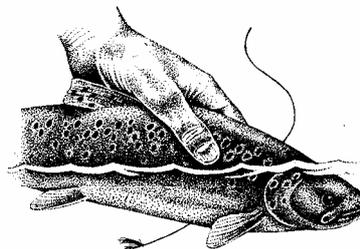


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Consultants : Freshwater Fisheries, Conservation & Wetland Ecology

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Lough Carra

Advisory visit report for The Wild Trout Trust



Current available information

Nick Giles was invited by The Carra, Mask, Corrib Water Protection Group Ltd (Headford, County Galway) on a short visit (October 8th/9th 2003) to view and discuss the current situation on Lough Carra. The trip was part-funded by The Wild Trout Trust; this report was produced as part of their advisory visit programme.

Background information

Loughs Carra, Mask and Corrib form a linked series of very large limestone-dominated catchments in Connemara. They are famed for their water clarity, rare aquatic plants, abundant wild trout stocks and for the fine fishing and wildlife watching which draws tourists each year from far and wide (O'Grady, 1989). The considerable economy and environmental resource associated with these lakes depends fundamentally on continuing high water quality and habitat quality in streams and rivers throughout the catchments of these loughs.

Considerable damage to wild trout and salmon spawning and nursery habitats in this area has been done in past years, primarily by extensive arterial drainage schemes and by associated increases in the intensity of agriculture; especially livestock rearing. During the author's visit to the area he was shocked by the extensive damage which has been done to important trout and salmon habitats.

Wild trout and salmon stocks, associated wildlife and the substantial tourist economy dependent upon them depend fundamentally on the successful protection of environmental quality in Ireland.

When pristine, the Lough systems of western Ireland would have had relatively low concentrations of freely available plant nutrients (especially Nitrogen and Phosphorus) and the aquatic plants, including the rare stoneworts (eg *Chara* species) would have absorbed much of the nutrients present, leaving little free to cause abundant algal growth. Algal growth would effectively have been limited by the availability of key nutrients: Phosphorus, Silicon and/or Nitrogen in a clean natural system.

If, however, nutrient levels are artificially boosted through the working of peat bogs, applications of organic (manure) or inorganic fertilisers (Nitrogen / Phosphorus / Potassium, NPK granules), human sewage inputs, and significant amounts of these nutrients enter watercourses and loughs, then rapid algal growth is often promoted. Shallow, clear-watered loughs, such as Lough Carra are especially vulnerable to these impacts.

The varied types of algae can cause brown, green or blue-green coloured water ('blooms'), they can smother submerged plants with a thick film of algal growth ('epiphytes') or clog gravel and stony beds with mats of filamentous growth ('blanket weed'). This excessive algal growth can have a wide range of damaging knock-on effects to both water quality and biological communities in delicate natural aquatic ecosystems.

A commonly-encountered phenomenon with changes from clear-watered, weedy lakes to algal bloom-dominated turbid lakes is the rapidity with which the switch can happen. As nutrient levels rise the existing submerged plants are out-competed for light and nutrients.

At this point the algal populations can grow very rapidly, reducing underwater light levels and extinguishing first sensitive submerged plants and, eventually, even hardy species. Sometimes only those species with floating leaves (water lilies and some pond weeds) are

able to survive in the turbid, frequent algal blooms of open water. Once out of balance through over-enrichment, it can be difficult or impossible to recover the clear water and *Chara* beds for which the lakes are famous (John et. al, 1982, Champ, 1993, 1998, Blindow, 1992). This pernicious process of over-enrichment is termed 'eutrophication'.

Irish lake and river habitats

Irish lakes and rivers are known to have suffered and continue to suffer damage from a range of activities including intensification of land use, land drainage and various forms of water pollution (see Western Water Protection Group, Carra Mask Corrib Water Protection Group Ltd: Ireland's twelve wild brown trout fisheries, McGarrigle & Champ, 1999). Lough Sheelin (County Cavan) is probably the best known case of an Irish lake with seriously damaged water quality - intensive pig production and slurry disposal being a major cause (Champ, 1993). Closer to Lough Carra, Lough Conn (County Mayo) is currently believed to be under threat from increased phosphorus loadings (McGarrigle & Champ, 1999). Arctic char had become extinct in Lough Conn by the early 1990s and algal blooms are commonplace (Char Conservation Group Ltd).

Lough Carra cSAC

The present grave concern is that the renowned, crystal-clear, marl-bedded Lough Carra with its *Chara* stoneworts and extensive reed beds, marginal wetlands, wildfowl flocks and wild trout could suffer the same fate (Huxley, 2002).

Lough Carra is showing some classic signs of eutrophication, causing the water to be less clear than before and potentially threatening the delicate ecosystem which currently exists (Thornton & Huxley, 2003). This ecosystem relies upon clear, clean water flowing from the adjacent land via wetlands, drains, rivers and streams which can help to purify incoming water.

Eutrophication would swamp this natural ability of the system to keep its water relatively clean. Water abstracted for human consumption would also run the risk of carrying elevated levels of bacteria and organisms such as *Cryptosporidium* which cause health problems.

Lough Carra is a candidate Special Area of Conservation (cSAC), the highest European conservation designation and a site which must be protected from environmental deterioration. It gains this protection from the EU 'Habitats Directive' Annexe 1 status. *Chara tomentosa* and *Chara denudata*, both present in Carra are Red Data Book species within Britain and Ireland.

The Lough and surrounding wetlands also harbour other important plant species, insect populations, breeding and wintering wildfowl and song birds and, of course, the famed wild brown trout stock. Future water quality in the catchment should also be subject to stringent monitoring and protection under the implementation of the EU Water Framework Directive.

Scientific research on Lough Carra

The Western Regional Fisheries Board have taken water samples from Lough Carra since the early 1970s (King & Champ, 2000) and have found a gradual reduction in water clarity over this period but no consistent increases in Phosphorus concentrations (their analytical methods changed over the programme, making direct comparisons difficult). They concluded that Lough Carra appeared to be staying in the 'mesotrophic' classification; intermediate between nutrient-poor ('oligotrophic') and enriched ('eutrophic') waters.

Huxley and co-workers (Thornton & Huxley, 2003) have recently compiled historic (1970) and current land use information on part of the Carra catchment to indicate conversion of all natural / semi-natural habitats. They found:

- Substantially increased numbers of cattle, sheep, and pigs reared with corresponding increases in inorganic fertiliser use and in the spreading of farmyard manure and slurry onto fields within easy reach of watercourses and the lough side.
- Conversion/ drainage of substantial areas of formerly natural / semi natural habitats to grazing land.
- Increases in human habitations with associated detergent and sewage outputs.

Their conclusion is that nutrient inputs to Lough Carra have increased substantially over the last 30 years.

An EU 'LIFE' - funded research project under the European BUFFER research programme (which seeks to understand nutrient inputs to lake systems) has recently been carried out by scientists from the Zoology Department, Trinity College, Dublin (Donohue & Irvine January 2003).

Preliminary analyses and results indicate the following important points:

- Apparently substantial nutrient inputs to Lough Carra from some in-flowing rivers with differences between catchments possibly linked to catchment land use.
- Because of a lack of gauged flows on in-flowing rivers, modelling of the likely dynamics of nutrient inputs requires further work.
- Three sediment cores taken from the bed of Lough Carra all show substantial recent (as yet undated) increases in Total Phosphorus content, "suggesting strongly that the P (Phosphorus) loading to the lake has increased in recent years" (Donohue & Irvine, January 2003, preliminary BUFFER report, Version 2).

Conclusions and recommendations

1. Ireland, and, in the wider context, Europe has a history of over-enriching sensitive lake catchments and ecosystems, leading to adverse ecological change, damage to sensitive species and reduced conservation and economic values. Once done, such damage is very difficult to reverse, especially so on large lakes (Giles, 2003).
2. Eutrophication of this type is usually linked to:
 - changing land-use; intensification of agriculture (especially manure disposal) and associated loss of natural habitats and conversion to more intensive grazing or arable regimes,
 - increased levels of treated sewage effluent (Royal Commission on Environmental Pollution, 1992, National Rivers Authority, 1992).
3. Lough Carra is a cSAC, protected under the EU Habitats Directive and Water Framework Directive for its very high conservation values. There is clear evidence of changing land-use and agricultural intensification in studied areas of the Carra catchment and observations of increased algal growths and decreased water clarity (Thornton & Huxley, 2003, C. Huxley, pers. comm.); both classic signs of increasing nutrient concentrations.
4. Substantial nutrient inputs are entering the Lough from certain sub-catchments and initial lake bed core samples analysed by scientists from Trinity College Dublin suggest increases in Phosphorus loadings in Lough Carra over an (as yet) unknown time period (Donohue & Irvine, 2003). These results, whilst preliminary, should be taken very seriously.
5. It is strongly recommended that enough scientific research funding is made available to further study the nutrient dynamics of the Carra catchments and to establish exactly where significant inputs of Nitrogen and Phosphorus are coming from. This should lead to a careful appraisal of current land use and any other factors which could be increasing nutrient loadings in the Carra Mask Corrib lake complex.
6. **Before this detailed research work is done, a justifiable precautionary approach to protecting the Lough Carra catchment would be to commission an urgent, short-term, comprehensive review of current agricultural practices and their potential impacts on lough water quality. If unacceptable, damaging land-use or other practices are discovered, all efforts must be made to change them immediately if the future of these important loughs is to be adequately safeguarded.**

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