Preview of Award 1026415 - Annual Project Report

*What are the major goals of the project?*

The overall goal of the BNZ LTER program is to understand the interactive effects of changing climate and disturbance interactions for the resilience of Alaska's boreal forest.
I. Direct effects of climate change on ecosystems and disturbance regimes

Hypothesis 1: Changes in temperature and precipitation are influencing ecosystem structure and function at multiple temporal scales through effects on key species, functional types and disturbance regimes, resulting in modifications to landscape structure and heterogeneity.

Task C1: Quantify the influence of site drainage and stand age on the climate sensitivity of vegetation communities and ecosystem function within black spruce forests at the regional scale.

Task C2: Based on tree-ring measurements and historic satellite data, determine trends in productivity from a longer temporal and larger spatial perspective.

Task C3: Manipulate the amount and seasonal timing of soil moisture availability to assess influences on productivity of dominant coniferous species.

Task C4: Document the effects of climate variability, vegetation type, and predation on vertebrate herbivore abundance along a latitudinal boreal transect.

Task C5: Determine whether key aspects of the fire regime covary in space and time, and if the sensitivity of fire regime to climate is consistent across different ecosystems and landscapes.

Task C6: Examine the relationship between seasonal and interannual variability in climate and permafrost temperature across a range of ecosystems, and couple these observations to model projections using future climate scenarios.

Task C7: Assess historical patterns of insect and pathogen outbreaks, and determine how recent summer warming and associated plant drought stress are affecting insect herbivore populations and outbreaks of key plant pathogens.

II. Climate-disturbance interactions as drivers of ecosystem and landscape change

Hypothesis 2a: Climate-driven changes in fire regime interact with environmental conditions and vegetation structure to alter ecosystem function and structure, and successional pathways.

Task D1: Determine the historic fire return interval for key vegetation types, stand ages, and landscape positions, and examine the potential for positive and negative feedbacks between changing vegetation composition and fire frequency.

Task D2: Determine how the establishment and persistence of key plant species post-fire are regulated by microbial communities, plant interactions, and herbivores.

Task D3: Determine the effects of an altered fire regime on successional trajectory.

Task D4: Determine the ecosystem and landscape consequences of an altered fire regime.
Hypothesis 2b: Ecosystem structure and soil drainage characteristics modulate both climate change disturbances to permafrost, and the ecological and hydrological outcomes of changing permafrost.

Task D5: Examine the relationship between organic soil layer remaining following fire and permafrost temperature across a range of ecosystems, and couple these observations to model projections using future fire and climate scenarios.

Task D6: Examine the coupling among permafrost distribution and thaw, and soil and vegetation structure on watershed hydrology and stream export of C and N in upland boreal forest catchments.

Task D7: Examine the effect of natural and manipulated permafrost thaw on vegetation structure, and ecosystem C and N cycling in upland boreal tundra landscapes.

Task D8: Examine the effects of natural and manipulated permafrost thaw on vegetation structure and ecosystem C and nitrogen cycling in boreal wetland landscapes.

Hypothesis 2c: Climate-driven changes in outbreaks of defoliating insects and plant pathogens affect successional pathways and ecosystem function by altering the abundance of key plant species.

Task D9: Coordinate monitoring of the abundances of native and invasive insects and pathogens with measurements of plant growth, community composition and stand structure.

Task D10: Quantify the effects of alder canker on N-fixation inputs and associated rates of plant growth and successional patterns of C and N storage.

Task D11: Manipulate the abundance of insect and vertebrate herbivores in early successional stands and assess consequences for plant growth, biogeochemical cycling, and vegetation development.

III. Regional ecosystem dynamics and climate feedbacks.

Hypothesis 3a: Responses of boreal ecosystems in interior Alaska to projected changes in climate and disturbance regimes will directionally shift vegetation distribution towards more deciduous forest cover primarily through increased disturbance frequency and severity, leading to successional pathways that allow regeneration by deciduous tree species at the expense of conifer tree species.

Task CF1: Couple the model of fire regime with the model of ecosystem structure and function, incorporate information developed from Hypotheses 1 and 2 into the coupled model framework, and conduct a retrospective analysis of the coupled model framework.

Task CF2: Apply the coupled model for future scenarios of climate for interior Alaska and analyze changes in ecosystem function/structure at the regional scale.

Hypothesis 3b: The responses of water and energy exchange associated with changes in climate and disturbance frequency and severity throughout the 21st Century will result in 1) positive feedbacks to climate warming during the shoulder seasons, and 2) negative climate feedbacks during summer, with net positive feedbacks over the annual cycle.
Hypothesis 3c: Boreal ecosystems of interior Alaska will lose C as CO$_2$ to the atmosphere as a result of increased disturbance frequency and severity and increased decomposition because of permafrost thaw, with the response to disturbance dominating the overall flux. CH$_4$ emissions of boreal wetlands will change because of warming-induced increases in methanogenesis and drainage-induced decreases in methanogenesis, with the former response dominating the overall flux.

Task CF4: Conduct factorial experiments with the modeling framework for future scenarios of climate change in interior Alaska to evaluate the relative effects of climate and disturbance on estimates of CO$_2$ and CH$_4$.

IV. Coupled Social-Ecological Dynamics for Interior Alaska

Task SE1: Identify the suite of services most critical to sustainability in interior Alaska.

Task SE2: Identify past trajectories and rates of change and likely future changes in critical ecosystem services.

Task SE3: Model the interaction of ecological, economic, cultural, and demographic conditions affecting participation in subsistence in rural households of interior Alaska, and how those dynamics affect village sustainability.

Task SE4: Conduct institutional analysis to identify the role of policy in mediating the effects of changing ecosystem services.

Task SE5: Through partnerships with communities, identify conditions that facilitate innovation in future human adaptation and transformation.

* What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?

Major Activities:

Direct effects of climate change on ecosystems and disturbance regimes

45 additional Extensive Network Sites were established, permitted, and permanently marked during the summer of 2013. Comprehensive tree inventory was completed and site, stand, and plant species characteristics were recorded.

36 stand ring width chronologies from the Grand River Transect were cross-dated. Tree-ring analyses were performed on a sample of ~200 black spruce trees from across interior Alaska and additional tree-ring samples were collected from mixed spruce-broadleaf stands in the summer of 2013. Treeline study plots established in 1998 along the Denali Highway were resampled in 2013. Plots were documented with high resolution aerial photography from kite borne RGB color and near infrared cameras.
The final treatment year for both rainfall and snow removal experiments were started. Standard measurements were performed and data analysis was started.

We completed a 4-year study of activity patterns, habitat use and sources of mortality in snowshoe hares. The study collared >300 hares and followed their fate using GPS and radio telemetry.

A study was initiated to examine post-fire revegetation pattern using historic wildfire polygons and remotely sensed data from Landsat sensors.

We continued to record and archive data on active layer and permafrost temperature (from 80 m boreholes) dynamics at sites within Fairbanks area.

We produced digital spatial data files of forest reference stands, collected the 27th year of growth and health data in a 1983 burned area, conducted inventories of tree mortality in an old stand following a major wind event, and maintained photo monitoring stations.

Climate-disturbance interactions as drivers of ecosystem and landscape change

We continued to measure ecosystem C fluxes across a factorial design of soil warming and water table manipulations, and in relation to seasonal thaw depth, soil temperature, and soil moisture among five wetland communities that varied in permafrost and hydrologic conditions along a physical gradient spanning from a conifer permafrost forest to an open saturated fen. We have completed 5 years of experimental warming manipulation. During the summer, field crews measured C fluxes and isotopes using static and auto chambers, and of vegetation composition and productivity. We completed the third year of a dry down experiment manipulating water table perched at the permafrost surface. We continued monitoring stream hydrology and chemical fluxes in the Caribou-Poker Creeks, and initiated experiments studying the coupling between organic matter quality and nutrient demand.

Johnstone and colleagues established a new set of herbivory experiments in 2013 that will examine the impacts of herbivory by moose and hares on early post-fire successional trajectories.

Mack and colleagues examined N fixation and nifH diversity on mosses in the understory of similarly-aged birch and black spruce stands to examine the role that microbial diversity and function plays in the nutrition and contrasting abundance of mosses in these two plant community types.
Mulder analyzed herbarium and citizen science data sets designed to evaluate 1) where and when post-fire plant species *V. uliginosum, V. vitis-idaea* and *Melilotus alba* currently overlap in flowering times, 2) whether this is expected to change under climate change, and 3) whether there is evidence for change in flowering phenology over the past 100 years. She also tracked leaf and flower phenology of native and non-native plants species from late May into an unusually warm October (third warmest on record).

Rebecca Hewitt (Ph.D.) continued to study whether the distribution of the dominant black spruce and green alder at and beyond their current range limit is determined by the availability of ectomycorrhizal fungi symbionts, which are critical to seedling nutrient acquisition, and whether the availability of these mycobionts may be altered by climate-driven changes in the fire regime at high-latitudes.

Erin Julianus (M.S.) began a study investigating the interactions between time since last fire and moose habitat in Kanuti National Wildlife Refuge. The goal of the 2012 summer field season was to quantify summer browse production based on density of browse species within burns, browse biomass in terms of current annual growth of browse species, and nutritional quality of browse species in burns.

We completed research examining the composition of early post-fire vegetation communities following the 2004 fire season, the largest annual area burned in Alaska’s 58-year record. We were interested in whether variations in fire severity would affect community composition by altering the relative success of plant regeneration strategies after fire.

Simon McClung (M.S.) harvested tree seedlings outplanted across a gradient of fire severity in an effort to understand how plant functional traits related to nutrient use covary with growth across the burn severity gradient.

We continued long-term sampling of forest insect densities and of foliar damage sustained by deciduous tree and shrub species. We collected the full first year of data from a long-term experimental manipulation designed to test the interactive effects of invertebrate folivory and vertebrate browsing on willow performance and community composition in early successional stands. Among the invertebrate folivores suppressed by the experiment is the irruptive willow leaf blotch miner responsible for outbreak levels of damage to many willow species for the past 6 years.

Regional ecosystem dynamics and climate feedbacks.

Activities continued to focus on synchronous model coupling of the Alaska Frame Based Ecosystem Code (ALFRESCO), the Dynamic Vegetation Model Dynamic Organic Soil version of the Terrestrial Ecosystem Model (DVM-DOS-TEM), and the Geophysical Institutes
Permafrost Lab (GIPL) Model. We conducted modeling studies that to represent landscape and temporal variability in the combustion of organic soil horizons during fire, which is a major determinant of post-fire vegetation dynamics. We have conducted studies that coupled TEM output with GIPL to examine the stability of permafrost with respect to the combustion of organic horizons.

Coupled Social-Ecological Dynamics for Interior Alaska

We conducted interviews with active harvesters of Nenana concerning what harvesters and elders perceived as the most important landscape: a) observed changes, b) the implications of changes to ecosystem services, and c) ways the community residents have responded to these changes. The interview method included a participatory mapping component in which observations and other comments were captured spatially. Video-taped interviews were edited and a video/DVD of each respondent’s interview was produced. After highlighting the themes of all elder and active harvester interviews, we filmed short interviews about ecological change with LTER researchers, and combined these to create a 20 minute film, “Observations of Landscape change Interior Alaska – Local Knowledge holders and LTER Researchers”. Audio of harvesters’ interviews is currently being transcribed for qualitative content analysis. Responses to closed questions (quantifiable) from the survey have been digitally entered and we have generated descriptive statistics and are exploring methods of analyses. Mapped local knowledge is being entered into a GIS program for spatial analysis.

Specific Objectives: see section above regarding project goals

Significant Results: Direct effects of climate change on ecosystems and disturbance regimes

Preliminary analyses of stand structure indicate that sites selected for the new extensive site network capture (a) the range of canopy types for intermediate age class sites, and (b) a range of black spruce densities for the mature sites (Fig 1).

Analysis of a long-term data set showed that white spruce seedfall was positively associated with increased summer precipitation and decreased summer warmth in all years except for the year prior to seedfall. In contrast, seed viability showed positive correlations to summer warmth and was greatly reduced near treeline (Roland et al. 2013).

Climate sensitivity of floodplain white spruce growth across Alaska shows opposite temperature sensitivity in the west (+) versus the east (-) that are closely tied to regional climate regimes. From a sample of 200 black spruce across interior Alaska, approximately 50% had negative correlations between ring widths and summer temperature, regardless of topographic position. Resampling of treeline study plots established in 1998 along the Denali Highway showed low mortality and accelerated recruitment of white spruce seedlings, with similar responses above treeline tundra and in upper treeline forest.
Snowshoe hares occupy a home range of 3-6 ha, but may undertake exploratory movements of more than 1 km before returning to their core area and use a variety of habitats ranging from early successional shrub communities to late-successional black spruce forests (Feierabend 2013) (Fig 2).

Satellite imagery analyses of burn scars indicate a consistently higher percentage of broadleaf forest within repeat burn areas but only for wildfires on upland landscapes. Only one of the 6 repeat burns in lowland landscapes had a higher percentage of broadleaf forest relative to the surrounding unburned area (Fig 3).

There is decadal and multi-decadal scale variability in the near-surface ground temperatures with a decrease in the ground temperatures since the mid-1990s. However, temperatures are at the level of the late-1970s and 1980s and at least 1°C higher than in the late 1950s and early 1960s (Fig 4).

A 12-year aspen leaf miner outbreak comprehensively collapsed in 2013. Environmental conditions for tree growth went from excellent with low stress levels at the beginning of the growth season, to the greatest number of days with extreme warm temperatures and high stress at the end.

Climate-disturbance interactions as drivers of ecosystem and landscape change

Analysis of herbarium specimens revealed no evidence for a change in flowering phenology for *V. uliginosum* or *V. vitis-idaea* over the past 100 years; however, *V. uliginosum* shows increased variability in flowering phenology over the past 25 years. Flowering phenology of these species is explained by geographic factors and long term climate variables, and both species show increased developmental rates at higher latitudes. In contrast, flowering phenology of *M. alba*, non-native species, is poorly explained by geographic variables with no change in developmental rate over space. Non-native plants reached leaf senescence 26 days later than did all non-native deciduous species, and 24 days later than ruderal non-native species (Fig 5).

Whereas boreal soils typically have low nitrification rates, wildfires resulting in warmer and drier soils coupled with reduced acidity can increase nitrate supply, which constitutes a large portion of N utilized by trees.

We found no evidence of ectomycorrhizal symbionts in soils collected from tundra postfire sites. Seedling growth was inversely correlated with burn severity, and biomass was significantly related to fungal composition (Fig 6). Alder seedling performance was more sensitive to changes in fungal composition related to fire severity than fire-adapted black spruce suggesting that shrub expansion in the arctic more so than black spruce migration beyond current treeline may be limited by availability of fungal partners following fire (Fig 7).
Variation in species composition post-fire was related first to fire severity, and secondarily to environmental variables, and strongly related to differences in plant traits such as regeneration strategy and predominant rooting depth. Associations with different regeneration modes and rooting substrates were predominantly expressed along the fire severity gradient. Colonizers and species that root in mineral soil were more abundant after high-severity burns, while resprouters and species that rooted in the upper duff and moss layer were most abundant at low-severity sites (Fig 8, 9).

Increases in fire return interval that exceeds the age requirements of cone production may disrupt the stability of serotinous conifer forests (Fig 10).

We found a negative relationship between water table position and Q10 of ecosystem respiration (ER), showing that ER was more temperature sensitive under drier soil conditions. Across a wetland gradient, ER was temperature-limited until conditions became so wet that respiration became oxygen-limited (McConnell et al. 2013). However, in a rich fen, findings did not support the prediction that experimental drought would stimulate soil CO2 efflux by reducing anaerobic constraints on microbial activity. Instead, across water table plots, aerobic and anaerobic CO2 production rates were correlated with DOC leachate concentrations (Kane et al. 2013). Soil temperature was 4-8 °C warmer during the winter in the winter warming (snowfence) treatments. This temperature difference disappeared in early spring when the snow pack was removed, but resulted in a persistent difference in the depth of thaw throughout the growing season. The resulting permafrost degradation led to a two-fold increase in net ecosystem C uptake during the growing season. However, warming also enhanced winter respiration, which entirely offset growing season C gains (Natali et al. 2013).

Regional ecosystem dynamics and climate feedbacks.

Modeling analyses indicate that lowlands were more resistant to severe fires and climate warming, showing smaller increases in active layer thickness and soil carbon loss compared to drier flat uplands and slopes. The combination of warming and fire over our study area led to a simulated cumulative loss of 9.6 kg C m-2 in soil C by 2100 (Fig 11, 12). Our analysis suggests that ecosystem carbon storage in boreal forests in interior Alaska is particularly vulnerable, primarily due to the combustion of organic layer thickness in fire and the related increase in active layer thickness that exposes previously protected permafrost soil carbon to decomposition.

Modeling results also indicate that climate warming accompanied by fire disturbances could significantly accelerate permafrost degradation. In upland black spruce forest, permafrost could completely degrade in an 18 m soil column within 120 yr of a severe fire in an unchanging climate (Fig 13). In contrast, in a lowland black spruce forest, permafrost is more resilient to disturbance and can persist under a combination of moderate burn severity and climate warming.
We are now at the beginning stages of analyzing findings from interviews. At this initial stage, several themes can be identified, including observed lowering of water levels, changes in break-up and freeze-up dynamics, decrease in king salmon, increase in fire frequency, increase if shrub growth, increase in lake drying, an increase in competition for moose with non-local hunters, a decrease in community harvesters’ engagement in trapping, mixed assessments changes in the quantity of moose, and an increase in government regulations limiting hunting opportunities. Harvesters also talked about the how changes in fuel costs have affected their ability to meet subsistence needs, with some also indicating concern for current oil and gas exploration activities in their traditional use area.

1. Through long-term studies of fire cycles and their links to climate, BNZ scientists have documented an increase in fire severity brought on by climate warming that will likely shift the Alaskan boreal forest from a spruce- to a broadleaf-dominated landscape.

   Increased fire in late summer is associated with greater consumption of the soil organic layer, northern ecosystems become more vulnerable to regime shifts, including permafrost thaw and altered vegetation succession. After severe fires, deciduous tree species such as aspen and birch can establish at high densities. Once deciduous forests are established, a new domain of feedbacks emerges where shallow organic soils are maintained by rapidly decomposing litter from highly productive deciduous species. Deciduous broadleaf trees increase rates of evapotranspiration and export moisture from the soil to the atmosphere. Once thick organic layers are consumed by fire, permafrost degradation is likely, leading to a state change that permanently alters ecosystem structure and function, including ecosystem productivity and carbon storage, feedbacks to regional climate, and the supply of ecosystem services to society.

2. BNZ scientists have discovered that the thaw of permafrost induced by climate change is causing the rapid decomposition of previously frozen organic carbon in boreal forest soils. This CO₂ release is likely to amplify climate warming to the same extent as land use change worldwide.

   Latitudinal gradients of soil C storage, field experiments, and laboratory incubations all show that soil C cycling in northern ecosystems is likely to be strongly influenced climate warming and changing disturbance regimes. Sustained transfers of C to the atmosphere from pools long protected in frozen or waterlogged soils since the Holocene could cause a significant positive feedback to climate change. BNZ data document significant losses of soil C with permafrost thaw that, over decadal time scales, overwhelms increased plant C uptake at rates that could make permafrost a large biospheric C source in a warmer world, similar in magnitude in the future to current C fluxes from land use change.

3. By tracking seasonal changes in snow cover for decades, BNZ scientists have discovered that the snow free season in the boreal forests of Alaska is lengthening and likely to speed the rate of warming by increasing the amount of light energy absorbed by the land surface.

   Modeling simulations over boreal Alaska have documented changes in albedo due to changes in the duration of the snow season and due to changes in the amount of
deciduous forest due to changes in the fire regime. In addition, changes in the exchange of the greenhouse gases CO2 and methane have also been estimated due to changes in climate, atmospheric carbon dioxide concentrations, fire regimes, and methane emissions. The strongest feedback to climate warming was derived from a lengthening of the growing season (reducing the snow-albedo feedback) between 2003–2100, and this was only partially counterbalanced by the cooling effect of an increase in the amount of young stands in the landscape under more severe fire regimes, and increases in carbon uptake by terrestrial ecosystems.

4. N is an essential nutrient that plants need to live and grow. BNZ scientists have discovered that boreal plants acquire N through a variety of mechanisms, including uptake from hyporheic water and direct uptake of organic compounds such as amino acids.

N cycling in boreal forest soils continues past freeze-up; about 40% of the annual N flux occurs during winter. The production and turnover of dissolved organic N in boreal forests appear to be as rapid as that of inorganic N, and the uptake of amino acids by plants and microbes appears equally important as the uptake of dissolved inorganic N. Soils on the Tanana River floodplain exhibit both qualitative and quantitative shifts in biogeochemical processes across succession. Early successional soils which have low organic matter content are characterized by low in situ rates of N mineralization and proteolysis. Riparian vegetation derives most N from nitrate supplied via hyporheic flow. N mineralization increases with increasing soil organic matter content, reaches a peak in mid-succession, and declines thereafter possibly due to an accumulation of recalcitrant soil organic matter derived from the dominant coniferous tree species. By contrast, soil proteolytic activity and the turnover of free amino acids increases steadily across succession despite marked reductions in soil temperatures. This diversity of biogeochemical processes is reflected in qualitative changes of the N economy of successional vegetation.

5. For more than 20 years, BNZ scientists have studied the hidden impact of browsing on ecosystems by conducting experiments that exclude moose and snowshoe hares from large areas. Results show that browsing controls which plant species dominate, how large some trees grow, and how rapidly nutrients cycle through the ecosystem.

Browsing by moose and snowshoe hares strongly controls vegetation development and ecosystem function in boreal forests. Mammalian herbivores control species composition, nutrient cycling, and plant population dynamics at the stand and landscape levels. A major effect of herbivory on nutrient cycling is the selective browsing by moose and snowshoe hares on willows, which leads the dominance of alder, an important N-fixing species that is chemically defended against herbivory. During periods of high snowshoe hare density, browsing on spruce seedlings can result in effects on forest community composition that persist for decades. Studies of snowshoe hare populations at BNZ have shown that, in addition to the classical decadal population cycle, hare abundance varies nearly as much on an intra-annual basis, underscoring the large oscillations of resource availability in boreal forests. The effects of mammalian herbivory can also alter the activity and abundance of insects and other arthropods.

6. Successful study of the dynamics of social-ecological systems requires engagement with local communities through meaningful partnerships and processes that facilitate an exchange of knowledge between scientists and local knowledge holders in ways that can inform decision making.
Changes in climate and fire regime are already affecting rural Alaskan communities where indigenous people have historically led a subsistence lifestyle as hunters, fishers, and gatherers. Local residents are observing firsthand that warming has changed the timing of freeze up and melting of rivers and reduced the thickness of river ice and therefore reduced the safety of winter travel and access to some hunting grounds. Increased evapotranspiration and lower river levels reduce opportunities for barge delivery of fuel and increase the cost of living and therefore the dependence on subsistence harvesting. Now that communities are permanently situated rather than semi-nomadic, the increased wildfire risk caused by warmer drier conditions is substantially affecting rural communities. Wildfire is a risk to life and property, reduces access to the land, threatens cultural and historic resources, and reduces moose and caribou abundances for one to several decades. Sources of resilience to address these changes include local residents’ knowledge of village homelands, oral traditions transmitted by community elders, cooperative harvesting strategies, and sharing networks that maintain community identity while sustaining food supplies to the most vulnerable households and allowing hunters to borrow hunting equipment. As LTER research seeks to improve understanding of social-ecological system dynamics and the options for successful human adaptation, research partnerships are critical in improving science and demonstrating the relevance of research to society.

* What opportunities for training and professional development has the project provided?

Education outreach to K-12 children through the SLTER has brought hands-on experience in learning science through teacher training courses/workshops, classroom involvement by LTER scientists, and by engaging students in a classroom in on-going research or by mentoring students in investigations that they have independently developed. SLTER has provided place-based, investigative scientific activity to schoolchildren in and around Fairbanks and rural AK involving Native Alaskan children and communities in LTER research.

Teacher Workshops: In June 2013, a 6-day professional development workshop that combined measurement protocols and learning activities for plant phenology, soils, atmosphere/weather, frost tube/active layer investigations, and best teaching practices was conducted by Sparrow for AK educators. Another workshop was conducted in June 2013 by Mulder, Spellman (PhD student) and Christine Villano (SLTER teacher) on plant phenology and biological invasions for educators from across the state. Both workshops were offered for UAF continuing education credits. Year-long support was provided to teachers for classroom implementation, through emails, phone calls, mail (equipment and supplies), and classroom visits.

LTER scientist involvement with pre-college teachers and students: LTER scientists, including graduate students and staff, continue to work with K-12 teachers and students by giving presentations in classrooms, mentoring students in their science fair or high school science symposium research projects as well as serving as judges in local and regional Science Fairs and the AK Statewide High School Science Symposium. Sparrow has continued to coordinate the Science Fair at a Fairbanks school.

Some LTER graduate students have worked closely with local K-12 teachers throughout the school year in a collaborative project called GK-12 Changing AK Science Education (CASE) program, sharing science expertise with teachers while learning how to communicate science to diverse audiences by co-teaching in the classrooms. For example, graduate student Rebecca Finger worked to extend her BNZ LTER research to students at Lathrop High School as a 2013 CASE fellow.

Mulder and Spellman worked on a collaborative project with elementary school teachers at Pearl Creek Elementary and Denali Elementary to investigate the potential for non-native plant species to capitalize on extended growing seasons. Approximately 75 students collected data on the fall senescence of native and non-native plant species, compared the senescence rates to the rates found by Mulder and Spellman at BNZ LTER sites, and presented results of the scientist-student collaboration at the Annual AK Invasive Species Conference.
Development of Master trainers/teacher leaders: Trained teachers have mentored and trained other teachers in scientific measurements for use in inquiries and research. We continued our involvement with the GLOBE Seasons and Biomes Program; one of our teacher leaders was awarded the 2013 Swiss Award of Phenology and Seasonality (see http://www.seasonsandbiomes.net/index.html).

International activities: In September 2013, Sparrow (SLTER and Seasons and Biomes) conducted a professional development workshop for 40 educators from 7 participating schools from across the Philippines. Sparrow presented at the Education Meets Science: Bringing Polar Research into the Classrooms international PD workshop for 30 educators, held in Coimbra, Portugal, March 2013.

REU Student Training: Each year, the BNZ LTER supports 2 REU students. Students develop and complete research projects under supervision of senior personnel, work closely with grad students and PIs throughout the summer, and participate in student-run seminar activities at the end of the field season. Female and male, urban and rural, Native and non-Native students participate in these and many other undergraduate research opportunities afforded by the LTER.

Involvement in graduate education: Graduate education is a major component of the BNZ LTER. Approximately 44 graduate students were affiliated with BNZ research during 2013. The BNZ LTER has been the central natural science facility for an IGERT graduate program in Regional Resilience and Adaptation (RAP) that links ecological, economic, and cultural aspects of sustainability and resilience.

Direct involvement of under-represented groups in BNZ research: BNZ LTER has contributed substantively to education and diversity at many levels and has made progress toward the goal of broadening participation in science at all levels. 41% of the PIs and senior personnel involved in BNZ in 2013 are women. Of the LTER graduate students in our last grant period, 66% are women and 11% are minorities (Native American, Asian, and Hispanic/Latino). Our effort to enhance diversity is through recruitment of minority graduate students, particularly AK Natives. Minority recruitment has been a strong emphasis of the IGERT graduate program in RAP, where there are over 41 graduate students, 32 of them being women, many of whom are involved in LTER research.

Schuur continued work on the course textbook “Radiocarbon in Ecology and Earth System Science”. The goal of this intensive course is to train the next generation of researchers in ecology and earth sciences in the use of AMS technology. Increased numbers of 14C measurements combined with more researchers skilled in the interpretation of 14C data offers great promise towards addressing the human impact on global carbon cycling and the feedback to climate change. This course has been co-organized by Schuur and Susan Trumbore, and is now taught every other year, with the next class held at UCI in July 2014. This year we also hosted a teacher at the Healy site in the late winter/spring period for the third year in a row. This was coordinated through the Polartrec program by Elizabeth Webb. A high school teacher (Tom Lane) from Vermont spent time at the site and prepared materials for his classes based on his experience helping with the fieldwork. He visited the site for six weeks in April, and then again in July to see the experiment during the summer growing season.

Research Experience for Teachers: Marcia Kuntz, 4-6 grade teacher at Pearl Creek Elementary, joined BNZ LTER during summer 2013 as a part of the research experience for teachers program, working with Mulder’s research team to investigate differences in phenology of native and non-native plant species. The experience began with an orientation to BNZ research sites and conceptual and methodological training through a credited PD field course. Kuntz fully participated in the Mulder Lab field activities, which helped her gain experience with scientific data collection, plant identification, community ecology concepts and methodologies, and working directly with a team of scientists. She then worked with Mulder to develop lessons and protocols which were transferred into her classroom.
How have the results been disseminated to communities of interest?

Mulder and graduate student Katie Spellman took advantage of a wide range of public education programs to introduce people to the problems of invasive species and competition for pollinators in the context of rapid climate change. In May 2013, Mulder and Spellman were featured in the public art and science cafe series “Colors of Nature” at a local coffee shop discussing the role pollen and pollination play in plant competition. Additional public lectures were given in partnership with Fbks Cooperative Weed Management Association (April 2013), the Fbks Garden Club (June 2013), Ageya Wilderness Education (July 2013), and the AK Center for Climate Assessment and Policy (August 2013). These events were used to recruit volunteers to the citizen science phenology monitoring program (below).

Mulder and Spellman have developed, piloted, and fully launched (summers 2012-2013) a statewide citizen science program to aid their research on interactions between invasive plants, native berry plants and pollinators. Volunteer citizens monitor the phenology of focal species across the state. Mulder and Spellman conducted in-person volunteer trainings in Fbks and Bethel, and conducted webinar-delivery trainings via for remote volunteers in small towns and villages. As of fall 2013, 246 citizen scientists from families, youth groups, nature centers and tourist groups contributed 868 observations at 106 monitoring sites. Data are being used to determine the geographic mosaic of potential pollinator interactions between Melilotus albus and Vaccinium vitis-idaea and V. uliginosum based on phenological overlap of the native and invasive species. Data will supplement and validate models that predict phenology based on climate and geographical variables that are being developed using herbarium records; these models will be used to produce a risk model for the entire state of AK, with particular emphasis on rural communities that have not yet been invaded by Melilotus. Initial results were communicated to rural Alaskan audiences in 2013 by Mulder in Nome at the Western Alaska Science Conference and Bethel at an invasive plants training workshop that Spellman instructed. Project website: https://sites.google.com/a/alaska.edu/melibee-project/.

Outreach to K-12 children through the SLTER has brought hands-on experience and inquiry to children learning science through teacher training courses/workshops, classroom involvement by many LTER scientists, and engaging all students in a classroom in on-going research or by mentoring students in investigations that they have independently developed.

LTER scientists often present their research to a variety of community groups through classes, presentations, and workshops. PhD candidate Katie Spellman has been actively engaging community members, teachers, students, and land managers in LTER research through numerous activities and programs focusing on invasive plant ecology in AK. The Osher Lifelong Learning program adult education provides another avenue for LTER scientists to share their research with community members. Recent courses led by LTER scientists have covered the science of climate change, the role of humans in ecological change, energy and economics, predator-prey relationships, and more.

Research at the Healy site continues to be used as a foundation for developing a protocol for the Denali NP as part of the Central AK Network of Parks. This protocol is being developed for long-term monitoring of C and permafrost. Additional work on the Standard Operating Protocols continued this year in close collaboration with DNP researchers. This site has been chosen as a relocatable site for the NEON taiga domain, and we continue to interface with that effort in particular trying to provide a bridge between science and the local community.

In a Time of Change (ITOC), a BNZ organized network of visual and performing artists, writers and scientists has been actively working together since 2007 to integrate scientific and artistic perspectives on social-ecological issues in interior AK. To date, these efforts have involved field workshops for artists, writers and performers with scientists fostering collaborative creative processes culminated in public performing arts events and visual art exhibits presented locally, regionally and nationally. Our series of projects has generated considerable enthusiasm among artists, scientists and the public. It has created a growing consortium of AK artists and scientists committed to 1) exchanging perspectives between the arts, sciences and humanities on topics related to social-ecological systems 2) producing high-quality, original work informed by these collaborations and 3) presenting these works to the public to promote awareness and understanding of science and the interactions between humans and the ecosystem.
This year’s ITOC program was in collaboration with Denali NP, entitled *In a Time of Change: Trophic Cascades*. Ten artists from across AK were selected through a competitive proposal process, and visual artists representing diverse styles and media, as well as prose writers, playwrights and an AK Native storyteller were selected. The project focused on the dynamics of predator/prey interactions and associated effects on ecosystems via trophic cascades, including the effects of humans and predator control on ecosystems. Two field workshops were offered to artists along with scientists, at Denali National Park and the BNZ LTER. In-kind support was provided by DNP and the Murie Science and Learning Center. The project culminated in an integrated, multimedia gallery exhibit in August of 2013 in Fairbanks, AK. The exhibit was attended by over 1,820 people and survey data were collected to assess impacts. Postdoctoral researcher Lissy Goralnik (AND LTER) visited BNZ to attend the exhibit opening and interviewed participating artists and scientists for her research efforts to synthesize arts and humanities activities across the LTER network. Her work is supported by an LTER Network Office Cross-site Synthesis grant to PI Michael Nelson (AND) and Co-PIs Frederick Swanson (AND) and Mary Beth Leigh (BNZ). Selected works from our previous exhibit, *The Art of Fire*, joined a touring exhibit to AK Pacific University in Anchorage, AK (Jan. 4-29, 2013), and were included in an LTER Network-wide exhibit at the NSF (Feb-June, 2013).

BNZ has been a leader in LTER Network wide arts and humanities activities. ITOC Program Director Mary Beth Leigh (BNZ) co-leads the *Ecological Reflections* program along with leaders of arts and humanities activities from AND (Fred Swanson), NTL (Terry Daulton) and HFR (Clarisse Hart), and is working with AND (Nelson, Swanson) on an LTER Network Synthesis project to synthesize arts and humanities activities across the LTER Network.

We established a close working relationship with the AK Div of Forestry through project BAKLAP (Boreal Alaska – Learning, Adaptation, and Production), which is evaluating forest regeneration records for informing DOF decisions about new wood biomass energy management. BAKLAP partners with 6 elementary and middle schools, and a dozen classroom teachers.

For a study of hydrological controls over river ice conditions and its implications for subsistence activities in rural communities, we completed a web site with interactive maps, interviews, and videos administered by the UAF Oral History ([www.jukebox.uaf.edu/dangerice](http://www.jukebox.uaf.edu/dangerice)). In collaboration with local stakeholders we also published a booklet summarizing descriptions of dangerous ice conditions, how to recognize these conditions, and how river travelers should prepare for these conditions. Copies have been distributed to the public and the booklet is available on the website.

*What do you plan to do during the next reporting period to accomplish the goals?*

continue to work towards completing tasks outlined in the proposal and restated above

**Supporting Files**

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**Products**

**Books**


**Book Chapters**

Chapin III, F. S. (2013). Overview of Ecosystem Functions and Services: Their Importance and Vulnerability. *Climate*


Inventions
Nothing to report.

Journals or Juried Conference Papers


Bierbaum, Rosina; Smith, Joel B.; Lee, Arthur; Blair, Maria; Carter, Lynne; Chapin, F. Stuart, III; Fleming, Paul; Ruffo, Susan; Stults, Missy; McNeely, Shannon; Wasley, Emily; Verduzco, Laura (2013). A comprehensive review of climate adaptation in the United States: more than before, but less than needed. Mitigation and Adaptation Strategies for Global Change. 18 (3), 361-406. Status = PUBLISHED; Acknowledgment of Federal Support = No; Peer Reviewed = Yes; DOI: 10.1007/s11027-012-9423-1


Feierabend, D. and K. Kielland (). Multiple crossings of a large glacial river by Canada Lynx (Lynx canadensis). *Canadian Field-Naturalist*. Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes


Grimm, Nancy B.; Chapin, F. Stuart, III; Bierwagen, Britta; Gonzalez, Patrick; Groffman, Peter M.; Luo, Yiqi; Melton, Forrest; Nadelhoffer, Knute; Pairis, Amber; Raymond, Peter A.; Schimel, Josh; Williamson, Craig E. (2013). The impacts of climate change on ecosystem structure and function. *Frontiers in Ecology and the Environment*. 11 (9), 474-482. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes ; DOI: 10.1890/120282


Hewitt, R.E., Bent E., Hollingsworth T.N., Chapin III F.S., Taylor D.L (). Resilience of Arctic Mycorrhizal Fungal Communities After Wildfire Facilitated by Resprouting Shrubs.. *Ecoscience*. Status = AWAITING_PUBLICATION; Acknowledgment of Federal Support = Yes; Peer Reviewed = Yes


Johnson, Kristofer D.; Harden, Jennifer W.; McGuire, A. David; Clark, Mark; Yuan, Fengming; Finley, Andrew O. (2013). Permafrost and organic layer interactions over a climate gradient in a discontinuous permafrost zone.


Koljalg, Urmas; Nilsson, R. Henrik; Abarenkov, Kessy; Tedersoo, Leho; Taylor, Andy F. S.; Bahram, Mohammad; Bates, Scott T.; Bruns, Thomas D.; Bengtsson-Palme, Johan; Callaghan, Tony M.; Douglas, Brian; Drenkhan, Tiia; Eberhardt, Ursula; Duenas, Margarita; Grebenc, Tine; Griffith, Gareth W.; Hartmann, Martin; Kirk, Paul M.; Kohout, Petr; Larsson, Ellen; Lindahl, Bjoern D.; Luecking, Robert; Martin, Maria P.; Matheny, P. Brandon; Nguyen, Nhu H.; Niskanen, Tuula; Oja, Jane; Peay, Kabir G.; Peintner, Ursula; Peterson, Marko; Poldmaa, Kadri; Saag, Lauri; Saar, Irja; Schuessler, Arthur; Scott, James A.; Senes, Carolina; Smith, Matthew E.; Suija, Ave; Taylor, D. Lee; Telleria, M. Teresa; Weiss, Michael; Larsson, Karl-Henrik (2013). Towards a unified paradigm for sequence-based identification of fungi. *Molecular Ecology*. 22 (21), 5271-5277. Status = PUBLISHED; Acknowledgment of Federal Support = No; Peer Reviewed = Yes; DOI: 10.1111/mec.12481


Pantey, Madhav; Sharma, Jyotsna; Taylor, Donald. Lee; Yadon, Vern L. (2013). A narrowly endemic photosynthetic orchid is non-specific in its mycorrhizal associations. *Molecular Ecology*. 22 (8), 2341-2354. Status = PUBLISHED; Acknowledgment of Federal Support = Yes ; Peer Reviewed = Yes


**Licenses**

Nothing to report.

**Other Conference Presentations / Papers**


**Other Products**

*Databases.*

The BNZ LTER program maintains a comprehensive collection of metadata and data products that are available to search and download data directly through our local website. Data are also submitted to the LTER Network data and metadata repository. The local BNZ data catalog currently has 463 data packages, 418 of those have been deemed appropriate and meet LTER-NIS standards and have already been inserted into the LTER Network and are available in the LTER Data Co-Op.

*Physical Collections.*

http://www.lter.uaf.edu/bnz_herbarium.cfm

The BNZ-LTER Herbarium was created in 2007 to document plant species specimens that occur at Bonanza Creek Long Term Ecological Research monitoring (BNZ-LTER) sites. Plants are an important part of wildlife forage, landscape water balance, and carbon flux and thus the herbarium is a valuable tool for those interested in plant-animal interactions, ecosystem processes, and hydrologic processes; not just those interested in plant ecology. There are approximately 220 vascular plant specimens, comprised of 38 plant families and 98 genera, currently accessioned in the BNZ-LTER herbarium. There are also non-vascular plant specimens - including mosses, lichens and liverworts - that have been recently added. The herbarium serves as an educational resource to scientists, staff, and students new to the boreal forest as well as an aid for the identification of plant species collected in long term monitoring plots or in research that occurs at the BNZ-LTER. It is available to visiting scientists and current undergraduate and graduate students who are associated with BNZ-LTER or the University of Alaska, Fairbanks.

**Other Publications**


**Patents**

Nothing to report.
Technologies or Techniques
Nothing to report.

Thesis/Dissertations


Websites

http://www.lter.uaf.edu/

Our website provides a comprehensive and organized portal from which to access information and resources concerning the Bonanza Creek LTER and the LTER Network. The website delivers detailed information about our research program, study design, monitoring program, environmental information, educational resources, outreach activities and details concerning our data collections and products (data, documentation, imagery, maps, and visualization tools). The website includes modules developed to search and access information about personnel (investigators, affiliated scientists, research associates, students, technicians and staff), publications and reference materials, the data and data products we collect. Data are provided through two linked data catalogs: first through our traditional data catalog of data packages complete with enriched metadata and secondly through a graphical portal linked directly with our streaming environmental sensor network. The website additionally provides links to other LTER Sites, LTER Network resources and the National Science Foundation, host institutions, affiliate organizations and funding institutions, and other relevant research organizations and data resources. The website also operates as a venue to assist with communications; supporting the outreach and education mission, integrating messages with other social media, and by highlighting activities and accomplishments.

Data Catalog

http://www.lter.uaf.edu/data_b.cfm

The BNZ LTER program maintains a comprehensive collection of metadata and data products that are available to search and download data directly through our local website. Data are also submitted to the LTER Network data and metadata repository. The local BNZ data catalog currently has 463 data packages, 418 of those have been deemed appropriate and meet LTER-NIS standards and have already been inserted into the LTER Network and are available in the LTER Data Co-Op.

Symposium Resources

http://www.lter.uaf.edu/sympo_2013.cfm

The BNZ LTER program organizes an annual research symposium to gather all our various project participants together to facilitate and further discussions and project development. Each year the presentations and documents associated with the meeting are assembled and provided through our website for future reference.

Herbarium

http://www.lter.uaf.edu/bnz_herbarium.cfm

The BNZ-LTER Herbarium was created in 2007 to document plant species specimens that occur at Bonanza Creek Long Term Ecological Research monitoring (BNZ-LTER) sites. Plants are an important part of wildlife forage, landscape water balance, and carbon flux and thus the herbarium is a valuable tool for those interested in plant-animal interactions, ecosystem processes, and hydrologic processes; not just those interested in plant ecology. There are approximately 220 vascular plant specimens, comprised of 38 plant families and 98 genera, currently accessioned in the BNZ-LTER herbarium. There are also non-vascular plant specimens - including mosses, lichens and liverworts - that have been recently added. The herbarium serves as an educational resource to scientists, staff, and students new to the boreal forest as well as an aid for the identification of plant species collected in long term monitoring plots or in research that occurs at the BNZ-LTER. It is available to visiting scientists and current undergraduate and graduate students who are associated with BNZ-LTER or the University of Alaska, Fairbanks.
The BNZ LTER program administers a comprehensive database with modules to manage metadata, data products, personnel information, research site location information, publications, images and other resources. This database functions to provide content for our website and is integral to our production of metadata products.

BNZ LTER website
http://www.lter.uaf.edu/

### Participants/Organizations

#### Research Experience for Undergraduates (REU) funding

Form of REU funding support: REU supplement

- How many REU applications were received during this reporting period? 9
- How many REU applicants were selected and agreed to participate during this reporting period? 2

REU Comments:

### What individuals have worked on the project?

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## Full details of individuals who have worked on the project:

<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Most Senior Project Role</th>
<th>Nearest Person Month Worked</th>
<th>Contribution to the Project</th>
<th>Funding Support</th>
<th>International Collaboration</th>
<th>International Travel</th>
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<tr>
<td>Roger W Ruess</td>
<td><a href="mailto:rwruess@alaska.edu">rwruess@alaska.edu</a></td>
<td>PD/PI</td>
<td>1</td>
<td>BNZ LTER PI and lead of research on floodplain disturbance and succession. Involved in Data Contribution.</td>
<td>USDA</td>
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<tr>
<td>Teresa N Hollingsworth</td>
<td><a href="mailto:tnhollingsworth@alaska.edu">tnhollingsworth@alaska.edu</a></td>
<td>Co PD/PI</td>
<td>9</td>
<td>Leads LTER research on plant community dynamics; liaison with Forest Service; currently Co-PI; formerly senior investigator. Involved in data contribution and data management.</td>
<td>USDA Forest Service, PNW Research Station</td>
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<tr>
<td>Jeremy B Jones</td>
<td><a href="mailto:Jay.Jones@alaska.edu">Jay.Jones@alaska.edu</a></td>
<td>Co PD/PI</td>
<td>2</td>
<td>Leads work focusing on permafrost thaw and watershed hydrology and nutrient fluxes. Involved in data contribution and data management.</td>
<td>NSF/LTER</td>
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<td>Michelle C Mack</td>
<td><a href="mailto:mcmack@ufl.edu">mcmack@ufl.edu</a></td>
<td>Co PD/PI</td>
<td>1</td>
<td>Heads research on post-fire biogeochemistry. Involved in data contribution and data management.</td>
<td>-</td>
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</tbody>
</table>
A. David McGuire
Email: admcguire@alaska.edu
Most Senior Project Role: Co PD/PI
Nearest Person Month Worked: 6

Contribution to the Project: Leads synthesis modeling efforts focused on large-scale ecosystem dynamics and climate feedback pathways; supervisor of the BNZ data manager. Involved in data contribution and data management.

Funding Support: USGS

International Collaboration: Yes, Canada, Denmark, United Kingdom
International Travel: No

Todd Brinkman
Email: tjbrinkman@alaska.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Integrating local / traditional knowledge with best available science to model SES dynamics; PhD graduate. Involved in data contribution.

Funding Support: LTER

International Collaboration: No
International Travel: No

F. Stuart Chapin
Email: terry.chapin@alaska.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Former BNZ LTER PI and lead of the task on ecosystem services; currently affiliate LTER investigator

Funding Support: -

International Collaboration: No
International Travel: No

Eugenie Euskirchen
Email: seeuskirchen@alaska.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 5

Contribution to the Project: Co-lead on the regional ecosystem dynamics and climate feedbacks section of this LTER grant. Involved in data contribution and data management.

Funding Support: USGS, NFS, USFWS
Jennifer Harden  
**Email:** jharden@usgs.gov  
**Most Senior Project Role:** Co-Investigator  
**Nearest Person Month Worked:** 6  

**Contribution to the Project:** Leads LTER research in wetland carbon cycling and biogeochemistry. Involved in data contribution and data management.  

**Funding Support:** USGS, NSF Biocomplexity  

**International Collaboration:** Yes, Germany, Sweden, Switzerland  
**International Travel:** Yes, Germany - 0 years, 1 months, 0 days

Tamara Harms  
**Email:** tamara.harms@alaska.edu  
**Most Senior Project Role:** Co-Investigator  
**Nearest Person Month Worked:** 1  

**Contribution to the Project:** Conducted study examining factors controlling nitrogen loss from soils  

**Funding Support:** -  

**International Collaboration:** No  
**International Travel:** No

Jill Johnstone  
**Email:** jill.johnstone@usask.ca  
**Most Senior Project Role:** Co-Investigator  
**Nearest Person Month Worked:** 2  

**Contribution to the Project:** Leads research on post-fire successional trajectories and vegetation sensitivity to climate change; formerly LTER PHD student studying plant ecology. Involved in data contribution and data management.  

**Funding Support:** NSERC (Canada), SERDP (U.S. DoD/DoE)  

**International Collaboration:** Yes, Canada  
**International Travel:** Yes, Canada - 0 years, 11 months, 0 days

Miriam Jones  
**Email:** miriamjones@usgs.gov  
**Most Senior Project Role:** Co-Investigator  
**Nearest Person Month Worked:** 4  

**Contribution to the Project:** Field-based studies of paleoenvironments of peat. Involved in Data Contribution.  

**Funding Support:** USGS  

**International Collaboration:** No  
**International Travel:** No
Torre Jorgenson
Email: ecoscience@alaska.net
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 4

Contribution to the Project: Interpretations and field investigations of permafrost. Involved in data contribution and data management.

Funding Support: NSF Biocomplexity

International Collaboration: Yes, Russian Federation
International Travel: Yes, Russian Federation - 0 years, 1 months, 0 days; - 0 years, 0 months, 0 days; - 0 years, 0 months, 0 days

Glenn Juday
Email: gpjuday@alaska.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 8

Contribution to the Project: Leads LTER dendroecological research, focusing on climatic and insect controls over tree growth. Involved in data contribution and data management.

Funding Support: Alaska Department of Natural Resources and USDA

International Collaboration: Yes, France, United Kingdom
International Travel: Yes, United Kingdom - 0 years, 0 months, 14 days

Eric Kasischke
Email: ekasisch@umd.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 2

Contribution to the Project: Conducts research on changing boreal forest fire regimes. Involved in data contribution and data management.

Funding Support: NASA

International Collaboration: No
International Travel: No

Knut Kielland
Email: kkielland@alaska.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 6

Contribution to the Project: Leads LTER research on mammals and mammalian herbivory, and conducts research on the role of organic nitrogen in the boreal N cycle. Involved in data contribution and data management.

Funding Support: NSF

International Collaboration: No
Gary Kofinas
Email: gpkofinas@alaska.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Leads LTER research on human dimensions of subsistence. Involved in data contribution and data management.

Funding Support: -

International Collaboration: No
International Travel: No

Mary Beth Leigh
Email: mbleigh@alaska.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 12

Contribution to the Project: Leads the integration of LTER science with arts and humanities and public outreach; researches soil microbiology. Involved in data contribution and data management.

Funding Support: -

International Collaboration: Yes, Czech Republic, Thailand
International Travel: Yes, Thailand - 0 years, 3 months, 0 days

Andrea Lloyd
Email: lloyd@middlebury.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 0

Contribution to the Project: Leads paleoecological research. Involved in Data Contribution.

Funding Support: -

International Collaboration: No
International Travel: No

Jack McFarland
Email: jmcfarland@usgs.gov
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 12

Contribution to the Project: Experimental observations of gas flux and biogeochemistry; microbial processing of carbon; maintained and improved flux autochamber systems. Involved in Data Management

Funding Support: USGS Climate R&D and USGS Climate Science Center

International Collaboration: Yes, Canada, Finland
International Travel: No
Christa Mulder
Email: cpmulder@alaska.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 4

Contribution to the Project: Leads LTER research on plant-animal interactions, including environmental controls and ecological consequences
Funding Support: Mulder USDA grant
International Collaboration: No
International Travel: No

Vladimir Romanovsky
Email: veromanovsky@alaska.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Leads permafrost modeling for LTER. Involved in data contribution and data management.
Funding Support: USGS
International Collaboration: No
International Travel: No

Scott Rupp
Email: tsrupp@alaska.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 2

Contribution to the Project: Leads landscape modeling of the LTER program and coordinates scientific outreach on climate change projections and impacts on boreal forest to agencies and NGOs. Involved in data management.
Funding Support: Department of Defense and USGS
International Collaboration: No
International Travel: No

Edward Schuur
Email: tschuur@ufl.edu
Most Senior Project Role: Co-Investigator
Nearest Person Month Worked: 1

Contribution to the Project: Leads research on interactions between permafrost thaw and altered ecosystem carbon budgets. Contributes to Data Management
Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics. Involved in data contribution and data management.
International Collaboration: No
International Travel: No
Elena Sparrow
Email: ebsparrow@alaska.edu
**Most Senior Project Role:** Co-Investigator
**Nearest Person Month Worked:** 3

**Contribution to the Project:** BNZ Education and Schoolyard LTER Coordinator

**Funding Support:** IARC, AK EPSCOR, Seasons & Biomes

**International Collaboration:** Yes, Philippines, Portugal, Switzerland

**International Travel:** Yes, Portugal - 0 years, 0 months, 7 days; Philippines - 0 years, 0 months, 7 days

Lee Taylor
Email: ltaylor@iab.alaska.edu
**Most Senior Project Role:** Co-Investigator
**Nearest Person Month Worked:** 2

**Contribution to the Project:** Leads LTER research on microbial role in plant community dynamics. Involved in data contribution and data management.

**Funding Support:**

**International Collaboration:** Yes, France, Russian Federation, Sweden, United Kingdom

**International Travel:** No

Merritt Turetsky
Email: mrt@uoguelph.ca
**Most Senior Project Role:** Co-Investigator
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Studies vegetation and carbon cycling in peatlands. Involved in Data Contribution.

**Funding Support:** LTER, NSF

**International Collaboration:** No

**International Travel:** No

David Valentine
Email: dvalentine@alaska.edu
**Most Senior Project Role:** Co-Investigator
**Nearest Person Month Worked:** 1

**Contribution to the Project:** Studies soil carbon and nutrient dynamics, particularly as a function of changing moisture. Involved in Data Contribution.

**Funding Support:** McIntire-Stennis

**International Collaboration:** No

**International Travel:** No

David Verbyla
**Diane Wagner**
**Email:** diane.wagner@alaska.edu  
**Most Senior Project Role:** Co-Investigator  
**Nearest Person Month Worked:** 2  

**Contribution to the Project:** Co-investigator on effects of herbivory on plant performance and ecosystems. Involved in data contribution and data management.

**Funding Support:** -

**International Collaboration:** No  
**International Travel:** No

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**Mark Waldrop**
**Email:** mwaldrop@usgs.gov  
**Most Senior Project Role:** Co-Investigator  
**Nearest Person Month Worked:** 10  

**Contribution to the Project:** Leads LTER research in wetland carbon cycling and biogeochemistry; Experimental observations and interpretations of belowground C processing; microbial community dynamics; C budgets. Involved in data contribution and data management.

**Funding Support:** USGS Climate R&D and USGS Climate Science Center  

**International Collaboration:** Yes, Canada, Finland  
**International Travel:** No

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**John Yarie**
**Email:** jayarie@alaska.edu  
**Most Senior Project Role:** Co-Investigator  
**Nearest Person Month Worked:** 6  

**Contribution to the Project:** Senior investigator studying tree growth dynamics. Involved in data contribution and data management.

**Funding Support:** McIntire-Stennis  

**International Collaboration:** No  
**International Travel:** No

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Heather Alexander
Email: heather.alexander@utb.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 3

Contribution to the Project: Led survey of productivity and structure of intermediate aged stands in boreal forest. Involved in data contribution and data management.

Funding Support: NSF PLR grant

International Collaboration: Yes, Russian Federation
International Travel: Yes, Russian Federation - 0 years, 0 months, 30 days

Amy Breen
Email: albreen@alaska.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 6

Contribution to the Project: Leading ALFRESCO development of tundra vegetation dynamics and wildfire

Funding Support: Department of Defense and USGS

International Collaboration: No
International Travel: No

Claudia Czimczik
Email: czimczik@uci.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Experimental and mathematical modeling of C cycling using soil radiocarbon

Funding Support: Univ. Calif. Irvine; USGS

International Collaboration: Yes, Denmark
International Travel: Yes, Denmark - 0 years, 2 months, 0 days

Patricia Doak
Email: pdoak@alaska.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

Contribution to the Project: Collaborated on research addressing insect outbreaks and plant performance

Funding Support: -

International Collaboration: No
International Travel: No

Stephanie Ewing
Email: stephanie.ewing@montana.edu
Most Senior Project Role: Faculty
Nearest Person Month Worked: 1

**Contribution to the Project:** Experimental observations of gas flux and biogeochemistry. Involved in Data Contribution.

**Funding Support:** USGS; Montana State U

**International Collaboration:** No

**International Travel:** No

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**Thomas III Grant**

**Email:** tagrant@alaska.edu

**Most Senior Project Role:** Faculty

**Contribution to the Project:** Field data collection, Proposal preparation, database design, dendrochronology investigation. Involved in data contribution and data management.

**Funding Support:** BLM

**International Collaboration:** Yes, France

**International Travel:** No

---

**Stuart McDaniels**

**Email:** stuartmcdaniel@ufl.edu

**Most Senior Project Role:** Faculty

**Contribution to the Project:** Led molecular characterization of moss population genetics and diazotroph diversity in black spruce forests

**Funding Support:** State of Florida

**International Collaboration:** No

**International Travel:** No

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**Susan Natali**

**Email:** natali@ufl.edu

**Most Senior Project Role:** Faculty

**Contribution to the Project:** Collaborating scientist studying ecosystem effects of climate change. Former postdoc on this project; now a faculty member at Woods Hole Research Center. Involved in data contribution and data management.

**Funding Support:** NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics

**International Collaboration:** No

**International Travel:** No

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**Yuri Shur**

**Email:** ffys@uaf.edu

**Most Senior Project Role:** Faculty
Paul Stoy  
Email: paul.stoy@gmail.com  
**Most Senior Project Role:** Faculty  
**Nearest Person Month Worked:** 1  
**Contribution to the Project:** Experimental observations and modeling of gas flux and biogeochemistry  
**Funding Support:** Montana State U  
**International Collaboration:** Yes, Sweden  
**International Travel:** Yes, Sweden - 0 years, 1 months, 0 days

Ruth Varner  
Email: rkv@gust.sr.unh.edu  
**Most Senior Project Role:** Faculty  
**Nearest Person Month Worked:** 2  
**Contribution to the Project:** Experimental observations of gas flux and biogeochemistry  
**Funding Support:** USGS; Univ. New Hampshire  
**International Collaboration:** Yes, Sweden  
**International Travel:** Yes, Sweden - 0 years, 1 months, 0 days

Mike Geil  
Email: mike.geil@k12northstar.org  
**Most Senior Project Role:** K-12 Teacher  
**Nearest Person Month Worked:** 1  
**Contribution to the Project:** Schoolyard LTER (SLTER) teacher  
**Funding Support:** Randy Smith Middle School  
**International Collaboration:** No  
**International Travel:** No

Joyanne Hamilton  
Email: jhamilton@iditarodsd.org  
**Most Senior Project Role:** K-12 Teacher  
**Nearest Person Month Worked:** 1  
**Contribution to the Project:** Schoolyard LTER teacher
Marcella Kuntz  
Email: marcella.kuntz@k12northstar.org  
Most Senior Project Role: K-12 Teacher  
Nearest Person Month Worked: 1  
Contribution to the Project: RET participant; also taught her class techniques learned and supervised their research projects  
Funding Support: BNZ LTER

Tom Lane  
Email: tom.lanetw@gmail.com  
Most Senior Project Role: K-12 Teacher  
Nearest Person Month Worked: 1  
Contribution to the Project: Visiting teacher that participated in PolarTREC at the site and helped with field research  
Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics

Timothy Lundt  
Email: Timothy.Lundt@matsuk12.us  
Most Senior Project Role: K-12 Teacher  
Nearest Person Month Worked: 1  
Contribution to the Project: Schoolyard LTER teacher  
Funding Support: Mat-Su Career & Tech High School

Christine Villano  
Email: christine.villano@k12northstar.org  
Most Senior Project Role: K-12 Teacher  
Nearest Person Month Worked: 1  
Contribution to the Project: SLTER teacher and teacher trainer on invasive species curriculum  
Funding Support: Denali Elementary School
Cheryl Williams
Email: cheryl.williams@matsuk12.us
Most Senior Project Role: K-12 Teacher
Nearest Person Month Worked: 1

Contribution to the Project: Schoolyard LTER teacher

Funding Support: Palmer High School

Steve Blazewicz
Email: sjblazewicz@usgs.gov
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 10

Contribution to the Project: Lead research on microbial life in ice and below ice; Microbial genetics and dynamics for belowground studies of frozen, thawed soil carbon. Involved in data management.

Funding Support: USGS Climate R&D and USGS Mendenhall Program

Rosvel Bracho
Email: rbracho@ufl.edu
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 12

Contribution to the Project: Assisted with the field component of this project in particular with maintenance and processing of the eddy covariance data. Research supported in part by this grant. Involved in data contribution and data management.

Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics

Gerardo Celis
Email: celis@ufl.edu
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 3

Contribution to the Project: Postdoctoral research assisting with data processing and data posting. Involved in data contribution and data management.

Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring,
<table>
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<tr>
<th>Name</th>
<th>Email</th>
<th>Most Senior Project Role</th>
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<th>Funding Support</th>
<th>International Collaboration</th>
<th>International Travel</th>
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<tbody>
<tr>
<td>Kirsten Coe</td>
<td><a href="mailto:kkcoe@ufl.edu">kkcoe@ufl.edu</a></td>
<td>Postdoctoral (scholar, fellow or other postdoctoral position)</td>
<td>5</td>
<td>Post-doc studying ecosystem effects of climate change (UFL). Involved in data contribution and data management.</td>
<td>NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Helene Genet</td>
<td><a href="mailto:hgenet@alaska.edu">hgenet@alaska.edu</a></td>
<td>Postdoctoral (scholar, fellow or other postdoctoral position)</td>
<td>12</td>
<td>Modeling research on forest vegetation dynamics in interior Alaska. Involved in Data Contribution.</td>
<td>Department of Defense</td>
<td>Yes, United States</td>
<td>No</td>
</tr>
<tr>
<td>Jenni Hultman</td>
<td><a href="mailto:jenni.hultman@gmail.com">jenni.hultman@gmail.com</a></td>
<td>Postdoctoral (scholar, fellow or other postdoctoral position)</td>
<td>3</td>
<td>Writing up omics data for publication. Involved in Data Management</td>
<td>Department of Energy BER Terrestrial Ecosystem Science (TES)</td>
<td>Yes, Canada, Finland</td>
<td>Yes, Canada - 0 years, 12 months, 0 days</td>
</tr>
<tr>
<td>Kimberley Maher</td>
<td><a href="mailto:kcmaher@alaska.edu">kcmaher@alaska.edu</a></td>
<td>Postdoctoral (scholar, fellow or other postdoctoral position)</td>
<td>5</td>
<td>Dendrochronology measurement and analysis. Involved in data contribution and data management.</td>
<td></td>
<td>Yes, Canada - 0 years, 12 months, 0 days</td>
<td>Yes, Canada - 0 years, 12 months, 0 days</td>
</tr>
</tbody>
</table>
Marguerite Mauritz
Email: mauritzmarguerite@gmail.com
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 4
Contribution to the Project: Post-doc studying ecosystem effects of climate change (UFL). Involved in data contribution and data management.
Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics
International Collaboration: No
International Travel: No

April Melvin
Email: April.Melvin@ufl.edu
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 12
Contribution to the Project: Led experimental study of controls over productivity and decomposition in intermediate-aged stands; led study of fuel management effects on soil processes. Involved in data contribution and data management.
Funding Support: Department of Defense SERDP
International Collaboration: No
International Travel: No

Christina Schaedel
Email: cschaedel@ufl.edu
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 1
Contribution to the Project: Postdoctoral researcher assisting with data processing and data posting. Contributes to Data Management
Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics. Involved in data contribution and data management.
International Collaboration: No
International Travel: No

Carlos Sierra
Email: csierra@bgc-jena.mpg.de
Most Senior Project Role: Postdoctoral (scholar, fellow or other postdoctoral position)
Nearest Person Month Worked: 1
### Contribution to the Project:
- Experimental and mathematical modeling of C cycling using soil radiocarbon

**Funding Support:** USGS; Max Planck Inst.

**International Collaboration:** Yes, Germany

**International Travel:** Yes, Germany - 0 years, 10 months, 0 days

### Yujin Zhang
- **Email:** yzhang27@alaska.edu
- **Most Senior Project Role:** Postdoctoral (scholar, fellow or other postdoctoral position)
- **Nearest Person Month Worked:** 12

**Contribution to the Project:** Modeling research on ecosystem transitions in response to thermokarst disturbance

**Funding Support:** USGS

**International Collaboration:** No

**International Travel:** No

### Barbara Adams
- **Email:** badams.ak@gmail.com
- **Most Senior Project Role:** Other Professional
- **Nearest Person Month Worked:** 0

**Contribution to the Project:** Assisting in social data analysis. Involved in Data Management.

**Funding Support:** -

**International Collaboration:** No

**International Travel:** No

### Kirsten Barrett
- **Email:** kbarrett@usgs.gov
- **Most Senior Project Role:** Other Professional
- **Nearest Person Month Worked:** 8

**Contribution to the Project:** Remote sensing research on fire severity and vegetation dynamics in interior Alaska. Involved in Data Contribution.

**Funding Support:** USGS

**International Collaboration:** No

**International Travel:** No

### Alec Bennett
- **Email:** apbennett@alaska.edu
- **Most Senior Project Role:** Other Professional
- **Nearest Person Month Worked:** 12

**Contribution to the Project:** Lead programmer for the ALFRESCO model. Involved in data management.
Donna DiFolco
Email: Donna_DiFolco@nps.gov
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 2

Contribution to the Project: Collaborator on Task C4 (vertebrate herbivore abundance) from NPS, Gates of the Arctic National Park. Involved in Data Contribution.

Funding Support: National Park Service
International Collaboration: No
International Travel: No

Zhaosheng Fan
Email: zfan2@alaska.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Modeling research on biogeochemical cycling of peatland ecosystems in interior Alaska

Funding Support: Department of Energy
International Collaboration: No
International Travel: No

Chris Fastie
Email: cfastie@middlebury.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 2

Contribution to the Project: Leads field research. Involved in Data Contribution

Funding Support: -
International Collaboration: No
International Travel: No

Martha Kopplin
Email: mrkopplin@gmail.com
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Helped coordinate Schoolyard LTER activities

Funding Support: Seasons and Biomes Project
International Collaboration: Yes, Switzerland
Lina Koyama
Email: linak@bre.soc.i.kyoto-u.ac.jp
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 1

Contribution to the Project: Collaborator on Task C4 (vertebrate herbivore abundance) from Kyoto University. Involved in Data Contribution.

Funding Support: JAXA

International Collaboration: No
International Travel: No

Tom Kurkowski
Email: takurkowski@alaska.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 6

Contribution to the Project: Leads model data development and management. Involved in data contribution and data management.

Funding Support: USGS

International Collaboration: No
International Travel: No

Michael Lindgren
Email: malindgren@alaska.edu
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 6

Contribution to the Project: Contributes to model data development and model data output management and analysis. Involved in data management.

Funding Support: USGS

International Collaboration: No
International Travel: No

Kristen Manies
Email: kmanies@usgs.gov
Most Senior Project Role: Other Professional
Nearest Person Month Worked: 6

Contribution to the Project: Sample and data collection; data synthesis and management. Involved in data contribution and data management.

Funding Support: USGS

International Collaboration: No
<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Most Senior Project Role</th>
<th>Nearest Person Month Worked</th>
<th>Contribution to the Project</th>
<th>Funding Support</th>
<th>International Collaboration</th>
<th>International Travel</th>
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</thead>
<tbody>
<tr>
<td>Sergei Marchenko</td>
<td><a href="mailto:ssmarchenko@alaska.edu">ssmarchenko@alaska.edu</a></td>
<td>Other Professional</td>
<td>1</td>
<td>Collaborator from Geophysical Institute (UAF). Involved in data contribution and data management.</td>
<td>NSF, USGS</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Inga-Lill Persson</td>
<td><a href="mailto:Inga-Lill.Persson@slu.se">Inga-Lill.Persson@slu.se</a></td>
<td>Other Professional</td>
<td>1</td>
<td>Collaborator on Task C4 from Swedish University of Agricultural Sciences. Involved in Data Contribution.</td>
<td>VINNOVA</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Pam Randles</td>
<td><a href="mailto:pamrandles@me.com">pamrandles@me.com</a></td>
<td>Other Professional</td>
<td>1</td>
<td>Schoolyard LTER teacher trainer</td>
<td>Takshanuk Watershed Council</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Kim Wickland</td>
<td><a href="mailto:kpwick@usgs.gov">kpwick@usgs.gov</a></td>
<td>Other Professional</td>
<td>1</td>
<td>Experimental observations of gas flux, hydrology, and biogeochemistry</td>
<td>USGS</td>
<td>Yes, United States</td>
<td>No</td>
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<td>Name</td>
<td>Email</td>
<td>Most Senior Project Role</td>
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<tr>
<td>Jenna Baker</td>
<td><a href="mailto:jtuxbaker@gmail.com">jtuxbaker@gmail.com</a></td>
<td>Technician</td>
<td>9</td>
<td>Aided in field data collection for extensive site network.</td>
<td>-</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>William Cable</td>
<td><a href="mailto:bill.cable@alaska.edu">bill.cable@alaska.edu</a></td>
<td>Technician</td>
<td>4</td>
<td>Maintains manipulations and data logging equipment in the Alaska Peatland Experiment. Involved in data contribution and data management.</td>
<td>-</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Tobey Carman</td>
<td><a href="mailto:tcarman2@alaska.edu">tcarman2@alaska.edu</a></td>
<td>Technician</td>
<td>3</td>
<td>computer programming for modeling studies</td>
<td>USGS</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Brian Charlton</td>
<td><a href="mailto:bacharlton@alaska.edu">bacharlton@alaska.edu</a></td>
<td>Technician</td>
<td>4</td>
<td>BNZ LTER Research Technician. Involved in Data Contribution.</td>
<td>-</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Grace Crummer</td>
<td><a href="mailto:gracec@ufl.edu">gracec@ufl.edu</a></td>
<td></td>
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<tr>
<td>Name</td>
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<td>Contribution to the Project</td>
<td>Funding Support</td>
<td>International Collaboration</td>
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<tr>
<td>Sarah DeWitt</td>
<td><a href="mailto:sarahenz99@yahoo.com">sarahenz99@yahoo.com</a></td>
<td>Technician</td>
<td>3</td>
<td>Aided in field data collection for extensive site network.</td>
<td>-</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Jason Downing</td>
<td><a href="mailto:jpdowning@alaska.edu">jpdowning@alaska.edu</a></td>
<td>Technician</td>
<td>12</td>
<td>BNZ LTER Data Manager. Involved in Data Management.</td>
<td>-</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Colin Edgar</td>
<td><a href="mailto:cedgar3@alaska.edu">cedgar3@alaska.edu</a></td>
<td>Technician</td>
<td>4</td>
<td>eddy covariance technical support. Involved in data contribution and data management.</td>
<td>USGS</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Shalane M Frost</td>
<td><a href="mailto:scarlson3@alaska.edu">scarlson3@alaska.edu</a></td>
<td>Technician</td>
<td>12</td>
<td></td>
<td></td>
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</tbody>
</table>
Contribution to the Project: Coordination of field work.

Funding Support: -
International Collaboration: No
International Travel: No

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Jamison Gryzb
Email: jamisongrzyb@hotmail.com
Most Senior Project Role: Technician
Nearest Person Month Worked: 2

Contribution to the Project: Aided in field data collection for extensive site network.

Funding Support: -
International Collaboration: No
International Travel: No

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Monica Haw
Email: mhaw@usgs.gov
Most Senior Project Role: Technician
Nearest Person Month Worked: 6

Contribution to the Project: Processed soil, water, and microbial samples. Involved in Data Management.

Funding Support: USGS Climate R&D and USGS Climate Science Center
International Collaboration: No
International Travel: No

---

Ian Herriott
Email: icherriott@alaska.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with art exhibit promotions and logistics

Funding Support: -
International Collaboration: No
International Travel: No

---

Jamie Hollingsworth
Email: jhollingsworth@alaska.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 12

Contribution to the Project: BNZ LTER Site Manager. Involved in Data Contribution.

Funding Support: -
Kristen Hruska
Email: kmhruska@alaska.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 1

Contribution to the Project: Assisted with art exhibit promotions and logistics

Funding Support: -

Patricia Hurtt
Email: p.a.hurtl@gmail.com
Most Senior Project Role: Technician
Nearest Person Month Worked: 4

Contribution to the Project: field and lab technician

Funding Support: Mulder USDA grant and BNZ LTER grant

Celia Jackson
Email: celiaj87@gmail.com
Most Senior Project Role: Technician
Nearest Person Month Worked: 5

Contribution to the Project: Aided in core data collection and entry.

Funding Support: -

Ryan Jess
Email: rdjess@alaska.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 12

Contribution to the Project: Field data collection, Tree Ring Lab Manager, database design and entry. Involved in data contribution and data management.

Funding Support: Alaska Department of Natural Resources and BLM
Erin Kinney
Email: erin.kinney10@gmail.com
Most Senior Project Role: Technician
Nearest Person Month Worked: 3

Contribution to the Project: Aided in field data collection for extensive site network.

Funding Support: -

International Collaboration: No
International Travel: No

Justin Ledman
Email: justin.ledman@gmail.com
Most Senior Project Role: Technician
Nearest Person Month Worked: 9

Contribution to the Project: Aided in field data collection for extensive site network. Responsible for assisting with field data collection and infrastructure

Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics

International Collaboration: No
International Travel: No

Camilo Majoica
Email: camilomoj14@ufl.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 12

Contribution to the Project: Assisted with fieldwork and labwork (Mack)

Funding Support: Department of Defense SERDP

International Collaboration: No
International Travel: No

Lorien Nettleton
Email: lmnettleton@alaska.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 4

Contribution to the Project: Aided in field data collection for extensive site network.

Funding Support: -

International Collaboration: No
International Travel: No

Jonathon Newman
<table>
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<tr>
<th>Name</th>
<th>Email</th>
<th>Most Senior Project Role</th>
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<th>Funding Support</th>
<th>International Collaboration</th>
<th>International Travel</th>
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<tbody>
<tr>
<td>jnewman11</td>
<td><a href="mailto:jnewman11@alaska.edu">jnewman11@alaska.edu</a></td>
<td>Technician</td>
<td>3</td>
<td>Aided in field data collection for extensive site network.</td>
<td>-</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Lola Oliver</td>
<td><a href="mailto:lkoliver@alaska.edu">lkoliver@alaska.edu</a></td>
<td>Technician</td>
<td>5</td>
<td>Laboratory Technician for LTER and McIntire-Stennis projects. Involved in data contribution and data management.</td>
<td>McIntire-Stennis</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Karl Olson</td>
<td><a href="mailto:kdolson@alaska.edu">kdolson@alaska.edu</a></td>
<td>Technician</td>
<td>9</td>
<td>BNZ LTER Research Technician; Research technician (mammal populations, herbivory, and biogeochemistry). Involved in data contribution and data management.</td>
<td>NSF</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Leah Pyne</td>
<td><a href="mailto:leah.pyne3@gmail.com">leah.pyne3@gmail.com</a></td>
<td>Technician</td>
<td>3</td>
<td>Temporary technician aiding in core data collection and entry.</td>
<td>-</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Richard Ranft</td>
<td><a href="mailto:rdranft@alaska.edu">rdranft@alaska.edu</a></td>
<td>Technician</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
<td>No</td>
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Most Senior Project Role: Technician
Nearest Person Month Worked: 11

Contribution to the Project: Laboratory Technician for LTER and McIntire-Stennis projects. Involved in data contribution and data management.

Funding Support: McIntire-Stennis

International Collaboration: No
International Travel: No

Matt Robertson
Email: mrober57@alaska.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 11

Contribution to the Project: Field Technician for LTER and McIntire-Stennis projects. Involved in data contribution and data management.

Funding Support: McIntire-Stennis

International Collaboration: No
International Travel: No

Raphael Rodriguez
Email: ralph6453@gmail.com
Most Senior Project Role: Technician
Nearest Person Month Worked: 3

Contribution to the Project: Aided in field data collection for extensive site network.

Funding Support: -

International Collaboration: No
International Travel: No

Erin Shew
Email: eshew@alaska.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 4

Contribution to the Project: Aided in field data collection for extensive site network.

Funding Support: -

International Collaboration: No
International Travel: No

David Spencer
Email: dlspencer@alaska.edu
Most Senior Project Role: Technician
Nearest Person Month Worked: 5
<table>
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<tr>
<th>Contribution to the Project</th>
<th>Funding Support</th>
<th>International Collaboration</th>
<th>International Travel</th>
<th>Nearest Person Month Worked</th>
<th>Most Senior Project Role</th>
<th>Email</th>
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<tr>
<td>Field data collection, Tree Ring Lab Manager, database design and entry. Involved in data contribution and data management.</td>
<td>Alaska Department of Natural Resources and BLM</td>
<td>No</td>
<td>No</td>
<td>3</td>
<td>Staff Scientist (doctoral level)</td>
<td><a href="mailto:JRJansson@lbl.gov">JRJansson@lbl.gov</a></td>
</tr>
<tr>
<td>Writing up omics data for publication. Involved in Data Management.</td>
<td>Department of Energy BER Terrestrial Ecosystem Science (TES)</td>
<td>Yes, Canada, Denmark, Finland</td>
<td>Yes, Denmark - 0 years, 1 months, 0 days</td>
<td>3</td>
<td>Staff Scientist (doctoral level)</td>
<td><a href="mailto:resikind@ufl.edu">resikind@ufl.edu</a></td>
</tr>
<tr>
<td>Directed lab work (Mack). Involved in data contribution and data management.</td>
<td>Department of Defense SERDP</td>
<td>No</td>
<td>No</td>
<td>3</td>
<td>Staff Scientist (doctoral level)</td>
<td><a href="mailto:aallaby@gmail.com">aallaby@gmail.com</a></td>
</tr>
<tr>
<td>Field study of tree regeneration in experiment in BNZ. Involved in Data Contribution.</td>
<td>Alaska Department of Natural Resources</td>
<td>No</td>
<td>No</td>
<td>12</td>
<td>Graduate Student (research assistant)</td>
<td><a href="mailto:bpallman@alaska.edu">bpallman@alaska.edu</a></td>
</tr>
<tr>
<td>Participated in research on consequences of vertebrate and invertebrate herbivory for willow community. Involved in Data Contribution.</td>
<td></td>
<td></td>
<td></td>
<td>6</td>
<td>Graduate Student (research assistant)</td>
<td></td>
</tr>
</tbody>
</table>
Garrett Altmann
Email: galtmann@alaska.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 3

Contribution to the Project: Remote sensing of lake surface water changes associated DOE Los with Alamos wildfire. Involved in data contribution.

Funding Support: -
International Collaboration: No
International Travel: No

Christina Baker
Email: christina.l.baker@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Conducted dissertation research examining consumer effects on streams. Involved in Data Contribution.

Funding Support: NSF
International Collaboration: No
International Travel: No

Fay Belshe
Email: fayray@ufl.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 4

Contribution to the Project: Finishing student who is taking the lead on eddy covariance measurements in the field and on spatial analysis of thermokarst using remote sensing. Involved in data contribution and data management.

Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics
International Collaboration: No
International Travel: No

Casey Brown
Email: clbrown12@alaska.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 12

Contribution to the Project: PhD student studying moose movement and browse availability across burn sites in interior Alaska. Involved in Data Contribution.
**Robert Burgess**  
**Email:** raburgess@alaska.edu  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 3  
**Contribution to the Project:** MS student, soil microbiology. Involved in Data Contribution.  
**Funding Support:** Alaska Department of Environmental Conservation  
**International Collaboration:** No  
**International Travel:** No

**Cameron Carroll**  
**Email:** ccarroll21@hotmail.com  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 6  
**Contribution to the Project:** MS student, fire effects on moose browsing. Involved in Data Contribution.  
**Funding Support:** Alaska Department of Fish & Game  
**International Collaboration:** No  
**International Travel:** No

**Amber Churchill**  
**Email:** acchurchill@alaska.edu  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 1  
**Contribution to the Project:** M.S. research on primary production in boreal peatlands. Involved in Data Contribution.  
**Funding Support:** -  
**International Collaboration:** No  
**International Travel:** No

**Alexandra Conway**  
**Email:** alix.conway@usask.ca  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 12  
**Contribution to the Project:** Ph.D. student working on herbivore impacts on successional pathways after fire. Involved in Data Contribution.  
**Funding Support:** NSERC (Canada), NSTP (Canada)  
**International Collaboration:** Yes, Canada
<table>
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<tr>
<th>Name</th>
<th>Email</th>
<th>Position</th>
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<th>Contribution to the Project</th>
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<th>International Collaboration</th>
<th>International Travel</th>
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<tbody>
<tr>
<td>Chris Dorich</td>
<td><a href="mailto:cd@gust.sr.unh.edu">cd@gust.sr.unh.edu</a></td>
<td>Graduate Student (research assistant)</td>
<td>1</td>
<td>Experimental observations of gas flux and biogeochemistry. Involved in Data Contribution.</td>
<td>USGS</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Dashiell Feierabend</td>
<td><a href="mailto:dfeierab@alaska.edu">dfeierab@alaska.edu</a></td>
<td>Graduate Student (research assistant)</td>
<td>12</td>
<td>MS student, predator-prey interactions of lynx and snowshoe hares. Involved in data contribution and data management.</td>
<td>University of Alaska Fairbanks</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Rebecca Finger</td>
<td><a href="mailto:rfinger@alaska.edu">rfinger@alaska.edu</a></td>
<td>Graduate Student (research assistant)</td>
<td>12</td>
<td>Field studies of N cycling related to permafrost thaw</td>
<td>NSF</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Dana Fjare</td>
<td><a href="mailto:dfjare@alaska.edu">dfjare@alaska.edu</a></td>
<td>Graduate Student (research assistant)</td>
<td>4</td>
<td>Conducted thesis research examining stream nutrient spiraling. Involved in data contribution and data management.</td>
<td>NSF/LTER</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Dan Glass  
Email: djglass@alaska.edu  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 1  

**Contribution to the Project:** Analyzed novel fungal lineages recovered from Bonanza Creek soils. Involved in Data Contribution.  
**Funding Support:** -  
**International Collaboration:** No  
**International Travel:** No

---

Yujie He  
Email: he72@purdue.edu  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 1  

**Contribution to the Project:** Computer modeling and field support regarding microbial degradation of carbon  
**Funding Support:** NSF Biocomplexity  
**International Collaboration:** No  
**International Travel:** No

---

Rebecca Hewitt  
Email: rehewitt@alaska.edu  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 9  

**Contribution to the Project:** PhD student, the role of mycorrhizae in post-fire plant succession. Involved in Data Contribution.  
**Funding Support:** NSF PhD Fellowship, UAF Thesis completion grant  
**International Collaboration:** No  
**International Travel:** No

---

Jack Hutchings  
Email: jahutch2@ufl.edu  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 3  

**Contribution to the Project:** PhD student assisting with data processing and data posting. Involved in data contribution and data management.  
**Funding Support:** NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics  
**International Collaboration:** No  
**International Travel:** No
Elchin Jafarov  
**Email:** eejafarov@alaska.edu  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 4  
**Contribution to the Project:** Collaborator from Geophysical Institute (UAF). Involved in Data Contribution.  
**Funding Support:** USGS  
**International Collaboration:** No  
**International Travel:** No

Mélanie Jean  
**Email:** melanie.jean@usask.ca  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 12  
**Contribution to the Project:** Ph.D. student working on moss successional dynamics and ecosystem processes. Involved in data contribution and data management.  
**Funding Support:** NSERC (Canada), NSTP (Canada), SERDP (U.S. DoD/DoE)  
**International Collaboration:** Yes, Canada  
**International Travel:** Yes, Canada - 0 years, 10 months, 0 days

Carmel Johnson  
**Email:** carmel.johnston@msu.montana.edu  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 8  
**Contribution to the Project:** Experimental observations of gas flux and biogeochemistry. Involved in data management. Involved in Data contribution and data management.  
**Funding Support:** USGS; Montana State University  
**International Collaboration:** No  
**International Travel:** No

Chas Jones  
**Email:** cejonesjr@alaska.edu  
**Most Senior Project Role:** Graduate Student (research assistant)  
**Nearest Person Month Worked:** 12  
**Contribution to the Project:** Ph.D. student, hydrology and ice physics. Involved in data contribution and data management.  
**Funding Support:** EPSCoR, NIWR, NSF  
**International Collaboration:** No  
**International Travel:** No
<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Most Senior Project Role</th>
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<th>Contribution to the Project</th>
<th>Funding Support</th>
<th>International Collaboration</th>
<th>International Travel</th>
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</thead>
<tbody>
<tr>
<td>Erin Julianus</td>
<td><a href="mailto:eljulianus@alaska.edu">eljulianus@alaska.edu</a></td>
<td>Graduate Student (research assistant)</td>
<td>6</td>
<td>MS student, linking fire history to moose populations in Kanuti National Wildlife Refuge</td>
<td>University of Alaska Fairbanks Teaching Assistantship, Kanuti National Wildlife Refuge</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Mary-Cathrine Leewis</td>
<td><a href="mailto:mcleewis@alaska.edu">mcleewis@alaska.edu</a></td>
<td>Graduate Student (research assistant)</td>
<td>12</td>
<td>PhD student, soil microbiology. Involved in Data Management</td>
<td>University of Alaska Fairbanks Grad School thesis completion fellowship. Involved in data contribution and data management.</td>
<td>Yes, Czech Republic</td>
<td>No</td>
</tr>
<tr>
<td>Simon McClung</td>
<td><a href="mailto:simon.mcclung@ufl.edu">simon.mcclung@ufl.edu</a></td>
<td>Graduate Student (research assistant)</td>
<td>3</td>
<td>Led study of lodgepole pine effects on ecosystem processes. Involved in Data Contribution.</td>
<td>Department of Defense SERDP</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Nicole McConnell</td>
<td><a href="mailto:namcconnell@alaska.edu">namcconnell@alaska.edu</a></td>
<td>Graduate Student (research assistant)</td>
<td>1</td>
<td>M.S. research on ecosystem respiration in boreal peatlands. Involved in Data Contribution.</td>
<td>-</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Miho Morimoto</td>
<td><a href="mailto:mmorimoto@alaska.edu">mmorimoto@alaska.edu</a></td>
<td>Graduate Student (research assistant)</td>
<td></td>
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Nearest Person Month Worked: 12

**Contribution to the Project:** Field study of state forest harvest and tree regeneration. Involved in data contribution and data management.

**Funding Support:** Alaska Department of Natural Resources

**International Collaboration:** Yes, Japan

**International Travel:** Yes, Japan - 0 years, 2 months, 0 days

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Fleur Nicklen
Email: efleur.nicklen@gmail.com
**Most Senior Project Role:** Graduate Student (research assistant)
**Nearest Person Month Worked:** 6

**Contribution to the Project:** PhD graduate student studying climate sensitivity of white and black spruce within and among interior Alaskan ecoregions

**Funding Support:** National Park Service

**International Collaboration:** No

**International Travel:** No

---

Dana Nossov
Email: dnossov@gmail.com
**Most Senior Project Role:** Graduate Student (research assistant)
**Nearest Person Month Worked:** 12

**Contribution to the Project:** PhD student studying permafrost; Former LTER lab manager and research technician. Involved in data contribution and data management.

**Funding Support:** USGS

**International Collaboration:** No

**International Travel:** No

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Naomi O'Neal
Email: noneal2@alaska.edu
**Most Senior Project Role:** Graduate Student (research assistant)
**Nearest Person Month Worked:** 2

**Contribution to the Project:** conducting interviews. Involved in data contribution and data management.

**Funding Support:** LTER

**International Collaboration:** No

**International Travel:** No

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Ann Olsson
Email: akolsson@alaska.edu
**Most Senior Project Role:** Graduate Student (research assistant)
**Nearest Person Month Worked:** 4
Contribution to the Project: Conducted dissertation research examining effects of wildfire on watershed nutrient exports, assisted with stream discharge and chemistry monitoring. Involved in data contribution and data management.

Funding Support: NSF/LTER

International Collaboration: No
International Travel: No

Vijay Patil
Email: vppatil@alaska.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 9

Contribution to the Project: PhD student studying vegetation dynamics surrounding areas with lake change in boreal Alaska

Funding Support: USGS

International Collaboration: No
International Travel: No

Randy Peterson
Email: rlpeterson@alaska.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 1

Contribution to the Project: Use of tree monitoring database to design sampling protocol. Involved in Data Management.

Funding Support: Alaska Department of Natural Resources

International Collaboration: No
International Travel: No

Amanda Rinehart
Email: ajrinehart2@alaska.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6

Contribution to the Project: Conducted dissertation research examining effects of permafrost on stream-riparian interactions, assisted with stream discharge and chemistry monitoring. Involved in Data Contribution.

Funding Support: -

International Collaboration: No
International Travel: No

Verity Salmon
Email: vsalmon@ufl.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 12
**Contribution to the Project:** PhD student who is taking the lead on measurements of nitrogen in soil organic matter pools. Supported by an Alumni Fellowship from the University of Florida; research activities supported by this grant. Involved in data contribution and data management.

**Funding Support:** NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics

**International Collaboration:** No
**International Travel:** No

---

**Emily Schwing**
Email: eeschwing@alaska.edu
**Most Senior Project Role:** Graduate Student (research assistant)
**Nearest Person Month Worked:** 2

**Contribution to the Project:** Influence of soil moisture stress on allocation of carbon belowground and partitioning of soil respiration

**Funding Support:** -

**International Collaboration:** No
**International Travel:** No

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**Aditi Shenoy**
Email: aditi.shenoy@gmail.com
**Most Senior Project Role:** Graduate Student (research assistant)
**Nearest Person Month Worked:** 12

**Contribution to the Project:** Ph.D. student, effects of fire severity on succession & biogeochemistry. Involved in Data Contribution.

**Funding Support:** NASA

**International Collaboration:** No
**International Travel:** No

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**Katie Spellman**
Email: kvillano@alaska.edu
**Most Senior Project Role:** Graduate Student (research assistant)
**Nearest Person Month Worked:** 5

**Contribution to the Project:** PhD student working on invasive plants and competition for pollinators with native plants

**Funding Support:** Mulder USDA grant

**International Collaboration:** No
**International Travel:** No

---

**Michaela Swanson**
Email: m.swanson@alaska.edu
**Most Senior Project Role:** Graduate Student (research assistant)
Nearest Person Month Worked: 12
Contribution to the Project: MS student, coupling nitrogen fixation and phosphorous biogeochemistry. Involved in Data Contribution.
Funding Support: -
International Collaboration: No
International Travel: No

Ina Timling
Email: itimling@alaska.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6
Contribution to the Project: Analysis of fungal community composition in the Arctic. Involved in data contribution and data management.
Funding Support: NSF IPY grant
International Collaboration: Yes, France, Russian Federation, Sweden, United Kingdom
International Travel: No

Delia Vargas-Kretsinger
Email: Delia_Vargas_Kretsinger@fws.gov
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 6
Contribution to the Project: MS student, early successional dynamics of Yukon River floodplains. Involved in Data Contribution.
Funding Support: USF&WS
International Collaboration: No
International Travel: No

Xanthe Walker
Email: xanthe.walker@usask.ca
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 12
Contribution to the Project: Ph.D. student, conducting research on climate-growth relationships and post-fire resilience of black spruce. Involved in Data Contribution.
Funding Support: NSERC (Canada), SERDP (U.S. DoD/DoE)
International Collaboration: Yes, Canada
International Travel: Yes, Canada - 0 years, 10 months, 0 days

Elizabeth Webb
Email: webb.elizabeth.e@gmail.com
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 12

Contribution to the Project: Master's student who is taking the lead on winter carbon flux measurements. Contributed to data management.

Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics. Involved in data contribution and data management.

International Collaboration: No
International Travel: No

Mark Winterstein
Email: mawinterstein@alaska.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 9

Contribution to the Project: MS student, plant succession of drying lake margins in the Yukon Flats. Involved in Data Contribution.

Funding Support: University of Alaska Fairbanks Teaching Assistanship

International Collaboration: No
International Travel: No

Suzanne Worker
Email: sbworker@alaska.edu
Most Senior Project Role: Graduate Student (research assistant)
Nearest Person Month Worked: 9

Contribution to the Project: MS student, snowshoe hare response to climate-mediated changes in plant toxicity. Involved in Data Contribution.

Funding Support: USGS

International Collaboration: No
International Travel: No

Catherine Johnstone
Email: ckjohnston80@gmail.com
Most Senior Project Role: Non-Student Research Assistant
Nearest Person Month Worked: 1

Contribution to the Project: Worked in the field during late winter 2013 helping the snow shoveling campaign.

Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics

International Collaboration: No
International Travel: No

John Krapek
Email: jpkrapek@gmail.com
Most Senior Project Role: Non-Student Research Assistant
Nearest Person Month Worked: 8

Contribution to the Project: Responsible for assisting with field data collection and infrastructure.

Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics

International Collaboration: No
International Travel: No

Elaine Pegoraro
Email: epegoraro@ufl.edu
Most Senior Project Role: Non-Student Research Assistant
Nearest Person Month Worked: 12

Contribution to the Project: Student and laboratory technician, responsible for the laboratory processing of field samples. Also completed an honors project on litter quality. Involved in data contribution and data management.

Funding Support: NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics

International Collaboration: No
International Travel: No

Nicholas Boldt
Email: nicholas.boldt@usask.ca
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 4

Contribution to the Project: Assisted with research on vegetation successional dynamics after fire

Funding Support: NSERC (Canada)

International Collaboration: Yes, Canada
International Travel: Yes, Canada - 0 years, 10 months, 0 days

Shae Bowman
Email: slbowman@alaska.edu
Most Senior Project Role: Undergraduate Student
Nearest Person Month Worked: 5

Contribution to the Project: Undergraduate working with the Forest Soils Lab on LTER related tasks including the isotope analysis of tree stem water. Involved in data contribution.

Funding Support: McIntire-Stennis

International Collaboration: No
International Travel: No

Benjamin Robinson
Email: orobinson@ufl.edu
**Most Senior Project Role:** Undergraduate Student  
**Nearest Person Month Worked:** 3  
**Contribution to the Project:** Worked in the field during the summer and fall of 2013 through the REU program.  
**Funding Support:** NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics  
**International Collaboration:** No  
**International Travel:** No

**Alicia Sendrowski**  
**Email:** apsendro68@ufl.edu  
**Most Senior Project Role:** Undergraduate Student  
**Nearest Person Month Worked:** 6  
**Contribution to the Project:** Assisted with labwork (Mack)  
**Funding Support:** Department of Defense SERDP  
**International Collaboration:** No  
**International Travel:** No

**Patrick Soucy**  
**Email:** patricksoucy75@ufl.edu  
**Most Senior Project Role:** Undergraduate Student  
**Nearest Person Month Worked:** 6  
**Contribution to the Project:** Worked in the field during the summer and fall of 2013 through the REU program.  
**Funding Support:** NSF CAREER Award, DOE Terrestrial Ecosystem Program, National Parks Inventory and Monitoring, DOE Microbial Genomics  
**International Collaboration:** No  
**International Travel:** No

**Ariel Thomasson**  
**Email:** ariel.thomasson@gmail.com  
**Most Senior Project Role:** Research Experience for Undergraduates (REU) Participant  
**Nearest Person Month Worked:** 3  
**Contribution to the Project:** Curator of art, exhibit promotions, logistics, website, coordination. Involved in data contribution and data management.  
**Funding Support:** -  
**International Collaboration:** No  
**International Travel:** No  
**Year of schooling completed:** Other  
**Home Institution:** UAF  
**Government fiscal year(s) was this REU participant supported:** 2013
<table>
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<th>Email</th>
<th>Most Senior Project Role</th>
<th>Nearest Person Month Worked</th>
<th>Contribution to the Project</th>
<th>Funding Support</th>
<th>International Collaboration</th>
<th>International Travel</th>
<th>Year of schooling completed</th>
<th>Home Institution</th>
<th>Government fiscal year(s) was this REU participant supported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sarah Wood</td>
<td><a href="mailto:swood15@utk.edu">swood15@utk.edu</a></td>
<td>Research Experience for Undergraduates (REU) Participant</td>
<td>4</td>
<td>Maintained field instrumentation and assisted with field research</td>
<td>LTER and USGS Climate R&amp;D</td>
<td>No</td>
<td>No</td>
<td>Other</td>
<td>Univ. Tennessee Knoxville</td>
<td>2013</td>
</tr>
<tr>
<td>Syndonia Bret-Harte</td>
<td><a href="mailto:msbretharte@alaska.edu">msbretharte@alaska.edu</a></td>
<td>Other</td>
<td>0</td>
<td>Affiliate scientist - plant physiological ecologist</td>
<td>Home Institution/Agency</td>
<td>No</td>
<td>No</td>
<td>Other</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Caroline Brown</td>
<td><a href="mailto:caroline.brown@alaska.gov">caroline.brown@alaska.gov</a></td>
<td>Other</td>
<td>0</td>
<td>Affiliate scientist - wildfire impacts on subsistence, Alaska Dept of Fish &amp; Game</td>
<td>Home Institution/Agency</td>
<td>No</td>
<td>No</td>
<td>Other</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Monika Calef</td>
<td><a href="mailto:mcalef@albany.edu">mcalef@albany.edu</a></td>
<td>Other</td>
<td>0</td>
<td>Affiliate scientist - landscape dynamics of human-fire interactions</td>
<td>Home Institution/Agency</td>
<td>No</td>
<td>No</td>
<td>Other</td>
<td>No</td>
<td>No</td>
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</tbody>
</table>
Randi Jandt
Email: randi.jandt@gmail.com

Most Senior Project Role: Other
Nearest Person Month Worked: 0

Contribution to the Project: Affiliate scientist - fire ecology

Funding Support: Home Institution/Agency

International Collaboration: No
International Travel: No

Chanda Meek
Email: chanda.meek@alaska.edu

Most Senior Project Role: Other
Nearest Person Month Worked: 0

Contribution to the Project: Conducting institutional analysis related to Social Ecological Systems. Involved in data contribution.

Funding Support: -

International Collaboration: No
International Travel: No

Tom Osterkamp
Email: t.osterkamp@worldnet.att.net

Most Senior Project Role: Other
Nearest Person Month Worked: 0

Contribution to the Project: Affiliate scientist - permafrost

Funding Support: Home Institution/Agency

International Collaboration: No
International Travel: No

Chien-Lu Ping
Email: cping@alaska.edu

Most Senior Project Role: Other
Nearest Person Month Worked: 0

Contribution to the Project: Affiliate scientist - soil science

Funding Support: Home Institution/Agency

International Collaboration: No
International Travel: No

Dave Schirokauer
Email: Dave_Schirokauer@nps.gov

Most Senior Project Role: Other
<table>
<thead>
<tr>
<th>Name</th>
<th>Email</th>
<th>Nearest Person Month Worked</th>
<th>Contribution to the Project</th>
<th>Most Senior Project Role</th>
<th>International Collaboration</th>
<th>International Travel</th>
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</thead>
<tbody>
<tr>
<td>John Southon</td>
<td><a href="mailto:jsouthon@uci.edu">jsouthon@uci.edu</a></td>
<td>0</td>
<td>Keck Carbon Cycle Accelerator Mass Spectrometry facility at the University of California, Irvine</td>
<td>Other</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Jason Vogel</td>
<td><a href="mailto:jason_vogel@tamu.edu">jason_vogel@tamu.edu</a></td>
<td>0</td>
<td>Affiliate scientist - ecosystem studies - former post-doc</td>
<td>Other</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Richard Werner</td>
<td><a href="mailto:wernerr@peak.org">wernerr@peak.org</a></td>
<td>0</td>
<td>Affiliate scientist - insect population dynamics - retired senior investigator</td>
<td>Other</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Lori Winton</td>
<td><a href="mailto:lmwinton@fs.fed.us">lmwinton@fs.fed.us</a></td>
<td>0</td>
<td>Collaborator on alder canker studies. Forest Pathologist, USFS Region 10, State and</td>
<td>Other</td>
<td>No</td>
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</tbody>
</table>
Xiaomei Xu
Email: xxu@uci.edu
Most Senior Project Role: Other
Nearest Person Month Worked: 0

Contribution to the Project: Keck Carbon Cycle Accelerator Mass Spectrometry facility at the University of California, Irvine

Funding Support: -
International Collaboration: No
International Travel: No

Kenji Yoshikawa
Email: kyoshikawa@alaska.edu
Most Senior Project Role: Other
Nearest Person Month Worked: 0

Contribution to the Project: Affiliate scientist - permafrost science

Funding Support: Home Institution/Agency
International Collaboration: No
International Travel: No

Fengming Yuan
Email: fyuan@alaska.edu
Most Senior Project Role: Other
Nearest Person Month Worked: 2

Contribution to the Project: Modeling research on biogeochemical cycling of forest ecosystems in interior Alaska

Funding Support: Department of Energy
International Collaboration: No
International Travel: No

John Zasada
Email: jzasada@fs.fed.us
Most Senior Project Role: Other
Nearest Person Month Worked: 0

Contribution to the Project: Affiliate scientist - forest products

Funding Support: Home Institution/Agency
What other organizations have been involved as partners?

<table>
<thead>
<tr>
<th>Name</th>
<th>Type of Partner Organization</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ageya Wilderness Education</td>
<td>Other Nonprofits</td>
<td>Homer, Alaska</td>
</tr>
<tr>
<td>Alaska Association of Conservation Districts</td>
<td>Other Nonprofits</td>
<td>Seward, AK</td>
</tr>
<tr>
<td>Ekuk Village Council</td>
<td>State or Local Government</td>
<td>Ekuk, Alaska</td>
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<tr>
<td>Fairbanks Soil and Water Conservation District</td>
<td>Other Nonprofits</td>
<td>Fairbanks, AK</td>
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<td>Georgeson Botanical Garden</td>
<td>Other Nonprofits</td>
<td>Fairbanks, AK</td>
</tr>
<tr>
<td>Hands on the Land</td>
<td>Other Organizations (foreign or domestic)</td>
<td>Web Based</td>
</tr>
<tr>
<td>Institute of Chemical Technology, Prague</td>
<td>Academic Institution</td>
<td>Prague, Czech Republic</td>
</tr>
<tr>
<td>Keck Carbon Cycle Accelerator Mass Spectrometry</td>
<td>Academic Institution</td>
<td>Irvine, CA</td>
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<td>Kuskokwim River Watershed Council</td>
<td>Other Nonprofits</td>
<td>Bethel, Alaska</td>
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<td>Michigan State University</td>
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<tr>
<td>Middlebury College</td>
<td>Academic Institution</td>
<td>Middlebury, VT</td>
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<td>Alaska Division of Forestry</td>
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<td>Alaska Statewide</td>
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<tr>
<td>National Ecological Observation Network</td>
<td>Academic Institution</td>
<td>USA</td>
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<tr>
<td>National Park Service</td>
<td>Other Organizations (foreign or domestic)</td>
<td>Fairbanks, AK</td>
</tr>
<tr>
<td>National Park Service Exotic Plants Management</td>
<td>Other Organizations (foreign or domestic)</td>
<td>King Salmon, AK</td>
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<tr>
<td>Native Village of Goodnews Bay</td>
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<td>Goodnews Bay, Alaska</td>
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<tr>
<td>Nunapitchuk IRA Council</td>
<td>State or Local Government</td>
<td>Nunapitchuk, Alaska</td>
</tr>
<tr>
<td>Oregon State University</td>
<td>Academic Institution</td>
<td>Corvallis, OR</td>
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<tr>
<td>Organization</td>
<td>Type</td>
<td>Location</td>
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<tr>
<td>------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Orutsarmiut Native Council</td>
<td>State or Local Government</td>
<td>Bethel, Alaska</td>
</tr>
<tr>
<td>Prince of Songkla University</td>
<td>Academic Institution</td>
<td>Hat Yai, Thailand</td>
</tr>
<tr>
<td>Toolik LTER Field Station</td>
<td>Academic Institution</td>
<td>Toolik, Alaska</td>
</tr>
<tr>
<td>U.S. Army CRREL</td>
<td>Other Organizations (foreign or</td>
<td>Fairbanks, Alaska</td>
</tr>
<tr>
<td>Aniak Traditional Council</td>
<td>State or Local Government</td>
<td>Aniak, Alaska</td>
</tr>
<tr>
<td>U.S. Fish and Wild Service Youth Corps Program</td>
<td>Other Organizations (foreign or</td>
<td>Fairbanks, Alaska</td>
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<td>Other Organizations (foreign or</td>
<td>Anchorage, Fairbanks</td>
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<tr>
<td>U.S. Geological Survey</td>
<td>Other Organizations (foreign or</td>
<td>Anchorage, AK</td>
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<tr>
<td>USDA Natural Resources Conservation Service</td>
<td>Other Organizations (foreign or</td>
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<td>Academic Institution</td>
<td>Anchorage, AK</td>
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<tr>
<td>University of Maryland</td>
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<td>University of Oklahoma</td>
<td>Academic Institution</td>
<td>Norman, OK</td>
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<tr>
<td>Valdez High School</td>
<td>School or School Systems</td>
<td>Valdez, Alaska</td>
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<tr>
<td>Anvil City Science Academy</td>
<td>School or School Systems</td>
<td>Nome, Alaska</td>
</tr>
<tr>
<td>Bureau of Land Management</td>
<td>Other Organizations (foreign or</td>
<td>Steese NCA/White Mountains NRA</td>
</tr>
<tr>
<td>Center for Alaskan Coastal Studies</td>
<td>Other Nonprofits</td>
<td>Homer, Alaska</td>
</tr>
<tr>
<td>Denali Education Center</td>
<td>Other Nonprofits</td>
<td>Denai National Park, Alaska</td>
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<tr>
<td>Denali National Park and Preserve</td>
<td>Other Organizations (foreign or</td>
<td>Denali, AK</td>
</tr>
<tr>
<td>Diamond M Ranch</td>
<td>Industrial or Commercial Firms</td>
<td>Kenai, Alaska</td>
</tr>
</tbody>
</table>

**Full details of organizations that have been involved as partners:**
Ageya Wilderness Education

Organization Type: Other Nonprofits
Organization Location: Homer, Alaska

Partner’s Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Local host organization for invasive plant and native plant phenology research network. Organization provided paid employee to help collect data or coordinate volunteers for the Alaska-wide project.

Alaska Association of Conservation Districts

Organization Type: Other Nonprofits
Organization Location: Seward, AK

Partner’s Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Local host organization for invasive plant and native plant phenology research network. Organization provided paid employee to help collect data or coordinate volunteers for the Alaska-wide project.

Alaska Division of Forestry

Organization Type: State or Local Government
Organization Location: Alaska Statewide

Partner’s Contribution to the Project:
Financial support
In-Kind Support
Facilities

More Detail on Partner and Contribution: AK DoF funds the BAKLAP project, provided a pickup and boat travel, and forest harvest database records and imagery

Aniak Traditional Council

Organization Type: State or Local Government
Organization Location: Aniak, Alaska

Partner’s Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Local host organization for invasive plant and native plant phenology research network. Organization provided paid employee to help collect data or coordinate volunteers for the Alaska-wide project.

Anvil City Science Academy

Organization Type: School or School Systems
Organization Location: Nome, Alaska

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Local host organization for invasive plant and native plant phenology research network. Organization provided paid employee to help collect data or coordinate volunteers for the Alaska-wide project.

Bureau of Land Management

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Steese NCA/White Mountains NRA

Partner's Contribution to the Project:
Financial support
In-Kind Support

More Detail on Partner and Contribution: BLM funds the White Mountains caribou habitat-fire-climate change study, and a large tree disk and vegetation sample database

Center for Alaskan Coastal Studies

Organization Type: Other Nonprofits
Organization Location: Homer, Alaska

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Local host organization for invasive plant and native plant phenology research network. Organization provided paid employee to help collect data or coordinate volunteers for the Alaska-wide project.

Denali Education Center

Organization Type: Other Nonprofits
Organization Location: Denai National Park, Alaska

Partner's Contribution to the Project:
Collaborative Research

More Detail on Partner and Contribution: Local host organization for invasive plant and native plant phenology research network. Organization provided paid employee to help collect data or coordinate volunteers for the Alaska-wide project.

Denali National Park and Preserve

Organization Type: Other Organizations (foreign or domestic)
Organization Location: Denali, AK

Partner's Contribution to the Project:
Collaborative Research
<table>
<thead>
<tr>
<th>Partner</th>
<th>Organization Type</th>
<th>Organization Location</th>
<th>Partner's Contribution to the Project</th>
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<td>Diamond M Ranch</td>
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<tr>
<td>Web Based</td>
<td></td>
<td></td>
<td>Other</td>
<td>Hosted the Melibee Citizen Science website and data entry portal</td>
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<td>Collaborative Research</td>
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<td>King Salmon, AK</td>
<td>Collaborative Research</td>
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</table>
**Organization Type:** State or Local Government  
**Organization Location:** Goodnews Bay, Alaska

**Partner's Contribution to the Project:**  
Collaborative Research

**More Detail on Partner and Contribution:** Local host organization for invasive plant and native plant phenology research network. Organization provided paid employee to help collect data or coordinate volunteers for the Alaska-wide project.

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**Nunapitchuk IRA Council**

**Organization Type:** State or Local Government  
**Organization Location:** Nunapitchuk, Alaska

**Partner's Contribution to the Project:**  
Collaborative Research

**More Detail on Partner and Contribution:** Local host organization for invasive plant and native plant phenology research network. Organization provided paid employee to help collect data or coordinate volunteers for the Alaska-wide project.

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**Oregon State University**

**Organization Type:** Academic Institution  
**Organization Location:** Corvallis, OR

**Partner's Contribution to the Project:**  
Collaborative Research

**More Detail on Partner and Contribution:**

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**Orutsararmiut Native Council**

**Organization Type:** State or Local Government  
**Organization Location:** Bethel, Alaska

**Partner's Contribution to the Project:**  
Collaborative Research

**More Detail on Partner and Contribution:** Local host organization for invasive plant and native plant phenology research network. Organization provided paid employee to help collect data or coordinate volunteers for the Alaska-wide project.

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**Prince of Songkla University**

**Organization Type:** Academic Institution  
**Organization Location:** Hat Yai, Thailand

**Partner's Contribution to the Project:**  
Collaborative Research
### Toolik LTER Field Station

**Organization Type:** Academic Institution  
**Organization Location:** Toolik, Alaska  

**Partner’s Contribution to the Project:**  
Collaborative Research  

### U.S. Army CRREL

**Organization Type:** Other Organizations (foreign or domestic)  
**Organization Location:** Fairbanks, Alaska  

**Partner’s Contribution to the Project:**  
Collaborative Research  

### U.S. Fish and Wild Service Youth Corps Program

**Organization Type:** Other Organizations (foreign or domestic)  
**Organization Location:** Fairbanks, Alaska  

**Partner’s Contribution to the Project:**  
Collaborative Research  

**More Detail on Partner and Contribution:**  
Local host organization for invasive plant and native plant phenology research network. Organization provided paid employee to help collect data or coordinate volunteers for the Alaska-wide project.

### U.S. Fish and Wildlife Service

**Organization Type:** Other Organizations (foreign or domestic)  
**Organization Location:** Anchorage, Fairbanks  

**Partner’s Contribution to the Project:**  
Financial support  

**More Detail on Partner and Contribution:**

### U.S. Geological Survey

**Organization Type:** Other Organizations (foreign or domestic)  
**Organization Location:** Anchorage, AK  

**Partner’s Contribution to the Project:**  
Collaborative Research
<table>
<thead>
<tr>
<th>Organization Name</th>
<th>Organization Type</th>
<th>Organization Location</th>
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<td><strong>University of Alaska Anchorage</strong></td>
<td>Academic Institution</td>
<td>Anchorage, AK</td>
<td>Collaborative Research</td>
<td>Home organization for collaborators Matt Carlson and Laura Schneller</td>
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<tr>
<td><strong>University of Florida</strong></td>
<td>Academic Institution</td>
<td>Gainesville, FL</td>
<td>Financial support, In-Kind Support, Facilities, Collaborative Research</td>
<td>Home institutions, Schuur; Mack</td>
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<td>Facilities</td>
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<tr>
<td><strong>University of Oklahoma</strong></td>
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<td>Norman, OK</td>
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</tbody>
</table>
What other collaborators or contacts have been involved?

YES

**Impacts**

**What is the impact on the development of the principal discipline(s) of the project?**

see Key Outcomes in Accomplishments section

**What is the impact on other disciplines?**

Nothing to report.

**What is the impact on the development of human resources?**

see sections on Education and Outreach listed in Accomplishments section

**What is the impact on physical resources that form infrastructure?**

Nothing to report.

**What is the impact on institutional resources that form infrastructure?**

Nothing to report.

**What is the impact on information resources that form infrastructure?**

Nothing to report.

**What is the impact on technology transfer?**

Nothing to report.

**What is the impact on society beyond science and technology?**

Understanding the sensitivity of ecosystem services to social-ecological change is key to predicting how feedbacks between ecosystems and society can be managed in a changing world. Our research with local residents of rural Alaskan communities asks three basic questions concerning changing social-ecological systems: 1) what are their observations of change, 2) how are those changes affecting local people’s livelihoods, and 3) how are people responding to changes. As a
part of this line of inquiry we explore the exposure and sensitivity of rural communities to environmental change, and their capacity to respond to these changes. We also bring local observations together with best available science to compare human perceptions with instrument-measured observations, and use their integrations to facilitate a discussion with researchers and local residents about possible futures. We undertake this enterprise to test the assumption that these discussions will advance our collective knowledge of change as well as inform community residents as they make decisions that affect future adaptive responses.

Changes/Problems

Changes in approach and reason for change
Nothing to report.

Actual or Anticipated problems or delays and actions or plans to resolve them
Nothing to report.

Changes that have a significant impact on expenditures
Nothing to report.

Significant changes in use or care of human subjects
Nothing to report.

Significant changes in use or care of vertebrate animals
Nothing to report.

Significant changes in use or care of biohazards
Nothing to report.