2001 HiMCM

Problem B: Forest Service

Your team has been approached by the Forest Service to help allocate resources to fight wildfires. In particular, the Forest Service is concerned about wildfires in a wilderness area consisting of small trees and brush in a park shaped like a square with dimensions 80 km on a side. Several years ago, the Forest Service constructed a network of north-south and east-west firebreaks that form a rectangular grid across the interior of the entire wilderness area. The firebreaks were built at 5 km intervals.

Wildfires are most likely to occur during the dry season, which extends from July through September in this particular region. During this season, there is a prevailing westerly wind throughout the day. There are frequent lightning bursts that cause wildfires.

The Forest Service wants to deploy four fire-fighting units to control fires during the next dry season. Each unit consists of 10 firefighters, one pickup truck, one dump truck, one water truck (50,000 liters), and one bulldozer (w/ truck and trailer). The unit has chainsaws, hand tools, and other fire-fighting equipment. The people can be quickly moved by helicopter within the wilderness area, but all the equipment must be driven via the existing firebreaks. One helicopter is on standby at all times throughout the dry season.

Your task is to determine the best distribution of fire-fighting units within the wilderness area. The Forest Service is able to set up base camps for those units at sites anywhere within the area. In addition, you are asked to prepare a damage assessment forecast. This forecast will be used to estimate the amount of wilderness likely to be burned by fire as well as acting as a mechanism for helping the Service determine when additional fire-fighting units need to be brought in from elsewhere.