Case study

Using nematodes to prevent pine weevil infestation

Integrated Pest Management (IPM) on a landscape scale

Llywodraeth Cymru
Welsh Government

Organisation overview

Natural Resources Wales (NRW) manages the Welsh Government Woodland Estate, which represents about 40% of all woodland in Wales. Their forestry operations include clear-felling (removing all, or most, trees in an area to harvest the timber before replanting new trees) and long-term woodland management, often in environmentally sensitive locations. Protecting young trees from pest damage is essential to ensure successful woodland regeneration, financial sustainability and delivery of wider environmental objectives.

Why explore alternatives to chemical control?

Pine weevil (*Hylobius abietis*) is one of the most damaging pests affecting conifers newly planted to restock woodlands in the UK. Adult weevils feed on the bark of young trees, often killing them within the first year after planting. Historically, chemical insecticides were used to protect these young trees.

In light of concerns around environmental impact, operator safety and long-term sustainability NRW looked for alternatives to chemical control, adopting Integrated Pest Management (IPM) principles to reduce reliance on chemicals while maintaining effective pest control.

This approach aligns with NRW's responsibilities for protecting biodiversity, soil health and sustainable forestry management.

The alternative approach

NRW have been implementing a landscape-scale biological control programme using entomopathogenic nematodes to manage pine weevil populations for the last two decades. Nematodes are naturally occurring, microscopic worm-like organisms that can play an important role in the environment acting to decompose plant and animal material or as parasites. 'Entomopathogenic' nematodes can be used to specifically target damaging insect pests without affecting other wildlife. In this scenario they infect and kill pine weevil larvae within tree stumps, interrupting the pest's lifecycle before adults emerge.



Assessing stumps for pine weevil infestation

The approach works by:

- applying nematodes to freshly cut stumps following clear-felling
- targeting the larval stage of pine weevil, which develops within the stump
- reducing the overall pine weevil population pressure across entire forest blocks.

This method is combined with other IPM measures, including:

- **fallow periods** between felling and replanting to reduce weevil pressure
- **monitoring of pest risk** at site level
- **planting strategies** designed to improve restock resilience.

The programme requires careful timing, specialist application equipment and trained operators to ensure nematodes are applied correctly and remain effective in controlling pine weevil larvae within tree stumps. While the upfront cost is higher than chemical treatment, the approach delivers control at scale without the potential environmental risks associated with insecticide use.

Benefits and long-term results

NRW's biological control programme has delivered consistent, long-term benefits, such as:

- **Effective pest control:** Pine weevil damage to restocks has been significantly reduced, improving establishment success rates.
- **Reduced chemical reliance:** The programme has significantly reduced NRW's reliance on insecticides for pine weevil control across large areas of the estate, with chemical treatments now used only where permitted and strictly necessary.
- **Environmental protection:** Nematodes are species-specific and pose no risk to non-target organisms, soils or watercourses.
- **Financial savings:** Although initially expensive, the programme has significantly reduced costs by preventing restock failure and reducing the need for repeated replanting.

Future plans

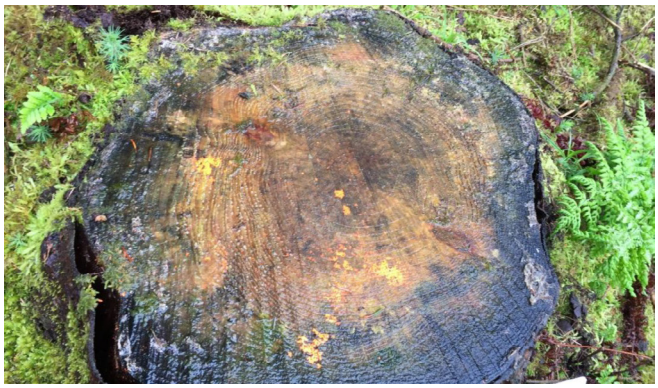
NRW continues to refine its IPM approach to pine weevil management, using nematode biocontrol as a core tool alongside monitoring, allowing sites time to rest between felling and replanting, and adapting forestry practices to make restocks less vulnerable to pine weevil damage. The organisation is also contributing to wider research and knowledge-sharing across the forestry sector.



Pine weevil larvae (*Hylobius abietis*) – one of the most damaging pests affecting conifers



Manual application of nematodes by four operatives, working with hoses running from a large forwarder mounted nematode mix tank



Nematode application completed on a tree stump

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