



National Park Service Interior Region 11, Alaska Fire Ecology Annual Report Calendar Year 2020

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A. Summary

Overview of 2020

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 to maintain and understand fire-adapted ecosystems in Alaska. This annual report provides a summary of the NPS Alaska 2020 fire season, fire ecology projects, and fire ecology program activities and outreach.

Most of the fire ecology field work in 2020 was put on hold due to COVID-19 concerns. Despite the challenges, the fire programs were able to continue with fuels treatments (Figure 1) and nearly all fire staff responded to fire assignments in Alaska or the Lower 48. The fire ecologists provided guidance on fuels treatment activities and fire planning, published fire monitoring protocols and several SOPs, trained staff on fuel moisture monitoring and researchers on the CBI method, participated on Incident Management Teams, and continued collaboration on research projects. A major effort to improve the fire records for the Arctic Network I&M parks resulted in updated fire history data layers and fire records for 5 parks in Alaska.



Figure 1. Fuels treatment around Wrangell-St Elias headquarters was completed in 2020. Information from fire ecology monitoring helped shape this treatment prescription. NPS photo

The pandemic brought about new ways of working and collaborating. It resulted in additional planning and re-thinking of methods that were commonly used on fire incidents and day-to-day work. The spring involved planning for fire management and Incident Management Teams on how to handle COVID-19. Both fire ecologists were involved in the planning and preparations during and throughout the season. Although the fire season was relatively quiet in Alaska, numerous personnel from the region participated in fire assignments in the Lower 48 states.

2020 Fire Season and Fuel Treatments



Figure 2. The Trout Creek Fire in Yukon-Charley Rivers National Pr. started in late May and is likely burning in an oil shale deposit. Photo courtesy of BLM-Alaska Fire Service

The 2020 fire season was a below average year in Alaska with 348 fires and only 181,262 acres burned, far below the 1.16 million acre 10-year average. Fire season began early with the first reported wildfire ignition in March followed by 24 fire starts in April, primarily in the Kenai and Matsu areas. With spring snow still on the ground, hot spots from overwintering (or holdover) fires were reported within several large fires that burned late into the busy 2019 season (including Deshka Landing, Shovel Creek and Swan Lake fires). Fire activity progressed quickly in late May and into June, the most active month of the 2020 season (Figure 2). Significant lightning events pummeled southwestern Alaska from Bethel through the central interior, extending to the Canadian border. Within a 7-day period (from May 30th-June 5th), nearly 23,000 lightning strikes ignited 73 fires across the state. A second smaller lightning bust combined with Red Flag Warnings for hot dry weather, started another cluster of fires in mid-June, the last significant period of fire ignitions for the season.

At the peak of activity in June, up to 8 fires were staffed at one time with one Type 2 Incident Management Team assigned (AK Black Team to Isom Creek Fire). During this time, the highest planning level of the season (Planning Level 3) was reached on June 8th and lasted for 17 days. The month of June accounted for 94% of the total area burned (170,000 acres) and 44% of the fire ignitions (153). By early July, substantial precipitation events hampered significant fire growth and limited the potential for new ignitions (Figure 3). Saturated fuels never recovered as periodic rainfall throughout the remaining season continued to moderate conditions. This allowed for Alaska resources to respond to incidents during a record-breaking season in the Lower 48 states.

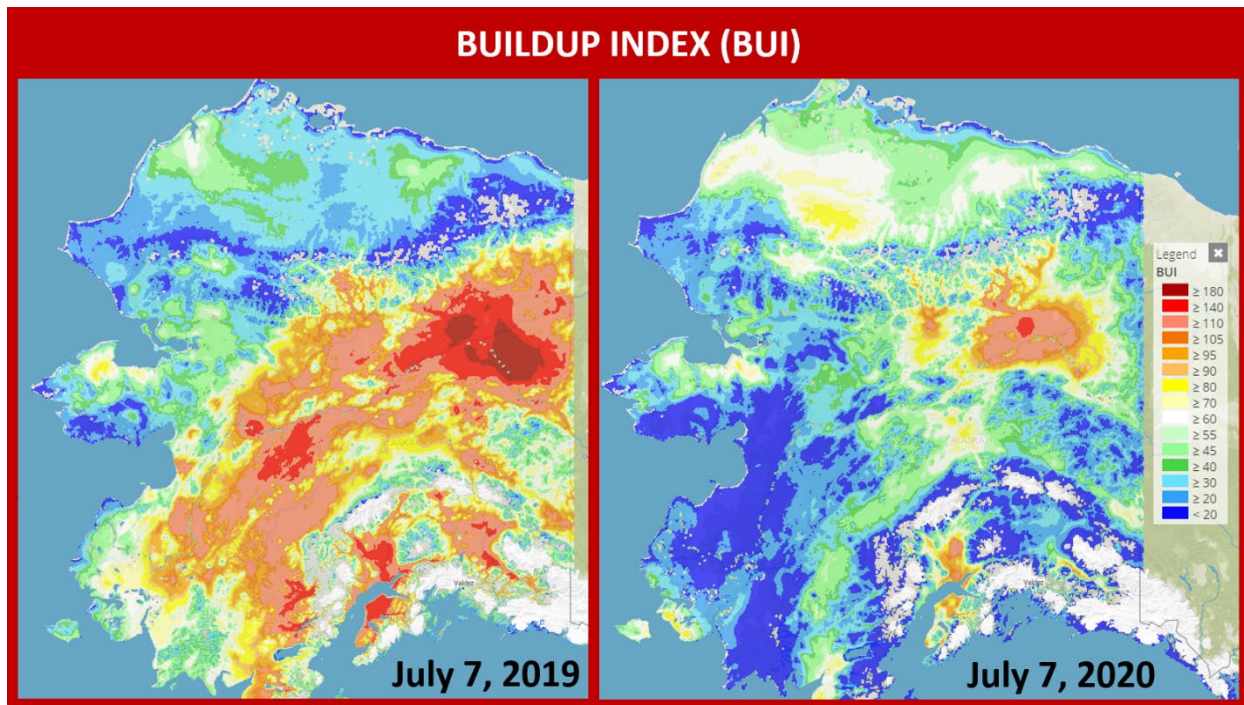


Figure 3. By early July, the 2020 fire season had slowed significantly. This image compares the Buildup Index (BUI) from July 7, 2019 (left) during a very active season to the same date in 2020 (right). The BUI represents the effect of weather on flammability and fuels available to burn (consumption). As seen in 2020, much of the map is blue to green, indicating higher moisture conditions and low fuel consumption potential. (Image modified from akfireinfo.com)

The National Park Service fire season followed suit with the general pattern in Alaska for 2020; an active early season that was quickly extinguished by mid-summer precipitation. Overall, 13 wildfires spanned across five park units and burned a total of 5,594 acres, 4,658 acres of which burned on NPS managed lands (Table 1). A lightning bust in early June in western Alaska started 7 of the 13 total fires within a two-day period, 6 of which were in Noatak National Preserve. The neighboring Cape Krusenstern National Monument, which has only had 12 fires since 1956, had one lightning start in 2020. In Yukon-Charley Rivers National Preserve, a fire in the Trout Creek area re-emerged for a 4th time within the past 5 years (Figure 2). These fires are likely burning in an [oil shale rock formation](#) and are holding over underground during the winter. The fire history map below highlights all the 2020 fires in Alaska (Figure 4).

In 2020, the two area fire management programs were able to complete 9 fuel treatments at 31 different sites (Table 1). For Eastern Area (EAFM), 15 acres were treated by either thinning, loping and scattering or hand piling debris across 8 remote locations throughout Yukon-Charley Rivers National Preserve. EAFM also completed the thinning and hand piling treatments (20 acres) around the Wrangel-St. Elias Park Headquarters buildings that was initiated in 2019. The Western Area Program (AWAFM) completed 3 fuel treatments between both front county and back county sites for a total of 53 acres and burned 18 acres of piles within Denali National Park and Preserve. The parks met (and exceeded) their annual fuels treatment targets for the year.

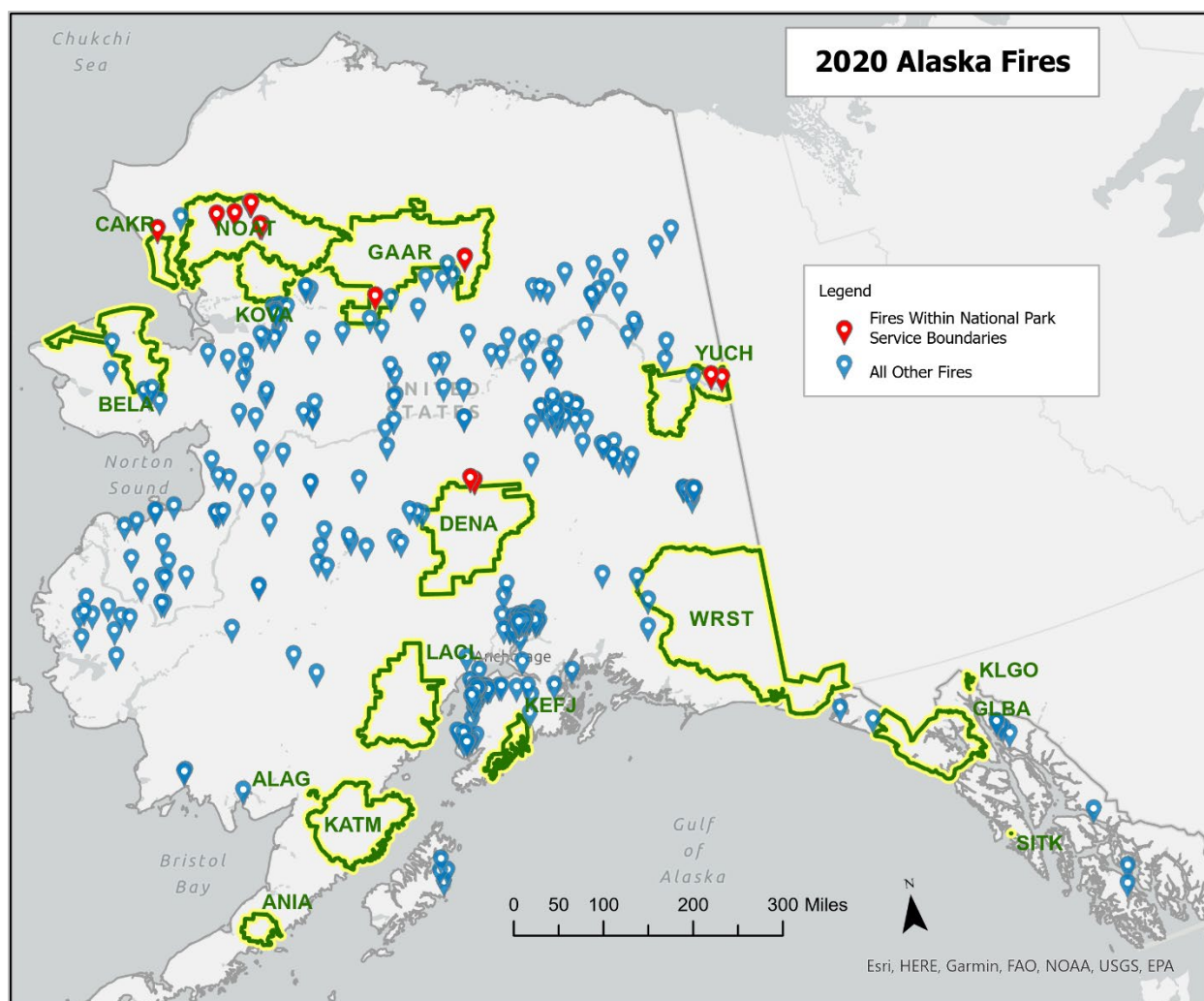


Figure 4. Map of all 2020 fire locations in Alaska. Fires that occurred within NPS park unit boundaries are shown in red.

Table 1. Wildfires, fuels treatments and prescribed fires in Alaska park units for 2020.

Park Unit	Number of Wildfires ¹	Total Acres Burned ¹	Number of Wildfires Started on NPS Lands ²	Acres Burned on NPS Lands ²	Number of Fuels Treatment/RX Sites	Acres of Fuels Treated	Acres of Prescribed Fires
Cape Krusenstern	1	12	1	12	-	-	-
Denali	2	674	2	674	22	53	18
Gates of the Arctic	2	86	1	77	-	-	-
Noatak	6	4,572	6	3,643	-	-	-
Wrangell-St. Elias	-	-	-	-	1	20	-
Yukon-Charley Rivers	2	252	1	252	8	15	-
Total for Region	13	5,596	11	4,658	31	88	18

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 wildfire ignitions and acres burned on NPS owned lands.

B. Science & Monitoring

Science and monitoring 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 fire/fuels monitoring or inventory plots established in Alaska parks since 2001 through 2020. No additional plots were monitored or measured in 2020. These plots are also shown on the NPS Alaska – Fire Ecology Plots Map, including the number of plots by park and type (Figure 5).

Although field work was truncated in 2020, several science related projects continued for the fire ecology program. Fire is one of the vital signs for the Arctic Network Inventory and Monitoring Program. During 2020 a major effort took place to update all the fire records and fire perimeters for the 5 parks in the Arctic Network. Fuel moisture monitoring continued in Fairbanks, along with post-fire monitoring and vegetation mapping of a 2018 fire in Yukon-Charley Rivers. Brief descriptions and results of these activities are provided below.

Table 2. Fire effects and fuels treatment (TX) plot workload (2020) and total monitoring plots Installed 2003-2020.

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-burn/TX 2020	1yr Post 2020	2-42 yrs Post 2020	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					28
Denali	Headquarters – TX	AKR Hazard Fuels Plots					28
	VDM	AKR Fire & Fuels Plots					43
	Landcover-CBI	AKR Fire & Fuels Plots					55

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-burn/TX 2020	1yr Post 2020	2-42 yrs Post 2020	Annual Total	Total Plots
Denali (cont.)	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
	Fairhaven Ditch Cabins-TX	AKR Hazard Fuels Plots					4
Total			0	0	0	0	692

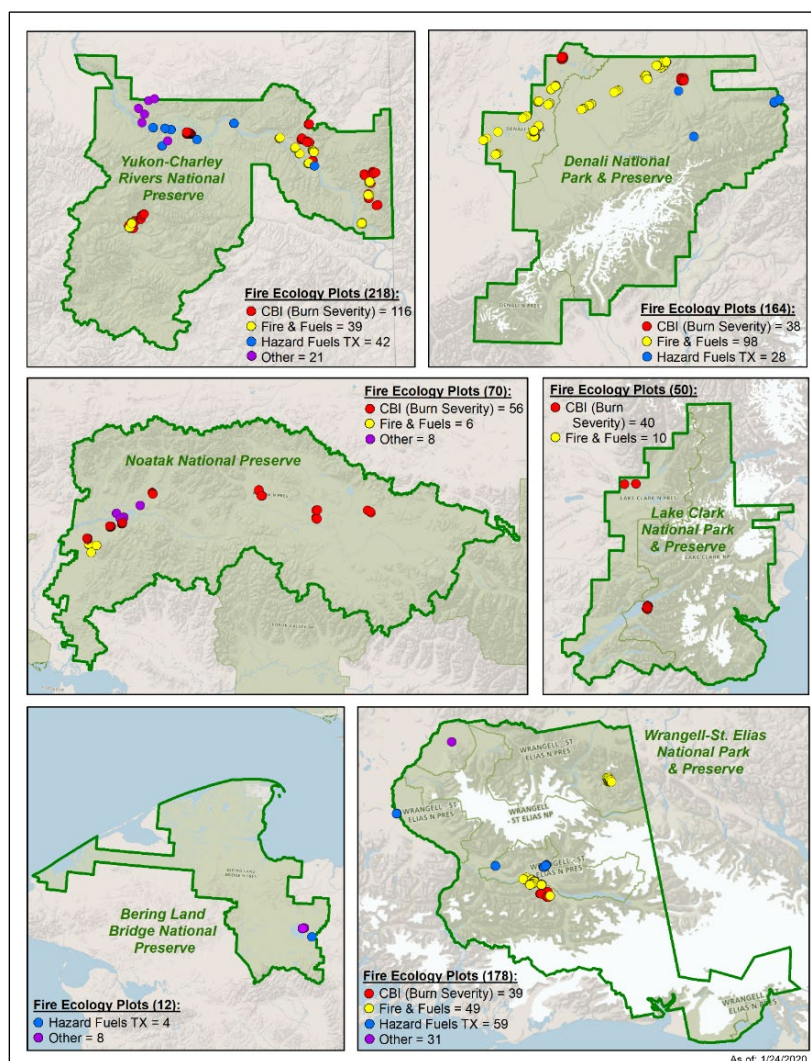


Figure 5. Map of fire monitoring plots (by type) installed since 2001 within Alaska NPS park units.

Arctic Inventory & Monitoring Network – Fire History Re-Visited

[Fire](#) is one of 18 vital signs that are monitored under the [Arctic Inventory and Monitoring Network](#) (ARCN). ARCN incorporates 5 park units in northwestern Alaska including Bering Land Bridge National Preserve (BELA), Cape Krusenstern National Monument (CAKR), Gates of the Arctic National Park and Preserve (GAAR), Kobuk Valley National Park (KOVA), and Noatak National Preserve (NOAT).

Accurate fire reporting records and fire history spatial data are immensely important to understanding historical fire patterns, determining long-term trends in fire frequency and area burned, and identifying changes in fire regimes and fire's response to climate change and other environmental variables. In 2020, as part of Fire Extent and Frequency component of the [ARCN Fire Monitoring Protocol](#), all of the NPS fire records for ARCN parks from 1956-2019 were carefully examined along with the fire history perimeter data and improved for the best possible accuracy. The quality control process followed the subsequent basic steps (see [ARCN Fire SOPs 1.3-1.5](#) for details):

- 1) Verify fire perimeter (from [AICC Alaska Fire History Perimeters](#) geodatabase) against satellite imagery, aerial photos and/or incident maps.
- 2) Edit perimeter if needed. Re-calculate total acres and ownership acres breakdown.
- 3) Verify fire point of origin (from NPS Fires Alaska GIS data layer – exported from [WFMI](#)) is located within the fire perimeter. If outside of perimeter, record coordinates of new point location.
- 4) Edit the fire record fields in WFMI (official fire reporting database for NPS through 2019). Document all changes from the original values in the Remarks.
- 5) Submit NPS perimeter updates for inclusion in AICC Alaska Fire History Perimeters geodatabase, in the Alaska Region permanent GIS dataset and on NPS Theme Manager.
- 6) Generate new NPS Fires Alaska GIS layer from WFMI records and submit for inclusion in the Alaska Region permanent GIS dataset and on NPS Theme Manager.

In some instances, we found that the perimeter acres and WFMI reported acres varied between datasets, ranging from a difference of 0.1 acres to 35,918 acres. Approximately 30% of the original perimeters had a difference of at least 10 acres when compared to the WFMI reports. For example, the 1972 Donkey Fire in Kobuk Valley was originally reported at 3,000 acres and, after a slight modification, mapped at 17,185 acres (a difference of +14,185 acres) (Figure 6). In other instances, the original perimeter acres and reported acres matched (within 10 acres), but after comparing the perimeter against imagery, we found the perimeter needed to be adjusted (this was the case for 43 perimeters). Hence every existing perimeter was verified and the WFMI record was updated to match. If the perimeter could not be verified, the reported acres and other information in WFMI was not edited.

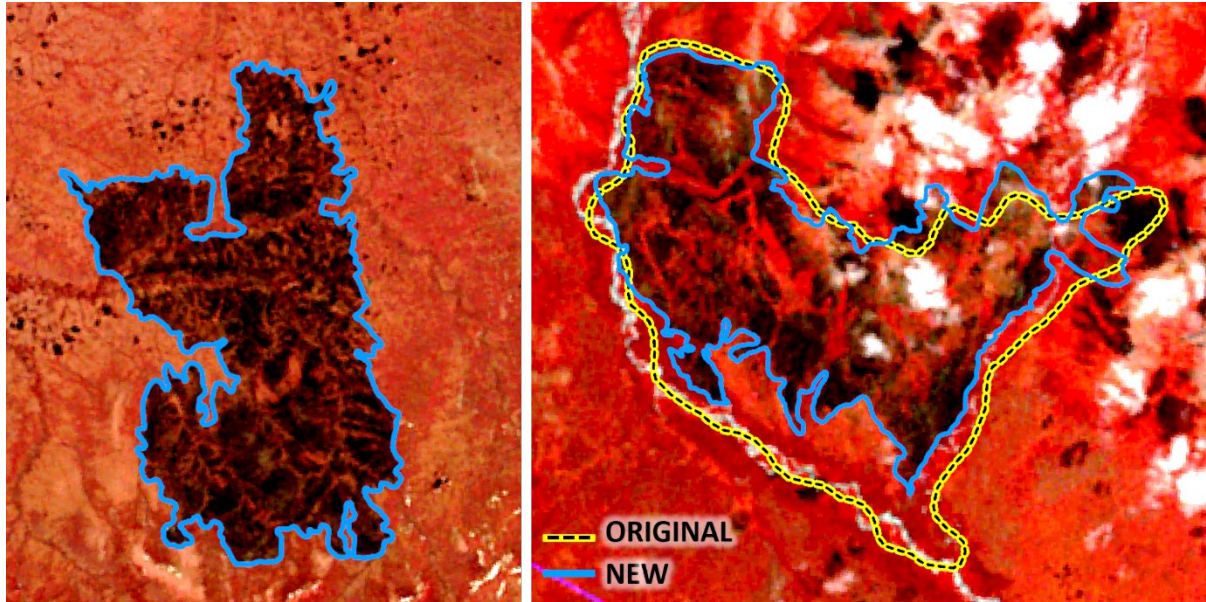


Figure 6. The 1972 Donkey Fire (left) was reported in WFMI at 3,000 acres but was mapped at 17,185 for a difference of +14,185 acres between the WFMI and perimeters datasets. This was likely due to limited access to fires in remote areas of Alaska. The 1974 Redundant Fire (right) original perimeter (show in black and yellow dashes) matched the fire report data but after verification, was remapped (blue line) to show a decrease in acres burned (-3,953 acres).

Through this quality control process, 65 existing fire perimeters were updated, and 72 new perimeters were identified in 4 out of 5 ARCN park units, adding 8,755 acres of burned area (Table 3). In addition, 253 fire records were updated in WFMI, including 7 new fire records that were not previously accounted for by NPS, and updates to 121 fire locations (points of origin) that were adjusted to reside within the verified fire perimeter. After updating the perimeters, 4 fires are now mapped outside of NPS park boundaries (2 in GAAR, 1 in NOAT and 1 in BELA). We also found that acreage was double counted for 5 fires that were consumed by larger fires (3 in KOVA, 1 in BELA and 1 in NOAT).

Table 3. Number of updates and additions to the Alaska Fire History Perimeters dataset and NPS fire records in WFMI by ARCN park unit. All fires from 1956-2019 were reviewed.

Park Unit	Perimeters Updated	New Perimeters Added	Fire Locations (Point of Origins) Updated	WFMI Records Updated	New WFMI Records Added
Bering Land Bridge	1	16	13	25	-
Cape Krusenstern	1	-	-	1	-
Gates of the Arctic	32	29	31	71	1
Kobuk Valley	6	7	14	31	-
Noatak	25	20	63	118	6
Total for ARCN	65	72	121	246	7

A total of **44,946 (absolute) perimeter acres** were changed (for fires that burned within or crossed ARCN park boundaries). This includes both increases and decreases in area expressed as a positive value. The net change in the total perimeter area was **+8,123 acres**. The WFMI fire records had a **208,214 (absolute) acres** with a net change of **-8,817 acres**, indicating that the total reported acres burned for fires that impacted ARCN parks decreased after completing the QC process.

When looking at these changes by park, Noatak and Kobuk Valley were most impacted by updates to WFMI fire records with 79,943 and 74,457 acres of change (Figure 7). Gates of the Arctic and Noatak had the most perimeter area change with 18,368 and 15,287 acres.

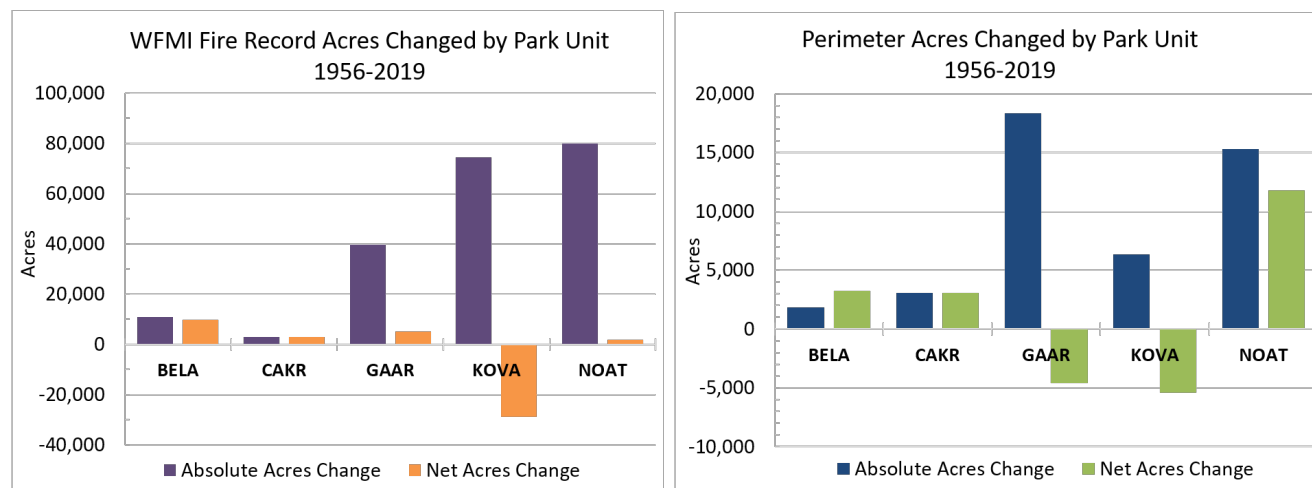


Figure 7. These graphs illustrate the number of acres changed in the WFMI Fire Records (left) and the Perimeters dataset (right) by ARCN park unit. The absolute acres are the sum of both increases and decreases in area burned expressed as a positive value.

The fire records and perimeter data for ARCN parks will continue to be evaluated on an annual basis. Historic records will also be periodically updated as new information becomes available. We hope to expand this process of verifying and updating fire history records to other parks as time and funding allows. A Focused Condition Assessment (FCA) proposal was submitted in 2020 for funding in FY22 to improve fire history datasets in Denali, Wrangell-St. Elias and Yukon-Charley Rivers park units though the outcome is currently undecided.

Fuel Moisture Monitoring

Duff, foliar and other live fuel moisture samples were collected from May through August of 2020 at the Fairbanks Ballaine Road site. Duff moisture sample are collected with the intent to convert the actual % moisture content of the live moss, dead moss and upper duff layers to the corresponding Canadian Forest Fire Danger Rating System (CFFDRS) Fuel Moisture Codes and compare them to the RAWs derived Fuel Moisture Codes (e.g., Fine Fuel Moisture Code, Duff Moisture Code and Drought Code). Table 4 shows an example comparing calculated fuel moisture codes (based on measured % moisture content) to the Fairbanks FRBA2 RAWs codes (based on weather inputs) from two different sampling events. During early fire season in mid-May, the RAWs reported FFMC and DMC values higher (drier) than the actual fuels, and a DC value (representing the deeper duff layer)

that was wetter than conditions in the field. By early July, the RAWS fuel moisture codes were tracking well with the sampled fuel moisture conditions.

Table 4. Comparison of CFFDRS Fuel Moisture Codes calculated from measured % moisture content and RAWS (FRBA2) values derived from weather inputs on two different sampling events. Adjective ratings are represented by the cell color and code. Red (E) is extreme, Orange (VH) is Very High, Yellow (H) is High, Blue (M) is Moderate and Green (L) is Low.

	Sampled 5/19/2020			Sampled 7/7/2020		
	% Moisture Content	Calculated Fuel Moisture Code	RAWS Fuel Moisture Code	% Moisture Content	Calculated Fuel Moisture Code	RAWS Fuel Moisture Code
Live Moss (FFMC)	18.3	90.8 (VH)	93.3 (E)	31.2	91.1 (VH)	89.4 (VH)
Dead Moss (DMC)	121.3	49.3 (M)	68.5 (H)	233.7	35.6 (L)	28.9 (L)
Upper Duff (DC)	255.6	173.6 (M)	103.3 (L)	215.2	219.6 (M)	220.9 (M)

Black spruce foliar, labrador tea, willow, dwarf birch, and bluejoint grass samples were also collected to track seasonal moisture trends in common interior plants and provide fuel moisture inputs for fire behavior modeling. All data is entered into the [National Fuel Moisture Database](#) (NFMD) and publicly available. Short summaries including fuel moisture code comparisons (as shown in Table 4), foliar and live fuel moisture contents, seasonal graphs (produced in NFMD) and other results were distributed to NPS fire management staff and other interagency fire personnel after each sampling event.

The fire ecologists also provided two small fuel moisture sampling training sessions, one for new Eastern Area forestry technicians and one refresher for the State of Alaska – Fairbanks Area fire fighters.

Yukon-Charley Rivers – Andrew Creek Fire Monitoring and Mapping

Understanding the effects of climate change and fire are important for future fire management planning in Alaska. A real time study of a 2018 fire in Yukon-Charley Rivers National Preserve is providing insight into the complicating factors of fire and climate change on a frozen landscape. The Andrew Creek Fire provided an ideal location to investigate the short- and long-term effects of fire and climate change on permafrost, soils, water quality, vegetation, and wildlife habitat. This 7,800 acre fire burned through vegetation and lake monitoring sites previously established by the [Central Alaska Inventory and Monitoring Network](#) (CAKN). The fire occurred in boreal forest dominated by upland black spruce (*Picea mariana*) mixed with white spruce (*Picea glauca*) and Alaska paper birch (*Betula neoalaskana*) forest along the Yukon River. The area was underlain by ice-rich permafrost yedoma, which is an organic-rich Pleistocene-age permafrost with high ice content.

One year after the fire (2019), field crews re-measured the long-term vegetation plots and burn severity to ground truth the Landsat remote sensed dNBR burn severity maps. Imagery of the area was collected, a weather station was installed, lake monitoring occurred, and a bird sound station was installed. For more information on the 2019 field work see <https://www.nps.gov/articles/ice-birds-streams-amidst-fire.htm> or [2019 Annual Report](#). Analyses and studies continued in 2020 on the Andrew Creek fire and included lake monitoring, permafrost monitoring, change detection mapping

of erosion, and preliminary post-fire vegetation map utilizing Structure-from-Motion (SfM) imagery that has been collected.

In 2020, the CAKN Aquatic Ecologists (Larsen and Knapp) re-measured a long-term monitoring lake within the burn and a comparison unburned lake. They are measuring impacts of the fire on water clarity and lake chemistry. Their initial findings suggest, based on the dissolved organic carbon (DOC) and a measure called SUVA, that carbon being added into the burned lake is likely coming from degrading ice wedges, as compared to a control lake. They also took water samples for the CAKN Stream Ecologist (Simons) from a stream monitoring site that has significant erosion from high severity burns and hydrologic changes likely from thawing permafrost (Figure 8B).

Structure-from-Motion (SfM) imagery was flown of the fire area in 2018 immediately post fire, 2019 summer (funded by NPS Reserve Fund Research), and 2020 fall. The SfM imagery and the sub-meter DEMs (32 cm resolution) were utilized by the Regional Geologist (Hults) and GIP intern (Hansen) to develop a change detection layer to identify areas of landslides, erosion and potentially tree fall or vegetation growth (Figure 8A). The change detection layer, that spanned just 1-year (2018 to 2019), detected 126 landslides within the fire area. Most of the landslides or thermokarst features were along the Yukon River bluffs, near creeks or gullies, or near lake shorelines (Figure 8B). This high level of post-fire erosion has not been well documented on Alaska fires, and is likely due to the Yedoma ice-rich permafrost thawing due to warm temperatures experienced over the last several years, exasperated by the reduction of insulating organic layers in the fire area.

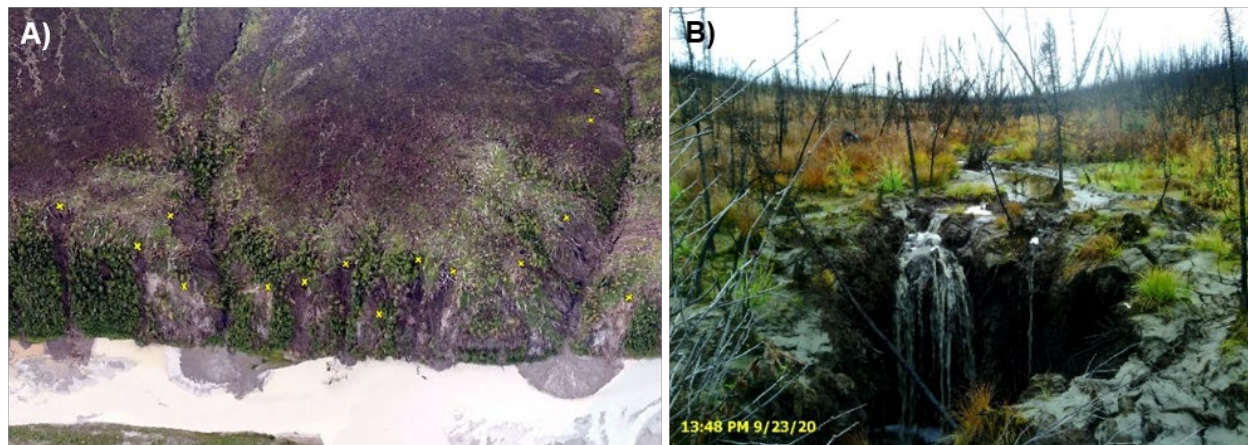


Figure 8. A) 3D view of the 2019 SfM imagery one year after the Andrew Creek fire draped over a DEM produced from the sub meter imagery shows major erosion paths from the Andrew Creek fire flowing into the Yukon River. The yellow Xs show landslides and active layer detachment sites. The ice-rich permafrost areas appear to be eroding and thawing rapidly, with permafrost ice wedges visible from the river. **B)** A small stream that is being monitored in the Andrew Creek fire area has shown significant erosion in this area of high severity in 2020. NPS Photo: D. Knapp

The sub-meter resolution SfM imagery from 2019 is being utilized to prepare a 1-year post fire vegetation map that will be compared to pre-fire imagery from 2007 (Figure 9). The SfM imagery was used in an object-based image classification process using a segmentation process in ArcPro and classification in R studio to develop a draft post-fire vegetation map (Hults and Hansen). Over 4,000 ground truth points were completed this fall via photo interpretation to classify segmentation

polygons for a vegetation map based on the SfM 2019 imagery by CAKN botanists (Roland, Nicklen, and Stehn) and AKRO fire ecologist (Barnes). A similar process is planned for the 2007 pre-fire imagery to develop a pre-fire landcover map. The pre-fire map and post-fire map will be compared to determine relative change in landcover and to assess early successional pathways.

In the fall of 2020, NPS physical scientists (Hill) and terrestrial ecologist (Swanson) established a network of permafrost monitoring sites within the fire area and in adjacent areas with different times since fire. Data indicates deeper active layers (depth to permafrost) at the recent Andrew Creek fire compared to the Chester Flat grid; the average active layer depth was 81 cm at Andrew Creek vs 49 cm at the “unburned” Chester Flat grid. The increased active layer depth due to thawing permafrost is common in areas where the organic soil layers have been reduced by fire. Data from the CAKN vegetation monitoring plots indicate that an average of 10 -15 cm of organic layer was consumed in the fire (Roland, Nicklen and Stehn).

Although the record of fire effects at Andrew Creek seem dramatic, many of these physical, geologic, and biotic changes are part of a natural process after fire. Understanding whether we are seeing accelerated changes will be important. This collaborative study of the 2018 Andrew Creek fire is planned to continue thanks to the ongoing work of the CAKN monitoring program, the Alaska Regional Geologists, and funding from the NPS Reserve Fund Research grant. More information on the preliminary results of this project can be found online at <https://www.nps.gov/articles/000/andrewcreekpostfire.htm>.

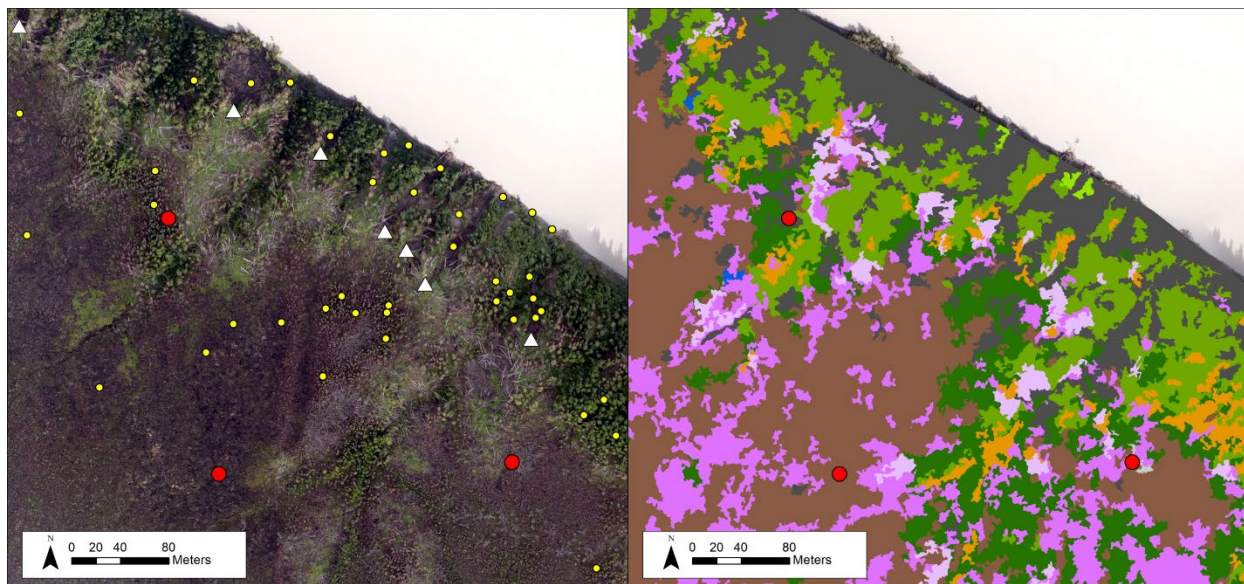


Figure 9. One-year post-fire SfM imagery (left) from August 2019 with data points and a draft one-year post-fire vegetation map (right) produced from the SfM imagery and data. The yellow dots on the 2019 image are photo interpreted vegetation points to help classify the imagery. The red dots are CAKN vegetation monitoring plots. The white triangles on the 2019 image show landslides and active layer detachment sites along the banks of the Yukon River.

Data Management

In 2020, no new 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>). Several corrections were made to legacy data including moving active layer depth measurements from the Post Burn Severity Protocol to the SOILS Protocol and entering 2005/2006 duff/fuelbed depth data for the DENA-VDM project, updating the Disturbance History for all projects in the Western Area FFI database, and correcting Monitoring Status errors in both Eastern and Western Area FFI databases. Additional QC needs have been identified for 2021. As of December of 2020, all of the Alaska fire ecology FFI databases were migrated to the new FFI Remote Application hosted by the USGS EROS program.

The AK FFI databases and metadata files were also digitally archived on the NPS Data Store IRMA in January 2021. The Alaska Eastern Area fire ecology data set includes data for YUCH and WRST: <https://irma.nps.gov/DataStore/Reference/Profile/2284296>. The Alaska Western Area fire ecology data set includes data for DENA, NOAT, BELA, and LACL: <https://irma.nps.gov/DataStore/Reference/Profile/2284297>. The updated FFI databases reflect the recent data additions and QC to the AK NPS fire ecology databases (Table 5).

Table 5. Monitoring data entered, quality checked, and number of units monitored in 2020.

Park/Project/Database	% 2020 Data Entered	% 2020 Data Quality Checked	# Prescribed Fires Monitored	# Non-fire Fuels Treatments Monitored	# Wildfires Monitored	# BAER Treatments Monitored
Denali Videography/Moose Browse Project	Legacy Data – 100%	Legacy Data - 60%	0	0	0	0
Western Area FFI Database – Disturbance History Protocol	Legacy Data – 100%	Legacy Data – 100%	0	0	0	0
Eastern Area & Western Area FFI Databases – Monitoring Status	N/A	Legacy Data – 100%	0	0	0	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 fire ecologists submitted three research proposals in 2020 (Table 6). Two proposals were submitted for the FY21 NPS Reserve Fund Research pertaining to fuels treatment effectiveness in Wrangell-St Elias and Denali and proposal to support additional work on the Andrew Creek fire research in Yukon-Charley Rivers. All three of these parks were included in a proposal for FY22 funding under the Focused Condition Assessments (FCA) to improve the fire history records for these parks. Decisions on funding are still under way.

Climate change is a reality and how we manage fire in the face of climate change is a challenge for fire managers and park managers. In 2020 the fire ecologists assisted with the [NPS Wildland Fire Strategic Plan](#) 3A task on Climate and Fire to survey fire managers, resource managers and park

superintendents about climate change and fire management. The surveys revealed some key points for park managers in Alaska:

“The fuel/vegetation types are changing; our fire seasons are longer, and our seasons start earlier. All of these things impact decision-making. Our decision process is about risk. Historically we look at the past for prologue for the future. We can’t assume anymore that the fire will not reach a certain point or will not burn into certain fuel types.” Fire Management Officer, NPS Alaska

- **Is climate change impacting fire management?** Most people identified changes due to climate change in Alaska (and elsewhere) but thought that fire management planning or activities have not significantly changed yet. Fire managers are more focused on the short-term/immediate tactical and weather situations.
- **Barriers:** Climate research and results need to be in a digestible format for managers. Tools, websites, sound bites, or information that can be used in a management context. They experience information overload and are not sure how to apply it in real life. Other barriers include low staffing numbers, clear policy direction, managing a natural process versus suppressing fires, and lack of financial and resource availability to change fire management activities.
- **What is needed:** Need for modeling fire risk and how it may change with climate change - developed for more site-specific areas (not Alaska wide). Understanding how vegetation and fuels may change, particularly in areas with less fire currently. What is the threshold for having too much fire on the landscape? Better pre-season forecasting of fire season. Lack integrated studies that show the interconnection of how fire and climate change may be impacting vegetation, permafrost, water resources, and potentially our wildlife and subsistence resources.
- **Sources of climate change studies/data/information:** UAF models and tools – SNAP, ACAP etc., Alaska Fire Science Consortium presentations, Seasonal Outlooks from NIFC and AICC, I&M networks, Fire Ecologists, park staff, and literature.

A follow-up summary based on the NPS R11 interviews is planned for 2021. Work will continue with the Climate Change working group for the NPS Wildland Fire Strategic Plan 3A climate change and fire tasking.

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, Alaska InFORM Technical Review Team, and the Interagency Arctic Research Policy Committee (IARPC) Terrestrial Ecosystems Collaboration Team.

Table 6. Research workload in 2020.

Park	Are research needs identified in FMP or Monitoring Plan?	# of Proposals Submitted in 2020	# of Proposals Funded in 2020	# of Research Projects Supported in 2020 ¹	Additional Comments
Wrangell-St. Elias NPPr	Yes	2	0	0	FCA proposal and Reserve Fund Treatment Effectiveness FY21
Denali NPPr	Yes	2	0	0	FCA proposal and Reserve Fund Treatment Effectiveness FY21
Yukon-Charley Rivers NPr	Yes	3	0	1	FCA proposal FY22 and Reserve Fund Andrew Creek FY21

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

D. Outreach and Communicating Results

Communicating results of projects or research is an important aspect of the fire ecology program to provide information and outreach to fire managers, park staff, and the public. Table 7 lists the number of monitoring reports and presentations completed by park/affiliated group. See Appendix A for a list of reports, presentations, publications, and other forms of communication completed in 2020 by the fire ecology program.

Providing information that is accessible for the public and managers is important. Fuel treatments to protect infrastructure has continued to be a high priority for the National Park Service and other agencies. A newsletter article and a web article were written about the completion of a fuel treatment project in Wrangell-St. Elias NP&Pr (Figure 10). The article highlighted how the two NPS Alaska area fire programs worked together to complete a shaded fuel break around the park headquarters and used fire ecology monitoring to provide effective fuels planning (<https://www.nps.gov/articles/000/ak-wrst-fuels-management.htm>). Other articles highlighted the collaborative monitoring and research work that has continued on the 2018 Andrew Creek fire in Yukon-Charley Rivers NPr and provides an update on work and results for the last two years (<https://www.nps.gov/articles/000/andrewcreekpostfire.htm>).



Figure 10. Web article about fuels treatment work in Wrangell-St. Elias.

The regional fire ecologist participated in writing a multi-regional educational article about the benefits and challenges of managing fire for kids as part of the Frontier for Young Minds “[Taking the](#)

[Pulse of US National Parks](#)” call for papers. In addition, a Wrangell-St. Elias fire brochure that will be sent out to the community in the spring of 2021 was reviewed and revised by the fire ecologist. While many of the usual interpretation presentations for the parks were canceled this year, the fire ecologists provided information on fire science through emails, webinars, and hands (and masks) on training.

Education is an important part of communicating. The assistant fire ecologist provided a hands-on field training session on fuel moisture sampling, data processing, and using the National Fuel Moisture Database with the NPS Eastern Area fire staff based in Fairbanks. An additional refresher field session was held for a small group of State of Alaska – Division of Forestry fire fighters who have several sampling sites within the Fairbanks Fire Protection Area.

The fire ecology program also provided University of Alaska (UAF) researchers and graduate students with training and subject matter expertise on collecting burn severity field data using the Composite Burn Index (CBI) method in Alaska. The 2019 Shovel Creek Fire located just north of Fairbanks provided an easily accessible study site where the assistant fire ecologist joined several field sampling sessions to help build their confidence and skills in severity assessments (Figure 11).



Figure 11. Burn severity (CBI) training session with NPS Fire Ecologist and UAF graduate students one year after Shovel Creek Fire near Fairbanks, Alaska. Photo by: S. Panda (UAF)

Table 7. Communicating Results - 2020

Park	# of Project Monitoring Reports completed in 2020	# of Annual meeting(s) with Park staff	# of Formal presentations of results	Web Articles or Publications	Do you use Minitab?
Yukon-Charley Rivers	0	0	0	2	No
Denali	0	0	0	1	No
Noatak	0	0	0	0	No
Lake Clark	0	0	0	0	No
Wrangell-St. Elias	0	0	1	2	No
Regional Office	0	1	1	0	No
Arctic Inventory & Monitoring Network	1	1	0	1	No

E. Planning and Compliance

The fire ecology program participates in *planning* activities for the Fire Management and Park Land Management Programs. Table 8 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 (e.g. Resource Stewardship Strategies). All fire management plans for Alaska are available on IRMA.

Table 8. Fire Management Plan - Fire Monitoring Plan Status as of 2020

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 2020?
Bering Land Bridge NPr	Yes – Interim Fire Desired Conditions	2012	2	0
Denali NPPr	Yes in RSS	2012	4	0
Gates of the Arctic NPPR	Yes - Interim Fire Desired Conditions in FMP	2014	1	0
Glacier Bay NPPr	Not completed	In Progress	0	0
Katmai NPPr	Yes – Suggested Fire Desired Conditions in FMP	2012	0	0
Lake Clark NPPr	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 NPPr	No - Fire Management Objectives in FMP	2010	5	0
Yukon-Charley Rivers NPr	No - Fire Management Objectives in FMP	2010	3	0
Klondike Gold Rush National Historic Park	No - WERP to be converted to FMP			
Sitka National Historic Park	No - WERP to be converted to FMP			

F. Fire Management and Incident Support

Fire Management Option Planning – Wrangell-St. Elias

Wrangell-St. Elias National Park and Preserve (WRST) and Ahtna Native Regional Corporation lands are interspersed in forested areas within the administrative boundaries of the park. Ahtna representatives, park staff, and fire protection agencies (State of Alaska Division of Forestry and BLM-Alaska Fire Service) had a series of meetings over the past 1.5 years to discuss [fire management option](#) changes in response to Ahtna's enrollment of forested lands into a carbon credit program. The park requested assistance to assess fire history data and develop fire models to assess the impacts of changing wildfire management options to protect carbon credit values on Ahtna Inc. lands. Fire behavior models, lightning data, and fire records were utilized by the regional fire ecologist to present to the group and to write a briefing paper on the data and modeling efforts. The information was incorporated into the decisions made by the group for fire management option changes that were updated for the 2020 fire season, affecting nearly 445,000 acres of lands in the Copper River area.

Incident Management Team (IMT) Participation & COVID-19 Mitigation Planning

This year the NPS Alaska Fire Management Program, including the fire ecology staff, were heavily involved with interagency COVID-19 mitigation and planning efforts for wildfire response throughout spring and into early summer. The NPS Fire Program staff assisted in developing the Alaska COVID-19 Wildfire Response Plan, Best Practices Guides and Interagency COOP plans, and participated in IMT COVID scenarios/exercises and IMT Section Breakouts (along with the full IMT meeting). The fire ecology staff also provided expertise in the Plans and Logistics functions on section specific best practices, virtual feasibility and paperless processing, transitioning to FirenetO365 tools, and participated in post-season lesson learned discussions.

With limited field work and high demand for firefighting resources, the fire ecology staff participated in the combined total of 5 Alaska Incident Management Team fire assignments and served in Resource Unit Leader and Supply Unit Leader positions. The Alaska Fire Management Program has been working hard to encourage others to participate in wildland fire incident response and this year it paid off. Approximately 41 individuals, including 22 non-fire program employees and NPS sponsored ADs, from the Alaska Region went on over 60 out-of-park fire assignments in 2020, most of which were in the Lower 48 states. Of note, the Alaska Region was able to provide 6 Level 1 Security Specialists (SEC1) to fill a national critical resource shortage. Multiple Alaska NPS personnel were also rostered with the Alaska Incident Management Team for all 4 team assignments.

G. Fire Ecology Accomplishments and Areas of Focus

Fire Ecology Staffing 2020

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. Table 9 provides an overview of the fire management personnel that worked on or have assisted with fire ecology projects in 2020.

Table 9. Fire Ecology Staffing 2020

Ecologist and Monitors	Starting Date	Ending Date	# of Pay Periods	READ Qualified (Yes or No)	Training and Development
Jennifer Barnes (Regional Fire Ecologist)	1/1/2020	12/31/2020	26	No	ArcPro, IROC
Jennifer Hrobak (Assistant Regional Fire Ecologist)	1/1/2020	12/31/2020	25*	No	ArcPro, ATR Re-Certification, IROC, Aviation Courses

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

Regional Fire Ecologists Accomplishments/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 2020, the regional fire ecologist analyzed data from past projects, wrote portions of Fire Management Plans, prepared for COVID-19 mitigations for Incident Management Teams (IMT) Resources Unit, participated on two Alaska IMT assignments, prepared research proposals, wrote reports, and provided back up to the Regional Fire Management Officer. Table 10 provides a summary of the Regional Fire Ecologist focus areas and accomplishments for the calendar year of 2020.

Table 10. Fire Ecologist 2020 Accomplishments/Focus Areas (J. Barnes).

Category	Percent Time	Accomplishments and/or areas of activities
Planning	10%	Denali Fire Management Plan revisions Glacier Bay Fire Management Plan EA (postponed) RSS – Yukon-Charley Rivers and Gates of the Arctic Incident Management Team and NPS Fire Management planning for COVID mitigations
Presentations/ Reports	15%	Presentations: NPS, Interagency Meetings Annual reports for Fire Ecology program and I&M network Articles for NPS High Latitude Highlights and web articles WRST Fire Brochure and briefing papers on fire management option changes
NPS Meetings/ task groups	10%	AKRO and Park Fire Meetings Regional Fire Ecologist conference calls I&M Technical Committee meetings Strategic Planning – Climate & Fire task group FFI Remote App testing group
Interagency work	10%	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	10%	Isom Creek Fire - AK (AK Type 2 IMT) – RESL – 14 days Grizzly Creek Fire – CO (AK Type 1 IMT) – RESL – 17 days Trout Creek – AK-YCP - THSP (GSAN) - 2 days
Prescribed fire projects (implementation)	0	

Category	Percent Time	Accomplishments and/or areas of activities
Non-fire fuels projects (implementation)	0	
Research	6%	Research Proposals Submitted: • YUCH Andrew Creek – NPS Reserve Fund • WRST/DENA Fuels Treatment Effectiveness – NPS Reserve Fund • DENA/YUCH/WRST Fire History – NPS FCA FY22 Repeat fire research publication preparation Research consultation on various projects
Data collection	0%	
Data entry	2%	Data entry supervision and database assistance QC of data FFI Remote App testing
Data analysis	10%	WRST Fire modeling for Fire Management Option changes WRST, DENA and YUCH Fire and Repeat fire plots
Supervision/Admin	10%	Supervision STF GS-9 Fire Ecologist Paperwork and administrative (time, travel, email) Budget
Training	2%	Annual NPS Spring Training Virtual, Prep for classes that were cancelled: CAN S-290, S-490
Travel out-of-park for plot or project work	0%	No travel other than fire assignments in 2020.
Miscellaneous	15%	Acting Regional Fire Management Officer (2 months)

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 in 2020 focused on finalizing and posting the 23 Standard Operating Procedure documents for the [ARCN Fire Monitoring Protocol](#) to the NPS Data Store – IRMA and completing the fire history review and quality control process for the Fire Extent and Frequency portion of the ARCN Protocol. Other notable accomplishments include completing the ARCN Fire Extent and Frequency data summaries and posting data deliverables to IRMA, finalizing and posting both AKR [Belt](#) and [Circular](#) Plot Fuels/Fire Effects Monitoring Protocols to IRMA, writing ARCN Resource Brief (to be published Feb 2021), completing Burn Severity data acquisition and summary statistics for the ARCN Protocol, assisting in development of internal and incident related COVID mitigation measures, and participating in 3 Alaska Incident Management Teams assignments (one in Alaska and 2 in the Lower-48 states). Table 11 provides a summary of the Assistant Regional Fire Ecologist focus areas and accomplishments for the calendar year of 2020.

Table 11. Assistant Fire Ecologist Accomplishments/Focus Areas 2020 (J. Hrobak).

Category	Percent Time	Accomplishments and/or areas of activities
Planning	5%	Kenai/Yukon Flats CBI project (Interagency) - Cancelled Annual Field Project Preparation (Trimble conversion and workflow changes from Windows Mobile Device Center, ArcGIS/ArcPro updates, data dictionary editing, gear preparation, COVID mitigation plans, etc) Annual Spring Training Development & Preparation
Presentations/Reports	25%	All presentations listed in Appendix A. (Outreach, Seasonal Training, etc) Fire Ecology Annual Report ARCN Fire Monitoring SOPs (23) AKR Fire Ecology Monitoring Protocols (Circular & Belt) ARCN Fire Extent & Frequency Resource Brief Repeat Fire GIS Report Revisions Virtual Risk Assessment Guide Annual Spring Training Presentations (2) Fire Management & Climate Change Interviews (Strategic Plan – Task 3A)
NPS Meetings/ task groups	5%	AKRO Fire Staff Meetings (weekly) AKRO Ranger Services Meetings (twice a month) Interior Region 11 Fire Management Meetings (monthly) Regional Fire Ecologist Meetings (alternate) AKRO Fire In-Person Staff Meetings (semiannual) Miscellaneous Project Meetings Yukon Quest - Slaven's Roadhouse Logistics
Interagency Work	10%	Alaska Fire Science Consortium – Advisory Board Member AWFCG Fire Research, Development & Application Committee (Chair) AWFCG GIS Committee (Alternate) AWFCG Fire Modeling and Analysis Committee (Participant) Alaska Incident Management Team & Logistics Section Meetings Alaska Interagency Fall Fire Review Alaska Fire Science Consortium Workshops NPS Representative for IARPC InFORM Tech Review Group & AOP Revisions Group AK InFORM Best Practices Webinar – Co-Presenter
Wildfire Assignments	12%	Isom Creek Fire - AK (AK Type 2 IMT) – SPUL(t) Grizzly Creek Fire – CO (AK Type 1 IMT) – SPUL(t) August Complex – CA (AK Type 1 IMT) – SPUL
Prescribed fire projects	0%	
Non-fire fuels projects	0%	
Research	3%	NPS Research proposal for WRST/DENA Fuel Treatment Effectiveness Proposal Review and Project Collaboration
Data Collection	2%	Fuel Moisture Sampling in Fairbanks
Data Entry/Processing	5%	FFI Database QC Fuel Moisture Sampling Data Entry
Data Analysis	20%	ARCN Protocol – Fire Extent & Frequency fire history QC and data analysis ARCN Protocol – Burn Severity data analysis
Supervision/Admin	3%	Quick Time, Travel Authorizations/Vouchers, Credit Card Statements, Email, etc.

Category	Percent Time	Accomplishments and/or areas of activities
Training	10%	Aviation Courses (A-100, A-110, A-200) IROC – Basic User NPS ATR Re-Certification Section 508 Compliance ESRI – Migrating to ArcPro Trimble Positions Workflow Shotgun Certification/Bear Safety DOI Required Courses (FISSA+, Sexual Harassment, EEO, Privacy for Systems Managers, Records Management, CUI Awareness Training, Privacy Awareness, Active Shooter, Travel Card) Fuel Moisture Sampling Training & Refresher (Instructor) UAF CBI Training (Instructor)
Travel out-of-park for plot or project work	2%	Travel to L-48 for IMT fire assignments
Miscellaneous		

H. 2021 Fire Ecology Program Direction

The primary goals and direction for 2021 include writing up technical reports or publications from past field work. Planning work includes re-organizing Fire Monitoring Plans within Fire Management Plans and compliance for all field work. Field work planned for this year include measuring and re-measuring fuels treatment plots at Wrangell-St. Elias and Denali and assessing re-vegetation at the 2018 Andrew Creek fire in Yukon-Charley Rivers. See lists below for the proposed direction for the R11 fire ecology program for 2021.

Planning

- Fire Monitoring Plan revisions in FMPs
- Field compliance and aviation planning

Projects and Data Entry

- Project: Andrew Creek post fire monitoring in Yukon-Charley Rivers NPr (continued)
- Project: Fuels Treatment Effectiveness plots in Denali and Wrangell-St. Elias
- Data Entry: 2021 Field plots
- Data Entry: Complete QC of all FFI databases and posting

Reports/Outreach

- Report: WRST & DENA Fuels Treatment (Fire Effects Report)
- Publication on DENA, WRST and YUCH fire ecology studies
- Report: ARCN 10-year trends
- Outreach: North for Science – Fire Ecology session
- Outreach: Success Stories/High Latitude Highlights

I. Overall Data Entry Status and FFI Suggestions

Data Entry Status

No new project data was entered in 2020 as all fire ecology field projects were postponed. Legacy data entry errors continued to be identified and corrected in both the “FFI_AKRO” and “FFI_AKWEST” databases. Additional fixes have been identified for 2021. As of December 2020, all 3 FFI databases (including the “FFI_PairedPlot” database) have been migrated to the FFI Remote Application hosted on the USGS EROS server. New guides and training on using the remote app will be offered in 2021.

Table 12 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 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. It is desirable to convert some of the Access database projects into FFI, particularly the CBI plots (partially completed).

Table 12. 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	335	6	23%	22%
Excel	15	1	1%	4%
FFI	1083	20	76%	74%
Totals	1433	27		

FFI Suggestions

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

- Add additional fields to the Reports (e.g., project name, 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 2020

- Barnes, J.L. 2020. Briefing Fire Management Option Change Proposal Wrangell-St. Elias & Ahtna (Presentations and Briefing Papers) Copper Center, AK February 2020, March 2020 and Oct 2020.
- Barnes, J.L. 2020. Fire Ecology & Fuels Monitoring Program. (Virtual Presentation). NPS Spring Seasonal Training. Fairbanks, AK. May 2020.
- Barnes, J.L. 2020. CFFDRS Fire Weather Index & Fire Behavior. (Virtual Presentation). NPS Spring Seasonal Training. Fairbanks, AK. May 2020.
- Barnes, J.L. 2020. East meets West: Collaboration in Active Fuels Management. High Latitude Newsletter. Summer 2020.
- Barnes, J.L. 2020. East meets West: Collaboration in Active Fuels Management in Wrangell-St. Elias. NPS Fire Success Story Web article: <https://www.nps.gov/articles/000/ak-wrst-fuels-management.htm>
- Barnes, J.L. and J.L. Hrobak. 2020. [Standard Operating Procedures 3.1-3.5 \(Fire Effects\) for Arctic Network Fire Monitoring Protocol: Fire Extent, Severity and Effects](#). National Park Service. Fairbanks, AK.
- Barnes J., McMillan J., and J. Hrobak. 2020. [NPS Alaska Fire and Fuels Belt Transect Plot Monitoring Protocol, Version 1.0](#). Alaska Fire Management – Fire Ecology Program. National Park Service. Fairbanks, AK.
- Barnes J., McMillan J., and J. Hrobak. 2020. [NPS Alaska Fire and Fuels Circular Transect Plot Monitoring Protocol, Version 1.0](#). Alaska Fire Management – Fire Ecology Program. National Park Service. Fairbanks, AK.
- Hrobak, J.L. 2020. Alaska Field Logistics. (Virtual Presentation). NPS Spring Seasonal Training. Fairbanks, AK. May 2020.
- Hrobak, J.L. 2020. NPS Risk Assessments. (Virtual Presentation). NPS Spring Seasonal Training. Fairbanks, AK. May 2020.
- Hrobak, J.L. 2020. Virtual Risk Assessments. (Report, Unpublished). National Park Service. Fairbanks, Alaska.
- Hrobak, J.L. and J.L. Barnes. 2020. [2020 ARCN Fire Extent and Frequency Data Deliverables](#). (Dataset – Internal Only). Arctic Inventory and Monitoring Network, National Park Service. Fairbanks, AK.

- Hrobak, J.L. and Barnes, J.L. 2021. Fire Extent and Frequency Resource Brief for the Arctic Network. NPS Arctic Network Web article: <https://www.nps.gov/articles/000/fire-extent-and-frequency-resource-brief-arctic-network.htm>
- Hrobak, J.L. and J.L. Barnes. 2020. [Standard Operating Procedures 1.1-1.9 \(Fire Extent\) for Arctic Network Fire Monitoring Protocol: Fire Extent, Severity and Effects](#). National Park Service. Fairbanks, AK.
- Hrobak, J.L. and J.L. Barnes. 2020. [Standard Operating Procedures 2.1-2.8 \(Burn Severity\) for Arctic Network Fire Monitoring Protocol: Fire Extent, Severity and Effects](#). National Park Service. Fairbanks, AK.
- Hrobak J.J. and J. Humphrey. 2020. [InFORM Best Practices for Alaska](#). (Report, Unpublished). National Park Service and BLM-Alaska Fire Service. Fairbanks, AK.
- Humphrey, J. and J.L. Hrobak. 2020. Alaska InFORM Best Practices. (Webinar). Fairbanks, AK. July 2020.
- Larsen, A., Knapp, D., Barnes, J., Hults, C., Roland, C., Nicklen, E. 2021. After the Andrew Creek Fire. Yukon-Charley Rivers National Preserve Web Article <https://www.nps.gov/articles/000/andrewcreekpostfire.htm>
- Smith, C., Panda, S., Bhatt, B., Meyer, F., Badola, A., Hrobak, J. and C. Jo Haan. 2020. [Assessing Burn Severity in the Alaskan Boreal Forest Using Remote Sensing Methods](#). (Poster). AGU Fall Meeting. Virtual. December 2020.