Site Description (OS Grid Ref: SX 8267 4405)
Slapton Ley is the largest natural freshwater lake in southwest England. It was formed by rising sea levels and coastal sediment damming a small estuary by a shingle barrier. The large (219 ha) freshwater lake and wetland area behind the shingle barrier creates a diverse and nationally important range of habitats.

History of Slapton Ley 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 116 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 (~30 cm depth). Much of the core remains undated due to the limits of dating techniques.
- The sediment composition shows that lake sediments have become more organic (LOI 550 C is a measure of organic content determined by combustion at high temperature) over the last century. Zr (Zircon) is used as measure of mineral sediment and this has gradually decreased as the Ley has evolved. Clearly there was a carbonate (probably shell derived) phase of deposition that ended in the 1950s.
- \( ^{137}\text{Cs} \) (Caesium-137) is a man-made radioactive isotope that has been released historically by global atmospheric nuclear weapons tests and reactor accidents. We sometimes find the isotope in sediments that are too old as it has diffused through the mud following burial.
- 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.
- \( \text{Pb}_{206}/\text{Pb}_{207} \) 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.
- Levels of metals in the sediments reflect 20th century industrialisation and atmospheric/runoff derived contamination.
- 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 Slapton Ley with a submerged data logger (0.5m depth) and during our quarterly visits at 0.5m depth intervals (max 2m). 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 would be expected as the lake is well mixed by coastal winds and wave action.

Maximum temperature from depth profile data: 21.6 ºC (July 2009)
Minimum temperature from depth profile data: 4.8 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 Slapton Ley. Data gathered during the OPAL project shows how the water in the pond changes over a 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 Slapton Ley are low, with the highest amounts corresponding to elevated chlorophyll.
- Phosphorus - a nutrient in aquatic systems - 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. Concentrations are generally quite low in Slapton Ley.