

Thawing Ground

A Newsletter of the US Permafrost Association



Big Idea, Big Funding, Big Results: Permafrost Discovery Gateway

The mission of USPA is to advance permafrost science and engineering, support career development for students and early-career professionals, and facilitate international collaborations.

This issue celebrates the fantastic work being done at Woodwell with their Permafrost Discovery Gateway. We'll cover its history, goals, early donors, people involved, programs and (big) data, results, outreach, and its future. There's a lot to unpack in two pages. Buckle up for a cool ride!

USPA Leaders

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The Active Layer:

What is PDG Anyway? Who's Paying for All This?

The Permafrost Discovery Gateway (PDG) is “an online platform... for creating, analyzing, and visualizing big geospatial permafrost products to enable knowledge-generation about the changing Arctic landscape.” It was created in 2019 as part of the National Science Foundation’s (NSF) Arctic Data Center (ADC), which is a centralized hub for researchers, educators, and the wider public. It is also part of NSF’s Navigating the New Arctic (NNA), which I’m sure you know about. PDG’s purpose is to “provide researchers, planners, policy makers, educators, and the public... with timely monitoring of permafrost thaw and its implications,” so it follows right along with the ADC’s mission and certainly aligns with Woodwell’s mission of conducting “science for solutions at the nexus of climate, people, and nature—solutions that are urgently needed to propel us toward a more equitable, healthy, and sustainable world.”

To fund this big idea, NSF got the ball rolling with a \$3M grant to run from 2019-2024. Google came onboard with another \$5M for the years 2023-2026 to allow expansion.

PDG is all about “big data.” The box below has an intro to “V” words.



Anna Liljedahl

Who's Going to Develop PDG and Deliver Results?

Creating a new program is a huge lift, but once it's up and running, people want to see results, a return on investment. (Spoiler alert: they're rockin' it.) You need strong leadership and a solid, dedicated team. PDG is led by USPA-member and former president, Anna Liljedahl.

Others on the team include Michael Brubaker*, Chandi Witharana*, Wenwen Li, Kenton McHenry*, Matt Jones, Guido Grosse, Helene Genet*, Brendan Rogers*, and Jason Cervenec. There are also 20 current and 3 previous contributors. * USPA member



Chandi Witharana



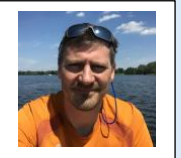
Wenwen Li

Big Data: All Those “V” Words

Clever folks have described big data using “v” words: volume, velocity, and variety. We can now obtain lots of data really fast and of many kinds. If three words isn't enough, there are now seven more we can use.

Results: *What Have They Done ?*

- * Gathered feedback from their prototype to ensure they were developing useful tools.
- * Generated real-time data using Sentinel, Landsat, MODIS, and commercial satellite imagery from the Polar Geospatial Center and Planet.
- * Developed software that can be accessed and used with a regular Internet browser.
- * Created a website that is user-friendly to all and includes how-to sections.
- * Made software open-sourced, so it can be adapted by others, like glacier researchers.
- * Used less expensive non-standardized software.
- * Contributed to IPA Action Group Retrogressive Thaw Slump Inventory
- * Included a “storytelling” section to put the human face on the regions we study.
- * Welcomed 15 Google fellows for six months in 2024.
- * Welcomed focus groups in Jan-Feb of this year to hear what they wanted out of PDG. And paid them for their feedback!



Clockwise from top left:
Michael Brubaker,
Kenton McHenry,
Helene Genet,
Guido Grosse,
Matt Jones

Education: *Is PDG Just for Researchers?*

NO! It’s for everyone—kids, adults, grandparents, the interested public, policy makers. Everyone.

“Using the Gateway, students are exposed to machine learning for processing big data, which helps to expand our understanding of complex global issues.” OK, when I was in grade school in the 1960’s, we didn’t have many of these words. The term “global” evoked an image of a TWA plane going somewhere far away, places we only saw in *National Geographic*, places we frankly didn’t need to care about. Or so we thought. Now....

Lesson plans for every level from K to 12 to undergraduate, are being developed and will be available to all through open sourcing. In the meantime, teachers can guide students through a neat virtual tour of the famous permafrost tunnel, learn the vocabulary, and take an online course entitled *Elements of Permafrost Science* created by the Research Council of Norway. Armed with this foundation knowledge, they can begin to use the PDG technology using a step-by-step guide.

Mood Board: *What Excites Them?*

Well, there’s impacting what science can do, assisting rural communities to have safe and healthy futures, policy-ready geospatial products, cutting edge AI to help communities cope, understanding and controlling climate change, impacting trajectory of mitigation programs, understanding the complete story, representing implications of abrupt thaw, on-the-ground decision making, and education and outreach.

Permafun Corner



Is “vulnerability” one of the ten “V” words in big data?

The Latest: *Infrastructure Risk Update*

In *Nature Portfolio Communications Earth and Environment*, Manos, Witharana, and Liljedahl report on the use of satellite imagery to 0.5m resolution, deep learning, and OpenStreetMap to more comprehensively predict the risk of both physical damage and the dollar cost of it for 285 Alaskan communities. Their map doubled what we knew about building and road infrastructure locations in permafrost areas, a critically important forward step, since Alaska is not nearly as granular on the built environment that we are in the Lower 48. Further, the U.S. has not previously included permafrost thaw hazards in its risk assessments. That’s a big mistake, on the order of \$37B to \$51B. Big mistake. Big correction. THANK YOU, PDG!

[Permafrost Discovery Gateway](#)

PDG link

Return on Investment: *Has PDG Delivered?*

I would say “WOW, YES!!” When Anna Liljedahl said, “We can do better than that,” in her presentation with IARPC in December 2024, I am guessing she didn’t say that just once, but that this is her mantra every day.

Permafrost Discovery Gateway, you *are* doing better, and we can’t wait to see what come next!

Membership Renewal Reminder

Haven’t renewed your membership yet? Please do. Here is the link:

[https://uspa.memberclicks.net/join-now-](https://uspa.memberclicks.net/join-now)

The Future: *What’s on Tap? (A lot.)*

- * Lake drainage tool for real-time information
- * Pan-Arctic data on ice-rich polygons
- * Pan-Arctic infrastructure map
- * Pan-Arctic summary statistics (helpful for the lay public)
- * AI mining of the LEO network to integrate this data
- * Additional layers of data
- * Lesson plans teachers can build upon, including use of AI

Yes! So, we need to keep an eye on how we’re using it.

A HUGE THANK YOU TO OUR CORPORATE AND INSTITUTIONAL MEMBERS!



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