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The barrier effect of twin tracked, non fenced railroads in Sweden
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Fenced infrastructure composes an almost total barrier for larger wildlife, and movements across
the road or railroad are thus restricted to fauna passages, fence openings and other mitigation
measures. However, the strength of the barrier caused by non fenced railroad systems is not
sufficiently studied. The present Swedish railroad system is mostly single tracked and poorly
mitigated for wildlife connectivity, but as new larger lines with high traffic volumes are planned,
this question has to be evaluated.

In theory, the barrier effect caused by a railroad may vary depending on the traffic volume,
railroad width and other characteristics of the embankment, and be species specific. The aim of the
study was to quantify moose and roe deer movements across and near railroad systems, and to
quantify the barrier effect caused by non fenced railroads with different traffic volumes. The snow
track survey was conducted at two transects parallel to the railroad. The transect near the railroad
were used to control movements across the embankment and movements near the railroad, and
the transect 200 meters from the railroad were used as a reference.

In total, 152 km of railroads and an equal length of reference transects were studied. Moose and
roe deer crossed the railroad in average 0.065 and 0.46 times per day and km respectively during
the study. No structural effects of single or twin tracked railroad systems could be found on moose
and roe deer movements across the embankment. However a significant effect from train volume
was found for both moose and roe deer. The results indicated that an increased traffic volume
effects ungulate movements across the railroad and thus connectivity plans for wildlife should be
used on present high volume lines and when planning new high volume lines.

A quantitative comparison of the reliability of animal detection systems and
recommended requirements for system reliability
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Animal detection systems have the potential to reduce collisions with large mammals and improve
human safety while not blocking or confining animal movements across the road. However, reliable
warning signs are essential as the effectiveness of these systems depends on driver response. To
investigate the reliability of the systems we constructed a controlled access test facility near
Lewistown, Montana, USA. Nine systems were installed to detect horses and llamas that roamed in
an enclosure. The llamas and horses served as a model for wild ungulates. Data loggers recorded
the date and time of each detection for each system. Animal movements were also recorded by six
infrared cameras with a date and time stamp. By analyzing the images and the detection data, we
were able to investigate the reliability for each system. The percentage of false positives (i.e., a
detection is reported by a system but there is no large animal present in the detection zone) was
relatively low for all systems (≤1%). The percentage of false negatives (i.e., an animal is present
in the detection zone but a system failed to detect it) was highly variable (0–31%). The percentage
of intrusions (i.e., animal intrusions in the detection area) that were detected varied between 73
and 100 percent. The results suggest that some animal detection systems are quite reliable in
detecting large mammals with few false positives and false negatives, whereas other systems have
relatively many false negatives. In addition we investigated how the reliability of individual
systems was influenced by environmental conditions. Finally we surveyed three stakeholder
groups—employees of transportation agencies, employees of natural resource management
agencies, and the traveling public—with regard to their expectations on the reliability of animal
detection systems and compared the reliability of the nine systems to these expectations.