



The Fernbank interglacial site near Ithaca, New York, USA

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ABSTRACT

The Fernbank interglacial site, on the west side of Cayuga Lake, New York, has been recently subjected to more detailed study. To a lengthened mollusc list are added ostracodes, insects, fish, pollen, and plant macrofossils. Of these, plants are well preserved and diverse, whereas other groups are poorly preserved and incomplete. Nevertheless, all support the interglacial assignment (Sangamon), which is further supported by minimum age radiocarbon dates ($>50,000$ ^{14}C yr BP) and a TL date of 81 ± 11 ka. In the plant record near the top of the sequence, abundant tree charcoal indicates forest fires. Like the Toronto interglacial record, the plants show a declining July mean temperature from 24 to 18°C (according to transfer functions) through the sequence, from mixed deciduous forest to boreal forest.

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Introduction

Interglacial fossil sites below Wisconsin till are rare in glaciated areas. They can yield paleoenvironmental information about former climates and can display evidence of environmental change (e.g. Dredge et al., 1990). These sites provide baseline data for understanding the present interglacial and how environments may change in the future. Interglacial deposits also provide data for correlation with the unglaciated areas (e.g. Morrison, 1991), which prevail over most of the world's land surface.

Maury (1908) briefly described a fossiliferous section on the west side of Cayuga Lake, in west-central New York State. Based on unionid molluscs, she correlated the sediments with interglacial beds previously described from Toronto (Don beds). Rediscovered in the mid-20th century, a new study of the fossil assemblages was undertaken.

Aside from fossiliferous marine deposits and a glaciotectionic peat clast on Long Island (Stone and Borns, 1986), the Fernbank site (Fig. 1) is one of only two fossil sites in New York State (see Muller et al., 1993, for the other site in the Adirondack area) and only a handful in the Great Lakes region generally (e.g., Terasmae, 1960, Kapp and Gooding, 1964)

believed to represent the last (Sangamon) interglacial. Until now, it has received little attention and study. Its nearby location in the same (Lake Ontario) basin, invites comparison with the Toronto deposits, which have received extensive study (Karrow, 1990; Karrow et al., 2001).

Previous work

The Fernbank site was discovered by R.S. Tarr of Cornell University late in the 19th century. Maury (1908) published a short description with a list of 18 fossil molluscan species from the beds, which she compared with the interglacial beds at Toronto (Coleman, 1894, 1901, 1906) and suggested they were of similar age. Her fossil collection was deposited at Cornell University and is now housed at the Paleontological Research Institution near Ithaca, New York.

The location of the site became lost over the years, but in 1966 Bloom found what he believed was the “Fernbank” section (Bloom, 1967), and in 1967 he invited McAndrews to examine the plant record. From ten sample levels they identified a lower part of the sequence with a warm-climate assemblage and an upper part with a cool-climate assemblage, together reminiscent of the Toronto sequence (Don and Scarborough formations); they also obtained three radiocarbon dates $>50,000$ ^{14}C yr BP (Bloom and McAndrews, 1972). Regional reviews of Quaternary history routinely refer to the site; the most recent were Muller and Calkin (1993) and Karrow (2004). Other than the brief

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Figure 1. Map showing the location of the Fernbank interglacial site.

report of Bloom and McAndrews (1972), this is the first detailed study of the site since Maury (1908) first reported the fossiliferous beds.

Location

The Fernbank site was located by Maury (1908), in a small ravine on the west side of Cayuga Lake between Taughannock Falls and Frontenac Beach. The site found by Bloom (1967) was a shallow gully where a small landslide exposed the beds. That exposure had deteriorated, but in 1988, a fresher exposure appeared in another landslide gully about 100 m farther south, which is where our sampling was carried out. By 2006, new housing construction resulted in heavy debris accumulation across the upper part of the site and nearly total downslope cover of the interglacial beds. Any future study will be very difficult.

The site (Fig. 1) is located about 170 m north of the Seneca-Tompkins County boundary (42° 33' N, 76° 36.9' W), about 15 km northwest of Ithaca. The site is reached off Route 89 on a local cottage road to the west shore of Cayuga Lake. The lake (average elevation of 116.4 m, about 41.5 m above Lake Ontario) is the reference level for stratigraphic section measurements.

A small additional fossiliferous exposure was found in 2000 at Camp Barton Boy Scout Camp, just south of Frontenac Point about 1.4 km WNW of the 1988 site. The exposure, only about 50 cm high, is in the south bank of a small stream tens of meters above Cayuga Lake and thus corresponds to the upper part of the fossiliferous zone of the 1988 exposure.

The present-day upland vegetation is a mixed forest of evergreen *Pinus strobus* and *Tsuga canadensis*, together with *Acer saccharum*, *Fagus grandifolia*, *Tilia americana*, and various species of *Fraxinus*, *Quercus*, *Betula*, *Nyssa*, and other deciduous tree genera. The modern cool-temperate climate at nearby Ithaca at 135 masl is like that of Toronto at 90 m; the more southerly location of Ithaca balances its greater elevation. Ithaca mean temperature for July is 20.3°C, for

January is -5.8°C , and annually is 7.7°C ; the mean annual precipitation is 899 mm.

Field and laboratory work

In September 1968, Karrow, guided by Bloom, measured the Fernbank exposure and sampled for molluscs. In the summer of 1988, Karrow, Miller, and B.G. Warner made a new systematic sampling for molluscs, plants, and other fossils. Bulk samples at 0.5-m intervals at 19 levels yielded the plant and animal fossils; a separate set of five bulk samples (A to E) from the lower part of the fossil zone yielded the molluscs. Sampling proceeded from top down, with samples 1 to 5 from the silt below the gravel, 6 to 8 from the underlying sand, 9 to 16 from the clayey sand, and 17 to 19 from the clayey silt above the lower boulder gravel. The samples for mollusc study correspond approximately to the numbered samples as follows: A to 19, B to 15, C to 14, D to 13, and E to 10. Molluscs recovered from the numbered samples were studied as well as those from the lettered samples. The sampling arrangement is shown in Figure 2. A block sample was taken low in the sequence for a thermoluminescence date, and wood was collected for amino acid dating. A preliminary summary of some of the findings is in Karrow et al. (1990). Grab samples were taken from the Scout Camp site in 2000. Haas et al. (2003) presented a preliminary report on the Fernbank plant macrofossil assemblages.

Bulk samples were wet-sieved through a series of 10- (2000- μm), 35- (500- μm) and 60- (250- μm) mesh sieves. Dry residues were picked for plant macrofossils, molluscs, ostracodes, insects, and microvertebrates. Subsamples of sediment were examined for diatoms and Cladocera. Samples proved to be barren of diatoms, Chrysophyta, and sponges (H.C. Duthie, oral communication, 1992), and of Cladocera and chironomids (B.J. Hann letter, 1998). The vertebrates were identified by Seymour using recent comparative fish skeletons stored in the vertebrate paleontology collection at the Royal Ontario Museum.

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