

UTILIZING DPLOT, SEDLOG, AND ARCGIS PRO TO ENHANCE GEOLOGIC FIELD SKILLS

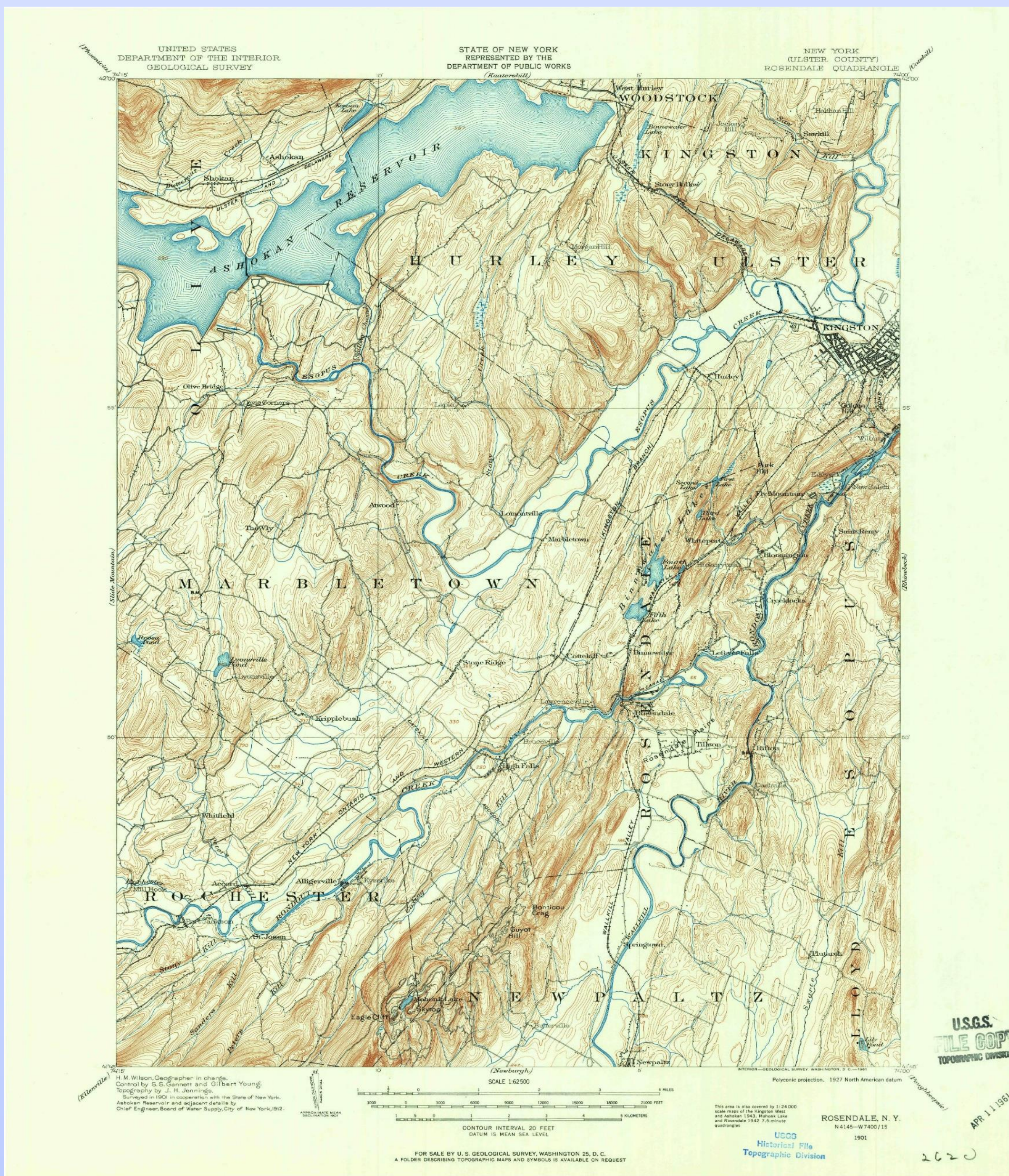
ROSENDALE, ULSTER COUNTY – NEW YORK

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Abstract

Capstone geologic field mapping courses in undergraduate geoscience programs aim to compliment the academic knowledge with technical field skills. As a pilot study, these tools were used to collect field data using folded lower Paleozoic to mid-Paleozoic sedimentary outcrops consisting of elastic, non-clastic and occasional mixed siliciclastics in Rosendale, Ulster County, New York. Rosendale is known for its classic geological outcrops with variable structural, stratigraphic, paleontological and sedimentological complexities – ideal for a field mapping course. Traditionally, students’ data acquisition in the field and its subsequent laboratory analysis to produce a final geologic field report utilized acetate overlays to produce geologic maps, stratigraphic sections, and cross sections. However, the transition into digital mapping has been a challenge due to the limited resources, software access, and adequate technical training. Nevertheless, a recent experiment in utilizing simple-interface softwares such as sedlog, Dplot, and ArcGIS Pro result in additional techniques that enhance data acquisition, graphic representation, and geological interpretation. Employing ArcGIS Pro to initiate geologic field layouts and digital geologic maps enabled students to optimize the accuracy of measurements and geologic correlation of both limited and well-spaced outcrops. Dplot capability of constructing geomorphic profiles to project folding and faulting has provided students with an opportunity to reconstruct the past geological settings and draw conclusions pertaining to the development of the sedimentary basin over time. Constructing stratigraphic type sections via Sedlog generated digital data projections with paleocurrents, sedimentary facies, and stratal thickness. In addition to generating maps and reports suitable for undergraduate research presentation, integrating this software spiked students’ enthusiasm and readiness for conducting geologic fieldwork and, ultimately to pursue higher education and training in geospatial technologies.

Traditional Mapping Techniques



Map. 4 – Rosendale USGS Topographic Map

Traditional field techniques in undergraduate geologic field mapping courses utilized USGS topographic maps (map. 4), USGS Base maps (map. 5), and Google Earth aerial maps (map. 6) in the form of handouts. Students would navigate the terrains logging strikes, dips, and rock identification on an acetate overlay to ultimately produce a final geological map (fig. 4). It has also been a tradition to utilize the sketching method to produce geological cross sections and stratigraphic columns (fig. 2,3,5).

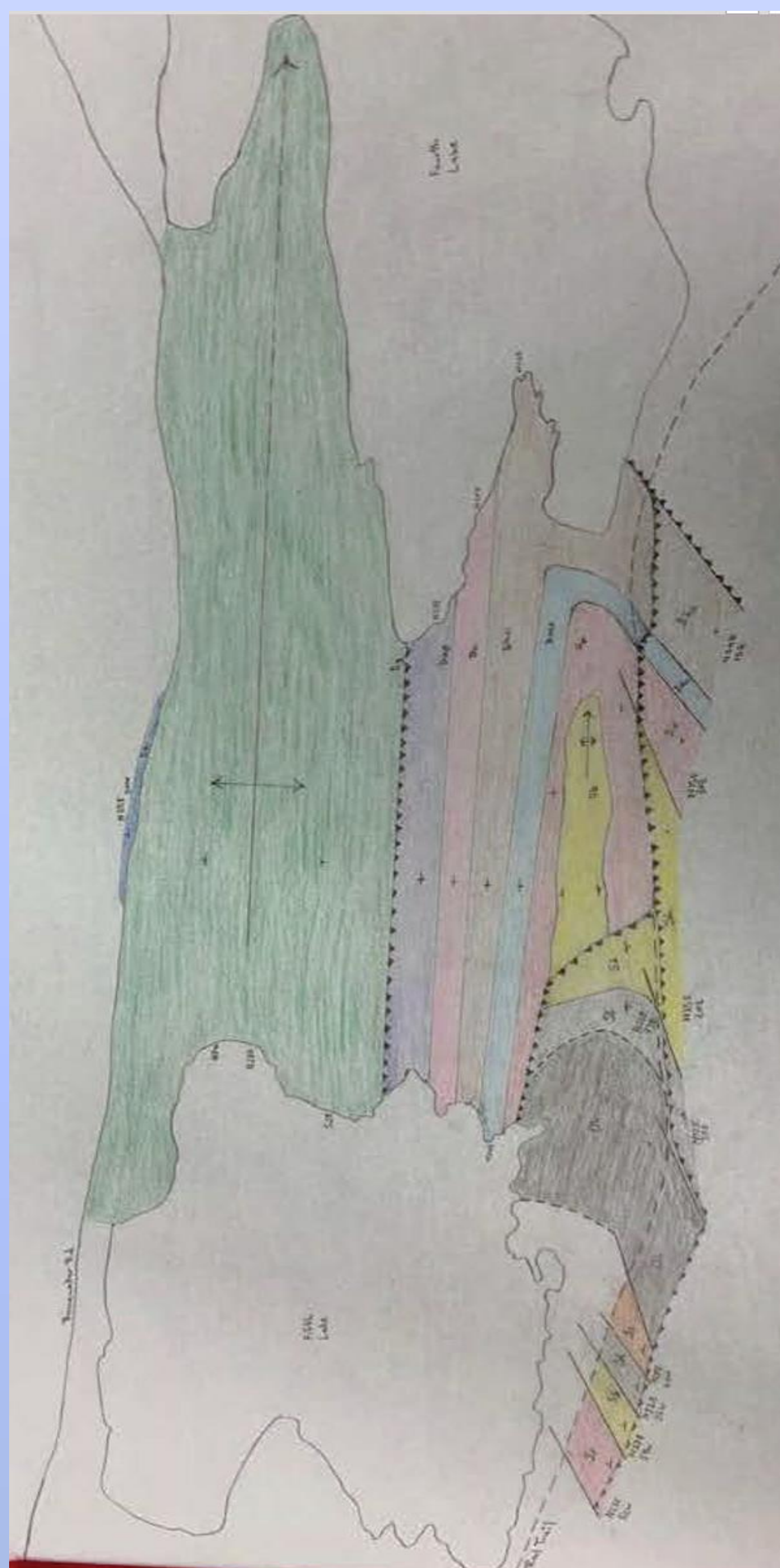
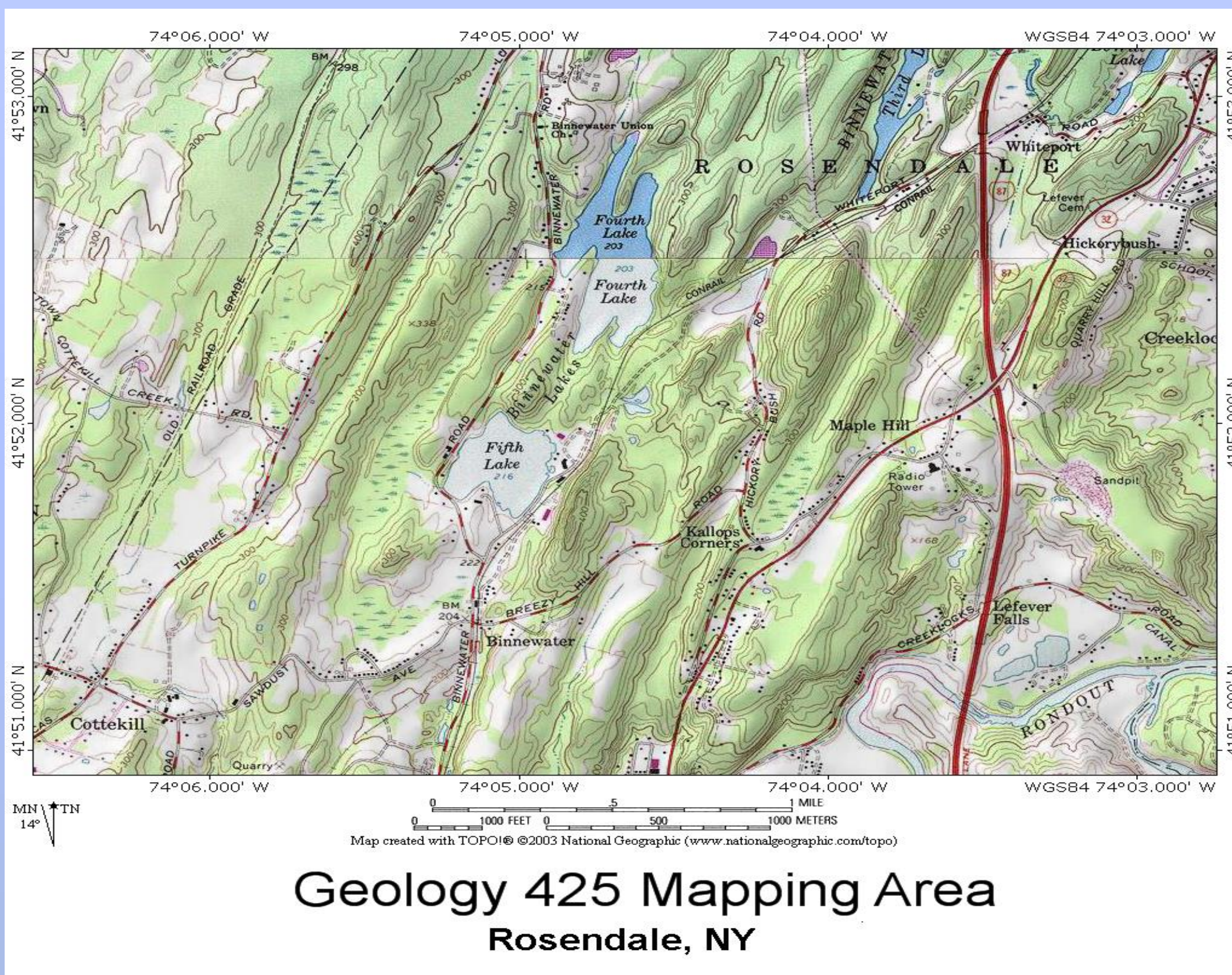


Fig. 4 – Traditional Geologic Map



Map. 5 – Rosendale Mapping Area

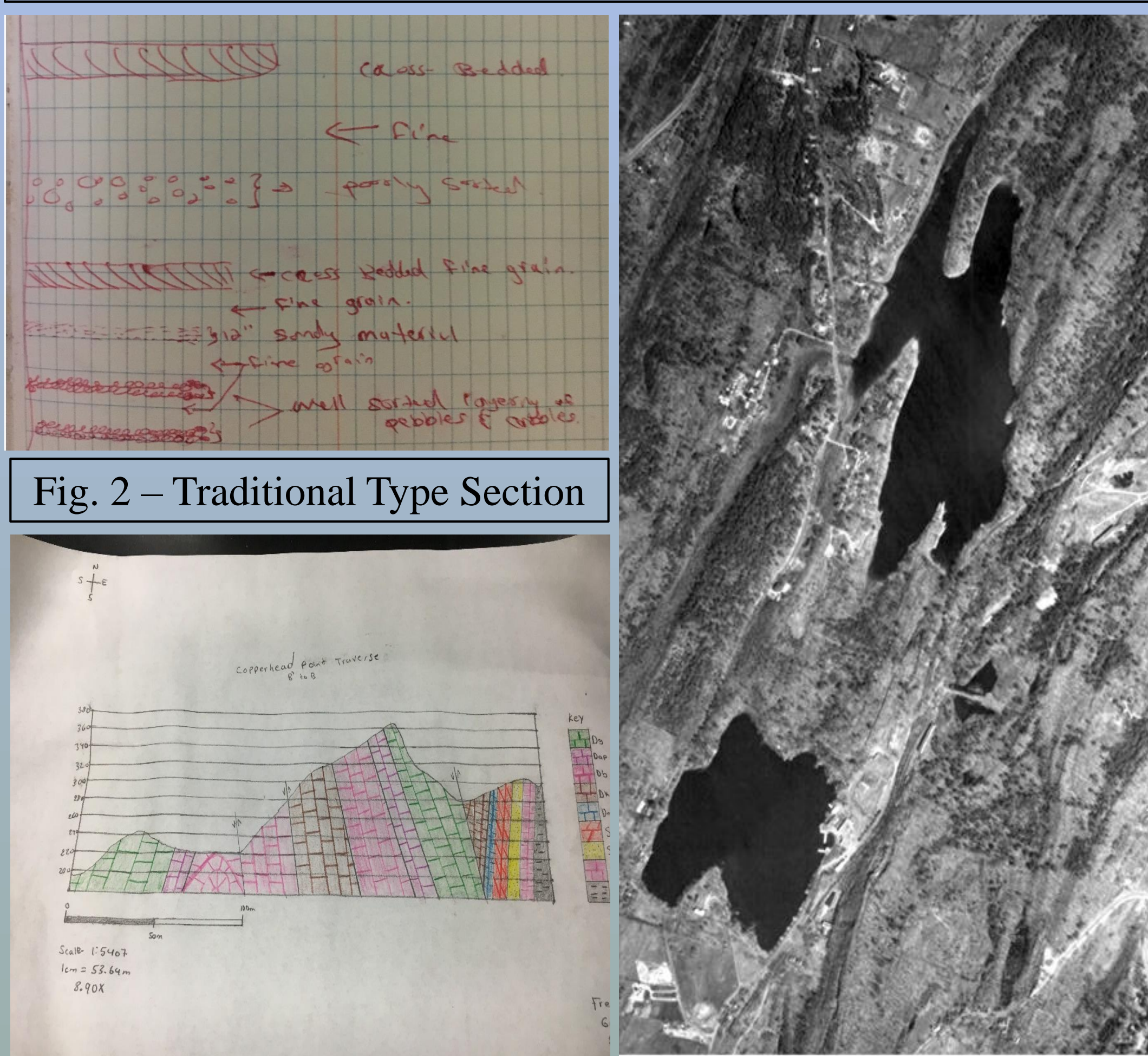


Fig. 3 – Traditional Cross Section

Map. 6 –Aerial Handout

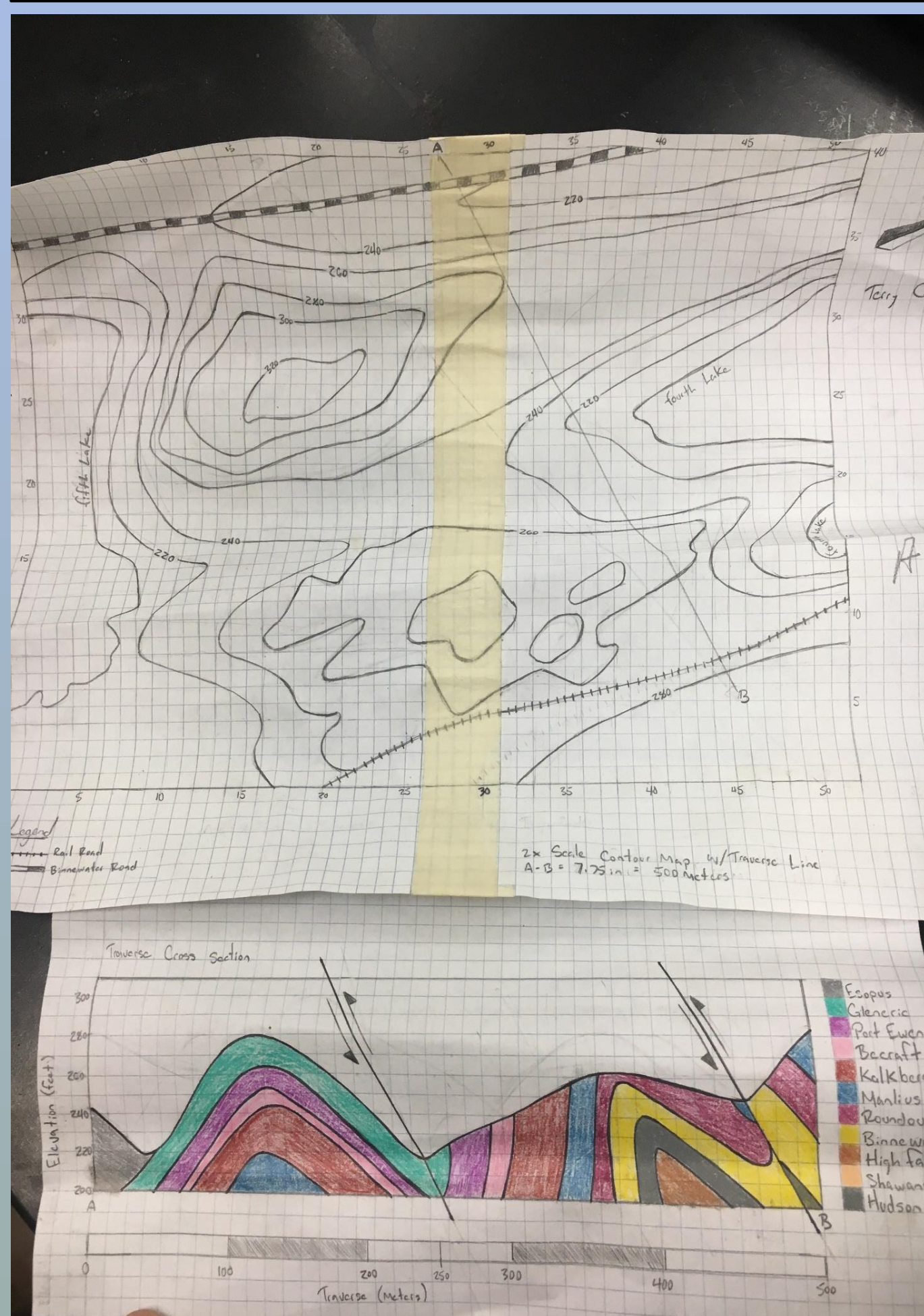


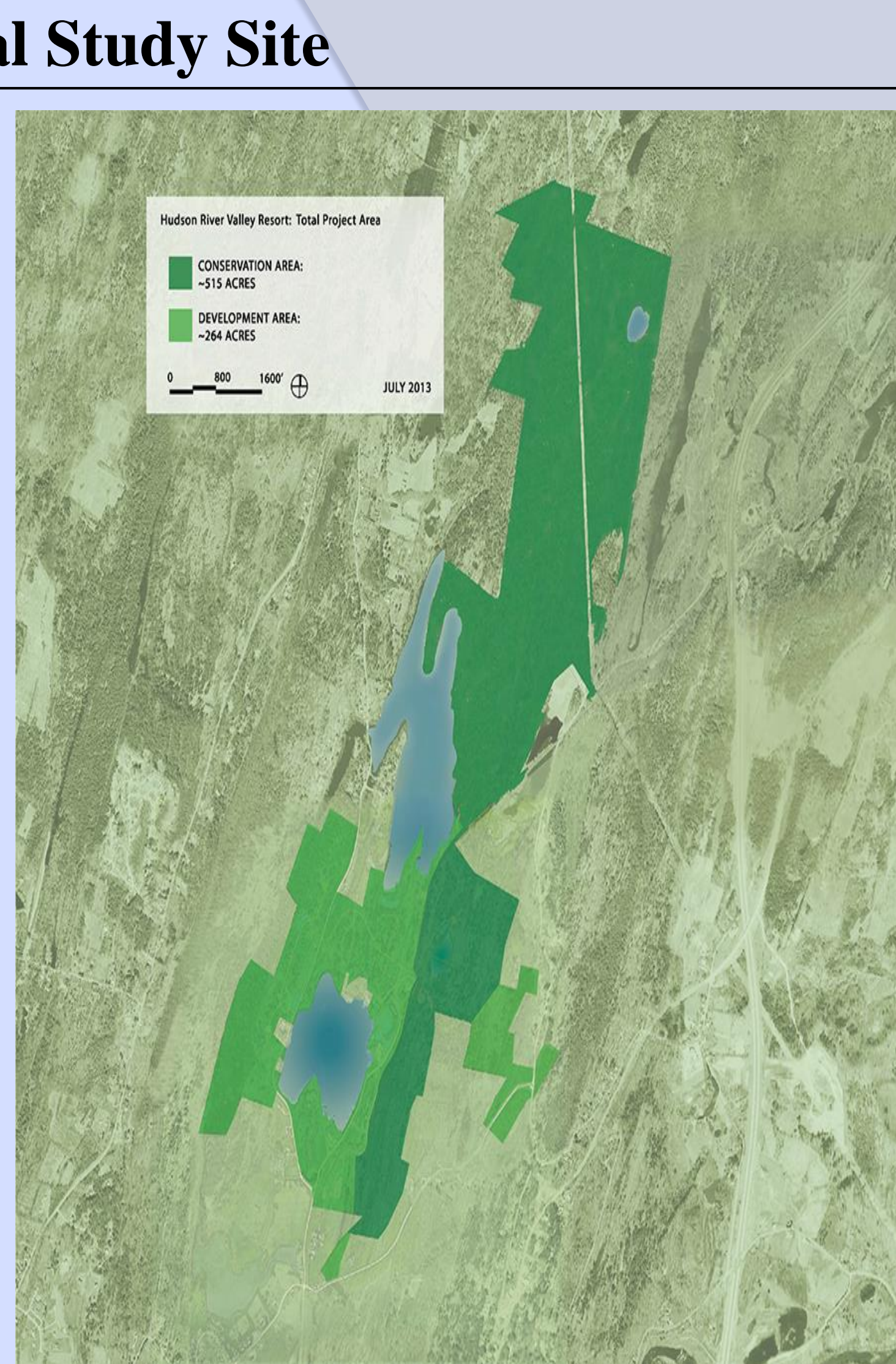
Fig. 5 – Traditional Cross Section



Map.1 – Rosendale's Location, Ulster County, NY



Map. 2 – Rosendale Base Map



Map.3 – Williams Lake Development Map

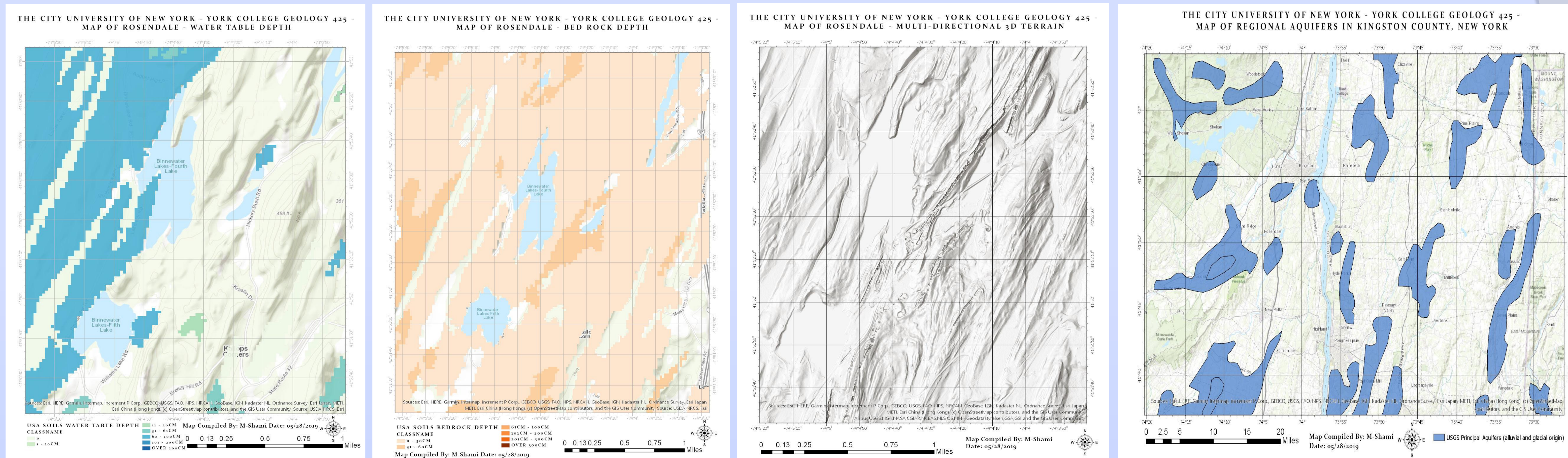
The Town of Rosendale is located along the Hudson Valley in Ulster County, NY (Map 1-2). Its folded Paleozoic sedimentary rocks coupled with the excavated cement mines makes it a classical geological setting suitable for teaching. Students have been mapping this area since the early 1960s.



Figure. 1 – Image of the study site

The Experimental Study Site

Digital Mapping Techniques



Map. 7-12 – Digital (GIS) Pre-Field Work Map Handouts



Fig. 6-10 – Geologic Field Work – Summer 2019

Enhancing geologic field skills for undergraduate students started by employing GIS layout before fieldwork. These layouts consist of high resolution aerial images that increase accuracy and fieldwork coordination. Other GIS maps containing hydrological, digital elevation, soil patterns, groundwater aquifers, and bedrock depth were used added skills in the field. Stratigraphic Columns and Digital Cross Sections generated via SedLog and Dplot respectively illustrate better resolution and accuracy. Though the lack of GIS software was a challenge, some students utilized google earth to project their final maps. Our goal for 2021 is to gain access and produce high quality digital maps.

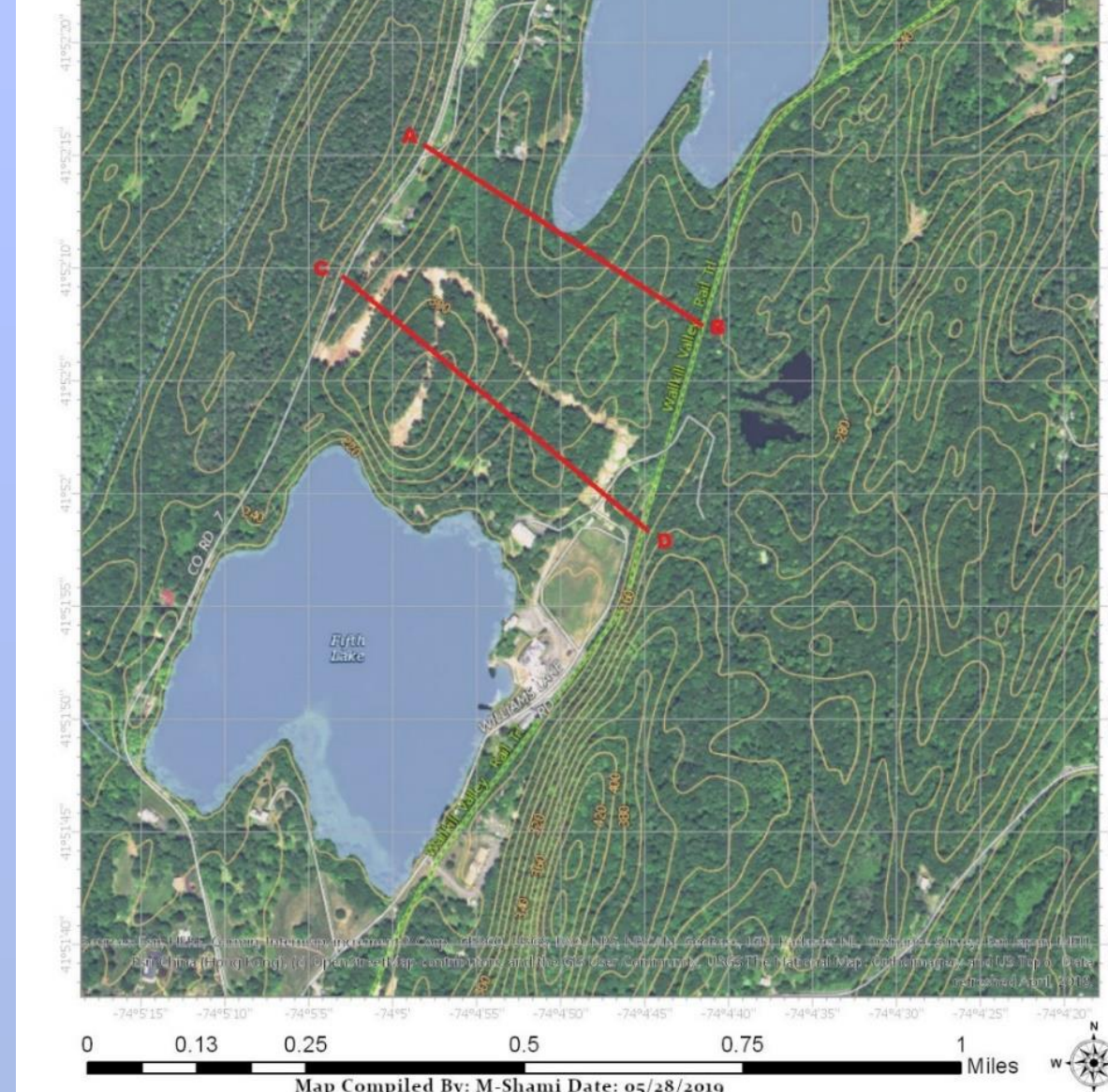


Fig. 11-14 Enhanced Geologic Map

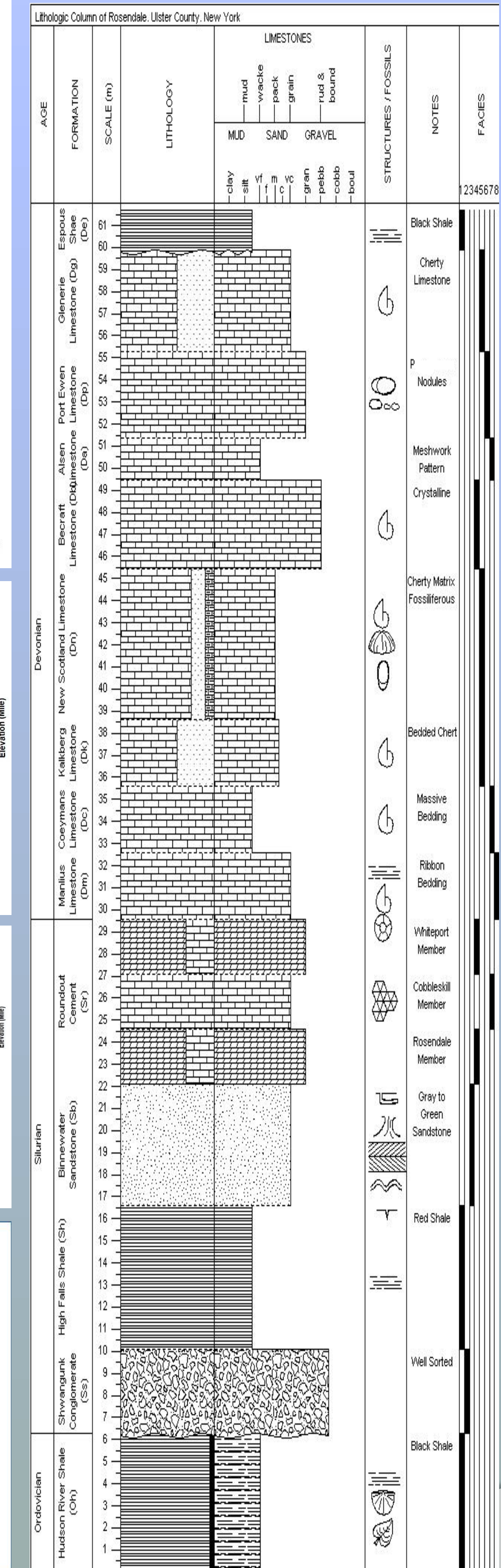


Fig. 15 –Digital Type Section

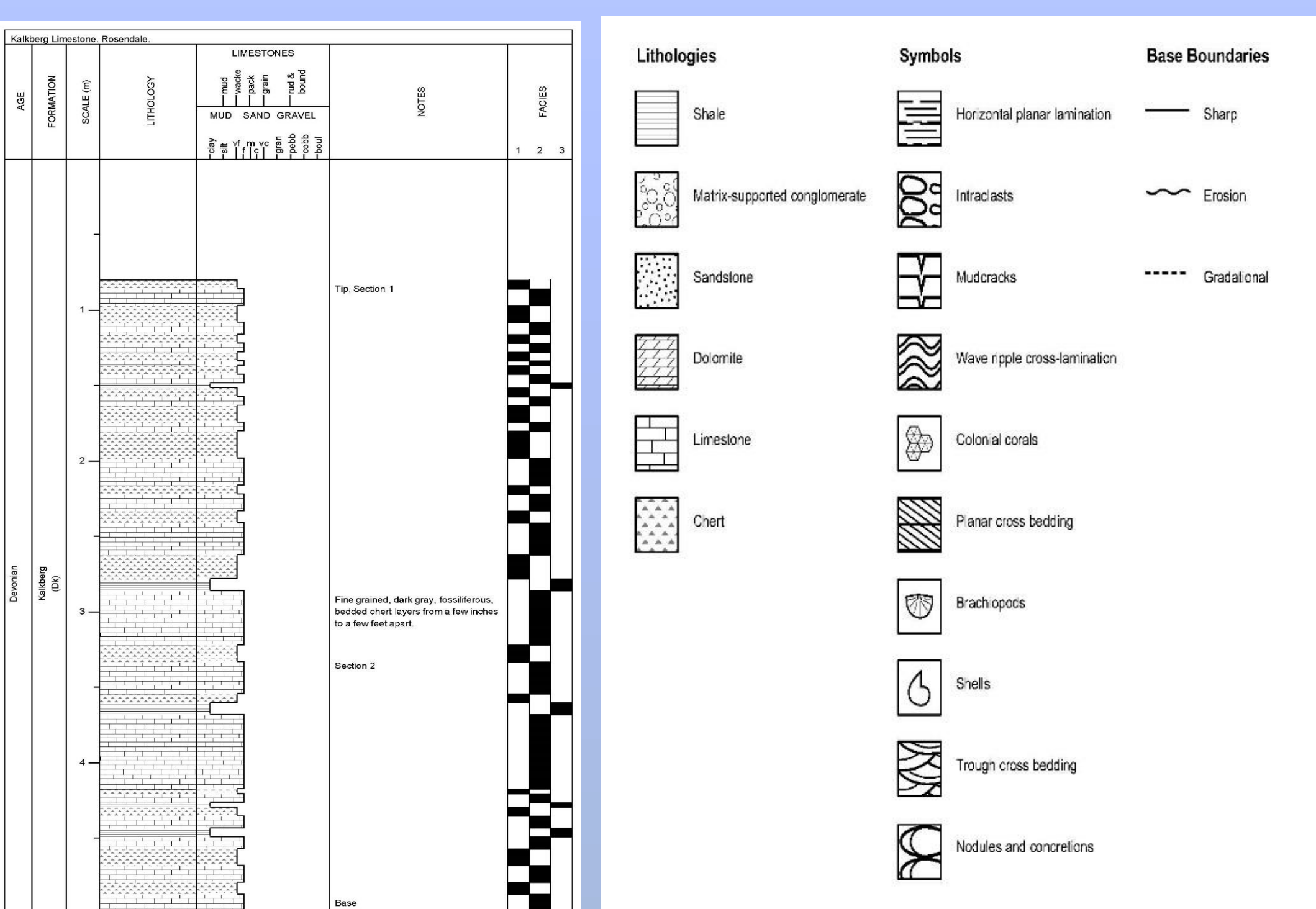


Fig. 16-17 – Kalkberg Type Section With Legend



Fig. 18 – Kalkberg Type Section With Legend

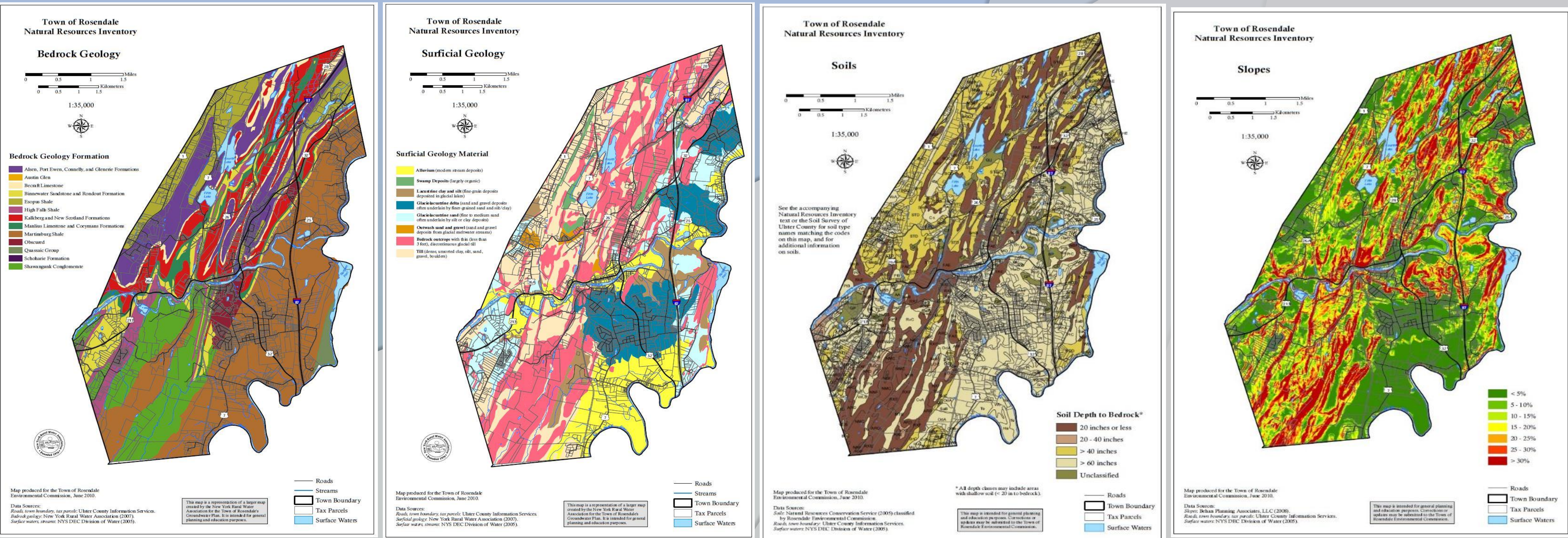


Fig. 13-16 – Targeted Goal for 2020 – 2022