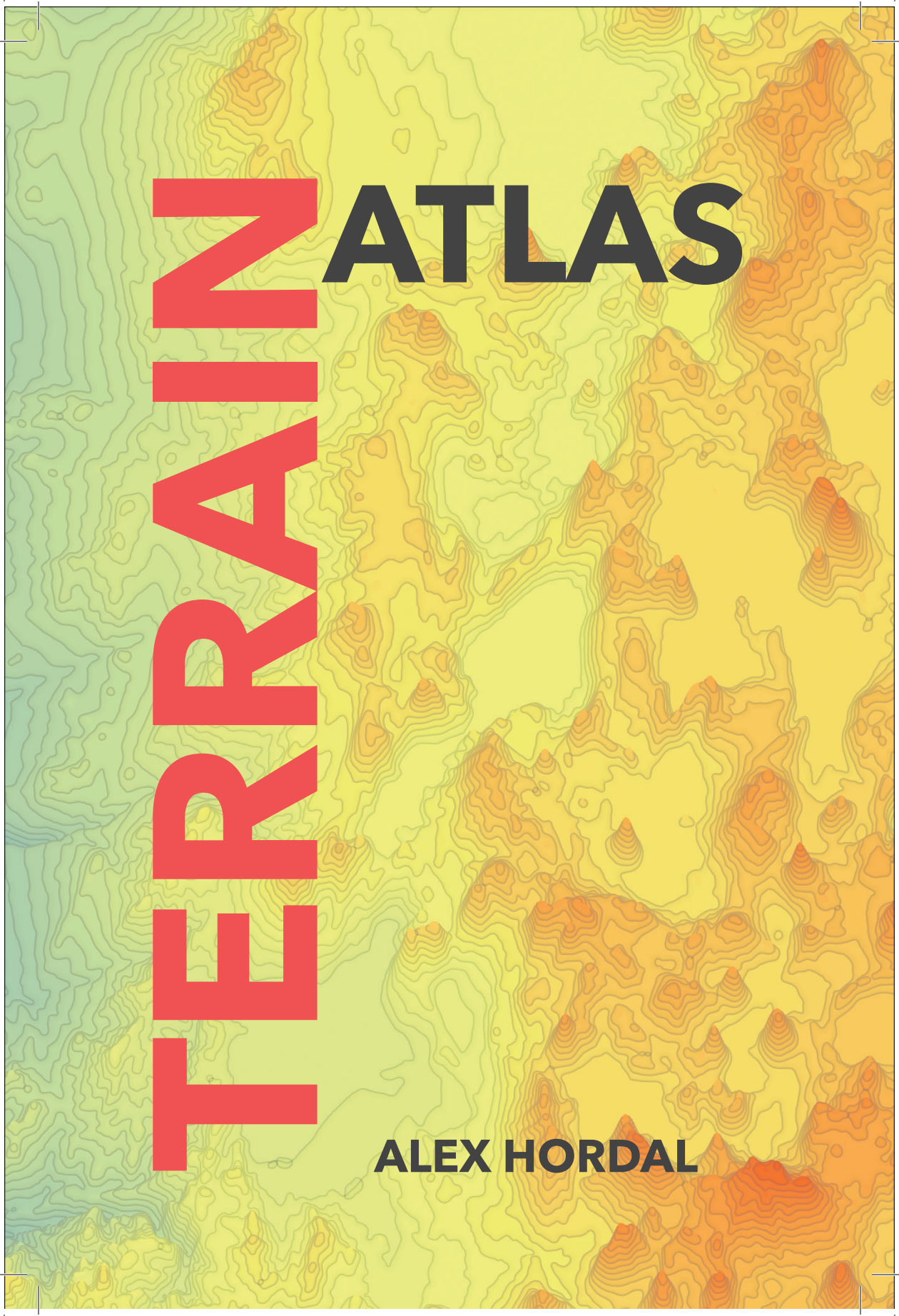

TERRAIN
ATLAS
ALEX HORDAL

TERRAIN ATLAS

ALEX HORDAL

This relief atlas is produced as a portion of the requirements of the GIS: Cartography and Geovisualization program of the Centre of Geographic Sciences, NSCC, Lawrencetown, Nova Scotia. The product is unedited, unverified and intended for educational purposes only.

Centre of Geographic Sciences
COGS | nscc

Cartography by Alex Hordal, 2026

TABLE OF CONTENTS

PREFACE

This relief atlas presents a small collection of terrain labs created in CRTY 1025: Visualizing Terrain and 3D Representations as part of the Cartography and Geovisualization program at the Centre of Geographic Sciences (COGS), Nova Scotia Community College (NSCC).

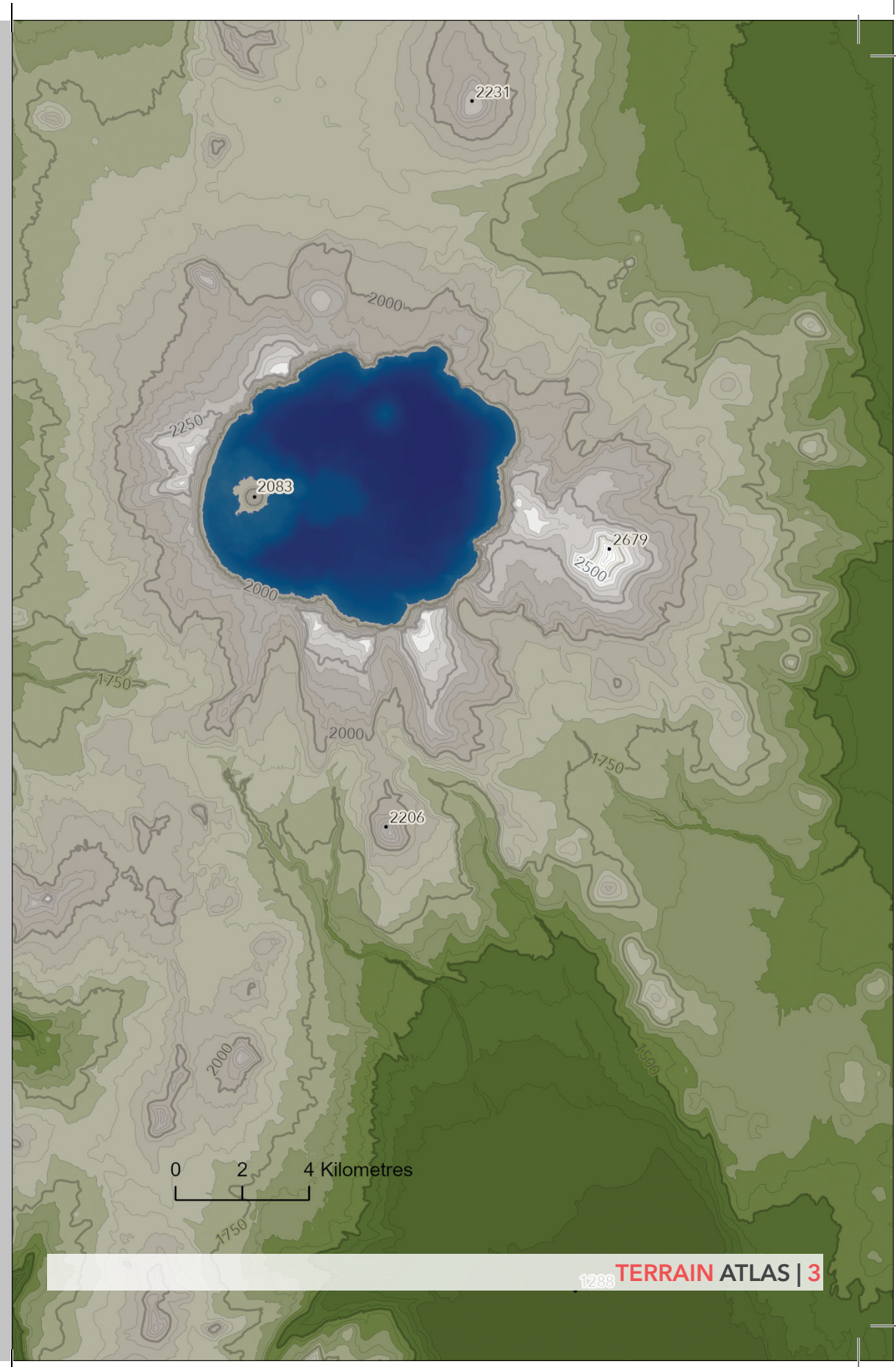
The reliefs explore a range of techniques for visualizing terrain, including hypsometric tinting and spot heights, false-colour image enhancement (a personal favourite), enhanced hillshading, an enhanced hillshade with added filters, relief inspired by Eduard Imhof, orthographic terrain rendering in Blender, and a more artistic interpretation of terrain inspired by John Nelson.

CRATER LAKE, OREGON, USA

CONTOURS, SPOT HEIGHTS AND HYPSO TINTS

This relief depicts the topography and bathymetry of Crater Lake, Oregon—the deepest lake in the United States—which formed approximately 7,700 years ago when Mount Mazama erupted and the magma chamber subsequently collapsed (National Park Service, n.d.).

This map was created in ArcGIS Pro using terrestrial and bathymetric digital elevation models (DEMs) obtained from the United States Geological Survey (USGS). Elevation-band polygons were derived from the terrestrial DEM using the Contour Polygon tool at 250 m and 50 m intervals for index and intermediate contours, respectively, and coloured using hypsometric tinting to represent elevation bands. The bathymetric DEM was symbolized directly using hypsometric tinting. Spot heights were added to provide additional elevation reference.



THE ISTHMUS OF PANAMA, 1794

FALSE COLOUR IMAGE ENHANCEMENT

This relief depicts a false-colour representation of cartographer Thomas Jefferys' nautical chart T*he Isthmus of Panama with the coast from Great River* [current-day Río Chagres or Chagres River] *on the Mosquito Shore* (Nicaragua and Honduras) *to Cartagena, Colombia* (David Rumsey Map Collection, n.d.).

The chart was imported into Adobe Photoshop, where it was appropriately trimmed to size, and various colouring techniques were applied using different brush sizes, opacity settings, and blending modes. Selections were used to control the colouring of more precise features, including the compass rose and the map's neatline, and were saved within the document so they could be adjusted quickly as needed.

Colour was applied selectively to provide contextual information. Light blue with low opacity was used to indicate reefs and shallow water, dark green to emphasize mountainous terrain, darker blue for rivers, and light brown to represent the coastline. This approach preserved the character of the historical chart while enhancing geographic features.

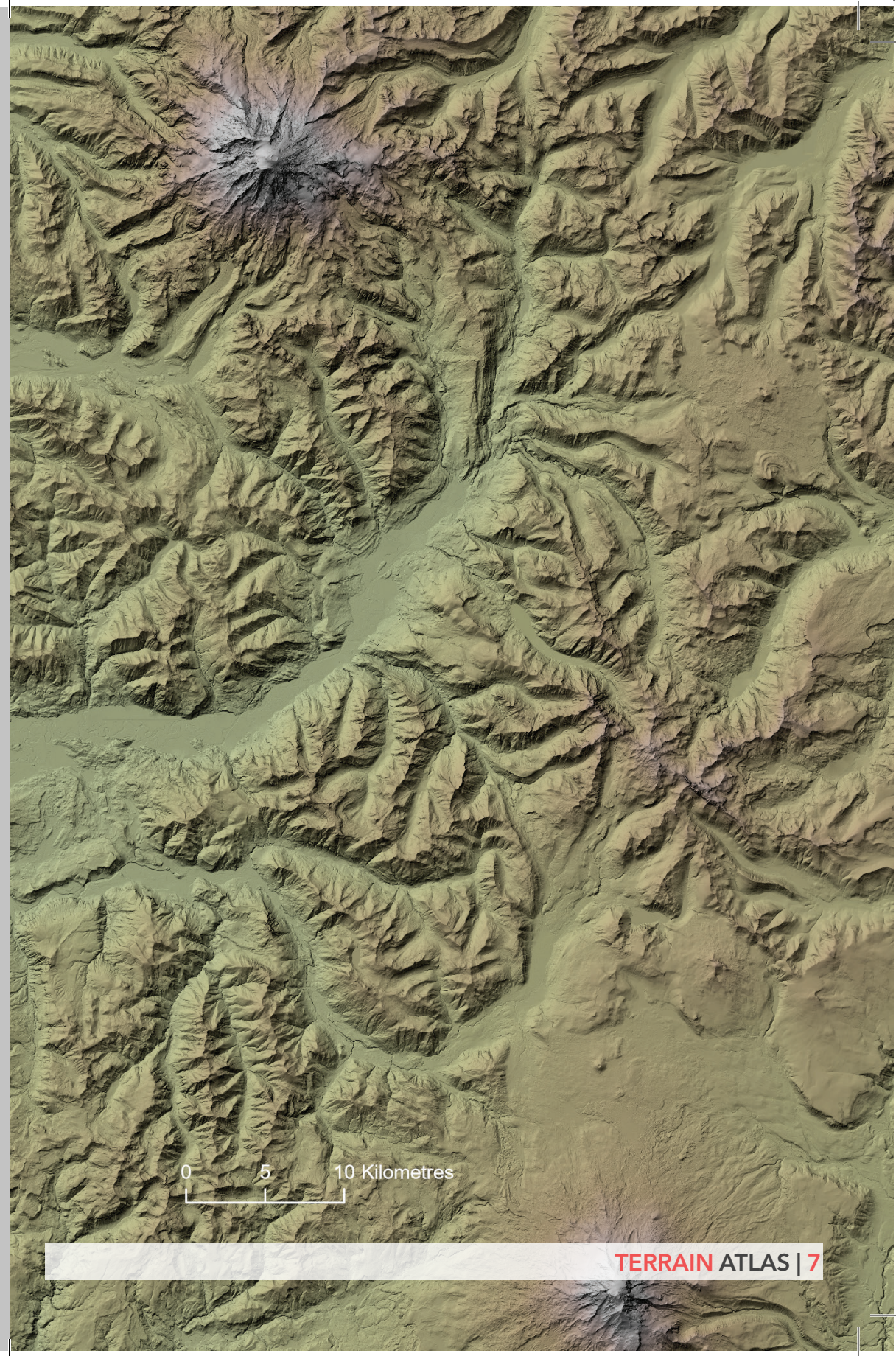
ENHANCED HILLSHADE

MOUNT RAINIER, WASHINGTON, USA

This relief depicts an enhanced hillshade of Mount Rainier, a 14,410-ft stratovolcano and the most glaciated peak in the contiguous United States, with 28 named glaciers (National Park Service, n.d.), and Mount Adams, a secondary volcano located to the southeast.

This relief was created in ArcGIS Pro by generating several terrain representations from a digital elevation model (DEM), including three hillshades, a shaded relief image, and a hypsometric tint. The hillshades were produced using different altitude and vertical exaggeration values to represent terrain under multiple illumination conditions. When combined, these variations allowed both subtle and exaggerated landforms to be emphasized.

Once exported as raster images, these layers were combined in Adobe Photoshop to create a composite relief image. By stacking the hillshades, shaded relief, and hypsometric tint layers, and using selection techniques to highlight ridgelines, it was possible to produce a more visually detailed and natural representation of the terrain.

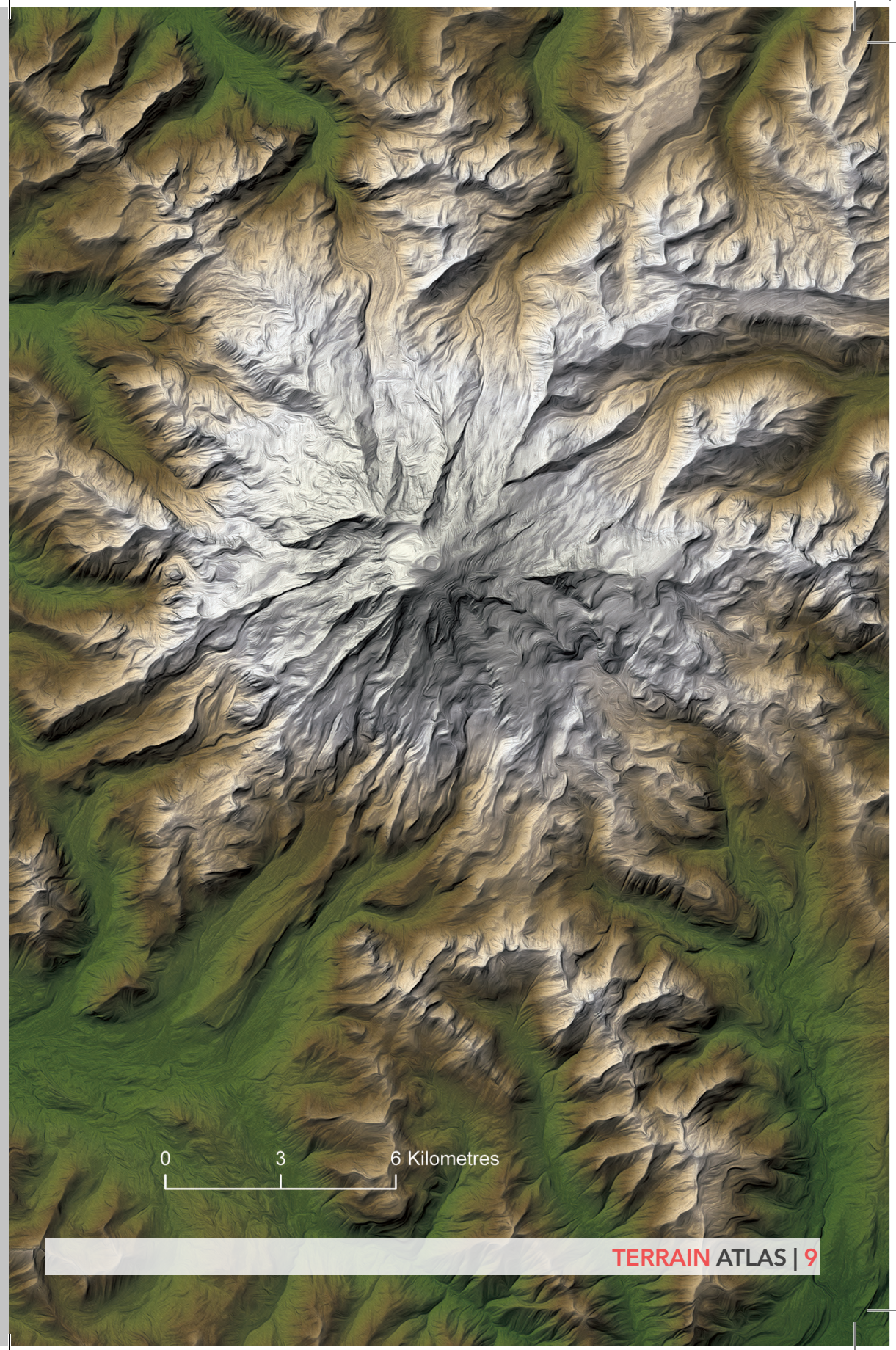


MOUNT RAINIER, WASHINGTON, USA

ENHANCED HILLSHADE WITH FILTERS

This relief builds upon the enhanced hillshade of Mount Rainier by following the same workflow in ArcGIS Pro and Adobe Photoshop, using the same DEM and composite hillshading techniques. The hillshades, shaded relief, and highlighting layers were combined into a single composite image before additional stylistic processing was applied.

Once the hillshades, shaded relief, and various highlighting layers were combined into a single image, the image was stylized with the *Oil Paint* filter to transform its visual character. By adjusting the brush stylization, cleanliness, scale, bristle detail, and lighting options, I created the desired effect of a hand-painted oil painting by smoothing textures and replacing fine detail with brush-like strokes. The resulting brush strokes naturally follow and emphasize terrain features while maintaining terrain interpretability.



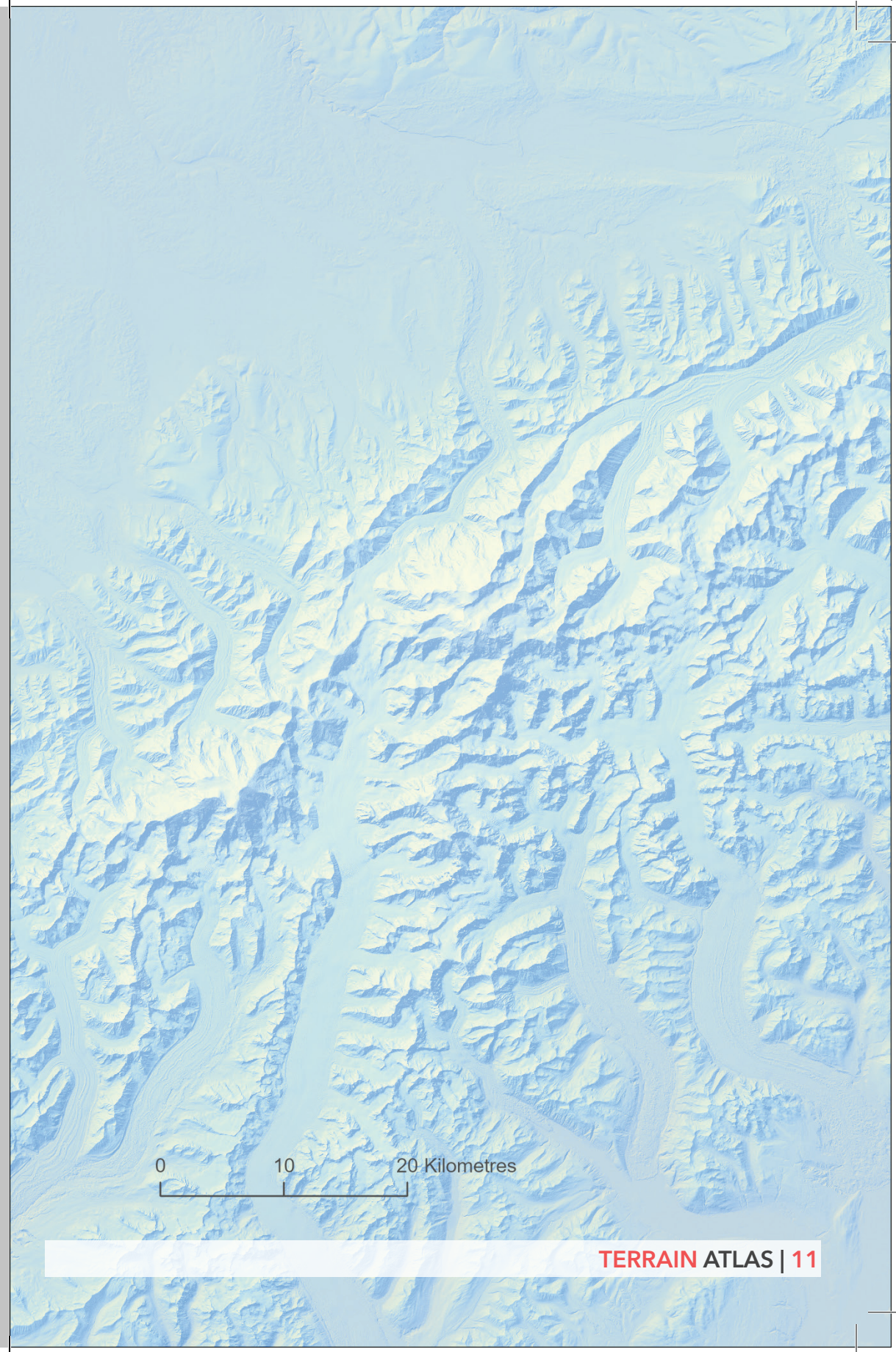
IMHOF INSPIRED RELIEF

MOUNT MCKINLEY, ALASKA, USA

This relief depicts Denali (formerly Mount McKinley) in the Alaska Range, the tallest mountain in North America at 20,310 ft, and is inspired by the relief representation techniques of Swiss cartographer Eduard Imhof.

Created in ArcGIS Pro, the process began by generating a hillshade from a USGS DEM using a standard azimuth of 315˚ and an altitude of 45˚, representing oblique lighting from the northwest. Additional hillshades were generated using raster calculations to simulate an aerial perspective, with higher elevations appearing lighter and lower elevations appearing darker. To further refine the relief, focal statistics were applied to a third and final hillshade to generalize and soften terrain features.

Then, values from the three hillshades (aerial, focal, and original) were reassigned using the Slice Tool and recombined using the Raster Calculator into a final composite relief. Colours and layer transparency were adjusted to produce the characteristic blue-yellow tones characteristic of Imhof-style relief (International Cartographic Association, n.d.). The final relief is an aerial, birds-eye view of Denali that enhances 3D perception while maintaining clarity.



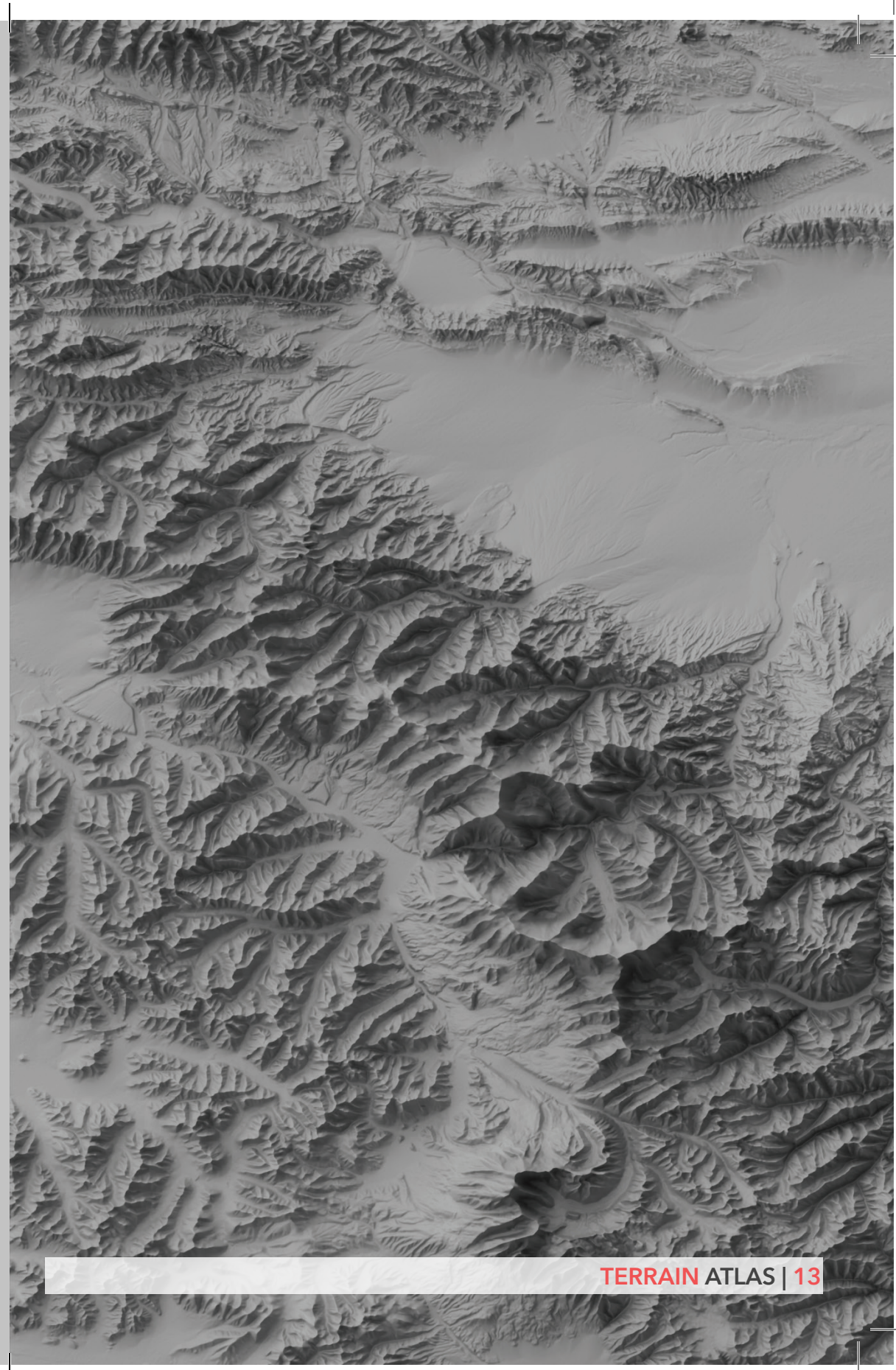
BLENDER RELIEF

KUNLUN MOUNTAINS, CHINA

This relief shows an orthographic view of the Kunlun Mountains in China, rendered in Blender. I acquired and mosaicked SRTM DEMs, then followed Daniel Huffman's tutorial on *Creating Shaded Relief in Blender* (Huffman, 2017).

The DEM was first prepared in ArcGIS Pro, including projection, clipping, resampling, and rescaling. The raster was then exported as a 16-bit unsigned TIFF to use in Blender. In Blender, a mesh plane was created, and the DEM was applied as a displacement map to generate the terrain surface.

I positioned the camera for an orthographic view, set lighting to simulate northwest sunlight, applied vertical exaggeration for legibility, and rendered the final shaded relief.

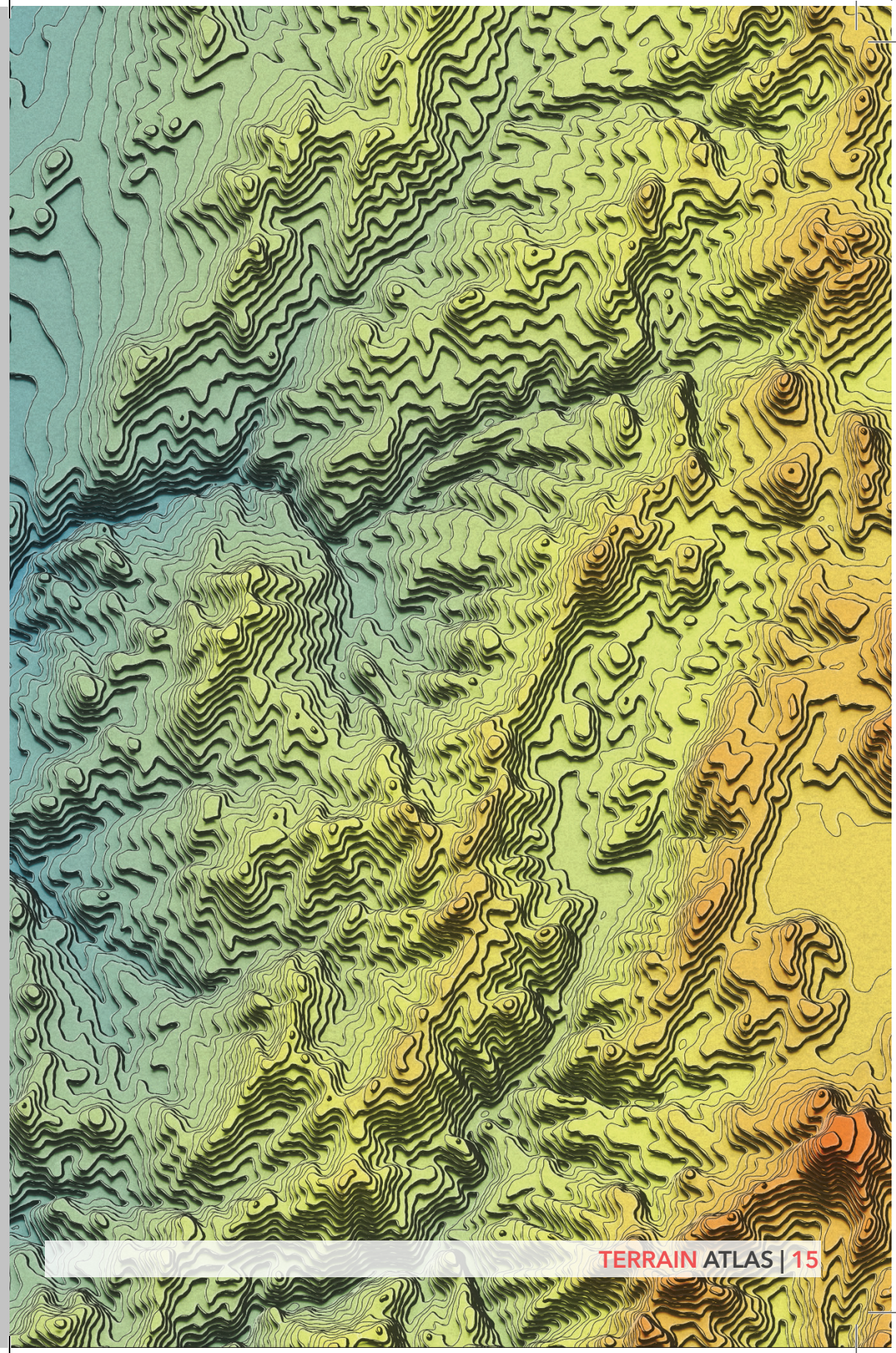


CENTRAL ANDES, CHILE/ARGENTINA

CARTOGRAPHERS CHOICE: ARTISTIC

This relief depicts an artistic representation of part of the Puna de Atacama plateau in northwestern Argentina, a high-elevation volcanic plateau within the Central Andes. This workflow is adapted from John Nelson's YouTube tutorial, *Re-creating Trippy AI-Generated Terrain Contours* (Nelson, 2023).

The first step was to acquire an SRTM DEM of the study area. The Focal Statistics tool in ArcGIS Pro was then used to blur and smooth the DEM, followed by an additional iteration to remove any artifacts introduced by the process. Once the DEM was smoothed, contours were generated at 100m intervals, using the contour shell up option, producing a set of stacked elevation polygons. The polygons were vertically offset to create an isometric effect, and a colour ramp was applied to symbolize elevation. Additional techniques were then used to add highlights and shadows to the polygons, and a poster paper texture was applied as an overlay. The final step involved adjusting layer blending and opacities to achieve the desired visual effect.



UNIACKE ESTATE MUSEUM PARK

LIDAR RELIEF

This LiDAR relief represents a visitor map of the Uniacke Estate Museum Park in Mount Uniacke, Nova Scotia.

The first step was to acquire LiDAR point cloud datasets covering the park and surrounding area from GeoNova. In ArcGIS Pro, the downloaded and compressed LAZ files were converted into an LAS dataset for spatial analysis. A DEM was then generated using the LAS Dataset to Raster tool to represent the ground surface. To separate vegetation and terrain, a canopy height model (CHM) and a vegetation mask were created from the LiDAR point cloud. These layers effectively separated the tree canopy from the underlying terrain, allowing them to be symbolized independently.

The LiDAR data did not clearly separate water surfaces during processing, resulting in portions of the terrain DEM extending into water bodies adjacent to the estate park. To address this, water polygons were used to mask the DEM, ensuring the water bodies were appropriately represented. Additionally, the point cloud lacked a defined sixth class (buildings), so LiDAR points representing structures needed to be manually reclassified to incorporate building features into the map.

The final step involved symbolizing the terrain and vegetation layers, adding labels, and identifying key tourist attractions throughout Uniacke Estate Museum Park.

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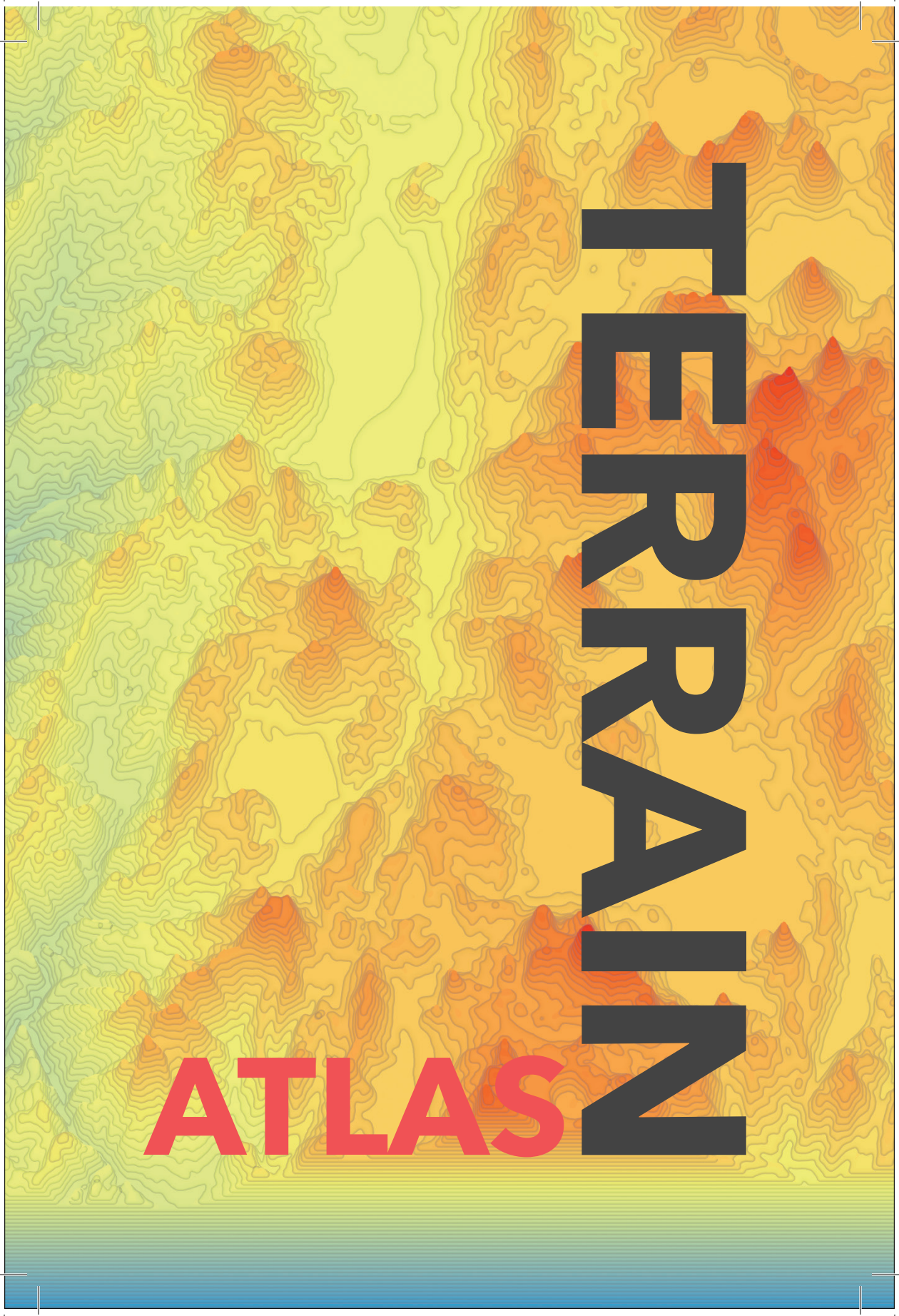
Front and back cover imagery by Alex Hordal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