

the result of an inspection by eye and nose. The grey growth mentioned in the last column of the table appears to be eminently characteristic of an undesirable degree of pollution.

The efficacy of the test recommended depends upon the fact that clean river water in normal condition, and at 60 deg. F., contains in solution 7 c.c. of oxygen, or 1 part by weight, in 100,000 of water. If polluted, this dissolved oxygen, as the result of bacterial action, enters into combination with the organic matter present, with a consequent reduction in the amount of that freely dissolved, and this loss of oxygen thus serves to indicate the degree of pollution of a stream. All river water contains some organic impurity, and hence, if kept in conditions in which the store of oxygen cannot readily be replaced from the air, there will, on keeping, be always some reduction in the quantity of oxygen contained in solution. With clean river water, however, this loss is small, whilst with badly contaminated streams the whole of the dissolved gas may disappear from the sample under test. The connection between the oxygen dissolved and the character of the stream is stated to be as follows:—

	Gramme of dissolved oxygen in 5 days.
Very clean	0.1
Clean	0.2
Fairly clean	0.3
Doubtful	0.5
Bad	1.0

The figures refer to the weight lost from 100,000 grammes of the water under test. It will be noted in the above table that the figure given for a badly polluted stream exceeds the total amount of oxygen which water is capable of holding in solution at a temperature of 65° F. This, in fact, was frequently the case in the tests, which were made by mixing the sample under observation with tap water in such proportion that some 50 to 60 per cent. of the total dissolved oxygen was taken up in the five days

over which the test extended. This degree of dilution was found by experiment to yield the most concordant results.

A very fair correlation was, as already mentioned, also established between the condition of a stream and the ammoniacal nitrogen present, but the Commissioners came to the conclusion that this test was on the whole the less satisfactory of the two, since the ammonia figure in the case of a stream receiving sewage effluents was not always as good an index of the actual condition of the stream as the dissolved oxygen test was found to be.

A most interesting feature of the present series of researches has been the comparisons made between the condition of a stream above a sewage outlet and below it. Probably the most interesting observations made in the whole investigation are those on the River Avon, from Rugby to Stratford. This river rises in Northamptonshire, near Naseby, and flows across Warwickshire to the River Severn at Tewkesbury. It is a winding, sluggish stream, with a muddy bed, and there are many weirs on it. On it, or its tributaries, are situated the towns of Rugby, Coventry, Kenilworth, Leamington, Warwick, Stratford, and Evesham, the distance between successive centres of pollution being generally about 10 miles. For many years the stream received the untreated sewage effluents from all the centres above named; but as matters stand to-day, it would appear that the effluents sent into the stream are in the main fairly satisfactory, and that the river is maintained in a passable condition. Between Rugby and Stratford the proportion of sewage-derived water in the river never falls below 1 in 8 or 1 in 9, and in one reach amounts to as much as 1 in 2.5.

The town of Rugby has a population of 21,000, and is sewered on the "partially separate" system. The sewage, which is "domestic" in character, is treated in septic tanks, the effluent from which is passed through percolating filters and irrigated over land. This effluent is stated to be bright and clear, with a clean, healthy smell, and is

Features Characteristic of Streams in Normal Summer Weather.

Condition of water as regards	"Very Clean"	"Clean"	"Fairly Clean"	"Moderate"	"Doubtful"	"Bad"
Suspended matter	Clear	Clear	Fairly clear	Fairly clear	Slightly turbid	Turbid
Opalescence	Bright	Bright	Slightly opalescent	Distinctly opalescent	Opalescent	Opalescent
Smell on being shaken in bottle	Odorless	Faint earthy smell	Pronounced earthy smell	Earthy wormy smell	Strong earthy wormy smell	Soapy, foecal, or putrid smell
Appearance in bulk	Limpid	—	Slightly brown and opalescent	Brown and opalescent	Black looking	Brown or black and soapy looking
Delicate fish	May be plentiful	Scarce	Probably absent	Absent	Absent	Absent
Coarse fish	—	Plentiful	Plentiful	Present	Scarce	Do
Stones in shallows	Clean and bare	Clean	Lightly coated with brown fluffy deposit	Coated with brown or dark green layer	Coated with brown fluffy deposit	Coated with grey growth and deposit
Stones in pools	Do	Covered with fine light brown deposit	Do	Coated with brown deposit	Do	Coated with brown or black mud
Water weeds	Scarce	Plentiful; fronds clean except in late autumn	Plentiful; fronds brown-colored in places	Abundant and covered with deposit in pools	Plentiful and covered with fluffy deposit	Scarce
Green algæ	Do	Moderate quantities in shallows	Plentiful in shallows	Plentiful	Abundant	Abundant in protected pools
Grey algæ	—	—	—	Plentiful in green algæ	Present	Plentiful
Insects, larvæ, etc.	—	—	—	—	Plentiful in green algæ	Abundant in green algæ