Vertebrate Pest Control Education and Outreach for Dealing with California Wildlife Pests

Ryan S. Krason, **Lorin L. Lima**, and **Terrell P. Salmon**
University of California Cooperative Extension, San Diego County, San Diego, California

ABSTRACT: This project was undertaken to provide a flexible multimedia education and outreach program on vertebrate pest control in agricultural settings. The target audience for this concept is the California agricultural industry and urban members of the public who are dealing with California ground squirrel, pocket gopher, and meadow vole problems. Online users are able to access various learning tools for all three species. Each program consists of an interactive training course, video learning, study guide, two section quizzes, and a final exam with an option to obtain 2-hours of California Department of Pesticide Regulation (DPR) or Structural Pest Control Board (SPCB) continuing education credit. The site also has a Facts and Questions section, podcasts of the training programs, and links to a YouTube, Facebook, and Twitter pages. The training programs are available to DPR certified pesticide applicators, SPCB licensed applicators and the general public. All educational content is capable of being added to or amended from any location, via the Internet. In addition to educating users, the website seamlessly collects statistical data and voluntary information from users (i.e., email messages and website comments). The success and wide availability of internet-based training programs demonstrate the site's potential for use in statewide continuing education and in pesticide applicator certification efforts related to vertebrate pest control.

KEY WORDS: anticoagulants, California ground squirrel, continuing education credit, interactive training, meadow vole, *Microtus californicus*, pocket gopher, rodent control, *Spermophilus beecheyi*, *Thomomys* spp., vertebrate pest education

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INTRODUCTION

In order to manage the growing number of incidents of human-wildlife conflicts in California, controlling some wildlife pests with rodenticides, fumigants, and traps is necessary. Growers and others routinely conduct vertebrate pest control efforts. In reviewing past failures in vertebrate pest control programs and the problems associated with controlling vertebrate pests, it is obvious that lack of training and understanding is the key to many recorded issues involving non-target wildlife and other control program failures.

There are very few content-specific materials immediately available for growers, land managers, trappers, and members of the public on methods and materials for vertebrate pest control. Most of these are on-site trainings. Thus, there exists an opportunity to develop affordable continuing education for growers, trappers, and others using the Internet and other social-type media. Vertebrate pest control education and outreach can have a tremendous positive impact on California agriculture.

Current vertebrate pest management methods in California use an Integrated Pest Management (IPM) approach. An essential part of these management programs is the use of rodenticide baits such as anticoagulants (chlorophacinone, diphacinone) and zinc phosphide. Each of these rodenticides is registered for agricultural uses in California, and almost 1 million pounds of finished baits are used each year in the state (Clark 1994a,b,c; Salmon et al. 2000, Timm et. al. 2004).

The U.S. Environmental Protection Agency (EPA) recently issued a proposed Risk Mitigation Decision for rodenticide bait products containing the following 9 active ingredients: brodifacoum, bromadiolone, difethialone, chlorophacinone, diphacinone, warfarin, zinc phosphide, bromethalin, and cholecalciferol (US EPA 2008). This decision was based on EPA's evaluation of the ecological risks associated with the use of rodenticide bait products containing these 9 active ingredients. EPA is forcing labeling changes to mitigate the potential risks associated with bait products containing any of the 9 rodenticides. The changes will classify chlorophacinone and diphacinone for agricultural uses as Restricted Use Pesticides (with an exception for baits that area applied below ground, e.g., for control of pocket gophers). This classification will limit the use of these common baits to certified pesticide applicators. EPA's hope is that certified applicators will have sufficient training to know when and how to use these products in order to limit risks. Unfortunately, the current certification processes do not necessarily ensure the certificate holder has an adequate knowledge about specific rodenticide uses in agricultural areas.

Proper use of rodenticides is especially important because the active ingredients can pose risks to non-target wildlife, pets, and children when applied as bait products. The risks are from primary exposure (direct consumption of rodenticide bait) for all compounds, and secondary exposure (consumption of poisoned rodents by predators or scavengers), mostly associated with anticoagulants (Salmon 2007).

This project was undertaken to provide a flexible multimedia education and outreach program on vertebrate pest control to help bait applicators better understand the practical use and application of rodenticides and other vertebrate pest control methods. This training program will serve as a key tool in the continuing education and maintenance of pesticide applicator certification.

FRAMEWORK DEVELOPMENT

Our overall goal was to develop a comprehensive multimedia education and outreach program that provides users with the ability to self-educate and self-test using an interactive online training program about vertebrate pest control. The main objective of this project was to develop various program delivery methods including web-based, web broadcast, kiosk-based, email managed, in-person training, and a correspondence course. These training programs were designed with this objective in mind.

The key features of this approach are its innovativeness, flexibility, and ability to respond rapidly to changing rules, regulations, laws, and accepted pest management practices. Each program contains content developed from existing and proposed regulations, current methods for educating, information from the CDFA Vertebrate Pest Control Handbook, and the expertise of vertebrate pest control specialists. The California Vertebrate Pest Control Handbook (CDFA 2009), whose earlier editions were only sold in a printed hard copy format, is now available online and in downloadable format. This handbook is the primary resource for species-specific vertebrate pest control methods within California.

Each of the three independent training programs contain six main components of information relating to the California ground squirrel (*Spermophilus beecheyi*), pocket gopher (*Thomomys* spp.), and meadow vole (*Microtus californicus*): displayed written data, detail page narration, multiple videos, a study guide, two self-tests, and a final exam with optional DPR credit. A participant opinion survey is also included, in order to measure client satisfaction with the training program and its content.

WEB-BASED TRAINING PROGRAMS

The online training programs were developed in conjunction with the CDFA Vertebrate Pest Control Handbook, focusing on the California ground squirrel, pocket gopher, and meadow vole. The information provided in the text was compiled into a structured format with particular emphasis on the identification, biology, and control methods for each of these vertebrate pests. Each course is comprised of approximately 50 detail pages (screens with specific information) derived from the handbook, images to relate to the text, and numerous videos focusing on elements vital to the safe and effective practice of a rodent control program (see Figure 1). The training programs themselves are designed to be completely interactive, giving the user the ability to navigate through all content and to take the course at one's leisure. Navigational buttons present the user with an ability to move forward and backward through the entire course. Section quizzes and a final exam are provided for each course to ensure maximum retention.

Research and published literature were reviewed to ensure the most current information was available. The information was then compiled in a structured format with particular attention paid to clarity, conciseness, and information content. A total of 146 individual detail pages were created. These pages provide information for each of the three pests species on the identification, behavior, biology, pest management control methods, best management practices, and safety concerns for wildlife, pets, and children. The majority of these detail pages contain images to accompany the text. There were also 53 accompanying video modules that give detailed explanations and examples of control.

Figure 1. Example of a detail page from the California ground squirrel online training course form the "Damage" section.

Study Guide

Prior to taking each online training program, users are prompted to download in portable document format (PDF) and print a copy of the study guide from a link located on our website. The guide is comprised of fill-in-the-blank questions, and it covers various topics in each section (identification, biology, and control methods) that are vital in preparing the user for the section quizzes and final exam. The study guide is also designed to act as a field guide, making it a useful reference.

Video Component

Short instructional videos were developed to provide information and instruction on a variety of topics including identification, biology and control methods. There are 53 instructional videos, ranging from 30 seconds to 4 minutes in length (depending on the complexity of the topic), contained in the online training programs. Each video starts automatically following a detail page relating to the topic of that video. The detail page(s) preceding the video act as an overview of that topic, while the videos provide visual demonstrations.

Section 1, 2, and 3 Quizzes

All online courses are accompanied by a Section 1 (Identification), 2 (Biology) and 3 (Control Methods) quiz. Questions were developed from essential facts and information located within the subject's study guide and training course. All Section 1 and 2 quizzes feature 20 questions, while Section 3 quizzes contain 40 questions. All quizzes are comprised of multiple-choice and true-false questions. For every incorrect answer, a reply

containing the correct answer is provided immediately after its submission. Each quiz is given after the corresponding section, and the user is prompted to complete the quiz prior to continuing further. Once finished, results are displayed for review, with an option to take the user back to the location within the course where they left off. Once the final section and quiz are completed, the user is prompted to begin the final exam.

Final Exam

The final exam provides the student with an easy-to-use exam, as well as credit card payment options. Each final exam contains 30 questions and is divided between multiple-choice and true-false questions. Exam questions are taken from a pool of questions that comprise the quizzes for that subject. A correct answer is displayed when a question is answered incorrectly. However, at the end of the final exam, the results are not posted for reviewing; this is to discourage users from taking the exam multiple times after failed attempts. Upon completion of the final exam, the user is prompted to submit a payment of $15 to review and process the exam, as well as to provide the user with a certificate of completion when a passing grade of 70% or above is achieved. The program administrator reviews each completed exam and a confirmation email is then sent to the user with the outcome of their test. Given that they have filled out their name and address correctly, the user should receive a certificate of completion through the U.S. Postal Service within 3-5 business days.

Participant Opinion Survey

Upon completing the final exam and submission of payment for the course, the user is sent via e-mail a link to an online survey that asks about their experience while using the training program. This survey has 6 questions relating to the online training program and its effectiveness as a continuing education portal. Survey responses will help to inform us of how the training programs are being received by the general public, as well as of any changes that may be necessary to make the information and programs more effective. In its current configuration, completion of the survey is voluntary.

Podcasts

Although the online training programs were designed for the user's convenience, creating a podcast for each of the training programs enabled us to provide users with a downloadable copy of each course. This not only provides users with the course on their personal computer, but all files are transferrable to mobile devices such as iPods, MP3 players, and iPhones, supplying the portable training that is accessible anywhere the user goes. With this feature, students are no longer required to be connected to the Internet in order to view our training programs. Once a course is downloaded onto a portable device, an application such as iTunes (a standard application with iPod and iPhone) can open and play the file. The podcast can also be transferred to an external portable hard-drive so the user can either store the course or transfer it to a computer without an Internet connection. The podcast portion of our site enables users to download and install a copy of iTunes for free.

Facts and Questions

The Facts and Questions section of our website was designed to allow users to ask questions or leave comments. In the event that a user has difficulty with the course or needs clarification on a given topic, this allows them to address their concerns freely and privately by e-mail. It also allows students to comment or critique the training programs, providing feedback on needed course improvements.

Continuing Education Credits

The California Department of Pesticide Regulation (DPR) requires that anyone possessing a pesticide applicator license or certificate must obtain 20 hours of continuing education credit between each 2-year cycle, while the Structural Pest Control Board (SPCB) requires a licensed applicator to complete 12 hours of Board-approved continuing education during each 3-year renewal period. All 3 of our training programs were approved as online correspondence courses and provide 2 hours of DPR as well as 2 hours of SPCB technical continuing education credit towards Branch 2 operators and field representatives. Users are able to satisfy their continuing education hourly requirements without the inconvenience of having to find a location for training hours, drive to that location, and sit through hours of information (which is sometimes unrelated to the person's job). The certificate of completion provided by each program is accepted by DPR and SPCB as evidence of earned continuing education credits.

Promotion Efforts and Materials

A strong emphasis has been placed on outreach and promotional efforts. With the progression of technology and the way in which people are getting their news and information, it was important for us to use these new technologies alongside some of the more traditional methods to promote our online training programs.

Facebook

Facebook is a popular online network community that enables users to stay in touch with family friends, or even meet new people by way of e-mail, instant messaging, photo sharing, status updates, and event invitations, all through one application. Originally intended for individual use, Facebook has now become a marketing and outreach tool for businesses worldwide.

By creating a profile for the Vertebrate Pest Control Education website (see Figure 2), Facebook users around the state or elsewhere now have the opportunity to find us online without ever having seen our website. Users may find us by use of a search engine while seeking an online training course or basic pest management information, or by stumbling upon us through their connections with other Facebook users. Once found, they can add us as 'friends,' and we can automatically send them training program news, workshop invitations, project photos, correspondence messages, or anything we decide to post. A link to our website is displayed on our Facebook profile page.

Figure 2. Facebook profile created for the Vertebrate Pest Control Education website to be used in the sites web-based outreach.
http://www.facebook.com/profile.php?id=1811468780

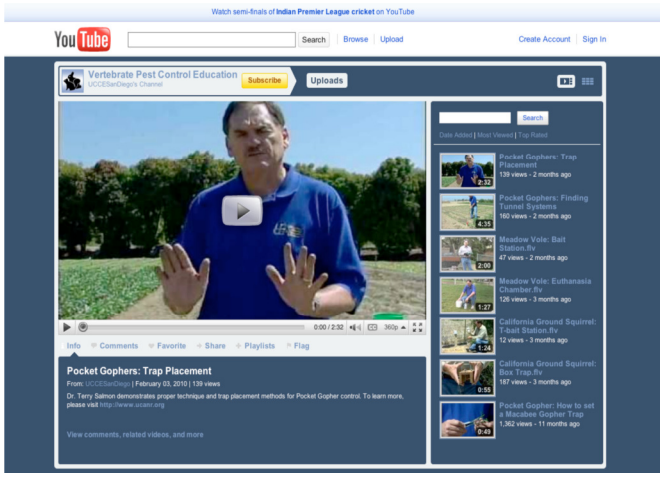

Figure 3. Home page of the YouTube Channel created for the Vertebrate Pest Control Education website as a web-based outreach method.
http://www.youtube.com/user/UCCESanDiego

Twitter

Twitter is another free online application that takes the power of text messaging and combines it with the correspondence features of Facebook. Users get instant, up-to-date information sent directly to their e-mail or cell phones. We have created a profile online to post short messages, status updates, or reminders everyone with a Twitter account who has elected to receive our messages.

YouTube

This is a free online application that allows subscribers to upload and share videos. We have created a 'channel' or a hub (see Figure 3), where users can find educational videos on vertebrate pest control. While our online training courses aren't posted here, many of the shorter videos used in the training programs are. At the end of these 30-second to 4-minute videos, viewers see a link to our website. Further, YouTube users can search a work or phrase to find a video on a particular topic. For example, if they type in *squirrel* or *trapping*, one of our videos will appear in their results. Viewers can leave pre-approved comments relating to our videos, and they can rate our videos or even send us a link to other media they felt were useful.

Traditional Outreach

We have developed business cards, a flyer, handouts, and a mailer describing our educational programs. These have been provided to various organizations, vertebrate pest control conferences, and licensed trappers, and others through contact lists available to us from DPR and other sources.

KEY FEATURES OF THE PROGRAM

Accessible and Changeable

Due to the fact that rules, regulations, laws, and accepted pest management practices change, it is important not only for users to get up-to-date information pertaining to these changes, but also that users possess the tools and knowledge to conduct a safe and effective pest control program. The fact that our courses are online means that we can update information as it becomes pertinent to the program. The training program and web-site do not require any maintenance, but are available for updating at any time. Content can be added, altered, or amended within minutes and uploaded instantaneously to the website, so users always have current information.

Data Collection

Integrated with the quizzes and exams, we are able to monitor data from users. Every time someone takes a test, our survey module archives the results and data, separating them into categories including users' name, score, date of completion, and a list of the questions and their responses.

PROGRAM USE

The interactive web-based training program was successfully activated and available for public access on June 16, 2009. The interactive elements of the training program make it a great tool to incorporate as a supplemental training aide for structured learning programs, such as lectures by vertebrate pest specialists and others traveling throughout the state. Since its inception, the program website has received over 42,000 hits, with the majority originating within the United States, but ranging across the globe from the United Kingdom and Germany all the way to China (Table 1).

With YouTube, Twitter, and Facebook, the public exposure of the program is constantly increasing in number of users without physically seeking an audience, meaning anyone can find our program through the use of these online tools. These technologies are stand-alone entities, but they were incorporated as a means to funnel and guide users towards the training website and ultimately the training programs. The most easily monitored of the chosen online outreach venues was YouTube. Of the 7 videos posted to the YouTube channel created for training program outreach, the most popular was "How to

Set a Macabee Trap," with 3,257 views (Table 2). The channel had over 7,300 views in the first year of activity, providing exposure for our webpage and training materials.

Table 1. Geographical use of the UCCE San Diego YouTube Channel from May 2009 to September 2010.

Country	Page Views	Visits	Hits
United States	9,885	2,744	36,487
N/A	966	441	4,720
France	114	39	121
Canada	41	17	361
Greece	24	1	24
Australia	23	3	135
Sweden	17	4	18
Germany	16	2	29
United Kingdom	15	9	110
China	10	2	11

Table 2. Individual 'hits' on the video segmentsof the UCCE San Diego YouTube Channel, May 2009 to September 2010.

Species	Video Title	Number of Views
Pocket Gopher	Trap Placement	733
Pocket Gopher	Finding Tunnel Systems	1,061
Pocket Gopher	How to Set a Macabee Trap	3,257
Meadow Vole	Bait Station	319
Meadow Vole	Euthanasia	670
California Ground Squirrel	T-Bait Station	256
California Ground Squirrel	Box Trap	1,080

These methods of outreach find an audience in those who would not otherwise have located our website. This potentially expands our demographic to licensed applicators, as well as the general public and anyone interested in vertebrate pest control. With the incorporation of these modern outreach methods providing public access to up-to-date training materials, such as those offered in this program, relevant vertebrate pest information becomes more readily available. It also ensures that we are staying relevant with technologies used to deploy content to potential users. People are using the internet more and more to find what they are looking for, instead of relying on traditional outreach methods (i.e., workshops, mailers, etc.). With this program garnering more exposure, our goal is to provide similar training programs in the future that include an expanded list of vertebrate pests such as ravens, rabbits, rats, and mice.

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