FY 2020 Annual Report of Accomplishments and Results

University of Alaska Fairbanks
Institute of Agriculture, Natural Resources and Extension (IANRE)
composed of
Cooperative Extension Service (CES) and
the Agricultural and Forestry Experiment Station (AFES)

I. Report Overview

The NIFA reviewer will refer to the executive summary submitted in your FY 2020 Plan of Work located in the Institutional Profile. Use this space to provide updates if needed.

1. Executive Summary (Optional)

As a result of a university reorganization, in July 2019, UAF's Mining and Petroleum Training Service (MAPTS), along with CES and AFES, became an entity now known as the Institute of Agriculture, Natural Resources and Extension (IANRE). The realignment allows for greater coordination in meeting the tripartite mission of teaching, research, and service. Due to COVID-19 limitations on face-to-face gatherings, IANRE has pivoted to expanded use of online platforms and pick-up or mail-home kits to continue providing educational services. Instructional opportunities have been successfully hosted through Facebook Live, Zoom, Google Classrooms and more.

Please see our 2022 Plan of Work update for more background on our goals for Alaska. Recent additions to the narrative are extracted below for emphasis.

II. Merit and Scientific Peer Review Processes

The NIFA reviewer will refer to your 2020 Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Process	Updates ONLY
1. The Merit Review Process	No updates
2. The Scientific Peer Review Process	No updates.

III. Stakeholder Input

The NIFA reviewer will refer to your 2020 Plan of Work. Use this space to provide updates as needed or activities that you would like to bring to NIFA's attention.

Stakeholder Input Aspects	Updates ONLY
1. Actions taken to seek stakeholder input that encouraged their participation with a brief explanation	No updates.
2. Methods to identify individuals and groups and brief explanation.	No updates.
3. Methods for collecting stakeholder input and brief explanation.	IANRE has recently published new internal guidelines for recruiting, diversifying, organizing and mentoring advisory groups. As part of our civil rights compliance process, we also created an updated inventory of all electronic mailing lists and sent surveys to our stakeholders asking for feedback on topics of interest to them.
4. A Statement of how the input will be considered and brief explanation of what you learned from your stakeholders.	New insights on digital delivery preferences were gathered from stakeholders as Extension programming expanded to new online platforms due to COVID-19. Educators sought stakeholder feedback through surveys and discussions regarding internet access and digital literacy, allowing programming to be tailored statewide. Stakeholders statewide also continued to express concerns about Alaska's reliance on imported goods, with supply chain interruptions highlighted during COVID-19. IANRE has been working with stakeholders on a comprehensive response to food security in Alaska. Staff at the Matanuska Experiment Farm and Extension Center conducted a pilot course in October 2020 with 25 key members of the state's food system, including farmers, policy makers, government agents, nonprofit members, distributors, fisheries staff, and others. The course covered the five key sectors of production, transformation and processing, distribution and marketing, consumption and access, and resource management. From program discussions, IANRE learned about unrepresented sectors and underserved populations, enabling IANRE to bridge gaps. A public course will launch in 2021 with hopes of strengthening current networks to build and nourish an equitable and resilient statewide food system.

IV. Critical Issues Table of Contents

No.	Critical Issues in order of appearance in Table V. Activities and Accomplishments
1.	Agriculture & Food Security
2.	Natural Resources, Ecosystems & Sustainable Energy
3.	Healthy Individuals, Families & Communities
4.	4-H & Youth Development

V. Activities and Accomplishments

Please provide information for activities that represent the best work of your institution(s). In your outcome or impact statement, please include the following elements (in any order): 1) the issue and its significance (e.g. who cares and why); 2) a brief description of key activities undertaken to achieve the goals and objectives; 3) changes in knowledge, behavior, or condition resulting from the project or program's activities; 4) who benefited and how. Please weave supporting data into the narrative.

No.	Project or Program Title	Outcome/Impact Statement	Critical Issue Name or No.
1.	IANRE increases Alaskan growers' ability to understand and	**Issue:** During the COVID-19 pandemic, many Alaskans faced food security issues stemming from the state's dependence on out-of-state food suppliers. Shipments from Outside were limited and in-state suppliers could not meet public demand for agronomic crops. Research is needed to assist farmers in improving the quantity and quality of crops grown in Alaska to lower production costs and increase profits for farmers. **Response:** An agronomist and research assistant conducted experiment farm research to identify cold-climate hardy crops. The first project is focused on	1. Agriculture & Food Security

	assess optimum production practices	evaluating two-row barley and related crop management systems that are suitable for Alaska. Cultivation methods such as tillage and irrigation and organic matter content were considered when assessing varieties to ensure appropriate maintenance of soil health. The second project focused on continuing to develop a more suitably adapted hard red spring wheat for Alaska. A third project focused on improving cultivation practices for peonies. Results were shared with growers through presentations at annual meetings like the Delta Harvest Wrap-Up. **Results:** Successful red spring wheat crops will allow for the reliable production of quality bread flour, benefitting local growers, food industry workers and consumers. Improving soil conditions through cultural practices will result in better quality and quantity of local foods. Lowering production costs, and increasing profits for grains and oilseeds in Alaska will increase the production and supply of quality grain already in the state. Improved peony production can increase the efficiency of fertilizers and nutrient cycling, reducing costs for growers. Collectively, outcomes from these projects can help improve food security for Alaskans and contribute to the state's economy.	
2.	IANRE discovers method for invasive plant managers to reduce loss of non-target vegetation	**Issue:** Invasive species are considered a leading cause for the loss of biodiversity and natural resources prompting many land and resource managers to initiate control programs. Prunus padus, an invasive tree in the boreal forests of Alaska, is believed to alter fish and wildlife habitat. Herbicides used to control root and stump regeneration have unintended impacts on non-target vegetation. Invasive species concerns have further prompted land managers to require the use of certified weed-free straw and forage that is used for bedding, feed, and production of erosion control materials. Production to meet demand is hampered, though, by broadleaf weed species that can set seed multiple times in a growing season. The use of persistent herbicides would control these weed species. However, in some instances carry-over has caused damage to rotational crop species. Research is needed to help stakeholders avoid non-target impacts and improve production. **Response:** A researcher transplanted Prunus padus trees from surrounding forests to a field in 1-square-meter plots. Each plot had either 1,3, or 6 trees	1. Agriculture & Food Security

		planted in it, to be given basal bark treatments of aminopyralid or triclopyr in the full or half label rates as is planned in the forested areas. These densities were chosen based on previous data of Prunus padus density in the forests they have invaded in Anchorage. Weed-free straw production plots at the Alaska Forestry Experiment Stations in Fairbanks and Palmer were set up and treated with full label rates of aminopyralid, clopyralid, or chlorsulfuron. The plots in this year's treatment simulate the fallow year that is often used in the rotation of weed-free straw and potatoes. Staff evaluated plots for weed presence in August. Methods were also developed for analytical detection of aminopyralid and clopyralid with method detection limits of 1 part per billion. Soils were collected from Fairbanks and Anchorage for sorption experiments. These soils were sterilized with gamma irradiation at an Oregon State University lab. **Results:** Generally, aminopyralid provided the broadest control of weeds and had reduced frequency of prohibited weeds. This project increased knowledge of herbicide effects for stakeholders in Alaska. Invasive plant managers were reached through meetings with the Alaska Invasive Species Partnership (AKISP), Alaska Community Forest Council and the Division of Forestry. The weed-free certification committee held a special meeting at the 2020 Alaska Sustainable Agriculture Conference, held February 20-22 in Anchorage, which also reached agricultural producers. Each year at the Alaska Invasive Species Workshop, evaluations indicate stakeholders have changed their practices based on knowledge gained on topics like these. Researchers also integrated input from stakeholders into project methodology based on feedback regarding projection benefits; per input from producers of certified weed-free straw, metsulfuron methyl treatments were replaced with chlorsulfuron.	
3.	IANRE prepares Alaskans to successfully raise livestock	**Issue:** Shortages related to economic effects of the pandemic highlighted Alaska's vulnerability to supply chain disruptions. Educators across Alaska reported stakeholders showing increased interest in home gardening, backyard chickens, and other locally grown foods. Alaskans new to small-scale production need guidance in how to efficiently and effectively increase their food security.	1. Agriculture & Food Security

		Response: An Extension agent in the Mat-Su district taught workshops in poultry science. Due to the COVID situation, there were more attendees than in past years, with 150 stakeholders signing on to some Zoom classes. The Kenai agriculture agent updated online tools for Alaska farmers and ranchers, including the production of several online soil calculators and tools for calculating stocking rates for livestock. Extension continued to offer online publications and videos regarding livestock management. 4-H agents and leaders also found creative means to conduct market livestock project education. **Results:** Extension's efforts have increased knowledge about locally grown meat. After a poultry class, a participant reported they felt more prepared to handle a recently hatched batch of chicks, and invited the agent to speak about poultry on their local food-themed radio show. A YouTube video on identifying sick livestock, posted by the Extension veterinarian, has gained over 3,500 views in the last year and has even gotten positive feedback from producers in Texas and New York. Although the Alaska State Fair had to be canceled for 2020, a scaled down Harvest Fest was held. Approximately 10,000 attended. As part of that event, a Junior Livestock auction was conducted. More than $200,000 was raised at the auction. Kenai Peninsula 4-H also donated pork, frozen after the FY19 auction, to the local food bank for use in its FY20 daily lunches.	
4.	IANRE assesses crop variety suitability for Alaska's extreme climate	**Issue:** Alaska's climate is changing and growing seasons have lengthened in many areas of Alaska. It may be possible to grow different vegetable varieties than have grown here previously. Plant breeders also develop new varieties and update older varieties. Continued trials in different locations are important to determine what will grow best where, so the information can be shared with gardeners and farmers, strengthening Alaska's food security **Response:** Alaska's experiment stations have conducted vegetable variety trials since the early 1900s. After an eight-year break, trials resumed at the Fairbanks Experiment Farm in 2017 and have expanded to the Matanuska Experiment Farm and Extension Center. Sixty-six varieties of vegetables were planted in 2020 in Fairbanks, including corn, carrots, beets, beans, fennel, winter squash, and spinach. All trials except the corn were replicated in Mat-Su. The vegetables are	1. Agriculture & Food Security

		weighed to determine yield, and also rated for plant vigor, bolting sensitivity, uniformity, pest and disease resistance, and taste. The trials usually continue over several years because of the variability in weather. Annual results from the variety trials have been shared with the public during presentations, outreach events, on the AFES website and through a YouTube series on specific vegetables. **Results:** Produce raised in the variety trials is donated to food distribution centers for those in need. In 2020, nearly 4,500 pounds of produce from both farms was donated to local food banks and other community hunger-relief organizations. Once vegetables have been trialed sufficiently, Extension publications on recommended varieties for Interior and Southcentral will be updated. Megan Schulze of Frontieress Farm in Fairbanks, says "As a beginning small farm, I view the vegetable variety trials as a way to make more informed crop decisions without sacrificing space and time … as well as justification to explore new production avenues."	
5.	IANRE connects the public to locally grown food	**Issue:** The Matanuska Experiment Farm and Extension Center hosts an annual potato harvest for community members. The harvest is usually held in early October and anyone is welcome to attend. Due to the COVID-19 pandemic, the farm closed its doors to the public in March, and it was uncertain whether the harvest would take place. **Response:** The potato harvest is an opportunity for the farm to provide food for families, while showing them where their food comes from. An administrative assistant at the farm worked toward making modifications that would allow the harvest to take place. The Alaska Plant Materials Center donated 135 varieties of seed potatoes and staff tended the plots. At harvest time, new policies, such as preregistration, limiting the harvest to 30 families, splitting the attendees into two time slots and keeping groups 6 feet apart, were implemented to ensure public safety. One family at a time checked in and employees wore masks and gloves to limit contact. During the harvest, staff were positioned around the plots to ensure people were distancing and not harvesting outside of their designated area. The previous year, the tops of the plants were cut off and participants dug any varieties they desired. This year, each group was assigned a plot with four	1. Agriculture & Food Security

		varieties of potatoes, and a potato harvester brought potatoes to the surface so people didn't have to use tools to dig them, reducing contact time. **Results:** Because modifications that ensured social distancing were implemented, many families were able to attend the harvest and supplement their food supply. In total, 2,441 pounds of potatoes were harvested between 30 Mat-Su families, two food distribution organizations, Frontline Mission and Kids Kupboard, and six staff families. The administrative assistant said that as potatoes were weighed, many families reported they would be sharing their harvest with others.	
6. I	IANRE supports Alaska's peony industry	**Issue:** Establishing an agricultural industry in Alaska is very difficult and the peony cut-flower industry is no exception. The peony (Paeonia spp), a flowering perennial plant, is one of two new, nontraditional agricultural crops in Alaska. In the past decade, diseases have become increasingly common. In a preliminary survey conducted recently, the PI learned that diseases like bud blast are a serious threat to peony cut-flower production. At least 25 peony diseases were reported from across the globe, (Garfinkel & Chastagner, 2016). In Alaska, incidence of several diseases have been confirmed, including plants displaying the symptoms of an invasive tobacco rattle virus. Conventional agricultural practices that rely heavily on the use of chemicals could have especially serious consequences for the environment and human health in the far North. To protect the ecosystem and human health, disease management measures for grey mold/Botrytis blight, bud blast and other diseases using biological and nutritional measures should be studied. **Response:** In the fall of 2019, soil samples were taken from the roots of peony plants in the UAF Georgeson Botanical Garden and processed. In July 2020, samples of peony leaves and soils (from root zones) were obtained from four peony farms, in Homer (3) and Wasilla (1). These samples were stored at -80 C, awaiting processing. To date, a total of 163 bacteria isolates (primarily Bacillus spp.) were obtained. Among them, more than 53 are adapted to cold temperature (can grow at 7C) and 18 isolates demonstrate different degrees of antagonism against Botrytis spp., Rhizoctonia solani, Fusarium spp., and Penicillium spp. Leaves and soils from root zones were harvested from seven	1. Agriculture & Food Security

		peony cultivars treated with Plant Helper and their untreated controls. In the fall of 2019, fallen leaves from aspen trees were collected and divided into two groups depending on the numbers of sori of Melampsora rust disease. Due to the COVID-19, retrieval of mesh bags for the study of nutrient recycling was postponed. High molecular weight DNA was extracted from isolates obtained from the rhizospheres of peony plants, and will be sent to the University of Tennessee for next generation sequencing and further analysis. **Results:** Treated plants were significantly taller with larger leaves and thicker stems. In late-September, untreated control peonies moved into sceneses, while treated plants stayed green and continued to produce photosynthates stored in the root system. All treated varieties showed elevated potassium and iron, indicating treatment enhances plant disease resistance. Peony farmers showed interest and enthusiasm about the project, resulting in an increase of collaborators from one to six farms. Improving the health of Alaska's peony crops has economic benefits. The potential autumn niche market and sale price of $4 or more per stem is attractive to investors. Alaska has 160 small peony farms in production, with a market decades away from saturation (Auer, 2008).	
7. 6	IANRE strengthens management of nontraditional ruminant livestock	**Issue:** Agricultural production of nontraditional ruminant livestock species like reindeer, bison, muskoden, yak, and elk is an important, emerging industry in Alaska. An obstacle to this industry is the lack of detailed understanding of intensive management practices, especially reproductive management for efficient production under Alaskan conditions. Though generally tractable, rutting reindeer and muskox bulls remain aggressive and dangerous to handle, destructive to facilities and threatening to herd-mates as well as to producers and their families. In addition, seasonal rutting activity takes a serious toll on the animal's condition; in reindeer, as much as 35 percent of their body mass can be depleted during rut. Currently, it requires a disproportionate amount of capital investment for fencing and a lot of skill to bring animals through the highly vulnerable post-rut phase. Collectively, these factors make rutting bulls costly, challenging to manage in traditional agricultural settings, and poor candidates for agritourism.	1. Agriculture & Food Security

		Response: Previous research established the benefits of using depot medroxyprogesterone acetate (DMPA) treatment to counteract rut-induced behavioral changes in reindeer bulls. Treatment reduced aggression, increased food intake and stabilized body mass, while still maintaining the production of live sperm and the ability to impregnate cows. In FY20, researchers attempted to determine the viability of reindeer semen (sperm) collected, extended and frozen during the 2019 breeding season from DMPA-treated bulls. The samples of reindeer bull semen were evaluated during fall 2019 immediately following collection. During the fall of 2020, handlers bred 10 reindeer cows. The team also collaborated with scientists from USDA Agricultural Research Service. **Results:** All measures of semen viability were found to be reduced in 2020 after one year of storage. However, previous work demonstrated that treated bulls are still fertile by natural breeding. Results from each year of the project were shared with reindeer herders, relevant agencies and research personnel. Specifically, knowledge was gained by Kawarak Reindeer Herders Association and attendees of the Alaska Sustainable Agriculture Conference. Results have also informed other states; in addition to informing members of the multistate research group W3112, Improving Reproductive Performance in Domestic Ruminants, and a collaborative journal article is in process with colleagues from MT, NE, and WY.	
8.	IANRE tests new lighting technologies to improve controlled environment vegetabl	**Issue:** Spinach is a popular leafy green with a public perception of providing higher nutritional quality than many other salad greens. But flower initiation and bolting occur under the long day conditions of Alaska, resulting in limited or discontinued leaf formation. Cultivar selections of spinach with less tendency for flower initiation under long days or warm growing conditions are available. Field production can nevertheless be limited, as many cultivars still tend to form flowers under less -than-optimal temperature or photoperiodic conditions. To meet year round requests for locally grown high quality spinach, shifting from field production to greenhouses and other controlled environments is an option. Light-emitting diodes offer opportunities to design spectral environments in support of productivity and nutritional quality. Studies determining the most	1. Agriculture & Food Security

	e producti on	effective LED wavelength compositions, configurations, durations and intensities are still needed in order to reach the production potential for such crops. **Response:** The impact of light quality on soluble solids content (°Brix), yield, dry matter accumulation and mineral nutrient content in fresh spinach were evaluated. Spinach was grown under panels of LEDs and compared to greenhouse growing conditions with natural or supplemented light. The cultivar Seaside was selected as it has a more limited tendency to initiate flowers and bolt. The light quality treatments included blue LEDs (peak emission at 450 nm), red LEDs (50:50, peaks at 625 and 660 nm), blue/red LEDs (20:40:40, peaks at 450, 625, and 660 nm), and white LEDs (5000K). In addition, T5 fluorescent (4100 K) and natural greenhouse light supplemented with high-pressure sodium (HPS) irradiance were evaluated in a greenhouse covered with the acrylic material DEGLAS®. The growing areas of LEDs and fluorescent lamps were separated and shielded from natural and greenhouse light using an opaque blackout material. Plants were grown at a constant 21 ± 2°C with a 16-hour photoperiod at a photosynthetic photon flux of approximately 150 µmol·m-2s -1. **Results:** Results revealed that fresh weights and dry weights were considerably smaller for plants grown in the greenhouse environment under natural and HPS lighting. Flowers formed quickly in the greenhouse-grown spinach that resulted in limited leaf growth and overall growth. Some spinach grown under blue LEDs also formed flowers with overall smaller fresh weights. The largest fresh weights were in the blue/red LEDs at 125.67 ± 9.16 grams per plant. The white LEDs also supported good growth (112.06 ± 4.86 g) while the red and fluorescent environments produced similar sized spinach. The proportion of dry weight varied between 7.5 to 8.5 percent. environments are essential for efficient local northern crop production. Results helped stakeholders gain knowledge on the efficient use of LEDs, protocols for spinach production and the nutritional value of locally grown produce and herbs. Project personnel have communicated at state, national and international scientific conferences, as well as leading postsecondary educational experiences and producer-oriented gatherings.	

9.	IANRE helps growers protect crops through Integrated Pest Management	**Issue:** Alaska is food insecure, due to the short growing season, limited selection of potential crops, lack of infrastructure, and remote location creating vulnerabilities in the food supply chain. Increasing in-state food production is one way to reduce food security. Alaskans produce vegetables, bedding plants, and potatoes. But insect pests of these crops limit production and may prevent the growing of other crops altogether. Root maggots, thrips, aphids, and leafhoppers attack crops in Alaska, but most insect pests in Alaska have not been thoroughly studied, thus their population fluctuations are not well understood. Research is needed to establish basic information like species presence, egg laying, timing of emergence, etc. This information will allow for robust predictions of pest infestations and recommendations for pest management actions. Better predictions enable growers to accurately preventative actions and lessen the need for remedial actions, such as insecticide applications. **Response:** An entomologist assessed insect assemblages in plots of cover crops at the Fairbanks Experiment Farm and in two fields of cover crops near Delta Junction, Alaska. Insects were sampled twice during the 2020 growing season using pitfall traps, sticky cards, and sweep net samples. Yellow, blue, and white sticky cards were used to compare insects caught with these different colors. Research plots with cabbage, broccoli, turnips, rutabagas and onions were planted at the Experiment farms in Fairbanks and Palmer in summer 2020 to attract root maggot flies. Plants were uprooted during the growing season and examined for maggots. Twigs of Prunus species at the University of Alaska Fairbanks Georgeson Botanical Garden and other locations around Fairbanks were examined in the late winter of 2020 to determine the number of overwintering aphid eggs. A presentation on insects found in cover crops was given at a field day hosted by the Salcha-Delta Soil and Water Conservation District. **Results:** All crops were infested with maggots except the onions. At the end of the season, remaining plants were harvested and the surrounding soil sifted to find root maggot pupae. Over 700 pupae were collected and stored in a refrigerator to terminate diapause. After diapause is completed, these pupae will	1. Agriculture & Food Security

		be used in temperature-controlled developmental studies to determine the degree-days needed for post-diapause development culminating in emergence of adult flies. Eggs were found on all chokecherries (Prunus virginiana) examined. A mean of 18 egg /100 buds were found on P. virginiana trees. Eggs were also found on bird cherry (P. padus), an average of 8 eggs/100 buds. The aphid egg data will be used to develop appropriate sampling schemes based on mean-variance relationship. These results will fill a gap in research regarding basic information regarding species composition, host-plant associations, life-history details, and phenology of common insect pests in Alaska agriculture. Further testing will enable aphid population forecasts for potato producers.	
10.	IANRE builds capacity for climate change planning in rural and Indigenous communities	**Issue:** In Alaska, there are often many individuals, research groups, Nongovernmental Organizations (NGOs), tribes, and tribal organizations working independently on issues of climate change, but they do not communicate with one another. We refer to this as the "silo effect." The tribe and community in Kake, Alaska, are concerned about how the surrounding ocean waters and marine ecosystems are impacted by global climate change in conjunction with local stressors. ACCAP, the Organized Village of Kake, and Kake Tribal Corporation have expressed an intention to document key climate and pollution indicators (e.g., pH, salinity, temperature, nutrients, dissolved metals, fecal coliform) that may affect the cleanliness and safety of ocean waters and shellfish around Kake. FY20 saw an unprecedented low marine traffic, especially cruise ship traffic, due to cancellations and travel restrictions put in place as a result of the COVID-19 pandemic. This presented an opportunity for researchers to offer assistance in collecting baseline data about ocean waters around Kake. **Response:** An Indigenous postdoctoral fellow began work on building the capacity of rural communities to respond and adapt to climate change, meeting and presenting six times with project partners. Within the themes noted above, the postdoc examined and offered solutions to the "silo effect"' within organizations working on climate change and adaptation methods in order to help support tribes planning for their future. She presented to school groups, the Alaska Marine Science Symposium, and Indigenous working groups. An	2. Natural Resources, Ecosystems & Sustainable Energy

		Indigenous graduate student expanded previous work on Indigenous village food sovereignty and security related to using biomass to provide heat for buildings and greenhouses. The student spent the summer living on the land at a remote site. A second graduate student led a traditional ecological knowledge webinar series. All three projects are supported by the same Hatch project. **Results:** These efforts have allowed information on co-production to be shared across the University of Alaska system as well as to a broader public and agency audience. On invitation from the Director of the Juneau Economic Development Council, the faculty member mentoring the graduate students played a prominent role leading the "Business in a Changing Climate" track of the Juneau Business Innovation Summit-February 2020. The summit provided a venue for participants to learn from experts, as well as each other. The summit was a success in raising awareness within the Juneau business community of the myriad of research and resources ongoing at the University of Alaska. The response to the "ask the expert" deep dive session was very positive and is expected to foster more engagement with business leaders and economic leaders in Southeast Alaska. The research team was invited to give subsequent talks as COVID-19 allows.	
11.	IANRE increases community awareness about the use of biomass and other	**Issue:** Sustainable energy is an increasingly popular issue in Alaska where transportation and heating costs are prohibitive. In the face of declining oil prices and production, there is a need for Alaska to invest in alternative energies. A fundamental shift in the state's energy focus requires constituent support to gain momentum. Community-level change begins with improving knowledge and awareness at the individual level, and IANRE has the research capabilities, content experts, and partnerships to help communities assess emerging options for biomass use in Alaska. **Response:** The energy specialist held workshops on topics related to biomass gasification, biochar, hydroelectricity, emergency energy, and greenhouse-heating in various cities around the state, including at events like energy fairs. Faculty and their team members consulted with communities and organizations regarding the use of biomass and with individuals interested in biomass	2. Natural Resources, Ecosystems & Sustainable Energy

	sustainable energies	production. A Juneau agent participated in a Place-based Fuels, Foods and Forests Working Group that is developing projects on wood gas-to-electric generation, compost heat recovery systems (CHRS), electric vehicle conversion and locally-sourced heated and powered growing environments. **Results:** Extension built community capacity for utilizing biomass. The energy specialist was able to get three different farmer-scale styles of kilns fabricated and taught several hands-on classes before COVID-19 prevented interactive settings. The specialist also led a group of interdisciplinary faculty in forming a working group to engage the State of Alaska Department of Commerce, Community, and Economic Development in a joint project seeking funding for recovering partially burnt timber for manufacturing biochar and torrefied wood products. The Division of Commerce director has been involved at each meeting, and the project is expected to have positive economic results.	
12.	IANRE facilitates climate adaptability for Alaskan communities	**Issue:** Climate change is in the forefront of the agricultural community. Current predictions on crop and animal performance are based on research literature and accepted understanding of the current biological systems. At present, published research is one the few options available to policymakers and producers alike to predict the potential impacts of climate change over the next 30 years. Many of these issues are extremely complex and cannot be evaluated in the field because of not only this complexity, but also because the changes will be gradual. In addition, the magnitude of these changes is uncertain and difficult to predict, especially at the local scale. Also masking some of the overall changes are the large variabilities that exist within climate systems. **Response:** In FY20, researchers completed a 3-year project intended to enhance the understanding of the effects of climate variability and change on crop and livestock production systems and discern how stakeholders use weather and climate information in management decisions. An IANRE research team tested 72 northern European cereal varieties for adaptability in Alaska climatic conditions. They also used machine learning algorithms to enhance our understanding on climate change impact on cereal crops in Alaska. The team compared different machine learning algorithms for their ability in predicting barley growth stages.	2. Natural Resources, Ecosystems & Sustainable Energy

		They also used DSSAT (Decision Supporting System for Agrotechnology Transfer) to predict climate change impact on current cultivars in next decades. The researchers collaborated regionally through NC-1179 and with Dr. Jones of Washington State University. **Results:** The team found that some imported varieties of spring wheat have a potential to grow in Alaska. They also found that barley growth stages (such as flowering) advanced as the lengthening of the growing season. DSSAT showed that climate change advances growth stages of current cultivars of cereals, but yield will be reduced. An undergraduate student and graduate student received training through the project. The results have been disseminated to growers through fall farmers' meetings, also through public media, such as newspapers and e-news and various meetings, such as the Soil Survey Workshop. The results were also disseminated to scientific communities by presenting posters in AGU conference, and published papers in scientific journals.	
13.	IANRE contributes to multistate efforts supporting recreation research and education	**Issue:** Persistent concerns about declining human health, environmental sustainability, and social equity demand innovative solutions. For decades, research has revealed that outdoor recreation, parks and green spaces have the capacity to address these issues by improving health and quality of life, encouraging environmental stewardship, promoting social equity and inclusion, and enhancing community vitality. This research, however, is scattered across a wide array of disciplines and publication outlets. Comprehensive resources are needed to synthesize the current state of knowledge regarding the broader benefits of parks and recreation and identify opportunities for generating equitable outcomes across diverse communities. **Response:** Researchers representing 13 states coast-to-coast collaborated on multistate project NE1962. The group made progress on an edited book, *The Transformative Power of Parks*. At the annual meeting, participants presented overviews of their respective research for the volume. There are 50 planned chapters covering everything from health and environmental literacy to equity, inclusion, and community vitality. Peer review of the chapters will take place in Spring 2021, with the goal of securing final manuscripts in July 2021.	2. Natural Resources, Ecosystems & Sustainable Energy

		Results: A researcher from Alaska chaired the multistate project in FY20, during which time collaboration was increased by 7 new members. Written by diverse authors around the world, the reference text in process will illustrate how parks and recreation can transform the way people live and interact with social and ecological systems. The book will serve as a resource to help practitioners, report researchers, students, and other key stakeholders across multiple disciplines understand and communicate the benefits of parks and recreation, ultimately impacting policy and planning on a path toward a sustainable future.	
14.	IANRE enhances national recreation data analysis for public lands managers	**Issue:** People engage in recreation in hopes of receiving beneficial outcomes. The desired outcomes and how best to achieve them will vary by individuals. Recreation managers can enhance the opportunities for individuals to realize their desired benefits. Crucial to doing so is understanding the benefits desired and how potential management actions could positively or negatively impact attainment. This project seeks to advance previous research that examined the relationship between attainment of desired benefits and management actions. In addition, if individuals within specific communities receive benefits from recreation, related research questions include whether a change could be detected at the community level and if management actions can increase the extent of positive change. This project also seeks to build on research that addresses the ability to measure and influence community-level beneficial outcomes. The expected impacts of this project are increased effectiveness of recreation management and enhanced beneficial outcomes to individuals and communities. **Response:** Studies were developed at the following sites; data that has been gathered is listed in parentheses. Logandale Trails (visitor survey, onsite n = 144, follow-up n = 34; community assessment, n = 21). Project reports complete. Kingman Field Office (visitor survey, onsite n = 271, follow-up n = 89; community assessment developed, but not started). Bears Ears National Monument (visitor survey, onsite n = 494, follow-up n = 246; community assessment developed). A surveyor of the Matanuska Experiment Farm and Extension Center (MEFEC) trail users included topics related to types and location of use, frequency and duration	2. Natural Resources, Ecosystems & Sustainable Energy

		of use, perceptions of problems on the trail system, management preferences, anticipated health outcomes, self assessment of attainment of those health outcomes, and demographics. Due to COVID-19 constraints the survey was distributed by placing signs with a QR at the main trailheads. Nine hundred twenty-eight responses were received. **Results:** Twenty-three datasets were examined for common topic areas and variables. Merged data represent over 6,500 cases, across four states. Project reports for the Logandale Field Office Study were developed and distributed to BLM managers and other relevant stakeholders. For MEFEC, initial summaries of key variables have been provided to its Trails Advisory Commission, improving capacity for data-based decision making. Overall, the project has resulted in increased efficiency in recreation survey use. Visitor and community assessments were developed within two months with minimal need to consult with a respective field office.	
15.	IANRE immerses stakeholders in natural resource issues	**Issue:** The effects of COVID-19 restrictions on the Matanuska Experiment Farm and Extension Center made the continuation of its citizen science programming challenging, as people could not gather to share their passion for science. Citizen science is essentially science performed by citizens to help answer real-world questions. According to the National Park Service, "anyone can be a scientist regardless of where they're from. It doesn't matter how old you are or what your background is. All it takes is some time, curiosity and a sense of wonder." **Response:** Mat-Su/Copper River 4-H District Program Coordinator Ann Biddle recognized the need to keep citizens engaged in science. Biddle launched Citizen Science Walkabout Wednesdays and a Citizen Science Academy to encourage the continuation of science from home during the pandemic. Walkabout Wednesdays feature Biddle and Matanuska Experiment Farm Director Jodie Anderson considering different science-related topics on the farm. The 45-minute program is streamed through Facebook Live every Wednesday. Topics have included birding, foraging, farming activities, gardening, nature scavenger hunt, clouds and soil science. A farm tour is also conducted each month as in-person tours were canceled due to the pandemic. The Citizen Science Academy was offered through	2. Natural Resources, Ecosystems & Sustainable Energy

		Zoom with the goals of encouraging learning, creating a sense of belonging within your community and comprehending science through discovery and technology. Citizens were encouraged to download apps on devices, which allowed them to participate in science activities from home. **Results:** The pandemic expanded the potential audience for both of these activities as it allowed participants from all over to attend weekly Walkabout Wednesdays and the Citizen Science Academy. As of January, 42 Walkabout Wednesdays have been conducted since last March. Participants from all over Alaska and from out of state can attend the live videos and ask real-time questions about each activity. Biddle hopes to continue offering a virtual option once in-person classes resume so a broader audience can be reached.	
16.	IANRE leverages new technology to create inventory of boreal forests	**Issue:** Appropriate forest harvest management and use of local wood could mitigate the effects of climate warming in various ways, such as creating fuel breaks, planting resilient genotypes and/or species, and producing energy using renewable local wood resources. Forest management in Interior Alaska has in general had low profit margins because of a small local demand and a long distance to major markets. However, new revenue sources are emerging, such as wood biomass for energy generation and carbon credits, which also mitigate the effects of climate change by reducing carbon footprints. In order to sustainably supply wood biomass for energy generation or successful carbon credit trades, accurate and precise forest inventories are essential. **Response:** A researcher worked with Alaska Center for Unmanned Aircraft Systems Integration to attach new sensors to the UAV with improved capacity to estimate aboveground biomass and learn to fly the new UAV. A technician on the project received training on how to operate the new UAV. The team worked on finding the optimum method to estimate aboveground biomass and to develop a protocol to accomplish fast, accurate, and precise forest inventory using UAV. The team is currently analyzing data to determine next steps. **Results:** The researcher plans to fly a couple more plots and analyze the data and share the information with stakeholders. The data acquired by UAF so far has great advantages in data collection over other techniques (e.g. field	2. Natural Resources, Ecosystems & Sustainable Energy

		measurement and airborne remote sensing or laser scanning), such as lower cost, faster data acquisition, and flexibility (e.g. weather conditions). UAV photogrammetry and Lidar are new, emerging technologies. Results from this project will allow for the development of UAV forest inventory protocols. The research team plans to host training in UAV operation and data analysis to help land owners and managers implement efficient forest inventory techniques using UAV photogrammetry.	
17.	IANRE equips stakeholders to harvest forest products	**Issue:** Various species of trees and the forest products that can be derived from them are just some of the many renewable natural resources that Alaska has to offer. Buy-in from communities is critical to ensuring forest products are harvested properly and processed safely. Improving awareness and knowledge of good stewardship practices is key to ensuring our forest products remain sustainable. The faculty and staff of IANRE work together to blend research and outreach to assure stakeholders understand best practices. There is a mutual benefit when research can be conducted in a participatory manner. **Response:** OneTree Alaska, part of IANRE, is an Alaska Center for Energy and Power (ACEP) partner for science, technology, engineering, art and math programs sponsored by the Office of Naval Research. The state-certified OneTree Alaska kitchen is a production space for local forest products, including birch syrup, caramels and birch sticks made from sap collected by a volunteer cooperative. Funds raised are used to sustain the OneTree Alaska program, which offers forestry outreach activities. Members of the Fairbanks Birch Sap Cooperative may also use the kitchen to work on their own projects or start-up companies. With sponsorship from ACEP, OneTree Alaska was able to work through COVID-19 restrictions to keep stakeholder involvement going in FY20 by creating and distributing 220 home birch-tapping kits. **Results:** The kits allowed for greater participation. While previous years saw an average of 60 households, in FY20 over 230 K-12 families and community members collected birch sap data, which will be entered onto a Google Earth map. Research at the OneTree lab continues to target greater predictability for when the birch sap season will start, peak and end. This has the potential to	2. Natural Resources, Ecosystems & Sustainable Energy

		provide greater certainty for producers to know when to set and pull taps. Local homeowners allowed OneTree Alaska staff to set up collection tubing and harvest hundreds of gallons of birch tree sap. The sap is expected to produce over 30 gallons of high-quality syrup, and an additional 10 gallons of late season syrup for use in birch caramels. Another successful season will allow for continued product sales that support forestry outreach.	
18.	IANRE empowers Alaskans to prevent and manage chronic disease	**Issue:** Alaska's senior population must remain active and healthy in a difficult environment. Alaska, per capita, has one of the fastest-growing populations of seniors in the nation, and the state expects the number of seniors to double in the next 30 years. All of Alaska is considered medically underserved, and costs to individuals for medical care are higher than the national average. It is imperative that Alaskans focus on health strategies to maintain health and independence throughout life. **Response:** During FY20, Extension continued to provide StrongWomen, Chronic Disease Self-Management and Diabetes Self-Management. Volunteer leaders in over 20 StrongWomen programs received support from Extension. StrongWomen continued to have hundreds of participants across the state, with many continuing past one year. A Fairbanks-based agent trained program leaders and added one new group in FY20. The course was adapted for COVID-19 restrictions and the agent was able to offer the StrongWomen/StrongSeniors Class by Zoom with more than 100 registered participants. Extension provided information on diabetes prevention to 458 community members. Activities ranged from coach and program leader training to helping participants adopt lifestyle changes. **Results:** StrongWomen Stay Young and StrongWomen Strong Bones are evidence-based programs known to increase strength, decrease falls, and improve bone density in both men and women. Preventing even one bone fracturing fall can save $35,000 (average cost of hospitalization for a fall). Extension's courses have resulted in positive behavior change. Participants in Alaska-based groups report feeling stronger and healthier with regular practice. They were provided with links class recordings, which many use to incorporate exercise a third time per week for better strength gains. Some have reported	3. Healthy Individuals, Families & Communities

		quicker recovery from surgery that they attribute to the muscle and bone strength built during StrongWomen. A participant in the diabetes self-management program was reported by a spouse to have lost weight and achieved a drop in A1C levels. Overall, these offerings improve lives and reduce the individual and societal burden of chronic disease.	
19.	IANRE trains Alaskans to prepare food more safely	**Issue:** Many Alaskans live a subsistence lifestyle or supplement their diets with fish and game meat. Alaska also has a large military population, and most have not previously preserved game meat or fish. Alaska has one of the nation's highest rates of botulism, which occurs in low-acid foods. The state has an average of at least one death every three years, with the most recent occurring in 2019. An Anchorage man was sickened by botulism believed to be caused by home-canned salmon in 2020. It is particularly important to teach people how to safely preserve local staples. All food establishments in Alaska are required to have at least one certified food protection manager on staff to ensure food safety. **Response:** In an effort to continue outreach beyond face-to face classes, many Extension instructors turned to online learning platforms, such as Zoom and Facebook Live. For example, since March 2020, a Mat-Su area agent taught 22 online classes and has reached 582 people. The Southeast agent redesigned the district's most requested classes to online platforms (Zoom, Canvas, Facebook). Videos of the recorded classes were also sent out to those who registered, so that people who had scheduling conflicts or connection issues could watch the videos later. Agents and program assistants also answered canning and food safety questions by phone and email, and offered canner gauge testing to the public. **Results:** Online instruction proved successful. Participants in food preservation classes expressed an intent to use the information and share the information with others. The majority of respondents surveyed after food preservation and safety classes indicated increased knowledge and confidence. Hundreds of canner gauges tested were tested, with many needing adjustment and some needing replacement, highlighting the importance of this service. Of the 55 food protection managers trained in FY20, 82 percent passed the exam. The classes	3. Healthy Individuals, Families & Communities

		helped food workers gain skills needed to keep existing jobs or pursue new work or promotions. Overall, UAF Extension extended its reach through online classes and social media, connecting with more stakeholders around Alaska and even in the Lower 48.	
20.	IANRE partners with Alaskans to improve air quality radon response	**Issue:** Every year approximately 20,000 Americans die from lung cancer as a result of breathing in radioactive radon gas at their homes, schools and workplaces. You can't see or smell radon, but there are easy methods to sample room air and have it analyzed for the average radon concentration. Testing is important in Alaska as subsurface uranium exists in many areas of the state. As uranium decays, radon gas is released. Many residents became aware of radon concerns following a major earthquake in Southcentral Alaska in November 2018. Residents were encouraged to test for radon because of potentially new subsurface pathways for radon to enter homes. No local or state regulations require testing. Alaska residents need assistance in checking their buildings' radon levels and mitigating radon levels, if necessary. **Response:** Extension has provided educational outreach on radon for more than 30 years. Environmental Protection Agency funding supported a joint effort with the Alaska Department of Natural Resources to distribute complimentary radon testing kits from July of 2019 to June of 2020. Public service announcements and other outreach were effective in driving people to get 944 complimentary test kits during this period. Extension also answered radon questions received through the Alaska Radon Hotline and provided information about radon through state fairs, conference booths, and workshops. **Results:** Of those individuals who received test kits, 644 tested and received valid results on radon levels in their buildings. Around 19 percent of those tests showed radon levels in excess of the Environmental Protection Agency's action level. EPA recommends mitigation at 4 picocuries of radon per liter or higher. Many of these residents received technical assistance after calling the radon hotline. They asked for information on how to either mitigate their own homes or where to contact professionals who mitigate. This successful radon outreach program spreads actionable knowledge.	3. Healthy Individuals, Families & Communities

21.	IANRE improves the nutrition knowledge and behaviors of Alaskans	**Issue:** The U.S. Department of Agriculture estimates that one in seven Alaskans struggles with hunger and food security issues. During the COVID-19 pandemic, unemployment rates increased, putting a greater strain on food resources throughout the state, including the Mat-Su area. The Alaska Tilth Program provides produce from local farms to people in need and the Cooperative Extension Service supplies nutrition information. Methods of distributing food and nutritional education needed to change due to the pandemic. R**esponse:** Nutrition educator Adair Harman is based out of the Matanuska Experiment Farm and Extension Center. She works to connect the Alaska Tilth Program with community partners who reach those in need. Alaska Tilth's mission is to "build food security in Alaska by growing food, growing farmers, and feeding those in need." This year, Harman organized the produce into donations and worked with four organizations – Kids Kupboard, Mat-Su Food Bank, Palmer Food Bank and the Wasilla WIC Office, to distribute them. Kids Kupboard served food at 31 locations, helping expand the reach of the program. In a typical year, organizations receive a bulk amount of produce, and Harman hosts cooking demonstrations to educate people about cooking fresh local produce. Due to COVID-19, these methods changed so the mission could still be achieved. Adaptations included providing flyers with recipes and fun activities to kids who received Kids Kupboard meals. Food banks were given resources such as "recipes in a bag" that included cooking tips, tricks, and preservation ideas. **Results:** Nine different farms and the Matanuska Experiment Farm's vegetable variety trials program contributed to the Tilth Program this year, and 39 vegetable varieties were donated, totaling 10,632 pounds of produce, a 5,067-pound increase from 2019. This year, Alaska Tilth handed out over 1,900 recipe bags, and the produce was used in 100,000 Kids Kupboard meals. The Tilth program not only helps supply food for people in need, but it also helps support local farmers, making our food system more reliable.	3. Healthy Individuals, Families & Communities
22.	IANRE teaches Alaska youth	**Issue:** The invasive European black slug (Arion ater) was introduced into Alaska relatively recently, but has quickly established and spread, especially thriving in wet, cool climates like Sitka. The ecological impacts of black slug populations on	4. 4-H & Youth Development

	to identify and monitor invasive species and pests	native slugs and vegetation in Alaska are currently being researched, along with their genetics. Elsewhere, the omnivore is known to consume other organisms and vegetative matter in gardens and agricultural crops. The public is asked to help in their eradication, but manual removal of slugs, which has the lowest impact on the environment, is very time-consuming. **Response:** Since 2011, Sitka Spruce Tips 4-H club has partnered with the Sitka Conservation Society, a local environmental nonprofit, to engage youth ages 5-18 in place-based, experiential learning unique to the Tongass National Forest. This year, the two organizations collaborated to spearhead an invasive European slug collection and awareness campaign in the community. Even with the added challenges of the COVID-19 pandemic, it was an easy event to organize in a safe, social-distanced manner and a way to build community at a time when it was especially important. First, youth members met online via Zoom for a Slugs and Bugs workshop with an entomologist from Scotland, where the slugs are native. This was an additional benefit of going virtual — being able to connect with a specialist on the other side of the planet! After learning identification skills for both native and invasive slugs, participating 4-H'ers set out with their families to see who could collect the most invasive slugs in 24-hours **Results:** The workshop and friendly competition resulted in over 600 invasive slugs collected and disposed of over two days. Slug samples were also collected and sent up to the Integrated Pest Management Program team in Anchorage for genetic analysis and a larger region wide investigation into the species. Our 4-H youth already have set the goal of collecting 1,000 slugs as a club this year, and will invite other community members to also participate in the collection.	
23.	IANRE welcomes diverse youth with culturally relevant programming	**Issue:** CNN reported in 2015 that Alaska has the top three most diverse census tracts in all of the U.S. Furthermore, Alaska's children are more diverse than its adults; as of 2016, 50 percent of youth ages 0 to 17 are nonwhite, compared to only 35 percent of Alaska adults, according to the Alaska Children's Trust. Outside of cities, there are many areas with minority youth that can only be reached by boat or plane. Thus, in many rural communities, activities for youth are limited. As the 4-H Essential Elements note, the youth development field recognizes that	4. 4-H & Youth Development

		positive development requires structure, support, skill-building, and "strong links between families, schools, and broader community resources." 4-H is uniquely positioned in Alaska to provide such opportunities to underserved youth. **Response:** A wilderness-themed afterschool club met weekly. In addition to engaging with dog mushers, the club expanded to include hiking, camping, snow shoeing, ice skating, and bike riding. An agent provided Trauma Informed Youth Development Practices and ACES training to rural 4-H staff and assisted The Holistic Life Foundation (HLF) in visiting the Bethel 4-H center. 4-H youth participating in a Human Library project at the local school interviewed and digitally recorded community elders in the Bristol Bay region, earning school credits and contributing to collective historical records. 4-H leaders traveled to Juneau with a group of members as part of the Youth in Governance program. 4-H'ers lobbied 60 legislators for a resolution calling for wider release of the Elizabeth Peratrovich dollar, and also met with Paulette Moreno, grand president of the Alaska Native Sisterhood. **Results:** Through partnerships, 4-H expanded local capacity for training and increased staff knowledge about culturally relevant programming. HLF delivered Social Emotional Learning programming to staff and youth collaborated with a local tribal organization, Orutsararmuit, to deliver programming during their suicide prevention week. A tribal extension educator is achieving the goal of starting 4-H programming in two new villages each year. From the inception of programming over three years ago, outreach has grown from the regional hub of Dillingham to include clubs in the Native villages of Nondalton, Iliamna, Manokotak, Aleknagik and Togiak. The agent who leads the youth track for the Alaska Forum on the Environment was asked to be on the board, which will provide 4-H with feedback on rural community interests related to STEM programming. The Youth in Governance delegation was influential in promoting wider distribution of the Peratrovich coin, the first U.S. currency to depict an Alaska Native person.	
24.	IANRE provides at-	**Issue:** Creating environments in which youth have a sense of belonging, experience independence, master skills and give back to the community becomes	4. 4-H & Youth Development

	home learning opportunities for youth during pandemic	more complex each year with changing environments. As a result of the pandemic, many 4-H families in Bethel have experienced limited access to child care, food resources, and youth activities. This gap can be filled through partnerships and programming based on positive youth development. 4-H faculty and staff must utilize their understanding of the Essential Elements of 4-H and their skills in volunteer management to connect schoolchildren with quality programs led by a cadre of caring adults. **Response:** Bethel 4-H has maintained its program during these unprecedented times through sustained relationships with partners and its 4-H families. Working with the Food Bank of Alaska, the Bethel 4-H Program continued its At-Risk Snack program, which provides nutritious meals and snacks to eligible children. It hosted a snack drop-in, three days a week, supplying a week's worth of snacks to families with youth 18 and under. It also partnered with Meyers Farm, a local farm, to purchase a variety of produce to create at-home "Cooking and Nutrition Kits'' and engage families in healthy eating practices. 4-H also provided activities, including kits for youth to use outside of school time, and clubs and meetings facilitated via Zoom. A youth leader led an art class through the statewide "Open HeArt Series and the program supplied 4-H'ers with supplies to participate in each art session. 4-H offers a club called Camp Invention, where 11 youth engage in fun science, technology, engineering, art, and math (STEAM) activities. 4-H recently partnered with a local high school to start a Study Club for students who may not have access to resources they need to succeed. **Results:** At-Risk Snack outreach includes families outside of 4-H, so more residents have become aware of what 4-H has to offer. Many families are now showing great interest in its clubs. The program has also had interest from teachers in surrounding villages in starting school clubs. The assistant director of the Bethel 4-H program, said, "Although having to engage via Zoom, to simply hold a conversation and see the faces of your peers, while engaging in activities has been truly impactful. Our relationships with our partners have strengthened, due to changes in their organizations and in our program, and we are putting our resources together to meet the needs of our stakeholders."	

25.	IANRE transforms STEAM learning for Alaska's youth	**Issue:** According to Alaska Children's Trust, 45,000 Alaska children do not have access to an afterschool program, yet 78 percent of Alaska parents say such programming helps working families. When the COVID-19 pandemic hit and Alaska went into lockdown, there was not a lot for kids in the Interior to do. Kids were shut up in their houses and away from their friends. School met by Zoom, with more computer time than normal. Keeping youth engaged in healthy and stimulating activities became more important than ever. **Response:** The state 4-H program provided kits over the summer for gardening and computer coding. For fall, they put together 200 kits for a Great Pumpkin Giveaway and a Holiday Fun Giveaway. Each kit has had something to do with a holiday, coloring sheets, crayons and other goodies. Between the state activity kits and what the Tanana District 4-H Leaders Council provided, more than 800 kits have been given to Interior youth between the ages of 3 and 18. Some kits were also mailed to Tok and Eagle upon request of teachers. Leftover kits were donated to the Interior Alaska Center for Non-Violent Living. In Kodiak, 4-H celebrated their 33rd Annual Sourdough Pancake Breakfast remotely, with 28 4-H families receiving starters from a sourdough that dates back over 100 years. Statewide, 4-H staff and volunteers sewed more than 1,400 coronavirus masks, which were donated to families, local businesses, fire departments and other first responders, rural villages, food banks and more. **Results:** Alaska 4-H has provided extracurricular activities to engage Alaska's youth during the pandemic. These efforts also let parents know that others care and are providing fun, constructive activities for their youth. They have also helped some families who couldn't afford things like pumpkins to provide something for their children around the holidays. When staff hand the kits to participants through the car window, the parents say, "Thank you so much, this has been fun and has meant a lot to us during this time." A youth volunteer noted that she learned new sewing skills from the practice the mask-making provided. Across Alaska, in FY20 617 4-H volunteers donated 142,149 hours for UAF, valued at $3.6 million.	4. 4-H & Youth Development