

# AquaticEngineering

Working Above Water, On Water & Under Water

## Case Study : A Biomanipulation Trial of a Utility Reservoir – Ivy Lake



Client: Wessex Water

February 2012

Blashford Lakes comprise of an education reserve extending over 200 hectares, with flooded gravel pits and a study centre managed by the Hampshire and Isle of Wight Wildlife Trust through a partnership with the New Forest District Council, Bournemouth and West Hampshire Water and Wessex Water.

In 2011 AquaticEngineering were approached by Wessex Water to look at the feasibility and options for controlling phytoplankton on one of their small reservoirs in this complex – Ivy Lake.

After a consultation period the preferred option worthy of further investigation was the installation of a fish exclusion partition to effectively biomanipulated one corner of the lake. The objective of this trial was to provide answers to the following questions:

- By excluding fish from this zone will the predicted increase in zooplankton result in a reduction in cyanobacteria algae? There is some concern that zooplankton will preferentially graze green algae leaving some types of BG algae to flourish.
- At what distance beyond the zone will there be an effect i.e. by zooplankton swimming through the mesh and grazing outside of the enclosure?
- Will this provide valuable information needed for algae control on other Wessex Water supply reservoirs?
- What are the draw backs of a fish exclusion partition be deployed effectively in a heavily weeded lake?
- How effective and time consuming is fish removal from a water such as Ivy Lake?
- How practicable it will be to scale up this approach for the whole lake or on reservoirs?



Ivy Lake and the location of the 160m fish exclusion barrier.



Firstly a draw net was deployed by the netting team to clear fish from the biomanipulation zone – divers cleared the scirpus beds prior to the net being installed.





Once the netting team had cleared the area of fish the 160m fish exclusion curtain was floated into place, the dive team were on standby ready to deploy the anchors required to hold it where deployed for the period of the trial which could be several years.



Monitoring the effectiveness of the bio-manipulation trial will be undertaken by Wessex Water through routine water quality/algal monitoring. This will include the measurement of zooplankton and algal density and community composition in the netted area and at points outside to assess how far any beneficial effects are detectable. A statistically significant difference will be expected over the next couple of years for the trial to be deemed a success.

Monthly samples for the period of survey indicate that the algal levels (as measured by chlorophyll *a*) and turbidity are generally lower in the test area with a greater tendency for algal blooms to occur in the main lake. There are more *Daphnia* and fewer Copepods present in the test area. The results are very variable but there is a period between November 2012 and April 2013 when all of the above occur and the likelihood is that it is due to the absence of fish allowing an increase in *Daphnia* that grazed algae more efficiently in the test area. The main cause of the spikes in chlorophyll *a* and turbidity is the BG algae *Anabaena* but other BG algae such as *Microcystis* and *Planktothrix*, the dinoflagellate *Chroomonas* and the green algae *Volvox* are also responsible for high cell counts. The dense algal blooms are short lived and may appear more prominent because of more frequent sampling of main lake. However if paired samples taken on the same day from both sides of the barrier are plotted then a very similar picture occurs.

It was noted that the test section had a greater abundance of macrophytes (mostly *Elodea nutallii*) during the trial. This may result from the clearer water allowing the macrophytes to photosynthesise more efficiently and also a greater availability of nutrients. Healthy macrophyte stands provide shelter for the zooplankton even in the presence of fish allowing a stable plant dominated system to remain.



The Biomanipulation barrier in place and being securely anchored to the banks

As of November 2014 the biomanipulation of a section of Ivy Lake continues to look promising and with the trial coming to a close consideration is being given to the removal of the temporary barrier and how best it would be to proceed using the collated data for a full scale biomanipulation of other Wessex Water reservoirs. Watch this space!



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