

Math 20 Fall 2003
§7.1 Eigenvalues and Eigenvectors
November 17, 2003

Problem 7.1.1: The northern spotted owl is native to the mature and old-growth forests in the Pacific Northwest. There has been much concern in the last two decades about the survival of these owls in the face of loss of habitat due to logging. The following is one population model for the northern spotted owl. (See Lamberson, R. H. et al., "A Dynamic Analysis of the Viability of the Northern Spotted Owl in a Fragmented Forest Environment," *Conservation Biology* **6**, 1992, for more information.)

The population of northern spotted owls is divided into three age classes: juvenile (up to 1 year old), subadult (1 to 2 years old), and adult (over 2 years old). The population is examined at yearly intervals. Since it is assumed that the number of male and female owls is equal, only female owls are counted in the analysis.

If there are j_k juvenile females, s_k subadult females, and a_k adult females at year k , then the population of owls could be modelled by the following equation.

$$\begin{bmatrix} j_{k+1} \\ s_{k+1} \\ a_{k+1} \end{bmatrix} = \begin{bmatrix} 0 & 0 & .33 \\ .18 & 0 & 0 \\ 0 & .71 & .94 \end{bmatrix} \begin{bmatrix} j_k \\ s_k \\ a_k \end{bmatrix}$$

What can be said of the long-term survival of the northern spotted owls under this population model?