Household Willingness to Pay for Biological and Chemical Public Pest Control Programs

by Karen M. Jetter, James A. Chalfant and Karen M. Klonsky

How much are Californians willing to pay to control newly discovered urban pests? UC study provides some answers.

Every year new pests enter the urban landscape from other areas. When a pest is new to an area, there may be no natural enemies there that can control it. In California, one or two of the new pests that enter it each year will become a nuisance and damage or kill trees in the urban landscape. Consequently, people in charge of the care of urban trees in public areas will need to undertake some type of public pest control program in order to manage the infestation. One way economists ascertain the extent of public support for taking some action is by determining the public's willingness to pay for control. This monetary measure can be thought of as the answer to the familiar question, "Would you pay $X for this good?" A greater willingness to pay corresponds to a higher level of net benefits to residents affected by an infestation. Similarly, alternative pest controls may be ranked, according to desirability, by these monetary measures.

In a wide range of settings, the willingness-to-pay concept has been applied by economists to place monetary values on public goods such as cleaner air or the preservation of a particular wilderness area. Our study looks at the household willingness to pay for alternative public pest control methods to reduce newly discovered pests in urban neighborhoods. The results provide information concerning both the overall level of support for pest control and the public's willingness to pay for environmentally benign methods.

When trees are lost or damaged due to insects or disease, aesthetic quality decreases drastically and public pressure develops for more active street tree management. In a study of insect damage on street trees in Norfolk, VA during 1988, 50 percent of the requests for public pesticide applications were for trees with less than 5 percent defoliation. In a series of studies a general pattern emerged, indicating that the majority of people perceive a reduction in the aesthetic beauty of trees at less than 10 percent defoliation, and start engaging in activities to prevent that damage.

Over the past few decades, however, there has been increasing awareness of the negative impacts to the environment and the potential harmful health effects due to pesticide pollution of water and soils. As knowledge about the negative impacts of pesticides grows, private citizens and environmental groups are actively seeking to limit the use of pesticides in urban areas. Another disadvantage to chemical pesticides is that they do not control pest infestations permanently. As a result, they must be reapplied in order to prevent defoliation or tree death in urban environments. The problem is thus how to prevent pesticide pollution, while at the same time maintaining a tree's aesthetic beauty, when faced with a newly discovered pest infestation.

Biological methods are one alternative to chemical controls. These methods have little or no environmental impacts. Biological methods include the use of bacterial sprays, pheromone traps, and the introduction of a natural enemy that will attack the pest. Bacterial sprays and pheromone traps provide immediate control of pests with little environmental impacts. The drawback is that bacterial sprays must be reapplied, and pheromone traps replaced periodically, if a pest infestation is to be managed successfully.

The process of introducing a natural enemy into a landscape is known as a classical biological control program. The natural enemy becomes a permanent part of the ecosystem and will result in the permanent reduction of pest populations, so that no further pest management actions will need to be undertaken. The problem is that it takes time to identify, import, rear

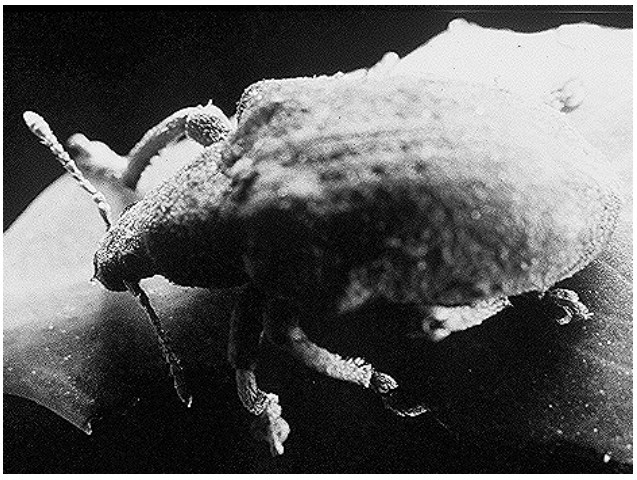


Photo courtesy of Larry Hanks

Eucalyptus Snout Beetle, defoliating pest of eucalyptus trees.

PEST CONTROL—continued on page 6

Pest Control—*continued from page 5*

and release the natural enemy. It also takes time for the natural enemy to spread completely throughout the landscape and achieve effective control.

Because the control of newly introduced pests is usually completed by public agencies, there are no market prices that can be used to measure the demand for the alternative methods. However, non-market valuation techniques have been developed to estimate the demand, or willingness to pay, for public goods. Two techniques are the contingent valuation method and the contingent ranking method. The contingent valuation method (CVM) asks people if they would be willing to pay at least a hypothetical cost that is presented to them by a researcher. The yes/no responses to that question may be used to estimate household willingness to pay for different pest control techniques.

With the contingent ranking method, a scenario describing the public good's individual attributes is presented. The attributes include changes in the quality of the good and the price for receiving the entire bundle of attributes. The attributes are varied in different scenarios to respondents. Respondents are then asked to rank their preferences for each scenario. The responses allow researchers to estimate the value placed on, or marginal willingness to pay for, each attribute by the respondents.

A phone survey asking households in Southern California both contingent valuation and contingent ranking questions was used to evaluate three alternative public pest control programs to manage a newly discovered pest, the eucalyptus snout beetle. Discovered in Ventura County in March 1994, the eucalyptus snout beetle, *Gonipterus scutellatus*, feeds on the leaves and tender shoots of susceptible eucalyptus species, especially manna gum and blue gum species. Since 1994, it has been identified in Los Angeles County and is expected to spread to other areas. Feeding by the snout beetle and its larvae damages a tree by causing defoliation, stunting, and, over time, tree death.

Prior to the phone interview a booklet describing three alternative public pest management programs was sent to each participating household. The three programs were to spray with a chemical insecticide, Carbaryl, spray with a bacterial insecticide, *Bacillus thuringiensis var. tenebrionis* (*Btt*), or to import and release a natural enemy, *Anaphes nitens*, a stingless wasp. The booklet described what the pest problem was, what would happen if no pest control took place, how the different pest control programs worked to control the snout beetle, and the environmental impacts of each program. For simplicity, it was stated that the use of any of the programs would result in the same aesthetic benefits. An information sheet was provided in the booklet that summarized the program characteristics and the cost of each program. The program characteristics and cost were varied over 48 different versions.

The primary difference between the chemical and bacterial spray programs is in the environmental impacts. The primary difference between the bacterial spray program and the classical introductory biological control program is in the long-run effectiveness of the method used to control the snout beetle. As a result, the marginal willingness to pay for the pest control programs can be related not only to the environmental characteristics, but also to the effectiveness of each program.

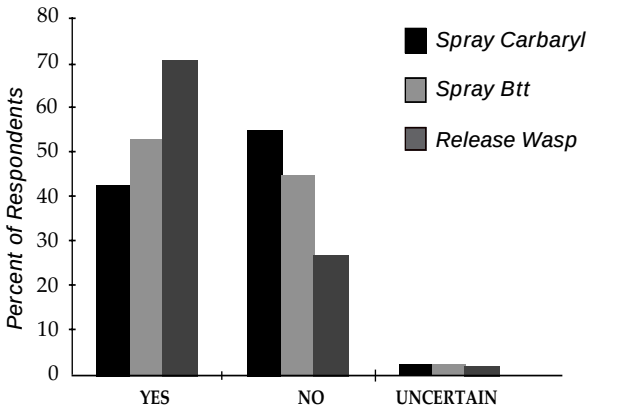
Each respondent was asked to rank the alternatives based on how long it would take to control the pest, the environmental impact of the pest control input used, the effectiveness of the program (was it permanent or were reapplications necessary) and the cost of the program. Finally, respondents were asked if they would support the implementation of that program if they had to pay the cost specified for it.

Contingent Valuation Responses

The responses to the contingent valuation questions show the most support for the biological alternatives, even at the relatively higher prices. A majority of respondents, 71 percent, would support the release of parasitic wasps at the price stated in the survey (Figure 1).

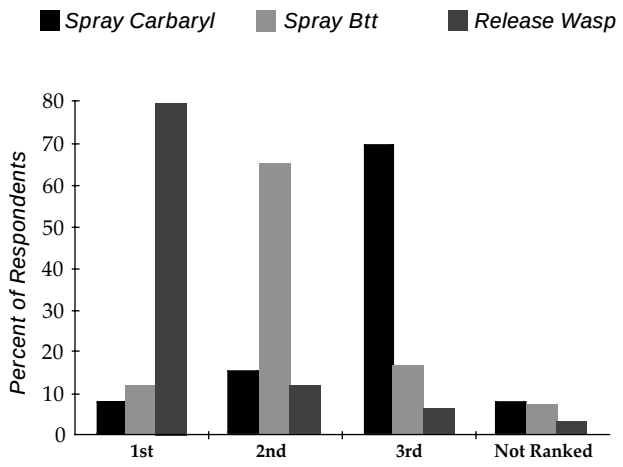
Slightly more than half of respondents, 55 percent, said that they would not vote to support the program

Figure 1. Support for Each Pest Control Program



Pest Control—*continued from page 6*

Figure 2. Program Rankings



to spray Carbaryl and 43 percent would vote to support it. More than half of the respondents, 53 percent, stated that they would support the program to spray *Btt*, given the characteristics and costs of the program on the information sheets they received. The remaining respondents were either uncertain about whether they would support the program, or did not answer the ranking question and so were not asked the support question.

The attributes that were significant in determining whether someone would be willing to pay the stated price of a program were the environmental characteristics of the program, how often Carbaryl and *Btt* needed to be reapplied every year, if there were eucalyptus trees in the neighborhood, and household income. Interestingly, how long it took before the wasp was able to effectively control the snout beetle was not important. Based on the responses to the support questions, median annual household willingness to pay was $27 for the option to spray Carbaryl, $135 for the option to spray Btt, and $490 for the wasp release program.

Contingent Ranking Responses

An overwhelming majority of the respondents preferred the release of the stingless wasp, *Anaphes nitens*, over the other two programs (Figure 2). The majority of respondents, 79 percent, ranked releasing the wasp as their most preferred program. Sixty-five percent ranked spraying *Btt* as their second most preferred program, and 69 percent ranked spraying Carbaryl as their least preferred program. The program to spray Carbaryl was ranked first by the smallest percent of respondents. Some respondents did not rank any programs, and some ranked only their most preferred program. If only one program was ranked, it tended to be the wasp program.

The attributes that were important in determining how the alternative programs were ranked were the environmental differences, the relative prices of the programs, if it was the wasp option, and the respondent's level of education. Both how long it took before the wasp program became effective, and the number of times Carbaryl and *Btt* needed to be reapplied each year, were not a factor in deciding how to rank the programs. Based on the responses to the contingent ranking question the willingness to pay for each attribute was $339 for being a biological control as opposed to a chemical control, $19 for the additional benefits of the wasp option, $0 for each additional application in the spray programs, and -$10 for each additional year the respondent waited before the wasp became effective. The results of the survey indicate that there is a preference for biological control methods, unless chemical methods are relatively cheaper. However, even at low prices, many people still do not support the use of chemical public pest control methods.

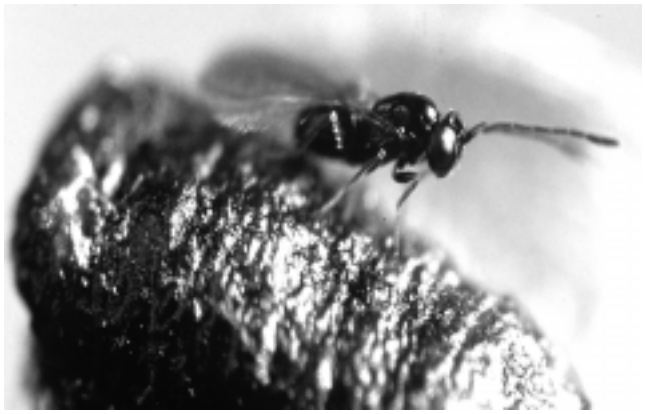


Photo courtesy of Larry Hanks

Anapheles nitens, *wasp parasite, laying eggs in Eucalyptus Snout Beetle egg case.*

Karen Jetter is a Ph.D. candidate in the ARE department at UC Davis. She can be contacted by e-mail at jetter@primal.ucdavis.edu.

James Chalfant is a professor in ARE and can be contacted by phone at (530) 752-9028 or by e-mail at jim@primal.ucdavis.edu.

Karen Klonsky is an Extension Specialist in the ARE department. Dr. Klonsky can be reached by telephone at (530) 752-3563 or by e-mail at klonsky@primal.ucdavis.edu.