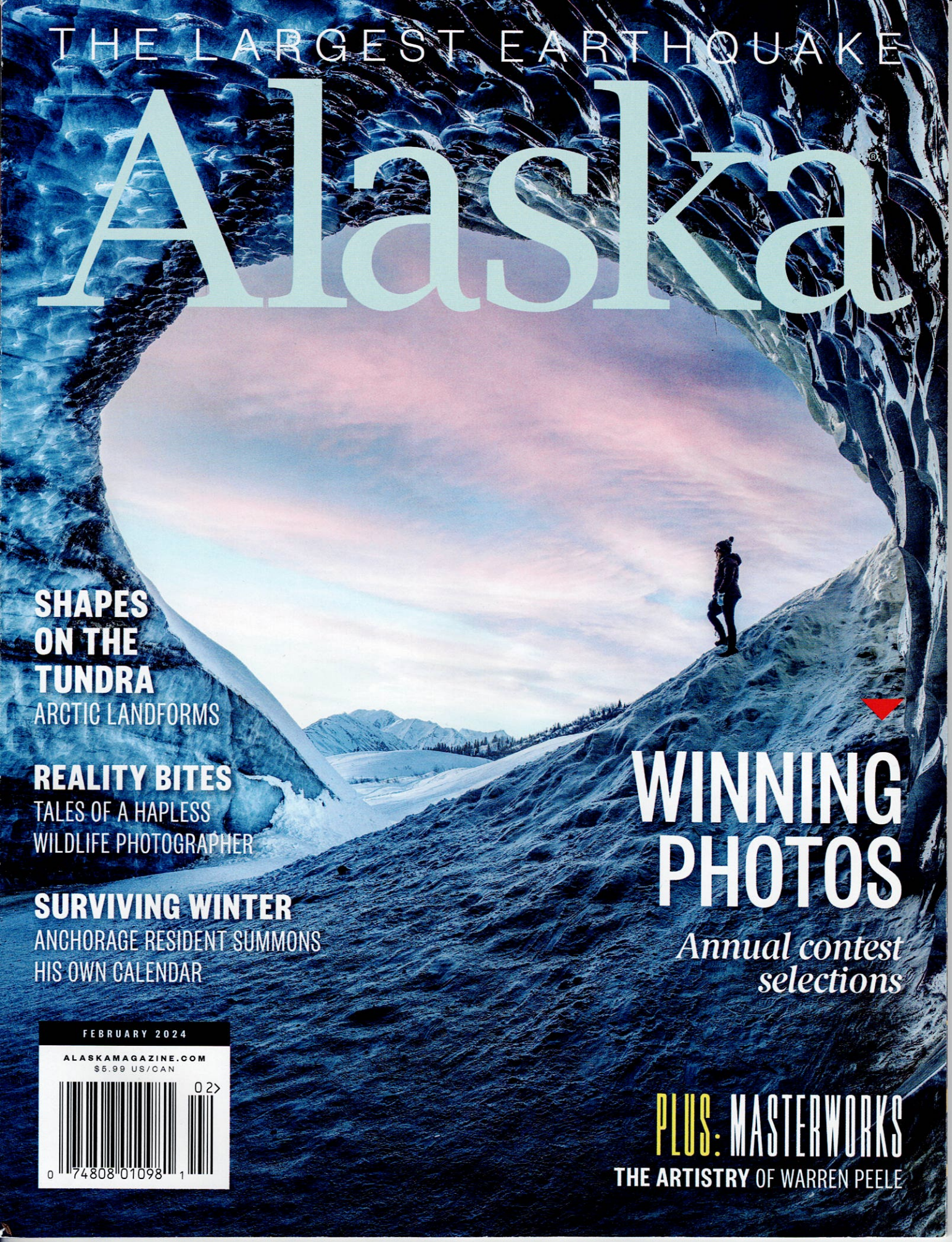
THE LARGEST EARTHQUAKE

Alaska®



SHAPES ON THE TUNDRA
ARCTIC LANDFORMS

REALITY BITES
TALES OF A HAPLESS WILDLIFE PHOTOGRAPHER

SURVIVING WINTER
ANCHORAGE RESIDENT SUMMONS HIS OWN CALENDAR

WINNING PHOTOS

Annual contest selections

PLUS: MASTERWORKS
THE ARTISTRY OF WARREN PEELE

FEBRUARY 2024
ALASKAMAGAZINE.COM
$5.99 US/CAN
02>
0 74808 01098 1

NATURAL ALASKA

SHAPES ON THE TUNDRA

ART CREATED BY PERMAFROST

by Melissa Ward Jones

THE WIND HOWLS ACROSS the tundra of Alaska's Arctic Coastal Plain, a vast lowland north of the Brooks Range, bordered by the northern Chukchi and Beaufort seas and underlain by perennially frozen ground: permafrost. The flatness here reminds me of my early childhood on the Canadian prairies where we had to bungee cord our garbage cans to the porch railing to avoid having them fly away.

I am with my then two-month-old who needs a diaper change, fast. There are limited options to get out of the wind, so I end up changing her in a depression that provides her shelter but leaves me exposed. The site does not feel like anything special, but the depression is elongated and composed of plants and occasional ponds. It connects to other identical recessions forming intersections, which surround mounds or align with ridges. On the ground, this network may not seem remarkable, but a look from above shows the intricate beauty of these landforms.

Aerial images reveal interconnected dips with polygon centers. These polygons vary in size from three- to six-sided geometric shapes, fitting together like puzzle pieces. Less often, fields of squares can be seen along large waterbodies. These landforms are called ice wedge polygons, and they captured my heart 10 years ago when I was a graduate student in the Canadian Arctic, before I came to work at the University of

Above: A field of ice wedge polygons. Caribou trails at the top of the photo show the scale.

Right: A partial exposure of ice wedge ice in the shore of a recently drained lake basin. This ground ice type creates many of the shapes seen on the tundra.

Alaska Fairbanks, where my research is funded by NASA. Ice wedge polygons create commonality within the Arctic; they are the most universal and characteristic permafrost feature. Polygons also encompass the coastal plain, covering an estimated 60 percent of the land surface.

The depressions surrounding the polygons are called ice wedge troughs, and these continuous geometric networks are created by thermal contraction cracks. During the coldest winter months, sudden large drops in temperatures tighten the ground and cause it to fracture, typically in 120-degree angles, creating polygons. Ground cracking can also cause ground shaking and explosive sounds. Alaska Natives who lived on the tundra in sod houses told stories of the earth trembling like mini earthquakes in the winter. Former soldiers stationed at various arctic research stations in the circumarctic after World War II reported bombs going off, but after searching to verify the blast, they were met with a quiet and still tundra. In the spring, snowmelt infiltrates the cracks, and the permafrost freezes it into ice. When this cracking-water-infiltration-freezing cycle repeats over long periods of time, significant amounts of ground ice accumulate.

The flatness of the Arctic Coastal Plain and ground ice sourced from ice wedge troughs creates an ideal environment for lakes to form. When lowland permafrost containing ice wedges thaws, lakes are created and will persist as long as the permafrost enveloping the lake water remains intact. When you look at a map of northern Alaska in areas from Point Lay to Utqiaġvik to Prudhoe Bay, the landscape looks like organized Swiss cheese. The land is covered in lakes that are generally elliptical shapes, ranging up to 10 miles long and four miles wide.

Most lakes are oriented with the longest axis running north to south. Scientists are not sure why, and the topic is not without controversy among researchers. The dominating hypothesis is related to wind erosion along the long axis, as these lakes sit perpendicular to the prevailing wind direction.

These lakes can and do drain, leaving imprints on the landscape of former lakeshores. Lake drainage can occur by various mechanisms such as riverbank migration or out flow of an ice wedge trough. These scars of former lakes help create a visual stacking of shapes: younger water-filled lakes surrounded by multiple overlapping outlines of old lakeshores that have reverted to tundra and are covered by a diversity of polygons, representing new cracking when those surfaces became exposed to the arctic cold. You can also see polygons along the beds of lakes, delineating ice wedges that have not yet completely melted.

This dynamic geometry on the landscape represents the different stages of a cyclical process that has been ongoing for thousands of years and continues today. This patterned ground spectacularly complements other shapes including linear caribou tracks and meandering rivers. The next time you fly over northern Alaska, take a look out the window to explore the wonderful world of shapes on the tundra.

Melissa Ward Jones is an assistant research professor at the University of Alaska Fairbanks.