Site Description (OS Grid Ref: SE 5785 4905)
Fleet Pond was originally a medieval fishpond, made by damming streams in a wide valley. The historical extent of the water body has been affected by the changing nature of local land-use. The pond was completely drained in the 1940s. The local group ‘The Fleet Pond Society’ has supported the welfare and conservation of the pond and surrounding lands since 1976.

History of Fleet Pond recorded in its sediments
Lake sediments provide a natural archive of changes that have taken place in the lake as well as pollution deposited on the lake and its catchment. A 61 cm core was collected in 2008. We have measured sediment properties, concentrations of metals and atmospheric contaminants in samples down the core. Dating the sediments by measuring the concentration of natural and man-made radioactive isotopes and the vertical distribution of contaminants in the core tells us that the sediment core records more than 150-200 years.

- We have generated a well-resolved sediment history back to the late 19th Century (~ 40 cm depth)
- The sediment composition shows that lake sediments have become less organic (LOI 550 C is a measure of organic content determined by combustion at high temperature). Ti (Titanium) is used as measure of mineral sediment and can see to have increased in the 20th century.
- \(^{137}\)Cs (Caesium-137) is a man-made radioactive isotope that has been released historically by global atmospheric nuclear weapons tests and reactor accidents. We see a rapid increase from the late 1940s, to a peak in the mid-1960s. This corresponds to the history of nuclear weapon atmospheric testing that was banned in 1963. Sustained levels of the isotope reflect continual sediment mixing of the shallow lake
- SCPs (spheroidal carbonaceous particles) are released into the atmosphere from high temperature combustion of fossil fuels in power stations. Our record of SCPs in the lake starts at low concentrations pre-1940 rising to a peak in the 1970s. Around this time in the UK, controls on emissions from power stations were introduced.
- \(^{206}\)Pb/\(^{207}\)Pb is a ratio of the abundance of Pb isotopes in the sediment. Lead sources from around the world have historically had different isotopic ratios that allow us to determine the source of lead found in lake sediments.
- Concentrations of Hg (mercury), Pb (lead), Ni (nickel), Cu (copper) and Zn (zinc) increase from the 19th century and have remained relatively constant since the mid 20th century.

- We are also investigating how the lake biology has changed through time by looking at the remains of diatoms (a type of algae) preserved in the core and the pollution record of persistent organic pollutants (POPs).
Water Temperature Monitoring
We have been constantly measuring water temperatures at Fleet Pond with a submerged data logger (0.5m depth) and during our quarterly visits. The figure (left) is a summary of the depth/temperature data since May 2008. What we observe is that there are strong seasonal changes but little change of temperature with depth. This is because the lake is very shallow and well mixed by wind and wave action.

Maximum temperature from depth profile data: 23.3 ºC (July 2008)
Minimum temperature from depth profile data: 3.2 ºC (Feb 2010)

Water Chemistry Monitoring
The analysis of water samples collected every 3 months since May 2008 are providing us with useful data on chemical and biological processes in Fleet Pond. Data gathered during the OPAL project shows how the water in the pond changes over the year and the overall quality of the water.

- Suspended solids is a basic measure of all matter found floating in the water, i.e. plankton and sediment particles. Levels in Fleet Pond are high due to organic-rich sediment.
- Chlorophyll levels reflect the spring-summer growth of green/blue algae in the water.
- Phosphorus - a nutrient in aquatic systems – is relatively high and shows a seasonal pattern, related to biological activity in the lake and inputs from the catchment.
- Our monitoring of mercury (Hg) and lead (Pb) concentrations in the water show that amounts available to be incorporated into the sediment (see overleaf) vary seasonally. Both lead and mercury are strongly associated with organic matter and so we see a strong relationship between these metals and TSS.