

A workshop with Centre for Ecology and Hydrology was held to conceptualise and compare water ecosystem services in Lunan Water and Loch Leven catchments. We compared how changes in sediment and water management might influence ecosystem service delivery in the two catchments. Through discussing these ideas we were able to identify seven main elements of Ecosystem Services Provision that were affected by sediment and water management and could be compared between the two catchments. These were:

1. The ecological response of changing water levels in wetlands associated with the lochs.

For example, on the upper Lunan Water catchment there are several wetlands (Restenneth Moss, Clocksbriggs, Fonah Bog and Chapel Mires), which may be sensitive to changing water level management.

At Loch Leven there are several wetlands managed by the RSPB that will also be sensitive to changing water levels.

2. Potential for management of water quality and pollutant loading into wetlands

For example, the loading of nutrients to these wetlands may vary with the time of year, as this influences for example release from loch sediment, with flow levels and with water level management. Andy Vinten gave some clear examples of how intervention to manage water levels could help reduce nutrient loads to Chapel Mires, on the Lunan Water.

3. The impact of flushing regimes, as determined by Loch exit gate levels, on aquatic ecology.

For example, at Loch Leven, the sluice gates that control the outflow are regulated according to a Royal Charter that aims to deliver sufficient water downstream to meet industrial requirements. However, there is potential to manage the flushing rate at the site in such a way that it allows nutrients that are released by from the sediments to be flushed out of the loch, rather than encouraging them to re-circulate.

On the Lunan Water such an approach could help to return Lochs Rescobie and Balgavies, which have significant internal loads of phosphorus, to good ecological status over a number of years. This is more feasible, without endangering river ecological status, now that the river soluble P status has returned to "Good".

4. The management of fish passage and influence on ecology of fish

At Loch Leven, the outflow is currently impassable to fish because of the sluice gates that were installed in the mid-1850s. There are concerns that re-instating fish passage into the outflow would allow parasites from infested trout populations downstream to enter the loch, to the detriment of

the local recreational fishery. Improving fish passage may also lead to invasion by less desirable species, such as roach, with potentially damaging effects on water quality.

Such issues do not occur on the upper Lunan Water at present, because of barriers to migration, but might be an issue if water level management through tilting weirs took place.

5. Opportunities for ecotourism and attitudes

The local wetland ecology and its associated wildlife supports a significant tourist economy in the Loch Leven catchment. This is in contrast to the Lunan Water catchment where access to the reserve to view birds, especially the nesting Osprey, is seen by reserve managers as potentially damaging to aspects of the ecology, such as wetland vegetation.

6. Governance approaches to water level management.

There is strong local input from riparian owners into water level management in the Lunan Water, but this is done on quite an informal basis. In contrast, in the Loch Leven catchment, governance of water levels is controlled by a Royal Charter and involves a wide range of stakeholders. Whilst this means, in theory, that many stakeholder interests are represented, it also makes decision making and management of change very slow and cumbersome. The original aim of installing flow regulation on the outflow from the loch was to provide a constant supply of water to downstream industry. A strong bias towards managing the water level of Loch Leven to meet the needs of downstream users remains to this day. There are proposals to electrify the Loch Leven sluice gates over the next couple of years, which may lead to more integrated management. Some lessons learned at Loch Leven may be applicable to the management of water levels in the Lunan Water via remotely controlled weirs.

7. Opportunities for hydro schemes

The existence of exit structures from lochs in the two catchments provide potential opportunities for hydro-electric generation schemes. There are existing hydro-electric generation schemes on the River Leven downstream of the Leven sluices.