

THE ERADICATION OF ARTHROPOD PESTS introduced from abroad continues to be a very important but controversial strategy for protecting agriculture, forestry, and public health. Approximately one-half of the major insect pests of U.S. agriculture originated overseas; many more dangerous insect pests lurk beyond our borders (Council for Agricultural Science and Technology 1987). MacGregor (1973) listed 35 of the more threatening foreign pest species; this list is shown in Table 1. Eradication of introduced arthropod pests is justified on the following bases:

- New pests increase the costs of production and marketing.
- Some pests are vectors of human diseases, whereas others bite or sting people.
- Pests such as the gypsy moth and elm bark beetles cause extensive environmental damage.
- The presence of some pests induces importing countries to embargo U.S. exports or to require costly quarantine treatments.
- Some introduced pests, if allowed to spread, would cause the use of insecticides to increase greatly. For example, Burditt & Harris (1976) estimated that, if tropical fruit flies were to infest California and the southern states, the use of malathion on fruits and vegetables would increase by more than 14 million pounds per year.
- Eradication of selected pest species would make management of the pests remaining in the pest complex easier, less costly, and ecologically more satisfactory than if they coexisted with these selected pest species (see Rabb 1978).

In 1977, at the annual meeting of the Entomological Society of America, the pros and cons of eradication were debated by L. D. Newsom, R. L. Rabb, E. F. Knipling, and W. C. Eden (Cox 1978). The late Professor Newsom (1978) examined various definitions of eradication. He proposed the definition, "Eradication is the destruction of every individual of a species from an area surrounded by naturally occurring or man-made barriers sufficiently effective to prevent reinvasion of the area except through the intervention of man." I adhere to Newsom's definition throughout this presentation.

As noted by Newsom (1978), "A species will be eradicated when its mortality is continually greater than its recruitment. Eradication occurs

when a species is unable to evolve with sufficient rapidity to keep pace with changing environmental conditions. As environmental changes pass the limits of tolerance of a species, it must evolve to cope with the new conditions or it will be eradicated. To paraphrase one of the late President Truman's often-quoted sayings, 'If it can't stand the environmental heat, it will get out of the evolutionary kitchen.' "

Eradication is technically feasible when a sensitive method is available to detect the pest at low densities and when powerful means are available to suppress the pest. Eradication is accomplished by iteratively delimiting the range of the population and by applying suppressive measures over the whole range so that the range occupied by the pest is progressively reduced toward zero. In operational terms, I suggest that a species may be considered to be eradicated if it has been reduced to a nondetectable level for at least 10 generations.

As explained by Rabb (1972), the strategy of eradication is one of several major strategies of pest management (Fig. 1). When we are confronted with a new pest problem, we must select an appropriate strategy and the methods of suppression on the basis of anticipated economic, ecological, and sociological consequences (see Rabb 1972). In dealing with exotic pests, experience has shown that the strategy of prevention has great merit. Truly, an ounce of prevention is worth a pound of cure. However, once an alien pest penetrates our quarantines, the option of eradication should be carefully and quickly examined. Clearly, our goal must be to carry out eradication programs in ways that are acceptable to people, spare the environment, and have highly favorable potential economic benefits.

The strategy of eradication emerged almost one century ago under the leadership of Charles Henry Fernald (Fig. 2) of the University of Massachusetts, Amherst. Under Fernald's intellectual leadership, Massachusetts attempted to eradicate the gypsy moth, *Lymantria dispar* L., in an 11-year campaign from 1890 to 1901. The gypsy moth had already been in Massachusetts for 20 years when, in 1889, there was a massive outbreak at Medford. Mrs. Fernald (née Maria Elizabeth Smith) established that it was indeed the gypsy moth and not a native insect (Mallis 1971).