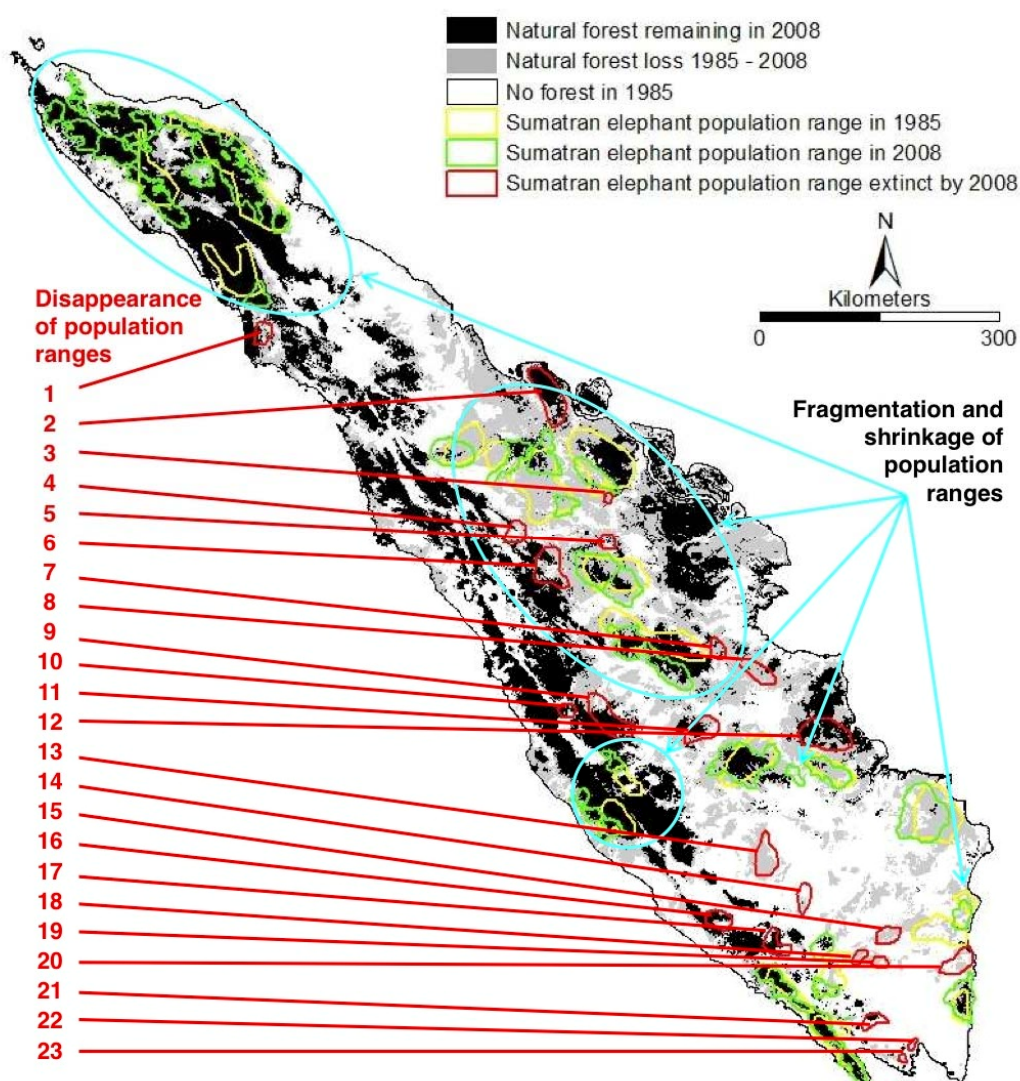


## Sumatran Elephant (*Elephas maximus ssp. sumatranus*)



**Figure 1.** Loss and fragmentation of natural forest cover and the ranges of Sumatran Elephant populations between 1985 and 2007/2008. Natural forest in 1985 (grey) and 2008 (black) are shown with 1985 elephant ranges which had disappeared by 2008 (red) and the 1985 elephant ranges (yellow) which had shrunk or become fragmented by 2008 (light blue).

## **Supplementary documentation for *Elephas maximus ssp. sumatranus* Red List**

### **Sumatra's Loss of Natural Forest 1932 to 2008/9**

About 75 years ago, Sumatra was covered by about 85% natural forest (Figure 2). As the human population and the demand for various resources increased, forests in Sumatra have also shrunk rapidly. In 1985, the island harbored about 53% forest cover. The forest on the island declined rapidly since then, to only about 27% in 2008 (Figure 3). The conversions particularly took place in flat lowland areas where elephants are mostly concentrated. These areas usually also happened to be among the best areas for agricultural purposes such as for oil palm development.

In the last c. 75 years (1932–2008), there has been a decline of 66.3% decline in natural forest cover over the island of Sumatra. Given that the first rapid surveys and island-wide picture of elephant distribution was made only in 1985.. There was a 50% loss of forest cover when compared to the forest cover in 1985 (Table 2) in 23 years (< 1 generation time of an Asian elephant, ca. 25 years). The situation was worse when it came to lowland (non-peat) forests in Sumatra.

The overall loss of lowland forests (< 300 m, non-peat forests), i.e. the forests considered to be most important for elephants, was very substantial (Table 1). In 1985 there was 104,017.47 km<sup>2</sup> of non-peat forests less than 300 m altitude was present and in 2008/9 only 32,130.18 km<sup>2</sup> of those non-peat forests at altitude less than 300m is left in the whole of Sumatra. A total of 71,887.29 km<sup>2</sup> has been lost since 1985. This amounts to about 69.11% of forests in this category, considered to be potential habitat for Sumatran Elephant, being lost within the time period of a single generation of elephants. Strong evidence that there has been a precipitous decline in available habitat, which has resulted in local extinctions, also comes from a look at provinces where there has been long-term data on elephant distribution.

### **The impacts of habitat loss are made worse as a result of habitat fragmentation**

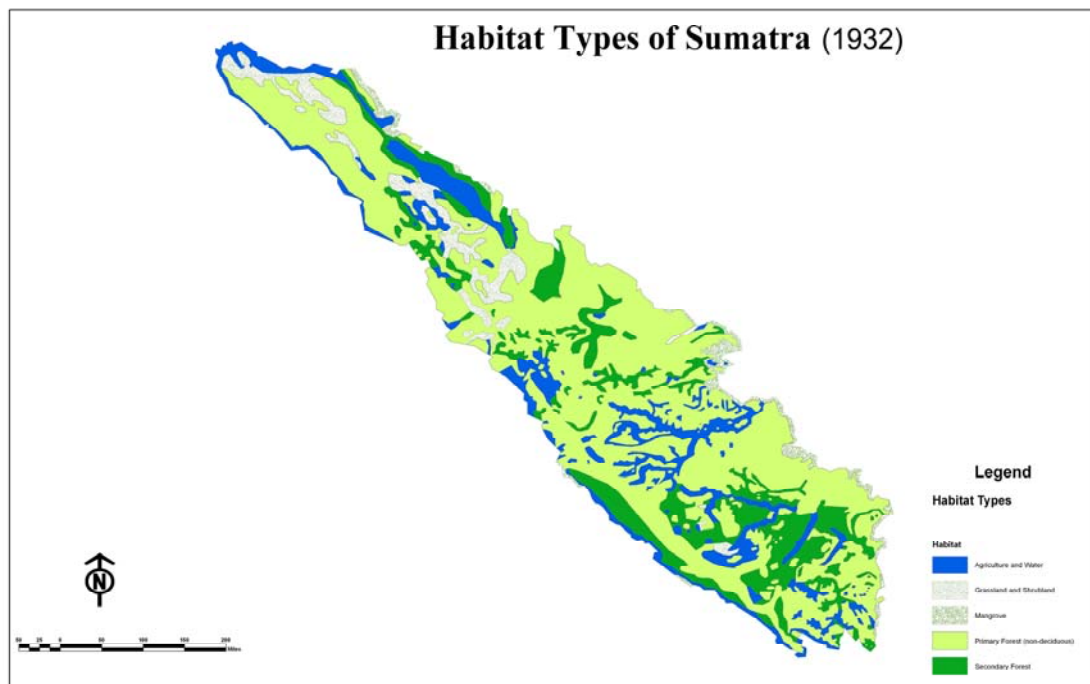
Gaveau *et al.* (2007) have shown that mean fragment size decreased with increasing habitat loss in south-western Sumatra. This has also been shown in the case of Riau

Province (Desai and Samsuardi 2009). Fragmentation is a serious threat to conservation of most species. It has been shown that large mammals like tigers, rhinoceroses, and elephants in BBSNP avoid the forest edges (Kinnaird *et al.* 2003), possibly due to poaching pressures and fear of humans. HEC has been shown to increase at the forest edge in recent times (Hedges *et al.* 2005). This is probably because natural habitats have been fragmented and substituted by farmland, which in turn has increased the likelihood of people encountering elephants and elephants encountering human use areas. Consequently fragmentation of habitat is generally very detrimental for elephant conservation.

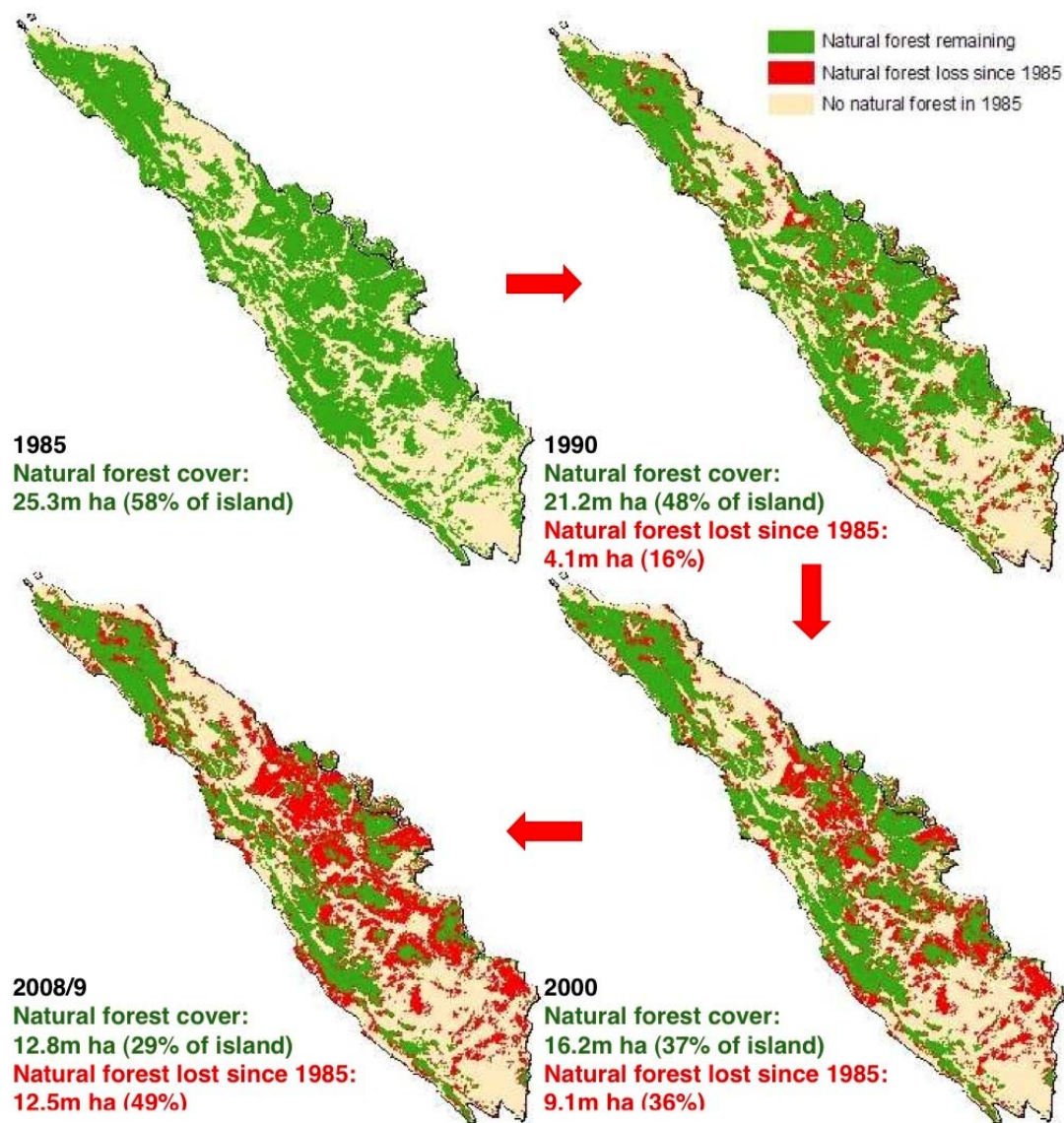
However the threat becomes even more serious when one takes into account the size of the remaining habitat patches and what proportion of the remaining forest cover they represent. The Riau study clearly indicates that as habitat loss increased there were increases in the number of patches, reduced sizes of patches and increasingly poor shape of the remaining habitat patches. All these factors contribute to these fragmented smaller patches becoming increasingly unsuitable for elephants.

Desai and Samsuardi (2009) have shown that in Riau Province the number of fragments increased from 104 in 1982 to 1658 in 2007. They also show that the average patch size for patches > 250 km<sup>2</sup> declined from 15,775.9 in 1982 to 858 in 2007. Given the species large home range sizes this is a very significant decline in the conservation potential of the remaining elephant habitat. The perimeter length for individual patches also increased with time in the same period, 1982–2007 (Figure 4). This clearly indicates that fragmentation is creating habitat patches that are increasingly unsuitable for elephant conservation. What is even more worrying is that the extent of remaining forests in Riau that are contained in unsuitable patches of less than 250 km<sup>2</sup> is 29%. As already mentioned above 69% of the suitable elephant habitat in Riau Province (<100 cm peat depth forests and dry land forests) has already been lost between 1982 and 2005. In addition, fragmentation renders a further 29% of the remaining 31% elephant habitat as unsuitable (in terms of size – >250 km<sup>2</sup>) for elephants. As such it would imply that over 78% of the suitable elephant habitat has been lost in Riau in less than one generation time. Consequently the only suitable habitat for elephants in Riau remain the two patches >250 km<sup>2</sup>. Even if habitat >100 km<sup>2</sup> was assumed as being suitable (a very unrealistic assumption) Riau has still lost over 77% of its elephant habitat in less than one elephant generation.

This clearly shows that we should not take into consideration the smaller habitat patches as being elephant habitat and instead add them to the habitat loss; for all practical purposes they are no longer suitable for elephants and elephants will be extirpated from such areas due HEC and retaliatory killing or capture.



**Figure 2.** Forest cover map of Sumatra in 1932 (Van Steenis 1935).

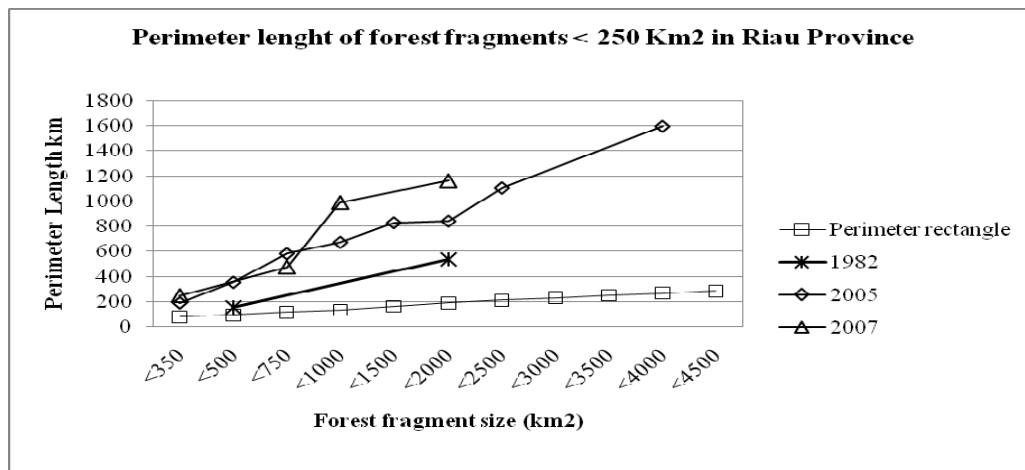


**Figure 3 a to d.** Natural forest remaining in Sumatra in 1985, 1990, 2000 and 2008/9 (green) and natural forest lost since 1985 (red)<sup>1</sup>

<sup>1</sup> Sumatra's 2008/2009 natural forest cover is based on an interpretation of Landsat images taken in 2008 and 2009, the earliest date was 8 May 2008, the latest 30 July 2009, average date was 31 October 2008.

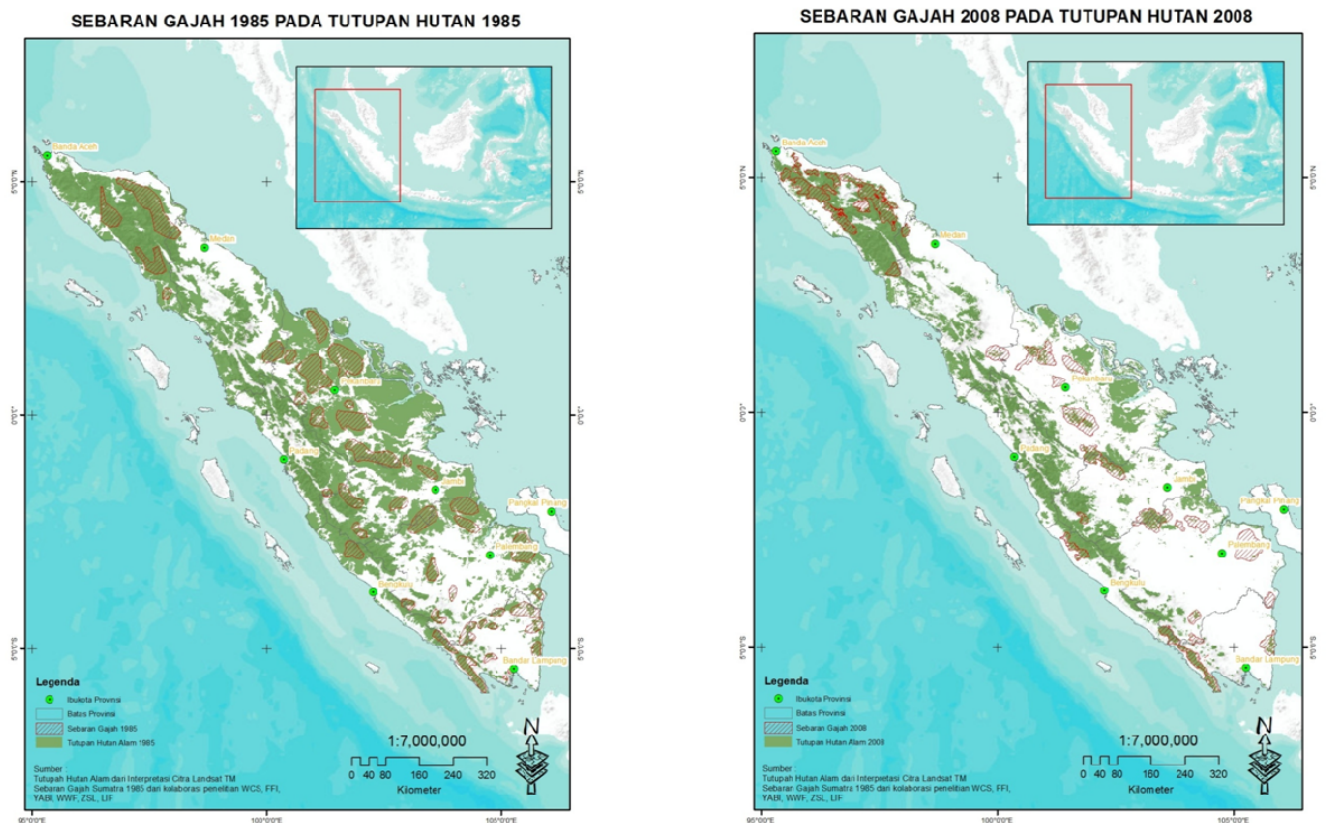
**Table 1.** Natural forest loss by category during 1985–1990, 1990–2000, 2000–2008/9 and 1985–2008/9 and percentage of 1985 forest loss in each category and contribution of each category's forest loss to overall Sumatra forest loss (from Uryu *et al.* 2010).

Category	Natural Forest Loss					
	1985-1990	1990-2000	2000-2008/9	1985-2008/9		
	Area (ha)	Area (ha)	Area (ha)	Area (ha)	% 1985 forest loss in category	% of overall Sumatra 1985 forest loss
< 150 m, on peat	679,866	1,695,411	1,277,602	3,652,880	63 %	29 %
< 150 m, on non peat	2,290,384	2,889,057	1,316,240	6,495,681	76 %	52 %
150-300 m	291,382	175,017	226,649	693,048	36 %	6%
> 300 m	792,311	280,240	549,632	1,622,182	18 %	13%
<b>Total</b>	<b>4,053,943</b>	<b>5,039,725</b>	<b>3,370,124</b>	<b>12,463,792</b>	<b>49 %</b>	<b>100 %</b>



**Figure 4.** Perimeter length of habitat patches > 250 km<sup>2</sup> in Riau Province





**Figure 5.** Change in forest cover (green areas) and elephant distribution (red polygons) between 1985 and 2008 on the island of Sumatra.

#### References:

For details of the references used, see the species account on the Red List web site.