GEOLOGY OF THE CAMBRIAN NONCONFORMITY AT THE WELLESLEY ISLAND STATE PARK NATURE CENTER

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INTRODUCTION

Wellesley Island straddles the international border between the USA and Canada within the Saint Lawrence Seaway, and in the heart of the Thousand Islands region (Figure 1). The island is underlain by Mesoproterozoic gneisses of the Frontenac Arc with a thin veneer of the Cambrian Potsdam sandstone. Bedrock exposures are abundant, with easy access to most rock types. Wellesley Island State Park nearly spans the distance between the two channels of the Saint Lawrence River. This self-guided field trip is a walking tour of the geology within the Minna Anthony Common Nature Center, located on the southwestern corner of the island within the state park (Figure 2).

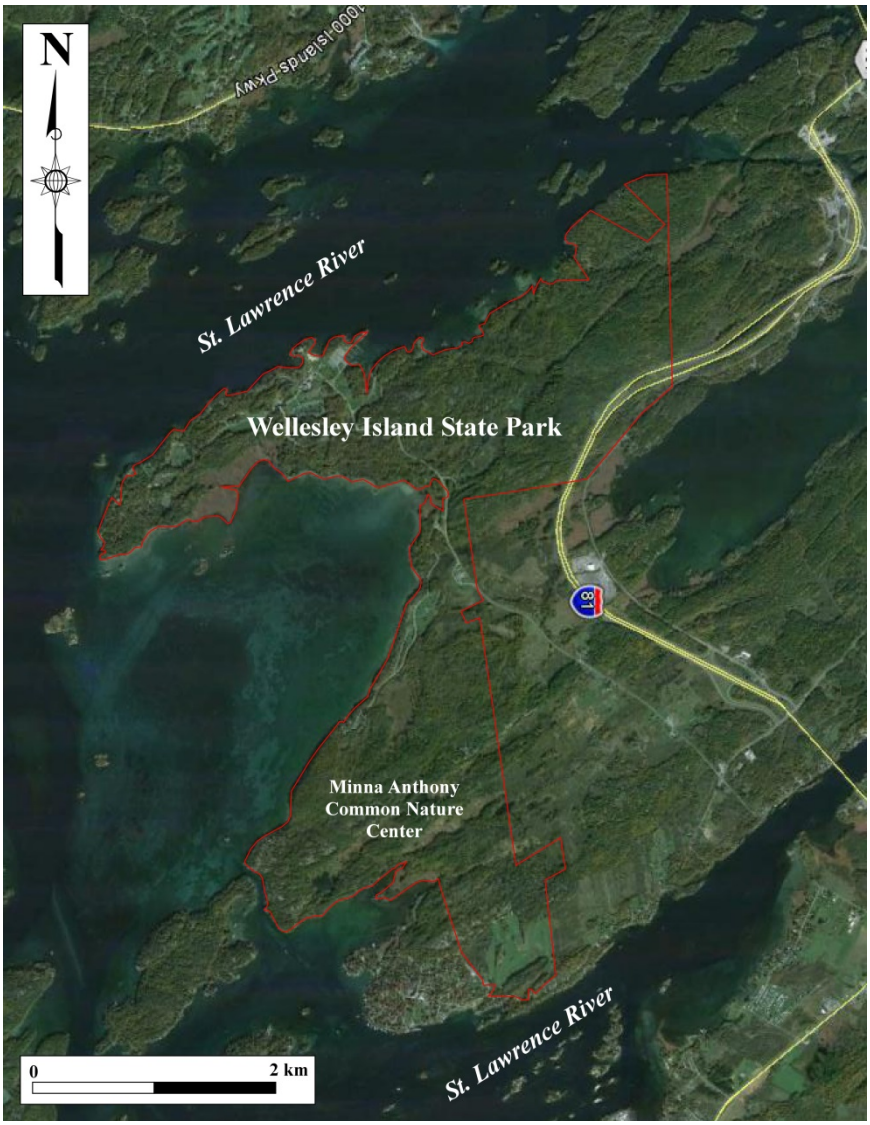


Figure 1. Air photograph of the southwestern end of Wellesley Island showing the location of the state park and the Minna Anthony Common Nature Center.

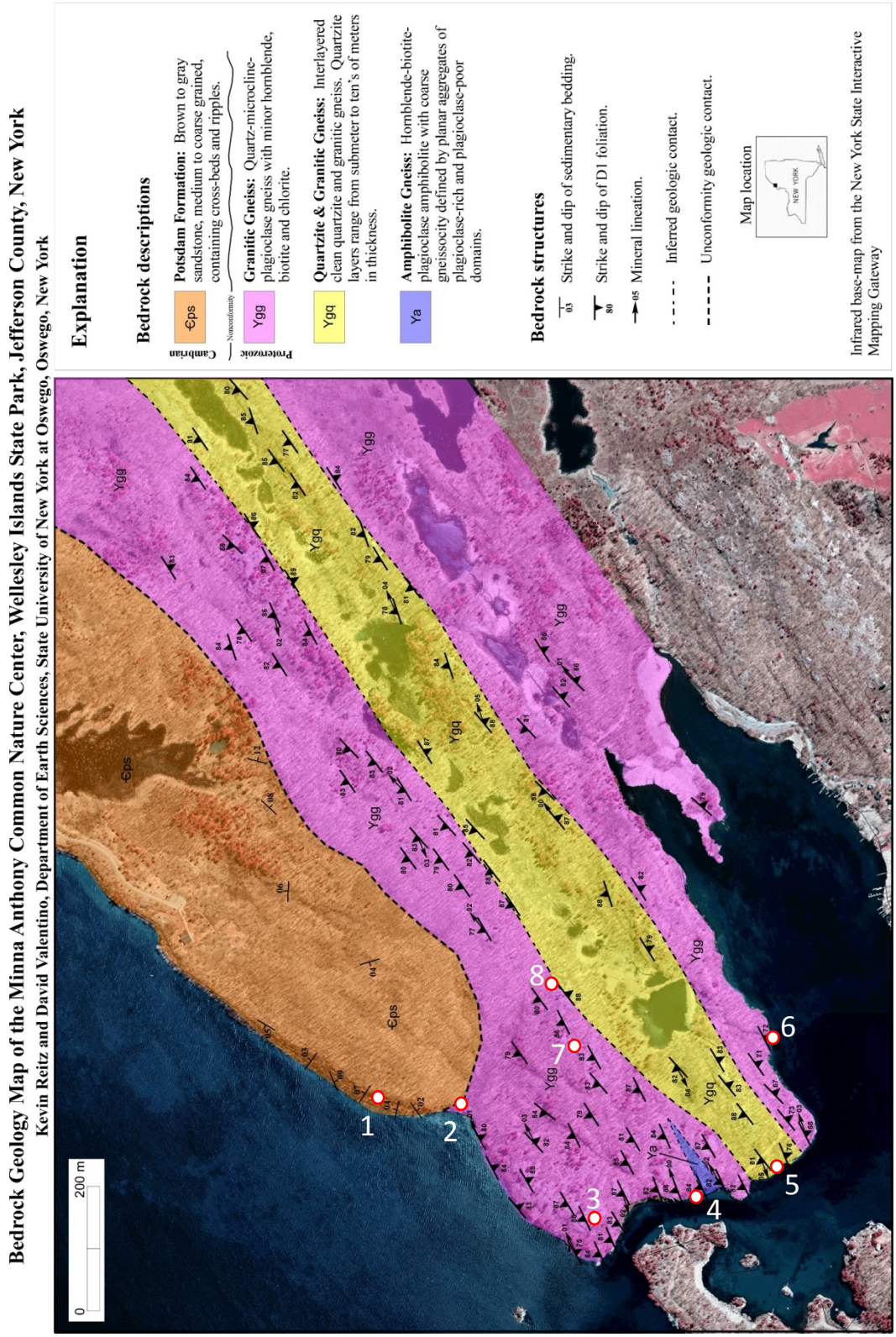


Figure 2 – Bedrock geology map of the Minna Anthony Common Nature Center, Wellesley Island, New York.

GEOLOGY OF MINNA ANTHONY COMMON NATURE CENTER

A series of well-marked trails lead from the parking area, across and around the wooded peninsula that makes up the Minna Anthony Common Nature Center. There is no specific trail to follow for this self-guided tour, however, a few key outcrop locations are marked on Figure 3 that will illustrate the different rock units and contact relations between units. Under no circumstances should anyone use a rock hammer or collect any samples in the nature center unless you have obtained a permit from NYS DEC in advance. There are many fresh bedrock exposures that can be studied without a hammer.

Location 1 – A series of deeply weathered outcrops of the Potsdam formation occur along the trail that follows the north shore of the island. At these locations, the Potsdam formation is a brown to gray, thin to medium bedded, medium to coarse grained sandstone with well-developed ripple marks and cross beds. The overall bedding attitude dips a few degrees northeast.

Location 2 – The trail traverses down-hill into a small cove. As you walk down the hill, note the transition in the bedrock. There are exposures of granitic gneiss at lake level on the west side of the cove. This is good place to stand on the gneiss and talk about the nonconformity contact relationship with the Potsdam sandstone.

Location 3 – There are many fresh exposures of the granitic gneiss as the trail winds around the southwestern end of the peninsula. The gneiss contains recrystallized quartz, microcline and plagioclase with minor hornblende and biotite. In places, the biotite has been replaced by chlorite. The gneiss contains a weakly- to strongly- developed foliation and mineral lineation. The foliation is defined by planar aggregates of the recrystallized feldspars and quartz, it generally strikes ENE and dips steeply to the north. Subhorizontal mineral lineations are defined by elongate hornblende and biotite grains in the foliation plane. Some exposures exhibit well developed lineation with very weak foliation (L>>S tectonite).

Location 4 – This location requires leaving the trail and is difficult to access. It is not recommended to take a larger group of people to this location at the same time. A thin amphibolite body is exposed in the rock ledge that overhangs the water. It contains planar aggregates of hornblende, biotite and plagioclase that define foliation that is concordant with the local foliation in the other rock units. The contact with the granitic gneiss is parallel to the foliation.

Location 5 – Outcrops along the river edge contain foliated quartzite that is interlayered on the meter-scale with the granitic gneiss. The quartzite contains quartz with accessory grains of biotite.

Location 6 – A glacier polished outcrop at river level at this location shows excellent field relations between the quartzite and granite intrusions. The well foliated quartzite is cross cut by a coarse granite dike with the contact exposed. In turn, both of these units are cross cut by a second steeply dipping granite dike that is about 40 cm wide.

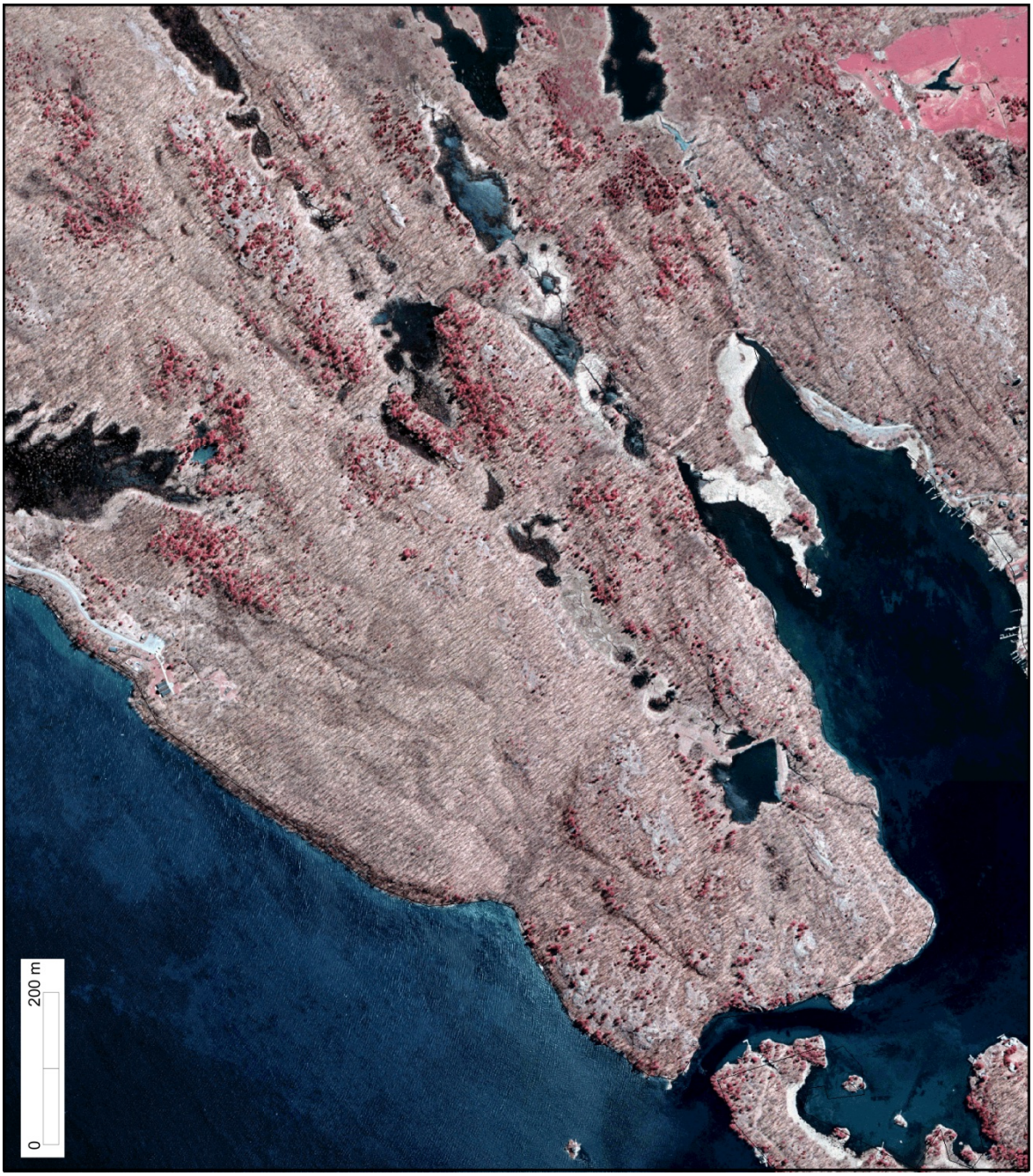
Location 7 – Although this location only includes more of the granitic gneiss, the excellent exposures on the glacier polished ridge allow for the study of the rock fabrics in detail.

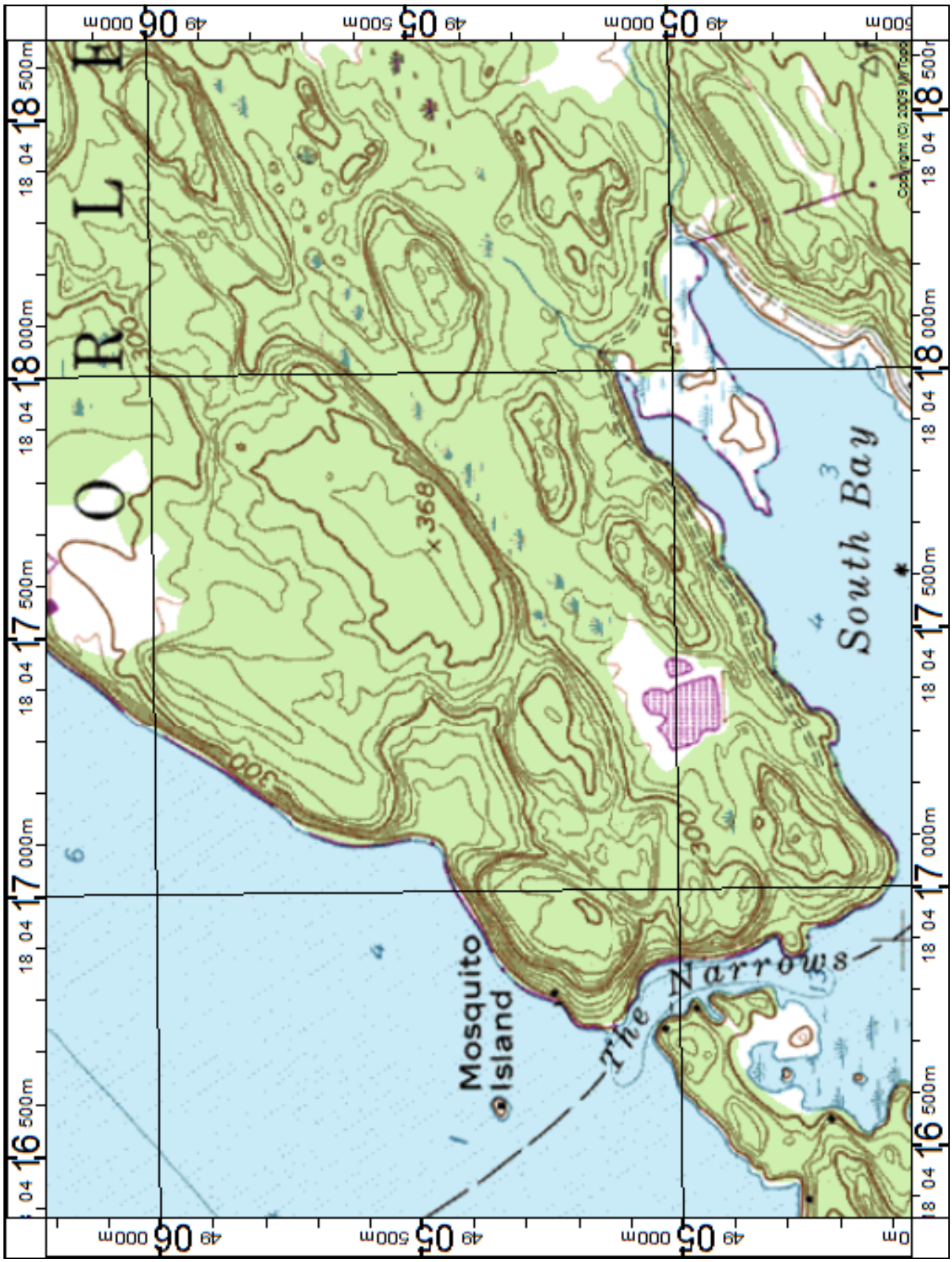
Location 8 – The northeastern end of the granitic gneiss ridge has a series of outcrops that show the field relations with the quartzite. There are small to large blocks of quartzite that form xenoliths in the granitic gneiss. There are also places were small granite injections penetrated the quartzite blocks along fractures.

FIELD EXERCISE

After leading students through the suggested field locations as an introduction to the area, it is recommended that the students are turned loose to discover the geology in teams of two or three. An infrared false color image and a topographic map are provided herein. Individual outcrops can easily be located on the infrared image while in the field. This exercise has been used as a first mapping experience for classes in structural geology, petrology, historical geology and geophysics at SUNY Oswego. The well exposed rock units and the relative ease of access makes it possible for students to cover the 1 square kilometer area in an afternoon. Please

emphasize that rock hammers are not to be used and samples should not be collected. Once the mapping exercise is over, it has been instructive to take students to the noncomformity outcrop located on Route 12, about 2 km north of Alexandria Bay. This world-class exposure can serve as the answer-key to the mapping exercise.




South Bay
Mosquito Island
the Narrows
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