

THE ARCTIC LANDSCAPE EXPLORER (ALEX) – AN ARCTIC PASSION PERMAFROST SERVICE

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Near the Native Village of Point Lay (Iñupiaq: Kali) on Alaska's Chukchi coast, a lake drained into the nearby Kokolik River in August 2016. Not an uncommon occurrence, as dozens of lakes in Alaska have disappeared in recent years. However, the lake was used as a freshwater source for the village, forcing the community to find an alternative supply ([see this news article](#)). This individual example shows us how communities living on frozen ground are directly affected by rapid changes in their lands.

And lake drainage is just one example of how permafrost degradation is changing the Arctic landscape. Others include coastal and river erosion, thaw slumping, and other thermokarst processes. Forest and tundra fires can also have profound impacts on the underlying permafrost. But where are these changes occurring and how do we know about them? While they often go unnoticed and undocumented in areas away from human settlements, many communities have first-hand knowledge of local problems with erosion and thaw subsidence. In other places, such as remote campsites, mines, along coastlines or roads, such changes are sometimes less noticed. Remote sensing analysis can reliably detect and quantitatively assess these key permafrost region disturbances, helping to make the dynamics of permafrost landscapes visible to everyone.

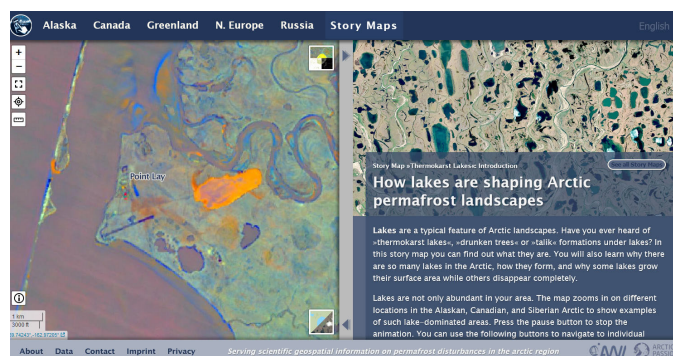
To make these often complex and large remotely sensed change data widely accessible and easily explorable, we have developed the [Arctic Landscape Explorer](#), or ALEX in short. The online tool features an easy-to-use map interface and seamlessly integrated story maps. This interactive approach combines map content with multimedia elements and narrative storytelling, encouraging users to engage more deeply with the map content. Users are guided step-by-step to read and explore the map to gain a better understanding of the spatially explicit data - and see for themselves where the permafrost landscape is changing or rather stable.

f Change data visualizes disturbance trends associated with abrupt permafrost degradation during a 20-year period. Based on 30 m resolution multispectral Landsat-5 TM, Landsat-7 ETM+, and Landsat-8 OLI imagery (with cloud-cover less than 80%, in the 15ths of July and August), the Tasseled Cap multi-spectral index was calculated to translate the spectral reflectance signal to information of Brightness, Greenness, and Wetness.

t Coastal erosion (a change trend where a land surface transitions to a water surface) is depicted in dark blue colors, while coastal accretion (a change where a water surface transitions to a land surface) is depicted in bright orange colors. Drained lakes appear in light yellow or orange colors, depending on the soil conditions and vegetation regrowth. Fire scars can appear in different colors, depending on how long ago the fire occurred and how much vegetation has grown back since.

In the ALEX tool, you can view trends for changes in Brightness, Greenness, and Wetness individually, select different background layers, including a high-resolution satellite basemap, switch to full-screen mode, locate yourself, measure distances, and learn more about the data sources used. But try it out yourself: <https://alex.awi.de>

As we plan to add more features and more story maps, we would appreciate your feedback. Let us know what you are missing or how the free service could be improved - or let us know what changes you have explored and which surprising discoveries you made with the help of ALEX.



The Arctic Landscape Explorer (ALEX) with change data for Point Lay on the left and a story map about thermokarst lakes on the right.



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