

PROJECT REPORT

Project Title: ECONOMIC IMPACTS OF RODENT AND BIRD DAMAGE TO VULNERABLE CROP/COMMODITY-PRODUCING COUNTIES

Research Agency: National Wildlife Research Center

Principal Investigator: Stephanie Shwiff

Budget: \$98,728.00

Background:

California is the nation's greatest producer of agricultural crops and commodities (California Department of Food and Agriculture, 2005). The State ranks first in the production of numerous crops and commodities. In 2004, total valuation of this agricultural production was \$31.8 billion, with fruit and nut crops, livestock and poultry commodities, vegetable and melon crops, greenhouse, nursery and floriculture, and field crops comprising \$9.66, \$8.62, \$7.28, \$3.31, and \$2.93 billion, respectively (California Department of Food and Agriculture, 2005).

Extensive scientific literature exists to document pest-induced impacts upon agricultural crops and commodities. However, the majority of this literature focuses on crop damage due to insects and the use of integrated pest management (IPM) strategies to control impacts (Kogan, 1998). A much smaller portion of research papers document rodent- and bird-caused losses to agriculture (e.g., Cummings et al., 1998; Salmon et al., 1984). During the mid-1990s, the Vertebrate Pest Control and Advisory Committee funded economic research to delineate statewide total impacts of vertebrate pest damage to 19 crops and commodities (Hueth et al., 1997). This was a significant step in the estimation of small mammal- and bird-caused damage to California Agriculture. While the models were sound, estimation of the indirect and induced economic impacts associated with vertebrate pest damage to crops was absent, making this estimate of total crop damage potentially significantly understated. A generic computation model was used that assigned rough per unit area loss values to the 19 crops and commodities under study. One way to quantify economic impacts of rodent and bird damage is through the use of IO models. These models have long been used by economists to quantify the economic impact that results from "shocks" to a regional economy. Input-output modeling creates a mathematical representation of the regional economy which then can be used to "model" how crop and commodity damage (shock) can affect jobs and revenue, for example. IO models allow the

analyst to consider three rounds of impact: direct, indirect and induced. Direct effects are the initial shock from the damage caused by birds and rodents. Indirect effects represent the second round of impact as the local economy responds to the initial shock caused by damage done to crops by rodents and birds. Lastly, induced effects are the third and final round of the direct shock as it diffuses through the wider regional economy. The total impact to the county economy is the sum of all of these effects.

Here, we describe economic research to expand upon the earlier work of Hueth et al. (1997). We propose to provide rodent and bird damage estimates based upon empirical values cited in scientific literature. Additionally, using IO modeling techniques, specific impacts to a set of counties can be projected. Specifically, this proposal describes economic research to quantify the impacts of diverse rodent- and bird-caused damage to California's major crops and commodities. The effort will entail a step-wise approach involving: (1) acquisition of recent empirical estimates of rodent- and bird-caused damage to the State's major crops and commodities, (2) developing scenario-based assessments of projected losses for these crops and commodities, and (3) projecting the impacts of these scenario estimates using state-of-the-art IO models to quantify the impacts for the 10 counties that lead the State in production of crops and commodities which are also determined to incur rodent- and bird-caused loss.

California is the nation's largest producer of agricultural crops and commodities. The State ranks first in U.S. for production of 81 crops and commodities. In 2004, total valuation of this agricultural production was \$31.8 billion. Vertebrate pest damage to these crops by numerous rodent and bird species can be significant and have substantial economic consequences.

Quantitative economic assessment of the impacts of this damage is possible through the use of sophisticated input-output (IO) models that provide a range of state-of-the-art estimates of the total economic impact of crop damage caused by vertebrate pests. Estimation of county-level economic impacts from rodent- and bird-caused damage requires current empirical inputs of specific magnitudes of crop or commodity loss. The current proposal describes a 2-year effort (Oct. 2007-Sept. 2009) to identify major crop impacts of rodents and birds within California. The research will provide a unique and current review of the scientific literature that documents rodent- and bird-caused damage to California's major crops and commodities. Empirical estimates of these reported losses will be used in a scenario-based approach to project the estimated losses incurred for these crops and will serve as inputs to an Impact Analysis for Planning (IMPLAN) model to determine economic impacts in the top 10 agricultural counties for the identified crops/commodities.

The main deliverable will be a Final Report that will include: (1) an up-to-date review of the vertebrate pest literature focused on empirical damage to the State's leading crops and commodities, (2) scenario-based projections of the monetary loss associated with reported estimates of rodent- and bird-caused losses for the leading crops and commodities and (3)

modeled economic impacts (e.g., lost jobs, revenues) of the rodent- and bird-caused damage to the 10 counties associated with most-damaged crops and commodities.

Objectives:

1. Determine the empirically-reported nature and magnitude of damage caused by rodents and birds to major crops and commodities for which California is the top U.S. producer; provide a critical review and analysis of this literature.
2. Develop scenario-based projections of the magnitude of these economic losses within the State.
3. Conduct an IMPLAN analysis of the job and revenue impacts attributed to the projected rodent- and bird-caused losses of the impacted crops and commodities for the 10 leading agricultural counties of the State.

Summary:

A Final Report was delivered to the California Department of Food and Agriculture titled:

‘The Economic Impact of Bird and Rodent Damage to California Crops’

The following is the Executive Summary from the report:

Agricultural pests, such as birds and rodents, damage crops and can cause significant economic impacts through reducing the growers’ ability to provide agricultural commodities to the market. When this occurs, the broader economy suffers due to reduced production and fewer commodities for processing and sale. If the agricultural sector plays a major role in the economy, the multiplier effects of this type of damage may be great since the agricultural sector typically provides inputs to almost all other sectors in the economy (i.e., manufacturing, retail trade, and accommodation and food service). In California, agricultural production is a cornerstone of the state economy, and more broadly, agricultural production in California is important to the nation. California produces nearly \$39 billion worth of agricultural products annually, making it the top producer in the U.S. The state ranks first in the nation for the production of avocados, grapes, processing tomatoes, and many other crops. It is the sole producer of the nation’s almonds, artichokes, figs, olives, and walnuts.

Bird and rodent pests, such as blackbirds and gophers, consume and damage crops in California, reducing crop yield and quality, and impacting all aspects of the economy, not just the individual grower. In 1974, it was estimated that vertebrates caused \$12.75 million in damage to California crops, and in 1998 university researchers estimated the California ground squirrel alone caused between \$8 and \$12 million in damage to California crops. In an effort to combat this damage, growers often use a variety of pest control measures including pesticides, trapping and exclusionary fencing. These methods reduce damage but impose a cost to producers. These pest-control expenditures, however,

represent a contribution to the general economy as the individual grower spends money purchasing pesticides, fencing material or traps.

The California Department of Food and Agriculture's Vertebrate Pest Control Research Advisory Committee collaborated with the USDA National Wildlife Research Center's Economics Project on a study to quantify the economic impact of bird and rodent damage to 22 different agricultural commodities in 10 different California counties. The direct cost of bird and rodent damage was estimated as the value of the decreases in yield of each individual crop in each of the 10 selected counties. An input-output model was used to estimate all potential impacts to California economy related to bird and rodent damage to the targeted crops and pesticide related expenditures in the selected counties. The total economic impacts associated with this damage were assumed to be the sum of all of the individual components.

Major results were:

The total estimated revenue lost in the 10 counties annually due to bird and rodent damage to 22 different crops ranged from \$168 million to \$504 million (in 2009 dollars).

The total estimated number of jobs lost in the 10 counties annually associated with the presence of bird and rodent damage to 22 different crops ranged from 2,100 to 6,300.

Monterey County reported the greatest decrease in revenue and jobs from bird and rodent damage at a range of \$44 million to \$128 million in annual revenue and 515 to 1514 in employment annually.

The total estimated revenue gained in the 10 counties annually due to pest control expenditures to prevent bird and rodent damage to 22 different crops was approximately \$38 million (in 2009 dollars).

The total estimated number of jobs created in the 10 counties annually associated with pest control expenditures to prevent bird and rodent damage to 22 different crops was approximately 692.

San Joaquin County reported the greatest increase in revenue from pest control expenditures to prevent bird and rodent damage at \$7.5 million annually.

Kern County reported the greatest increase in employment from pest control expenditures to prevent bird and rodent damage at 152 jobs created annually.

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