

Effects of land transport activities on New Zealand's endemic bat populations: reviews of ecological and regulatory literature

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Managing the impact of roads on bats and other vertebrates

There is currently no nationally accepted consistent approach in New Zealand for assessing or managing the effects that roads and other land transport infrastructure activities have on indigenous animals. Research funded by the NZ Transport Agency focused on the impact that roads and other linear infrastructure have on indigenous animals, with a particular focus on bats. The research represents a first step towards a national framework for managing the effects of land transport on all indigenous vertebrates.

Roads and other land transport activities can adversely affect indigenous animals during construction and operational activities. In recent years, the effect of road projects on New Zealand's endemic bats has become an issue. However, how best to monitor and mitigate these effects has been unclear for all parties involved in the process of authorising and operating these transport projects. In response to this, the Transport Agency identified the need to assess strategies for avoiding, reducing, or mitigating the negative effects that land transport activities have on indigenous vertebrates, with bats being a high priority. The information gained on good practice was used to establish a framework for those seeking authorisations and providing consent for transport projects. The framework is a guide in these situations.

New Zealand has two surviving species of bat, both of which are of conservation concern. Long-tailed bats are patchily distributed within forest, peri-urban and pastoral land across both the North Island and South Island, while lesser short-tailed bats are found only at 13 known locations generally associated with older indigenous forests, most of which are in the North Island. Examples of how roads affect bats include interruption or severance of their flight paths and removing potential roosting trees.

The ongoing Waikato Expressway project, and more recently investigations for the Hamilton Southern Links Notices of Requirement, have become the first projects in New Zealand to attempt to address the impact of roads on long-tailed bats. Steps taken have included bat detection surveys before construction began, and requirements for ongoing monitoring and predator control written into the resource consents for the projects.

To establish an evidence-based and nationally consistent approach for such activities in the future, Wildland Consultants, Landcare Research and AECOM, carried out Transport Agency funded research into the effects roading projects have on bats.

The project involved a review of the ecological literature on the impacts of roads on bats, and of the New Zealand statutory processes that currently govern interactions between bats and land transport activities.

The review revealed that most of the previous research had sought to quantify the effects roads have on bats' behaviour, rather than on population survival, making a full prediction of effects difficult. Demographic modelling has indicated that the survival of adult female bats was vital for the ongoing survival of New Zealand's long-tailed bat populations, making the need for effective road mitigation measures crucial. However, few of the studies reviewed have identified effective mitigation options.

This lack of understanding of whether roads have any effect on bats, and if they do, what the effects are and how they are best addressed, has often led to indecision and conflict during the legislative planning approval processes for road projects. Variation in how the legislative requirements have been interpreted and implemented has also resulted in delays and varying requirements. Such variations have been wide-ranging – from regional council and local authority decision making under the Resource Management Act 1991, to Department of Conservation decisions made under the Conservation Act 1987 and the Wildlife Act 1953.



Previously collected data about long-tailed bats was analysed in order to understand what impact the weather was likely to have on attempts to monitor bat activity. The analysis showed that long-tailed bat activity is strongly influenced by the temperature during the first four hours after sunset. Results of this research have already been used to help design monitoring for a number of projects.

The relationship between night-time traffic volumes and long-tailed bat activity was also investigated at sites throughout New Zealand, where there was known bat activity. Night-time traffic affected bat activity, and demonstrated a clear negative relationship between bat activity and night-time traffic volumes, ie bats were less active in locations with high traffic volumes.

From these research findings, the project team was able to develop a framework for monitoring and managing the impact of road activities on New Zealand's endemic bats, and provide guidance on how the research findings might be applied to other indigenous vertebrates.

The framework is designed to guide land transport managers, planners and ecologists through the process of getting statutory consents, monitoring bat activity, and mitigating the effects of roading projects on long-tailed bats. The framework pays considerable attention to the ecological uncertainty around the potential adverse effects of land transport activities on bats, and considers in some detail possible approaches for improving the rigour and effectiveness of ecological monitoring.

The project concluded that the 'the field of "road ecology", which addresses the effects of roads on fauna and plants, is an emerging discipline'. As a result, most of the mitigation packages developed



for previous road projects had been insufficiently robust, and many opportunities to understand and address the effects that road have on bats had been lost.

The report's authors state, 'This review and the subsequently developed framework propose a way forward based on either an iterative research-based process or strong evidence-based logic, for which the outcomes should be measured using well-designed monitoring regimes. Such an approach will expedite understanding of the effects of roading projects on bats, and the development of tools for avoiding, minimising and mitigating effects, and consequently the processes required by legislation. A similar lack of evidence of how to monitor and mitigate effects of roads and roading projects is also likely to be the case for other terrestrial indigenous vertebrate species and it is therefore appropriate that similar iterative research-based models or strong evidence-based logic models are also applied to their management.'