

Roadside management and the diversity and dispersal of species

Roadsides have become important habitats for many species that have been displaced from other parts of the landscape. But how do different kinds of management affect the diversity and dispersal of species along roadsides? MISTRA EviEM has assessed what evidence exists on this topic.

In many parts of the world, vegetation along roadsides is regularly controlled for traffic-safety reasons. As a result of this management, there are similarities between roadsides and habitats such as pastures and mown or grazed semi-natural grasslands. In contrast to roadsides, the latter habitats have declined rapidly in Europe during the last century. Today only a fraction of their former extent remains, but many species that were previously mainly associated with meadows and pastures now thrive along the roads instead. For example, almost 300 animal and plant species included in the Swedish Red List of threatened species are found in roadside habitats. Roadsides may also act as dispersal corridors for both native and alien species.

Current recommendations for roadside management to promote the conservation of fauna and flora are mainly based on botanical studies in meadows, pastures and similar open grasslands. However, the use of road salt for de-icing, ditching and reinforcement activities, sowing of exotic plant material and other measures specific to the maintenance of roads and roadsides are likely to impact animals and plants differently to traditional management of open grasslands. Therefore, there is a need for more targeted recommendations for roadside management based on studies actually performed along road verges.

Mapping the evidence

Following a suggestion by the Swedish Board of Agriculture, EviEM has initiated a review of the available evidence on how different kinds of roadside management affect the diversity and dispersal of species.

As a first step towards a more complete synthesis, we have compiled a **systematic map**. Such a map gives an overview of the evidence base by providing descriptions of relevant studies, but it does not synthesise reported results.



Appropriately managed, many roadsides can function as refuges for threatened species. Photo: Tore Hagman / N.

301 studies catalogued and described

Initially, our searches for literature identified more than 7,000 articles as possibly relevant to ecological effects of roadside management. Through several stages of screening, most of these articles were subsequently excluded, but after close reading, 207 articles describing 301 studies were assessed as useful.

We searched for relevant studies from anywhere in the world, but more than two thirds of the studies finally included were conducted in North America, with most of the rest performed in Europe. More than half of the studies were published in 'grey literature' such as reports from agencies or consultants, rather than in scientific journals.

The interventions most commonly studied were herbicide use, sowing and mowing, followed by soil amendments such as mulching and fertiliser additions.

The outcomes most frequently reported were effects of interventions on the abundance or species richness of herbs/forbs, graminoids and woody plants. Effects on insects and birds were reported in 6% and 3% of the studies, respectively.

Descriptions of the included studies are available in an Excel file, and also in an interactive Geographical Information System (GIS) application that displays data on the studies in detail. Both can be accessed at the EviEM website.

Our systematic map provides a key to finding concrete guidance for conservation- and restoration-oriented roadside management from published research. As such it should be of value to a range of actors, including managers and policy-makers. However, the map also highlights important knowledge gaps: little data was found for some geographical regions, research is heavily biased towards management effects on plants, and we found no study on how species dispersal was affected by roadside management. The map could therefore be a source of inspiration for new research.

The review team now continues with a full systematic review of a subtopic of high importance to environmental conservation, namely how vascular plants and invertebrates along roadsides are affected by mowing, grazing, burning and selective mechanical removal of plants.

Free access to full report

The GIS application and a description of the project are available at the EviEM website (<http://www.eviem.se/en/projects/Roadside-management/>). The full report on the systematic map can be downloaded there. The report has also been published in *Environmental Evidence* (<http://link.springer.com/article/10.1186/s13750-015-0050-7>).

What is a systematic map?

In this review we used a systematic approach to collate and catalogue studies of how biodiversity and the dispersal of species are affected by various kinds of roadside management. The result is a systematic map of the evidence.

Like other kinds of systematic reviews, systematic maps are characterised by meticulous planning, methodical procedures and a transparent documentation of all assessments carried out in the course of the work. This approach is designed to avoid bias and increase reliability and repeatability.

How this review was conducted

This review was initiated and financed by the Mistra Council for Evidence-Based Environmental Management (EviEM). It was conducted as part of a project by a specially appointed team of researchers chaired by Regina Lindborg, a Professor at Stockholm University. The project is managed by Claes Bernes, EviEM.

EviEM

The Mistra Council for Evidence-Based Environmental Management (EviEM) strives to ensure that environmental management in Sweden is informed by the best possible scientific evidence. Through systematic reviews of relevant research, we aim to improve the basis for decisions in environmental policy. EviEM is funded by the Swedish Foundation for Strategic Environmental Research (Mistra). It is financially and politically independent.



The red dots show the locations of the 301 studies included in the systematic map.