Environment Agency

Evidence

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Ecological indicators for abandoned mines

Project summary SC090024/S2

This report explores alternative ways of establishing whether surface waters affected by abandoned mines are meeting EU environmental standards for metals.

Abandoned metal mines are unregulated sources of pollution discharging hazardous and other polluting substances, notably cadmium (Cd), lead (Pb), copper (Cu), zinc (Zn) and iron (Fe), into our rivers and seas. The first classification of surface water in England and Wales under the European Water Framework Directive (WFD) identified 133 water bodies failing to meet environmental quality standards (EQS) for metals (Cd, Pb, nickel (Ni), Zn, Cu) in rivers draining abandoned metal mines.

This report aims to clarify whether conventional EQS are suitably protective of aquatic life (such as invertebrates, fish, diatoms, macrophytes), or whether higher metal levels are acceptable in mining-affected catchments without risk to aquatic life.

The project investigated the ecological impact of metals in rivers and proposed a new way to set water quality targets for aquatic ecosystems affected by long-term mining pollution.

Guidance has also been produced on:

- The evidence required to develop alternative water quality targets in mining-impacted rivers, particularly when the EQS for metals are breached but the biological community is in good condition.
- The use of metal bioavailability-based tools to assess water quality in rivers affected by abandoned metal mines.

The report draws the following conclusions:

- Accounting for the bioavailability of copper in affected water bodies using simple screening tools reduces the rate of failure to meet EQS by around two-thirds, and the “significant” EQS failure rate by more than 70 per cent.
- Accounting for the bioavailability of Zn and Ni as well as Cu using simple screening tools does not affect the overall EQS failure across water bodies, but reduces the proportion of mining-impacted water bodies affected by one or more significant failures from 54 to 36 per cent.
- Collection of site-specific physicochemical data can be used to refine the predictions of bioavailability screening tools made using conservative default data, and are likely to result in improved compliance (particularly for the copper EQS).
- The full biotic ligand model for copper provides less precautionary site-specific predicted no effect concentrations (PNEC) than the simple bioavailability screening tool and could be used to refine EQS compliance where risks remain after applying the bioavailability screening tool.
- Water body specific ambient background concentrations for zinc can be estimated by sampling in the headwaters of water bodies, but care must be taken to ensure these headwaters are not influenced by unrecorded abandoned mines.
- Site-specific quality targets for zinc, based on the macroinvertebrate ecology predicted or observed at a site, could potentially be used as clean-up targets for mining-impacted rivers. The approach is likely to be applicable to other metals and stressors. However, the method requires further work and validation before it can be used in surface water classification.

This summary relates to information from project SC090024:

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