1 INTRODUCTION

‘Monitoring’ has become an omnibus term and is sometimes applied, almost indiscriminately, to a range of disparate activities. Amongst these one may include, for example, attempts at describing prevailing environmental conditions; the occurrence, distribution and intensity of pollution; the status of ecological communities or populations of species; or simply providing a watching brief on the countryside at large.

Since ‘monitoring’ is a process, not a result, a means to an end rather than an end in itself, it should not be surprising to find that so many kinds are undertaken.

Implicit in the rationale for most monitoring activities is a recognition of the potential for change. One is concerned, therefore, to secure a means of detecting that a change has occurred, of establishing its direction and of measuring its extent or intensity. This stage may prove to be the simpler part of the monitoring process: often it is more difficult to assess the significance of the change which has been encountered. Monitoring schemes, especially those concerned with ecological change, may founder through lack of adequate criteria for significance and even well-established procedures for pollution monitoring may, in reality, be based on largely arbitrary limits of acceptability for given pollutant concentrations.

This chapter will, above all, stress the importance of establishing clearly-defined objectives in order to ensure the development of a successful monitoring strategy.

1.2 DEFINITIONS

Although ‘monitoring’ is still often used in a very broad sense, more recently it has acquired a stricter definition (Hellawell 1978) and there is evidence that this is becoming widely accepted. It will be seen from subsequent sections that insistence on greater precision is not merely a question of semantics: the design of a monitoring strategy is greatly assisted by the adoption of clearer definitions. These are as follows.
2 Development of a rationale for monitoring

(a) Survey
An exercise in which a set of qualitative or quantitative observations are made, usually by means of a standardised procedure and within a restricted period of time, but without any preconception of what the findings ought to be.

(b) Surveillance
An extended programme of surveys, undertaken in order to provide a time series, to ascertain the variability and/or range of states or values which might be encountered over time (but again without preconceptions of what these might be).

(c) Monitoring
Intermittent (regular or irregular) surveillance carried out in order to ascertain the extent of compliance with a predetermined standard or the degree of deviation from an expected norm.

It will be seen that while surveys and surveillance are, to a large extent, open-ended, the institution of a monitoring programme imposes a considerable degree of discipline since the standard or norm has to be defined or formulated, however vaguely, before the programme can be implemented.

Examples of the sorts of standards which might be used in ecological monitoring include the size of an animal population; the biomass of vegetation; growth, production or recruitment rates; checklists of species or species richness; community diversity indices; the extent or structure (mosaic or diversity) of habitats; vegetation (phytosociological) classifications, and the presence or absence of indicator species. In fact, almost any appropriate measure could be employed as the yardstick for monitoring. As will be noted, the list includes dynamic processes (e.g. production) as well as static measures (species checklists). Monitoring is undertaken to ascertain whether the prevailing conditions (physiological, behavioural, ecological or environmental) match the previously defined standards or norms, expressed perhaps as acceptable minima or maxima, or that they lie within certain defined limits.

It is evident that survey and surveillance differ from true monitoring, as defined above and as employed in this chapter, in both the intention for instituting them and in the likely consequences of undertaking them. The former are carried out without preconception, at least without explicit preconceptions, in an attempt to acquire information as objectively as possible. If one already knew the results, it would be difficult to justify the expenditure of resources merely to confirm them! Monitoring, on the other hand, presupposes that one already has an idea, however vague, of the results which one expects to obtain. Even vague concepts, for example whether a site matches up to an idealised or typical description, can be pressed into service