 (0.00 - 0.03)	0.4 (0.1 - 0.7)	1.1 (-0.05 - 2.3)	25.9 (19.0 - 32.8)	2.2 (1.1 - 3.3)	1.5 (0.8 - 2.3)
1983 (6 years post)	7	0.14 (0.01 - 0.3)	11.7 (6.3 - 17.2)	6.4 (1.0 - 11.8)	49.4 (42.1 - 56.7)	8.4 (3.6 - 13.1)	4.3 (3.0 - 5.7)
2001 (24 years post)	8	1.7 (0.9 - 2.5)	5.2 (3.3 - 7.0)	3.8 (1.7 - 5.9)	45.3 (37.5 - 53.1)	18.3 (10.3 - 26.3)	14.5 (8.8 - 20.1)
2009 (32 years post)	8	1.0 (0.5 - 1.5)	3.1 (1.8 - 4.3)	1.7 (0.1 - 3.3)	49.6 (40.8 - 53.4)	20.9 (12.0 - 29.9)	19.0 (11.4 - 26.6)
2019 (42 years post)	8	1.6 (1.1 - 2.1)	2.0 (1.4 - 2.7)	0.2 (-0.02 - 0.5)	61.2 (53.7 - 68.6)	13.6 (8.6 - 18.5)	17.3 (8.7 - 25.8)

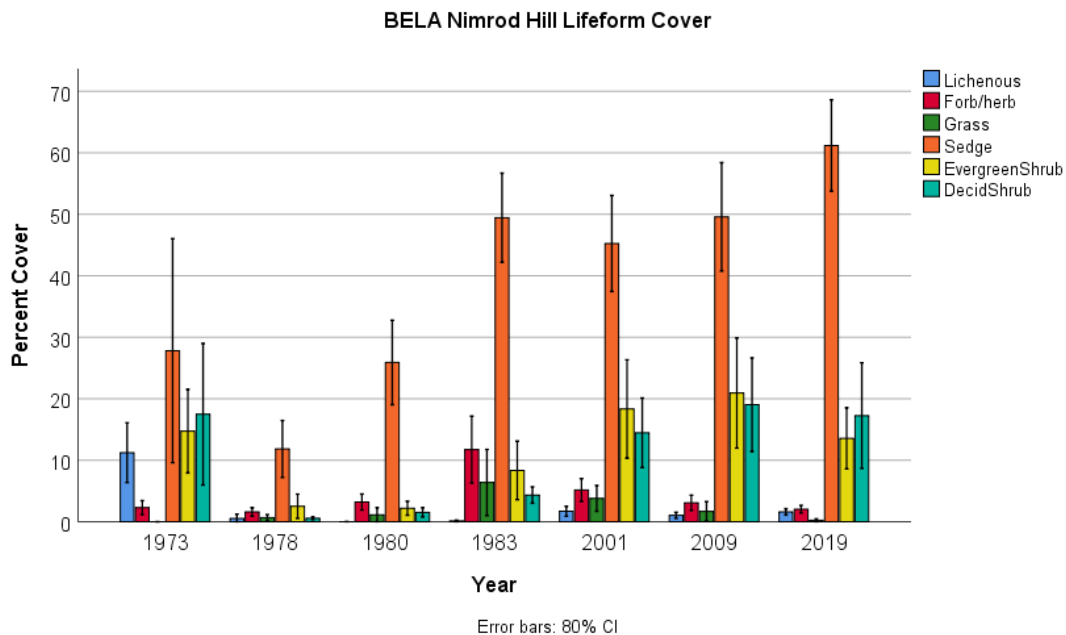


Figure 8. Average percent cover by functional lifeform for all transects by year at the Nimrod Hills tundra fire plots in Bering Land Bridge National Preserve.

Comparing the shrubs by pre-fire vegetation type, the changes in shrub cover species are more apparent. The lower slope tussock-tundra sites (Nim-01 through Nim-05) appear to have a reduction in Labrador tea (RHTO2), cranberry (VAVI), and shrub birch (BENA) cover in 2019, after peaking in 2009 (Figures 9, 10 and 11). The better drained sites on the upper slope (Nim-6 and Nim-7) which were previously considered a low shrub tundra type, have seen an expansion of diamond leaf willow *Salix pulchra* (SAPU15) that was first noted in 2001 (Racine et al 2004) (Figures 10 and 12). Between 2009 and 2019 there has continued to be an increase in cover of willow. Crowberry (EMNI) also appears to continue to increase at the shrub tundra sites. Shrubs at the wet sedge meadow transect (Nim-08) are not as common, but have not returned to pre-fire cover for several species of shrubs (Figures 10 and 11).

The preliminary results from this study show a fairly dramatic drop in cover of evergreen shrubs, predominantly Labrador tea and shrub birch at the tussock shrub tundra sites 40 years after the fire. This may be indicative of paludification or other changes to the soils that could limit the woody shrub growth. The better drained shrub tundra sites appear to continue to see an increase in cover of tall willow over time. Shrubification of tundra has been a topic of interest with increased warming in Alaska. This long term monitoring suggests that there is a limitation of the shrub expansion and that some shrub species such as Labrador tea and shrub birch could see a decrease over time after fire. There has also been minimal recovery of lichens at the site. Based on the pre-fire data the cover of lichens, which were commonly *Cladonia* and *Cetraria* species, have not recovered to pre-fire cover levels. Additional analyses and results will be presented in a report for this study site in 2020.



Figure 9. An example of evergreen shrub reduction in the tussock shrub tundra sites. Photos from a quadrat from Nim-01 shows a reduction in Labrador tea and other shrubs between 2009 (left) and 2019 (right). Tussock sedges have more cover in this quadrat in 2019.

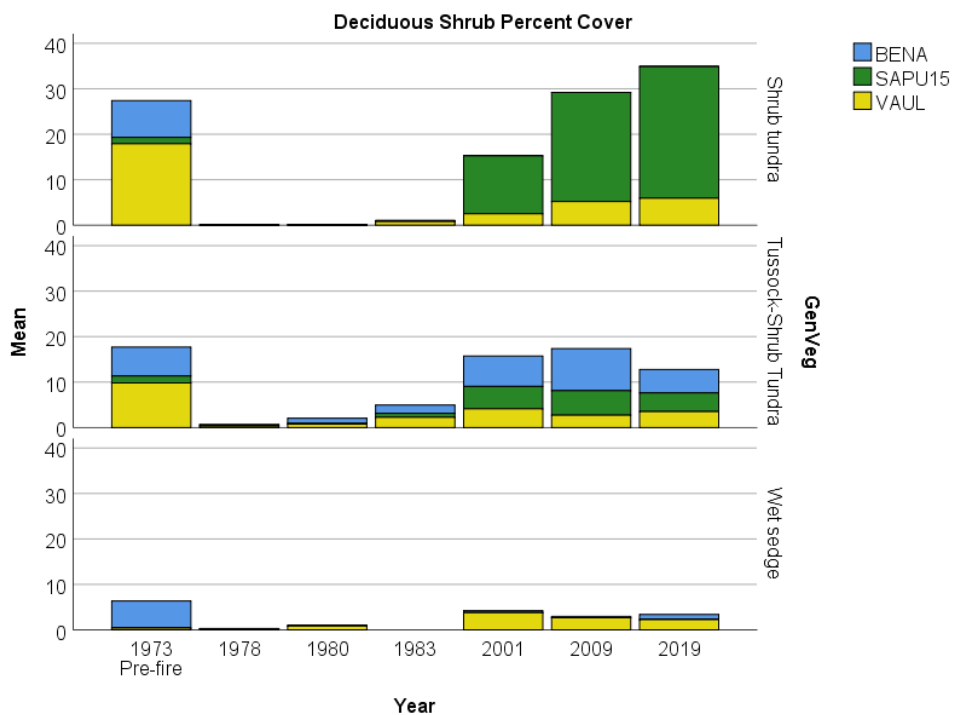


Figure 10. Average percent cover of dominant deciduous shrub species organized by general pre-fire vegetation type and sample year at the Nimrod Hills tundra fire plots in Bering Land Bridge National Preserve. Species are dwarf birch (BENA), diamond leaf willow (SAPU15), and blueberry (VAUL).

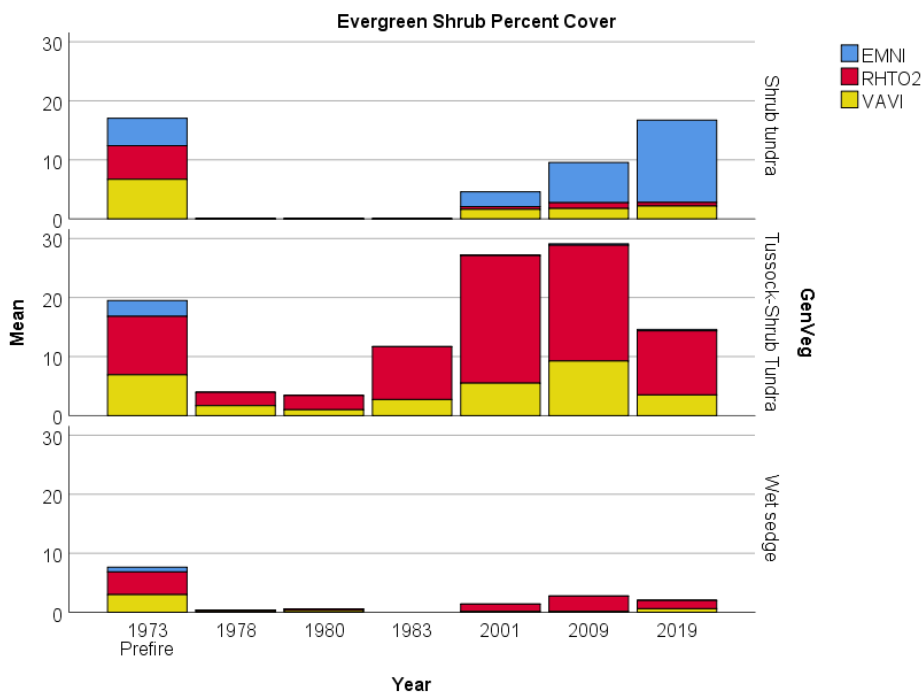


Figure 11. Average percent cover of evergreen shrub species organized by general pre-fire vegetation type and sample year at the Nimrod Hills tundra fire plots in Bering Land Bridge National Preserve. Species are crowberry (EMNI), Labrador tea (RHTO2), and bog cranberry (VAVI).



Figure 12. Transect Nim-06 photos from 1973 (pre-fire) low shrub tundra, 1978 (1 year post fire) high severity burn, 1983 sedge meadow, and 2019 open willow. Willows have expanded on this site since the fire in 1977. (1973 -1983 photos C. Racine, 2019 photo NPS/Barnes)

Data Management

Data for all 2019 monitoring projects were entered into FFI (FEAT/FIREMON Integrated) - a plot-level monitoring sequel server software tool designed to assist managers with collection, storage and analysis of ecological information (<https://www.frames.gov/ffi/home>). Additional legacy data collected in Bering Land Bridge National Preserve from 1973 through 2009 was converted and merged into FFI. Digital archives and metadata for the AK databases were uploaded to the NPS Data Store IRMA in January 2020. The Alaska Eastern Area fire ecology data set includes data for YUCH and WRST: <https://irma.nps.gov/DataStore/Reference/Profile/2271704>. The Alaska Western Area fire ecology data set includes data for DENA, NOAT, BELA, and LACL: <https://irma.nps.gov/DataStore/Reference/Profile/2271703>. The updated FFI databases reflect the recent data additions and QC to the AK NPS fire ecology databases (Table 4).

Table 4. Monitoring Data Entry and Number of Treatment Units Monitored for 2019

Park/Project	% 2019 Data Entered	% 2019 Data Quality Checked	# Prescribed Fires Monitored	# Non-fire Fuels Treatments Monitored	# Wildfires Monitored	# BAER Treatments Monitored
Yukon-Charley Rivers - Andrew Creek Grid Plots (CBI only)	100%	100%	0	0	1	0
Bering Land Bridge – Racine Long-term Tundra Fire Effects (plus 1973-2009 legacy data)	100%	100%	0	0	1	0

C. Research & Technology

The AKR fire ecology program coordinates *research* and facilitates the use of scientific data, modeling and technology to address the needs of the fire management program. The primary focus of 2019 has been to complete the final reports for the research study funded by the FWS-LCC to assess the extent, cause and impacts of shortened fire return intervals in boreal forests. The fire ecologists worked with Central Alaska Inventory & Monitoring staff to propose a reserve fund research request to research the impacts of a 2018 fire in Yukon-Charley Rivers NPr that burned through several Inventory & Monitoring plots and lake monitoring sites (Table 5). The proposal was funded and data analysis is underway.

Both fire ecologists are part of the interagency Fire Research, Development and Application Committee (FRDAC) for the Alaska Wildland Fire Coordinating Group (AWFCG) and are on the advisory board for the JFSP Alaska Fire Science Consortium. The fire ecology program also participates in other interagency research, project specific or technology related groups/teams including the Fire Modeling and Analysis Committee (AFWCG), Conservation of Arctic Flora and Fauna (CAFF) Arctic FIRE project group, Fire Self-regulation Synthesis group, Alaska InFORM Technical Review Team, and the Interagency Arctic Research Policy Committee (IARPC) Terrestrial Ecosystems Collaboration Team.

Table 5. Research workload in 2019.

Park	Are research needs identified in FMP or Monitoring Plan?	# of Proposals Submitted in 2019	# of Proposals Funded in 2019	# of Research Projects Supported in 2019 ¹	Additional Comments
Wrangell-St. Elias NPPr	Yes	0	0	1	FWS-LCC repeat fires.
Denali NPPr	Under revision	0	0	1	FWS-LCC repeat fires.
Yukon-Charley Rivers NPr	Yes	1	1	1	Two post-fire effects requests: Andrew Creek and Dome Creek.

¹Number of funded research projects, new or ongoing, supported by the fire ecology program including logistical info or support, staffing, etc.

D. Communicating Results

Communicating results of projects or research is an important aspect the fire ecology program in order to provide *information and outreach* to fire managers, park staff, and the public. Table 6 lists the number of monitoring reports and presentations completed by park/affiliated group.

The fire ecology program submitted two outreach articles on the “Fire and Ice: Integrated Resource Project” from the Andrew Creek Fire within Yukon-Charley Rivers NPr.

The articles highlight the importance of wildfire on the landscape and how National Park Service resource specialists are working together to investigate the impacts of fire in a changing climate (Figure 13).



Figure 13. Monitoring lake chemistry within the Andrew Creek fire area (Yukon-Charley Rivers National Preserve) (NPS Photo/S. Adams).

The fire management program “success story” article is publicly accessible and can be found here: <https://www.nps.gov/articles/ice-birds-streams-amidst-fire.htm>. This project was also included in the Fall 2019 edition of the High Latitude Highlights – The Resource Newsletter of the Interior Region 11 (Alaska), an internal NPS publication (<https://sites.google.com/a/nps.gov/in2-alaska-region/resources-and-planning/natural-resources/high-latitude-highlights>).

The fire ecologist also provided hands-on field training sessions on fuel moisture sampling, data processing, and using the National Fuel Moisture Database with the NPS Western Area Fire Management staff in Denali.

See Appendix A for a list of reports, presentations, and other forms of communication completed in 2019.

Table 6. Communicating Results - 2019

Park	# of Project Monitoring Reports completed in 2019	# of Annual meeting(s) with Park staff	# of Formal presentations of results	Do you use Minitab?*
Yukon-Charley Rivers	0	0	0	No
Denali	0	0	0	No
Noatak	0	0	0	No
Lake Clark	0	0	0	No
Wrangell-St. Elias	0	0	0	No
Regional Office	0	1	1	No
Arctic Inventory & Monitoring Network	1	1	0	No

*This information will help to assess Minitab multi-user license needs.

E. Planning and Compliance

The fire ecology program participates in *planning* activities for the Fire Management and Park Land Management Programs. Table 7 has a list of parks with fire management plans and the status for fire monitoring plans and Desired Future Conditions within the plans or other planning documents (<http://www.nps.gov/policy/DOrders/draftDO2-1.html>).

Table 7. Fire Management Plan - Fire Monitoring Plan Status as of 2019

Park	Does Park have written Desired Future Conditions (DFCs)? (yes or no)	Date Park-level Monitoring Plan completed (or revised)	Total # of Project- or Community-level Monitoring Plans	Assisted with how many BAER plans in 2019?
Denali	Yes in RSS	2012	4	0
Gates of the Arctic	Yes - Interim Fire Desired Conditions in FMP	2014	1	0
Glacier Bay		In Progress	0	0
Katmai	Yes – Suggested Fire Desired Conditions in FMP	2012	0	0
Lake Clark	No - Fire Management Objectives in FMP	2010	1	0
Western Arctic National Parklands	Yes - Interim Fire Desired Conditions in FMP	2012	4	0
Wrangell-St. Elias	No - Fire Management Objectives in FMP	2010	5	0
Yukon-Charley Rivers	No - Fire Management Objectives in FMP	2010	2	0

F. Fire ecology accomplishments and areas of focus

Fire Ecology Staffing 2019

The Alaska NPS Fire Ecology Program has a regional fire ecologist and a subject-to-furlough assistant regional fire ecologist. In general the fire ecology fieldwork has been accomplished with the assistance of the NPS fuels seasonal technicians or fire staff under the guidance of the regional fire ecologists. This season, the fire ecology program primarily worked with NPS resource specialists from the parks and I&M networks to complete field work due to high fire suppression/management activity. Table 8 provides an overview of the fire management personnel that worked on or have assisted with fire ecology projects in 2019.

Table 8. Fire Ecology Staffing 2019

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
Jennifer Barnes (Regional Fire Ecologist)	1/1/2019	12/31/2019	26	No	RT-372
Jennifer Hrobak (Assistant Regional Fire Ecologist)	1/1/2019	12/31/2019	25*	No	RT-372, Fire GIS Specialist Detail (120 days), Gettysburg Staff Ride for Operators

*13 pay periods on base funding, additional pay periods on I&M funds, fire and other project funds.

Regional Fire Ecologists Accomplishment/Focus Areas

The Interior 11 (Alaska) Regional Fire Ecologist facilitates planning, monitoring, research and outreach for the *region* and *park* programs. This position is responsible for monitoring plans, protocol development, compliance, administration, field instruction, field work, data analysis, and reporting on projects for the parks and region. In 2019, the regional fire ecologist finished the vegetation analysis for the FWS/LCC repeat fires project; planned and implemented field projects; and prepared presentations. Table 9 provides a summary of the Regional Fire Ecologist focus areas and accomplishments for the calendar year of 2019.

Table 9. Fire Ecologist 2019 Accomplishments/Focus Areas (J. Barnes)

Category	Percent Time	Accomplishments and/or areas of activities
Planning	15%	Compliance and planning for field work (YUCH, BELA) Task orders for aviation Glacier Bay Fire Management Plan and EA– meetings and prep RSS – Yukon-Charley Rivers and Gates of the Arctic
Presentations/ Reports	20%	Presentations: NPS, Public, Interagency Meetings Annual reports for Fire Ecology program and I&M network Repeat Fire Final Report (Prep for publication) Articles for NPS High Latitude Highlights
NPS Meetings/ task groups	10%	AKRO and Park Fire Meetings Regional Fire Ecologist conference calls I&M Technical Committee meetings WFPAC alternate
Interagency work	10%	S-495 unit instructor, CAN 390 instructor AWFCG Fire Research, Development & Application Committee AWFCG Fire Modeling and Application Committee Alaska Fire Science Consortium (Board member) Interagency fire meetings GA Editor for NPS Alaska
Wildfire assignments	2%	DMOB 10 days, THSP (GSAN) 3 days
Prescribed fire projects (implementation)	0	
Non-fire fuels projects (implementation)	0	
Research	6%	Proposal preparation/coordination – YUCH Andrew Creek USGS/FWS-LCC Repeat Fire research publication preparation Proposal reviews and letters of support
Data collection	6%	YUCH Andrew Creek fire monitoring BELA Racine tundra fire plots
Data entry	1%	Data entry supervision and database assistance QC of data
Data analysis	10%	BELA Racine tundra fire plots WRST and DENA Repeat fire plots
Supervision/Admin	12%	Supervision STF GS-9 Fire Ecologist Paperwork and administrative (time, travel, email) Budget
Training	2%	RT372 Supervisory Training Annual NPS Spring Training (RT-130, etc.)

Category	Percent Time	Accomplishments and/or areas of activities
Travel out-of-park for plot or project work	2%	All field work requires a travel authorization, multi-day trips away from duty station. Travel to Tucson for AFE Congress and S-495.
Miscellaneous	5%	Furlough – Gov't shutdown

Assistant Fire Ecologist Accomplishments/Focus Areas

The subject-to-furlough assistant regional fire ecologist works for the regional fire ecologist in Alaska. This position helps plan and implement fire effects and fuels monitoring projects. This position also assists in the development of park fire management plans, fire monitoring plans, and compliance for fire ecology activities.

The primary workload focused on completing the final report on repeat fire extent and trends in Alaska (GIS) and presenting the results at the 2019 AFE Congress in Tucson, AZ. Other notable accomplishments include completing a 120-day detail as the Fire GIS Specialist for the Interior Region 11 (Alaska), providing in-house fire support (briefing Fire Modules, fire perimeter mapping, logistical support, etc.), assisting at local fire dispatch offices, organizing two remote field projects (YUCH & BELA) and participating in the Alaska InFORM (fire reporting) Technical Review team and AOP Revisions group. Table 10 provides a summary of the Assistant Regional Fire Ecologist focus areas and accomplishments for the calendar year of 2019.

Table 10. Assistant Fire Ecologist Accomplishments/Focus Areas 2019 (J. Hrobak)

Category	Percent Time	Accomplishments and/or areas of activities
Planning	7%	YUCH – Andrew Creek Fire Integrated Resource Project (Project Proposals, Logistics, Flight Planning, Gear Prep, Maps, Field Crew Coordination, Project Plan, etc.) BELA – Racine Tundra Fire Plots (Logistics, Flight Planning, Gear Prep, Maps, Field Crew Coordination, Project Plan, etc.) Annual Field Project Preparation (Trimble, Garmin & InReach updates, CartoPac, ArcGIS updates, data dictionary editing, camera settings, Garmin waypoint organization, gear preparation, etc.) Annual Spring Training Preparation
Presentations/Reports	18%	All presentations listed in Appendix A. (Outreach, Seasonal Training, etc) Fire Ecology Annual Report Repeat Fire GIS Final Report (Prep for Publication) Repeat Fire GIS Presentation at AFE (Tucson) CFFDRS (CAN290) Course Units (2) Fire Monitoring/Documentation Presentation (Alaska Dispatch Workshop) Annual Spring Training Presentations (4) NPS AK Module Guide Review
NPS Meetings/ task groups	4%	AKRO Staff Meetings (weekly) Interior Region 11 Fire Management Meetings (monthly) Regional Fire Ecologist Meetings (alternate) AKRO Fire In-Person Staff Meetings (semiannual) Miscellaneous Project Meetings (Andrew Creek Fire Integrated Project, etc.)
Interagency Work	7%	Alaska Fire Science Consortium – Advisory Board Member

Category	Percent Time	Accomplishments and/or areas of activities
		AWFCG Fire Research, Development & Application Committee (Chair) AWFCG GIS Committee (Alternate) AWFCG Fire Modeling and Analysis Committee (Participant) Alaska Incident Management Team Meetings Alaska Interagency Fall Fire Review Alaska Fire Science Consortium Workshops NPS Representative for IARPC CAN 290 Course Cadre (Course Prep, Meetings, Instruction) Fire Self-Regulation Synthesis Project Meetings Fire History Update Meetings InFORM Tech Review Group & AOP Revisions Group
Wildfire Assignments	4%	3 Short Assignments in Dispatch (AICC/UYT)
Prescribed fire projects	0%	
Non-fire fuels projects	0%	
Research	0%	
Data Collection	4%	YUCH Andrew Creek Fire (CAKN Ben Creek Mini-grid Plots) BELA Racine Tundra Fire Effects Plots
Data Entry/Processing	6%	FFI Data Entry FFI Database QC & project metadata Photo and GPS Processing Datasheet Scans/File Processing Fuel Moisture Sampling Data Entry
Data Analysis	5%	Repeat Fires Project – Geospatial Data Analysis ARCN Fire Extent Monitoring Protocol through 2012/2013
Supervision/Admin	5%	Quick Time, Travel Authorizations/Vouchers, Credit Card Statements, Fire Physicals, Email, etc.
Training	8%	Aviation Courses (A-302) Annual NPS Spring Training (RT-130, First Aid, CPR, etc.) ATV/UTV Operator Bear Safety Training Shotgun Certification DOI Required Courses (FISSA+, Sexual Harassment, EEO, Privacy for Systems Managers, Records Management, CUI Awareness Training, Privacy Awareness) Gettysburg Staff Ride for Operators
Travel out-of-park for plot or project work	5%	Travel to YUCH field project Travel to BELA field project Travel to Gettysburg for Staff Ride Travel to Tucson for AFE Congress
Miscellaneous	10%	Furlough government shutdown
GIS Fire Detail	17%	

G. 2020 Fire Ecology Program Direction

The primary goals and direction for 2020 include data management for plot locations, converting legacy data and known QC issues in FFI databases and writing up technical reports or publications from past field work. Field work planned for this year include finishing the CBI plots and fuel treatment plots on the 2018 Andrew Creek/Dome Creek Fires and assisting the USFWS with plot work in the 2019 Swan Lake Fire. See lists below for the proposed direction for the R11 fire ecology program for 2020.

Planning

- Glacier Bay Fire Management Plan and EA
- Field compliance and aviation planning

Projects and Data Entry

- Project: Andrew Creek and Dome Creek post fire monitoring in Yukon-Charley Rivers NPr (continued)
- Project: Assist FWS with burn severity assessments
- Data Entry: Fixes for known FFI database errors
- Data Entry: Complete QC of all FFI databases
- Data Entry: Convert additional databases to FFI/Manually enter priority CBI data

Reports/Outreach

- Report: Repeat fires in Alaska Parks (Fire Effects Report)
- Outreach: North for Science – Fire Ecology session
- Outreach: Success Stories/High Latitude Highlights
- Presentations
- Report: Publish ARCN Protocol SOPs (24)

H. Overall Data Entry Status and FFI suggestions

Data Entry Status

Data from this field season along with legacy data from the BELA Racine Tundra Fire Plot was entered and quality checked in both “FFI_AKRO” and “FFI_AKWest” databases in 2019.

Table 11 estimates the number of fire ecology/fuels plots and projects since the mid-1980s that have been entered into FFI or another database format for the Interior Region 11 (Alaska) parks. The vast majority of data not currently included in FFI are from 2000-2003 era CBI plots. Other remaining non-FFI datasets are from fire effects projects that were implemented prior to 2005. Only one known project has not been entered into any database, which includes fire behavior, weather and vegetation observations from a 2007 fire in Yukon-Charley Rivers.

Table 11. Number of known fire ecology or fuels plots and number of projects from the NPS Interior Region 11 (Alaska) by database type.

Database Type	Number of Plots	Number of Projects	% Plots	% of Projects
Access	478	7	30%	22%
Excel	15	1	1%	3%
FFI	1084	24	69%	75%
Totals	1577	32		

It is desirable to convert some of the Access database projects into FFI, particularly the CBI plots. The highest priority is to complete the known fixes for data already entered into FFI.

FFI Suggestions

There are several suggestions to improve the user interface and functionality of FFI, including:

- Add additional fields to the Reports (e.g., sample date, year, and UV fields).
- Include the Project Unit Name in all queries that include multiple projects and in the Macroplot Report.
- Only include protocols with data when using the query function (instead of a list of all existing protocols).
- More detailed user guide instructions on all “Reports and Analysis” and “Toolbox” functions (including how density and other parameters are calculated using protocol heading fields).
- Ability to copy protocol UV field descriptions from one macroplot to another (within the same project unit) or set default UV field descriptions for each protocol.
- Ability to import macroplot coordinates and potentially other GPS derived fields (e.g., elevation, error, etc.) via csv file.

Appendix A. Reports, publications, or presentations completed in 2019

Barnes, J.L. 2019. Climate change and fire in Alaska (Presentation). Alaska Leadership Council (ALC) Meeting. Fairbanks, AK. April 2019.

Barnes, J.L. 2019. Fire Ecology & Fuels Monitoring Program. (Presentation & Field Exercise). NPS Alaska Fire Refresher. Fairbanks, AK. May 2019.

Barnes, J.L. 2019. CFFDRS Fire Weather Index Basics. (Presentation). NPS Spring Seasonal Training. Fairbanks, AK. May 2019.

Barnes, J.L. 2019. Fire and Ice, Birds and Burns, Lakes and Streams. High Latitude Newsletter. Fall 2019. Web article: <https://www.nps.gov/articles/ice-birds-streams-amidst-fire.htm>.

Barnes, J.L. 2019. Trends in Reburns in Alaska. (Presentation). Interagency Fall Fire Review. Fairbanks, AK. October 2019.

Barnes, J.L. 2019. Unit 6 – Conducting Your Own Assessment of the Fire Situation. (Presentation, Unit Instructor.) CAN290 – CFFDRS Intermediate Fire Behavior. Fairbanks, AK. April 2019.

Barnes, J.L., Loehman, R.A., Hrobak, J.L. 2019. Ecological consequences and management implications of short-interval fires in Alaska’s boreal forests. Final Report for LCC Northwest Boreal. (In prep).

Hrobak, J.L. 2019. 2019 GIS Updates – Things You Need to Know. (Presentation). NPS Spring Seasonal Training. Fairbanks, AK. May 2019.

Hrobak, J.L. 2019. Alaska Field Logistics. (Presentation). NPS Spring Seasonal Training. Fairbanks, AK. May 2019.

Hrobak, J.L. 2019. Avenza, Collector and Other Apps. (Presentation). NPS Spring Seasonal Training. Fairbanks, AK. May 2019.

Hrobak, J.L. 2019. Fire Monitoring and Documentation. (Presentation). 2019 Alaska Dispatch Workshop. Fairbanks, AK. March 2019.

Hrobak, J.L. 2019. GPS, GIS and Map Layouts. (Presentation & Training). NPS Spring Seasonal Training. Fairbanks, AK. May 2019.

Hrobak, J.L. 2019. NPS Risk Assessments. (Presentation & Field Demo). NPS Spring Seasonal Training. Fairbanks, AK. May 2019.

Hrobak, J.L. 2019. SOP: Manual Facility Risk Assessment Data Entry for NPS Alaska. (Report, Unpublished). Fairbanks, Alaska.

- Hrobak, J.L. 2019. The Footprint of Fire in Alaska: A GIS Analysis of “Repeat” Fire Patterns. (Presentation). 8th Fire Ecology and Management Congress. Tucson, AZ. November 2019.
- Hrobak, J.L. 2019. Unit 3A – Using the Alaska Fire & Fuels Website to Find FWI Values. (Presentation, Unit Instructor). CAN290 – CFFDRS Intermediate Fire Behavior. Fairbanks, AK. April 2019.
- Hrobak, J.L. 2019. Unit 4 – Inputs to the Fire Behavior Prediction (FBP) System. (Presentation, Co-unit Instructor). CAN290 – CFFDRS Intermediate Fire Behavior. Fairbanks, AK. April 2019.
- Hrobak, J.L., J. Walker, J.L. Barnes, and R. Loehman. 2019. Spatial and temporal trends in fire return intervals in Alaska and Canada’s Boreal Forests. (Report, Unpublished). Fairbanks, Alaska.
- Parks, S.A., Holsinger, L.M., Koontz, M.J., Collins, L., Whitman, E., Parisien, M.A., Loehman, R.A., Barnes, J.L., Bourdon, J-F., Boucher, J., Boucher, Y., Caprio, A.C., Collingwood, A., Hall, R.J., Park, J., Saperstein, L.B., Smetanka, C., Smith, R.J., Soverel, N. 2019. Giving ecological meaning to satellite-derived fire severity metrics across North American forests. *Remote Sensing* 11, 1735, 1-19. doi:10.3390/rs11141735