Math 363   Homework Due Friday, December 1

A country wants to establish a no-fishing zone along its coastal waters to protect a species of fish that grows exponentially. Outside a zone of width L, all fish are harvested by deep-sea trawlers. The fish move about at random in the direction from the shore to the zone's boundary. If L is too small, the destruction of fish may exceed their ability to reproduce which would lead to their eventual extinction.

1. Formulate a suitable model and find the minimum zone width L that prevents extinction from happening. You have to be careful about the boundary conditions because the fish cannot swim on-shore.

2. What is the largest ratio of diffusion proportionality constant to exponential growth rate which allows a 12-mile no-fishing limit? Be clear on your choice of units.