WERA-95: "VERTEBRATE PESTS OF AGRICULTURE, FORESTRY AND PUBLIC LANDS" 2006 ANNUAL MEETING

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WERA-95

"VERTEBRATE PESTS OF AGRICULTURE, FORESTRY AND PUBLIC LANDS"

2006 ANNUAL MEETING

MINUTES
ABSTRACTS

NOVEMBER 7 - 8, 2006
RENO, NEVADA
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2006 WERA-95 Officers

Chair: John D. Eisemann  
USDA APHIS WS  
National Wildlife Research Center  
4101 LaPorte Ave  
Fort Collins, CO 80521  
T: 970-266-6158  
E: John.D.Eisemann@aphis.usda.gov

Vice-Chair: Jeanette R. O’Hare  
USDA APHIS WS  
National Wildlife Research Center  
4101 LaPorte Ave  
Fort Collins, CO 80521  
T: 970-266-6156  
E: Jeanette.R.O’Hare@aphis.usda.gov

Secretary: Position Vacant

Interim Secretary: Jeanette R. O’Hare  
USDA APHIS WS  
National Wildlife Research Center  
4101 LaPorte Ave  
Fort Collins, CO 80521  
T: 970-266-6156  
E: Jeanette.R.O’Hare@aphis.usda.gov

Administrative Advisor: David G. Thawley  
College of Agriculture, Biotechnology, and Natural Resources  
Mail Stop 222  
University of Nevada  
Reno, NV 89557  
T: 775-784-1610  
E: thawley@cabnr.unr.edu

Meeting Arrangements: John O’Brien  
Nevada Department of Agriculture  
350 Capitol Hill Avenue  
Reno, NV 89502  
T: 775-688-1180 ext. 241  
jobrien@agri.state.nv.us
MINUTES

Number and title of the regional project:
WERA-95 Vertebrate Pests of Agriculture, Forestry and Public Lands

Location and dates of the meeting:
Reno, Nevada
November 7 and 8, 2006

Convening of Sessions

Tuesday - November 7, 2006

1:00 p.m.   Welcome
            John Eisemann – Chair, WERA-95
            David Thawley – Administrative Advisor, WERA-95

1:15 p.m.   Terry Salmon
            Investigating resistance to anticoagulant rodenticides in California
            agricultural setting

2:10 p.m.   Julia Figueroa
            Lagomorph and Rodents Responses to Protein Hydrolysates.

2:35 p.m.   Bruce Kimball
            Exploiting Wildlife Behavior for the Management of Invasive Plant Species.

3:00 p.m.   Break

3:15 p.m.   Alan Merrifield
            Repelling Pest Birds and Other Nuisance Wildlife with Compressed Air.

3:40 p.m.   Robert Timm
            A Test of the Firefly II Bird Repelling Reflectors.

4:05 p.m.   Mark Tobin
            Update on NWRC Research and Development of Bird Repellents.

4:30 p.m.   Stephen Vantassel
            Update on the Internet Center for Wildlife Damage Management.

4:55 p.m.   Discussion
Wednesday - November 8, 2006

8:30 a.m.   Business Meeting

10:00 a.m.  Break

10:15 a.m.  Are Berensten - cancellation
            *Say nah to da TB, eh: Upcoming NWRC Research on Bovine Tuberculosis in Michigan's Lower Peninsula.*

11:10 a.m.  Dale Nolte
            *International activities at the NWRC around Avian Influenza*

11:35 a.m.  Ray Sterner
            *Economic Methods Research in Wildlife Damage and Wildlife Disease.*

12:00 p.m.  Lunch break

1:15 p.m.   Jeanette O’Hare
            *Authorization of wildlife management tools (or not) under the auspices of the Food and Drug Administration*

1:40 p.m.   Kathy Fagerstone
            *GonaCon: A New Contraceptive Vaccine*

2:05 p.m.   John Eisemann
            *Rodents and birds: Continuing product development efforts at the NRWC*

2:30 p.m.   Break

2:45 p.m.   Research Updates – Roundtable Discussion

5:00 p.m.   Adjourn
Business Meeting (Wednesday, November 8, 2006)

1) Business meeting was called to order at 8:35 a.m. November 8, 2006 by John Eisemann, WERA-95 Chair.

2) Minutes from the 2005 WCC-95 meeting were unanimously accepted as written.

3) Budget Report:

The budget report was postponed pending the arrival of John O’Brien. The budget report was prepared and submitted by John O’Brien following the conclusion of the meeting when all expenses had been accrued and totaled. Twenty-five scientists, students and private business representatives attended the meeting. The meeting registration fees were $20 for students as decided at the 2004 meeting. The fee for all other attendees was set at $30. The budget report follows:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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<tr>
<td>Balance from 2005 meeting</td>
<td>$220.80</td>
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<tr>
<td>Income from the 2006 meeting *</td>
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<tr>
<td>Reimbursement from the VPC **</td>
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<td>Circus Circus Hotel Expenses for the 2006 meeting***</td>
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<tr>
<td>Other expenses</td>
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</tr>
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</table>

**Balance from 2006** $535.54

* Twenty-four wildlife professionals and one student attended the meeting. The total income from registration fees was $740.

** The Vertebrate Pest Council met in the Circus Circus meeting room during the morning of November 7 and subsequently reimbursed the WERA-95 $105.16 for the use of the room.

*** The WERA-95 meeting began at 1:00 p.m. on November 7. John O’Brien reserved the meeting room at Circus Circus for three days: Tuesday, November 7, 2006; Wednesday, November 8, 2006; and Thursday, November 9, 2006. This year the meeting was shortened by one half day. Therefore the meeting room was not needed on November 9, 2006. The hotel adjusted the bill accordingly, and also waived the meeting room charge. Thus the expenses for this meeting were substantially less than usual.

4) Officer Elections:

Scott Beckerman was unable to fill his elected tenure as a WERA-95 officer because of a new duty assignment. Therefore, two positions were open for election including Vice-Chair and Secretary.
- Duane Schnable was nominated by Ray Sterner for the office of Vice-Chair. The motion was seconded by Mark Tobin. Duane was unanimously elected by verbal vote.

- Mark Tobin nominated himself to serve as Secretary. John Eisemann seconded the nomination, and Bob Timm moved to close the nominations. Mark was also unanimously elected by verbal vote.

5) Generation of Additional Participation:

John Eisemann opened a discussion on how to generate more participation in the WERA-95. This issue has been a recurring concern for the committee. This year’s meeting did benefit from increased industry participation by pesticide product registrants. Other wildlife damage management industry sectors represented were distributors of nonlethal products, and wildlife control operators. Student participation was down this year. Administrative changes at the Berryman Institute (regular participants) disrupted usual communication routes. Consequently, none of their staff or students attended. One student was present from Colorado State University.

Initially the discussion centered on the purpose of WERA-95 and the contributions various participants make toward that end. WERA-95 serves as an important networking mechanism to facilitate appropriate research in wildlife damage management. The focus has traditionally been on rodent management. While rodents remain a focal point, the committee has also addressed broader wildlife management issues. Industry representation and collaboration is important to assist in developing appropriate research activities and possible leverage funds. Students are the future practitioners in the field and provide insight into new research and trends. They benefit by networking with other wildlife damage management professionals, and are provided an opportunity to present their research.

Several suggestions to increase attendance included:

- Renewing the relationship with the Berryman Institute to encourage student and faculty participation.

- Identify emerging or “hot button” issues to address at the annual meeting. This may provide incentive to interested persons to participate in the meeting.

- Continue to invite participants from the Vertebrate Pest Conference, as well as Agricultural Experiment Stations.
6) **Topic for WERA-95, 2007 Annual Meeting:**

Following on the discussion of increasing participation at WERA-95, it was decided that a timely topic for the next meeting is **"Emerging State and Federal Regulatory Issues Impacting Wildlife Damage Management."** A specific issue of concern is the interaction of US Fish and Wildlife Service with USDA Wildlife Services. Also suggested as a discussion topic, was how best to facilitate the movement of products into the market place within the existing regulatory mechanisms. Recent meetings have not been planned around the themes selected during the preceding annual meeting. A proposal was presented to focus presentations and discussion around a theme during a portion of the meeting, rather than trying to focus on the theme for the entire meeting. Another suggestion was to invite specific speakers (i.e. EPA of FWS) to present abstracts.

7) **WERA-95 2007 Annual Meeting Date and Location:**

The date and location for the 2006 WERA-95 annual meeting were selected. The dates are November 6-8, 2007 and the meeting will be held at the Circus Circus Hotel in Reno, Nevada. The meeting will start at 1:00 p.m. on November 6, 2007 and end at 12:00 p.m. on November 8, 2007.

8) **Announcements:**

- Bruce Menzel has retired from CSREES where he was the Fish and Wildlife National Program Leader. Bruce has been an active and valued participant in WERA-95 during his tenure. The committee agreed to submit a letter to CSREES to encourage that his vacated position be filled as soon as possible.

- The meeting minutes and most up to date mailing list of WERA-95 attendees for this and recent years will be posted on the “Collaborative Tools” website at [http://collaborate.ucanr.org](http://collaborate.ucanr.org). New attendees will be added to the WERA-95 group. Current members of the group were asked to update their e-mail address and other information on the website.

9) **Review of last year’s action items:**

- Update the Internet Center for Wildlife Damage Management website to include current WERA-95 information.
  - This website has been updated. This is an ongoing process that requires continual maintenance to keep the information current.

- Formation of a symposium committee (John Eisemann, Kathy Fagerstone, Dale Nolte, Terry Salmon and Robert Timm) to plan a symposium/workshop on secondary hazards of vertebrate pesticides.
The committee made a decision to coordinate a symposium on secondary hazards of vertebrate pesticides with the “Wildlife Damage Management Conference” on April 9-12, 2007 in Corpus Christi, TX. The symposium will attract participants also likely to attend the conference. This approach is logistically efficient and cost effective for both participants and sponsors.

**ACTION ITEMS FOR FY07**

- The secondary hazards of vertebrate pesticides symposium planning committee will approach Art Smith regarding the addition of a symposium to the meeting schedule of the Wildlife Damage Management Conference to be held April 9-12, 2007 in Corpus Christi, TX.

- The committee agreed to submit a letter to encourage that Bruce Menzel’s vacated position be filled as soon as possible.

**Individual Research Updates and Discussions**

Kathy Fagerstone – Kathy presented a summary of NWRC research on the development of contraceptives for wildlife management, including injectable vaccines and oral delivery systems for use in mammal and bird species. An abstract is located in the “Presentation Abstracts” section (page 15). Kathy also highlighted NWRC’s brown tree snake project and search for a toxicant delivery system, the economics project activities to evaluate the costs and benefits of animal control programs, and the centers growing wildlife disease program.

John Eisemann – John discussed a variety of wildlife damage management projects at NWRC. Topics included bird management at airports, feral pigs, Gambian pouch rat introduction into the Florida Keys, existing and experimental predator toxicants, mountain beaver control, and alpha-chloralose for immobilization of sandhill cranes and turkeys. John also discussed the implementation of the Endangered Species Protection Program (ESSP) under FIFRA. An abstract is located in the “Presentation Abstracts” section (page 14)."
Hans Sin – Hans is a Utah State University student studying the ecological effects of the invasive coqui frog. He reported that the coqui frog has been reported at three sites in Los Angeles County, CA. An abstract of Han’s research is found in the “Presentation Abstracts” section (page 21).

Mary Ann Douglas – Mary Ann is a chemist with HACCO, Inc. and works on method and product development. She reported that Judy Thompson (HACCO) has been working toward a supplemental label for zinc phosphide to control rodents at airports. It is likely EPA will allow this use at military air fields only.

Rex Baker – Rex is consulting on a project to examine exposure risk from the use of zinc phosphide on artichokes. He continues to be involved with the issue of coyote attacks on humans. He also noted that the number of coyote attacks reported has declined over the past year.

Ed Foster – The Nevada Department of Agriculture receives inquiries from the public on a variety of wildlife and pesticide related issues.

Erick Wolf – As a follow up to Eric’s presentation (“Presentation Abstracts” section; page 23), he discussed his experience with the U.S. Fish and Wildlife (FWS) consultation process. He cautioned others to be prepared to address a number of concerns, that may add additional permitting and reporting requirements as is happening with the Innolytics, LLC product, OvoControl G.

Jennifer Borgo – Jennifer, a student at Utah State University, is researching methods to reduce porcupine damage to pine seedlings in shelterbelts; and investigating the role of predator odor in roost site selection of southern flying squirrels (“Presentation Abstracts” section; page 13).

Richard Poche - Genesis Labs is working on several projects. They received a Small Business Initiative Research Grant form the CDC to work on controlling mole rats to reduce the spread of plague in Tanzania and Uganda. Their work also includes rodent control in refugee camps in Sierra Leon to mitigate the spread of Lasa fever. Other projects include a ground squirrel study in California to evaluate combination insecticide and a rodenticide bait to reduce the application rate of rodenticide; and a study to reduce Lime Disease transmission by using bait containing an antibiotic.

Are Berensten – Are has finished his work on the Coyote Lure Operative Device (CLOD), and is currently working with Terry Salmon on a UC Cooperative Extension ground squirrel study. An abstract on the CLOD is located in the “Presentation Abstracts” section (page 12).

Bob Timm – There are two open research positions with the Hopland Research and Extension Center that Bob is hoping to fill contingent upon funding and a hiring freeze. Hopland is seeking research proposals and also has work grants available. Bob also
introduced the “Birds-Away Attack Spider” (www.attackspider.com) developed to frighten away woodpeckers.

Robert Schmidt – Robert continues to be work on large predator issues including human responses by both the public sector and government. He reported that the Utah Wolf Management Plan has been approved. Another project involves participation in developing euthanasia guidelines. Current guidelines are generally vague, and there is a need to provide training to wildlife control professionals. An abstract discussing the development of wildlife control operator enterprises is available in the “Presentation Abstracts” section (page 21).

Heather Keough – Heather is finishing her doctorate degree at Utah State University. She summarized her work on reproductive success of ferruginous hawks in the Uintah Basin, UT. An abstract is located in the “Presentation Abstracts” section (page 15).

Joel Martin – Joel is a student at Utah State University, and is studying aversive control of egg predation in raccoons on Virginia’s barrier islands. An abstract is of work to date is located in the “Presentation Abstracts” section (page 16).

Bruce Kimball – Bruce is examining the ecology of deer browse damage in forestry. Data shows terpene production by western red cedar may influence palatability. A 3-year study is underway test the effect of various soil amendments on terpene production. Other studies show that a there may be genetic component involved in terpene production. Bruce is also evaluating repellents to reduce deer browse. An abstract is located in the “Presentation Abstracts” section (page 16).

Jim Knight – Jim highlighted several Montana State University projects. Studies are ongoing to evaluate fence modifications to manage deer and elk herds in high value pastures, mechanisms to divert animals along highways, and the effect of harvesting does. Other projects include management of pocket gophers and ground squirrels, assisting ranchers with ways to deal with wolf predation, and brucellosis management in bison.

Jeanette O’Hare – NWRC has tried several means to gain regulatory approval for the use of GnRH immunocontraceptive vaccine. These include requesting USDA/Veterinary Services to consider licensing as a disease vaccine to prevent the spread of brucellosis in bison, and petitioning FDA to allow the vaccine to be compounded by a compounding pharmacy. Jeanette presented modifications to USDA zinc phosphide pesticide labels resulting from ground squirrel taxonomy changes (“Presentation Abstracts” section; page 19).

John O’Brien – Nevada is working to control invasive saltcedar. John highlighted the State’s interactions with USFWS to address endangered species concerns for the southwest willow flycatcher. The flycatcher has adopted saltcedar as habitat. John also presented data on a field trial of strychnine cabbage baits to control ground squirrels. An abstract is located in the “Presentation Abstracts” section (page 12).
PRESENTATION ABSTRACTS

Rodents and Birds: Continuing Product Development Efforts at the NWRC

EISEMANN, JOHN D., USDA-APHIS Wildlife Services, National Wildlife Research Center, Fort Collins, Colorado, 80521.

The National Wildlife Research Center continues to develop new tools and improve existing tools to meet the needs of wildlife managers dealing with vertebrate pest issues. This presentation focuses on three projects the NWRC Registration Unit is currently assisting with. Other presenters at this meeting (Jeanette O'Hare and Kathleen Fagerstone) touch on additional registration efforts of the Registration Unit. Rodent eradication on islands continues to be a major focus of NWRC registration efforts. Within 1 month of this conference, NWRC will have three registration applications under review at the EPA specifically labeled for use to eradicate rodents from island ecosystems. One product is based on diphacinone. The product is a repack of HACCO Inc.'s Ramik Green. The other two products are based on brodifacoum and will be specially formulated by Bell Labs upon request. A short summary of an eradication operation in the Virgin Islands using a brodifacoum bait will be presented. The Registration Unit has also assisted the Florida Wildlife Services office obtain the necessary permits to begin an eradication effort against the Gambian pouch rat on Grassy Key. A short summary of this eradication effort will also be presented. The final topic presented will be a summary of the Wildlife Service effort to register a DRC-1339 product for corvids.

GonaCon: A New Contraceptive Vaccine


Overabundant wildlife species, such as white-tailed deer in the eastern United States, have the potential to adversely affect wildlife habitats. They can also pose risks to human health and safety through disease transmission and collisions with vehicles and aircraft. Traditional methods for reducing overabundant wildlife, such as hunting and trapping, are often restricted or infeasible in urban and suburban areas. Other management options are needed.

For the past 11 years, scientists with the U.S. Department of Agriculture’s (USDA) National Wildlife Research Center (NWRC) have been working to develop a single-shot, multiyear contraceptive for white-tailed deer. This research has resulted in the development of GonaCon™, a new gonadotropin-releasing hormone (GnRH) immunocontraceptive vaccine. The single-shot, multiyear vaccine stimulates the production of antibodies that bind to the GnRH hormone in an animal’s body, reducing GnRH’s ability to stimulate the release of the sex hormones. All sexual activity is decreased, and animals remain in a non-reproductive state as long as a sufficient level of antibody activity is present.
A single shot can successfully keep female deer infertile for 1 to 4 years without boosting, and infertility is reversible over time as antibody levels decline. Multiple injections increase the longevity of the vaccine. The NWRC has conducted numerous pen trials on the vaccine and is currently conducting field effectiveness studies with white-tailed deer in two fenced sites in Maryland and New Jersey. Preliminary field data in 2 studies show the vaccine to be effective in 71% and 88% of the deer in the first year. Effectiveness in the second year ranges from 70% (pen studies) to about 50% (1 field study).

The regulatory authority for contraceptives for wildlife and feral animals has recently been moved from the Food and Drug Administration (FDA) to the Environmental Protection Agency (EPA), which has a rigorous registration process. The pen and field effectiveness data gathered from NWRC studies will be submitted to the EPA in spring of 2007, along with other required data, to obtain a registration for use of GonaCon™ in managing cervid (deer and elk) populations. Data show that the contraceptive is safe for the vaccinated animals and that there is no danger associated with humans or wildlife eating vaccinated animals. A registration for GonaCon™ could be granted to USDA by early 2008.

NWRC scientists anticipate that GonaCon™ will be registered as a “Restricted Use” product, probably for use by state or federal wildlife or natural resource management personnel or persons working under their authority. GonaCon™ users will also need to follow state authorization processes.

GonaCon™ will not replace other management tools and its use alone cannot rapidly reduce overabundant deer populations to healthy levels. Instead, it is a tool to be used in conjunction with other wildlife management methods. The vaccine can be used to help manage overabundant deer herds in urban and residential areas where other management methods, such as hunting, are not always an option.

Lagomorph and Rodent Responses to Protein Hydrolysates

JULIA A. FIGUEROA, Department of Zoology, Colorado State University, Fort Collins, CO 80523;
BRUCE A. KIMBALL, USDA-APHIS Wildlife Services, National Wildlife Research Center, Fort Collins CO 80521;
WENDY M. ARJO, USDA-APHIS Wildlife Services, National Wildlife Research Center, Olympia, WA 98512

Agricultural systems undergo extensive damage from foraging lagomorphs and rodents. Practical, non-lethal pest control is one preferable approach to minimize product and financial loss to the producer. Several chemical deterrents have been effective but their application on plants used for human consumption is restricted by safety measures. Repellents altering the palatability of plants without conditioning an aversion have demonstrated significant reduction in herbivore damage to plants under varying foraging conditions. Recent studies have revealed hydrolyzed casein as an agent that reduces browsing with deer.
Various species of rodents and lagomorphs were used in bioassays to determine the effectiveness of protein hydrolysates (specifically hydrolyzed casein and gelatin) as repellents. Mixed sex groups of captive rabbits, pocket gopher, and mountain beaver were offered hydrolyzed casein and gelatin test diets to determine level of avoidance. Diet preference was determined through two-choice and one-choice tests given following a training period with a base diet.

The effectiveness of either hydrolyzed casein or gelatin was dependent upon the species. Hydrolyzed casein was identified as an effective repellent for mountain beaver and pocket gopher as these species showed a strong rejection towards the hydrolyzed casein diets. Rabbits demonstrated slightly higher avoidance of the gelatin diets rather than hydrolyzed casein. The different preferences suggest regional application of the repellent dependent on the pest species rather than universal application for all animals.

Exploiting Wildlife Behavior for the Management of Invasive Plant Species

BRUCE A. KIMBALL, USDA-APHIS Wildlife Services, National Wildlife Research Center, Fort Collins, CO 80521

Invasive plants have the potential to negatively impact plant species diversity and ecosystem services. Aggressive species can displace desirable plants, cause loss of forage for domestic livestock and big game, and habitat loss for associated wildlife. Introduction of natural enemies, typically specialist insects, has been employed to manage populations of problem plant species. However, this is a management tool that requires considerable planning and investigation because of risks associated with species introductions. On the other hand, using native generalist herbivores as consumers of invasive plants has rarely been considered.

Research with domestic mammalian herbivores has shown considerable progress in promoting consumption of chemically defended plants. Recent studies of postigestive consequences of plant secondary metabolites (PSMs) and mammalian foraging behavior demonstrate that plants thought to be unpalatable can be utilized by domestic mammalian herbivores. Most importantly, these studies demonstrate that mammalian herbivores will self-medicate with the proper supplement and increase consumption of PSMs. More research is needed to assess the possibility for exploiting wildlife herbivory to achieve management goals.
Repelling Pest Birds and Other Nuisance Wildlife with Compressed Air

ALAN J. MERRIFIELD, Urban Wildlife Management, Inc., Burlingame, CA 94011

In response to a growing demand for more humane ways of controlling pest birds and other nuisance animals, Urban Wildlife Management has developed an animal damage control product that combines electronic motion and heat sensors with a system for generating, releasing and directing blasts of compressed air to frighten and repel intruding pest birds and mammals out of protected areas designated as either “No Fly Zones” or “No Roam Zones”. As part of the research and development effort for the Birdblaster California Electronic Scarecrow System, three such zones were established to ambush and repel three species of pest birds and three species of nuisance mammals. The interactions between the system and the selected vertebrate pests were videotaped and analyzed.

Authorization of Wildlife Management Tools (or Not) Under the Auspices of the Food and Drug Administration

JEANETTE R. O’HARE, USDA-APHIS Wildlife Services, National Wildlife Research Center, Fort Collins, CO 80521

The US Department of Agriculture—Animal and Plant Health Inspection Service (APHIS) currently maintains four Investigational New Animal Drug (INAD) applications with the Food and Drug Administration (FDA). Two of the products are wildlife contraceptives including a GnRH-based immunocontraceptive vaccine called GonaCon™ and a potential oral bait product called DiazaCon. The other two products are immobilizing agents that include propiopromazine hydrochloride (PPZH) used in tranquilizer trap devices to capture wolves, coyotes and feral dogs; and alpha chloralose to capture waterfowl, coots, ravens, pigeons and sandhill cranes. All four products are for use by Wildlife Services (WS) personnel or persons under their supervision, or by research collaborators.

In recent years, FDA has indicated they are increasingly uncomfortable with the present regulatory status of our APHIS products. As a result, the National Wildlife Research Center (NWRC) – Product Development Program began pursuing alternate regulatory mechanisms to move the products forward. These approaches included an effort to license GonaCon™ with the USDA as a disease vaccine to prevent the transmission of brucellosis in bison, and alternately to produce the vaccine through a compounding pharmacy. While both attempts were unsuccessful, it appears the efforts contributed to renewed discussions between FDA and the US Environmental Protection Agency (EPA) regarding the most appropriate agency to regulate these four products. FDA has since notified APHIS that EPA is the appropriate regulatory authority because they (FDA) consider pest animals to be the focus of WS. In reality, WS operations are broader than this narrow assessment presented by FDA. Consequently, additional negotiations with FDA and EPA are required to arrive at the best regulatory solution to develop APHIS wildlife management products.
Investigating Resistance to Anticoagulant Rodenticides in California Agricultural Settings

TERRELL P. SALMON, University of California Cooperative Extension – San Diego County, San Diego, CA 92123

Anticoagulant resistance is well documented in commensal rodent populations. The occurrence of anticoagulant resistance in field rodents in agricultural settings has not been reported. In a recent study of meadow vole (Microtus californicus) control in artichoke fields in Central California, the effectiveness of chlorophacinone treated artichoke bract baits was evaluated and found to be much less effective than it was when introduced about 20 years ago. Control using this material in artichokes uses strategies that can increase the chances of developing resistance in the target population. Mainly, chlorophacinone has been used annually, sometimes with multiple treatments, with no alternative control materials or strategies available or used. We conducted a study comparing the blood clotting times of voles from the artichoke fields with those from fields where no anticoagulant materials were used for at least 5 years. We evaluated clotting times after dosing each vole with chlorophacinone. We found that clotting times for the voles from the artichoke fields were not lengthened; the opposite of what happened in voles from fields where chlorophacinone was never used. This finding supports the hypothesis that the artichoke field voles have developed a significant degree of resistance to the anticoagulant chlorophacinone. In subsequent feeding trials, voles from the artichoke fields experienced a mortality rate of about 50% compared to 90% for voles from the fields with little or no history of anticoagulant use. These findings highlight the importance of developing resistance management strategies for field rodent control programs. Additionally, monitoring other rodent species commonly controlled with anticoagulants in agricultural settings should be done to identify if resistance is developing.

Economic Methods Research in Wildlife Damage and Wildlife Disease

RAY STERNER, USDA-APHIS Wildlife Services, National Wildlife Research Center, Fort Collins CO 80521

Diverse economic methods have been adapted to conduct benefit-cost analyses of wildlife damage management and wildlife disease control activities by Wildlife Services (WS). Methods include: replacement costs, Impact Analyses for Planning (IMPLAN®), regression analyses, scenario projections and decision trees. Methods and results of three studies will be presented to illustrate the use of these methods—a programmatic assessment of WS-California, a hypothetical assessment of potential oral rabies vaccination (ORV) to control skunk rabies in southern CA and an assessment of urban goose management in the Puget Sound Area. Results showed: (1) 39 cooperating counties in California paid an average $51,798 share to WS, these counties would have incurred averaged net increased expenses of $122,023 and $174,575 for replacement services (2005 USD). (2) The mean (minimum-
maximum) cost of a suspected rabies exposure in southern California was estimated at $3,445 ($694-$8,586)—2005 USD; benefit-cost ratios (BCRs) ranged from 0.16 to 2.91 for a scenario that involved baiting 10 “hotspots” of skunk rabies in the State and 0.34 to 6.35 for a scenario that baited these “hotspots,” but recouped savings by preventing spread to the Greater Los Angeles Basin. (3) Econometric analyses showed that lethal removal and egg addling were cost effective methods of reducing goose-related damage in the Puget Sound Area, but hazing of geese never proved cost effective. Key steps of conducting BCAs in wildlife damage management and wildlife disease research are presented.

A Test of the FireFly II Bird Repelling Reflector

ROBERT M. TIMM and AMBER N. SHRUM, UC Hopland Research & Extension Center, Hopland, CA 95449

In previous years, numerous birds of various species (primarily passerines, but also some doves and quail) would be killed or injured as they flew into and struck the windows at the front of our Center’s administrative office near Hopland, CA. Presumably, these birds were seeing in the windows the reflection of sky and the surrounding oak woodland habitat. In December 2005, we installed a single FireFly II reflector device in front of this large window area at the front of the office. We kept track of all bird “hits” on the window during workdays when the receptionist (ANS) was present in the reception area immediately adjacent to the windows, typically 32 hours per week, from December 1, 2005 through October 31, 2006. We also recorded observations of whether birds were seen resting or foraging on the ground immediately adjacent to the windows. In alternating weeks, we either left the reflector device exposed, or we covered both reflective surfaces with a white 3 x 5 card. During the 11-month observation period, the presence of the active reflector did not shown significant repellency to most birds, as the number of birds “hits” on the windows did not greatly vary when the reflector surfaces were covered. The reflector did not appear to discourage birds from loafing or foraging in the immediately vicinity of the device. Further, the reflector appears to attract hummingbirds, possibly because of the bright reddish and yellowish coloration of some of the reflective surfaces.

Update on NWRC Research and Development of Bird Repellents

MARK E. TOBIN and JOHN D. EISEMANN, USDA-APHIS Wildlife Services, National Wildlife Research Center, Fort Collins, CO 80521

Scientists at the National Wildlife Research Center (NWRC) routinely conduct both cage and field tests to screen and evaluate potential bird repellents. In spite of this effort, few bird repellents have been registered for use in the United States. Methyl anthranilate (RejeX-it®, Bird Shield®) currently is the only chemical registered for use in the United States as a bird
repellent on crops. Methyl anthranilate is available for a variety of uses, including on fruit, corn and cereal crops, ornamental turf and shrubs, standing water, and landfills. Because of the minor-use nature of most bird repellents and the expense of product registration, NWRC scientists typically select potential bird repellents for evaluation that already are registered for another crop or pest species or are classified as generally recognized as safe (GRAS). Four candidate materials that have shown promise during recent testing are neem oil (an insecticide marketed by Gowan as Aza-Direct®), GWN 4470 (a fungicide), caffeine (a widely consumed GRAS compound), and anthraquinone (which is currently registered as a bird repellent for a number of non-food uses). Anthraquinone in particular has shown much promise for registration as a repellent on seeded rice and other crops. However, regulatory hurdles must be overcome if this chemical is to be registered for use on food crops. In particular, studies are needed to demonstrate either that there are no residues at harvest (i.e. they are below the minimum level of detection), or a 90-day toxicity test must be conducted with rats to show that anthraquinone is safe for human consumption. NWRC scientists have submitted several funding proposals to the U.S. Department of Agriculture (USDA) IR-4 program to gather additional efficacy data and to evaluate anthraquinone residues on seeded and emerging rice, lettuce, and melons. The USDA IR-4 program is a cooperative program among federal, state, and private stakeholders that was established to support pesticide use in minor-use crops. NWRC scientists continue to seek public and private partnerships to develop safe and effective tools to reduce crop depredations by birds.
PARTICIPANTS/ATTENDEES

Asterisked names (*) are participants of the 2005 annual meeting.

**Tamera Angle**  
HACCO Inc.  
110 Hopkins Drive  
Randolph, WI 53956  
T: (920)326-5141

**Lefty Ayers**  
Heritage Wildlife Management  
P.O. Box 726  
Frazier Park, CA 93225  
lefty@rerideranch.com

**Rex Baker***  
ROMAB Enterprises, Inc.  
24652 Gleneagles Dr.  
Corona, CA 92883  
T: (951) 277-4666  
C: (909) 938-7223  
F: (951) 277-4666  
RbakerVertIPM@aol.com

**Ken Ballinger***  
Airepel  
3521 Silverside Rd.  
Wilmington, Delaware 19810  
ken.ballinger@airepel.com

**John Eisemann***  
National Wildlife Research Center  
4101 LaPorte Ave.  
Fort Collins, CO 80521  
T: (970) 266-6069  
F: (970) 266-6069  
john.d.eisemann@aphis.usda.gov

**Kathleen Fagerstone***  
National Wildlife Research Center  
4101 LaPorte Ave.  
Fort Collins, CO 80521  
T: (970) 266-6161  
F: (970) 266-6157  
kathleen.a.fagerstone@aphis.usda.gov

**Julia Figueroa**  
National Wildlife Research Center  
4101 LaPorte Ave.  
Fort Collins, CO 80521  
Julia.Figueroa@aphis.usda.gov

**Harold Gain**  
Urban Wildlife Management, Inc.  
P.O. Box90  
Burlingame, CA 94011  
T: (415)468-5075  
uwm-adc@sbcglobal.net

**Bruce Kimball***  
USDA/NWRC  
4101 LaPorte Ave.  
Fort Collins, CO 80521  
T: (970) 266-6069  
F: (970) 266-6069  
bruce.a.kimball@aphis.usda.gov

**Brian Lex**  
HACCO, Inc.  
110 Hopkins Drive  
Randolph, WI 53956  
T: (920)326-5141  
blex@neogen.com
Annual Meeting WERA-95, Reno, NV
November 7 - 8, 2006

Scott McCalley
LiphaTech
349 Sussex Circle
Vacaville, CA 95687
C: (707)592-1482
mccalleys@liphatech.com

Alan Merrifield
Urban Wildlife Management, Inc.
P.O. Box90
Burlingame, CA 94011
T: (415)468-5075
alamer99@comcast.net

Dale Nolte*
USDA/APHIS/WS/NWRC
4101 LaPorte Avenue
Fort Collins, CO 80521-2154
T: (970) 266-6049
F: (970) 266-6089
dale.l.nolte@aphis.usda.gov

Jay Paxson
University of Nevada Cooperative Extension
701 Walnut Street
Elko, NV 89801
T: (775)738-7291
rpaxsonj@unce.unr.edu

Terry Salmon*
UCCE-San Diego
5555 Overland Ave. #4101
San Diego, CA 92123
T: (858) 694-2864
F: (858) 752-8751
tpsalmon@ucdavis.edu

Duane Schnabel*
California Dept. of Food and Agriculture
1220 “N” Street, Room A-357
Sacramento, CA 95814
T: (916) 654-0768
F: (916) 654-2403
dschnabel@cdfa.ca.gov

Jennifer Seifert
HACCO, Inc.
110 Hopkins Drive
T: (920) 326-5141
jseifert@neogen.com

Dennis Ortmeyer
USDA/APHIS/WS
34194A Ardin Way
Sacramento, CA 95825
dennis.i.ortmeyer@aphis.usda.gov

Ray Sterner
USDA/APHIS/WS/NWRC
4101 LaPorte Avenue
Fort Collins, CO 80521-2154
T: (970) 266-6156
F: (970) 266-6157 F
ray.t.sterner@aphis.usda.gov

Robert Timm*
UC Hopland R&E Center
4070 University Road
Hopland, CA 95449
T: (707) 744-1424
F: (707) 744-1040
rmtimm@ucdavis.edu

John O’Brien*
Nevada Department of Agriculture
350 Capitol Hill Avenue
Reno, NV 89509
T: (775) 688-1180 extn. 241
F: (775) 688-1178
jobrien@agri.state.nv.us

Jeanette O’Hare*
USDA/APHIS/WS/NWRC
4101 LaPorte Avenue
Fort Collins, CO 80521-2154
T: (970) 266-6156
F: (970) 266-6157 F
jeanette.r.o’hare@aphis.usda.gov

Ray Sterner
USDA/APHIS/WS/NWRC
4101 LaPorte Avenue
Fort Collins, CO 80521-2154
T: (970) 266-6156
F: (970) 266-6157 F
jeanette.r.o’hare@aphis.usda.gov

Jennifer Seifert
HACCO, Inc.
110 Hopkins Drive
T: (920) 326-5141
jseifert@neogen.com

Ray Sterner
USDA/APHIS/WS/NWRC
4101 LaPorte Avenue
Fort Collins, CO 80521-2154
T: (970) 266-6156
F: (970) 266-6157 F
jeanette.r.o’hare@aphis.usda.gov

Robert Timm*
UC Hopland R&E Center
4070 University Road
Hopland, CA 95449
T: (707) 744-1424
F: (707) 744-1040
rmtimm@ucdavis.edu

Jennifer Seifert
HACCO, Inc.
110 Hopkins Drive
T: (920) 326-5141
jseifert@neogen.com

Ray Sterner
USDA/APHIS/WS/NWRC
4101 LaPorte Avenue
Fort Collins, CO 80521-2154
T: (970) 266-6156
F: (970) 266-6157 F
jeanette.r.o’hare@aphis.usda.gov

Robert Timm*
UC Hopland R&E Center
4070 University Road
Hopland, CA 95449
T: (707) 744-1424
F: (707) 744-1040
rmtimm@ucdavis.edu
Mark Tobin  
USDA/APHIS/WS/NWRC  
4101 LaPorte Avenue  
Fort Collins, CO 80521-2154  
T: (970) 266-6135  
F: (970) 266-6138  
Mark.e.tobin@aphis.usda.gov

Stephen Vantassel  
School of Natural Sciences  
University of Nebraska – Lincoln  
Hardin Hall 414  
Lincoln, NE 68583-0974  
T: (402)472-8961  
svantassel2@unlnotes.unl.edu