



NRA

*National Rivers Authority
South West Region*

ENVIRONMENTAL PROTECTION

1990 CLASSIFICATION OF ESTUARY QUALITY

TWS/92/005

**Author: J. Driver
Tidal Waters Scientist**

**GORDON H BIELBY BSc
Regional General Manager**

**C V M Davies
Environmental Protection Manager**

1990 CLASSIFICATION OF ESTUARY QUALITY

Introduction

1. Each year, 22 estuaries in the region are classified in terms of their aesthetic, chemical and biological quality. In 1990 two surveys were carried out. The first (or "DoE Survey") was a repeat of the subjective assessment made in 1989 and previous years. This was based on the current NWC system of points allocation approved by the DoE/NWC Standing Technical Advisory Committee on Water Quality (Appendix 1). The second (or "NRA Survey") used the chemical data collected in each estuary during 1990 to provide a more objective classification for each estuary (using the same points allocation system as above).
2. Every 5 years, the NWC classification is reported to the DoE to form part of the report of the national survey of river and estuary quality. This was last done in 1985. The 1990 NWC classification has been forwarded to the DoE.
3. The results of the NRA survey will be forwarded to NRA HQ and will form the basis of future work.

1990 Classification

i) DoE Survey

4. The subjective assessment of each estuary in the region follows that of previous years. Appendix 2 give details of the 1990 classification.
5. For each estuary 2 lengths (1985 length and 1990 length) are reported. Towards the end of 1989 all the estuaries were re-measured (by splitting each estuary into sections, or zones, and measuring each zone). In most cases, the measured lengths differ although the actual area covered remains the same. The resultant small differences are thought to be due to the more accurate exercise carried out in 1989.
6. Nineteen estuaries, Axe, Otter, Exe, Teign, Dart, Kingsbridge, Avon, Erme, Yealm, Lynher, Plymouth Sound, Looe, Fowey, Helford, Hayle, Gannel, Camel, Torridge and Taw, were determined as being in Class A and comply with their quality objective of Class A - good quality.
7. In the River Plym estuary, the upper zone of 2 kilometres was determined as Class B and not complying with its objective of Class A. The rest of the estuary complied with the objective of Class A.
8. In the Rivers Tamar/Tavy estuaries, a small zone of 1.25 kilometres of Weston Mill Lake was determined as Class B and not complying with its objective of Class A. The remainder of this large estuary zone complied with the objective of Class A.



9. In the Fal estuary, three zones failed to comply with their objectives of Class A. The Ruan estuary (7.5km), upper Truro River estuary(3.25km) and Penryn River estuary (5.0km) were determined as Class B. Restronguet Creek complied with its quality objective of Class B.
10. For those estuaries which failed to achieve maximum points for aesthetic, biological or chemical quality, explanations for failures are given in Appendix 3.
11. Without taking account of the routine monitoring of the estuaries in the region it is very difficult to assess any changes in quality from year to year. However, on the basis of the subjective assessment made, no changes in quality were reported for any of the estuaries or zones in estuaries in 1990 compared to previous years.

ii) **NRA Survey**

12. During 1990, 4 surveys were planned (on a seasonal basis) for each estuary. Surveys were carried out over a tidal cycle. Samples, from a number of sites within each estuary, were collected at low water, mid flood, high water and mid ebb. Samples were analysed for dissolved oxygen, pH, turbidity, temperature, biochemical oxygen demand, suspended solids, orthophosphate, chlorophyll A, salinity, total and faecal coliforms, faecal streptococci, total oxidised nitrogen and ammonia.
13. An NRA Working Group on estuary and coastal water classification has proposed a revised system of estuary classification. However, this system has not yet been formally adopted. In the interim, measured dissolved oxygen levels have been assessed against existing NWC criteria to derive the 1990 NRA classification. Appraisal of biological and aesthetic quality remains subjective. The resultant classification (Appendix 2) does not differ from that derived for the DoE.

1991 Classification

14. It is anticipated that the new classification system will be established during 1991. Appropriate chemical and biological data have been collected during 1990 and are being collected during 1991. This will allow a more objective assessment of estuary quality to be reported.

APPENDIX 1

ESTUARY CLASSIFICATION SYSTEM

ALLOCATION OF POINTS

Aesthetic Quality

(One description only is chosen)

- | | | |
|-----|---|----|
| (a) | Estuaries or zones of estuaries that either do not receive a significant polluting input or which receive inputs that do not cause significant aesthetic pollution. | 10 |
| (b) | Estuaries or zones of estuaries which receive inputs which cause a certain amount of aesthetic pollution but do not seriously interfere with estuary usage. | 6 |
| (c) | Estuaries or zones of estuaries which receive inputs which result in aesthetic pollution sufficiently serious to affect estuary usage. | 3 |
| (d) | Estuaries or zones of estuaries which receive inputs which cause widespread public nuisance. | |

Biological Quality

Points awarded if the estuary meets this description

(Scores under a,b, c and d are summed)

- | | | |
|-----|--|---|
| (a) | Allows the passage to and from freshwater of all relevant species of migratory fish, when this is not prevented by physical barriers. (Relevant species include salmonids, eels, flounders and cucumber smelts etc.) | 2 |
| (b) | Supports a residential fish population which is broadly consistent with the physical and hydrographical conditions. | 2 |
| (c) | Supports a benthic community which is broadly consistent with the physical and hydrographical conditions. | 2 |
| (d) | Absence of substantially elevated levels in the biota of persistent toxic or tainting substances from whatever source. | 4 |

Maximum number of points 10

APPENDIX 1

Chemical Quality

(One value only is chosen)

Dissolved oxygen exceeds a saturation value of:	60%	10
	40%	6
	30%	5
	20%	4
	10%	3
Below	10%	0

DESCRIPTION OF QUALITY PARAMETERS

Aesthetic Quality

In assessing aesthetic quality the following factors are considered: smell, colour, debris, oil, recognisable sewage solids, and effects from discharge of domestic or industrial effluent.

The assessment also takes into account the natural turbidity of the waters in the area, algal growth, and the frequency with which floating oil and debris enter the area.

Biological Quality

Biological quality is classified by the following features:

(a) Passage of migratory fish

Except where other uses are deemed of greater importance, an estuary should allow the passage of all those species of migratory fish which can be supported by the freshwater reaches. The estuary would fail this criterion if the passage of one or more of the relevant species were seriously impeded by adverse water quality. Thus certain east coast estuaries, for instance, would not be failed because migratory salmonids do not pass through them, but would be failed if they did not allow the passage of elvers and eels. Similarly, an estuary would not be failed on this parameter if the only impediment to migration was a physical barrier. The main deterrent to migration is usually low dissolved oxygen, and this is reflected in the classification score under chemical quality. However, the scheme takes into account the possibility that fish might be able to migrate through an estuary with the lowest water quality classification if at the appropriate time there is sufficient dissolved oxygen present to allow migration to occur. For example, the lowest dissolved oxygen may occur during the third quarter of the year, whereas elvers and eels migrate during the second and fourth quarters respectively.

APPENDIX 1

(b) Fish population

To comply with this parameter, the classification scheme requires that each area of the estuary contains a population of fish appropriate to the physical and hydrographic conditions for most of the time. It follows that where water quality criteria for recreational, commercial, or biological grounds are not met, fish populations will also be reduced, either sporadically or permanently, in numbers or species and this will therefore also cause the area of estuary to fail in this respect.

(c) Benthic community

To comply with this parameter the benthic community of each area would have a diversity and biomass which is consistent with the physical and hydrographic conditions. This parameter is included because the sedentary characteristics of benthic organisms reflect the conditions at a given location, in contrast to the fish population which is mobile. It is often not easy to determine whether the benthos is healthy or otherwise, although the extreme are readily recognisable. Thus the benthic community may need to show a substantial deterioration before its failure to comply can be stated with any certainty.

(d) Persistent toxic or tainting substances

The accumulation of toxic or tainting substances by estuarine organisms may affect their subsequent acceptability for human consumption, or the viability of populations of sensitive species. The presence of higher-than-background concentrations of persistent chemicals in the biota would not constitute grounds for failing an area of estuary on this parameter, unless the substances approach concentrations which could cause harm to the organisms or render knowledge of the nature of inputs to an estuary, there is no reason to expect the accumulation of such substances in the biota, parts of the estuaries would be given the highest rating.

Chemical Quality

The chemical quality is classified in terms of dissolved oxygen levels which refer to those obtained under the worst conditions, where necessary averaged with depth and over a tidal cycle. It is expected that water having a mean dissolved oxygen value of 60 per cent will exceed this value for a substantial portion of the time.

APPENDIX 2

1990 ESTUARY CLASSIFICATION

ESTUARY NAME	1985 LENGTH	1990 LENGTH	1985 CLASS (NWC)	1990 CLASS (NWC)	OBJ. CLASS (NWC) OLD	1990 NRA CLASS
AXE	5.20	3.70	A	A	A	A
OTTER	2.40	2.50	A	A	A	A
EXE	15.00	14.50	A	A	A	A
TEIGN	9.60	9.50	A	A	A	A
DART	26.60	19.85	A	A	A	A
KINGSBRIDGE	23.00	10.00	A	A	A	A
AVON	7.00	6.50	A	A	A	A
ERME	6.30	6.00	A	A	A	A
YEALM	11.25	10.25	A	A	A	A
PLYM (UPPER)	4.35	2.00	B	B	A	B
(LOWER)	2.00	3.25	A	A	A	A
TAMAR/TAVY	44.00	37.95	A	A	A	A
- WESTON MILL LAKE	1.25	1.25	B	B	A	B
LYNHER	23.75	18.00	A	A	A	A
PLYMOUTH SOUND	6.35	7.50	A	A	A	A
LOOE (EAST)	3.25	4.80	A	A	A	A
(WEST)	2.65	3.00	A	A	A	A
FOWEY	9.05	10.85	A	A	A	A
- PONT PILL	1.60	1.75	A	A	A	A
- PENPOLL CREEK	2.30	2.25	A	A	A	A
- LERRYIN	2.40	2.30	A	A	A	A
FAL	7.50	14.40	A	A	A	A
- PERCUIL	7.50	6.00	A	A	A	A
- RUAN	7.50	1.25	B	B	A	B
- TRESILLIAN	5.00	4.80	A	A	A	A
- TRURO (UPPER)	3.25	2.50	B	B	A	B
- TRURO (LOWER)	13.00	3.75	A	A	A	A
- RESTRONGUET	6.25	5.40	B	B	B	B
- PENRYN	5.00	4.30	B	B	A	B
HELFOED	22.00	14.25	A	A	A	A
HAYLE	3.75	3.75	A	A	A	A
GANNEL	3.75	4.00	A	A	A	A
CAMEL	22.00	21.50	A	A	A	A
TORRIDGE	10.90	12.65	A	A	A	A
TAW	22.70	21.25	A	A	A	A

APPENDIX 3

ESTUARIES FAILING TO ACHIEVE THE MAXIMUM POINTS

1. Axe Estuary
Localised effects of Seaton STW continue to cause aesthetic pollution.
2. Exe Estuary
Localised effects of Lymptone outfall continue to cause some aesthetic pollution.
3. Teign Estuary
Discharges from Teignmouth continue to cause localised aesthetic pollution near the mouth of the estuary. Shaldon outfall occasionally operates on a rising tide due to insufficient holding capacity. This causes some limited localised aesthetic pollution.
4. Dart Estuary
Crude sewage discharges to the lower estuary cause localised aesthetic pollution.
5. Kingsbridge Estuary
Localised effects of the Salcombe and East Portlemouth sewerage system (including storm overflows) cause limited aesthetic pollution.
6. Torridge Estuary
Crude sewage discharges around Bideford and Appledore cause limited aesthetic pollution.
7. Yealm Estuary
Localised effects of Newton Ferrers sewerage system and yachts/boats cause limited aesthetic pollution.
8. Plym Estuary
In the upper estuary, the effects of the Tory Brook and the discharge from Marsh Mills STW cause limited aesthetic pollution and a reduction in biological quality.
9. Tamar/Tavy Estuaries
Localised effects of several sewage discharges from the sewerage systems in Plymouth cause limited aesthetic pollution. Discharge from Camel's Head STW also causes a reduction in biological quality in Weston Mill Lake.

APPENDIX 3

10. Plymouth Sound

Localised effects of several sewage discharges from the sewerage systems in Plymouth cause limited aesthetic pollution.

11. Looe Estuary

Localised effects of discharges from the Looe sewerage system cause limited aesthetic pollution.

12. Fowey Estuary

Localised effects of discharges from the Fowey sewerage system cause limited aesthetic pollution.

13. Fal Estuary

The aesthetic and biological quality of the Ruan estuary is affected by china clay (both in suspension and as a mobile bed load) carried by the River Fal.

The upper parts of the Truro River estuary are affected aesthetically, biologically and chemically by discharges from the Truro sewerage system and Newham STW. The lower part of the estuary has limited aesthetic pollution.

Restronguet Creek is affected by mining activities (past and present) in the Carnon River catchment. Aesthetic pollution is caused by the precipitation of iron compounds and metallic contamination causing a reduction in biological quality.

Penryn River estuary is affected aesthetically, biologically and chemically by discharges from the Falmouth and Penryn sewerage system.

14. Camel Estuary

Discharges from the Padstow sewerage system cause limited aesthetic pollution.