

FRESHWATER BIOLOGICAL ASSOCIATION
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**Nitrates in surface waters,
inputs and seasonality**

**Progress report for the period
April - December 1987**

by H. Casey

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The Freshwater Biological Association is part of the Terrestrial and
Freshwater Sciences Directorate of the Natural Environment Research
Council.

Objectives

To investigate, in a catchment on which earlier nitrate data are available for comparison, seasonality and budgets, in relation to land use, of nitrate inputs, concentrations and loads.

Introduction

Phase 1 of the contract involved sampling at a series of sites and the timings are given below.

1. April 1984

Sites on the River Frome and its main tributaries were selected for sampling for nitrate values and discharge where suitable. These sites had to be comparable to those sites sampled in 1970-71 when discharge and chemical composition was measured. Discharge measurements and water sampling began.

2. 1984-85-86

Farmers were contacted in the River Frome catchment area to get information on land-use changes and fertiliser applications. MAFF were contacted, both locally and in Bristol, to get information on changes in land use from the parish records from 1972 to 1985; also to get information on changes in recommendations of fertiliser applications for different crops. Sampling continued at the selected sites. Wessex Water Authority was contacted to obtain information on the amount of sewage effluent entering the River Frome catchment. The fertiliser manufacturing association was contacted to get up-to-date information on fertiliser usage and recommendations as some of the data obtained from MAFF were out of date. An extra sampling site was added on Tadnoll Brook because of the larger increase in nitrate concentrations than in the other River Frome tributaries.

3. 1986

Sampling ceased in September 1986. All data were transferred to NERC computer in order to apply statistical analysis.

4. 1987

The final report was written and sent to DoE.

Phase 2. A one-year extension was granted from 1 April 1987 to 31 March 1988. The object of the extension of the contract was to limit the sampling to two sites and to alter the sampling regime so that a better understanding of the mechanisms of the nitrate load of the River Frome could be obtained.

Progress in period April to December 1987

Weekly samples have been taken and analysed using the analytical technique that has been used since 1963 to give a direct comparison for all previous results. An automated technique has been used to compare the modern method of analysis with the old method. The old method measures nitrate concentrations only, whereas the new automated method measures both nitrate and nitrite. From the results obtained so far it would appear that the older method gives lower nitrate results than the modern method and this is not entirely due to the presence of nitrites.

A very intensive sampling regime has been made at East Stoke with sampling periods ranging from every 30 minutes during high flow events to daily during periods of steady flow. An intensive sampling programme has also been carried out at Dorchester.

However, obtaining flow data has proved difficult. The flow data archive has not yet got the information on River Frome discharges for 1986, let alone 1987. Because of the complexities of the River Frome gauging stations, information is needed from four gauging stations just to get the combined information for two water sampling sites. Information from these four gauging stations has been obtained from Wessex Water Authority but these are only the daily maximum, minimum and mean flows. Therefore, it is proposed to calculate daily loads for the River Frome using mean daily nitrate concentrations and the mean daily flows obtained from Wessex Water Authority. The discharge results obtained so far show that in 1987 the flows of the River Frome were for the summer months very different from those of 1986, e.g. the discharges in $m^3 s^{-1}$ are:-

	June		July		August	
	Max	Min	Max	Min	Max	Min
1986	7.63	5.06	5.06	3.54	8.11	2.52
1987	9.39	3.53	4.62	2.41	2.45	2.00

Nitrate concentrations for both years are similar but because of the between-year differences in discharge values, the nitrate loadings for the summer months will be lower for 1987 than 1986. Results from Phase 2 will be compared with weekly nitrate load values as calculated in the previous report. Also a comparison will be made of calculated fortnightly and monthly concentrations and nitrate loads.

In the Phase 1 final report sent to the Department in April, conclusion 5 stated that there was a distinct possibility that nitrogen fertiliser applications to Dorset grasslands would increase. New information obtained from local farmers shows that in certain cases, because of the milk quota situation, nitrogen fertiliser applications are increasing. Farmers are tending to cut down on some food concentrates as cattle food and are using their grass instead. In fact, in many cases the farmers are applying increased fertilisers in order to get three silage cuts instead of the previous two. Whether this situation is occurring in other areas is not known. However, it could affect nitrate run-off and leaching quite significantly if there was a period of heavy rain in late summer and autumn.

The report on Phase 1 showed that seasonal nitrate loads varied enormously but that the highest loading occurred in the three-monthly period January to March. Because this contract ends on 31 March 1988 and the report has to be written within this time, sampling will have to cease in late January or early February 1988 thus missing out February and March 1988 which normally are months of high nitrate loads. If possible, a three to six month extension of this contract would enable a complete calendar year of sampling and include the heaviest months of nitrate loads leaving the River Frome catchment.