

## Questionnaire

### 1. What impacts have people made upon Glenbrook Lagoon?

Glenbrook Lagoon's catchment is highly urbanised – most of the land that drains to the lagoon is covered by houses, shops and roads. This means that water now moves very differently through the catchment compared to the way it once did prior to development. When rain falls in a natural catchment, much of the water is used by vegetation or seeps through the ground to recharge groundwater stores – there is usually only a small amount of overland flow. In an urbanised catchment like that of Glenbrook Lagoon, rain falls mostly on impervious surfaces that do not allow water to soak through into the ground. Instead it is delivered at unnaturally large volumes and velocities via stormwater systems to natural waterways. In many systems this can cause serious problems such as creekline erosion, however given that Glenbrook Lagoon is a standing water body (and not so prone to erosion), the main problem associated with stormwater is pollution. When rain falls and flows into the stormwater system it carries with it contaminants that it 'collects' from the catchment. Fertilisers and herbicides from gardens, inappropriate greywater reuse, oil and petrol from roads, sediment, sewage, animal faeces, garden waste, litter and contaminants sourced from retail and industrial areas can all pollute stormwater, especially if behaviours practiced by residents and businesses are not as good as they should be.

The other major change that has been made to the lagoon is that it was dammed to provide water for the steam railway (it was originally a small, swampy 'billabong' that was spring-fed). This means that is now a closed system most of the time, with contaminants flowing in via stormwater but very rarely being flushed out (so pollution tends to accumulate in the lagoon).

A combination of the above factors plus dumping and/or seeding of aquarium plants have led to infestation by noxious aquatic weeds *Salvinia molesta* and *Cabomba caroliniana*. Look these up for further information about their impacts on aquatic ecosystems (hint: Department of Primary Industries have some good fact sheets and control manuals).

### 2. What pollutants are found in the Glenbrook Lagoon?

- Excess nutrients (although mostly nutrients are bound in sediment or weeds – there is actually very little available nutrient in the water column)
- Faecal coliform and enterococci levels have at times been very high – suggesting possible sewage contamination on top of existing high levels caused by waterfowl defecating into water
- Gross pollutants – litter, sediment and coarse organic material (sticks etc) are usually trapped by the stormwater quality improvement devices located in the three stormwater detention basins around the lagoon.

### 3. What are the causes of water pollution in Glenbrook Lagoon?

- Contaminated stormwater (discussed in Q1)
- Possible sewage contamination
- Duck/waterfowl faeces

4. **What actions have people taken in the past which now impact on the quality of water in Glenbrook Lagoon?**

- See Q1

5. **What parts of the Lagoon are most impacted by pollution?**

This varies according to which area of the catchment is contributing pollutants to the stormwater at a particular time. Our stormwater monitoring has indicated that all areas of the GBL catchment have contributed high pollutant loads at various times. There is generally not a lot of mixing or water movement at the lagoon due to the nature of the waterbody as well as the Cabomba infestation, so contaminants would probably be more concentrated around stormwater outlets. "The beach" area is most impacted by contamination from waterfowl, as they congregate there due to feeding.

6. **What impacts has the pollution made on the environment?**

- Mainly loss of biodiversity due to dominance by aquatic weeds (out-compete native plants and do not provide suitable habitat for many native animal species). Potential for eutrophication (look this one up).

7. **Are there any future plans to manage the pollution in the Glenbrook Lagoon?**

- All three stormwater detention basins are being upgraded in 08-09 to improve their capacity to remove nutrients from stormwater before it enters the lagoon (via extended flow paths, wetland membranes that encourage the establishment of nutrient consuming biofilms, and macrophytes).
- We are conducting ongoing water quality monitoring of the lagoon and stormwater that feeds it to try to locate and rectify sources of contamination.
- Ongoing community involvement and education to help improve practices in the catchment and stop the source of some of the pollution
- Once Cabomba is removed we are considering trialing rafted reedbeds to help remove excess nutrients from the water column.

8. **How are the weeds in the Lagoon controlled?**

Salvinia molesta:

- Mechanically harvested in 2006
- Ongoing hand-picking and spot-spraying with herbicide when appropriate
- Denitrifying bacteria added to the lagoon monthly during 2006 and 2007
- Salvinia molesta is now present only in very low levels and is becoming difficult to find at the lagoon

Cabomba caroliniana:

- No effective treatment is available as yet
- Cabomba takes up almost the entire water column at the lagoon
- Trials of a promising herbicide are currently being conducted by the Dept of Primary Industries. Assuming trials are successful the product will be

registered within the next couple of years and then we will be able to use it to treat Cabomba at the lagoon.

The nutrient reduction measures outlined in Q7 will help to treat one of the underlying causes of weed infestation to help prevent/reduce future outbreaks.

## 9. Who is responsible for managing the water quality and contaminants in Glenbrook Lagoon?

Blue Mountains City Council is the manager of Glenbrook Lagoon Reserve and takes on the primary responsibility for monitoring water quality at the site. Other stakeholders are Sydney Water (in relation to sewerage issues), all residents living within the catchment and all businesses operating within the catchment.

## 10. Are there any regularly scheduled clean up/management activities and how often are these held?

- Community volunteers meet with a Council Bushcare Officer one Sunday per month to conduct weeding in the bush around the lagoon
- Council's bush regeneration team works at the lagoon regularly
- Council has employed a contractor (grant funded) to remove by hand remnants of the *Salvinia* infestation. This usually happens about once per fortnight and is aimed at keeping *Salvinia* levels very low to prevent large-scale outbreaks. Ultimately we are aiming to eradicate *Salvinia* but this has never been achieved in a waterbody the size of Glenbrook Lagoon.
- A group of local residents usually participate in Clean Up Australia Day at the lagoon (once per year)
- The gross pollutant traps in the stormwater detention basins are (generally) cleaned out regularly by Council.

## 11. Why do you think it is important to manage pollution?

Although Glenbrook Lagoon is a highly altered system it still has the potential to provide excellent habitat for aquatic plants and animals, some of which are unusual in the Blue Mountains as we don't have many standing water bodies like the lagoon in our area. Improving water quality will improve the overall health of the system and the biodiversity it is able to support.

Public health is also a concern.