



U.S. Permafrost Association 2019 Annual Report

(<https://www.uspermafrost.org/>)

The Year in Review

The Annual Meeting of the US Permafrost Association (USPA) was held on December 10, 2019 during the Fall Meeting of the American Geophysical Union (AGU) in San Francisco, CA. The Meeting convened at the Thirsty Bear Brewing Company and was attended by approximately 135 members and their guests. Results of the Board of Directors elections were announced. Members of the 2020 Board of Directors are John Zarling, President; Dmitry Streletskiy, Past President; Cathy Wilson, President Elect; new members: Peppi Croft, Treasurer; Torsten Mayrberger and Mark Bennett, Board Members-at- Large; and continuing members are Thomas Krzewinski and Frederick Nelson as IPA representatives, and Matthew Whitley, PYRN representative. Gerald Frost, Thomas Douglas, and John Thornley were retiring Board members and their services were acknowledged. Two new USPA members were approved to start terms at the next IPA Council meetings for the following four years; Ed Yarmak and Kevin Shaeffer.

Several informational flyers were prepared for the Annual Meeting and are available on the USPA web site. Kristina Levine, student at Texas A&M University and supported by GW Scientific, prepared a compilation of all AGU abstracts related to permafrost. More than 300 abstracts presented in paper and poster sessions were arranged chronologically and were searchable in real time during the Fall Meeting and archived on the USPA website.

USPA-PYRN Education Fund (UPEF) provided five grants for travel to the AGU Fall Meeting: David Rey, Colorado School of Mines (Andrew Slater Memorial Award); Joel Eklof, University of Washington; Rodrigo Rangel, University of Wyoming; Erin Rooney, Oregon State University; and Aquanette Sanders, University of Texas Austin. The UPEF Committee chaired by Kelsey Nyland was responsible for solicitation of applications and the review process.

The Permafrost Engineering Education Program (PEEP) chaired by Margaret Rudolf made travel grants for the 18th International Conference on Cold Regions Engineering and 8th Canadian Permafrost Conference that was held in Quebec City to Eva Stephani and Jaimy Schwarber, from the University of Alaska Fairbanks. Funds were provided to Laurin Fisher, a student at UAF, to complete programming on the Permafrost Predictor app that was developed by Dmitry Nicolsky. The new chair of the PEEP Committee is Peppi Croft, Shannon and Wilson Inc. in Fairbanks

A new Membership Committee was approved in June and began its work during the summer. USPA membership in 2019 increased to 171 with members in 28 States, DC, and four non-US countries. Membership include 110 individual members, 37 student/PYRN members, 13 corporate/institutional members, and eight lifetime members.

Nine U.S. participants attended the highly successful SOUTHCOP, the first IPA regional conference held in the Southern Hemisphere, which was convened in Queenstown, New Zealand, December 4-14, 2019 (see abstracts on December 2019 Permafrost Monthly Alert).

USPA, led by Tom Douglas, developed additional plans for the IPA Regional Conference on Permafrost to be held 11-16 July 2021 on the campus of the University of Colorado Boulder. The proposed theme of the conference is "Permafrost Dynamics in Polar and Alpine Environments" and is being organized jointly by USPA, UC Boulder and the American Society of Civil Engineers. The conference web site was constructed and is accessible on the USPA website.

The USPA and the American Geosciences Institute (AGI) continue to jointly provide the monthly catalog of 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

website. The current eight-year collection includes over 97 monthly and special updates containing over 7,390 citations, in most instances, include abstracts and/or links to original content. The monthly accessions are uploaded by AGI to the Bibliography of Cold Regions Science and Technology (COLD), a searchable database that includes close to 30,000 permafrost references. For 2019, PMA content inquiries (views by individual readers) was the highest on record and exceeded 11,000 inquiries with over 60,000 inquiries since 2012. Poster presentations at both AGU and SouthCOP provided details of the PMA program. During 2019, Arctic Foundations Inc., Campbell Scientific Inc, USPA PEEP, Geo-Watershed Scientific and James Rooney provided PMA financial support. Sharon Tahirkheli, American Geosciences Institute, Michael Lilly, and Jerry Brown are principal participants, under the USPA Communications Committee. Michael Lilly succeeds Oliver Fraunfeld as Committee Chair and whose long-term service is greatly appreciated.

As reported in the following reports (ASCE, INE and NGEE), two long-term members of the USPA received distinguished awards: Yuri Shur and Vladimir Romanovsky.

Reports from Organizations and Members

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 Frozen Ground Committee of CRED completed the monograph *Frost Action in Soils – Fundamentals and Mitigation in a Changing Climate* (Sally Shoop, editor). 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 2020. ASCE co-sponsored the 18th International Conference on Cold Regions Engineering Conference in Quebec City, Canada, on August 18 - 22 to discuss sustainable infrastructure development in cold regions in conjunction with the 8th Canadian Permafrost Conference. This conference had a total of 120 communications, including 80 papers, 20 posters, and 20 invited plenaries. ASCE presented Student Paper awards to Timothy Ensom (Wilfrid Laurier University), Julie Malenfant-LePage (Universite' Laval), and Earl Marvin DeGuzman (University of Manitoba). Student Poster awards went to Benjamin Bouchard (Universite' Laval), Elise Devoie (University of Waterloo), and Georg Lackner (Universite' Laval). This year, Robert Ettema (Colorado State University) received the Harold R. Peyton Award for Cold Regions Engineering and Brian Morse (Universite' Laval) received the Can-Am Civil Engineering Amity Award. Additionally, Yuri Shur (University of Alaska, Fairbanks) was chosen to present the Eb Rice Lecture which he did in Fairbanks on January 15, 2020.

Submitted by Ed Yarmak

U.S. Army Cold Regions Research and Engineering Laboratory

CRREL Alaska researchers continue to work at a variety of sites to develop standoff detection technologies and models for permafrost ice content, thaw susceptibility, and thermokarst risks. Increasing use of machine learning and geospatial analyses are being exploited to analyze a variety of field measurements. The CRREL Permafrost Tunnel expansion has entered its fourth year. A major excavation effort in the winter of 2019-2020 will add 100 meters of new Tunnel. This includes new excavation into the oldest permafrost (40,000 years old) at the back of the 1960s era Tunnel. Extensive upgrades to air quality, safety, and access are also being made.

CRREL researchers are interested in understanding the biogeochemistry of the permafrost-active layer boundary and how that relates to trace element cycling at the watershed level. Particularly, we are focused on

understanding redox and temporal trends in late fall/early winter when the active layer is at the deepest annual extent. We have been investigating changes in microbial communities during thaw. Microbes play a key role in the ecosystem by providing key nutrients. This effort provides fundamental knowledge of the effects of climate change across the landscape since permafrost microbiomes are distinct and change differentially during thaw.

CRREL Alaska researchers are also developing a solar paneled thermosyphon system that can be used to extend the ground cooling periods. Solar powered hybrid systems could also be used to retrofit passive thermosyphons where a warming climate or a change in the cooling requirements are needed.

CRREL participated with University of Alaska Fairbanks and the Alaska District of the Corps of Engineers in compiling a threat assessment for all Alaska Villages with regards to permafrost degradation, flooding, and coastal erosion. The project was funded by the Denali Commission and provides a baseline for future evaluation of these evolving environmental threats. CRREL will be leading the revision and rewriting of the Unified Facilities Criteria engineering guidance series on Arctic and sub-Arctic Construction (UFC 3-130). The revision will be conducted as Cold Region amendments to existing and frequently utilized temperate region UFC guidance, and permafrost engineering will obtain significant updates to include climate warming guidance. The project is being funded by the Environmental Security Technology Certification Program (ESTCP) and is three years in duration.

CRREL was asked by the National Academies of the Sciences to help organize and participate in an international workshop on "Understanding and Responding to Global Health Security Risks from Microbial Threats in the Arctic" from 6-7 November 2019 at the Herrenhausen Palace in Hannover, Germany. The first of its kind, the goal of the workshop was to bring together an interdisciplinary, international group of researchers and public health officials to explore what is known and what critical knowledge gaps remain regarding existing and possible future risks of harmful infectious agents emerging from

thawing permafrost and ice in polar climates. The outcome was a helpful state-of-the-science overview and information to help frame new actions that advance research, surveillance, and response capacity. The final report is expected in March of 2020.

Submitted by Tom Douglas, Kevin Bjella, and Robyn Barbato

U.S. Geological Survey

In 2019 the U.S. Geological Survey continued to conduct research in the public interest to provide sound science for decision support to conserve land and water. Thematic areas include permafrost thaw and impacts on carbon cycling, visualization of permafrost through geophysical measurements and remote sensing, hydrologic modeling of thaw and linkages to biogeochemical changes, paleoecology of arctic lakes, and coastal change.

The USGS research contributed to synthesis reports on rapid losses of carbon following abrupt permafrost thaw and a synthesis report on non-growing season losses of soil carbon. Work also continues examining the molecular composition and biodegradability of carbon fractions from vegetation, active layers soils, permafrost and streams. Other work examined *in situ* microbial activity and water availability in permafrost near freezing (within 1°C), highlighting that microbial communities are active under freezing conditions and modify greenhouse gas concentrations. The USGS also continues to examine the use of unmanned aerial systems for determining methane fluxes.

The USGS completed a synthesis of new data products and analyses from the Yukon Flats of Alaska including: 1) airborne geophysical permafrost mapping, 2) clustering of Landsat derived lake-area time series and lake landscape position; and 3) exploration of hydrologic mechanisms and characteristics that influence lake-area dynamics. The results provide a fundamental basis for interpreting on-going lake-area change in the Yukon Flats in the context of permafrost thaw. Permafrost mapping and characterization using electrical resistivity, in situ NMR, and passive seismic techniques are ongoing.

USGS researchers contributed to hydrologic modeling in permafrost

environments. A new modeling study guided by geophysical field evidence from the West Fork Dall Creek watershed in Interior Alaska improved fundamental understanding of processes that enhance and seasonally alter terrestrial-to-aquatic transfer of permafrost carbon, nitrogen, and mercury previously sequestered in thawing watersheds. Additional studies showed how permafrost thaw and mobilization of carbon can be assimilated into invertebrates and fish. New research on Interior Alaskan lakes show they are net CO₂ sinks during the open water growing season. These lakes represent an understudied fraction (~25%) of lakes across the circumboreal that behave differently than the common paradigm of boreal lake heterotrophy and are effectively isolated from terrestrial carbon inputs because of semiarid climate and relatively flat landscapes.

USGS scientists also explored the utility of frozen peat pore-water isotopes as a proxy for paleoclimate and paleo-permafrost growth and thaw. Additional work compared macrofossils to peat DNA for paleoecological reconstruction. Other paleoclimatic work showed thermokarst lake expansion, stabilization, and subsequent climate-driven lake level variations during the past ~10,000 years.

In the area of coastal change hazards, the USGS completed an assessment of the past 80 years of shoreline change along Alaska's north coast. This extends the shoreline change assessment of the north coast of Alaska from the Bering Strait to the U.S.-Canadian border. USGS researchers also assessed the impacts of changes in sediment transport patterns on nearshore habitats from construction of an artificial island deemed for oil and gas exploration purposes near Prudhoe Bay. The USGS Climate and Permafrost Observing Network continues to monitor permafrost borehole temperatures on the North Slope of Alaska.

Finally, USGS scientists continue to be a part of the larger permafrost research community and contribute to synthesis activities with the Permafrost Carbon Network, IARPC, the USPA, the Fourth National Climate Assessment, the State of Carbon Cycle Report, and NASA ABoVE. USGS researchers have presented their findings in numerous journal articles and data

releases, IPCC reports, and national and international meetings including ASLO, ICOP, EGU, and AGU.

Submitted by Mark Waldrop

Oak Ridge National Laboratory Next-Generation Ecosystem Experiments

The Department of Energy's NGEE Arctic project continues to conduct research near Utqiagvik, AK, and has also established three field sites outside Nome, AK, on the Seward Peninsula in western Alaska. Every year since 2011 researchers from the NGEE Arctic project have gathered for two days to discuss plans and accomplishments from the previous year's field, laboratory, and modeling activities. This year was no exception as more than 90 participants in the project, joined by many national and international collaborators, spent two days sharing science from across the project. Team members focused their Day 1 efforts on reviewing 2019 research accomplishments and discussing steps required to migrate new knowledge to the DOE E3SM Earth system model. Early career scientists had an opportunity to share their insights during a Real Science, Real Short session moderated by Verity Salmon, Oak Ridge National Laboratory. Day 2 focused on site descriptions, use of the ILAMB software package, and international synthesis activities. An Arctic Café facilitated round-table discussions and engaged team members on what lies ahead for NGEE Arctic, including possible research topics beyond Phase 3. Kaare Erickson, community liaison with UIC Science in Utqiagvik, AK, spoke at lunch on Sunday and provided an informative and fascinating history of native communities in Alaska, along with personal thoughts on how scientists can better engage local communities. One of many highlights during the meeting was the Data, Safety, and Logistics Awards Ceremony. Dan Stover, sponsor of the NGEE Arctic project, joined the team in awarding plaques to Vladimir Romanovsky (UAF), David Graham (ORNL), Amy Breen (UAF), and Verity Salmon (ORNL). A list of NGEE publications is available: <https://ngee-arctic.ornl.gov/publications>

Submitted by Stan Wullschlegler



NEXT-GENERATION ECOSYSTEM EXPERIMENTS

NGEE Arctic

9th Annual All-Hands Meeting
RIU Plaza Fisherman's Wharf, San Francisco, CA
December 7-8, 2019



University of Alaska Fairbanks

Geophysical Institute Permafrost Laboratory

In 2019, the GI UAF Permafrost Laboratory group has continued to collect data on temperature and active layer depth from about 200 research sites in Alaska. Some of these records go back to the early 1980's. The research sites are distributed all over Alaska with a concentration of sites along the Dalton and Richardson Highways, around Barrow, in the Selawik area, Seward Peninsula, around Fairbanks and in the vicinity of Nikolai Village. (Please visit the website:

www.permafrostwatch.org for locations and to download historical data.) This year's data were processed and quality controlled and will be available from the NSF Arctic Data Center. These data show that ground temperatures continue to increase at almost all locations in Alaska. In the Interior, Seward Peninsula and Selawik region the increase in ground temperature triggered development of a near-surface taliks. At 26 sites where the active layer has been previously freezing completely during the winter, an unfrozen layer (talik) developed during the last

two years. These data were also used to calibrate the Geophysical Institute Permafrost Lab Model (GIPL) at very high spatial resolution. Some results of this modeling for the North Slope of Alaska and Alaska Northwest are presented at the website: <https://permamap.gi.alaska.edu/>. The results of this modeling can be used by any interested person. The GI Permafrost group is starting several new projects on the evaluation of the impacts of thawing permafrost and coastal erosion on several native villages in the North Slope Borough, as well as the City of Fairbanks and Whitehorse. This work will continue for the next five years with results presented in the coming years.

Submitted by Vladimir Romanovsky

Institute of Northern Engineering/Water and Environmental Research Center

INE received several new permafrost-focused, multi-year research awards in 2019 that contribute to the broader efforts of the US Permafrost Association. Notable awards include an NSF-AccelNet award to build an international network of networks focused on permafrost coastal systems (PI Jones), an NSF-NNA award

to develop the Permafrost Discovery Gateway – a new online scientific resource that will document changing permafrost conditions at the sub-meter scale throughout the Arctic (PI Liljedahl), an NSF-EPSCoR award to develop machine learning and multi-dimensional remote sensing techniques for permafrost-region landscape dynamics (PermaSense – PI Jones), and an NSF-P2C2 award focused on rapid permafrost-region landscape changes associated with subsea permafrost degradation, coastal plain permafrost inundation, and pro-glacial lake dynamics (PI Walter Anthony). Additional awards in 2019 were granted by the Alaska DOT&PF program to study frost susceptibility and strength of cement-treated fine-grained soils (PI Darrow) and permafrost protection (PI Goering), by the Army Corps of Engineers/CRREL for soil and water sample analyses associated with expansion of the Fox Permafrost Tunnel (PI Kanevskiy), and by the National Fish and Wildlife Foundation for development of a permafrost-research observatory at Teshekpuk Lake (PI Jones). Also related is the NSF-NNA Fresh Eyes on Ice: Connecting Arctic Communities through a Revitalized and Modernized Freshwater Ice Observation Network (PI Arp). Collectively, INE researchers contributed to more than 30 publications in peer-reviewed journals in 2019. Notable distinctions include, Dr. Yuri Shur being presented with the Eb Rice Award by the American Society of Civil Engineers and its Cold Regions Engineering Division and Dr. Katey Walter Anthony receiving distinction as INE researcher of the year.

Submitted by Ben Jones

International Arctic Research Center

The three-year, NASA ABoVE field project to quantify thermokarst and related carbon release following the historically largest tundra fire on the North Slope (the Anaktuvuk River Fire) was completed by Go Iwahana. During the project, in addition to the Anaktuvuk River Fire, permafrost sampling for analyses of GHG/carbon/ice content and monitoring of thaw depth, surface moisture and displacement were conducted near Utqiagvik, Kougarak in the Seward Peninsula, and Fairbanks. Laboratory studies continued following the 2017 and 2018

visits to the Barrow Permafrost Tunnel in Utqiagvik by researchers from University of Washington (PI: J. Deming) and University of Alaska (Co-I: H. Eicken). A number of permafrost samples including massive ice and cryopeg brine were collected for geocryological analyses. The project is a comprehensive effort to explore the biological diversity and genomics of bacterial, algal, and viral communities in a permafrost cryopeg and sea-ice brines.

The IARC and the Chinese State Key Laboratory of Cryospheric Sciences have initiated a collaboration covering a number of scientific themes. As part of this collaboration, Bob Bolton and T. Wu (SKLCS) are leading an effort comparing the discontinuous permafrost and moisture conditions found on the Seward Peninsula and on the Qinghai-Tibetan Plateau. The goals of this collaborative research include: 1) enhancing understanding differences in high-latitude and high-altitude discontinuous permafrost; and 2) monitoring the long-term impacts of climate change to the hydrothermal regimes in these two environments and include field monitoring and modeling activities.

Submitted by Bob Bolton

Alaska Geobotany Center

The AGC led three permafrost-related efforts in 2019 including work on two NSF grants directed at examining the cumulative impacts of infrastructure and climate change to ice-rich permafrost systems, and a review of the likely effects of proposed three-dimensional (3D) seismic exploration of the 1002 Area in the Arctic National Wildlife Refuge, Alaska. A white paper, edited by Skip Walker and Janet Peirce, and a paper accepted with modification in *Ecological Applications* (Martha Reynolds et al. in press) reviewed the landscape impacts of past 2D and proposed 3D-seismic surveys in the Refuge. AGC is currently synthesizing data collected during an NSF initiative called Arctic Science, Engineering, and Education for Sustainability (ArcSEES) that focused on the cumulative landscape effects of roads and infrastructure in the Prudhoe Bay oilfield. The ArcSEES work laid the foundation for a new award in 2019 titled “Navigating the new Arctic: Landscape evolution and adapting to change in ice-rich permafrost systems (NNA-IRPS)”. The work involves five

UAF institutes [Institute of Arctic Biology (IAB: Skip Walker, Anja Kade, Gary Kofinas, Jana Pierce, Martha Reynolds, Lisa Druckenmiller), Geophysical Institute (GI: Vladimir Romanovsky, Dmitri Nicolsky), Institute of Northern Engineering (INE: Yuri Shur, Billy Connor, Misha Kanevskiy), International Arctic Research Center (IARC: Amy Breen), and the Water and Environmental Research Center (WERC: Anna Liljedahl, Ben Jones, Helena Bergstedt)], the Alaska Division of Geological and Geophysical Surveys (DGGS: Ronnie Daanen), the Cold Climate Housing Research Center (CCHRC: Jack Hébert, Vanessa Stewart), partners in the village of Point Lay and the North Slope Borough, and two international collaborators (Jozef Sibik, Helga Bültmann). The project focuses on evolution of ice-rich permafrost landscapes, the effects of roads in the Prudhoe Bay oil field and the Dalton Highway, and housing issues associated with building on yedoma landscapes in the coastal village of Point Lay.

Submitted by Donald (Skip) Walker

The George Washington University

The Circumpolar Active Layer Monitoring (CALM) program is a network of sites monitoring active layer and near-surface permafrost responses to climate change throughout the polar and select mid-latitude regions. There are approximately 150 annually reporting CALM sites that are maintained by personnel from 11 countries. These include 16 sites in the Antarctic and 40 active sites in Alaska. The program is in its fifth iteration, having been continuously funded by NSF for 25 years. Nikolay Shiklomanov (GWU) is the lead PI on the project assisted by senior personnel, Dmitry Streletskiy, Frederick Nelson, Nathan Moore, and Anna Klene. The project also recently includes Kelsey Nyland as a GWU Postdoctoral Scientist. More information about the program and recent data updates can be found at (<https://www2.gwu.edu/~calm/>), the program website. In July 2019 CALM also supported a field course in cooperation with the NSF-funded project: Promoting Urban Sustainability in the Arctic.

Submitted by Nikolay Shiklomanov and Dimtry Streletskiy

Michigan State University

The periglacial group in Michigan State University's (MSU) Department of Geography, Environment, and Spatial Sciences continues to conduct field, remote sensing, and spatial-analytic research on cryoplanation terraces (CTs), large staircase-like series of periglacial landforms found in abundance in Alaska's Interior and Seward Peninsula regions. Clayton Queen completed his M.S. degree in 2018 and has submitted a series of papers on the geomorphometry of cryoplanated uplands to a peer-reviewed journal. Kelsey Nyland finished her Ph.D. in 2019 and has two papers concerned with age determination on CTs currently in press with the journals *Earth Surface Processes and Landforms* and *Quaternary Research*. Raven Mitchell, currently an M.S. student at MSU, is writing a thesis on the interplay between hillslope hydrology and periglacial mass movements adjacent to the Juneau Icefield Research Program's Camp 29 facility near Atlin, British Columbia.

Submitted by Fritz Nelson

National Snow and Ice Data Center University of Colorado

NSIDC focused on two areas in 2019: remote sensing of Active Layer Thickness (ALT) and mercury in permafrost. We used Interferometric Synthetic Aperture Radar (InSAR) to measure the surface subsidence resulting when the active layer thaws and the ice changes to water. We published a paper using these InSAR techniques on satellite data to quantify fire recovery in the Yukon-Kuskokwin Delta. We also applied the techniques to GPS interferometry to measure the subsidence over the entire thaw season. We are currently funded by NASA's Arctic Boreal Vulnerability Experiment (ABOVE) to combine airborne L-band and P-band radar to simultaneously estimate ALT and soil moisture for 66 flight lines in Alaska and northwest Canada. We also collect and integrate field measurements of ALT and soil moisture to validate the remote sensing products to produce a dataset of 350,000 measurements. In 2019, we extended our observations to Yellowknife, Northwest Territories.

Permafrost contains a great deal of mercury bound to the frozen organic matter. Mercury is a naturally-occurring contaminant that accumulates in organic matter, and thus accumulated in the high latitudes as the organic matter froze into permafrost. We collaborated with the US Geological Survey and the Northern Circumpolar Soil Carbon Database team to process additional samples to improve estimates of mercury stocks. We formed a new collaboration team through the Permafrost Carbon Network to improve estimates of mercury stock by leveraging published measurements. We created a new model of permafrost mercury and made estimates of future releases of mercury from thawing permafrost.

Submitted by Kevin Schaefer

Woods Hole Research Center

The WHRC permafrost-related fieldwork was focused in the Yukon Kuskokwim Delta, Alaska, which is the location of the summer field expedition for the Polaris Project undergraduate research program. We also worked with several Alaska Native communities to set up community-based permafrost monitoring networks. WHRC scientists are also using remote sensing data to detect changes in landscape characteristics associated with climate change and permafrost thaw, including changes in vegetation, surface water, and ground freeze-thaw. The WHRC Arctic group began a new project focused on monitoring and predicting carbon fluxes across the northern permafrost region. We are working with Harvard University's Belfer Center Arctic Initiative to bring this research to the policy community, and have partnered with ESRI to develop new data visualization tool. The WHRC co-hosted Permafrost Day in the Cryosphere Pavilion at the UN Climate Change Conference in Madrid (COP 25), and participated in and led several break-out sessions at the Permafrost Carbon Network annual meeting.

Submitted by Susan Natali

The University of Texas at El Paso (UTEP) Systems Ecology Laboratory

Funded by NSF, NASA, NOAA, and DHS, UTEP faculty spanning the Department of Biological Sciences and the Environmental

Science and Engineering programs maintained a range of research and education projects in the Arctic related to permafrost dynamics and/or permafrost landscapes. Sites near Utqiagvik, Atkasuk, Toolik Lake, and Innaviat Creek are partnered to the International Tundra Experiment (ITEX) that explore the responses of tundra ecosystems to warming. Our participation in NASA-ABOVE is focused on improving the representation of plant functional types as indicators of microtopography, soil moisture and other ecosystem parameters in land cover classifications; and developing new methods for using Solar Induced Fluorescence to monitor photosynthetic function and advance Arctic carbon cycle research. Our participation in the new NSF-funded Beaufort Lagoon Ecosystems Long Term Ecological Research project is exploring spatiotemporal patterns and controls, and the fate and transport of land-lagoon exports from runoff and coastal erosion. Students in the NOAA-CESST program are innovating ground to satellite remote sensing approaches for studying coastal dynamics. TeamVole is exploring the impact of herbivory on ecosystem processes at multiple localities on the North Slope and Seward Peninsula. Annually we host field schools for both the Arctic Summer Internship Program at the DHS-funded Arctic Domain Awareness Center and the NSF-funded Research Opportunities in the Arctic for Minorities (ROAM2) program at UTEP.

Submitted by Craig Tweedie.

University of Virginia, Department of Environmental Sciences

The Arctic field group at UVA (Howie Epstein, Claire Griffin, and Kelcy Kent) are collaborating on an NSF-funded project led by Anna Liljedahl (also with Torre Jorgenson, Misha Kanevskiy, Ronnie Daanen, and Yuri Shur) to study the dynamics of ice wedges (degradation and aggradation) in polygonal landscapes of the Alaska North Slope and Coastal Plain. We are working at three locations: Jago River in ANWR, Deadhorse / Prudhoe Bay, and Utqiagvik (Barrow). Our group is focusing on the ecology and biogeochemistry of the dynamic ice-wedge complexes, examining the vegetation, and carbon and nitrogen cycling components in

soils and surface water, as ice wedges degrade and potentially re-stabilize.

Submitted by Howard Epstein

Permafrost Carbon Network

The Permafrost Carbon Network facilitates synthesis of permafrost carbon science and communicates our current understanding to help society respond to a rapidly changing Arctic. Our two science highlights in 2019 were: 1) a comment piece in *Nature* (Turetsky et al. 2019; doi:10.1038/d41586-019-01313-4) showing that sudden collapse of thawing soils in the Arctic might double the warming from greenhouse gases released from tundra and 2) a synthesis of winter carbon dioxide emissions published in *Nature Climate Change* (Natali et al. 2019; doi:10.1038/s41558-019-0592-8, 2019). The study provides a baseline for winter carbon dioxide emissions from northern terrestrial regions and shows that winter emissions can offset carbon gains during the growing season. Members of the steering committee of the Permafrost Carbon Network participated and contributed to the Arctic Futures 2050 conference held in Washington, DC, in September of 2019. The Permafrost Carbon Network organized its 9th Annual Meeting in San Francisco, CA, December 8, 2019 with 130 participants in attendance. Synthesis leaders and co-leaders presented updates on synthesis activities in the morning and smaller breakout discussions in the afternoon focused on individual syntheses as well as new emerging topics. www.permafrostcarbon.org

Submitted by Christina Schädel

Permafrost Young Researchers Network (PYRN)

The Permafrost Young Researchers Network (PYRN) is an international organization established under the patronage of the International Permafrost Association (IPA) that fosters innovative collaboration, and seeks to recruit, retain and promote future generations of permafrost researchers. Its website currently lists 1,418 members and provides a newsletter of current activities: <https://pyrn.arcticportal.org/>. The current President, Helena Bergstedt, has recently taken a post-doctoral position at the University of Alaska Fairbanks working in the Water and Environmental Research Center at the

Institute of Northern Engineering. The PYRN Executive Committee submitted a letter of support to restore budget cuts to the University of Alaska system.

https://pyrn.arcticportal.org/images/docs/Reports/PYRN_letter_budget_cuts.pdf

PYRN Early Career Researcher (ECR) groups are involved in reviews of Intergovernmental Panel on Climate Change (IPCC) reports and its Sixth Assessment Report (AR6): *The Physical Science Basis*. PYRN, along with the Past Global Changes Early Career Network (PAGES-ECN), the United States Association of Polar Early Career Scientists (USAPECS), and the Young Earth System Scientists (YESS), is part of a Project Group involved in preparation of the Second Order Draft (SOD) of the IPCC AR6. Currently there are 16 PYRN representatives on the SOD-WGI-AR6, with Helena Bergstedt, Rebecca Finger Higgs, and Matthew Whitley representing the USA. This effort is important to the permafrost community as it engages early career researchers in IPCC activities, improves the overall quality and diversity of the content in IPCC reports, provides valuable editing and organizational challenges for young researchers, and generally provides exposure to PYRN and the permafrost community. The North American chapter of PYRN was approached by ECRs from Chile to improve collaboration in permafrost endeavors. PYRN continues the process of conducting its second census, in an effort to complete demographic and statistical information of its members.

Submitted by Matthew Whitley, U.S. PYRN Representative

Alaska Ecoscience

Torre Jorgenson collaborated on several permafrost-related projects in 2019. On Yuri Shur's NSF project related to the upper permafrost, he participated in field studies at Bylot Island, Itkillik River, Toolik Lake, and along the Dalton Highway to quantify permafrost characteristics in the intermediate layer. As part of the outreach for the project, Jorgenson worked with the Denali Park (Gosling Lake), the Koyukuk Refuge (Two Lakes) and the Innoko Refuge (Innoko Flats) to develop their thermokarst monitoring programs. As part of

Anna Liljedahl's NSF polygonal ecosystems project, Jorgenson has been analyzing ecosystem changes in response to ice-wedge degradation at the Jago site in ANWR and at Prudhoe Bay. In collaboration with Tom Douglas's Strategic Environmental Research and Development Program (SERDP) project on climate change effects on permafrost-affected habitats, research focused on remote sensing of ecological state

transitions associated with permafrost degradation and fire, as well as continuing thermokarst monitoring on the Tanana Flats. As a contribution to Michele Walvoord's ABoVE permafrost hydrology project, Alaska Ecoscience has continued monitoring of four thermal erosion gullies along the Dalton Highway, Alaska.

Submitted by Torre Jorgenson

Report compiled by Jerry Brown, Chair, USPA Membership Committee

In Memoriam of USPA Members

Hugh French, Professor Emeritus, University Ottawa, May 2019

https://www.uspermafrost.org/In_Memoriam/In_Memoriam_French.shtml

William Wayne, Professor Emeritus, University of Nebraska, November 2019

<https://news.unl.edu/newsrooms/today/article/obituary-william-bill-john-wayne/>

Robert H. Rutford, University of Texas Dalla, Professor and Emeritus President, December 2019

<https://americanpolar.org/about/leadership/robert-h-rutford-phd/>

Corporate and Institutional Members

We thank our Corporate and Institutional members, sponsors and donors both in Alaska and in the "Lower 48" for their continued involvement and generous support.

Corporate Members

Alaska Ecoscience
 Arctic Foundations Inc (Life member)
 GW Scientific
 Onset Computer Corporation
 Northern Geotechnical Engineering-TFT
 PND Engineers Inc
 R&M Consultants Inc
 Shannon and Wilson Inc

Institutional Members

American Geosciences Institute
 Arctic Research Commission
 International Arctic Research Center
 Institute of Northern Engineering-WERC
 National Snow and Ice Data Center
 University of Texas El Paso, Systems Ecology Lab
 University of Virginia, Dept. Environ. Sciences
 Woods Hole Research Center

Sponsors and Donors include Arctic Foundations Inc, Campbell Scientific Inc, Geo-Watersheds Scientific, James W. Rooney, and John Zarling.

