Permafrost Encyclopedia Article

Permafrost

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Permafrost

About 20% of Earth's surface is covered by permafrost, land that is frozen year-round. Permafrost occurs at high latitudes or at very high altitudes—anywhere the mean annual **soil temperature** is below **freezing**. About half of Canada and Russia, much of northern China, most of Greenland and Alaska, and probably all of **Antarctica** are underlain by permafrost. Areas underlain by permafrost are classified as belonging to either the continuous zone or the discontinuous zone. Permafrost occurs everywhere within the continuous zone, except under large bodies of **water**, and underlies the discontinuous zone in irregular zones of varying size. Fairbanks, Alaska, lies within the discontinuous zone, while Greenland is in the continuous zone.

The surface layer of soil in a permafrost zone may thaw during the warmer months, and the upper layer of the frozen zone is known as the permafrost table. Like the **water table**, it may rise and fall according to environmental conditions. When the surface layer thaws, it often becomes waterlogged because the meltwater can only permeate slowly, or not at all, into the frozen layer below. **Partial melting** coupled with irregular drainage leads to the creation of hummocky **topography**. Walking on permafrost is extremely difficult, because the surface is spongy, irregular, and often wet. Waterlogging of the surface layer also causes slopes in permafrost areas to be unstable and prone to failure.

Permafrost provides a stable base for construction only if the ground remains frozen. Unfortunately, construction often warms the ground, thawing the upper layers. Special care must be taken when building in permafrost regions, and structures are often elevated above the land surface on stilts. The Trans-Alaska Pipeline, along much of its length, is elevated on artificially cooled posts, and communities in permafrost regions often must place pipes and wires in above-ground conduits rather than burying them. Even roads can contribute to warming and thawing of permafrost, and are generally built atop a thick bed of gravel and dirt.

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Creep