

United States of America

US Permafrost Association (<https://www.uspermafrost.org/>)

The Annual Meeting of the US Permafrost Association (USPA) and the Board of Directors meeting were held on December 11 at the 2018 Fall Meeting of the American Geophysical Union (AGU) in Washington DC. The Annual Meeting convened at the Fadó Irish Pub and was attended by approximately 135 members and their guests. Results of the BOD election were announced: New members are: John Zarling, Vice President; Susan Wilson, Secretary, Cathy Wilson, Board Member-at-Large. Continuing Board Members are Dmitry Streletskev, Gerald Frost, Thomas Douglas, John Thornley, Frederick Nelson, Thomas Krzewinski. Matthew Whitley is the new PYRN Representative. Retiring Board members were Anna Liljedahl, Molly McGraw, Mark Demitroff, and Dan Vecellio. USPA paid membership has increased to approximately 100 including several non-US members: 68 regular members, 26 student/PRYN members, 5 corporate/institutional members, and include 7 lifetime members. The USPA Annual Report, prepared by Anna Liljedahl is available at <https://www.uspermafrost.org/>

The USPA, led by Tom Douglas, proposed to convene an IPA Regional Conference on Permafrost 11-16 July 2021 on the campus of the University of Colorado in Boulder. The proposed theme is "Permafrost Dynamics in Polar and Alpine Environments" and will include engineering themes. The International Permafrost Association has approved the invitation and national and international planning will commence in 2019.

The Association awarded 10 travel grants in 2018: Recipients of AGU travel grants were Mia Arvizu, Oregon State University; Stephanie James, US Geological Survey (USGS); Raven Mitchell and

Kelsey Nyland, Michigan State University; Brianna Rick, Colorado State University; and Bianca Rodriguez-Cardona, University of New Hampshire, and the 2018 Andrew Slater Memorial Awardee was Risa Madoff, University of North Dakota (see photograph). The summer EUCOP travel awardees were Clayton Queen, Michigan State University; Rebecca Frei, Brigham Young University; and Matvey Debolskiy, University of Alaska Fairbanks.

Kristina Levine and Kate Hobart, students at Texas A&M University and supported by GW Scientific, prepared a compilation of all abstracts related to permafrost. The more than 340 abstracts in 138 paper and poster sessions were presented chronologically and were searchable in real time during the Fall Meeting on the USPA website.

The USPA and the American Geosciences Institute (AGI) jointly provide a monthly catalog of the world-wide, permafrost literature. The Permafrost Monthly Alert (PMA) program, initiated in 2012, produces professionally reviewed reference material on a monthly schedule and results are made available in multiple locations including the USPA web site. The seven-year collection contains 5,800 citations. The monthly accessions are uploaded by AGI to the Bibliography of Cold Regions Science and Technology (COLD), a searchable database that includes more than 29,000 permafrost references. For 2018, PMA content inquiries (views by individual readers) was the highest on record and exceeded 12,800 inquiries and over 59,500 inquiries since 2012. An AGU poster presentation provided details of the PMA program. During 2018, Arctic Foundations and GW Scientific supplemented USPA financial support. Michael Lilly, GW Scientific, Sharon Tahirkheli, American Geosciences Institute, and Jerry Brown are principal participants.

<https://www.uspermafrost.org/monthly-alerts.shtml>



Figure 1: Photograph of AGU travel grantees with Anna Liljedahl, USPA President (extreme right)

American Society of Civil Engineers

The ASCE Cold Regions Engineering Division (CRED) has five technical committees that assess and report on effects of cold regions environments upon engineering design, construction, and operations. The Publication Committee of CRED is responsible for editing the peer-reviewed *Journal of Cold Regions Engineering* (Jon Zufelt, editor) that publishes 25 to 30 refereed papers per year on topics related to permafrost and seasonal frost, ice engineering, construction, environmental quality, snow and ice control, and cold regions materials. The Environmental and Public Health Engineering Committee of CRED is currently updating the Cold Regions Utilities Monograph that's widely used as a reference by engineers working in permafrost regions. It is scheduled to be published in 2019.

ASCE co-sponsored the 2018 Arctic Technology Conference in Houston, TX on November 5-7 to discuss the latest technologies, responsibilities, and practices for responsible exploration and production in the Arctic where permafrost can be a major challenge.

This year, Ralph J. Hodek (Michigan Technological University) received the Harold R. Peyton Award for Cold Regions Engineering and Kenneth R. Johnson (Canadian consulting engineer and historian) received the Can-Am Civil Engineering Amity Award.

ASCE's Committee on Adaptation to a Changing Climate published a Manual of Practice entitled *Climate-Resilient Infrastructure: Adaptive Design and Risk Management* to provide guidance for developing or enhancing methods for infrastructure analysis and design in a world with a changing climate. Although permafrost is not directly addressed, the methodology for performing design of infrastructure projects can be extended to permafrost environments. Report submitted by Ed Yarmak and Tom Krzewinski.

U.S. Army Cold Regions Research and Engineering Laboratory (CRREL)

CRREL reports on a variety of active research and engineering projects. Extensive excavation was conducted at the Permafrost Tunnel near Fairbanks. The North Tunnel (old Tunnel) was connected to the South Tunnel with an 83m cross-cut and the South Tunnel was advanced forward by 12m. Planning progresses for Phase IV excavation to be conducted in winter 2019-20 with the ultimate goal to create a three dimensional test bed for geophysical and remotely sensed measurements of massive ice features. A variety of projects focused on geophysics, remote sensing, and vegetation continue at a variety of field sites across Alaska. Engineering design and infrastructure siting support continues at Thule, Greenland, including remediation design for thaw-affected structures.

Site investigations on permafrost terrain were conducted to support the Eielson Air Force Base F-35A Beddown and expanded sensor development at the Chena Dam near Fairbanks. CRREL collaborated with the University of Alaska Fairbanks to conduct an analysis of permafrost thaw risk for 187 Alaska villages for the Denali Commission. CRREL organized a workshop with academics, industry, and government permafrost engineers to ascertain the State-of-the-Practice, determine knowledge gaps, and propose topics for future research. A multi-year project focused on remediation at sites near Barrow (Utqiaġvik) continues. Report submitted by Kevin Bjella and Tom Douglas.

U.S. Geological Survey (USGS)

The USGS, in collaboration with university, federal and independent partners, conducts fundamental research on hydrology, geology, soils, chemistry, and biology of permafrost and permafrost-affected environments to provide science for decision support to conserve land and water. The USGS has ongoing research throughout Arctic and boreal ecosystems of the northern circumpolar, where a suite of geophysical techniques and ecosystem surveys are judiciously used to monitor permafrost properties, conditions and landscape dynamics that exert strong controls on socioenvironmental systems.

USGS scientists continue to evaluate the effects of disturbance and climate on permafrost, soil physical, and hydrological conditions, and model surface and subsurface water distribution, flow, and water availability. Carbon cycling studies (both aquatic and terrestrial) are being conducted at lakes within the Yukon Flats National Wildlife Refuge, Kenai NWR, watersheds along the Dalton Highway, the Brooks Range, the Arctic Coastal Plain and at the Bonanza Creek LTER. Year-round studies are being conducted to characterize permafrost distribution and vulnerability from thermal characteristics using boreholes, water characteristics including groundwater, carbon sources and sinks in permafrost-impacted systems, including methane, nitrous oxide and dissolved organic carbon, and mapping of vegetation, active layer depths, and coastal erosion. Permafrost degradation and landscape change in Alaska are quantified through analyses of remote sensing data, geophysical data, wetland macrofossil analysis, field observations, and modeling. The group continued studies linking warming and permafrost thaw to biological responses, including beaver, waterfowl, and soil microbial communities. Detailed permafrost DNA and chemical analyses of pan-Arctic permafrost soils are being conducted as a reference for paleoecology, astrobiology, and biogeochemistry.

USGS research has been extended to the larger research community and land managers

through synthesis activities with the Permafrost Carbon Network, the USPA, the NCA4, the SOCCR report, and NASA ABoVE. USGS researchers have presented their findings in a series of journal articles and data releases, and national and international meetings including ASLO, EUCOP, and AGU. Report submitted by Mark Waldrop.

University of Alaska Fairbanks

Geophysical Institute Permafrost Laboratory

The main 2018 activity in the program “Thermal State of Permafrost” was focused on maintaining observations on the existing network that currently includes approximately 300 near-surface and deeper boreholes in Alaska, Canada, Greenland, and Russia. A limited number of new sites were instrumented. In Alaska, six shallow sites were instrumented by Vladimir Romanovsky and Alexander Kholodov as a part of the project “Alaska Reburn”. Kholodov instrumented two more shallow sites to extend the existing observation transect at the Smith Lake area near Fairbanks. In Russia, Heather Alexander (Mississippi State University), in collaboration with Valentin Spektor (Melnikov Permafrost Institute) drilled and instrumented two 15-meters deep boreholes in the town of Chersky. Under the US National Science Foundation-funded project “Vegetation Impact on Permafrost” Kholodov instrumented eight shallow sites in the Pleistocene Park to assess the possible effects of grazing animals on the thermal balance of the ground surface. See the Permafrost Laboratory website for additional activities: permafrost.gi.alaska.edu/

Water and Environmental Research Center, Institute of Northern Engineering

The NSF announced funding for three new projects in 2018 that focus on ice-rich permafrost landscapes and their dynamics across the Arctic. These studies include catastrophic thermokarst lake drainage (Arp, Jones, Kanevskiy), ice wedge mapping and dynamics (Liljedahl, Shur, Kanevskiy), and the transition zone of the upper permafrost (Shur, Kanevskiy). Additional support for coastal permafrost research is being provided by Sandia National Laboratory (Jones) and by NSF for a coastal permafrost research coordination network (Jones). NASA EPSCoR also provided funding for a remote sensing project focused on historic and potential future thermokarst lake drainage in northern Alaska (Jones). WERC researchers contributed more than 30 journal publications and more than 50 scientific presentations on permafrost in 2018. Report submitted by Ben Jones.

George Washington University, Northern Michigan University, Michigan State University

The NSF recently announced funding for another five-year phase of the Circumpolar Active Layer Monitoring (CALM) program in Alaska and Russia. Nikolay Shiklomanov will continue to serve as lead

PI, with Dmitry Streletskiy, Frederick Nelson, Grant Gunn, and Anna Klene as senior personnel. With this most recent award the project will have been funded by NSF for 25 consecutive years.

The CALM program is a network of active layer observatories located throughout both polar regions and select mid-latitude mountain ranges. The program is focused on assessing the long-term response of the active layer and near-surface permafrost to climate change. CALM recently marked its 25th anniversary, with continuous operation of observatories in North America, Europe, and Asia since the early 1990s (more information available at www.gwu.edu/~calm/).

The CALM V phase of the project will focus on several interrelated objectives: (1) maintain established programs of long-term active layer, near-surface permafrost, landscape, and geomorphologic observations in existing regional networks; (2) expand CALM networks to representative cold-region sites with strategic emphasis on currently unrepresented regions and on co-location with sites in the Thermal State of Permafrost (TSP) borehole network; (3) expand the range of environmental parameters measured at CALM sites; (4) continue development and refinement of data management and archiving activities and strategies and provide data management and archiving support; and (5) expand present CALM educational activities and outreach for the program.

Next-Generation Ecosystem Experiments (NGEE Arctic)

The Department of Energy, Office of Science Next-Generation Ecosystem Experiments (NGEE Arctic) project launched its eighth year in 2018 by continuing to build strong relationships with the broader permafrost community. NGEE scientists partnered with academics from across the US and around the world to chair seven sessions at the AGU annual meeting. Scientists on the NGEE Arctic project are engaged in a number of new and ongoing synthesis activities within the Permafrost Carbon Network. NGEE Arctic co-PI, Cathy Wilson from Los Alamos National Laboratory, serves on the SEARCH Permafrost Action Team and is a newly elected member of the USPA Board. In that role Cathy will work toward growing the diversity of USPA's membership and the development of closer relationships between the USPA and permafrost research organizations. Report submitted by Stan Wullschleger and Cathy Wilson.

Permafrost Carbon Network

The Permafrost Carbon Network (PCN) (www.permafrostcarbon.org) hosted two workshops in 2018 on ‘Reconciling Historical and Contemporary Trends in Terrestrial Carbon Exchange of the Northern Permafrost-Zone’ at the Arctic Data

Center and National Center for Ecological Synthesis and Analysis in Santa Barbara, California. These two workshops brought together international experts on ecosystem dynamics to synthesize an observational time series of ecosystem-atmosphere carbon exchange from the 1990s to the present day.

The PCN also hosted its 8th Annual Meeting prior to AGU in Washington, DC. The latest on permafrost carbon science was presented in 18 science speed-talks to an audience of 120 scientists. Many of these brief presentations laid the foundation for nine breakouts in the afternoon during which details for data collection, spatial data representation, analysis procedures, people to involve, and timelines were discussed. Current synthesis activities of the PCN focus on 1) reducing uncertainty in carbon pools in permafrost and upscaling carbon stocks in Arctic river deltas, 2) building a decadal-scale time series of ecosystem-atmosphere arctic/boreal carbon exchange through synthesis, 3) identifying thaw-induced changes to the permafrost microbiome, and 4) improving visibility and outreach opportunities on permafrost carbon to the public and decision makers.

Multiple science syntheses were spearheaded by the PCN. A model intercomparison project for permafrost-enabled models simulates changes in permafrost and carbon storage in the northern permafrost regions from 2010-2299. The results show that controlling greenhouse gas emissions in the coming decades could substantially reduce the consequences of carbon release from thawing permafrost during the next 300 years.

Several synthesis papers were published: McGuire AD et al. The dependence of the evolution of carbon dynamics in the Northern Permafrost Region on the trajectory of climate change, *Proceedings of the National Academy of Sciences*, 115, (15), 3882-3887 and Loranty MM et al. Reviews and syntheses: Changing ecosystem influences on soil thermal regimes in northern high-latitude permafrost regions, *Biogeosciences* 15 5287–313.

Related activities of the Permafrost Action Team resulted in three published ‘Arctic Answers’ focused on 1) Climate change and the permafrost carbon feedback, 2) How is permafrost degradation affecting ecosystem services? 3) How is permafrost degradation affecting infrastructure. Arctic Answers provide scientific information in a format that can be used by scientists, stakeholders, policy- and decision-makers, as well as students and journalists.

<https://www.searcharcticscience.org/arctic-answers>. The Permafrost Collaboration Team of the Interagency Arctic Research Policy Committee (led by Miriam Jones, USGS; Christina Schaezel, Northern Arizona University; Benjamin Jones,

University of Alaska Fairbanks) hosted a number of webinars focused on Modeling of Permafrost, the Well-being of Arctic Residents, and Regional Security. Report submitted by Christina Schaezel and Ted Schuur, Northern Arizona University

Permafrost Young Researchers Network (PYRN)

In late 2017 several young permafrost researchers created a North American chapter of PYRN (PYRN-NA) which successfully links young permafrost researchers in North America to information about upcoming conferences, workshops, funding opportunities, and recent publications. More information can be found at pyrnna.wordpress.com

At the AGU Fall Meeting, PYRN-NA teamed up with the US Association of Polar Early Career Scientists (USAPECS) to host a panel on Diversity and Inclusivity in the Polar Sciences. The panel included Emilie Sinkler (UAF), Kaare Erickson (Ukpeaġvik Iñupiat Corporation--Science), Allison Mattheis (CSULA), and Marilyn Raphael (UCLA) who all provided unique perspectives on: (1) the current challenges facing minority groups and women in the polar sciences, such as barriers to entry for underrepresented groups, sexual harassment at work and in the field, and representation of indigenous knowledge in the polar sciences; (2) what we as individuals can do to bring these issues to the forefront of conversations in scientific organizations and universities; and (3) strategies to promote diversity and inclusion of underrepresented perspectives in the polar sciences. The successful panel resulted in a larger turnout than the room could comfortably hold! Report submitted by Matthew Whitley.

Individual Member Activities

Mark Demitroff, Stockton University, is working on past permafrost and Pleistocene wind action across the mid-Atlantic region; coauthored a book chapter on a Clovis mastodon kill site in New York; co-led a PALSEA/QUIGS (PAGES-INQUA) joint-meeting field trip on Quaternary periglacial dynamics; and has a book due in 2019 on the paleoperiglacial legacy of the Pinelands National Reserve.

Matthew Whitley, newly appointed USPA PYRN representative, published his thesis work at the University of Alaska Fairbanks, based on research with the US ABoVE group: Assessment of LiDAR and Spectral Techniques for High-Resolution Mapping of Sporadic Permafrost on the Yukon-Kuskokwim Delta, Alaska.

Reginald Musket, Research Associate, Geophysical Institute, University of Alaska Fairbanks, continues research on geodesy, geophysics and remote sensing and included: "To Measure the Changing Relief of Arctic Rivers: A Synthetic Aperture RADAR Experiment in Alaska," and a presentation (Pol-SAR) at the 2018 Annual Meeting of the Geological Society of America.

In Memoriam:
Florence Rooney, Anchorage, Alaska
Michael Walegur, Moorpark, CA

Complied and edited by: Susan Wilson (Secretary),
Molly McGraw, and Jerry Brown, US Permafrost
Association