Priodiversity LIFE: Protecting biodiversity through restoration

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Emily Warrender

September 22, 2025

Continuous-cover forestry using gap cutting, combined with deadwood addition as artificial snags, 11 years post treatment. DISTDYN experiment, Eastern Finland. Image: © Matti Koivula

Matti Koivula from the Natural Resources Institute Finland (Luke) discusses the advancement of forest restoration techniques in Northern European forests and explains how the Priodiversity LIFE project will enhance this knowledge base, address biodiversity loss, and contribute to EU restoration goals

Priodiversity LIFE is a large-scale, multidisciplinary restoration project in Finland, targeting forests, wetlands, peatlands, and cultural habitats. With a budget of around €50 million, it stands out among restoration efforts. Coordinated by the Metsähallitus Parks and Wildlife Finland, the project involves several administrative and research bodies, including the Natural Resources Institute Finland (Luke), which oversees long-term monitoring over 10–30 years post-restoration.

Running from 2024 to 2031, the project focuses on implementing Regional Biodiversity Action Plans. It supports the EU Nature Restoration Regulation by contributing to the 2030 goal of restoring 20% of land areas. Additionally, it provides valuable insights into the effectiveness of restoration practices, enabling decision-makers to identify cost-effective and ecologically sound strategies.

Monitoring the impacts of biodiversity is essential to determine which restoration methods are most effective. Previous LIFE projects – such as Freshabit LIFE IP, Flying Squirrel LIFE, Hydrology LIFE, and PeatLandUse LIFE – have laid the groundwork for short-term monitoring (up to ten years). Priodiversity LIFE builds on this by emphasizing long-term ecological outcomes.

Protecting and restoring threatened species

In Finland, forests cover 75% of the land, mostly managed for commercial use. Since the 1950s, intensive rotation forestry based on clear-cutting has led to relatively even-aged forests and the near elimination of natural forest fires (Berglund & Kuuluvainen, 2021; Lindberg, 2021). While this has benefited timber production, it has negatively impacted biodiversity. Hence, to meet the EU Biodiversity Strategy's 2030 targets, forest management must evolve to support declining species.

Roughly 10% of forest-dwelling species in Nordic countries are threatened with extinction. In Finland, 21% of the 833 threatened forest species are declining due to the loss of old-growth forests and very old trees, and 19% due to a shortage of deadwood (Hyvärinen et al., 2019). These factors also degrade the ecological quality of forests (Kontula & Raunio, 2018). Restoration and protection efforts should prioritize threatened species — not because they are more valuable, but because they broadly indicate the state of biodiversity.

Continuous-cover forestry is slowly gaining popularity for balancing economic, aesthetic, and ecological values. It benefits shade-tolerant species, such as the bilberry, and those requiring canopy continuity, like the flying squirrel (Koivula et al., 2025). However, it targets the largest trees, offering limited support for species dependent on old-growth forests or coarse deadwood.

To support such species, both rotation and continuous-cover forestry should incorporate protection, retention, and restoration (Koivula & Vanha-Majamaa, 2020; Kuuluvainen et al., 2021). Key practices in Nordic managed forests include:

- Retention forestry:
  Partial cutting with up to 30% tree-removal intensity, or maintaining large retention patches (>0.5 ha), helps preserve pre-harvest species.
- Retention of old trees:
  Only permanent retention can increase the number of very large and old trees.
- Deadwood addition:
  Artificial snags ('high stumps') support deadwood- dependent beetles, though they differ from naturally deceased trees in this respect. Natural deadwood should nearly always be preserved.
- Prescribed burning:
  Initially harmful to most species, burning benefits rare and endangered species after 10–15 years, especially fire-adapted and deadwood-dependent species.

Prescribed burning combined with artificial addition of deadwood, seven years after treatment. EVO experiment, Southern Finland. Image: © Matti Koivula

The need for long-term monitoring of biodiversity

While the short-term benefits of these methods are well-documented, their long-term impacts remain less understood (Koivula & Vanha-Majamaa, 2020). Priodiversity LIFE addresses this gap through repeating biodiversity sampling in experiments established mainly in the 1990s. These experiments, even if outside the official action plan areas, examine similar methods and help answer critical questions, such as how long restoration benefits last and whether extinction debt exists.

Extinction debt refers to the delayed disappearance of specialist species from altered habitats (Hanski & Ovaskainen, 2002). Some species could persist for a while before eventually vanishing, highlighting the need for long-term monitoring. Priodiversity LIFE's monitoring extends beyond forests to peatlands, wetlands, and meadows. As in forests, described above, it involves repeating biodiversity surveys conducted 10–30 years ago, using consistent sampling protocols. While modern techniques such as environmental DNA (eDNA) and remote sensing could enhance data collection, the current approach ensures comparability with past data.

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The Priodiversity LIFE project is funded by the LIFE Programme of the European Union under Grant Agreement No. LIFE22-IPN-FI-Priodiversity-LIFE/101104217

Primary Contributor

Matti Koivula
Natural Resources Institute Finland (Luke)
ORCID: 0000-0001-6415-4904