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Tranquillity Mapping as an Aid to Forest Planning

INFORMATION NOTE

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SUMMARY

The concept and application of local tranquillity mapping that has been piloted at Sherwood Forest in Nottinghamshire is described. The idea of mapping areas of countryside that could be regarded as tranquil (away from noise and visual intrusion) was first developed for a Department of Transport study in 1991, and then for the Countryside Commission and Council for the Protection of Rural England, by the late Simon Rendel of the ASH Consulting Group. Following this work, the Forestry Commission became interested in its application to forest landscape planning and design. Tranquillity maps were prepared for the area covered by the Sherwood Initiative. They show different degrees of tranquillity and take into account the effect of woodland.

WHAT IS TRANQUILLITY?

Tranquillity is a term used to describe the relative sense of peace, quiet and 'naturalness' of the countryside. Tranquillity is an important contribution to the value many people obtain from living in or visiting the countryside. It takes into account a combination of factors which have effects on our perception of tranquillity, particularly related to sight and hearing. The perception of tranquillity also relates to our aesthetic response to the landscape and the pleasure we gain from visiting it. Tranquillity can be summed up as the quality that allows us to feel that we have 'got away from it all'.

Tranquillity in the open countryside can be affected by noise and intrusion much more than that of woodland. Hence there are particular qualities associated with woodland that may produce a greater sense of tranquillity than that found in surrounding open areas.

DEFINING TRANQUILLITY

In order for tranquillity maps to be used as a planning tool, there must be an objective, measurable basis to their production. If a scale or spectrum of tranquillity is drawn up, complete tranquillity would be found in the absence of unnatural noise (such as traffic, aircraft, etc.) and visual intrusion, while at the other end an absolute lack of tranquillity would exist where the traffic and other noise was greatest and/or where visual intrusion was significant. There would be degrees of tranquillity, depending on the proportions and combination of effects, between these two extremes.

Many of the factors, such as noise, diminish over distance according to defined formulae. Thus it is possible to map the effects of noise source on surrounding areas and relate them to the degree of perceived tranquillity. It is also possible to incorporate the effect of landform that blocks out noise or views, and of woodlands.

The following factors are used to assess tranquillity:

- noise from roads, railways, airports, low-flying aircraft, powerboats, blasting and industrial sites;
- visual intrusion from built-up areas, holiday/caravan parks, industrial areas, power stations, grid stations, overhead lines, mineral extraction activities, decommissioned airfields, derelict land, windfarms, glasshouses, dish aerials and masts;
- recreational use: numbers of visitors, effects of facilities, car parking and associated noise and visual intrusion.

The effect of roads depends on the amount of traffic, so that maps based on the number of vehicles per day can be used. Thus a busy motorway has a more intrusive effect than a country lane. Figures that can be used with some confidence are available from traffic counts carried out by local authorities.

Table 1 shows how different factors are categorised for their relative disturbance effects.

Once the defining factors have been identified, and their effect calibrated, it is possible to create bands or buffers around them that represent the relative cover of influence. These can be mapped.

Table 1 Disturbance categories

Noise disturbance	
Roads (average vehicles per day)	
>25 000	very high
10 000–25 000	high
5 000–10 000	medium
2 000–5 000	low
800–2 000	very low
Railways	
8 trains per hour	high frequency
6 trains per hour	medium frequency
3 trains per hour	low frequency
Airports (operating)	
DBA_{Leq} contour: noise levels at different distances from the source measured in decibels	
Other	
e.g. power boating, low-flying aircraft	

Visual psychological disturbance		
Settlements/Built-up areas		
	>500 000	metropolitan
	75 000–500 000	large towns
<18 km^2	25 000–75 000	medium towns
< 6 km^2	10 000–25 000	"
	4 000–10 000	small towns
< 1 km^2	2 000–4 000	large villages
< 1/2 km^2	1 000–2 000	small village
< 1/4 km^2	<1 000	10–50 dwellings
holiday/caravan parks:	by area	
industrial areas:	by area	
Electrical equipment		
power stations	largest with minimum of 6 cooling towers	
	medium	
	nuclear	
grid stations		
overhead lines	275 and 400 kV	
	132 kV	
	33 kV/11 kV if double pole	
Other		
Mineral extraction, decommissioned airfields, derelict land, windfarms, glasshouses, dish aerials, masts		

Usually, the disturbance effects are treated as inclusive; that is, the maximum distance is assumed to override any lesser effects. In other cases, cumulative effects of several lesser disturbances should be added together. This is where some professional judgement and local adjustment are needed.

Woodland is assumed to have a positive effect, unless there are factors in its layout and appearance that reduce tranquillity (such as unattractive 'industrial' plantations). Woodland tends to increase the measure of tranquillity by one step or zone. It is most useful for screening visual intrusion. It has some effect on noise, depending on the density of the woodland and the time of year. Trees can baffle some noise and also produce their own sounds that can compete with or mask external noises.

THE SHERWOOD TRANQUILLITY MAPS

ASH Consulting Group had produced a regional tranquillity map of the East Midlands for the Countryside Commission and Council for the Protection of Rural England that showed the Sherwood area to have become more disturbed over a 30-year period. The southern end of the Sherwood area is particularly fragmented by settlements and major roads. Within the context of the regional map it is possible to focus on the local Sherwood area and produce a more detailed map at a scale suitable for landscape planning.

The following local factors affect tranquillity at Sherwood:

- The two main towns close to Sherwood Forest are Worksop to the north and Mansfield to the west. Clipstone, Rainworth, Blidworth and Ravenshead are smaller but significant settlements. The effect of urban areas is mainly the amount of traffic they generate, rather than the presence of the built-up areas themselves.

- The traffic map for the area shows four non-urban roads with more than 10 000 vehicles per day:

  A60 as far north as Warsop
  A614 as far north as Ollerton
  A617 either side of Rainworth
  A57 Worksop bypass

  These roads are constantly noisy. They are allotted a 1 km disturbance distance (although they can be

heard much further away on a still day). There are zones within 1/2 km where, although disturbed by noise, some peaceful walking is possible. These are therefore semi-tranquil. These zones are consistent with the regional maps. At a scale of 1:50 000 more detail can be included, such as a sub-zone that is disturbed but where some recreation is possible, though not in an atmosphere of tranquillity. At the other end of the scale, distances greater than 1 km from the roads are more tranquil. This leads to the establishment of five zones, A–E, where A is the least and E the most tranquil.

- Smaller roads with less traffic produce effects some way along the zonal spectrum, depending on their degree of use, for example, summer recreation traffic. Data from traffic counts are not available for these roads, but local knowledge can be used to ascribe these roads to an appropriate zone.

- There are three categories of overhead line: 400/275 kV pylons, 132 kV pylons and 33 kV double pole. The effect of a 400 kV line is considered to be the same as that of 5–10 000 vehicles per day. The others are less, corresponding to lower zones.

- Other influences are coal mines and haul routes, which also have an effect equivalent to 5–10 000 vehicles per day.

- Recreation at 'honeypots', such as the Major Oak, can reduce tranquillity by one zone due to the accumulated effect of people, structures and traffic. It has no effect in zones A and B, because they are already heavily disturbed, so recreation is only counted in zones C–E.

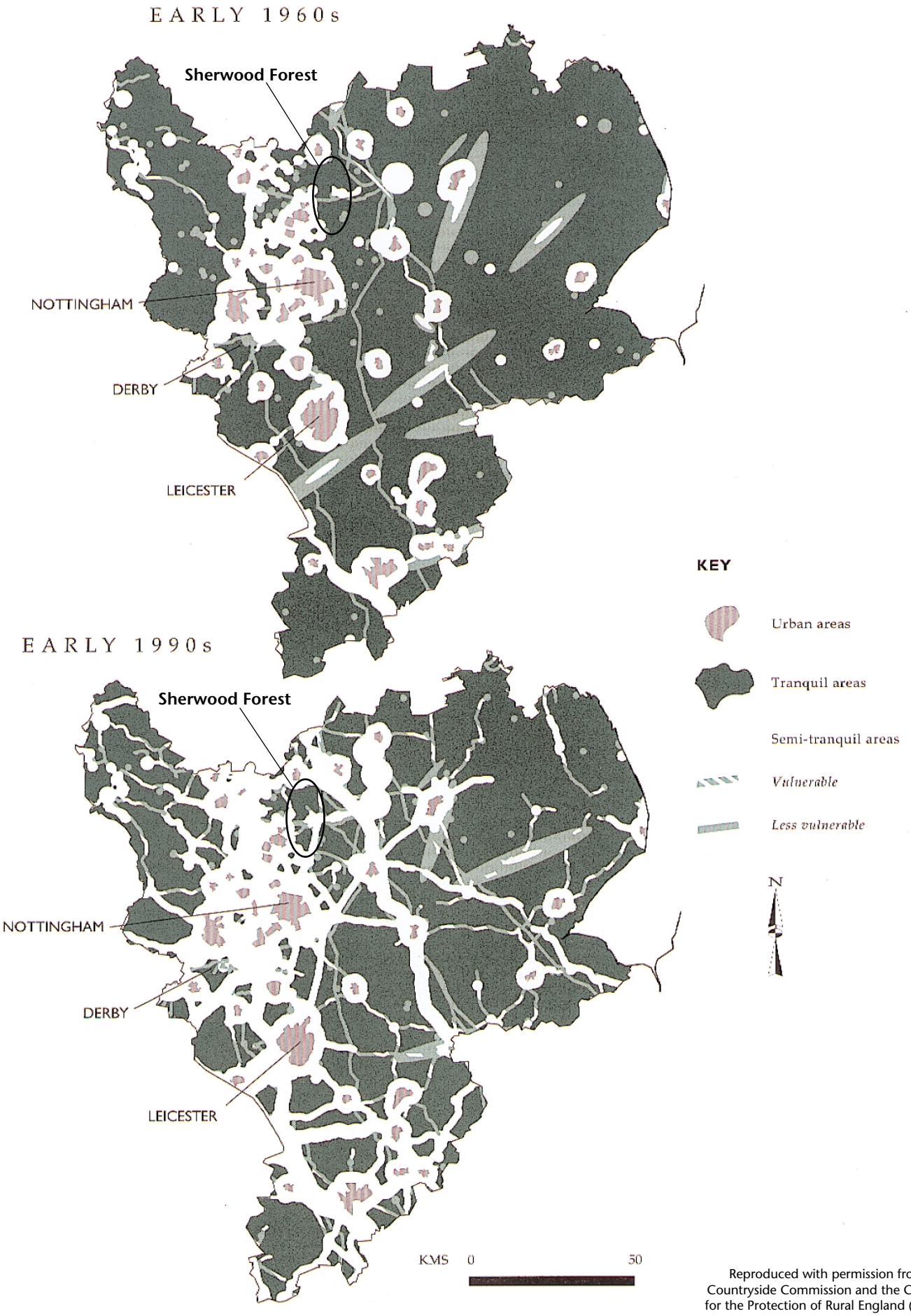
The zones have been calibrated in terms of their relationship to the regional mapping exercises as shown in Table 2.

There is little topographic effect on disturbance at Sherwood because it is flat or gently rolling, except around Manor Hill south of Worksop. The landform baffles noise emanating from the north which increases tranquillity by one zone.

Table 2 Local tranquillity zones related to regional maps

Local nomenclature	Local description	Regional description	Regional nomenclature
Zone E	Almost traffic free. Light passive recreation occurs.	N/A	Tranquil
Zone D	All public roads passing through zone are comfortable for walking. Moderate passive recreation occurs.	The broad Scottish definition of Tranquillity. Countryside free of any substantial disturbance in daytime. Night-time sky may be affected by light reflection.	Tranquil
Zone C	Some roads passing through are uncomfortable for walking. Boundary of zone somewhat disturbed by traffic noise. Intensive passive recreation occurs.	The broad English definition of Tranquillity. Countryside somewhat disturbed by light traffic noise, small settlements, etc.	Tranquil
Zone B	As regional.	Countryside subject to significant traffic intrusion and other equivalent disturbance.	Semi-tranquil
Zone A	Very substantial traffic disturbance throughout zone.	N/A	Disturbed

Figure 1 Tranquil areas: the change in tranquillity for the East Midlands



WOODLAND EFFECTS

The first tranquillity map produced for Sherwood Forest assumed the baseline conditions in the absence of any mitigation by woodland. A second map was produced to take woodland into account. The assumption is that woodland increases tranquillity by one zone. The effect of this is to increase the proportion of the area in the more tranquil zones C–E. This increase in tranquillity is especially significant in the southernmost part of the area where, without woodland, there are no areas in zones C–E. This demonstrates that strategically located woodland could enhance tranquillity in places where it is absent or low, with beneficial effects for local people.

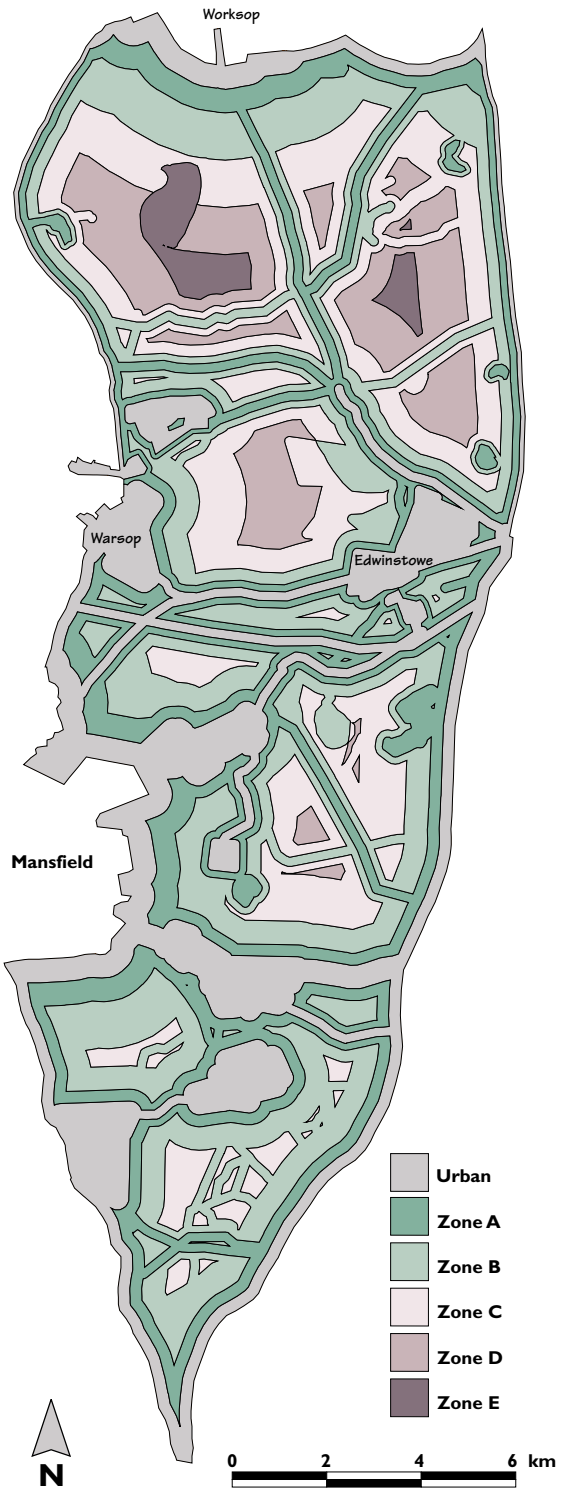


Figure 2 Map of tranquillity calculated using the factors described in Table 1, ignoring the presence of woodland.

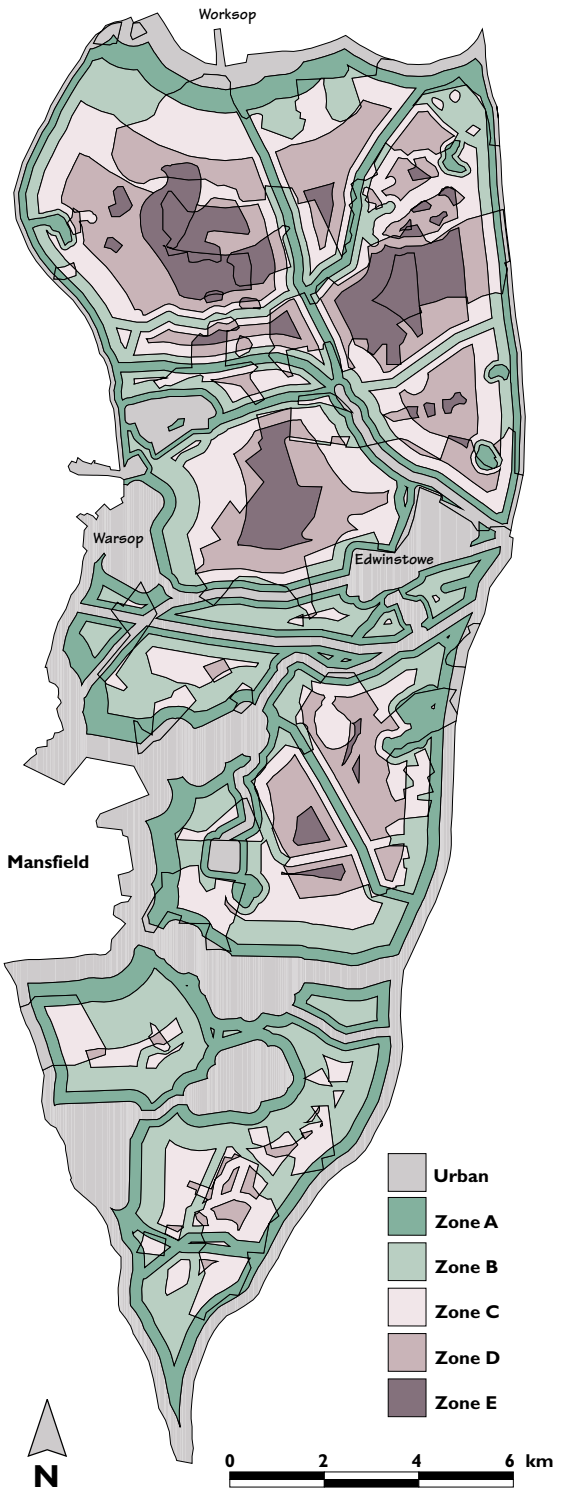


Figure 3 As left, but with the presence of woodland. This shows an increase in the number of tranquil areas.

USE OF TRANQUILLITY MAPS FOR LANDSCAPE PLANNING

The maps are digitally produced, so that it is possible to add or subtract woodland and test the effect of current and proposed woodland designs on tranquillity. Potential uses include:

- locating new woodland where the greatest increases in tranquillity are to be gained;
- using woodland to increase tranquillity in areas that are most disturbed near to where people live;
- testing the effect of felling woodlands on the tranquillity of part of an area.

CONCLUSIONS

While tranquillity mapping is not an exact science, relying to some extent on professional judgement, it is a reasonably robust measure of the degree to which landscapes possess peace and quiet. The methodology has gained quite wide acceptance as a result of previous studies at national and regional levels. The local application presents some useful possibilities for analysis and testing of, for example, different woodland locations, amounts and design. It is particularly applicable in areas where community woodlands are being planned, and where disturbance by noise and visual intrusion is greatest.

ACKNOWLEDGEMENTS

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