

Working with Eurasian beavers (*Castor fiber*) to deliver conservation management in a constrained landscape



Heather McCallum, Vicky Turnbull, Jane Sears, Yvonne Boles, Matt Self and Robert Coleman

RSPB Loch of Kinnordy

Managed as an RSPB Nature Reserve since 1976, Loch of Kinnordy is designated as a SSSI, SPA and a Ramsar site¹. Its features include the eutrophic loch, open water transition fen and breeding bird assemblage. Northern Lapwing (*Vanellus vanellus*), Common Redshank (*Tringa totanus*), and Marsh Harrier (*Circus aeruginosus*) regularly breed, and the reserve is home to a number of important species including Coralroot Orchid (*Corollarhiza trifida*).

Water level management has occurred since 1983 through operation of a sluice in the outflow, aiming to maintain water within the loch throughout the breeding season and then draw levels down to enable site management in the late summer.

The reserve is surrounded by prime agricultural land, predominantly in arable production. This landscape means that the reserve is negatively impacted by high levels of nutrients entering the reserve, but highlights the importance as a refuge for wildlife in an area with a very small proportion of open water and wetland habitat.



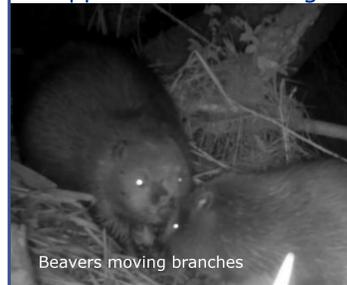
© Crown Copyright. Ordnance Survey licence number AC0000813580 (2025)

Date printed: 01/09/2025

Beavers at Loch of Kinnordy

Beaver (*Castor fiber*) signs were first detected at Loch of Kinnordy in 2011 with the first lodge found in 2013. Since then, they have modified their habitats in all the expected ways – tree felling and coppicing, damming and canal excavation.

Until 2024 it was thought likely that there was just one territorial family, however, beaver activity since then has suggested there may be two families on site. Beaver signs indicate that their activity is focussed on a particular area before they move to another part of the site, with their coppice allowed to regrow before they return to it.



Beavers moving branches



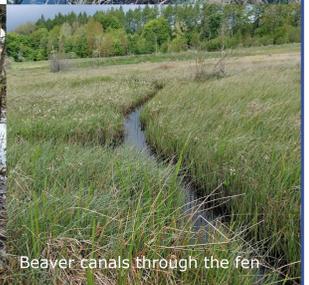
Beaver tree felling and coppice regrowth



Beaver canal from a lodge

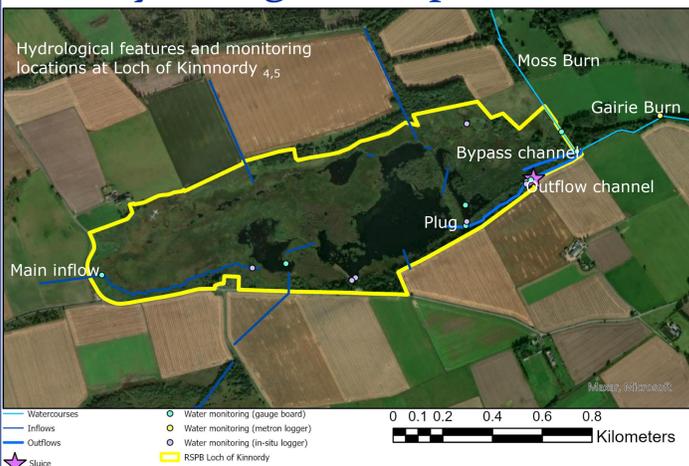


Beaver lodge



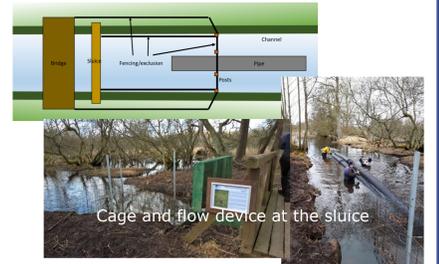
Beaver canals through the fen

Hydrological Impacts

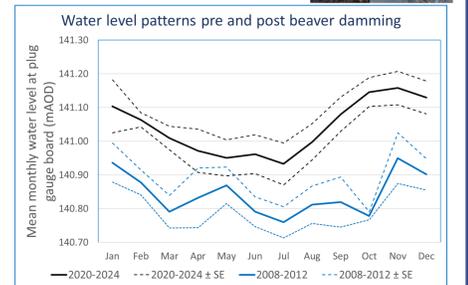


Beavers first dammed against the sluice in 2014, effectively making the sluice redundant. Over the years Kinnordy Estate (the landowner) has raised concerns about the impact of high-water levels on adjacent fields, flooding of paths and limiting access. RSPB were concerned about losing the ability for late summer drawdown impacting site management activities. In September 2014 (under license) the dam at the sluice was removed. Following this, there was a cycle of rebuilding by the Beavers and removal by RSPB, leading to installation of a Beaver flow device and cage structure designed in collaboration with SNH and Roisin Campbell-Palmer. Following installation of the cage and flow device, Beavers then moved their damming activity further along the outflow and excavated an old outflow channel which effectively acts as a by-pass to the sluice. Additional flow devices have been installed and there has been periodic dam management by removal and notching (all work carried out under license).

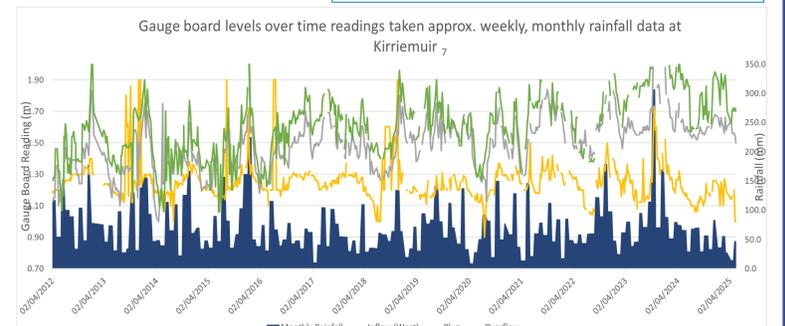
Water levels are higher overall and more stable over spring and summer than prior to Beaver damming on-site. Water level is determined by rainfall, Beaver activity and to a lesser extent our management of Beaver dams. Without the presence of Beaver dams, it would now be difficult to maintain water levels during the bird breeding season, as water can exit the site through routes other than those where the sluice is.



Cage and flow device at the sluice



Water level patterns pre and post beaver damming



Gauge board levels over time readings taken approx. weekly, monthly rainfall data at Kirriemuir

Out of all their activities Beaver damming has the potential to lead to the most substantial habitat changes, bringing about the biggest gains in biodiversity and ecosystem services but also the potential for conflict depending on the land impacted⁶. At Loch of Kinnordy, dam building was first noted on the outflow in May 2013, just downstream of the confluence of the Gairie and Moss Burns. It is likely that the shallow nature of the Loch (around 1 m to solid bed level at mean water level) has triggered dam building activity.

Impacts on Habitats and Notable Species

Habitat	Designation	Risk Level	Impact	Reason
Eutrophic Loch	SSSI / Ramsar	Slight-moderate	-ve +ve	Reduce ability to flush nutrients Maintain open water and water depth
Open Water Transition Fen	SSSI / Ramsar	Slight-moderate	-ve +ve	More stable water levels – combined with high nutrient inputs may favour <i>Typha latifolia</i> growth Herbivory of <i>Typha</i> , open new areas of open water for early successional habitat colonisation
Wet Woodland	NA	Slight-moderate	+ve	Coppicing, which was not occurring before - requires deer pressure to remain low to ensure coppice regrowth can occur

Key habitats and species have benefited from Beavers at Loch of Kinnordy through the maintenance of open water, the increase in habitat heterogeneity and through micro-habitat creation. Potential negative impacts may have resulted from the interaction of Beaver activity with high nutrient inputs from the catchment. The spread of *Typha latifolia* a negative indicator species on the designated fen^{8,9} is likely to be symptomatic of the very high nitrogen levels entering the reserve, but this species may also have benefited from increasingly high / stable water levels in spring / summer². Beaver damming has also made it harder to flush nutrients through the system, which was already a challenge due to the constricted nature of the outflow¹⁰.

Out of 22 notable species at Loch of Kinnordy, 12 were identified as those which Beaver activity may have benefits in contrast to just 3 where potential negative impacts were identified. Potential impacts of 2 of these have been mitigated against through tree protection. Nationally Scarce Coralroot Orchid was identified as vulnerable due to its association with Willow, poor ability to compete with more vigorously growing species and impact of higher water levels. The constrained landscape of Loch of Kinnordy means that there is limited additional suitable habitat for this species to move to as the main stronghold for this species on site has become wetter.

In conclusion, challenges around higher and more stable water levels due to Beaver activity at Loch of Kinnordy have largely resulted from its restricted location within an intensively arable dominated farming landscape. Beavers now play a key role in maintaining open water on site in spring, which is critical for many of the breeding birds on the reserve. The role of Beavers in maintaining spring water levels is likely to become more important under future climate change predictions of increasingly dry springs in the area.

References

- Turnbull, V. and McCallum, H. (2021) RSPB Loch of Kinnordy Management Plan 2021 – 2026, Unpublished
- McCallum, H., Turnbull, V., Boles, Y., Self, M., Sears, J. & Coleman, R. (2025) RSPB Loch of Kinnordy Ecological Task Team, Unpublished
- NatureScot (1997) SSSI Boundaries GIS Layer Sites of Special Scientific Interest | NatureScot Spatial Data Hub
- Crown Copyright Ordnance Survey license number AC0000813580
- EnviroCentre (2023) Loch of Kinnordy Restoration and Silt Removal Feasibility Study
- Campbell-Palmer, R., Gow, D., Campbell, R., Dickenson, H., Girling, S., Gurnell, J., Halley, D., Jones, S., Lisle, S., Parker, H., Schwab, G. & Rosell, F. (2016) The Eurasian Beaver Handbook: Ecology and Management of Castor fiber. Exeter: Pelagic Publishing, UK.
- SEPA Download Data - Scottish Rainfall Data - provided by Scottish Environment Protection Agency (SEPA)
- Caledonian Conservation Ltd (2024) RSPB Loch of Kinnordy: Assessing Habitat Change
- NatureScot (2015) Site Condition Monitoring Loch of Kinnordy SSSI Open Water Transition Fen
- ELP (2009) Loch of Kinnordy Restoration Stage 1: Evidence Base and Recommendations

Acknowledgements

This work would not have been possible without the continued support of Kinnordy Estate, the landowner of Loch of Kinnordy.

Thanks to the site staff and volunteers at RSPB Loch of Kinnordy past and present, particularly for collecting long-term data on water levels and biological recording at the reserve.

For advice on Beaver monitoring and mitigation we would like to thank Roisin Campbell-Palmer, Nigel Wilby, Alan Law and NatureScot.

Contact: heather.mccallum@rspb.org.uk