Grant Proposal to
CDFA Vertebrate Pest Control Research Advisory Committee

Date: August 1, 2006

Title: **EVALUATION AND CONTROL OF WILD TURKEY DAMAGE IN CALIFORNIA VINEYARDS**

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Project Duration	1/1/2007	to	12/31/2008
Total Budget Request	$120,417		

Overall Goal of Proposed Project

The overall goal of this research is to make an objective assessment of actual damage caused by wild turkeys in vineyards and to develop effective aversion strategies that could be used in vineyards and other agricultural areas, and perhaps be adapted for nonagricultural settings.

Introduction

Background

The wild turkey (*Meleagris gallopavo*) is a non-native bird, first released into California by ranchers on Santa Cruz Island in 1877. The California Department of Fish and Game (CDFG) released wild turkeys starting in 1908 with the intent of establishing a new species for hunting, and the releases continued until 1999, with most occurring between 1959 and 1999. During that period nearly 4,000 wild-caught birds from other western states were introduced to many locations ranging from San Diego County to Siskiyou County. As a consequence, wild turkeys are currently established in much of the lower elevation oak woodlands of the Sierra Nevada foothills and Coast Ranges, including the central coast, north coast through Mendocino County, south coast in San Diego County, and the foothills of the Klamath and Cascade mountain ranges of northern California.

The wild turkey population has recently increased noticeably in many regions of the state. The latest CDFG research estimates there were 242,000 wild turkeys (Gardner 2004), up significantly from an estimated 100,000 birds a decade ago. This population increase is supported by data from Breeding Bird Surveys conducted in the spring by the US Fish and Wildlife Service and Christmas Bird Counts conducted in the winter by the Audubon Society. Both surveys show a marked upward trend in turkey numbers starting around 1980 and continuing through the present (Sauer et al. 2005). Turkeys are now found in many locations where they were never previously observed (e. g., UC Davis campus in Yolo County, P Gorenzel personal observation).

Description and Extent of Problem

The growing wild turkey population and expanding range have resulted in conflict with human interests. Complaints include turkeys causing a nuisance in residential areas, damaging gardens and landscaping, and fouling yards and walkways. CDFG reports these problems have grown from rare to common in the past 5 years, especially in areas east and north of San Francisco Bay and in the Sierra Nevada foothills (Gardner 2004).

Complaints of agricultural damage have also increased, particularly from wine grape growers. Primarily in response to these complaints, the state legislature adopted changes in 2004 to the Fish and Game Code (sections 4181 and 4188) which provided for the issuance of depredation permits to landowners. The permit would allow the killing of wild turkeys damaging crops or other property. The changes took effect in January 2005. Since then, 88 depredation permits have been issued, authorizing the take of 283 wild turkeys. Twenty of those permits (23%) were issued to vineyards for 118 turkeys. Only 8 turkeys have been reported taken from 4 vineyards. CDFG notes the take statistic is probably under reported (T. Blankinship, CDFG, personal communication). Information on the success of depredation permits for controlling turkey damage is not available.

Previous Research or Outreach Efforts Related to This Proposal

Prior to the adoption of depredation permits, the National Wild Turkey Federation (NWTF) conducted a study in 2002-03 on 9 vineyards in California to document the species of wildlife damaging wine grapes (Mathis and Hughes 2005). Remote-sensing still cameras were used to identify the wildlife species in vineyards eating grapes. They recorded 268 turkeys in the test vineyards, 15 of which were photographed eating grapes. It was concluded that turkeys were not significant depredators of wine grapes. The authors also suggested that other species (e.g., raccoons, deer, and ground squirrels) were more damaging based on the percentage of photographs that showed these species feeding on grapes. The NWTF presented the results of the study at a workshop in March 2005. Several growers at the workshop claimed more damage than was documented by the cameras (SCGGA News 2004) and there apparently was discussion about cameras in operation when the grapes were not ripe, thus turkeys did not feed on the grapes.

The NWTF study had several limitations. First, the cameras did not allow quantification of the damage caused by the individual species. A wild turkey may consume more grapes during a feeding session than a ground squirrel. Second, the study did not account for differences in foraging behavior. A ground squirrel typically returns to the same location once a source of food is found and, thus, could be photographed several times over the course of a day. Turkeys, on the other hand, tend to continually move as they feed, thus reducing the time spent in the camera's field of view. Third, the report did not indicate if the study sites were all the same grape variety. Different grape varieties (e.g., Chardonnay vs. Pinot noir) ripen at different times, which in turn affects the period when they are attractive to wildlife. For example, starlings are known to start damage when the grapes are about 16 brix and show preference for one variety over another. It is likely that wild turkeys also behave in this manner.

Current Control Techniques or Outreach Efforts Related to This Proposal

Crop damage by wild turkeys is difficult to prevent. Control techniques commonly used for deer (fencing) or songbirds (reflective tape, propane canons) in vineyards are ineffective for wild turkeys. Growers have reported limited success with bird netting, but netting is expensive and not in use at many vineyards. There are no toxicants or repellents for wild turkeys. Some success has been reported with constant patrols on all-terrain vehicles and harassment by dogs that chase the turkeys. NWTF recommends spring hunting to keep wild turkeys away, but hunting is not possible in many locations due to safety considerations.

Biosonics (the use of natural alarm or distress calls) have not been examined for wild turkey control. Wild turkeys are a highly social and vocal species, with a vocabulary of 28 distinct calls (Healy 1992). The alarm call, or putt, is a relatively simple call in number of notes, note length, and pitch, but variations in the alarm putt transmit information about the degree of alarm. Depending on the volume, an alarm putt may cause birds to simply raise their heads or flush instantly. Based on previous experience, we think wild turkeys are a good candidate for biosonics.

Need for Research or Outreach

Recently we presented the results from our research project on bird control in vineyards (CDFA Contract 02-0399) at a workshop in St. Helena sponsored by the Napa Sustainable Winegrowing Group. Although the target birds for this research were starlings, finches, and robins, a large majority of the growers attending the workshop voiced concern about wild turkeys causing damage. Based on an analysis of previous research, our observation of turkey depredation in research vineyards at UCD, and the continuing chorus of grower complaints, we conclude that the problem needs an objective assessment of actual damage in wine grapes and the evaluation of potential control methods.

Benefit to California Agriculture

This project will determine the geographic extent of wild turkey damage to vineyards in California and provide an economic valuation of damage in vineyards. This in turn will help vineyard managers determine if a cost-effective control program can be implemented. This project will also develop a new technique for the "control toolbox", namely broadcast alarm/distress calls, which could then be part of an integrated control program.

Expected Results or Benefits

1. A determination of the extent and economic value of wild turkey damage in vineyards.
2. Development of a new technique for control of wild turkeys in vineyards.

Specific Objectives

1. Determine the extent and significance of damage to wine grapes by wild turkeys in California vineyards.
2. Identify wild turkey alarm and distress calls and evaluate their effect on foraging behavior.
3. Develop a field protocol for using broadcast alarm/distress calls in vineyards and measure the effect on damage levels.

Research Plans and Methodology for Each Objective

1. Survey growers and farm advisers in all grape production areas of California to assess the extent and significance of depredation in vineyards due to wild turkeys.
2. Review current methods for controlling turkeys in orchards, vineyards, crops, residential areas, and recreational areas.
3. Gather alarm and distress calls from various sources, including the NWTF, the National Wildlife Research Center, and university laboratories (Cornell, Ohio State). Digitize and edit the call sequences for playback in the field.

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4. Identify 5-10 potential test sites for damage measurements. Study sites will be selected that allow exclusion of other possible depredators (e.g., deer fencing around a vineyard eliminates deer as a potential depredator, absence of nearby ground squirrel colonies eliminates squirrels).
5. Perform preliminary tests in the field to determine how wild turkeys respond to broadcast calls.
6. Develop experimental methods to quantify the damage caused by wild turkeys. Sampling schemes similar to those used in our previous project on bird damage in vineyards will be adapted to allow estimation of the amount of damage. The ability to identify and distinguish wild turkey damage from damage caused by other species is an essential component of quantifying damage. Based on several inspections of vineyards at UCD, we determined that damage by wild turkeys can be separated from damage by starlings, robins, house finch, and ground squirrels. Grape clusters damaged by wild turkeys were typically the lowest bunches on the vines; 2½ - 3 ft above the ground on the vines we inspected (Fig. 1). Most berries were plucked leaving only the rachis, but some at the interface between the plucked berries and the remaining berries were pecked, leaving the slashed skin attached to the rachis (Fig. 2). Most of the damaged bunches had the appearance of being half-eaten, with the grapes missing from the lower half of each bunch.
7. Time-lapse video recording on selected sites will confirm wild turkey presence and provide information on feeding behavior and daily activity patterns.
8. Continue tests of alarm/distress calls and select sequences that have the most desirable effect on turkey foraging behavior
9. Adapt the vineyard broadcast units for use with controlling turkeys and record the alarm/distress calls determined to have the greatest aversion potential. Various sensing methods will be evaluated for activating the broadcast units only when the turkeys are present, including ultrasonic, passive infrared, and sound activated systems.
10. Develop a field protocol for damage control in vineyards using the broadcast units and turkey alarm/distress calls.
11. Conduct tests at the selected sites to determine the effect of wild turkey alarm/distress calls on damage in vineyards, including quantification and distinction of damage due to turkeys. Assess the potential for habituation to the broadcast calls.
12. Analyze the data and determine overall damage levels due to turkeys, as well as the effect of alarm/distress calls using the field protocol
13. Consider extension of turkey aversion strategies to other crops, residential areas, and recreational areas.
14. Summarize the results and develop a website to post the information. Present the findings at appropriate grower meetings.

Figure 1. Grape clusters damaged by a wild turkey in a vineyard at UCD.

Figure 2. Damaged grape cluster with berries plucked from the lower half but also some pecked berries higher up the bunch near the undamaged berries.

Literature Cited

Gardner, S. 2004. Strategic plan for wild turkey management. State of California, The Resources Agency, Department of Fish and Game. 41pp.

Healy, W. M. 1992. Behavior. Pages 46-65 *in* J. G. Dickson, editor. The wild turkey - biology and management. Stackpole Books, Harrisburg, Pennsylvania, USA.

Mathis, R., and T. Hughes. 2005. Do wild turkeys eat wine grapes? Practical Winery & Vineyard. 27(4):40-44.

Sauer, J. R., J. E. Hines, and J. Fallon. 2005. The North American Breeding Bird Survey, results and analysis 1966 - 2005. Version 6.2.2006. USGS Patuxent Wildlife Research Center, Laurel, Maryland

Budget:

	FY 1 7/1/08-6/30/09	FY2 7/1/09-6/30/10	FY3 7/1/10-12/31/11	Total
Personnel: Salary				
Biologist (25%, $60,000 yr. + %cola)	7,500	15,450	7,956	30,906
Engineer (25%, $60,000 yr + % cola)	7,500	15,450	7,956	30,906
Personnel: Benefits				
Biologist (30% of Salary)	2,250	4,635	2,387	9,272
Development Engineer (25% of Salary)	1,875	3,862	1,989	7,726
Subtotal	**19,125**	**39,397**	**20,288**	**78,810**
Travel:				
Truck rental (3 mo @ $700/mo)	2,100	2,100	2,100	6,300
Per diem (24 days @ $100/day)	2,400	2,400	2,400	7,200
VPCRAC meetings (2 trips @$400 ea)	800	800	800	2,400
Subtotal	**5,300**	**5,300**	**5,300**	**15,900**
Equipment:				
Time lapse camera system	5,000	0	0	5,000
Subtotal	**5,000**	**0**	**0**	**5,000**
Supplies and Expenses:				
Survey costs	500	-	-	500
Electronic parts	500	1,000	-	1,500
Field supplies	500	500	500	1,500
Video supplies	-	1,000	500	1,500
Subtotal	**1,500**	**2.500**	**1,000**	**5,000**
Total Direct Costs:	**30,925**	**47,197**	**26,588**	**104,710**
Overhead: (15%)	**4,639**	**7,080**	**3,988**	**15,707**
Total:	**35,564**	**54,277**	**30,576**	**120,417**

Supplemental or Matching Funds:

None.