Sedimentation and Sediment Chemistry, Neopit Mill Pond, Menominee Indian Reservation, Wisconsin, 2001

Prepared in cooperation with the Menominee Indian Tribe of Wisconsin

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U.S. Department of the Interior
U.S. Geological Survey

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Cover photograph shows the Menominee Enterprises, Inc. sawmill at Neopit, Wisconsin. From Milfred, C.J., Olson, G.W., and Hole, F.D., 1967, Soil resources and forest ecology of Menominee County, Wisconsin: University of Wisconsin, Geological and Natural History Survey, Soil Survey Division, Bulletin 85, Soil Series No. 60, fig. 7, p. 25. Date of photo and photographer unknown.

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Conversion Factors, Vertical Datum, and Abbreviated Units of Measurement

Multiply	By	To Obtain
inch (in.)	25.4	millimeter
inch (in.)	2.54	centimeter
foot (ft)	0.3048	meter
acre	0.4048	hectare
mile (mi)	1.609	kilometer
square foot (ft^2)	0.09294	square meter
square mile (mi^2)	2.590	square kilometer
cubic foot (ft^3)	35.314	cubic meter
cubic yard (yd^3)	1.308	cubic meter
pound (lb)	453.6	gram
pound (lb)	.4536	kilogram
ton (short)	0.9072	megagram

Temperature, in degrees Celsius (°C) can be converted to degrees Fahrenheit (°F) by use of the following equation: °F=1.8(°C) + 32.

Vertical datum: In this report, "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929), a geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called Sea Level Datum of 1929.

Abbreviated units of measurement used in this report: Sediment sample weight is given in grams. Bulk density is given in pounds per cubic foot (lb/ft^3) and grams per cubic centimeter (g/cm^3). Sediment chemical concentration is given in micrograms per gram ($\mu g/g$), grams per kilogram (g/kg), or percent.

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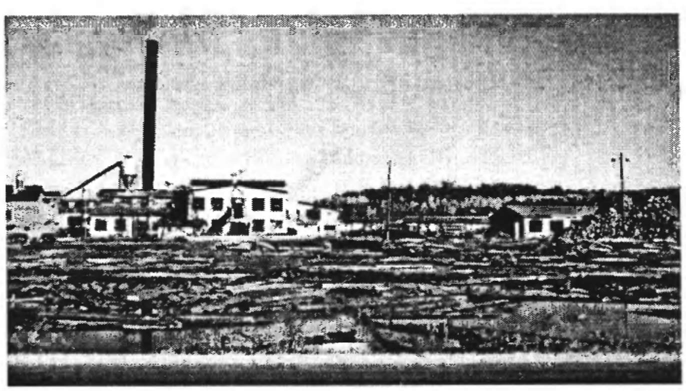
Abstract

The volume, texture, and chemistry of sediment deposited in a mill pond on the West Branch of the Wolf River at Neopit, Wis., Menominee Reservation, were studied in 2001–2002. The study was accomplished by examining General Land Office Survey Notes from 1854, establishing 12 transects through the mill pond, conducting soundings of the soft and hard bottom along each transect, and collecting core samples for preliminary screening of potential contaminants. Combined information from transects, cores, and General Land Office Survey notes were used to reconstruct the pre-dam location of the West Branch of the Wolf River through the mill pond. Neopit Mill Pond contains approximately 253 acre-ft of organic-rich muck, on average about 1.2 ft thick, that was deposited after the dam was built. Elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) associated with creosote and pentachlorophenol were found in post-dam sediment samples collected from Neopit Mill Pond. Trace-element concentrations were at or near background concentrations. Further study and sampling are needed to identify the spatial extent and variability of the PAHs, pentachlorophenol, and other byproducts from wood preservatives.



Photograph of the Menominee Enterprise, Inc. sawmill at Neopit, Wis. Date and photographer unknown (Milfred and others, 1967, p. 25).

Introduction

Neopit Mill Pond is located on the West Branch of the Wolf River at Neopit, Wis., Menominee Reservation (fig. 1). The dam for the mill pond was constructed in 1907 and the mill pond has been used in the past to store logs used in the Menominee Enterprise, Inc. sawmill located on the northeast side of the pond. A severe storm in 1905 damaged about 40 million board ft of hardwood-hemlock west of Neopit along the West Branch (Milfred and others, 1967). An Act of 1906 allowed the Menominee Tribe to log the timber under supervision of Government experts, create lumber mills, and sell lumber (Milfred and others, 1967). The lumber mill and mill pond at Neopit were constructed soon after these events. At the time of this study, the future of the dam is not known, and there is some possibility that the dam may be removed or upgraded and the stream restored or rehabilitated. Knowledge of the volume and chemical characteristics of the impounded sediment are needed prior to the removal of the dam or stream restoration. A cooperative study between the U.S. Geological Survey (USGS) and the Menominee Indian Tribe of Wisconsin was done in 2001–2002 to estimate the volume, texture, and chemistry of sediment deposited in Neopit mill pond. The objectives of this study were to: (1) identify and describe the pre-dam channel of the West Branch of the Wolf River; (2) estimate the volume and describe the texture of post-dam sediment in Neopit Mill Pond; and (3) describe the chemistry of post-dam sediment in the mill pond.

Purpose and Scope

The purpose of this report is to describe the findings from the study of sedimentation and sediment chemistry of Neopit Mill Pond. This report presents the results of the analysis of General Land Office Survey Notes, an estimate of pre-dam channel planform through the pond, results from soundings and surveys, core descriptions, estimates of post-dam sediment volume and weight, and results from preliminary screening of minor and trace elements and organic compounds in post-dam sediment.

Description of Study Area

Neopit Mill Pond is on the north side of Neopit, Wis., in the Menominee Indian Reservation. The pond has an area of 202 acres and a maximum depth of 10 ft. Two main tributaries enter the pond from the north (West Branch of the Wolf River) and the west (Little West Branch of the Wolf River). Neopit Mill Pond is surrounded by sandy glacial outwash and till and the topography is rolling to hilly (Milfred and others, 1967). Soils near the pond and in the watershed are composed of loams, sandy loams, and peat (Milfred and others, 1967). Vegetation in the watershed upstream of the pond mainly consists of northern hardwoods, hemlock-hardwoods, and swamp conifers (Milfred and others, 1967).

Acknowledgments

The authors thank Heather Arthur, Douglas Cox, and Jeremy Pyatskowit of the Environmental Services Department of the Menominee Indian Tribe of Wisconsin for their exhaustive field data collection efforts. They collected all the sounding data and greatly assisted with collecting cores and surveying. Matt Diebel (USGS) assisted with surveying and coring. Technical reviewers were Douglas Cox (Menominee Tribe Environmental Services), Herbert Garn (USGS), and Thomas Janisch (Wisconsin Department of Natural Resources). Janisch also provided insight on potential contaminants associated with wood preservatives and lumber mills in Wisconsin. Michelle Greenwood (USGS), Susan Jones (USGS), and Jen Bruce (USGS) provided editorial and graphic support.

Study Methods

This study involved examining historical documents, surveying 12 transects in the mill pond, determining the pre-dam land surface through soundings, collecting several cores along the transects, and analyzing subsamples of cores for analysis of organic content, minor and trace elements, organic compounds, and radiometric dating. Data were collected from November 2001 through July 2002.

Review of Historical Documents

Copies of original General Land Office (GLO) Survey Notes were obtained from the State of Wisconsin, Board of Commissioners of Public Lands for two townships: Township 29 North, Range 14 East and Township 29 North, Range 13 East. Notes for both townships are from 1854.

Transect Surveying and Sediment Coring

Data from transect surveys and sediment coring provided quantitative information on sedimentation and sediment geochemistry. Twelve transects (fig. 1) were placed along the pond at a spacing of about 1,000 ft. Depths to soft and hard sediment were measured by use of a sounding pole in impounded areas. An auto level was used to extend the transect data from below the water surface along the shoreline of the pond. Each transect end was marked with a semi-permanent marker such as rebar or pipe or painted trees. A "total station" surveying level was used to determine the elevations of the markers at each transect end point. Transect elevation data were referenced to a Wisconsin Department of Transportation benchmark on the railroad bed at Neopit (the benchmark has an altitude of 1,068 ft based on the 1982 USGS 7.5-minute quadrangle map, fig. 2). A global positioning system was used to verify the location of each transect and core.

The thickness, texture, geochemistry, and age of sediment in the pond were examined in cores collected with two devices—a geoprobe (2-in. diameter) and a piston corer (3-in. diameter). Ten cores were collected in March 2001 when the mill pond was frozen. The cores were examined in the field or at the USGS laboratory in Middleton, Wis. for color (Munsell Color, 1975), and field determination of texture was done by rubbing sediment between the fingers and use of the U.S. Department of Agriculture textural triangle (Soil Survey Staff, SCS, 1951). Samples were taken from a subset of side-by-side cores collected at sites 1, 2, 6, and 7 for preliminary analysis of water content, organic matter, minor and trace elements, organic compounds, and radiometric dating at USGS laboratories. Subsamples and cores were chilled or frozen during transport from the mill pond to the USGS in Middleton, where they were immediately frozen and archived upon arrival.

Sediment Laboratory Analyses

Physical Characteristics

Physical characteristics measured included water content and organic matter content (loss on ignition) for two samples from core 1, one sample from core 2, and eight samples from core 7 (table C1). Water and organic matter content were analyzed at the USGS laboratory in Middleton. Water content was measured by use of standard American Society for Testing and Materials Procedure D2216-92, except that sample sizes were less than 20 g wet weight due to the small sample size. Percentage dry weight was determined by measuring weight loss after 24 hours at 105°C. Organic matter content was determined by weight loss after ashing at 550°C for 1 hour (methods described in Dean, 1974). Dry bulk density was calculated by use of the formula:

$$\rho = (D(2.5I_x + 1.6C_x))/(D + (1\text{-}D)\,(2.5I_x + 1.6C_x)),(1)$$

where ρ is dry bulk density (g cm^{-3}), x is depth in the core, D is the proportion dry weight of unit wet volume, I is inorganic proportion of dry material (assuming a density of 2.5 g cm^{-3}), and C is organic proportion of dry material (assuming a density of 1.6 g cm^{-3}).

Radiometric Age Dating

Radiometric age dating included the analysis of six samples for ^{210}Pb, ^{137}Cs, and ^{226}Ra (table D1). The ^{210}Pb dating technique is based on the escape of radon from the Earth and the subsequent decay of this radioactive gas into ^{210}Pb. This technique is most suitable for dating material up to a maximum age of about 150 years because the half-life of ^{210}Pb is approximately 22 years (Olsson, 1986). To account for some of the variability associated with possible fluctuation in the sources of lead or inhomogeneous sediment, ^{226}Ra also was analyzed in each of the samples. Optimally, samples from sediment more than 150 years old are collected to measure local background concentrations of ^{210}Pb supplied to the sediment from decay of uranium minerals (Olsson, 1986). ^{137}Cs was first detected in 1945, and in 1954 the first increase occurred in the Northern Hemisphere, corresponding to increased nuclear weapon testing (Krishnaswami and Lal, 1978). In 1960 a minimum occurred, followed by a maximum in 1963. With the signing of the atmospheric nuclear test ban treaty, atmospheric contributions have dropped off substantially (Olsson, 1986). A date of 1963 is assigned to the sample with the highest ^{137}Cs activity.

Minor and Trace Elements

Two samples from core 1 and one sample each from cores 2 and 7 were submitted to the USGS National Water-Quality Laboratory, Denver, Colo. for analyses of minor and trace elements in sediment (table E1). The piston core tube was composed of Lexane and the geoprobe cores had plastic liners. The cores were subsampled with plastic equipment and samples stored in plastic jars. Samples were not sieved. Samples were frozen prior to shipping. All elements except sulfur were analyzed by use of inductively coupled plasma-mass spectrometry (Briggs and Meier, 1999). Sulfur was anaylzed by methods described in Jackson and others (1985) and Jackson and others (1987). Total digestions were done.

Organic Compounds

Four samples from core 1, two samples from core 2, and 1 sample from core 7 were analyzed for organic compounds at the USGS National Water-Quality Laboratory (tables F1 and F2). Compounds analyzed for included pesticides and metabolites, semi-volatile organic substances, polycyclic aromatic hydrocarbons (PAHs), chlorinated and nonchlorinated phenols, benzenes, ethanes, polychlorinated biphenyls (PCBs), DDT and metabolites, phthalate esters, nitrosamines, and halomethanes. Subsamples were collected from the cores by use of stainless steel equipment and samples were stored in glass jars. Jars were frozen after subsampling. Samples were not sieved. Laboratory methodology is detailed in Fishman (1993), Foreman and others (1995), and Furlong and others (1996).

Quality Control

Quality control procedures included collecting duplicate cores and approximately 15 percent replicate samples for laboratory analysis. Quality control measures at the USGS laboratories included comparisons to standard reference materials, spikes, and duplicates (Pirkey and Glodt, 1998).

Pre-Dam Topography and Channel Characteristics

A combination of the 1854 GLO notes and transect and core data (figs. 1 and 3; tables A1–A12, B1–B10) were used to reconstruct the location of the West Branch of the Wolf River. Estimated planforms for the West Branch and its tributary, the Little West Branch, are shown on figure 2. Three section lines bisect the mill pond. There was generally good agreement between the location of the channel from the GLO notes and the lowest elevation for the hard bottom (interpreted to be channel bottom) found along transects nearest to the section lines (fig. 3). There are some potential alternative locations for the channel or possibility that the channel was braided or contained islands. The presence of peat-like sediment in some of the cores suggests that part of the mill pond was previously wetland or lowland, making it difficult to pinpoint the exact location of the channel, especially where the two tributaries join.

The GLO notes give some indication of the width, depth, and type of sediment in the pre-dam channel in 1854 observed along section lines (table 1). The West Branch of the Wolf River through the impounded section was about 46–66 ft wide, 1–2 ft deep, and most likely gravel bottom. The Little West Branch was about 40 ft wide and is noted as having rapid current and high banks near the upstream end of the mill pond along the section line between sections 24 and 19. Downstream of the mill pond, the West Branch of the Wolf River was 109 ft wide, 1–2 ft deep, and had a sandy bottom.

The altitude of the pre-dam channel bottom of the West Branch of the Wolf River ranged from about 1,038 ft near the location of the dam (transects 13 and 14), to 1,049 ft near the north side of the mill pond at transect 7 (figs. 3E, 3K, and 3L). The Little West Branch pre-dam channel bottom ranged from an altitude of about 1,043 ft at its confluence with the West Branch of the Wolf River near transect 9 to about 1,046 ft near the west end of the mill pond at transect 2. The value of 1,046 ft for the west end is uncertain because of the lack of core data from transects 2 and 3. The hard bottom altitude for these transects can be used as an approximate indicator of the pre-dam topography because the sounding pole penetrated the pre-dam peat deposits that were present in this area, as shown in core 7 from transect 4.

Post-Dam Sedimentation

Figure 4 shows the estimated thickness of post-dam sediment at each of the core locations. Post-dam sediment is composed of organic-rich muck with or without wood pieces. Characteristics of the pre- and post-dam deposits at each core location are shown along the transects in figures 3A–L. A common stratigraphic sequence of the deposits is about 1 ft of organic-rich muck with large wood pieces near the base of the unit, underlain by pre-dam deposits of peat, sand, or sand and gravel. Large wood pieces were most prevalent in cores nearest to the lumber mill. The pre-dam peat deposit is thickest toward the western side of the pond near core 7.

The presence of wood pieces in loamy sand sometimes found below the organic muck in cores 2, 3, 6, 7, 9, and 10 was somewhat confusing because the sand is interpreted to have been deposited before the mill pond and lumber mill were constructed. The wood found in sandy deposits below the organic-rich muck may be related to the 1905 storm and related damaged timber in the West Branch drainage basin but also may be related to earlier logging, log drives, or older storms. Buried A horizons were also identified in cores 2 and 10 and likely represent old flood-plain surfaces. It is likely that during floods some of the organic-rich muck was eroded in the narrow reach of the pond upstream of the dam (for example transects 12, 13, and 14).

As stated in the previous section, the hard bottom altitudes based on soundings are sometimes deeper than interpreted pre-dam land surface based on core data (fig. 3). The sounding pole tended to extend into pre-dam deposits if they were composed of peat or loamy, organic-rich sand. However, sometimes the sounding pole would stop because of the presence of large wood pieces typically found at the base of the post-dam sediment, associated with debris coming off of the logs as they were stored in the mill pond prior to use at the lumber mill. The sounding pole correctly marked the altitude of the pre-dam surface if the muck was directly underlain by sand and gravel, such as in cores 4 and 5.

Cores collected in shallow water (cores 4 and 7) showed some disagreement between the top of sediment as measured by coring (February and March 2001) and that determined from sounding (summer 2001). It is thought that this is because the water was shallow enough that the entire water column was frozen down to the soft bottom. This means that there was potential for some of the top of the core to be lost from augering a hole in the ice.

The results from analysis of ^{210}Pb, ^{137}Cs, and ^{226}Ra for samples from core 7 were not helpful for determining sedimentation rates in the mill pond (table D1). The lack of a Cs peak most likely indicates that the sediment at this site possibly was subjected to mixing by wave action or bioturbation. Also, it is not known how much water levels varied in the mill pond historically.

A very rough estimate of the volume and weight of organic-rich muck associated with post-dam sedimentation can be made by averaging the depth of post-dam sediment at each transect (based mainly on the core data) and multiplying it by the average width of each transect and the length of mill pond that it represents (table 2). Dry bulk density of the organic-rich muck is estimated to be about 6.9 lbs/ft^3 based on the average of bulk density calculated from subsamples (table C1). The bulk density is quite low because of the high water content of the muck (generally about 90 percent) and substantial amount of organic matter (34–58 percent) (table C1). The sum of areas calculated for each transect is 211 acres, in close approximation to the listed size of 202 acres by the Wisconsin Department of Natural Resources. The mill pond is estimated to contain about 253 acre-ft (408,700 yds^3 or 38,000 tons) of post-dam related sediment. This estimate could be further refined by collecting additional core data and refining the sounding techniques to only penetrate the organic-rich muck.

Sediment Chemistry

A small set of archived subsamples (four samples from three cores for analysis of minor and trace elements and seven samples from three cores for analysis of organic compounds) was submitted for laboratory analysis of minor and trace elements and synthetic organic chemicals for preliminary identification of potential contaminants in the impounded sediment. The results from these analyses do not represent a complete range of concentrations of potential contaminants within Neopit Mill Pond. Instead, they are useful for preliminary screening and to help guide future sediment-chemistry sampling.

Minor and Trace Elements

Concentrations of the minor and trace-element in organic-rich muck (post-dam sediment) from Neopit Mill Pond were generally within the range of concentrations observed for streambed sediment samples collected from eight sites along the Wolf River and its tributaries, although there are a few exceptions (Scudder and others, 1997; Garn and others, 2001). Table E1 contains a comparison of element concentrations in Neopit Mill Pond and other Wolf River tributaries, as well as consensus-based sediment guidelines for aquatic life (threshold and probable effects concentrations, TEC and PEC, respectively) for arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc (MacDonald and others, 2000). Concentrations of arsenic, copper, mercury, and nickel in all Neopit Mill Pond sediment samples were within the concentration range for Wolf River streambed sediment and below the TECs. Cadmium and zinc concentrations were slightly higher in Neopit Mill Pond than in Wolf River streambed sediment, and two samples (core 1 and core 7) had concentrations just above the TEC. A chromium concentration from a core 7 sample was above the range of concentrations from Wolf River streambed sediment and above the TEC. Lead concentrations were within the range of concentrations from Wolf River streambed sediment, but one sample from core 1 was above the lead TEC. All sediment concentrations were below the PECs for the same eight elements.

Organic Compounds

Several organic compounds were detected in Neopit Mill Pond (table F1). Table F2 contains the list of organic compounds that were analyzed for but not detected in the Neopit Mill-Pond samples. Unlike minor and trace elements, these compounds were not analyzed previously by the USGS for streambed sediment at other sites in the Wolf River basin. The minimum reporting limits for some of the compounds are high because the sample size was smaller than the optimum sample size required by the laboratory (for example, fluorene). Detected concentrations are given as estimates if sample size was smaller than that required by the laboratory to meet quality-assurance guidelines.

Several of the organic compounds have sediment quality guidelines for aquatic life (Washington State, 1991; Persaud and others, 1993; Canadian Council of Ministers of the Environment, 1999; MacDonald and others, 2000; Janisch and others, 2002). The TECs and PECs for these compounds are listed in table 3. Janisch and others (2002) contains a compendium of TECs and PECs for PAHs and other organic compounds that are used to assess sediment quality in Wisconsin lakes and streams based on previous studies by Washington State (1991), Persaud and others (1993), Canadian Council of Ministers of the Environment (1999), and MacDonald and others (2000). In order to compare organic compounds to the TECs and PECs on a common basis, compound concentrations shown in table 3 are normalized to 1 percent total organic carbon. Samples from Neopit Mill Pond ranged from 18 to 29 percent organic carbon, which has a significant effect on lowering the normalized concentrations (and potential toxicity) of some of the organic compounds to values below TECs and PECs.

Concentrations of four organic compounds in sediment were above the consensus-based sediment quality guidelines for aquatic life (table 3). Concentrations of acenapthene and acenapthylene were above the TEC in samples from cores 1 and 2. One sample from core 1 had a napthalene concentration slightly above the TEC. This same sample from core 1 had concentrations of pentachlorophenol almost twice that of the draft Wisconsin PEC from Janisch and others (2002). This sample came from the core interval of 0.50–0.55 ft, or an actual depth of 1.06–1.22 ft when corrected with core recovery ratio, and also contained the highest concentrations of acenaphthene, acenaphthylene, anthracene, benz[a]anthracene, benzo[a]pyrene, benzo[b]fluoranthene, benzo[ghi]perylene, benzo[k]fluoranthene, carbazole, chrysene, fluoranthene, indeno[1,2,3-cd]pyrene, naphthalene, phenanthrene, bis(2-ethylhexyl)phthalate, and di-n-butyl phthalate (table F1). Although no sediment guidelines are available, p-cresol concentrations in the bottom of core 2 were over twice the concentrations in core 1 and the top of core 2, and in core 7 p-cresol concentrations were over 10 times higher than in core 1 (table F1).

Most of the organic compounds detected in sediment from the pond are polycyclic aromatic hydrocarbons (PAHs) and are found, along with a number of other organic compounds, in creosote, a common wood preservative (Awata and others, 1998; Brooks, 2000). Creosote is a distillate derived from coal tar produced by the carbonization of coal, and consists of at least 160 liquid and solid aromatic hydrocarbon compounds (Brooks, 2000). PAHs are also are released during forest fires and home wood burning and may be naturally found in high concentrations in peat. When released to water, many PAHs readily sorb to particulate matter and dissolved organic matter (Awata and others, 1998). The environmental fate of the compounds is determined by rates of adsorption, volatilization, and biodegradation. Some are carcinogenic, are listed by the Resource Conservation and Recovery Act (RCRA) as toxic hazardous waste, and may bioaccumulate in aquatic life. Some studies have shown that aquatic life and animals (including humans) may rapidly metabolize or excrete PAHs, thus confounding the relations between more persistent PAHs and biomagnification through the food chain (Brooks, 2000). Concentrations of the PAHs associated with wood preservatives and burning would be expected to be highest in cores 1 and 2 near the lumber mill, because historically, wood preservatives were used at the lumber mill and the mill currently burns wood. It is not known why a sample from core 7 had higher concentrations of p-cresol than samples from cores 1 and 2.

Pentachlorophenol (penta) is another commonly used wood preservative that was used at the Neopit lumber mill in the 1970s. It is not thought to occur naturally (Brooks, 2000). Penta may be dissolved in water or sorb onto particulate matter. It degrades through chemical, microbiological, and photochemical processes, thus the ultimate fate, toxicity, and bioaccumulation potential are highly dependent on local physical, chemical, and biological conditions. The complex processes involved in the persistence of penta in sediment may be why only one sample from this study contained detectable concentrations of the preservative, and why it had elevated concentrations. Alternatively, this sampled interval may represent the period when penta was used at the lumber mill. There seems to be more complexity to the spatial distribution of penta compared to the distribution of PAHs detected in sediment from the mill pond. Dioxins and furans have been found in discharges from other wood treatment facilities that used penta (Janisch and others, 2002). Samples were not analyzed for dioxin and furans in this study.

Additional analyses of organic compounds in sediment from Neopit Mill Pond are needed to better determine the spatial extent and concentration of PAHs, penta, and possibly other contaminants and byproducts that are associated with wood preservatives. The possible occurrence of dioxin and furans needs investigation. The potential transport of organic compounds to the water column and aquatic life also needs investigation and fish tissue should be analyzed. It would also be helpful to have more information on the history of the wood preservatives used at the lumber mill.

Conclusions

The following conclusions can be made from this study of sedimentation and sediment chemistry at Neopit Mill Pond:

- Combined information from transects, cores, and General Land Office Survey Notes were useful for reconstructing the pre-dam location of the West Branch of the Wolf River through Neopit Mill Pond. The probable pre-dam location of the channel was mapped by use of a combination of the above three sources of data. Core data indicated that pole soundings overestimated the depth to the pre-dam land surface (hard bottom) if pre-dam deposits were composed of peat or loamy sand.
- Approximately 253 acre-ft (408,700 yds^3) of sediment have been deposited in Neopit Mill Pond after the dam was constructed in 1907. Post-dam sediment is composed of organic-rich muck, on average about 1.2 ft thick. Post-dam sediment has a water content of about 79–93 percent and an organic matter content of about 35–58 percent. The mill pond contains about 38,000 tons (dry weight) of post-dam sediment. Large pieces of wood are abundant in the sediment, especially near the dam and lumber mill.
- Elevated concentrations of polycyclic aromatic hydrocarbons (PAHs) associated with creosote and pentachlorophenol (both commonly used wood preservatives) were found in samples from three cores from Neopit Mill Pond. Trace-element concentrations were at or near background concentrations.
- Further study is needed to identify the spatial extent and variability of the PAHs, pentachlorophenol, and other byproducts from wood preservatives. Potential effects of these contaminants on the water column and aquatic life need more investigation to guide future restoration efforts.

References Cited

Awata, H., Bates, S., Knaub, D., and Popelka, R., 1998, Polynuclear aromatic hydrocarbons: properties and environmental fate—an EXAMS model simulation: Environmental Engineering and Science, Clemenson University, accessed (2002) at URL http://entweb.clemson.edu/pesticid/document/leeorg1/leeorg4.htm.

Briggs, P.H., and Meier, A.L., 1999, The determination of forty two elements in geological materials by inductively coupled plasma-mass spectrometry: U.S. Geological Survey Open-File Report 99–0166, 15 p.

Brooks, K.M., 2000, Assessment of the environmental effects associated with wooden bridges preserved with creosote, pentachlorophenol, or chromated copper arsenate: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory Research Paper FP–RP–587, 100 p.

Canadian Council of Ministers of the Environment, 1999, Canadian sediment quality guidelines for the protection of aquatic life: Winnipeg, Canadian Council of Ministers of the Environment Report.

Dean, W.E., Jr., 1974, Determination of carbonate and organic matter in calcareous sediments and sedimentary rock by loss on ignition—comparison with other methods: Journal of Sedimentary Petrology, v. 44, p. 242–248.

Foreman, W.T., Connor, B.F., Furlong, E.T., Vaught, D.G., and Merten, L.M., 1995, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—determination of organochlorine pesticides and polychlorinated biphenyls in bottom sediment by dual capillary-column gas chromatography with electron-capture detection: U.S. Geological Survey Open-File Report 95–140, 78 p.

Furlong, E.T., Vaught, D.G., Merten, L.M., Foreman, W.T., and Gates, P.M., 1996, Methods of analysis by the U.S. Geological Survey National Water Quality Laboratory—determination of semivolatile organic compounds in bottom sediment by solvent extraction, gel permeation, chromatographic fractionation, and capillary-column gas chromatography/mass spectrometry: U.S. Geological Survey Open-File Report 95–719, 67 p.

Garn, H.S., Scudder, B.C., Richards, K.D., and Sullivan, D.J., 2001, Characteristics of water, sediment, and benthic communities of the Wolf River, Menominee Indian Reservation, Wisconsin, water years 1986–98: U.S. Geological Survey Water-Resources Investigations Report 01–4019, 54 p.

Jackson, L.L., Brown, F.W., and Neil, S.T., 1987, Major and minor elements requiring individual determinations, classical whole rock analysis, and rapid rock analysis, *in* Baedecker, P.A., ed., Methods for geochemical analysis: U.S. Geological Survey Bulletin 1770, p. G12–G17.

Jackson, L.L., Engleman, E.E., and Peard, J.L., 1985, Determination of total sulfur in lichens and plants by combustion-infrared analysis: Environmental Science and Technology, v. 19, p. 437–441.

Janisch, T., Liebenstein, L., Galarneau, S., and others, 2002, Consensus-based sediment quality guidelines; recommendations for use and application: Madison, Wis., Wisconsin Department of Natural Resources WT–732–2002, February 2002, 32 p.

Krishnaswami, S., and Lal, D., 1978, Radionuclide limnochronology, in Lerman, A., ed., Lakes: Chemistry, Geology, Physics: Springer-Verlag, NY, p. 153–177.

MacDonald, D.D., Ingersoll, C.D., and Berger, T. A., 2000, Development and evaluation of consensus-based sediment quality guidelines for freshwater ecosystems: Archive of the Environmental Contamination Toxicologists, v. 39, p. 20–31.

Milfred, C.J., Olson, G.W., and Hole, F.D., 1967, Soil resources and forest ecology of Menominee County, Wisconsin: University of Wisconsin, Geological and Natural History Survey, Soil Survey Division, Bulletin 85, Soil Series No. 60, Madison, Wis.., 203 p. and 3 plates.

Munsell Color, 1975, Munsell soil color charts, Baltimore, Munsell Color Division of Kollmorgen Corp., variable pagination.

Olsson, I.U., 1986, Radiometric dating, in Berglund, B.E., ed., Handbook of Holocene Paleoecology and Paleohydrology: Chichester, John Wiley and Sons, p. 273–312.

Persaud, D.R., Jaagumagi, R., and Hayton, A., 1993, Guidelines for the protection and management of aquatic sediment quality in Ontario: Toronto, Ontario Ministry of Environment and Energy Report, 27 p.

Pirkey, K.D., and Glodt, S.R., 1998, Quality control at the U.S. Geological Survey National Water Quality Laboratory: U.S. Geological Survey Fact Sheet FS–026–98, 6 p.

Scudder, B.C., Sullivan, D.J., Fitzpatrick, F.A., and Rheaume, S.J., 1997, Trace elements and synthetic organic compounds in biota and streambed sediment of the Western Lake Michigan Drainages, 1992–1995: U.S. Geological Survey Water-Resources Investigations Report 97–4192, 34 p.

Soil Survey Staff, SCS, 1951, Soil Survey Manual, in USDA Agricultural Handbook No. 18.

Washington State, Department of Ecology, 1991, Sediment management standards: Washington State Department of Ecology, Chapter 173–204 WAC, 61 p.

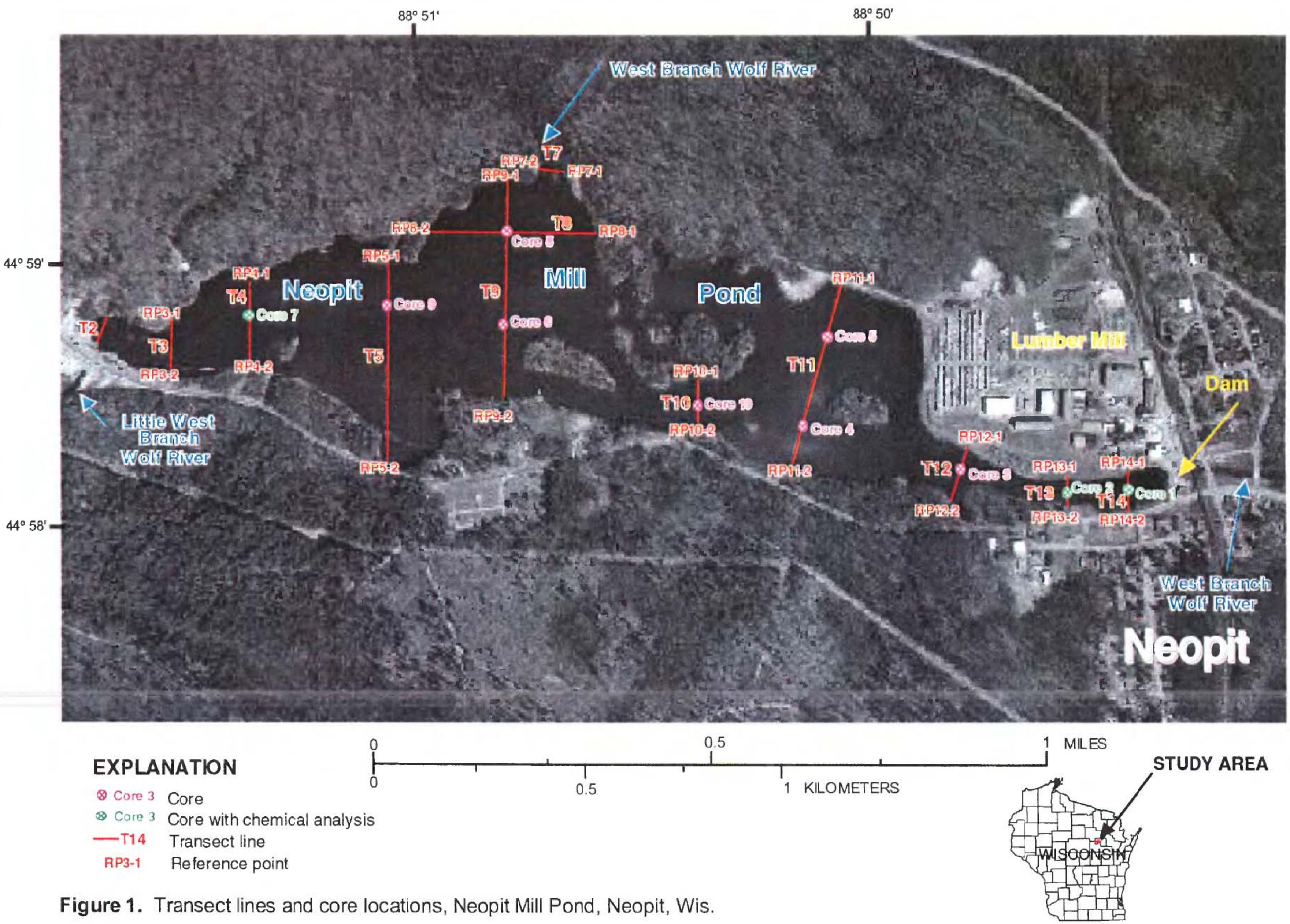


Figure 1. Transect lines and core locations, Neopit Mill Pond, Neopit, Wis.

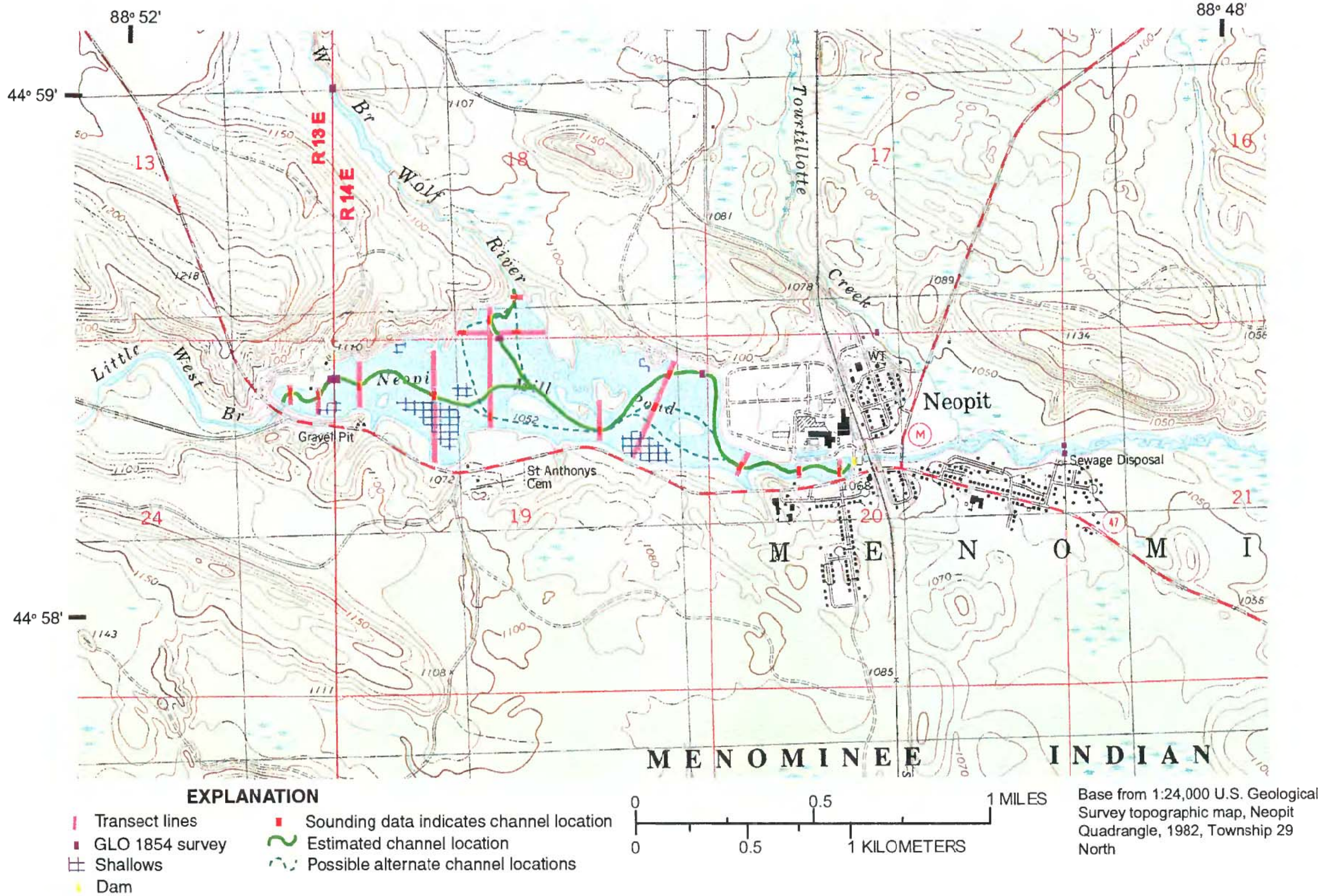


Figure 2. Estimated location of pre-dam channel, Neopit Mill Pond. Interpretations based on 1854 General Land Office (GLO) Survey Notes, sounding and core data collected in 2001, and 1958 and 2001 aerial photographs.

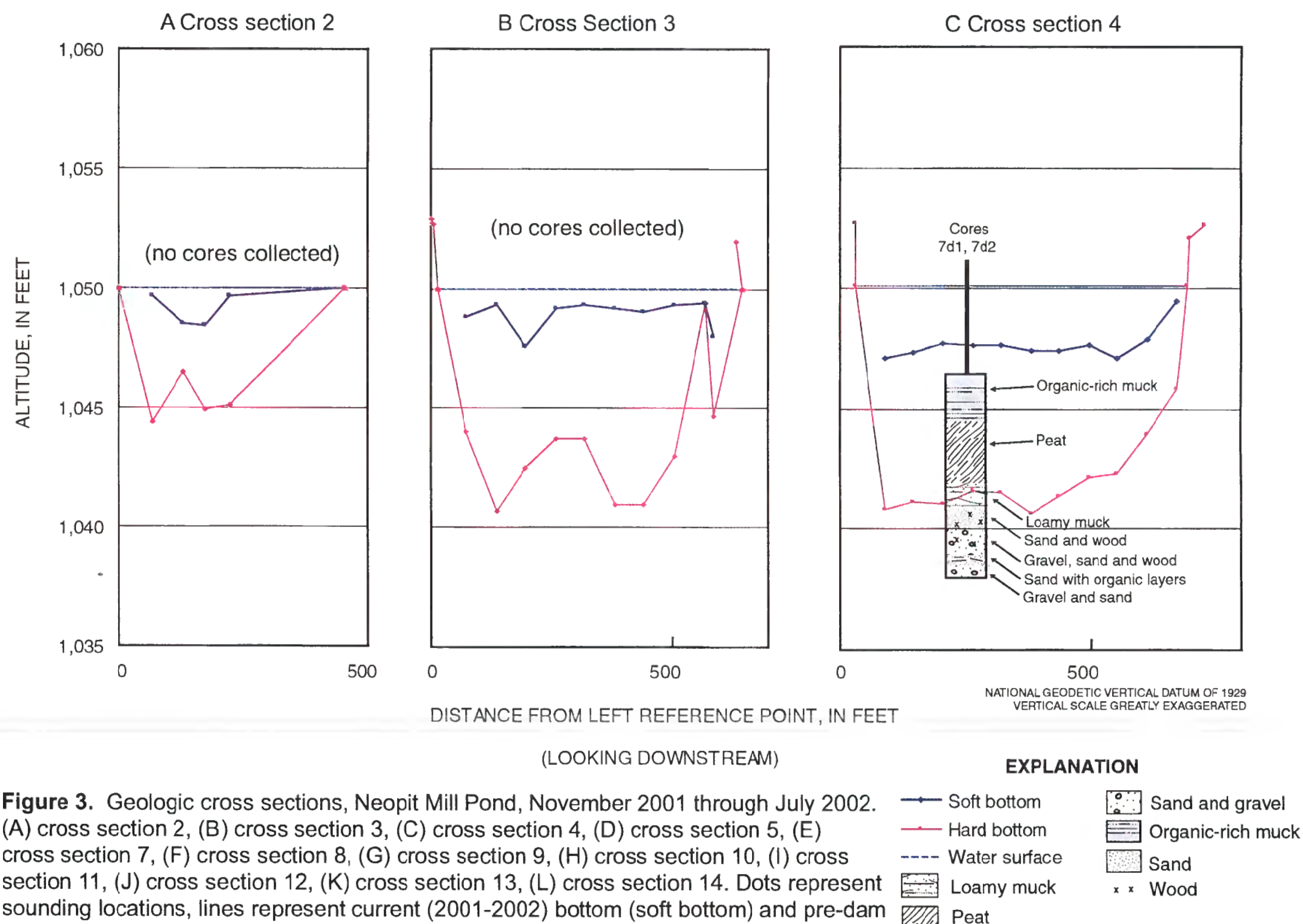


Figure 3. Geologic cross sections, Neopit Mill Pond, November 2001 through July 2002. (A) cross section 2, (B) cross section 3, (C) cross section 4, (D) cross section 5, (E) cross section 7, (F) cross section 8, (G) cross section 9, (H) cross section 10, (I) cross section 11, (J) cross section 12, (K) cross section 13, (L) cross section 14. Dots represent sounding locations, lines represent current (2001-2002) bottom (soft bottom) and pre-dam (1907) bottom (hard bottom). Cross section and core locations are shown on fig. 1.

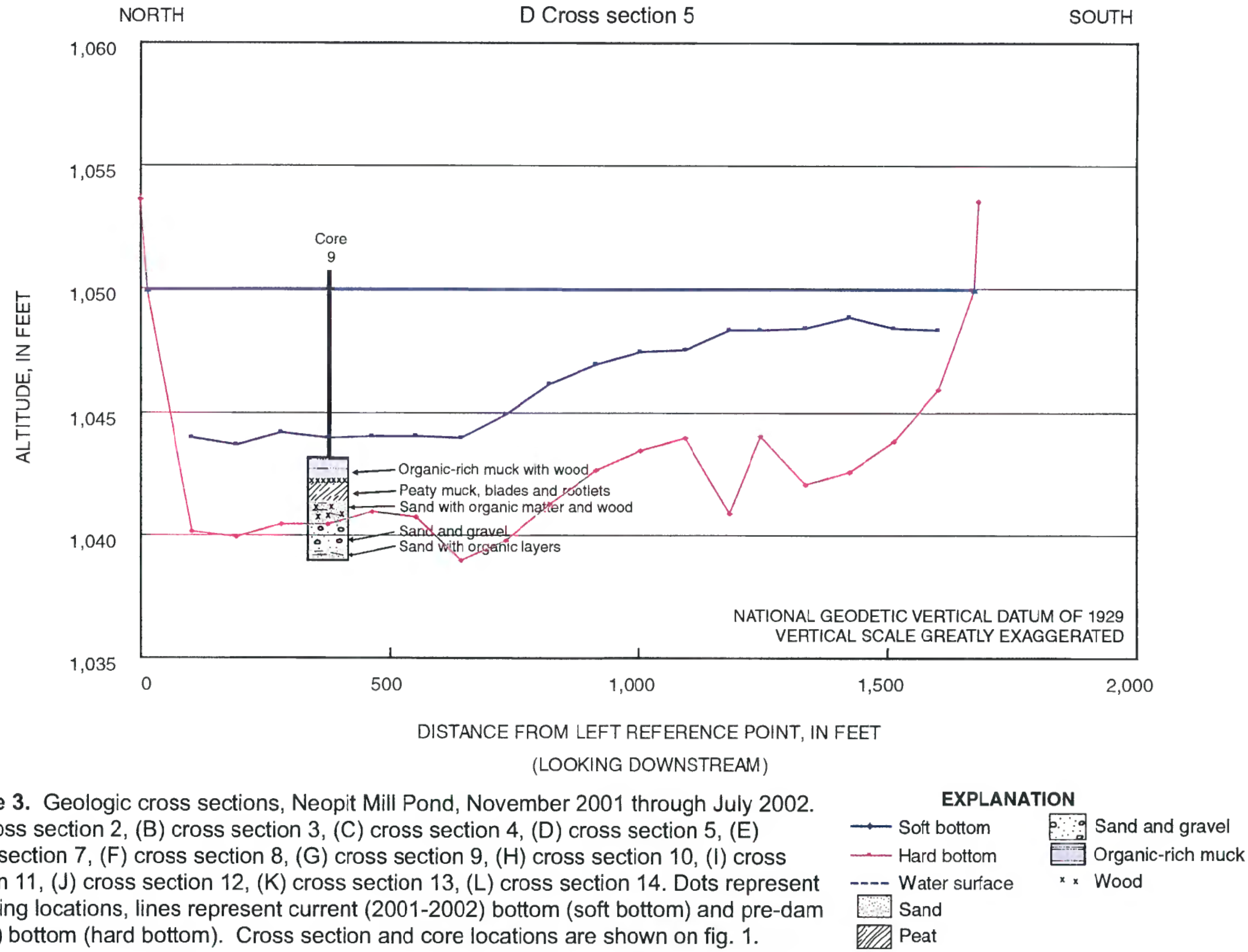


Figure 3. Geologic cross sections, Neopit Mill Pond, November 2001 through July 2002. (A) cross section 2, (B) cross section 3, (C) cross section 4, (D) cross section 5, (E) cross section 7, (F) cross section 8, (G) cross section 9, (H) cross section 10, (I) cross section 11, (J) cross section 12, (K) cross section 13, (L) cross section 14. Dots represent sounding locations, lines represent current (2001-2002) bottom (soft bottom) and pre-dam (1907) bottom (hard bottom). Cross section and core locations are shown on fig. 1.

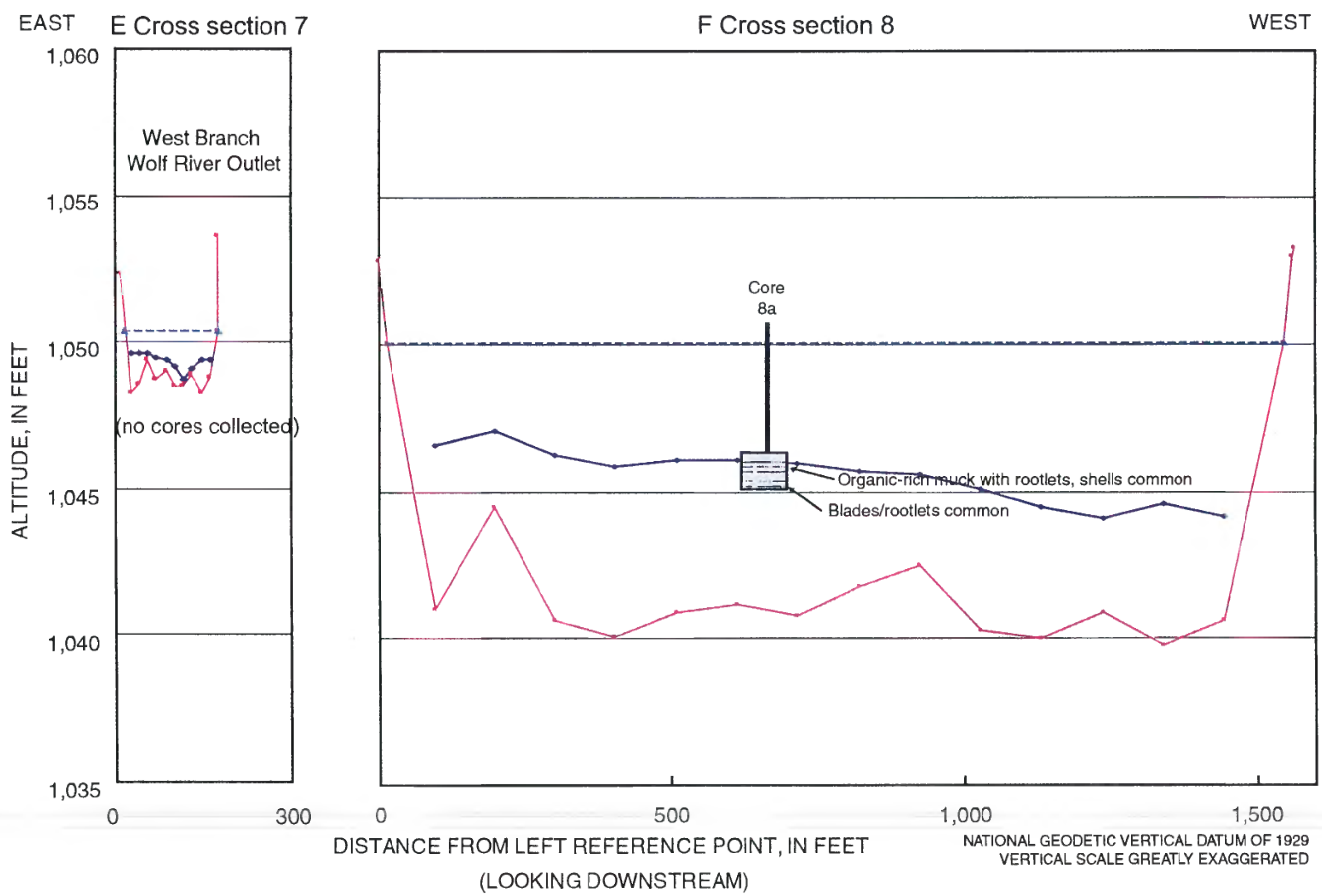


Figure 3. Geologic cross sections, Neopit Mill Pond, November 2001 through July 2002. (A) cross section 2, (B) cross section 3, (C) cross section 4, (D) cross section 5, (E) cross section 7, (F) cross section 8, (G) cross section 9, (H) cross section 10, (I) cross section 11, (J) cross section 12, (K) cross section 13, (L) cross section 14. Dots represent sounding locations, lines represent current (2001-2002) bottom (soft bottom) and pre-dam (1907) bottom (hard bottom). Cross section and core locations are shown on fig. 1.

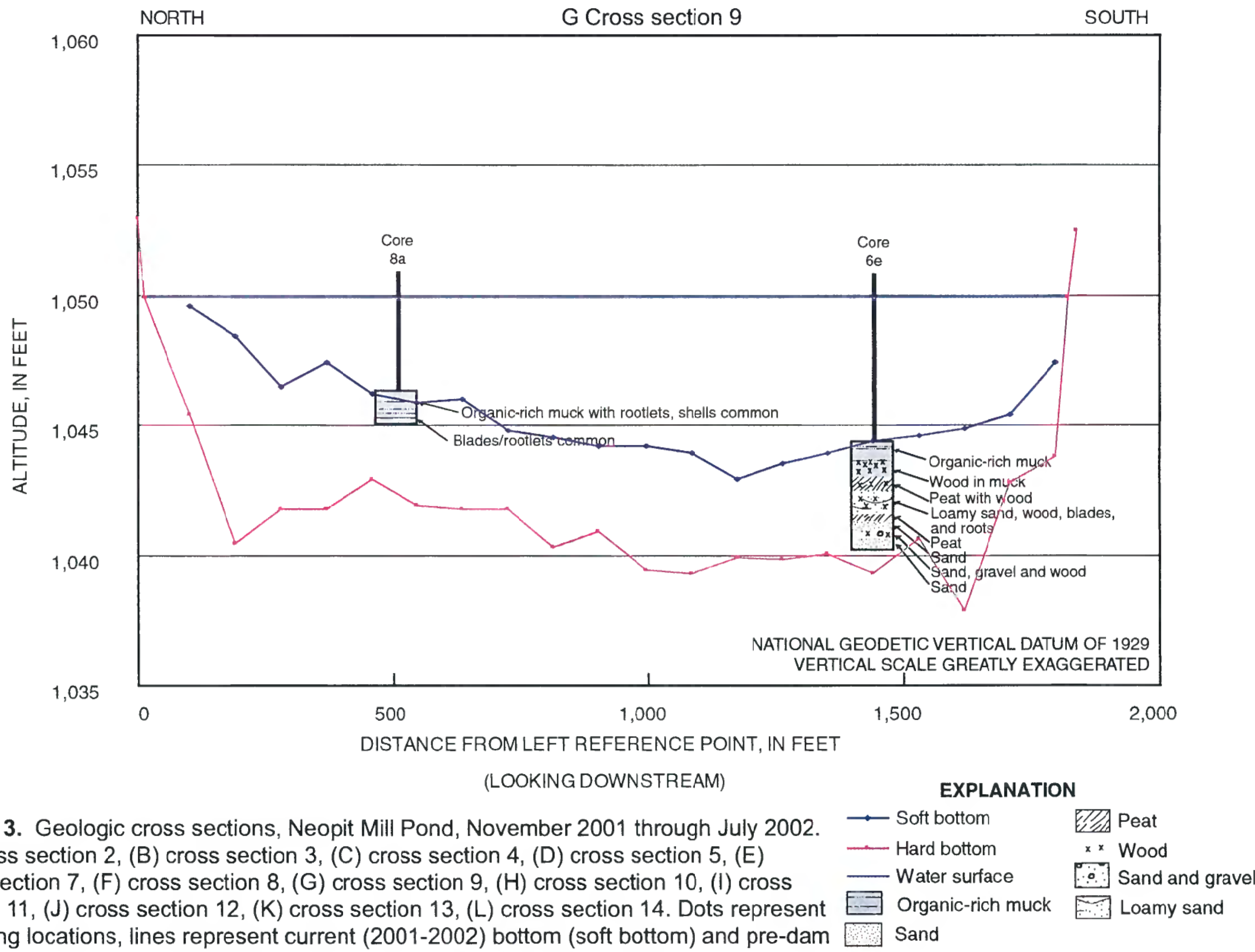


Figure 3. Geologic cross sections, Neopit Mill Pond, November 2001 through July 2002. (A) cross section 2, (B) cross section 3, (C) cross section 4, (D) cross section 5, (E) cross section 7, (F) cross section 8, (G) cross section 9, (H) cross section 10, (I) cross section 11, (J) cross section 12, (K) cross section 13, (L) cross section 14. Dots represent sounding locations, lines represent current (2001-2002) bottom (soft bottom) and pre-dam (1907) bottom (hard bottom). Cross section and core locations are shown on fig. 1.

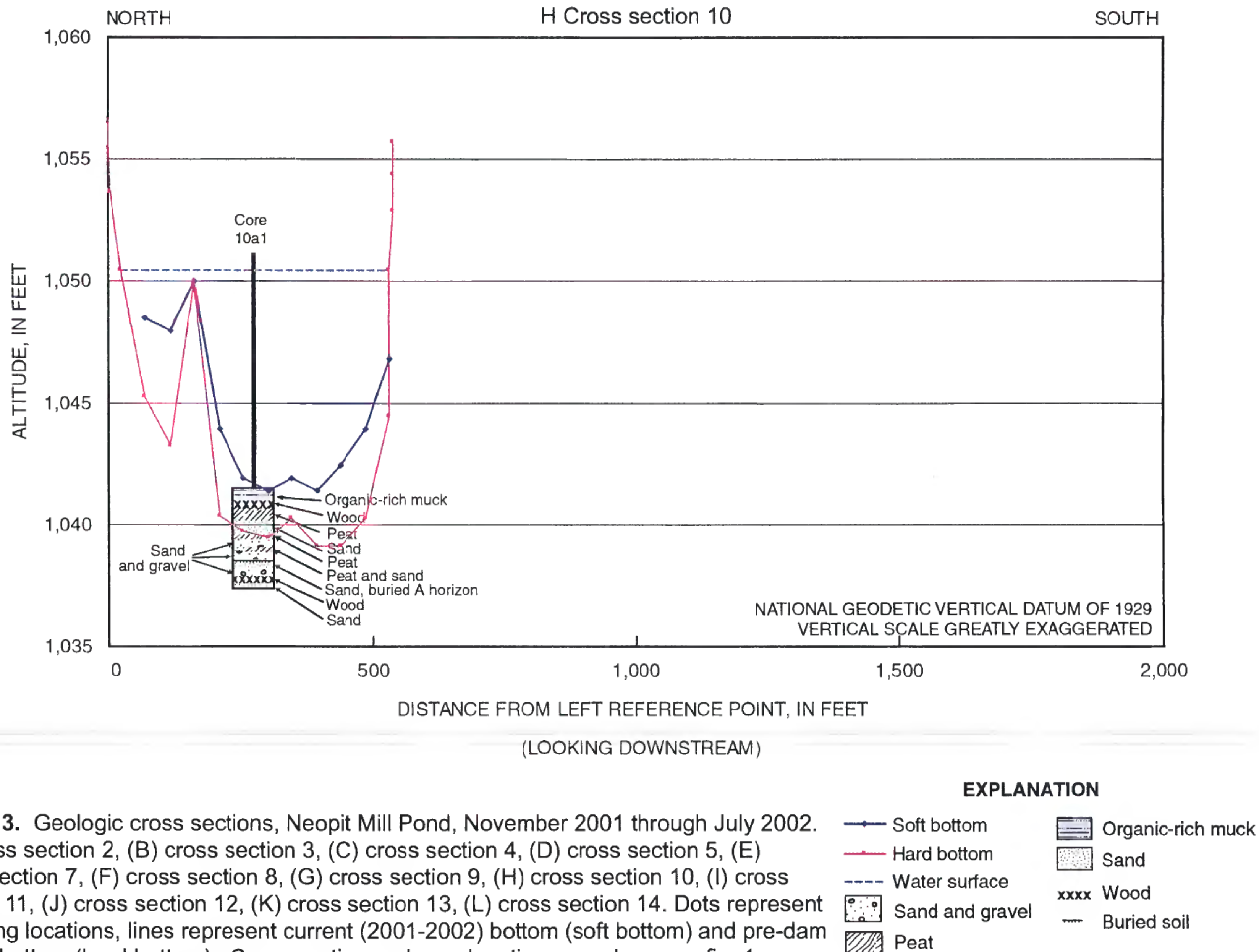


Figure 3. Geologic cross sections, Neopit Mill Pond, November 2001 through July 2002. (A) cross section 2, (B) cross section 3, (C) cross section 4, (D) cross section 5, (E) cross section 7, (F) cross section 8, (G) cross section 9, (H) cross section 10, (I) cross section 11, (J) cross section 12, (K) cross section 13, (L) cross section 14. Dots represent sounding locations, lines represent current (2001-2002) bottom (soft bottom) and pre-dam (1907) bottom (hard bottom). Cross section and core locations are shown on fig. 1.

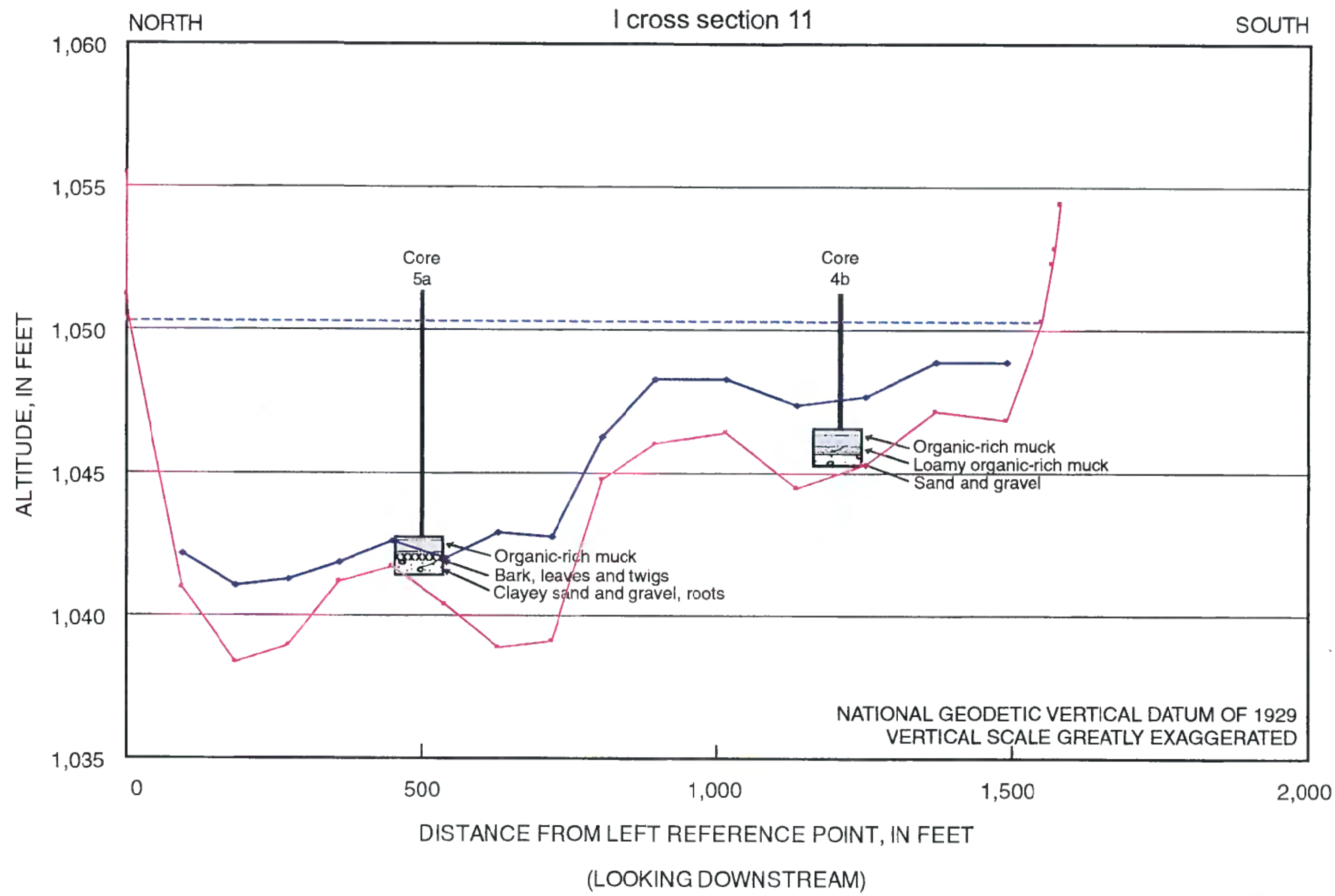


Figure 3. Geologic cross sections, Neopit Mill Pond, November 2001 through July 2002. (A) cross section 2, (B) cross section 3, (C) cross section 4, (D) cross section 5, (E) cross section 7, (F) cross section 8, (G) cross section 9, (H) cross section 10, (I) cross section 11, (J) cross section 12, (K) cross section 13, (L) cross section 14. Dots represent sounding locations, lines represent current (2001-2002) bottom (soft bottom) and pre-dam (1907) bottom (hard bottom). Cross section and core locations are shown on fig. 1.

EXPLANATION

Soft bottom
Hard bottom
Water surface
Organic-rich muck
Sand and gravel
Loamy muck
xxxx Wood

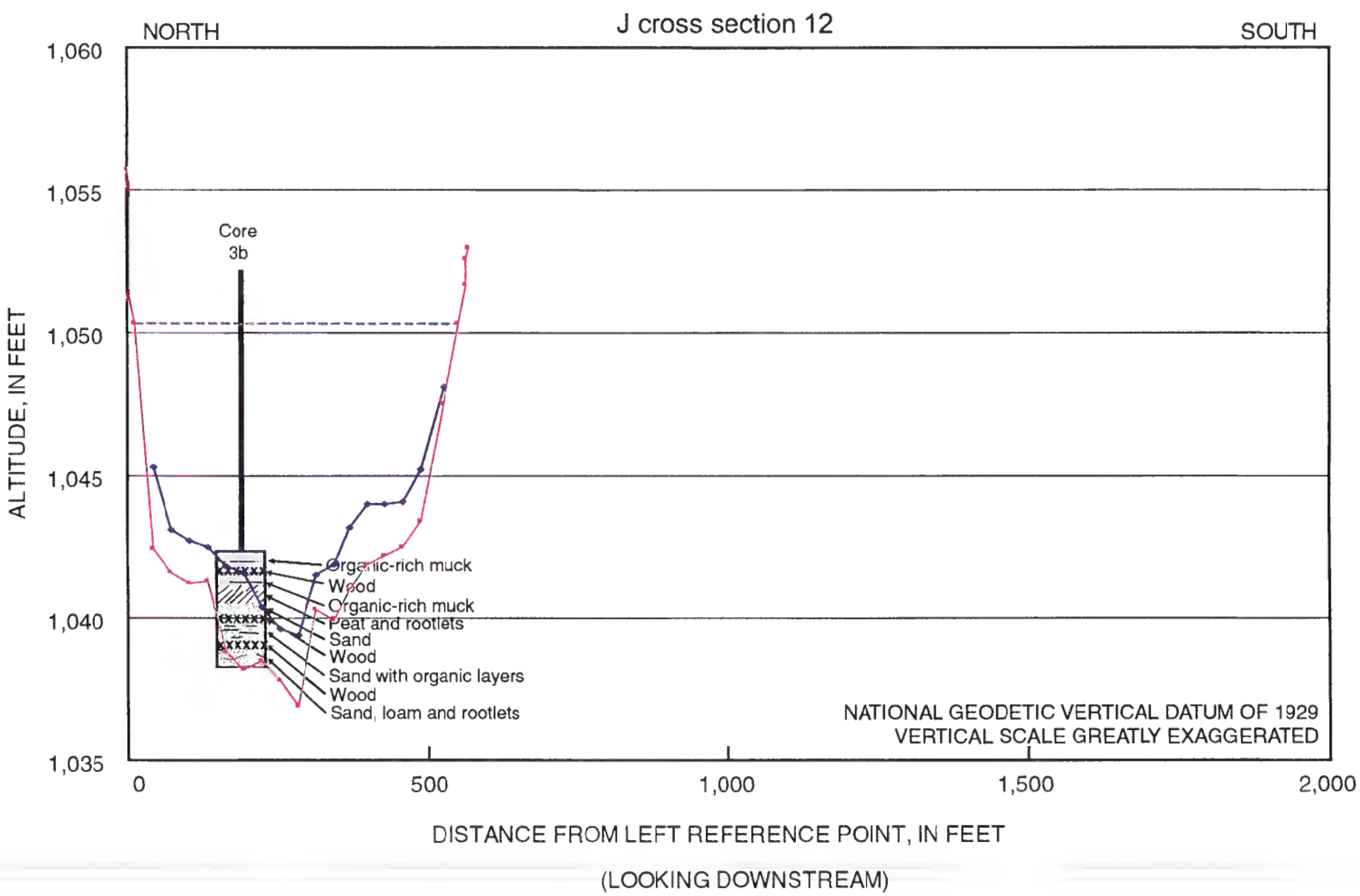


Figure 3. Geologic cross sections, Neopit Mill Pond, November 2001 through July 2002. (A) cross section 2, (B) cross section 3, (C) cross section 4, (D) cross section 5, (E) cross section 7, (F) cross section 8, (G) cross section 9, (H) cross section 10, (I) cross section 11, (J) cross section 12, (K) cross section 13, (L) cross section 14. Dots represent sounding locations, lines represent current (2001-2002) bottom (soft bottom) and pre-dam (1907) bottom (hard bottom). Cross section and core locations are shown on fig. 1.

EXPLANATION

- Soft bottom
- Hard bottom
- Water surface
- Sandy loam
- Peat
- Organic-rich muck
- Sand
- xxxx Wood chip layer

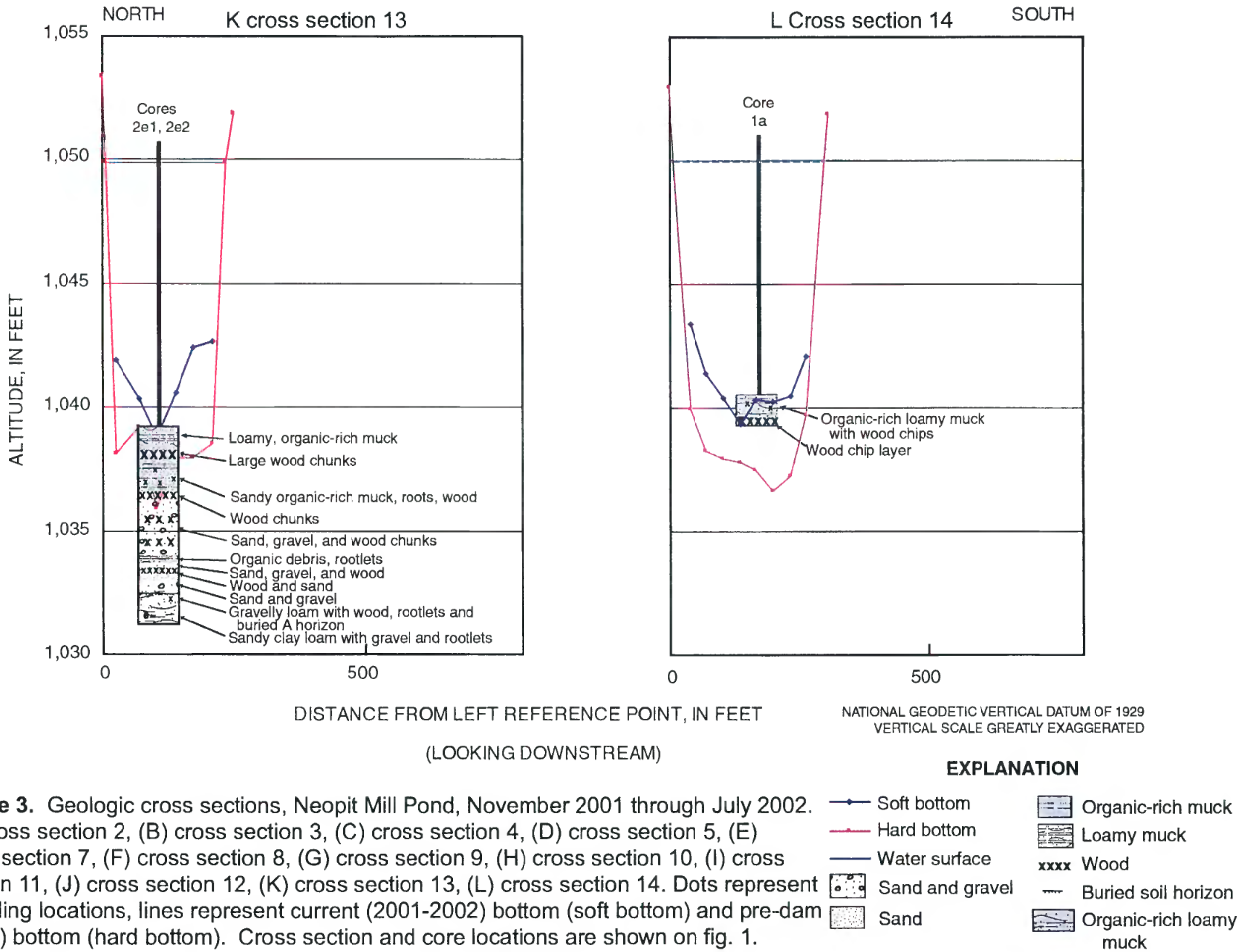


Figure 3. Geologic cross sections, Neopit Mill Pond, November 2001 through July 2002. (A) cross section 2, (B) cross section 3, (C) cross section 4, (D) cross section 5, (E) cross section 7, (F) cross section 8, (G) cross section 9, (H) cross section 10, (I) cross section 11, (J) cross section 12, (K) cross section 13, (L) cross section 14. Dots represent sounding locations, lines represent current (2001-2002) bottom (soft bottom) and pre-dam (1907) bottom (hard bottom). Cross section and core locations are shown on fig. 1.

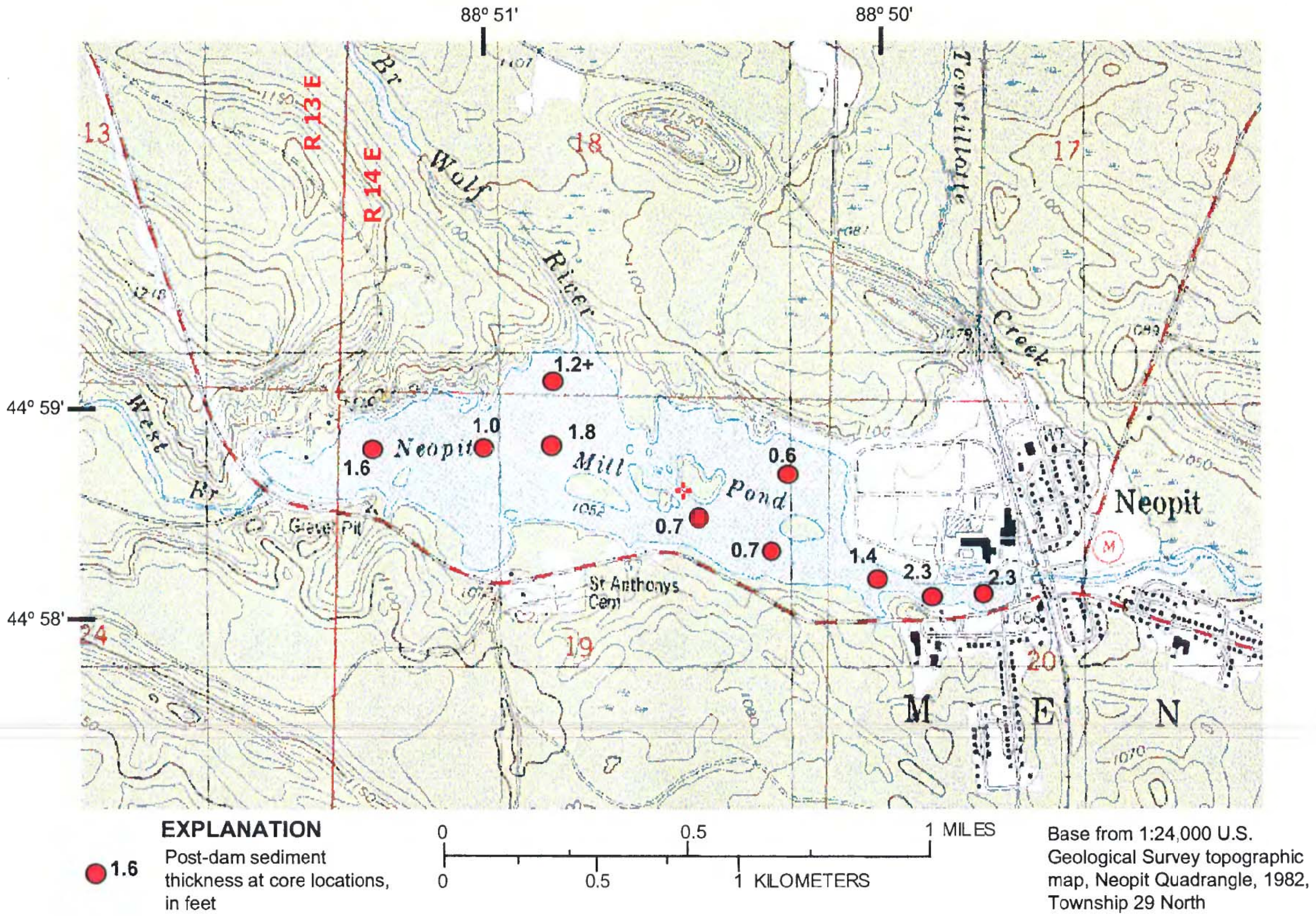


Figure 4. Post-dam sediment thickness at core locations, Neopit Mill Pond, Neopit, 2001.

Table 1. General Land Office Survey Notes from 1854 for the Neopit Mill Pond area
[ft, feet; *, calculated from survey unit of measure links where 1 link = 0.66 feet; --, no information given]

Section line	Stream name	Channel width (ft*)	Channel depth (ft)	Streambed sediment	Remarks
T29N, R14E, sections 20 and 21	West Branch Wolf River	108.9	1-2	sandy	
T29N, R14E, sections 19 and 20	West Branch Wolf River	46.2	1-2	--	
T29N, R14E, sections 17 and 20	Tourtillotte Creek	9.9	--	sandy	
T29N, R14E, sections 18 and 19	West Branch Wolf River	66.0	1-2	gravelly	
T29N, R13E, section 24, and T29N, R14E, section 19	Little West Branch	39.6	--	--	rapid current, high banks
T29N, R13E, section 13, and T29N, R14E, section 18	West Branch Wolf River	39.6	--	--	

Table 2. Worksheet for calculating volume and weight of post-dam sediment in Neopit Mill Pond
[ft, feet; g, gram; cm, centimeter; lbs, pounds]

Transect number	Post-dam sediment depth (ft)	Map transect width (ft)	Sounding transect width (ft)	Average transect width (ft)	Transect length (ft)	Transect area (ft^2)	Island area (ft^2)	Transect area, no islands (ft^2)	Transect volume (ft^3)
2	2.0	300	450	375	463	173,438	0	173,438	346,875
3	2.0	400	600	500	513	256,250	0	256,250	512,500
4	1.6	650	650	650	850	552,500	22,500	530,000	848,000
5	1.0	1,600	1,600	1,600	975	1,560,000	0	1,560,000	1,560,000
9	1.8	1,700	1,800	1,750	1,225	2,143,750	160,000	1,983,750	3,570,750
10	0.7	1,900	na	1,900	1,250	2,375,000	225,000	2,150,000	1,505,000
11	0.7	1,600	1,550	1,575	1,200	1,890,000	200,000	1,690,000	1,183,000
12	1.4	450	500	475	1,175	558,125	0	558,125	781,375
13	2.3	250	250	250	725	181,250	0	181,250	416,875
14	2.3	300	300	300	450	135,000	0	135,000	310,500

Totals for impoundment	
Area (acres)	212
Volume of sediment (ft^3)	11,034,875
Volume of sediment (acre-ft)	253
Volume of sediment (yds^3)	408,699
Average dry bulk density (g/cm^3)	0.1104
Average dry bulk density (lbs/ft^3)	6.893
Weight of dry sediment (tons)	38,033

Table 3. Organic compounds detected in Neopit Mill Pond sediment (concentrations normalized to 1 percent total organic carbon) and consensus-based sediment quality guidelines

[ft, feet; g, gram; kg, kilogram; µg, microgram; E, estimated; na, not available; USGS, U.S. Geological Survey. Interval top and bottom depths are not corrected for recovery ratio
Threshold and probable effect concentrations are from Janisch and others (2002), which are primarily based on guidelines in MacDonald and others (2000), Canadian Council of Ministers of the Environment (1999), Persaud and others (1993), and Washington State (1991).
Pentachlorophenol TECs and PECs are draft guidelines.
See table F1 for full list of detected compounds with unnormalized concentrations.]

Core number	USGS site number	Interval top (ft)	Interval bottom (ft)	Date collected	Inorganic carbon (g/kg)	Total carbon (g/kg)	Organic carbon (pct)	4H-cyclpenta[def]-phenanthrene (µg/kg)	Fluorene (µg/kg)	Acenaphthene (µg/kg)	Acenaphthylene (µg/kg)	Anthracene (µg/kg)	benz[a]anthracene (µg/kg)	Benzo[a]pyrene (µg/kg)	Benzo[b]fluorathene (µg/kg)	Benzo[ghi]perylene (µg/kg)	Benzo[k]fluoranthene (µg/kg)	Chrysene (µg/kg)
1c	445851088495000	0.00	0.05	2/13/2001	8	190	18	na	7	na	18	6	8	11	14	15	na	5
1c	445851088495000	0.05	0.10	2/13/2001	5	180	18	na	7	11	49	9	9	14	17	16	3	10
1c	445851088495000	0.50	0.55	2/13/2001	1	240	23	10	na	13	55	18	30	39	50	49	27	36
1c	445851088495000	0.55	0.60	2/13/2001	1	240	24	3	6	4	17	6	9	14	14	20	11	11
2c	445850088495600	0.10	0.15	2/13/2001	2	170	17	na	na	6	29	6	7	8	11	12	2	4
2c	445850088495600	0.15	0.20	2/13/2001	2	180	18	na	10	12	51	7	7	13	17	19	6	7
7c	44590588512700	0.20	0.30	3/1/2001	1	290	29	na	na	na	na	na	7	na	na	na	na	7
Threshold effect concentration								na	77.4	6.7	5.9	57.2	108	150	240	170	240	166
Probable effect concentration								na	536	89	128	845	1,050	1,450	13,400	3,200	13,400	1,290

Table 3. Organic compounds detected in Neopit Mill Pond sediment (concentrations normalized to 1 percent total organic carbon) and consensus-based sediment quality guidelines—Continued

[ft, feet; g, gram; kg, kilogram; µg, microgram; E, estimated; na, not available; USGS, U.S. Geological Survey. Interval top and bottom depths are not corrected for recovery rat
Threshold and probable effect concentrations are from Janisch and others (2002), which are primarily based on guidelines in MacDonald and others (2000), Canadian Council of Ministers of the Environment (1999), Persaud and others (1993), and Washington State (1991).
Pentachlorophenol TECs and PECs are draft guidelines.
See table F1 for full list of detected compounds with unnormalized concentrations.]

Core number	USGS site number	Fluoranthene (µg/kg)	Indeno[1,2,3-cd]pyrene (µg/kg)	1,6-Dimethylnaphthalene (µg/kg)	2,3,6-Trimethylnaphthalene (µg/kg)	2,6-Dimethylnaphthalene (µg/kg)	Naphthalene (µg/kg)	p-Cresol (µg/kg)	1-Methylphenanthrene (µg/kg)	Phenanthrene (µg/kg)	Phenol (µg/kg)	Pentachlorophenol (µg/kg)	Di-n-butyl phthalate (µg/kg)	Diethyl phthalate (µg/kg)	Pyrene (µg/kg)	Total PAHs (µg/kg)
1c	445851088495000	19	8	3	2	22	78	24	na	28	8	na	na	na	21	265
1c	445851088495000	39	12	6	3	24	172	28	4	72	11	na	na	na	41	519
1c	445851088495000	100	36	1	na	16	183	na	12	106	16	367	3	na	89	869
1c	445851088495000	30	15	na	na	5	67	17	4	31	9	na	na	4	26	293
2c	445850088495600	26	6	2	na	8	100	61	na	24	10	na	na	5	29	280
2c	445850088495600	28	11	3	na	18	128	128	22	46	18	na	na	na	33	437
7c	445905885127000	11	na	na	na	22	na	317	na	na	na	na	na	na	4	51
Threshold effect concentration		423	200	na	na	na	176	na	na	204	4,200	150	2,200	610	195	1,610
Probable effect concentration		2,230	3,200	na	na	na	561	na	na	1,170	12,000	200	17,000	1,100	1,520	22,800

Appendix Tables

Table A1. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 2.
Based on survey and sounding data collected in 2001 and 2002.
[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,050.0	LEW
66.0	1,049.7	1,044.4	
129.0	1,048.5	1,046.5	
171.0	1,048.4	1,044.9	
219.0	1,049.7	1,045.1	
453.0	1,050.0	1,050.0	REW

Table A2. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 3.
Based on survey and sounding data collected in 2001 and 2002.
[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,053.6	top of rebar at RP3-1
0.0		1,052.9	ground surface at RP3-1
2.4		1,052.7	top of bank
11.0		1,050.0	LEW
72.6	1,048.8	1,044.0	fairly soft
134.3	1,049.3	1,040.7	very soft (muck)
195.9	1,047.6	1,042.5	in channel
257.6	1,049.2	1,043.7	solid bottom
319.2	1,049.3	1,043.7	very solid bottom
380.9	1,049.2	1,041.0	bottom becoming softer
442.5	1,049.0	1,041.0	
504.1	1,049.3	1,043.0	hard bottom
565.8	1,049.4	1,049.4	all gravel, old railroad bed
584.3	1,048.0	1,044.7	
642.5		1,050.0	REW
631.8		1,052.0	ground and top of bank at RP3-2
631.8		1,053.6	top of rebar at RP3-2

Table A3. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 4.
Based on survey and sounding data collected in 2001 and 2002.
[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,053.2	top of rebar at RP4-1
30.7		1,052.7	top of bank
30.7		1,050.1	LEW
88.9	1,047.1	1,040.8	
147.1	1,047.3	1,041.1	
205.2	1,047.7	1,041.0	
263.4	1,047.6	1,041.6	
321.6	1,047.6	1,041.5	
379.8	1,047.4	1,040.6	
437.9	1,047.4	1,041.3	
496.1	1,047.6	1,042.1	
554.3	1,047.1	1,042.3	
612.5	1,047.9	1,043.9	
670.7	1,049.4	1,045.8	
692.3		1,050.1	REW
699.7		1,052.0	top of bank
728.7		1,052.6	ground at RP4-2
728.7		1,053.3	top of rebar at RP4-2

Table A4. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 5.
Based on survey and sounding data collected in 2001 and 2002.
[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,054.0	top of rebar at RP5-1
0.0		1,053.7	ground surface at RP5-1 and top of bank
13.4		1,049.9	LEW
103.4	1,043.9	1,040.1	soft
193.4	1,043.6	1,039.9	
283.5	1,044.1	1,040.4	hard bottom
373.5	1,043.9	1,040.4	
463.5	1,044.0	1,040.9	
553.5	1,044.0	1,040.7	
643.5	1,043.9	1,038.9	peaty layer
733.6	1,044.9	1,039.7	
823.6	1,046.1	1,041.2	
913.6	1,046.9	1,042.6	hard bottom
1,003.6	1,047.4	1,043.4	
1,093.6	1,047.5	1,043.9	
1,183.7	1,048.3	1,040.8	very soft
1,243.7	1,048.3	1,044.0	more solid
1,333.7	1,048.4	1,042.0	
1,423.7	1,048.8	1,042.5	
1,513.7	1,048.4	1,043.8	hard brush layer (over old railroad bed)
1,603.8	1,048.3	1,045.9	hard brush layer (over old railroad bed)
1,674.4		1,049.9	REW
1,682.7		1,053.6	ground surface at RP5-2
1,682.7		1,054.0	top of rebar at RP5-2

Table A5. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 7.
Based on survey and sounding data collected in 2001 and 2002.
[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,056.2	top of rebar at RP7-1
0.0		1,054.6	ground surface at RP7-1
9.7		1,052.3	top bank
17.7		1,050.4	LEW
26.7	1,049.6	1,048.3	
41.7	1,049.6	1,048.6	
56.7	1,049.6	1,049.4	muck
71.7	1,049.5	1,048.7	
86.7	1,049.4	1,049.0	sand bar in middle
101.7	1,049.2	1,048.5	sand bar in middle
116.7	1,048.7	1,048.5	gravel
131.7	1,049.1	1,048.9	gravel
146.7	1,049.4	1,048.3	gravel
161.7	1,049.4	1,048.8	gravel
176.7		1,050.4	REW
176.7		1,053.6	top of bank
176.7		1,054.6	ground surface at RP7-2

Table A6. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 8.
Based on survey and sounding data collected in 2001 and 2002.
[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,054.1	top of rebar at RP8-1
0.0		1,052.8	ground surface at RP8-1
15.3		1,050.1	LEW
94.8	1,046.6	1,041.0	soft
198.6	1,047.1	1,044.5	more solid bottom
302.3	1,046.3	1,040.6	spongy
406.0	1,045.9	1,040.1	spongy
509.8	1,046.1	1,040.9	
613.5	1,046.1	1,041.2	
717.2	1,046.0	1,040.8	
820.9	1,045.7	1,041.8	
924.7	1,045.6	1,042.5	spongy
1,028.4	1,045.1	1,040.3	spongy
1,132.1	1,044.5	1,040.0	
1,235.9	1,044.1	1,040.9	solid
1,339.6	1,044.6	1,039.8	very soft bottom
1,443.3	1,044.2	1,040.6	
1,547.1		1,050.1	REW
1,560.1		1,053.0	top bank
1,564.1		1,053.3	ground surface at RP8-2
1,564.1		1,054.1	top of rebar at RP8-2

Table A7. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 9.
Based on survey and sounding data collected in 2001 and 2002.
[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,053.5	top of rebar at RP9-1
0.0		1,052.9	ground surface at RP9-1 and top of bank
11.0		1,049.9	LEW
100.3	1,049.6	1,045.4	very soft
189.7	1,048.4	1,040.4	spongy
279.0	1,046.5	1,041.8	solid (gravel)
368.4	1,047.4	1,041.8	
457.7	1,046.2	1,042.9	very solid (sand)
547.1	1,045.9	1,041.9	
636.4	1,046.0	1,041.8	stopped, very solid
725.8	1,044.8	1,041.8	solid stop
815.1	1,044.5	1,040.3	spongy
904.5	1,044.2	1,040.9	spongy
993.8	1,044.2	1,039.4	soft
1,083.2	1,043.9	1,039.3	
1,172.5	1,042.9	1,039.9	solid
1,261.9	1,043.5	1,039.8	soft
1,351.2	1,043.9	1,040.0	(peat like bottom)
1,440.5	1,044.4	1,039.3	spongy
1,529.9	1,044.6	1,040.6	
1,619.2	1,044.9	1,037.9	very soft
1,708.6	1,045.4	1,042.8	sandy-gravel
1,797.9	1,047.4	1,043.8	
1,822.7		1,049.9	REW
1,837.7		1,052.4	ground surface at RP9-2
1,837.7		1,053.5	top of rebar at RP9-2

Table A8. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 10. Based on survey and sounding data collected in 2001 and 2002.

[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,056.4	top of rebar at RP10-1
0.0		1,055.4	ground surface at RP10-1
2.6		1,053.7	top of bank
23.4		1,050.4	LEW
69.8	1,048.5	1,045.2	
116.2	1,047.9	1,043.2	
162.6	1,050.0	1,049.9	
208.9	1,043.9	1,040.3	
255.3	1,041.9	1,039.7	
301.7	1,041.4	1,039.4	
348.1	1,041.9	1,040.2	
394.5	1,041.4	1,039.1	
440.9	1,042.4	1,039.1	
487.3	1,043.9	1,040.2	
533.6	1,046.8	1,044.4	
533.6		1,050.4	REW
539.9		1,052.9	top of bank
541.9		1,054.4	ground surface at RP10-2
541.9		1,055.7	top of rebar at RP10-2

Table A9. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 11. Based on survey and sounding data collected in 2001 and 2002.

[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,055.4	top of rebar at RP11-1
0.0		1,055.4	ground surface at RP11-1 (boulder)
1.5		1,051.2	bottom of slope
5.0		1,050.3	LEW
94.1	1,042.2	1,041.0	
183.2	1,041.1	1,038.4	
272.3	1,041.3	1,039.0	
361.3	1,041.9	1,041.2	
450.4	1,042.6	1,041.7	
539.5	1,042.0	1,040.4	
628.6	1,042.9	1,038.9	
717.7	1,042.8	1,039.1	
806.8	1,046.3	1,044.8	
895.9	1,048.3	1,046.1	
1,014.6	1,048.3	1,046.4	
1,133.4	1,047.4	1,044.5	
1,252.2	1,047.7	1,045.3	
1,371.0	1,048.9	1,047.2	
1,489.8	1,048.9	1,046.9	
1,549.2		1,050.3	REW
1,569.2		1,052.3	old shoreline
1,572.2		1,052.9	
1,580.7		1,054.4	ground surface at RP11-2
1,580.7		1,055.8	top of rebar at RP11-2

Table A10. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 12. Based on survey and sounding data collected in 2001 and 2002.

[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,055.8	top of rebar at RP12-1
0.0		1,055.6	ground surface at RP12-1
2.3		1,055.2	top of left slope
4.8		1,051.2	bottom of bank
12.8		1,050.3	LEW
42.6	1,045.3	1,042.4	
72.4	1,043.1	1,041.6	
102.2	1,042.7	1,041.2	
132.0	1,042.5	1,041.3	
161.8	1,041.8	1,038.8	
191.6	1,041.6	1,038.2	
221.4	1,040.4	1,038.5	
251.2	1,039.6	1,037.8	
281.0	1,039.4	1,036.9	
310.8	1,041.5	1,040.3	
340.6	1,041.9	1,039.9	
370.4	1,043.2	1,041.0	
400.2	1,044.0	1,041.9	
430.0	1,044.0	1,042.2	
459.8	1,044.1	1,042.5	
489.6	1,045.2	1,043.4	
525.3	1,048.1	1,047.5	
552.2		1,050.3	REW
565.2		1,051.6	old shoreline bottom
566.2		1,052.6	old shoreline top
567.7		1,052.9	ground surface at RP12-2
567.7		1,053.4	top of rebar at RP12-2

Table A11. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 13. Based on survey and sounding data collected in 2001 and 2002.

[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,053.3	top of rebar at RP13-1
0.0		1,053.3	ground surface at RP13-1
7.0		1,049.9	LEW
24.4	1,041.9	1,038.1	very sudden hard
69.5	1,040.4	1,039.2	very soft, firm stop
104.2	1,038.8	1,035.9	very soft, firm stop
138.9	1,040.6	1,038.0	very soft, firm stop
173.6	1,042.4	1,038.0	very solid bottom
208.3	1,042.7	1,038.5	
236.0		1,049.9	REW
251.0		1,051.9	ground surface at RP13-2
251.0		1,052.2	top of rebar at RP13-2

Table A12. Altitudes of land surface and hard and soft bottom and descriptive notes for transect 14.
Based on survey and sounding data collected in 2001 and 2002.
[ft, feet; LEW, left edge of water; REW, right edge of water]

Distance from left side (ft)	Altitude of soft bottom (ft)	Altitude of hard bottom (ft)	Description
0.0		1,053.9	top of rebar at RP14-1
0.0		1,052.9	ground surface at RP14-1
7.0		1,049.9	LEW
39.3	1,043.4	1,039.9	barky layer then hard
71.6	1,041.4	1,038.2	very soft, firm stop
103.8	1,040.4	1,037.9	very soft, firm stop
136.1	1,039.3	1,037.8	very soft, firm stop
168.4	1,040.3	1,037.5	very soft, firm stop
200.7	1,040.2	1,036.6	slight middle resistace layer
233.0	1,040.5	1,037.2	very soft, firm stop
265.2	1,042.1	1,039.7	very soft, firm stop
300.2		1,049.9	REW
308.2		1,051.8	ground surface at RP14-2
308.2		1,052.3	top of rebar at RP14-2

Table B1. Core descriptions for core 1 at cross section 14, approximately 135 ft from left edge of water and right edge of water.

Core location is 44°, 58.844'; 88°, 49.838'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 1a collected on 2/13/01 with a piston corer
Water depth = 9.85 ft
Core depth = 0 to 0.9 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)**	Description
0	0.0	1.6	1,040.5	3 ft north of core 1
0.45	0.7		1,039.7	muck and sand, homogenous 10YR2/1, wood chips common
0.55	0.9		1,039.6	same, wood chips abundant, more sand, less muck, 10YR2/1

Core 1b collected on 2/13/01 with a piston corer
Water depth = 10.1 ft
Core depth = 0 to 0.9 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)**	Description
0	0.0	1.5	1,040.2	3 ft east of core 1
0.6	0.9		1,039.3	subsampled for trace elements

Core 1c collected on 2/13/01 with a piston corer
Water depth = 9.8 ft
Core depth = 0 to 1.7 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)**	Description
0	0.0	2.1	1,040.5	6 ft east of core 1
0.8	1.7		1,038.8	subsampled for organic chemicals

*Depth corrected with recovery ratios

**Altitude assumed from water level at transect 12 and given water depth

Table B2. Core descriptions for core 2 at cross section 13, approximately 96 ft from left edge of water and 108 ft from right edge of water

Core location is 44°, 58.838'; 88°, 49.931'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 2a collected 2/13/01 with a piston corer
Water depth = 9.25 ft (log on top)
Hard bottom = 11.8 ft
Core depth = 0 to 1.3 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	2.6	1,041.1	3 ft south of core 2
0.5	1.3		1,039.8	sample fell out of tube- muck, sand and wood common, liquified

Core 2b collected 2/13/01 with a piston corer
Water depth= 10 ft
Core depth = 0 to 1.3 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	5.2	1,041.1	3 ft north of core 2
0.25	1.3		1,039.8	lost some sample from the top, subsampled every 0.5 in. for trace elements

Core 2c collected 2/14/01 with a piston corer
Water depth = 10 ft
Core depth = 0 to 1.2 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	4	1,041.1	6 ft west of core 2
0.3	1.2		1,039.9	subsampled for organic chemicals

Core 2d1 collected 3/9/01 with a geoprobe corer
Water depth = 10 ft
Hard bottom = 11.5 ft
Core depth = 0 to 4.0 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	2.5	1,040.3	
0.9	2.3		1,038.1	loamy sandy, organic-rich muck with wood chips at base, unknown smell, 10YR2/1 (sharp boundary)
1.3	3.3		1,037.1	poorly sorted m. sand with common bark wood pieces ~ 1", some 3 mm lamination of organic matter from 0.75-1.00 ft, f. gravel increases at base, 10YR4/2 (moderate boundary)
1.6	4.0		1,036.3	poorly sorted m. to v.c. sand with (~40 percent) pea gravel and gravel up to 1", rounded, 10YR3/2

Table B2. Core descriptions for core 2 at cross section 13, approximately 96 ft from left edge of water and 108 ft from right edge of water—Continued

Core location is 44°, 58.838'; 88°, 49.931'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 2e1, collected 3/9/01 with a geoprobe corer

Water depth = 10 ft

Core depth = 1.0 to 5.0 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	3.6	1,039.3	
0.35	1.3		1,038.0	muck, organic rich muck, sand gradually increasing toward base, 10YR3/2, large chunks of wood at 0.35 ft
0.6	2.2		1,037.1	loamy-sand organic-rich muck, sand increasing toward base, 10YR3/2, small pieces of wood, chips, more brown than above, roots abundant
0.75	2.7		1,036.6	wood pieces in loamy-sand organic-rich muck, 10YR3/2 (abrupt boundary)
1.1	4.0		1,035.3	poorly sorted, m. to v. c. sand and gravel up to 0.5" abundant pink feldspar, wood common, 1.5 in. piece of wood, 2.5Y4/2

Core 2e2 collected 3/9/2001 with geoprobe corer

Water depth = 10 ft

Core depth = 5.0 to 9.0 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	2.9	1,035.3	
0.15	0.4		1,034.9	gravel and chunks of bark and wood (moderate boundary)
0.45	1.3		1,034.0	well sorted m. sand, 2.5YR5/2 (gradual break)
0.5	1.4		1,033.9	gravel and poorly sorted c. sand, 2.5Y4/2 (abrupt boundary)
0.55	1.6		1,033.7	1mm organic debris layer plus rootlets, 10YR2/1 (abrupt boundary)
0.65	1.9		1,033.5	m. to c. sand, occasional 1/4" feldspar pebbles, 2.5Y3/2 (moderate with 1/4" woodchip layer)
0.7	2.0		1,033.3	mainly 1/4" bark with sand, 10YR3/1 (moderate)
0.75	2.1		1,033.2	m. to c. sand, 2.5Y4/2 (abrupt boundary)
0.95	2.7		1,032.6	more gray m. to c. sand with feldspar pebbles (~1/4"), common rootlets, occasional small bark pieces, 2.5Y3/2 (abrupt boundary)
1	2.9		1,032.5	organic rich loam with occas. 1/4" wood chips, abundant rootlets, 1/4" pebbles common, (old A horizon??) soft, 10YR2/1 (abrupt boundary)
1.4	4.0		1,031.3	sandy clay loam with ~20% gravel, poorly sorted but up to 3/4" diameter, occas. rootlets, 10YR4/1

*Depth corrected with recovery ratios

Table B3. Core descriptions for core 3 at cross section 12, approximately 191 ft from left edge of water.

Core location is 44°, 58.879'; 88°, 59.127'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 3a collected 3/1/2001 with a piston corer
Water depth = 8.0 feet
Core depth = 0.0 to 1.6 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	1.5	1,042.3	3 ft south of site location
0.2	0.3		1,042.0	organic fluff, high water content, 10YR2/1
0.8	1.2		1,041.1	organic-rich muck, 10YR2/1, 1 in. bark pieces towards base common, silt loam
1.1	1.6		1,040.7	organic rich muck, 1-3" abundant large bark pieces, 10YR2/1, leaves common, silt loam to loam, sand content increases toward the base

Core 3b collected 3/9/2001 with a geoprobe
Water Depth = 8.0 feet
Core depth = 0.0 to 4.0 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	2.2	1,042.3	
0.2	0.4		1,041.9	organic-rich muck, fluffy, no visible pieces of organic material, very pungent smell, 5Y3/2 (gradual boundary)
0.3	0.7		1,041.6	large piece of bark in organic-rich muck, 10YR2/2 (gradual boundary)
0.65	1.4		1,040.9	organic-rich muck, brownish, 10YR2/2 (moderate boundary)
0.85	1.9		1,040.4	peat, brownish, loamy muck, organic-rich, abundant rootlets, root mass, buried A horizon? (moderate boundary)
1.15	2.6		1,039.8	poorly sorted f. to m. sand, 10YR3/2 (moderate boundary)
1.25	2.8		1,039.5	large chunk of wood with f. to m. sand matrix, rootlets 10YR3/1 (moderate boundary)
1.4	3.1		1,039.2	c. to v.c. sand, poorly sorted with dark organic matter, 10YR4/1 (gradual boundary)
1.5	3.3		1,039.0	poorly sorted m. sand with 1/8" organic lamination, sand 10YR4/2, organic lamination 10YR2/1 (moderate boundary)
1.55	3.4		1,038.9	1/4" wood chunk, dark on outside, smaller chunks of wood, 10YR2/1 (sharp boundary)
1.7	3.8		1,038.5	poorly sorted loamy m. to f. sand, occasional rootlets, 10YR3/1 (moderate boundary)
1.8	4.0		1,038.3	silt loam, unoxidized, rare rootlets, 2.5Y3/2

*Depth corrected with recovery ratios

Table B4. Core description for core 4 at cross section 11, approximately 1,200 ft from left edge of water and 354 ft from right edge of water.

Core location is 44°, 58.920'; 88°, 50.409'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 4b collected 3/1/2001 with a piston corer

Water depth = 3.7 ft

Hard bottom = 4.7 ft, through gravel and weeds

Core depth = 0.0 to 1.0 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	0.6	1,046.6	3 ft north of core 4
0.4	0.3		1,046.3	organic muck, silt 2.5YR2/2
1.1	0.7		1,045.9	organic muck, silt loam, increase in sand toward base, occasional roots, 2.5YR2/2
1.6	1.0		1,045.6	sand and gravel, 0.1in., 10YR3/3, top of unit marks pre-dam boundary

*Depth corrected with recovery ratios

Table B5. Core description for core 5 at cross section 11, approximately 500 ft from left edge of water and 699 ft from core 4.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 5a collected 3/1/2001 with a piston corer				
Water depth = 7.5 ft				
Hard bottom = 9.0 ft				
Core depth = 0.0 to 1.2 ft				
Depth (ft)	**Corrected depth (ft)***	**Recovery ratio**	**Altitude (ft)**	**Description**
0	0.0	0.9	1,042.8	3 ft south of core 5
0.4	0.3		1,042.4	organic muck, silt, silt-loam, 10YR2/1
0.7	0.6		1,042.2	organic muck with bark, leaves and twigs, silt loam, 10YR2/1 (sharp boundary)
1.4	1.2		1,041.6	clayey sand and gravel, 0.5 in., roots common, loamy sand, gravel common, 2.5YR4/2, two clayey loam lenses about 0.05 ft thick

*Depth corrected with recovery ratios

Table B6. Core descriptions for core 6 at cross section 9, approximately 1,440 ft from left edge of water and 865 ft from right edge of water

Core location is 44°, 59.098'; 88°, 50.967'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 6a collected on 3/1/2001 with a piston corer				
Water Depth = 5.6 ft				
Hard bottom = 10.0 ft				
Core depth = 0.0 to 3.0 ft				
Depth (ft)	**Corrected depth (ft)***	**Recovery ratio**	**Altitude (ft)**	**Description**
0	0.0	1.8	1,044.3	3 ft south of core 6
1.7	3.0		1,041.3	organic muck, high water content, aquatic vegetation matter common, grass blades, rootlets, maybe wild rice, silt organics, low sediment content, mostly organics, 10YR2/1
Core 6c collected on 3/2/2001 with a piston corer				
Water depth = about 5.6 ft				
Hard bottom = about 10.0 ft				
Core depth = 0.0 to 1.5 ft				
0	0.0	1.7	1,044.3	3 ft east of core 6
0.9	1.5		1,042.8	subsampled for trace elements every 0.05 ft from 0-0.8 ft
Core 6d collected on 3/2/2001 with a piston corer				
Water depth = about 5.6 ft				
Hard bottom = about 10.0 ft				
Core depth = 0.0 to 1.5 ft				
Depth (ft)	**Corrected depth (ft)***	**Recovery ratio**	**Altitude (ft)**	**Description**
0	0.0	1.7	1,044.3	6 ft north of core 6
0.9	1.5		1,042.8	subsampled for organic chemicals every 0.1 ft from 0.2-0.7 ft

Table B6. Core descriptions for core 6 at cross section 9, approximately 1,440 ft from left edge of water and 865 ft from right edge of water—Continued

Core location is 44°, 59.098'; 88°, 50.967'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 6e collected on 3/9/2001 with a geoprobe corer
Water depth = about 5.6 ft
Hard bottom = about 10.0 ft
Core depth = 0.0 to 4.0 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	2.0	1,044.3	
0.3	0.6		1,043.7	organic-rich muck, fluff, fine-grained, no visible organic matter, 10YR2/2, organic smell, (abrupt boundary)
0.7	1.4		1,042.9	large pieces of wood/bark (up to 2"+) with muck matrix 10YR2/1, slight pungent smell, (moderate boundary)
0.9	1.8		1,042.5	organic matter with abundant small wood chips ~1/4", 10YR2/2, organic smell, (moderate boundary)
1.45	2.9		1,041.4	f. sandy loam to loamy m. sand, occas. 1/4" wood chips, occas. grass blades 1/16" wide rare, 3/4" chunks of wood, occas. rootlets, 10YR3/1 (moderate boundary)
1.5	3.0		1,041.3	brown peat, sandy (may have mixed in), 1/16-in. pieces of organic debris, 10YR2/2 (sharp boundary)
1.6	3.2		1,041.1	m. sand, moderate sorting, clean, 2.5Y4/2 (moderate boundary)
1.7	3.4		1,040.9	mix of c. sand (30%), f. gravel (30%), large bark chips up to 1 1/4" (30%), 2.5Y4/2 (moderate boundary)
1.83	3.7		1,040.7	c. sand with v.c. sand, moderate sorting, no organic material, 2.5Y4/2
2	4.0		1,040.3	m. sand, well sorted, no organics, except in core tip, rare charcoal chips ~1/8-1/4", 2.5Y4/2

*Depth corrected with recovery ratios

Table B7. Core descriptions for core 7 at cross section 4, approximately 225 ft from left edge of water and 489 ft from right edge of water.

Core location is 44°, 59.079'; 88°, 51.449'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 7a collected on 3/1/01 with a piston corer				
Water depth = 3.4 ft				
Hard bottom = 9.1 ft				
Core depth = 0.0 to 2.4 ft				
Depth (ft)	**Corrected depth (ft)***	**Recovery ratio**	**Altitude (ft)**	**Description**
0	0.0	1.3	1,046.7	6 ft south of core 7
0.5	0.7		1,046.1	organic muck, high water content, silt, no sand, occas. fine rootlets, 10YR2/1, no wood
1.8	2.4		1,044.3	organic muck, less water, silt, no sand grains, no wood, uniform, 10YR2/1
Core 7b collected on 3/2/01 with a piston corer				
Water depth = about 3.4 ft				
Hard bottom = about 9.1 ft				
Core depth = 0.0 to 1.2 ft				
Depth (ft)	**Corrected depth (ft)***	**Recovery ratio**	**Altitude (ft)**	**Description**
0	0.0	0.9	1,046.7	6 ft east of core 7
1.45	1.2		1,045.5	(lost organic fluff from top) subsampled for trace elements and radiometric dating
Core 7c collected on 3/2/01 with a piston corer				
Water depth = about 3.4 ft				
Hard bottom = about 9.1 ft				
Core depth = 0.0 to 1.7 ft				
Depth (ft)	**Corrected depth (ft)***	**Recovery ratio**	**Altitude (ft)**	**Description**
0	0.0	1.0	1,046.7	6 ft west of core 7
1.7	1.7		1,045.0	subsampled for organic chemicals
Core 7d1 collected on 3/9/01 with a geoprobe corer				
Water depth = about 3.4 ft				
Hard bottom = about 9.1 ft				
Core depth = 0.0 to 4.0 ft				
Depth (ft)	**Corrected depth (ft)***	**Recovery ratio**	**Altitude (ft)**	**Description**
0	0.0	1.5	1,046.1	**all very gradual boundaries**
0.2	0.3		1,045.8	organic muck 10YR2/1
1.1	1.6		1,044.5	organic muck with occasional rootlets, more towards the top of the unit 10YR2/1 "smells like PAHs"
2	2.9		1,043.2	peat, occasional rare stick roots, fibrous, brownish 10YR3/2
2.75	4.0		1,042.1	peat occasional rare sticks and roots, fibrous, more brown, occasional bits of 1/8" wood pieces 10YR4/4

Table B7. Core descriptions for core 7 at cross section 4, approximately 225 ft from left edge of water and 489 ft from right edge of water—Continued

Core location is 44°, 59.079'; 88°, 51.449'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 7d2 collected on 3/9/01 with a geoprobe corer
Water depth = about 3.4 ft
Hard bottom = about 9.1 ft
Core depth = 4.0 to 8.0 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	1.3	1,042.1	
0.65	0.9		1,041.3	loamy organic-rich muck (may have been some sand mixing in from core extrusion), rare rootlets, 10YR2/1 (gradual boundary)
0.9	1.2		1,040.9	well sorted f. to m. sand, rare organic debris, 2.5Y4/4 (gradual boundary)
1	1.3		1,040.8	f. to m. sand with wood pieces 1/8-1/4" in size, also peat-like fibers, 10YR3/2 (gradual boundary)
1.05	1.4		1,040.8	large wood chunks in organic-rich f. sand, 10YR3/2 (moderate boundary)
1.6	2.1		1,040.0	f. to m. sand coarsening gradually to c. sand with depth, no wood or organic matter, clean, 2.5Y4/2
1.75	2.3		1,039.8	gravel and v.c. sand, poorly sorted, subrounded, occas. 1/8-1/4" wood pieces, pink feldspar common, 10YR3/2 (moderate boundary)
1.82	2.4		1,039.7	wood pieces, decomposed organic matter in m. sand, 10YR2/2 (moderate boundary)
2.05	2.7		1,039.4	v.c. sand to v.f. gravel (2-4 mm), abundant pink feldspar, subrounded, 10YR3/3
2.15	2.8		1,039.3	large (2 in.) chunk of wood, roots and wood pieces in matrix of v.c. sand and v.f. gravel (gradual boundary)
2.3	3.0		1,039.1	v.c. sand to v.f. gravel (2-4 mm), abundant pink feldspar, subrounded, 10YR, 1/8" and smaller bits of decomposed organic matter (moderate boundary)
2.52	3.3		1,038.8	alternating f. to m. sand with layers of partially decomposed organic matter and wood bits <1/8", rootlets, 10YR2/1 (sharp boundary)
2.75	3.6		1,038.5	organic debris (possibly slackwater deposit), stems roots and wood pieces, bark 1/16-1", 10YR3/2 (sharp boundary)
3.05	4.0		1,038.1	pink feldspar f. gravel and smaller with v.f. gravel and v.c. sand, 10YR3/3

*Depth corrected with recovery ratios

Table B8. Core descriptions for core 8 at cross sections 8 and 9, approximately 498 ft from left edge of water along cross section 9 and and 678 ft from left edge of water along cross section 8.

Core location is 44°, 59.169'; 88°, 50.966'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 8a collected on 3/2/2001 with a piston corer
Water depth = 3.7 ft
Hard bottom = 6.6 ft
Core depth = 0.0 to 1.2 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	1.0	1,046.4	3 ft south of core 8
1.2	1.2		1,045.2	organic-rich muck, silt, high water content, shells common from 0.8-1.0, leaves, grass blades and rootlets common throughout, leafy material increases from 1.0-1.2, 10YR2/2

*Depth corrected with recovery ratios

Table B9. Core descriptions for core 9 at cross section 5, approximately 315 ft from left edge of water and 1,353 ft from right edge of water.

Core location is 44°, 59.079'; 88°, 51.195'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 9a1 collected on 3/9/01 with a geoprobe

Water depth = about 6.8 ft

Core depth = 0.0 to 4.0 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	1.7	1,043.1	
0.4	0.7		1,042.4	organic rich muck, fluffy, pungent smell, 10YR2/2 (moderate boundary)
0.6	1.0		1,042.1	organic rich muck with wood chunks and pieces, pungent smell, 10YR2/2 (moderate boundary)
0.85	1.5		1,041.7	organic rich muck with peat - grass blades and rootlets, 10YR2/2 (abrupt boundary)
1.02	1.8		1,041.4	f. to m. sand, occas. rootlets, occas. decomposed organic matter, well sorted, 10YR3/3 (moderate boundary)
1.18	2.1		1,041.1	f. to m. sand with organic matter, layered 1/8 in. wood pieces, rootlets, decomposed debris, bark slightly pungent smell, 10YR3/2 (moderate boundary)
1.6	2.8		1,040.3	f. to m. sand, zone with organic matter and bits from 1.45-1.5 ft, well sorted, 10YR3/3 (gradual boundary)
1.93	3.4		1,039.8	alternating layers of v.c. sand and f. gravel, pink feldspar occasionally, rare, 2.5Y4/2 (sharp boundary)
2.05	3.6		1,039.6	alternating laminations of decomposed oganic matter and f. sand, 2.5Y3/2 (gradual boundary)
2.3	4.0		1,039.1	f. sand, well sorted, rare organic matter, 2.5Y4/2

*Depth corrected with recovery ratios

Table B10. Core descriptions for core 10 at cross section 10, approximately 262 ft from left edge of water.

Core location is 44°, 58.960'; 88°, 50.620'.

[ft, feet; in., inch; v., very; f., fine; m., medium; c., coarse; occas., occasional]

Core 10a1 collected on 3/9/01 with a geoprobe

Water depth = 8.9 ft

Core depth = 0.0 to 4.0 ft

Depth (ft)	Corrected depth (ft)*	Recovery ratio	Altitude (ft)	Description
0	0.0	1.4	1,041.5	
0.25	0.4		1,041.2	organic-rich muck, pungent smell, 10YR2/1 (gradual boundary)
0.5	0.7		1,040.8	organic-rich muck with 1/8" wood chips, 10YR2/1 (moderate boundary)
0.9	1.3		1,040.3	peat, tiny rootlets abundant, occas. blade-like pieces, 7.5YR2/1 (sharp boundary)
1.2	1.7		1,039.8	m. to v.c. sand, poorly sorted, 2.5Y4/2 (moderate boundary)
1.25	1.8		1,039.8	brown peat, 7.5YR3/2 (moderate boundary)
1.65	2.4		1,039.2	fine gravel (1/16-1/8 in.) and very coarse sand, pink feldspar common, clean no organics, 10YR4/3 (moderate boundary)
1.75	2.5		1,039.0	peaty (fibers and rootlets) m. sand, 10YR3/3 (moderate boundary)
1.95	2.8		1,038.8	f. gravel (1/16-1/8 in.) and v.c. sand, pink feldspar common, clean no organics, 10YR4/3 (sharp boundary)
2.3	3.3		1,038.3	organic-rich m. sand, slightly fibrous, buried A horizon 10YR3/2 (very gradual boundary)
2.5	3.6		1,038.0	v.c. sand to v.f. gravel, clean 10YR4/2 (very sharp boundary)
2.6	3.7		1,037.8	wood bits, roots, organic debris, 10YR2/2
2.8	4.0		1,037.5	f. to m. sand, clean, gray, 2.5Y4/2

*Depth corrected with recovery ratios

Table C1. Bulk density and organic matter data for core samples collected from Neopit Mill Pond, Neopit, Wis., 2001

[ft, feet; g, grams; cm, centimeter; USGS, U.S. Geological Survey; sed, sediment. Interval top and bottom depths are not corrected for recovery ratio.]

Core number	USGS site number	Interval top (ft)	Interval bottom (ft)	Date collected	Plate (g)	Plate + wet sed (g)	Plate + dry sed (g)	After 550° plate + dry sed (g)	Dry sed (g)	Wet sed (g)	After 550° sed (g)	Water content (pct)	Organic matter (pct)	Calculated bulk density (g/cm^3)
1b	445851088495000	0.00	0.10	2/13/2002	1.11843	10.82269	1.78106	1.55091	0.66263	9.70426	0.43248	93.2	34.7	0.071
1b	445851088495000	0.35	0.45	2/13/2002	1.11516	4.32596	1.78562	1.53249	0.67046	3.2108	0.41733	79.1	37.8	0.24
2b	445850088495600	0.10	0.20	2/13/2002	1.10808	10.30604	2.55673	2.01607	1.44865	9.19796	0.90799	84.3	37.3	0.17
7b	44590588512700	0.05	0.10	3/1/2001	1.11830	5.68614	1.34794	1.21834	0.22964	4.56784	0.10004	95.0	56.4	0.052
7b	44590588512700	0.20	0.25	2/13/2002	1.11517	7.37327	1.64825	1.35156	0.53308	6.2581	0.23639	91.5	55.7	0.089
7b	44590588512700	0.25	0.30	3/1/2001	1.10135	7.67137	1.66431	1.34855	0.56296	6.57002	0.2472	91.4	56.1	0.090
7b	44590588512700	0.45	0.50	3/1/2001	1.11819	9.71865	1.84905	1.43278	0.73086	8.60046	0.31459	91.5	57.0	0.089
7b	44590588512700	0.75	0.80	3/1/2001	1.11749	8.57298	1.82715	1.42473	0.70966	7.45549	0.30724	90.5	56.7	0.10
7b	44590588512700	0.75	0.80	3/1/2001	1.10963	10.98807	2.04813	1.5185	0.9385	9.87844	0.40887	90.5	56.4	0.10
7b	44590588512700	0.95	1.00	3/1/2001	1.11423	14.56833	2.4237	1.65925	1.30947	13.4541	0.54502	90.3	58.4	0.10
7b	44590588512700	1.40	1.45	3/1/2001	1.10408	9.28475	1.99696	1.48685	0.89288	8.18067	0.38277	89.1	57.1	0.12

Table D1. Radiometric dating results for core samples collected from Neopit Mill Pond, Neopit, Wis., 2001

[ft, feet; pCi/g, picoCuries per gram; USGS, U.S. Geological Survey. Interval top and bottom depths are not corrected for recovery ratio.]

Core number	USGS site number	Interval top (ft)	Interval bottom (ft)	Date collected	^{210}Pb (pCi/g)	^{210}Pb 2-sigma	^{137}Cs (pCi/g)	^{137}Cs 2-sigma	^{226}Ra (pCi/g)	^{226}Ra 2-sigma
7b	44590588512700	0.05	0.10	3/1/2001	13	2.4	2.0	0.69	0.06	2.0
7b	44590588512700	0.25	0.30	3/1/2001	12	1.6	1.6	.77	.13	1.2
7b	44590588512700	0.45	0.50	3/1/2001	13	1.8	2.3	.72	.59	1.0
7b	44590588512700	0.75	0.80	3/1/2001	11	1.4	2.6	.48	.88	.78
7b	44590588512700	0.95	1.00	3/1/2001	11	1.5	2.4	.56	.42	1.3
7b	44590588512700	1.40	1.45	3/1/2001	9.9	1.9	3.0	.79	.64	1.7

Table E1. Minor and trace element results for core samples collected from Neopit Mill Pond, Neopit, Wis., 2001

[ft, feet; pct, percent; ug/g, micrograms per gram; na, not available; USGS, U.S. Geological Survey. Interval top and bottom depths are not corrected for recovery ratio. Threshold and probable effect concentrations are from MacDonald and others, 2000.]

Core number	USGS site number	Interval top (ft)	Interval bottom (ft)	Date collected	Inorganic carbon (pct)	Organic carbon (pct)	Total carbon (pct)	Calcium (pct)	Magnesium (pct)	Potassium (pct)	Sodium (pct)	Sulfur (pct)	Phosphorus (pct)
1b	445851088495000	0.00	0.10	2/13/2001	0.99	19	20	3.1	1.1	1.1	0.34	0.74	0.11
1b	445851088495000	0.35	0.45	2/13/2001	0.16	22	22	1.4	0.53	1.0	0.41	0.94	0.048
2b	445850088495600	0.10	0.20	2/13/2001	0.15	19	19	1.3	0.49	1.1	0.42	0.72	0.043
7b	44590588512700	0.20	0.25	3/1/2001	0.48	28	29	3.6	0.37	0.44	0.18	0.6	0.13
Range in concentration from eight Wolf River basin sites (Scudder and others, 1997; Garn and others, 2001)					0.06-0.31	11.6-22.3	11.9-22.4	1.5-1.9	0.53-0.74	0.80-0.98	0.37-0.59	0.28-0.38	0.17-0.23
Threshold effect concentration					na	na	na	na	na	na	na	na	na
Probable effect concentration					na	na	na	na	na	na	na	na	na

Table E1. Minor and trace element results for core samples collected from Neopit Mill Pond, Neopit, Wis., 2001—Continued

[ft, feet; pct, percent; ug/g, micrograms per gram; na, not available; USGS, U.S. Geological Survey. Interval top and bottom depths are not corrected for recovery ratio. Threshold and probable effect concentrations are from MacDonald and others, 2000.]

Core number	USGS site number	Aluminum (pct)	Antimony (µg/g)	Arsenic (µg/g)	Barium (µg/g)	Beryllium (µg/g)	Cadmium (µg/g)	Cerium (µg/g)	Chromium (µg/g)	Cobalt (µg/g)	Copper (µg/g)	Gallium (µg/g)	Iron (µg/g)	Lanthanum (µg/g)
1b	445851088495000	2.4	0.5	7.8	270	0.8	0.8	45	50	5	28	7	1.8	23
1b	445851088495000	2.6	0.6	7.9	300	0.6	1.7	35	41	4	22	6	1.7	18
2b	445850088495600	2.6	0.4	5.6	310	0.7	0.9	34	39	4	18	7	1.4	17
7b	44590588512700	1.6	0.2	3.4	220	0.5	1.1	36	87	4	20	4	1.4	21
Range in concentration from eight Wolf River basin sites (Scudder and others, 1997; Garn and others, 2001)		2.3-3.0	na	5.6-20	300-380	<1-0.81	0.4-0.9	31-58	33-66	5.2-8.0	13-23	<4-10	2.3-3.2	18-32
Threshold effect concentration		na	na	9.79	na	na	0.99	na	43.4	na	31.6	na	na	na
Probable effect concentration		na	na	33	na	na	4.98	na	111	na	149	na	na	na

Table E1. Minor and trace element results for core samples collected from Neopit Mill Pond, Neopit, Wis., 2001—Continued

[ft, feet; pct, percent; ug/g, micrograms per gram; na, not available; USGS, U.S. Geological Survey. Interval top and bottom depths are not corrected for recovery ratio. Threshold and probable effect concentrations are from MacDonald and others, 2000.]

Core number	USGS site number	Lead (µg/g)	Lithium (µg/g)	Manganese (µg/g)	Mercury (µg/g)	Molybdenum (mg/g)	Neodymium (µg/g)	Nickel (µg/g)	Niobium (µg/g)	Scandium (µg/g)	Selenuim (µg/g)	Silver (µg/g)	Strontium (µg/g)
1b	445851088495000	40	15	350	0.13	5.7	20	13	9	5	2.0	0.1	61
1b	445851088495000	33	13	270	0.1	6.5	15	10	8	4	1.7	0.1	59
2b	445850088495600	26	13	250	0.1	2.6	14	10	7	4	1.4	0.1	60
7b	44590588512700	22	10	320	0.17	0.7	18	8	5	4	4.6	<.1	48
Range in concentration from eight Wolf River basin sites (Scudder and others, 1997; Garn and others, 2001)		16-40	10-13	1,600-3,500	0.04-6.1	0.5-<2.0	16-27	7-14	<4-8	4.8-7.0	0.9-5.3	0.2-0.7	63-87
Threshold effect concentration		35.8	na	na	0.18	na	na	22.7	na	na	na	na	na
Probable effect concentration		128	na	na	1.06	na	na	48.6	na	na	na	na	na

Table E1. Minor and trace element results for core samples collected from Neopit Mill Pond, Neopit, Wis., 2001—Continued

[ft, feet; pct, percent; ug/g, micrograms per gram; na, not available; USGS, U.S. Geological Survey. Interval top and bottom depths are not corrected for recovery ratio. Threshold and probable effect concentrations are from MacDonald and others, 2000.]

Core number	USGS site number	Thorium (µg/g)	Tin (µg/g)	Titanium (µg/g)	Uranium (µg/g)	Vanadium (µg/g)	Yttrium (µg/g)	Zinc (µg/g)
1b	445851088495000	6	3	0.14	15	38	13	140
1b	445851088495000	5	3	0.16	15	40	10	110
2b	445850088495600	5	2	0.16	7	38	10	90
7b	44590588512700	4	1	0.082	4.5	25	14	130
Range in concentration from eight Wolf River basin sites (Scudder and others, 1997; Garn and others, 2001)		3.6-11	1.4-<5	<1	2.4-4.7	42-60	14-22	61-130
Threshold effect concentration		na	na	na	na	na	na	121
Probable effect concentration		na	na	na	na	na	na	459

Table F1. Organic compounds detected in core samples collected from Neopit Mill Pond, Neopit, Wis., 2001

[ft, feet; g, gram; kg, kilogram; µg, microgram; E, estimated; USGS, U.S. Geological Survey; <, less than; interval top and bottom depths are not corrected for recovery ratio.]

Core number	USGS site number	Interval top (ft)	Interval bottom (ft)	Date collected	Inorganic carbon (g/kg)	Total carbon (g/kg)	Organic carbon (g/kg)	4H-cyclopenta[def]-phenanthrene (µg/kg)	Anthraquinone (µg/kg)	Fluorene (µg/kg)	Acenaphthene (µg/kg)	Acenaphthylene (µg/kg)	Anthracene (µg/kg)	Benz[a]anthracene (µg/kg)	Benzo[a]pyrene (µg/kg)
1c	445851088495000	0.00	0.05	2/13/2001	7.7	190	180	<250	<250	E120	<50	330	E100	E140	200
1c	445851088495000	0.05	0.10	2/13/2001	4.7	180	180	<250	<250	130	190	880	160	160	250
1c	445851088495000	0.50	0.55	2/13/2001	0.9	240	230	E180	<250	<250	E240	990	320	540	710
1c	445851088495000	0.55	0.60	2/13/2001	1	240	240	E60	210	E100	E80	300	E100	170	250
2c	445850088495600	0.10	0.15	2/13/2001	2.2	170	170	<250	<250	<250	E110	520	E100	E120	E150
2c	445850088495600	0.15	0.20	2/13/2001	2.3	180	180	<300	<300	E180	E210	910	E130	E130	E240
7c	44590588512700	0.20	0.30	3/1/2001	1.2	290	290	<620	<620	<620	<620	<620	<620	E120	<620

Table F1. Organic compounds detected in core samples collected from Neopit Mill Pond, Neopit, Wis., 2001—Continued

[ft, feet; g, gram; kg, kilogram; µg, microgram; E, estimated; USGS, U.S. Geological Survey;
<, less than; interval top and bottom depths are not corrected for recovery ratio.]

Core number	USGS site number	Benzo[b]-fluoranthene (µg/kg)	Benzo[ghi]-perylene (µg/kg)	Benzo[k]-fluoranthene (µg/kg)	Carbazole (µg/kg)	Chrysene (µg/kg)	Fluoranthene (µg/kg)	Indeno[1,2,3-cd]-pyrene (µg/kg)	1,6-Dimethyl-naphthalene (µg/kg)	2,3,6-Trimethyl-naphthalene (µg/kg)	2,6-Dimethyl-naphthalene (µg/kg)	Naphthalene (µg/kg)	p,p'-DDE (µg/kg)	p-Cresol (µg/kg)	1-Methyl-phenanthrene (µg/kg)	Phenanthrene (µg/kg)
1c	445851088495000	250	270	<250	<250	E90	350	E140	E50	E40	400	1,400	<4	440	<250	510
1c	445851088495000	300	290	50	<250	180	710	220	100	60	440	3,100	E2	500	80	1,300
1c	445851088495000	900	880	480	E150	650	1,800	640	E10	<250	290	3,300	<9	<250	E220	1,900
1c	445851088495000	250	360	190	E50	200	540	270	<150	<150	E90	1,200	<3	300	E80	560
2c	445850088495600	E200	E210	E40	<250	E70	470	E110	E30	<250	E140	1,800	E4	1,100	<250	440
2c	445850088495600	310	340	E110	<300	E120	500	E200	E50	<300	330	2,300	E4	2,300	400	820
7c	44590588512700	<620	<620	<620	<620	E130	E190	<620	<620	<620	E400	<620	E7	5,700	<620	<620

Table F1. Organic compounds detected in core samples collected from Neopit Mill Pond, Neopit, Wis., 2001—Continued

[ft, feet; g, gram; kg, kilogram; µg, microgram; E, estimated; USGS, U.S. Geological Survey;
<, less than; interval top and bottom depths are not corrected for recovery ratio.]

Core number	USGS site number	Phenol (µg/kg)	Pentachlorophenol (µg/kg)	bis(2-Ethylhexyl) phthalate (µg/kg)	Butylbenzyl phthalate (µg/kg)	Di-n-butyl phthalate (µg/kg)	Diethyl phthalate (µg/kg)	Pyrene (µg/kg)	Dibenzothiophene (µg/kg)
1c	445851088495000	E150	<250	<250	<250	<250	<250	380	<250
1c	445851088495000	190	<250	240	240	<250	<250	740	<250
1c	445851088495000	290	E6,600	360	<250	E50	<250	1,600	<250
1c	445851088495000	160	<150	<150	<150	<150	E70	470	E60
2c	445850088495600	E180	<250	<250	<250	<250	E90	530	<250
2c	445850088495600	330	<300	230	<300	<300	<300	590	<300
7c	44590588512700	<620	<620	E280	E380	<620	<620	E80	<620

Table F2. Organic compounds (micrograms per kilogram) not detected in core samples collected from Neopit Mill Pond, Neopit, Wis., 2001

2,2'-Biquinoline	1,2-Dimethylnaphthalene
3,5'-Xylenol	2-Chloronaphthalene
4-Bromophenylphenylether	2-Ethylnaphthalene
4-Chlorophyenyl phenyl ether	o,p'-DDD
1-Methyl-9H-fluorene	o,p'-DDE
Acridine	o,p'-DDT
Aldrin	Oxychlordane
alpha-HCH	p,p'-DDD
2-Methylanthracene	p,p'-DDT
Dibenz[a,h]anthracene	Polychlorinated biphenyls
Azobenzene	Pentachloroanisole
1,2,4-Trichlorobenzene	Phenanthridine
Hexachlorobenzene	2,4-Dichlorophenol
1,3-Dichlorobenzene	2,4-Dinitrophenol
Nitrobenzene	4,6-Dinitro-2-methylphenol
1,2-Dichlorobenzene	C8-Alkylphenol
1,4-Dichlorobenzene	4-Nitrophenol
Pentachloronitrobenzene	2-Chlorophenol
Benzo[c]cinnoline	2-Nitrophenol
Beta-HCH	2,4,6-Trichlorophenol
bis(2-Chloroisopropyl) ether	Dimethyl phthalate
bis(2-Chloroethyl) ether	Di-n-octyl phthalate
Hexachlorobutadiene	1-Methylpyrene
Chloroneb	Quinoline
cis-Chlordane	2,4-Dinitrotoluene
cis-Nonachlor	2,6-Dinitrotoluene
cis-Permethrin	Toxaphene
Hexachlorocyclopentadiene	trans-Chlordane
Dacthal	trans-Nonachlor
Dieldrin	trans-Permethrin
N-Nitrosodiphenylamine	
N-Nitrosodi-n-propylamine	
alpha-Endosulfan	
Endrin	
Hexachloroethane	
Heptachlor epoxide	
Heptachlor	
Isodrin	
Isophorone	
Isoquinoline	
Lindane	
4-Chloro-3-methylphenol	
2,4,6-Trimethylphenol	
bis(2-Chloroethoxy)methane	
o,p'-Methoxychlor	
p,p'-Methoxychlor	
Mirex	