



## Invasion of California by exotic pests

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California is particularly vulnerable to attacks by exotic insect pests because of the diversity of its more than 250 semitropical and temperate crops, most of which are of exotic origin themselves; the state's climatic diversity and rapid population growth; and the agricultural industry's relatively recent history that hasn't allowed it to reach equilibrium with the environment of the remainder of North America.

California's biological isolation imposed by deserts, mountains, and the Pacific Ocean was seriously breached with the completion of the transcontinental railroads (1869-1893), expansion of the transcontinental highway system (1926-1960), and the burgeoning of air transport after World War II. A comprehensive list of exotic insect pests established in California between 1769 and 1994, includes 115 species judged to be of major economic importance.

Damages from exotic pest invasions of California are enormous; 50 to 62% of all specific crop losses have been attributed to introduced insect pests. Using the generally accepted loss of 10 to 15% of crop production caused by insect pests, these costs aggregate to about \$1 billion annually. These estimates do not include damages of about \$130 million annually from silverleaf whitefly infestations of desert agriculture nor the potential cost of more than \$1 billion annually, including loss of fruit export markets, if the Mediterranean fruit fly becomes endemic. The Africanized honeybee poses a public health problem and threatens to disrupt commercial honeybee pollination of 47 fruit, nut, vegetable, and forage seed crops valued at \$1.8 billion annually.

Annual property damages from the aggressive Formosan termite could eventually reach 1% of the total value of wooden structures. A host of exotic pests continues to "bug" homeowners and home gardeners. These include cockroaches, the house fly, the Argentine ant, the European earwig, the German yellow jacket, a great variety of aphids, scales, mealybugs, and whiteflies, the mimosa webworm and the iris borer. To reduce these domestic pests to tolerable levels, people often use expensive insecticides. In summation, exotic pests could cost Californians more than \$100 per capita each year.

The establishment of the UC Center for Exotic Pest Research (CEPR) is an important step in meeting present and future challenges posed by exotic pest invasions. The Center will foster cooperation and coordination of research efforts among scientists working on the various UC campuses, as well as for the US Department of Agriculture, the California Department of Food and Agriculture and the agricultural industry. CEPR's first task is to define critical research needs and to implement

vital research programs. The long-term goal of CEPR is to develop a systematic methodology for coping with exotic pests by:

- Conducting risk assessment and analysis of invasion biology.
- Improving techniques for early detection of pest invasions through lures, traps and monitoring.
- Developing control/eradication measures employing biological, cultural, genetic and chemical techniques.
- Exploring the potential of transgenic manipulations to control exotic pests.
- Evaluating the economic and sociological implications of exotic pest introductions.

An important function of CEPR is to facilitate the exchange of ideas on exotic pest research at annual conferences. The first of these, "The Medfly Situation: Defining Critical Research" was held at UC Riverside in November 1994. The proceedings will be published in March. Initial efforts of CEPR will focus on developing new technologies for monitoring the nature and extent of the Medfly infestation, developing less controversial control procedures, and improving the effectiveness of the sterile male program.

Already UC scientists are conducting a wide variety of research and outreach programs dealing with exotic pests affecting our urban, agricultural and natural environments. In June 1992, UC Riverside faculty initiated a baiting-eradication program in San Diego to deal with a newly discovered infestation of Formosan termites (see p. 30). Other UC Riverside scientists have developed a comprehensive management program for the eucalyptus longhorned borer (see p. 34).

For many other exotic pests, a statewide effort is underway. Since 1991, faculty and Cooperative Extension specialists and farm advisors have worked together to develop management strategies for the silverleaf whitefly. UC scientists serve on a steering committee to coordinate agency response statewide to the Africanized honeybee, as well as conducting research on such important issues as defensive behavior, swarm control and genetics.

The rate of exotic pest introductions continues unabated despite rigorous quarantine and inspection programs by regulatory agencies. Over the past 20 years, initial infestations of 23 major pest species have been found. These include Mediterranean fruit fly (1975), yellow-fever mosquito (1979), apple maggot (1983), boll weevil (1984), Africanized honeybee (1985), Russian wheat aphid and white-fringed beetle (1988) and Formosan termite (1991). Continuing invasions are inevitable primarily due to increasing tourism, expanding international air traffic, immigrations from tropical and semitropical countries, and free trade agreements that weaken quarantine regulations.