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**ENVIRONMENTAL SYSTEMS AND SOCIETIES
STANDARD LEVEL
PAPER 2**

Monday 23 May 2011 (afternoon)

2 hours

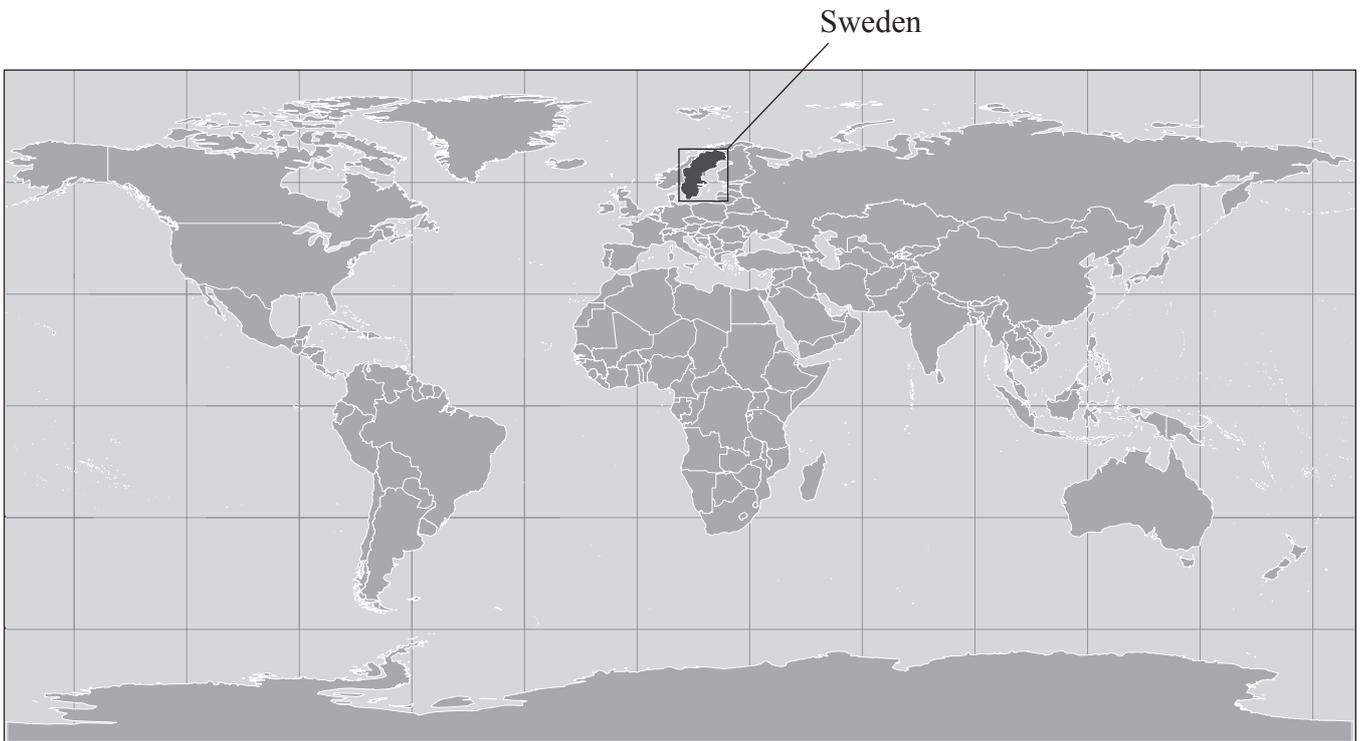
RESOURCE BOOKLET

INSTRUCTIONS TO CANDIDATES

- Do not open this booklet until instructed to do so.
- This booklet contains **all** of the resources required to answer question 1.

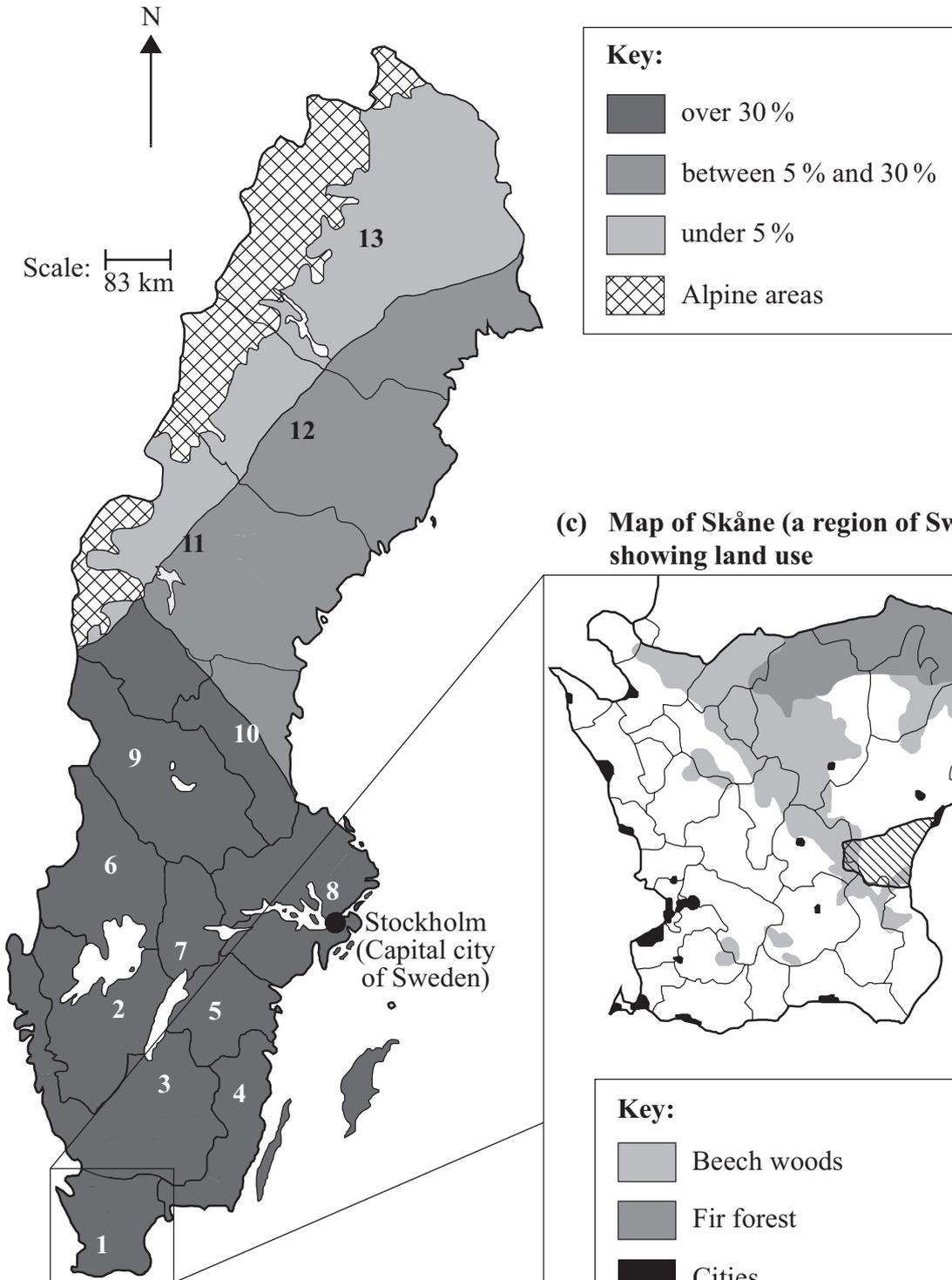
Figure 1 Maps showing the area covered by this case study

(a) World map showing the location of Sweden



[Source: adapted from www.un.org/depts/cartographic/map/profile/world.pdf]

(b) Map of Sweden showing 13 regions and the proportion (percentage) of land used for agriculture



(c) Map of Skåne (a region of Sweden) showing land use

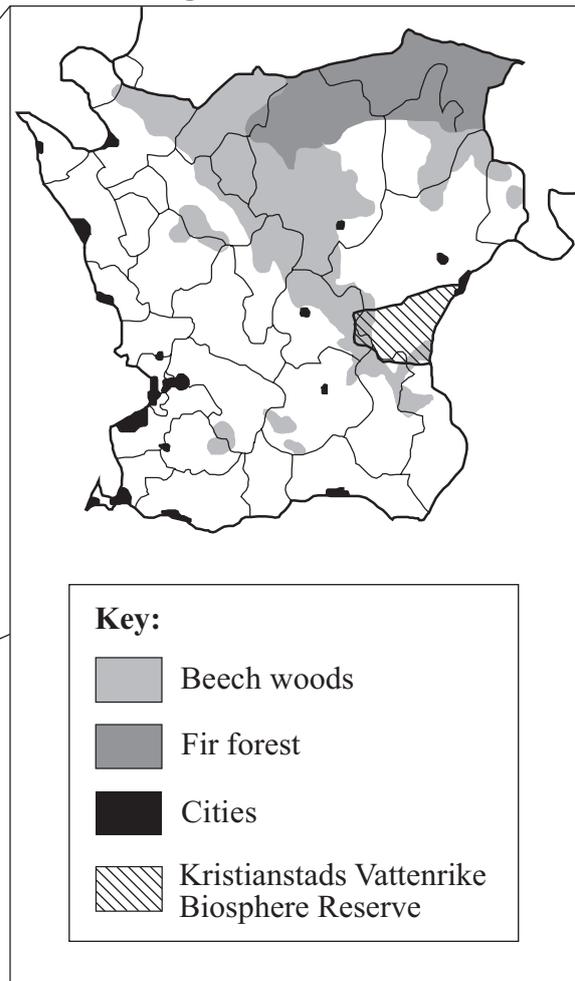


Figure 2 Fact file on Skåne

- population: 1.17 million (13 % of Sweden’s population)
- 90 % of population is urban
- population density: Skåne – 107 people per km²
Sweden – 21 people per km²
- 50 % of Skåne is agricultural land
- 34 % is forested with conifers and beech trees
- major crops: sugar beet, potato, canola (rapeseed oil)
- highest elevation: 212 metres
- lowest elevation: –2.7 metres
- average annual precipitation: 701 mm y⁻¹



Skåne city scene



Wetlands of Skåne



Grasslands of Skåne

[http://en.wikipedia.org/wiki/File:Malm%C3%B6_view_from_east.jpg
http://en.wikipedia.org/wiki/File:Jorchr-Malm%C3%B6_r%C3%A5dhus.jpg
<http://commons.wikimedia.org/wiki/File:Dalarna1.jpg>]

Figure 3 Nitrate and phosphate levels for 13 regions of Sweden (refer to Figure 1(b))

| Region | Number of freshwater habitats sampled | pH | Mean nitrate / $\mu\text{g L}^{-1}$ | Mean phosphate / $\mu\text{g L}^{-1}$ |
|---------------|--|-----------|---|---|
| 1* | 171 | 6.2 | 728 | 14 |
| 2 | 312 | 6.2 | 441 | 9 |
| 3 | 208 | 6.4 | 524 | 13 |
| 4 | 213 | 6.5 | 606 | 12 |
| 5 | 118 | 6.8 | 501 | 12 |
| 6 | 170 | 6.4 | 352 | 9 |
| 7 | 249 | 6.5 | 504 | 12 |
| 8 | 258 | 7.2 | 722 | 15 |
| 9 | 498 | 6.4 | 420 | 10 |
| 10 | 259 | 6.6 | 433 | 10 |
| 11 | 473 | 6.7 | 312 | 8 |
| 12 | 344 | 6.5 | 290 | 7 |
| 13 | 634 | 6.7 | 286 | 7 |

[Source: adapted from Bergström, *et al.*, (2005), *Limnol. Oceanogr.*, **50**(3), pages 987–994]

* Skåne is represented by Region 1

Figure 4 Information on Kristianstads Vattenrike Biosphere Reserve in Skåne

Photo removed for copyright reasons
Available at: <http://vattenriket.kristianstad.se/eng/gif/summary.jpg>

Biosphere reserves were created by the United Nations as part of Agenda 21 following the Rio Declaration in 1992. There were 531 biosphere reserves in 105 countries in 2008. The Kristianstads Vattenrike Biosphere Reserve was protected in 2005. It is 1225 km² in size and is a wetland area with a large number of endangered species of birds, amphibians and fish. There are 29 000 people living permanently in the Kristianstads Vattenrike Biosphere Reserve and they are predominantly employed in farming. It is visited by 100 000 tourists each year.

While the conservation of individual species such as threatened amphibians is important to the managers of the biosphere reserve, the primary focus is on preserving landscapes and ecosystems through collaboration with local farmers who tend the hay fields, pastures and sandy grasslands.

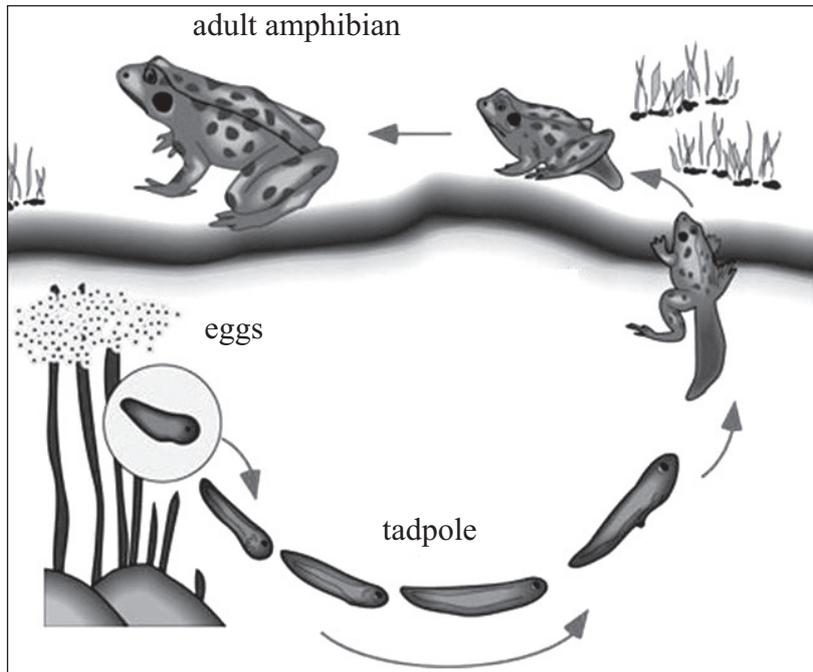
Figure 5 Information on the Common Spadefoot Toad (*Pelobates fuscus*)

(a) Photograph of the Common Spadefoot Toad



[http://en.wikipedia.org/wiki/File:Pelobates_fuscus_insubricus01.jpg]

(b) Life cycle of an amphibian

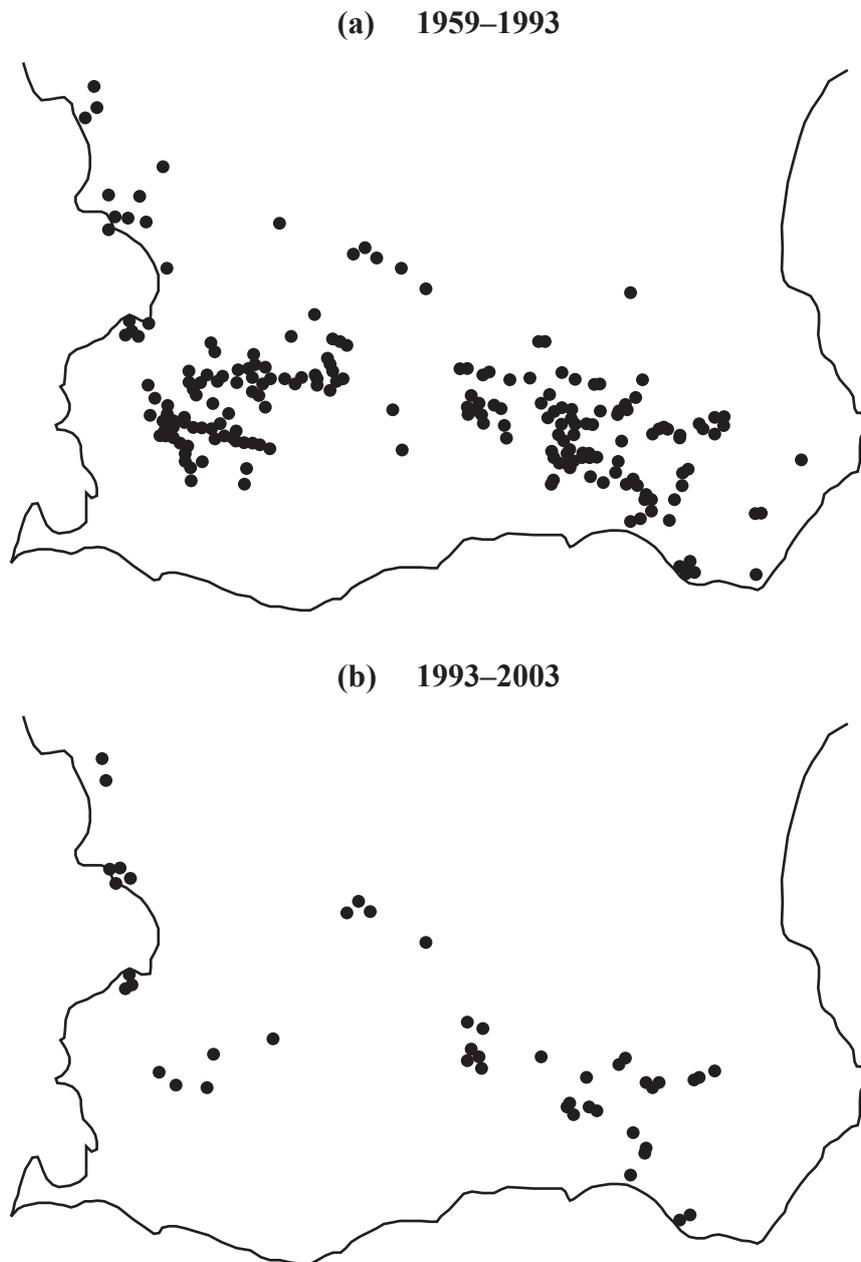


[Source: adapted with permission from www.infovisual.info/02/029_en.html]

(c) Fact file on the Common Spadefoot Toad

- amphibian
- habitat: fields, sand dunes, heathland and gardens
- in winter (November–February), hibernates in deep burrows which toad digs with feet
- range: 500 m from freshwater
- eggs laid in shallow water
- optimal development temperature for eggs: 15 °C
- diet: omnivorous
- threats include: traffic, predation, eutrophication, ultraviolet (UV) radiation, loss of habitat
- Conservation status: least concern

Figure 6 The location of sites in Skåne where the Common Spadefoot Toad was present between 1959 and 1993, and between 1993 and 2003



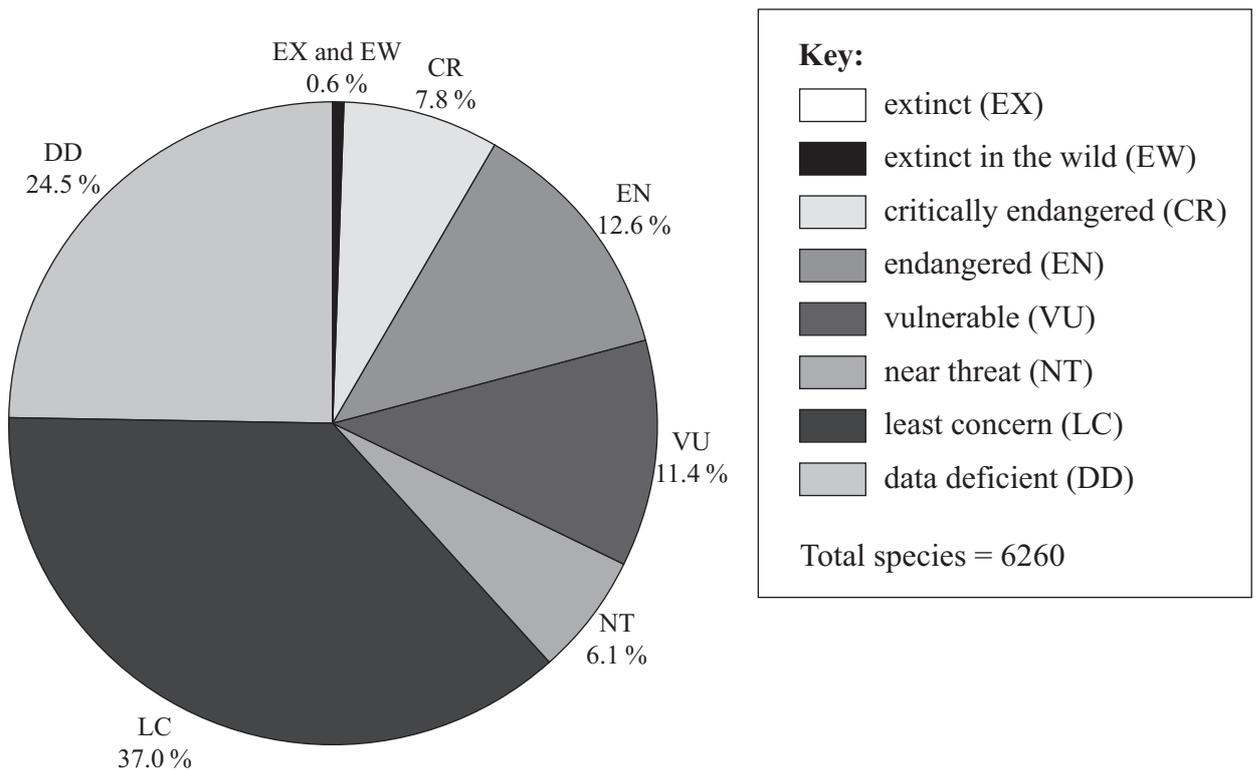
[P. Nystrom *et al.* (2002) "The declining spadefoot toad *Pelobates fuscus*: calling site choice and conservation"
Ecography, 25(4), pp.488–498.]

Figure 7 Soil types in Skåne where Common Spadefoot Toads are present and absent

| Main soil type | Number of surveyed habitats with toads present | Number of surveyed habitats with toads absent |
|----------------|--|---|
| Till | 12 | 116 |
| Clay/Till | 3 | 56 |
| Clay | 1 | 14 |
| Sand | 41 | 37 |
| Silt | 2 | 1 |

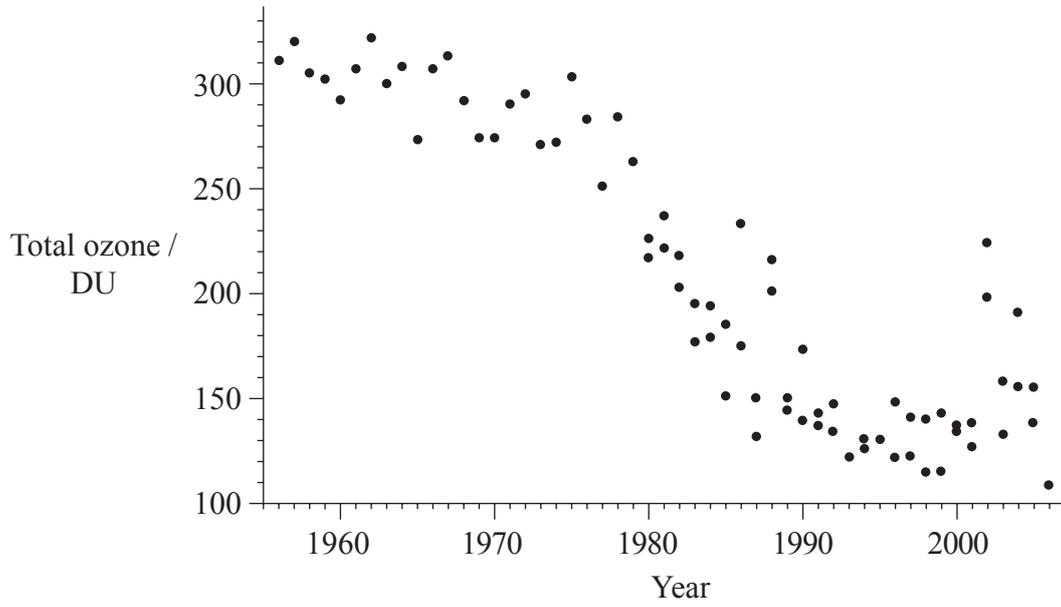
[P. Nystrom *et al.* (2002) "The declining spadefoot toad *Pelobates fuscus*: calling site choice and conservation" *Ecography*, 25(4), pp.488-498.]

Figure 8 2009 Red List conservation status for the 6260 known amphibian species worldwide



[© IUCN (International Union for Conservation of Nature). Used with permission.]

Figure 9 Total amount of stratospheric ozone in Dobson units (DU) recorded between the years 1955 and 2006



[© NASA.]