Appendix 9

Nuisance macrophyte growths

An often overlooked adverse effect of nutrient enrichment is the proliferation of nuisance macrophytes (weeds) which choke small to medium sized water bodies, adversely affecting aquatic ecosystem health by smothering the stream bed, reducing water velocity, trapping fine sediment, and decreasing dissolved oxygen at night. Weed-choked streams also provide little recreational opportunity for water users, block irrigation intakes and reduce the available habitat and spawning environment of fish.

Nuisance macrophyte growth is common in small to medium sized streams and rivers within target zones (
Photo 1a-1m). The effects of nuisance macrophyte growth on water body values in small streams can be more pervasive than periphyton; in some cases it is difficult to see where the stream channel actually lies. In some circumstances periphyton and macrophyte nuisance growths can co-occur, with macrophytes providing a surface for the attachment of periphyton (
Photo 1f and 1i).

A brief review of the international literature suggests that links between nutrient reduction and macrophyte reduction are not well studied. However, one long-term study from the Bow River in Alberta, Canada (Soziak, 2002) found relationships between reductions in nuisance macrophytes and decreased nutrient concentrations (particularly nitrogen) from improvements to the Calgary municipal wastewater discharge.

In the 16-year Bow River study, total phosphorus was reduced by 80% between 1982 and 1983 and soluble nitrogen was reduced by approx 50%[1] between 1987 and 1990. Significant reductions in macrophyte biomass occurred after enhanced phosphorus removal began (1983), but the greatest biomass reductions occurred over the period of nitrogen reduction and stable (albeit lowered) phosphorus. The management implications found by Soziak (2002) were that macrophytes could be controlled through reductions in nutrient concentrations, but the response would depend on the species of macrophytes, substrate characteristics and whether nutrient concentrations in sediment pools and water were below optimum levels for growth. Interestingly, macrophyte reductions in the Bow River occurred when median concentrations for soluble inorganic nitrogen reached 0.58 g/m^3-1.09 g/m^3 and at dissolved phosphorus concentrations of < 0.01 g/m^3.

[1] Total ammonia was reduced by 53% and total oxidised nitrogen was reduced by 50%.

A National Envirolink Tools project is underway to review the plant-nutrient instream guidelines and develop a model which relates nutrient concentrations to nuisance macrophyte growths.

Key points: nuisance macrophyte growth

- Nuisance macrophyte growth is common in smaller streams and rivers in target zones identified by Rule 13-1 for contaminant management;
- Proliferation of nuisance macrophytes is associated with nutrient enrichment;
- Reductions in nutrients, particularly nitrogen, have been effective in causing significant reductions in macrophyte biomass;
- Additional environmental benefits from the POP combined nutrient management approach may occur in small streams as a result of reductions in macrophyte biomass and commensurate improvements in water quality, habitat and recreational use.

Photo 1a: Tributary of the Mangarangiora Stream (upper Manawatu target zone)

Photo 1b: Oruakeretaki Stream at Oringi (upper Manawatu target zone)

Photo 1c: Brechin Stream, tributary of the Mangatainoka River (Mangatainoka target zone)

Photo 1d: Brechin Stream showing flow (Mangatainoka target zone)

Photo 1e: Unnamed tributary of the Mangatainoka River near DB Breweries (Mangatainoka target zone)

Photo 1f: Mangamaire Stream macrophytes and nuisance algal growth, stream identified for trout spawning (Mangatainoka target zone)

Photo 1g: Makakahi River at Konini, severe submerged macrophyte growth (Mangatainoka target zone)

Photo 1h: Unnamed tributary of the Mangaatua Stream (Manawatu above Gorge target zone)

Photo 1h: Waiwiri Stream, outflow of Lake Papaitonga (Lake Papaitonga target zone)

Photo 1i: Arawhata Stream weed and algal growth (Lake Horowhenua target zone)

Photo 1j: Arawhata Stream (Lake Horowhenua target zone)

Photo 1k: Piakatutu Stream (upstream from Sanson sewage treatment plant – Coastal Rangitikei target zone)

Photo 1l: Tutaenui Stream upstream from Marton sewage treatment plant showing stormwater inflow pipe (Coastal Rangitikei target zone)

Photo 1m: Unnamed tributary of the Mangapapa Stream (Mangapapa target zone)

Photo 1 (a – m): Examples of nuisance macrophytes and algal-macrophyte growths from various target zones within the Region. Typical problem species include *Mimulus guttatus* (monkey musk), *Polygonum* species (willow weed), *Apium nodiflorum* (water celery), and *Azolla pinnata* (ferny azolla).