WOODLAND TRUST

The East Sussex County Council (Bexhill to Hastings Link Road) Compulsory Purchase Order 2009 ("the Transport CPO")
The East Sussex County Council (Bexhill to Hastings Link Road) (Planning) Compulsory Purchase Order 2009 ("the Planning CPO")
and
The East Sussex County Council (Bexhill to Hastings Link Road) Side Roads Order 2009 ("the SRO").

PROOF OF EVIDENCE

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1. Introduction

1.1. The Woodland Trust is the UK's leading woodland conservation charity. We have four main aims: no further loss of ancient woodland, restoring and improving woodland biodiversity, increasing new native woodland and increasing people's understanding and enjoyment of woodland. We own over 1,000 sites across the UK, covering around 20,000 hectares (50,000 acres) and we have 300,000 members and supporters.

1.2. The route passes within metres of ancient semi natural woodland identified on the Natural England woodland inventory. In addition to this there are a number of smaller woodlands within the impact zone of the road that have ancient features and are likely to be ancient. There is a significant body of evidence that indicates indirect impacts have a detrimental effect on ancient woodland and these are discussed in detail below.

1.3. The scheme passes within metres of ancient woodland identified on the Natural England woodland inventory:

1) Chapel Wood (Grid reference TQ770110)
2) Park Wood (part of Marline Valley SSSI)

1.4. It is noted within the Environmental Impact Assessment that the scheme passes within metres of the following designated sites:

1) Marline Valley Woods SSSI
2) Combe Haven SSSI
3) Woodland complex at Buckholt Farm SNCI

1.5. There is direct loss of and indirect impacts on Marline Valley SSSI and indirect impacts on the remaining designated sites which is against Government guidelines.

2. Legislation and policy relating to ancient woodland

2.1. Planning Policy Statement 9 states:

"Ancient woodland is a valuable biodiversity resource both for the diversity of species and for its longevity as woodland. Once lost it cannot be recreated. Local planning authorities should identify any areas of ancient woodland in their areas that do not have statutory protection (e.g. as an SSSI). They should not grant planning permission for any developments that would result in its loss or deterioration unless the need for, and benefits of, the development in that location outweigh the loss of the woodland habitat."

2.2. South East Plan States:

'In the development and implementation of local development documents and other strategies, local authorities and other bodies will support the implementation of the Regional Forestry and Woodland Framework, ensuring the value and character of the region's woodland are protected and enhanced. This will be achieved by:

Protecting ancient woodland from damaging development and land uses.

2.3. Policy NRM 5 states:

'Local planning authorities and other bodies shall avoid a net loss of biodiversity, and actively pursue opportunities to achieve net gain across the region.

- *They shall seek to avoid damage to nationally important sites of special scientific interest and seek to ensure that damage to county wildlife sites and locally important wildlife and geological sites is avoided, including additional areas outside boundaries of European sites where these support the species for which that site has been selected.*

2.4. Rother Local Plan states:

Policy DS1 In determining whether development is appropriate in a particular location, proposals should accord with the following principles:

- *it protects sites of recognised nature conservation importance, particularly of internationally and nationally important sites, as defined on the Proposals Map;*
- *it respects the importance of the countryside in terms of its distinct landscape character, natural resources, woodland and agriculture;*
- *it protects ancient woodland from development that would prejudice its ecological and landscape value;*

2.5. The Hastings Local Plan sates:

Key issues:
The Council is committed to sustainable development and conserving the diversity of wildlife and habitats, and will seek to:-

- *Protect all sites of special importance for wildlife and nature conservation in the Borough;*
- *Maintain a green network of wildlife habitats, informal nature areas and wildlife corridors;*
- *Ensure that new developments Protect the remaining areas of woodland;*

2.6. Policy NC2 states

Designated Sites of Special Scientific Interest (SSSIs) will be safeguarded and protected. Proposals for development within SSSIs, or likely to have an adverse effect on them directly or indirectly, will be subject to special scrutiny and will not be permitted unless:-

- *The need for development outweighs the national importance of the site for nature conservation and/or geological interest;*
- *It is not possible to meet the need for the development on an alternative site; and*
- *Any harm to the nature conservation and/or geological interest of the site is kept to a minimum.*

Where development is permitted, the Council may attach planning conditions and/or may seek to enter into legal agreement(s) to ensure the continuing protection and enhancement of the nature *conservation and/or geological interest and to provide appropriate compensatory measures and/or site management.*

2.7. Policy NC3 states:

Areas designated or proposed as Local Nature Reserves (LNRs) will be safeguarded and protected. Proposals for development within Local Nature Reserves, or likely to have an adverse effect on them directly or indirectly, will not be permitted unless:-

- *the need for development outweighs the importance of the site for nature conservation;*
- *and any harm to the nature conservation interest of the site is kept to a minimum.*

Where development is permitted, the Council may attach planning conditions and/or may seek to enter into legal agreement(s) to ensure the continuing protection and enhancement of the nature conservation interest and to provide compensatory measures and/or site management.

2.8. Policy NC8

General Planning Requirements

Development proposals will be required to minimise damage to wildlife and habitats. Wherever possible, development should:-

- *Retain features of biodiversity importance such as woodland, trees, hedgerows, wetland habitats, herb rich grassland, watercourses, geological features and other natural features or habitats and protect them during construction;*
- *Avoid fragmenting habitats and isolating species;*
- *Where the loss of existing wildlife habitats or geological features is unavoidable, keep the loss to a minimum and provide compensation through the creation of replacement habitats or other appropriate measures;*
- *Incorporate, wherever appropriate, creative conservation measures which contribute to a net gain in biodiversity such as the development of new wildlife habitats;*
- *Incorporate the greatest possible proportion of appropriate native vegetation in any landscaping or planting scheme, except where special requirements of purpose or location dictate otherwise;*

2.9. Policy NC10

Ancient Woodland

Planning permission will not be granted for development that would adversely affect an area of ancient woodland shown on the Proposals Map. The layout of any development encroaching into, or close to, such woodland must take account of the designation and be designed so as to minimise the impact upon it. The Council may impose conditions on any planning permission and/or seek to enter into legal agreement(s) to secure the protection, enhancement and management of ancient woodland affected, directly or indirectly, by development proposals.

3. An Ecosystem Approach

3.1. The Woodland Trust believes that Combe Valley represents an important biodiversity resource at a county and regional level that should be viewed both in terms of the individual constituents as well as the ecosystem as a whole. Assessments of the impacts of the proposal should therefore also be carried out at an ecosystem level as all the constituent parts are an integral part of the functioning ecosystem.

3.2. Equally, the requirements to adapt to climate change will be best addressed at an ecosystem level, the Trust believes that adaptation is about developing resilient natural systems that can absorb and respond to change. Developing strategies to help the natural environment cope with these changes are not an alternative to mitigating the effect of increased CO2 emissions; indeed they should add to the urgency for action by recognising that change is already with us.

3.3. The Convention on Biological Diversity's Ecosystem Approach identifies a number of principles. Principle 5 states that the conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.

3.4. Ecosystem functioning and resilience depends on a dynamic relationship within species, among species and between species and their abiotic environment, as well as the physical and chemical interactions within the environment. The conservation and, where appropriate, restoration of these interactions and processes is of greater significance for the long-term maintenance of biological diversity than simply protection of species.

3.5. The Department for Environment, Food and Rural Affairs (Defra) believes that government policies for protecting the natural environment were not sufficiently integrated to provide a sustainable future and that in order to achieve sustainable patterns of economic and social development a different approach to policy development and implementation for environmental goods and services needs to be adopted.[1]

3.6. Defra have produced guidance on how to carry out an effective valuation of ecosystem services.[2] Whilst we accept that the EIA has been carried out following the technique recommended in Defra's guidance, we do not believe that full attention has been paid to the ecosystem impacts. For example the Economic Assessment Report provides monetary values for the saving in accidents, makes an attempt at looking at the value of regeneration jobs but does not even mention the negative values of ecosystem damage.

3.7. The Woodland Trust does not believe that the statement "The economic assessment of the Most Likely Scheme shows that the Scheme is value for money" (Economic Assessment Report 7.1.1) can be supported when the full costs of the scheme have not been evaluated. We, therefore, believe that the scheme should not be allowed to progress until a full evaluation of the cost of the scheme has been carried out following current Government best practice guidance.

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[1] http://www.defra.gov.uk/environment/policy/natural-environ/eco-approach.htm

[2] Defra 2007 An introductory guide to valuing ecosystem services

4. Climate Change

4.1. Evidence for accelerating climate change has built relentlessly over the past few years. Global average temperatures increased 0.74°C in the last 100 years[3]; the 1990s was the warmest decade in the last 1,000 years; many ice sheets and glaciers worldwide are retreating; the frequency of floods, droughts and storms is increasing; populations, ranges, migration patterns, and seasonal and reproductive behaviour of animals and plants, on land and in the sea, are changing. The evidence that these changes are caused principally by human activity releasing greenhouse gases is now incontrovertible[4,5]

4.2. There is a solid body of evidence to show that the effects of climate change are already being felt in the natural world. UK Phenology Network (run by the Woodland Trust and the Centre for Ecology and Hydrology) research shows that there is a marked difference in the timing of leafing of oak and ash for example, in the wake of average spring temperatures rising in the last decade. Other data shows disturbing patterns emerging with birds, insects and plants all responding at relatively different rates.

4.3. In their current state, key ecological habitats are simply not sustainable given their fragmented character and the immobile nature of many of their characteristic species, which are "locked in" by the surrounding environmentally hostile landscape. It is now widely accepted that the species compositions of semi-natural habitats will change considerably. Further increasing the fragmentation of Combe haven Valley will decrease the resilience of the habitats within and reduce their ability to adapt in the future.

4.4. In addition to this the scheme would increase car-based trips, discourage sustainable development and increase CO_2 emissions. PPS1 requires the integration of economic, social and environmental concerns. It appears that economic and social issues are being pursued at the expense of the environment with this scheme. The supplement to PPS1 on Climate Change together with UK commitments to reduce CO_2 emissions means that the transport sector must play a role in reducing emissions, yet this scheme will impact on this region's ability to achieve emissions reductions, sending out inappropriate messages.

5. Impacts of the proposed development

5.1. The Woodland Trust believes that the individual impacts of the scheme have been undervalued. The area over which significant ecological effects extend outwards from a road is typically many times wider than the road surface and associated roadsides often extending into adjacent woodland areas. A recent analysis of data from over 100 woodland sites in Britain found that roads through or adjacent to woods were more important than all other recorded boundary variables (e.g. presence of hedges) and grazing variables (e.g. presence of sheep or deer) in explaining the composition of

[3] IPCC, 2007: Summary for Policymakers. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
[4] Inter Governmental Panel on Climate Change (2001) Climate Change 2001 - The Scientific Basis. Third Assessment report.
[5] G8 communiqué July 2005

woodland ground flora. They were also very important relative to site-level climatic and spatial variables. [6]

5.2. Chemical effects

5.2.1. Application of herbicides and spillage of hazardous substances during construction may have local impacts on adjacent woodland. However, pollution connected with road and motorway development arises principally during operation, i.e. once these are in use (see Figure 4.1). Chemical pollutants connected with road use include road-salt, and gaseous and particulate emissions.[7] [8]

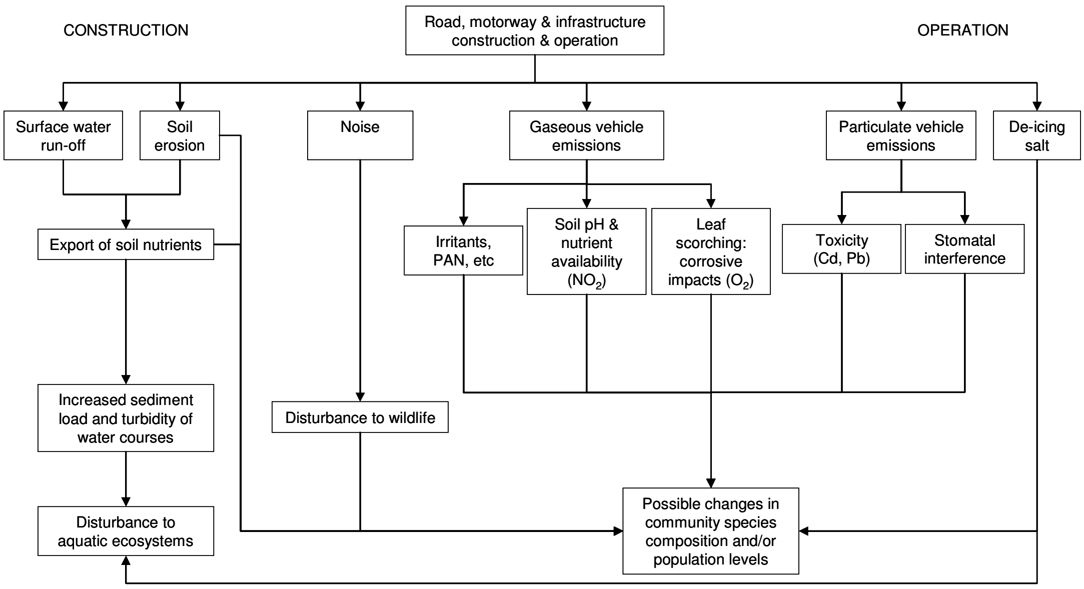

Figure 4.1. The major chemical and disturbance effects of road development. Redrawn from Sheate & Taylor (1990)

3.1.1. Chemicals used to de-ice roads in winter are primarily salts; sodium chloride, calcium chloride, or calcium magnesium acetate.[9] The use of these chemicals increases sodium, calcium and magnesium to levels in the immediate environment that may be toxic to many species of plants, fish and aquatic organisms. Road salt is a substantial deterrent to amphibian road crossing and

[6] Corney, P. M., Le Duc, M. G., Smart, S. M., Kirby, K. J., Bunce, R. G. H. & Marrs, R. H. (2006) Relationships between the species composition of forest field-layer vegetation and environmental drivers, assessed using a national scale survey. *Journal of Ecology*, **94**, pp. 383-401.

[7] Bernhardt, M, Fischer, A., Kirchner, M. & Jakobi, G. (2004) Impact of motorways on adjacent coniferous forest communities. *Eco-complexity and dynamics of the cultural landscape, Proceedings of the 34th Annual Conference of the Ecological Society of Germany, Austria and Switzerland* (ed. A. Otte, D. Simmering, L. Eckstein, N. Holzel, & R. Waldhardt), pp. 90. Ecological Society of Germany, Austria and Switzerland.

[8] Sheate, W. R. & Taylor, R. M. (1990) The effect of motorway development on adjacent woodland. *Journal of Environmental Management*, **31**, pp. 261-267.

[9] Forman, R. T. T. & Alexander, L. E. (1998) Roads and their major ecological effects. *Annual Review of Ecology and Systematics*, **29**, pp. 207- 231.

may also be harmful to roadside woodland amphibian populations, such as great-crested newts *Triturus cristatus*.[10]

3.1.2. Road salt application, together with nitrogen from vehicle exhausts, has been shown to significantly alter the species composition and abundance of ground flora in woodland alongside roads in Germany.[11] Airborne sodium chloride is known to cause leaf injury to trees over 100m from roads, particularly in down-wind and down-slope directions. Harmful gaseous emissions from vehicles include hydrocarbons, carbon monoxide, peroxyacetyl nitrate (PAN), nitric oxide and nitrogen dioxide, which can produce ozone.[12]

3.1.3. In the UK, nitrogen oxides are produced primarily by vehicle emissions.[13] Moderate concentrations of nitrogen oxides produce both positive and negative plant growth responses, depending on species sensitivity to, or ability to capitalise on, increased nutrient load. Woodland is not a habitat in which nitrogen availability limits growth, as compared to nutrient poor habitats, such as moorland, but increasing nitrogen can alter the outcome of competitive interactions, changing the character of woodland vegetation, in terms of species composition.[14] There is recent evidence from woods across Britain that species increasing in cover are more likely to be associated with high nutrient status conditions. Some species have shown consistent increases (e.g. nettle *Urtica dioica*, rough meadow grass *Poa trivialis* and pendulous sedge *Carex pendula*) or decreases in abundance correlated with modelled nitrogen changes[15].

3.1.4. Nitrogen oxides can contribute to local acid rain, lowering soil pH levels, which have been linked to reduced tree root development and increased drought susceptibility in European forests.[16] Research conducted in a wood at Rothamstead Experimental Station (UK) found that nitrogen deposition and consequent acidification reduces the total number of plant species and

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[10] Gent, T. & Gibson, S. (2003) *Herpetofauna workers manual*. Joint Nature Conservation Committee, Peterborough.

[11] Bernhardt, M, Fischer, A., Kirchner, M. & Jakobi, G. (2004) Impact of motorways on adjacent coniferous forest communities. *Eco-complexity and dynamics of the cultural landscape, Proceedings of the 34th Annual Conference of the Ecological Society of Germany, Austria and Switzerland* (ed. A. Otte, D. Simmering, L. Eckstein, N. Holzel, & R. Waldhardt), pp. 90. Ecological Society of Germany, Austria and Switzerland.

[12] Forman, R. T. T. & Alexander, L. E. (1998) Roads and their major ecological effects. *Annual Review of Ecology and Systematics*, **29**, pp. 207- 231.

[13] NEGTAP. (2001) *Transboundary air pollution: acidification, eutrophication and ground level ozone in the UK*. Report of the National Expert Group on Transboundary Air Pollution (NEGTAP) for the UK Department for Environment, Food and Rural Affairs, Scottish Executive, the National Assembly for Wales and the Department of the Environment for Northern Ireland. CEH, Edinburgh.

[14] Sheate, W. R. & Taylor, R. M. (1990) The effect of motorway development on adjacent woodland. *Journal of Environmental Management*, **31**, pp. 261-267.

[15] Kirby, K., Smart, S. M., Black, H. I., Bunce, R. G. H., Corney, P. M. & Smithers, R. J. (2005) *Long-term ecological change in British woodlands (1971 - 2001)*. English Nature Research Report (ENRR) No. 653, pp. 1-139. English Nature, Peterborough.

[16] Matzner, E. & Murach, D. (1995) Soil changes induced by air pollutant deposition and their implication for forests in Central Europe. *Water Air and Soil Pollution*, **85**, pp. 63-76.

alters soil microbial processes.[17] Soil acidification can also reduce nutrient availability and increase solubility of deposited metals, such as lead. Nutrient deficiency combined with increased metal toxicity creates conditions of ecological stress for plant communities. This changes the composition of the ground flora and may lead to competitive dominance by one or a few species able to tolerate harsh road-edge conditions.[18] However, there is evidence that, in general, woodland soils in the UK have become less acidic over recent years.[19]

3.1.5. Importantly, nitrogen deposition can stimulate increased decomposition and mineralisation rates, particularly if soil pH increases. Acting as positive feedbacks, these mechanisms further increase nitrogen availability in the soil, enhancing the nutrient effect of nitrogen deposition.[20]

3.1.6. Turbulence caused by the passage of vehicles distributes particles emitted in vehicle exhausts into nearby vegetation. A study undertaken in woodland adjacent to the M6 motorway in England found that engine particles were concentrated on tree leaf surfaces adjacent to the road corridor, which became less frequent with increasing distance from the road. However, particles were sometimes carried for 200m or more through or over woodland, particularly in the direction of the prevailing wind.[21] Ground-level air pollution of this kind can cause a substantial reduction in the health of trees, such as sessile oak *Quercus petraea* and beech *Fagus sylvatica*.

3.1.7. Trees in woodland next to two motorways surveyed in England (M62 & M40) showed increased defoliation, insect damage and poor crown condition. This effect of roadside pollution extended approximately 100m into adjacent woods. This is consistent with the measured profile of nitrogen dioxide, which declined to background levels at about 100m.[22]

3.1.8. A study of woodland areas around the M25/M40 motorway junction in England has demonstrated that pollution from roads affects invertebrates (bagmoth *Luffia ferchaultella*

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[17] Goulding, K. W. T., Bailey, N. J., Bradbury, N. J., Hargreaves, P., Howe, M., Murphy, D. V., Poulton, P. R. & Willison, T. W. (1998) Nitrogen deposition and its contribution to nitrogen cycling and associated soil processes. *New Phytologist*, **139**, pp. 49-58.

[18] Sheate, W. R. & Taylor, R. M. (1990) The effect of motorway development on adjacent woodland. *Journal of Environmental Management*, **31**, pp. 261-267.

[19] Kirby, K., Smart, S. M., Black, H. I., Bunce, R. G. H., Corney, P. M. & Smithers, R. J. (2005) *Long-term ecological change in British woodlands (1971 - 2001)*. English Nature Research Report (ENRR) No. 653, pp. 1-139. English Nature, Peterborough.

[20] NEGTAP. (2001) *Transboundary air pollution: acidification, eutrophication and ground level ozone in the UK*. Report of the National Expert Group on Transboundary Air Pollution (NEGTAP) for the UK Department for Environment, Food and Rural Affairs, Scottish Executive, the National Assembly for Wales and the Department of the Environment for Northern Ireland. CEH, Edinburgh.

[21] Freer-Smith, P. H., Holloway, S. & Goodman, A. (1997) The uptake of particulates by an urban woodland: Site description and particulate composition. *Environmental Pollution*, **95**, pp. 27-35.

[22] Bignal, K. L., Ashmore, M. R., Headley, A. D., Stewart, K. & Weigert, K. (2007) Ecological impacts of air pollution from road transport on local vegetation. *Applied Geochemistry*, **22**, pp. 1265-1271.

larvae) that eat lichens.[23] [24] Roadside pollution significantly reduced the feeding rate of these invertebrates on lichen gathered from areas adjacent to the motorways, compared to control sites. The causative agents of this effect included heavy metals such as lead, chromium, vanadium, and copper. The effect was directionally dependent on the prevailing winds but was spread over some 2km.[25]

3.2. Disturbance

3.2.1. Large roads and motorways are associated with direct mortality of species. Increased noise pollution and activity disturbs wildlife and may ultimately lead to changes in community composition (see Figure 4.1).

3.2.2. Removing adjacent trees or vegetation for road construction may also have hydrological impacts on remaining woodland. These may include reduced rainfall interception, increased surface water run-off and soil erosion, which may have long-term impacts on any remaining or adjacent woodland.[26]

3.2.3. Road kill is probably the leading cause of direct, human-linked animal mortality today. Wildlife casualty rates can be important locally.[27] Recent data demonstrates that road kills affect over 20 species of mammals in the UK, with approximately 10,000 sightings of mammal casualties each year between 2001 and 2004. Data collected in 2005 indicates that mammal road casualties of all species are significantly linked to the quantity of nearby woodland habitat.[28]

3.2.4. Nesting birds avoid habitat adjacent to well-used tracks, roads and motorways.[29] [30] [31] [32] [33] [34] Other effects on birds can be quite subtle, for example, through acoustic masking of birdsong

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[23] Sims, I. & Lacey, R. (2000) Measuring atmospheric pollution around junction 16 of the M25 motorway, London, United Kingdom, using lichenophagous invertebrates. *Environmental Toxicology and Chemistry*, **19**, pp. 2029-2037.

[24] Sims, I. R. & Reynolds, P. J. (1999) Effects of atmospheric pollution on a lichenophagous lepidopteran. *Ecotoxicology and Environmental Safety*, **42**, pp. 30-34.

[25] Sims, I. & Lacey, R. (2000) Measuring atmospheric pollution around junction 16 of the M25 motorway, London, United Kingdom, using lichenophagous invertebrates. *Environmental Toxicology and Chemistry*, **19**, pp. 2029-2037.

[26] Sheate, W. R. & Taylor, R. M. (1990) The effect of motorway development on adjacent woodland. *Journal of Environmental Management*, **31**, pp. 261-267.

[27] Mumme, R. L., Schoech, S. J., Woolfenden, G. W. & Fitzpatrick, J. W. (2000) Life and death in the fast lane: Demographic consequences of road mortality in the Florida Scrub-Jay. *Conservation Biology*, **14**, pp. 501-512.

[28] Mammals Trust UK. (2006) *Mammals on roads*. pp. 1-4. Mammals Trust UK, London.

[29] Brotons, L. & Herrando, S. (2001) Reduced bird occurrence in pine forest fragments associated with road proximity in a Mediterranean agricultural area. *Landscape and Urban Planning*, **57**, pp. 77-89.

[30] Foppen, R. & Reijnen, R. (1994) The effects of car traffic on breeding bird populations in woodland. 2. Breeding dispersal of male willow warblers (*Phylloscopus-Trochilus*) in relation to the proximity of a highway. *Journal of Applied Ecology*, **31**, pp. 95-101.

[31] Ingelfinger, F. & Anderson, S. (2004) Passerine response to roads associated with natural gas extraction in a sagebrush steppe habitat. *Western North American Naturalist*, **64**, pp. 385-395.

by traffic.[35] Indeed bird species most affected appear to have song frequencies closest to that of traffic noise.[36]

3.2.5. Disrupted hydrological function caused by road building, particularly cutting construction, is likely to have long-term effects upon adjacent woodland, which could be considerable and possibly irreversible. Cuttings or drained slopes may lead to a reduced water supply in nearby woodland, resulting in loss of trees and/or changes in species composition. The scale of these physical impacts will depend upon the degree to which the local water table level and the main supply of water to the wood are affected.[37] For example, premature death of many trees occurred at the Woodland Trust's Hardwick Wood, near Plympton, Devon on land alongside a large road cutting created when the A38 trunk road was widened.

3.3. Fragmentation

3.3.1. The primary effects of road incursion into woodland are illustrated in Figure 4.2. The isolation effects identified are also relevant to roads routed across land between woods.

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[32] Reijnen, R. & Foppen, R. (1994) The effects of car traffic on breeding bird populations in woodland. 1. Evidence of reduced habitat quality for willow warblers (*Phylloscopus-trochilus*) breeding close to a highway. *Journal of Applied Ecology*, **31**, pp. 85-94.

[33] Reijnen, R. & Foppen, R. (1995) The effects of car traffic on breeding bird populations in woodland. 4. Influence of population-size on the reduction of density close to a highway. *Journal of Applied Ecology*, **32**, pp. 481-491.

[34] Reijnen, R., Foppen, R. & Veenbaas, G. (1997) Disturbance by traffic of breeding birds: Evaluation of the effect and considerations in planning and managing road corridors. *Biodiversity and Conservation*, **6**, pp. 567-581

[35] Warren, P. S., Katti, M., Ermann, M. & Brazel, A. (2006) Urban bioacoustics: it's not just noise. *Animal Behaviour*, **71**, pp. 491-502.

[36] Rheindt, F. E. (2003) The impact of roads on birds: Does song frequency play a role in determining susceptibility to noise pollution? *Journal fur Ornithologie*, **144**, pp. 295-306.

[37] Sheate, W. R. & Taylor, R. M. (1990) The effect of motorway development on adjacent woodland. *Journal of Environmental Management*, **31**, pp. 261-267.

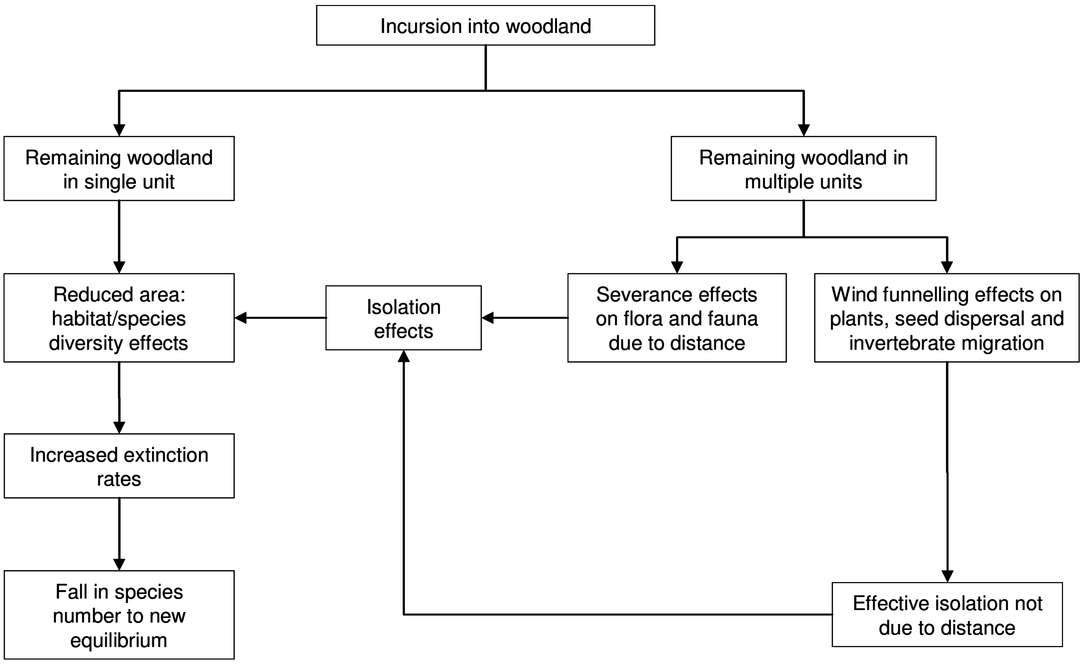

Figure 4.2. Species diversity effects as a result of woodland incursion. Redrawn from Sheate & Taylor (1990)

3.1.1. Woodland fragments, with small area to perimeter ratios, are particularly susceptible to physical impacts resulting from road development, as they lack core area, i.e. area that is unaffected by negative edge effects from adjacent land-use.[38] The isolation of large woods with a spatially varied structure that support a diversity of wildlife may also have a disproportionate impact at a landscape scale.[39]

3.1.2. Some species may take advantage of habitats alongside transport corridors (e.g. verges or hedgerows). These may act as valuable movement pathways for some species, where conditions are suitable,[40] particularly in otherwise highly-arable landscapes. However, transport corridors can act as a barrier to dispersal and migration of species that seek to cross them[41] and

[38] Woodland Trust. (2000) *Woodland biodiversity: Expanding our horizons*. pp. 1-24. Woodland Trust, Grantham.

[39] Sheate, W. R. & Taylor, R. M. (1990) The effect of motorway development on adjacent woodland. *Journal of Environmental Management*, **31**, pp. 261-267.

[40] Mata, C., Hervás, I., Herranz, J., Suárez, F. & Malo, J.E. (2008). Are motorway wildlife passages worth building? Vertebrate use of road-crossing structures on a Spanish motorway. *Journal of Environmental Management*. 88(3): 407-415.

[41] Pirnat, J. (2000) Conservation and management of forest patches and corridors in suburban landscapes. *Landscape and Urban Planning*, **52**, pp. 135-143.

the open habitats along their margins.[42] Many species are known to be affected, for example: bumblebees; woodland ground beetles; and deer. [43] [44] [45]

3.1.3. Motorways are major barriers due to their width, speed and frequency of traffic and wind-funnelling, which affects wind-dispersed invertebrate and plant populations.[46] This is also highly likely to be true of other substantial linear transport corridors (e.g. new railways and airport runways). By reducing the amount of habitat that can be reached from a particular habitat patch,[47] new transport corridors may isolate nearby woods, with consequent and inevitable species losses.[48] In this way, transport corridors may have landscape-scale effects, sub-dividing populations, with demographic and probably long-term genetic consequences.[49]

3.2. Invasion by non-native plants

3.2.1. Non-native plant species are often abundant in roadside vegetation.[50] [51] Roadsides can act as a reservoir for such plants, facilitating the ongoing spread of non-native species into nearby wildlife habitats.[52] Non-native species were found to be frequent up to 25m from road and railway corridor edges in forests in Banff National Park in Canada[53] with come species present more than 50m away.

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[42] Koivula, M. J. & Vermeulen, H. J. W. (2005) Highways and forest fragmentation - effects on carabid beetles (Coleoptera, Carabidae). *Landscape Ecology*, **20**, pp. 911-926.

[43] Bhattacharya, M., Primack, R. B. & Gerwein, J. (2003) Are roads and railroads barriers to bumblebee movement in a temperate suburban conservation area? *Biological Conservation*, **109**, pp. 37-45.

[44] Dyer, S. J., O'Neill, J. P., Wasel, S. M. & Boutin, S. (2002) Quantifying barrier effects of roads and seismic lines on movements of female woodland caribou in northeastern Alberta. *Canadian Journal of Zoology-Revue Canadienne de Zoologie*, **80**, pp. 839-845.

[45] Koivula, M. J. & Vermeulen, H. J. W. (2005) Highways and forest fragmentation - effects on carabid beetles (Coleoptera, Carabidae). *Landscape Ecology*, **20**, pp. 911-926.

[46] Sheate, W. R. & Taylor, R. M. (1990) The effect of motorway development on adjacent woodland. *Journal of Environmental Management*, **31**, pp. 261-267.

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3.3. Cumulative effects

3.3.1. Disturbance from noise, vibration, visual queues, pollution, and predators can cumulatively lead to species avoiding habitats. For example, pied flycatcher *Ficedula hypoleuca* breeding success in wooded areas in Finland decreases within 130m of nearby roads.[54] Woodland specialist birds in sagebrush steppe habitat adjacent to dirt and paved roads associated with natural gas extraction in Wyoming, USA are similarly affected.[55] They are encountered less frequently within 100m of roads, even where traffic is light (less than 12 cars per day).

3.3.2. Disturbance to woodland birds associated with roads is particularly well-documented in the Netherlands.[56] [57] [58] Effects measured for over forty woodland bird species vary between species and traffic usage but have been detected 40-1,500m from roads with 10,000 cars per day and 70-2,800m from roads with 60,000 cars per day. Reductions in the abundance of birds of 20-98 per cent have been recorded within 250m of roads, depending on species. Brotons & Herrando (2001)[59] also documented reduced bird occurrence in wooded fragments up to 2,000m (2km) away from a main road. These studies consistently record that forest specialist bird species are more affected than generalists. It is conceivable that disturbance also deters deer from frequenting roadside woods to some degree, which may have a beneficial impact where browsing would otherwise be detrimental.

3.3.3. Transport corridors remove habitat, alter adjacent areas, and interrupt and redirect species movement. They subdivide wildlife populations, foster spread of invasive species, change hydrology and water courses and increase human use of adjacent areas.[60] Although the cumulative effect of these factors is not particularly well-documented, it is unquestionable that transport developments have a potentially profound effect on surrounding habitat.

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4. Conclusions

4.1. The Bexhill to Hastings link road will have major and irreversible impacts on the local environment which is contrary to legislation, government guidance and local planning policy. Additionally to this the scheme will cause loss and fragmentation of habitat and impacts indirectly on Combe Haven Valley during the construction phase and operational phase. There is a significant body of evidence showing the negative impacts that road developments impose on an ecosystem.

4.2. The ecological assessment of the BHLR fails to accurately assess the impacts of the road at both an ecosystem level and economic level. Ecosystem functioning and resilience depends on an established relationships between species, their environment and other species and is vital for long term maintenance of a habitat. Full assessment in ecological and monetary terms is vital to realise the full impacts of the scheme on the local environment, thus providing a true cost of the scheme.