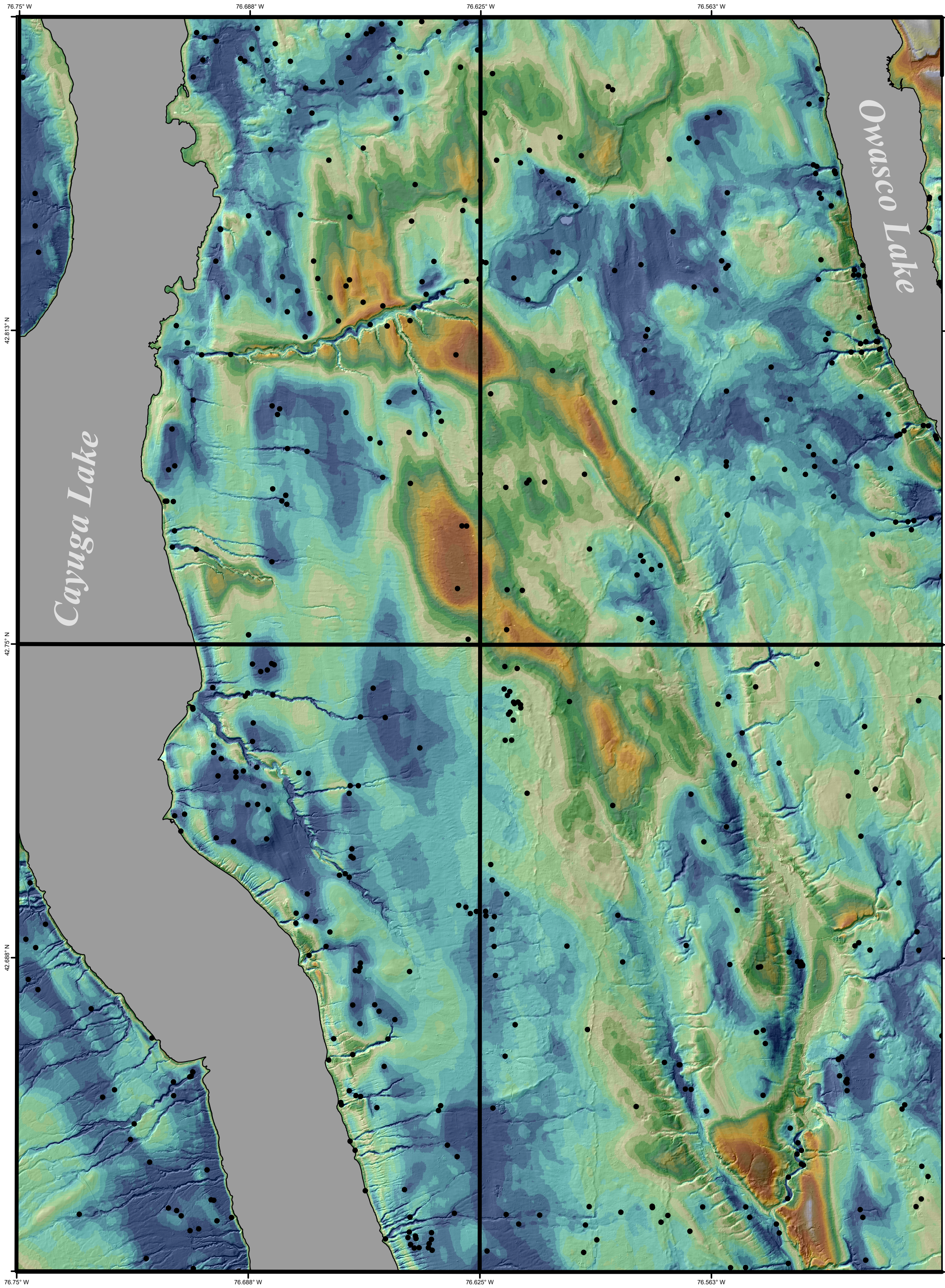
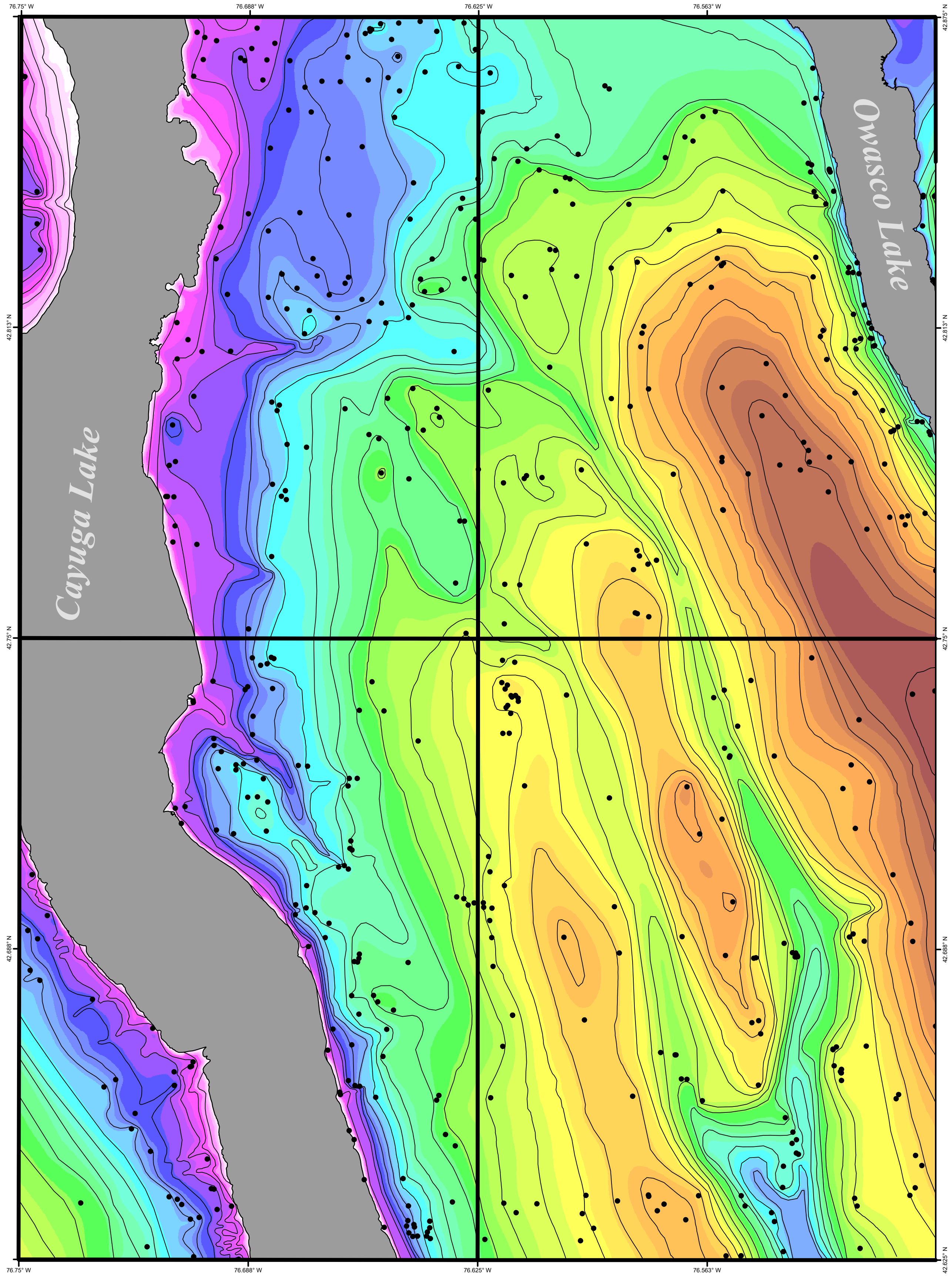
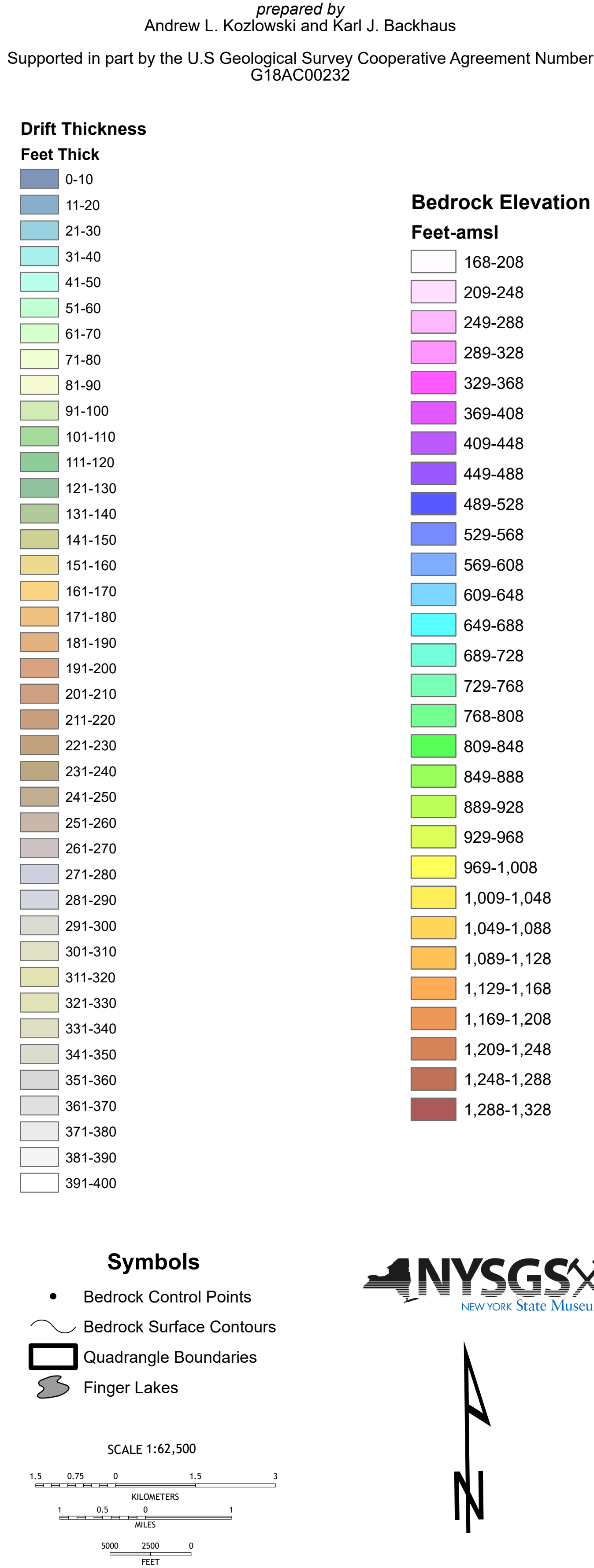


# BEDROCK ELEVATION AND DRIFT THICKNESS OF THE GENOA, SCIPIO CENTER, SHELDRAKE AND UNION SPRINGS 7.5-MINUTE QUADRANGLES



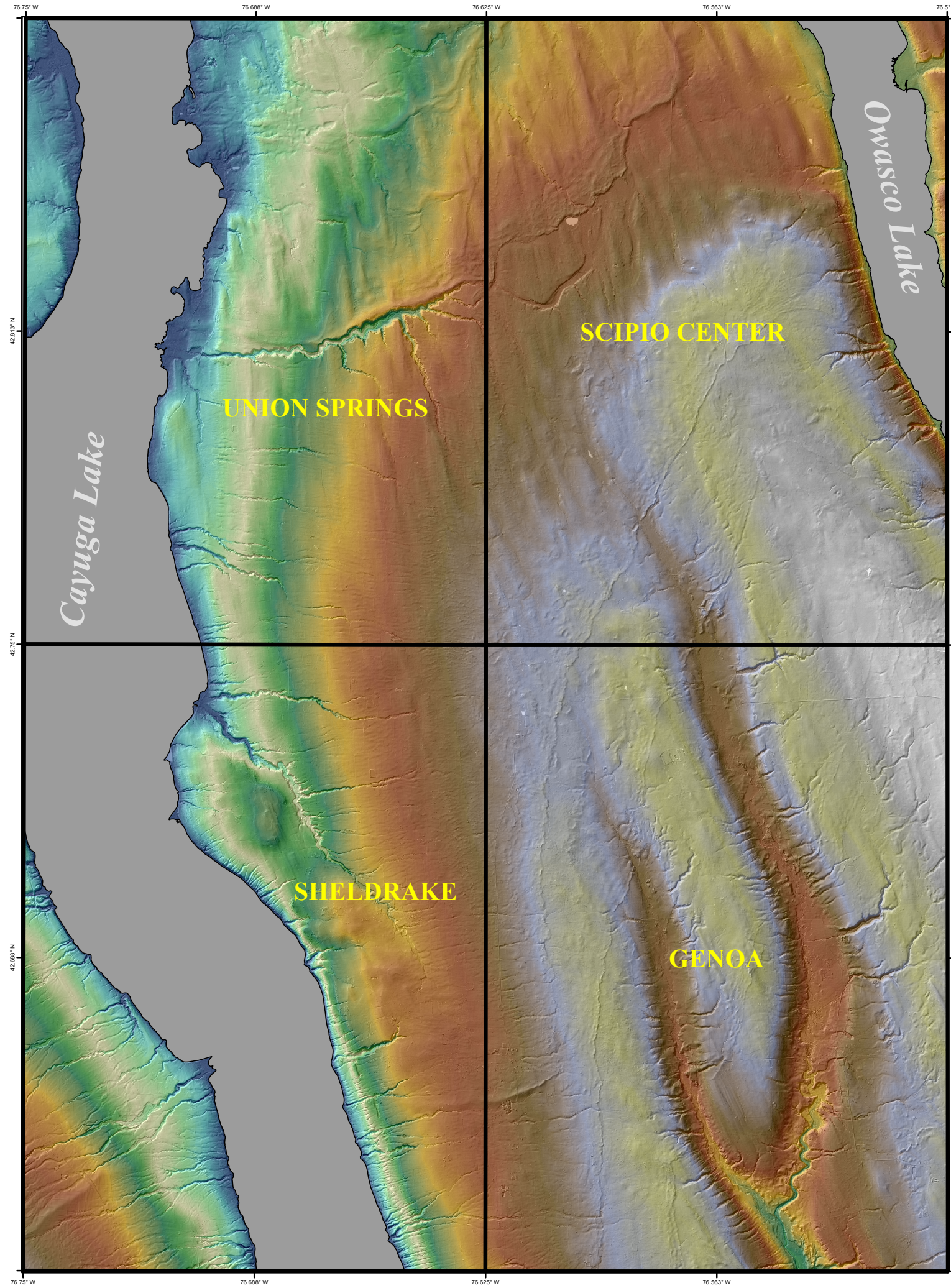
Drift Thickness of the Genoa, Scipio Center, Sheldrake and Union Springs 7.5-Minute Quadrangles

Andrew L. Kozlowski and Karl J. Backhaus  
2019



Bedrock Elevation of the Genoa, Scipio Center, Sheldrake and Union Springs 7.5-Minute Quadrangles

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Surface Elevation of the Genoa, Scipio Center,  
Sheldrake and Union Springs 7.5-Minute Quadrangles  
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2019

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## Introduction

As part of the Fiscal Year 2018 the STATEMAP program of the National Cooperative Geologic Mapping Program administered by the United States Geological Survey authorized that federal funding could be used for the creation of derivative geological map products. In response to this new opportunity the New York State Geological Survey (NYSGS), a division of the New York State Museum, elected to focus efforts on an anomalous area of thick glacial deposits in Central Cayuga County. The thick glacial deposits were previously mapped and described by Kozlowski et al., (2015a, 2015b, 2016, 2017, 2018 and 2019). While previous mapping described the texture, inferred age and distribution of surface sediments deposited by glaciers, it did not attempt to fully resolve the buried bedrock topography or the associated thickness of glacial drift.

Drift thickness and by association bedrock topography is a source of critically important data. The thickness of glacial drift combined with the hydrogeologic properties of the sediment are often directly related to the distribution of aquifers present in the surficial materials that overly bedrock. All things being equal thicker drift in the Great Lakes Region usually equates to better potential aquifers. In addition, drift thickness maps can serve to illustrate best locations for direct societal applications such as minimal drift thickness to access bedrock for quarries, or thicker drift that will allow for ease of excavation and burial of underground utilities.

## Methodology

To create the 15-minute drift thickness derivative map we utilized geologic mapping and subsurface information of four 7.5-minute quadrangles area comprising the Union Springs, Scipio Center, Genoa and Sheldrake quadrangles. In total we collected and compiled 535 bedrock control points to delineate the bedrock topographic surface. These points consist of data from water well completion reports, oil and gas wells, engineering boreholes, exploratory boreholes, sampling stops, and known bedrock outcrops. From these points, using their latitude and longitude, the surface elevation was extracted from the 2018 Cayuga/Oswego 1-meter, 2012 Seneca Watershed 2-meter and 2008 Tompkins County Soil and Water Conservation District 2-meter lidar data sets and the depth to bedrock was subtracted. This elevation is the true bedrock surface elevation. These data were entered ESRI's ArcMap 10.6 program and using the "Contours" tool, 50ft contours were generated (see inset map to the bottom right). Using the bedrock surface elevation from each point and knowing the surface elevation in the county, the contours were adjusted manually through a multi-step review process to fix any errors created by the tool. The contours, after being adjusted, were then converted into a 10-meter raster using the "Topo to Raster" tool and excluded the Finger Lakes within the county as bedrock depth is unknown, or poorly constrained within the lakes themselves. The raster generated from the contours is then resized to a 1-meter resolution using the "Resampling" tool. This map construction technique is performed to heighten the resolution of the raster and match that of the DEM that it is subtracted from. Lastly, the "Raster Calculator" tool is used to subtract the surface elevation from the bedrock elevation to determine the thickness of the drift in the county.

## Results

Two maps produced for this mapping project include the Bedrock Elevation Map and the Drift Thickness Map. Both the drift thickness and the bedrock elevation maps display northwest to southeast linear trends on the upland divide separating Cayuga Lake and Owasco Lake. These high-resolution maps reveal previously unidentified preglacial stream valleys etched into the Alleghany Plateau. Subsequent glaciations have buried and all but erased any surface expression of the valleys as evidenced by the cross-cutting moraines on the hill-shade lidar topography draped over the drift thickness map. Kozlowski et al. (2019) dated deep non-glacial deposits and stratigraphy in the north end of the western buried valley near Great Gully to an age of ~125,000 years before present (BP) equivalent to Marine Isotope Stage six (MIS 6). Till units below are inferred to be Illinoian or perhaps Pre-Illinoian in age. However, the first glaciations to potentially affect the latitude of the northern Finger Lakes most likely occurred in the Late Pliocene. Thus, these basal glacial deposits interred into the bedrock stream valleys identified may be as old as three million years in age.

A more pragmatic consideration is that these newly identified stream valleys also serve as vessel to retain glacial aquifers. Presently, the City of Auburn located 10 km to the north of the map area has been considering alternate options for water supplies due to recurring water quality concerns from harmful algal blooms (HABs) that affect surface water in the Finger Lakes. Groundwater retained in the buried valleys is not subject to the HABs and the valleys identified in this study may help to target further groundwater investigations to evaluate if groundwater potential is sufficient for use as primary or supplemental water supply considerations. Additionally, with the identification of buried valleys, local health department official can utilize this data for groundwater protection decisions.

In closing, high resolution drift thickness and bedrock topography maps are vital data sets in complex glaciated terrains like the Finger Lakes and elsewhere in the Great Lakes Region. The investment of time and resources to obtain and create this data is vital not only to deciphering the natural history and geologic framework, but also vital to understanding the distribution resources that society depends on.

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