

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

---

USDA National Wildlife Research Center - Staff  
Publications

U.S. Department of Agriculture: Animal and Plant  
Health Inspection Service

---

February 2004

## Keynote Address: Breathing Lessons

J. Russell Mason

*USDA-APHIS-Wildlife Services*

Follow this and additional works at: [https://digitalcommons.unl.edu/icwdm\\_usdanwrc](https://digitalcommons.unl.edu/icwdm_usdanwrc)



Part of the [Environmental Sciences Commons](#)

---

Mason, J. Russell, "Keynote Address: Breathing Lessons" (2004). *USDA National Wildlife Research Center - Staff Publications*. 364.  
[https://digitalcommons.unl.edu/icwdm\\_usdanwrc/364](https://digitalcommons.unl.edu/icwdm_usdanwrc/364)

This Article is brought to you for free and open access by the U.S. Department of Agriculture: Animal and Plant Health Inspection Service at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in USDA National Wildlife Research Center - Staff Publications by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

## Keynote Address

# Breathing Lessons

J. Russell Mason

USDA APHIS Wildlife Services, National Wildlife Research Center, Fort Collins, Colorado

**ABSTRACT:** Current issues in wildlife damage management and the protection of human health and safety arise from the successful application of traditional methods by state and federal managers. The paradox is that these same methods are increasingly controversial. Within this constraint, management strategies may be difficult to implement. In California, for example, protecting state-threatened foxes could mean killing federally protected golden eagles. In Utah, restoring Gunnison sage grouse may require the sustained lethal suppression of predator populations unless or until habitat can be restored. The obvious fact is that these are unpopular choices, and special interest groups frequently oppose selective intervention, promoting instead somewhat neo-Romantic interpretations of ecosystem management. Luckily for the species involved, the motivating biological facts remain. The need for wildlife damage management is now a necessity in many instances, and the discipline is experiencing geometric growth. The real challenge is to make the best possible choices despite the controversies, within the already developed fabric. This presentation focuses on the contributions that USDA Wildlife Services is making to these efforts.

**KEY WORDS:** agriculture, alternative methods, disease, invasive, urban, Wildlife Services

Proc. 21<sup>st</sup> Vertebr. Pest Conf. (R. M. Timm and W. P. Gorenzel, Eds.)  
Published at Univ. of Calif., Davis. 2004. Pp. 3-7.

## INTRODUCTION

Experts maintain that changing societal values mandate different methods to address conflicts between humans and wildlife. Predictably, these changing values are said to reflect the changing demographics of the American public. Commonly provided explanations include shifts in population from rural to urban, general declines in public appreciation for existing methods of management (Duda et al. 1998), gender differences in environmental activism (Tindall et al. 2003), and/or an increasing but poorly defined 'environmental awareness' (e.g., Conover and Conover 2003). The contradictory nature of these explanations has not, apparently, proved especially troublesome, and they have stimulated the investment of large sums and great effort in public surveys (e.g., Lauber et al. 2002), awareness campaigns (e.g., Chase et al. 2002), and the development of alternative methods of damage control (e.g., Nolte et al. 2002, Shivik et al. 2002). The allusion here is to a demand for (currently more or less unavailable) non-lethal tools (e.g., Clark 1998), including repellents and scaring devices, and more humane capture systems that inflict less physical damage to the restrained animal (e.g., Earle et al. 2003).

Concurrent with these developments, populations of many wildlife species are dramatically increasing. These increases are often a direct result of successful wildlife management (e.g., Craven et al. 1998), and they present an ever-increasing need for damage control. Coyotes (*Canis latrans*) now inhabit most of the continent (Knowlton et al. 1999), and problems once confined to the West are being experienced by suburban residents and livestock producers in the Northeast and Mid-Atlantic. Black bear (*Ursus americanus*), cougar (*Felis concolor*), and white-tailed deer (*Odocoileus virginianus*) populations are higher than ever in many (often suburban) areas (Etter et al. 2002), and these increases are coupled

with an increase in damage, disease, and other potential threats to human health and safety. Snow geese (*Chen caerulescens*) are sufficiently abundant that they have become economically important to farmers and a threat to the ecological integrity of their habitats (Béchet et al. 2003). Overabundant beaver (*Castor canadensis*) now cause substantial economic damage throughout their range (Ruid 2003), including Arizona (Nolte et al. 2003b), and their removal of streamside vegetation is threatening endangered salmonid populations in the Pacific Northwest (DuBow 2000). Blackbirds (*Agelaius* spp.) in the central flyway (Peer et al. 2003), double-crested cormorants (*Phalacrocorax carbo*) in the Mississippi delta and on the Great Lakes (Glahn et al. 2000), pelicans (*Pelecanus erythrorhynchos*; Overstreet et al. 2002), and other species of adaptable and overabundant wildlife are creating damage and disease concerns that were largely absent or ignored a decade ago.

For all of these reasons and more, wildlife damage management has become an inexorable component of modern wildlife and wildlands conservation (Conover 2002). Despite sometimes strident reservations expressed by the animal rights community (e.g., Rutberg 2001) and environmental neo-Romantics (e.g., Schlickeisen 1999, Weber 2000), the realities speak for themselves. The increasing need for sound, safe, efficient, and economical damage management is apparent everywhere; natural systems simply do not exist apart from human influences (Kleese 2002). Reflecting this reality, USDA Wildlife Services created the Berryman Institutes at Utah State University and Mississippi State University to help supply the professional biologists needed as employees, and to assist in other educational and research activities (e.g., Wagner and Conover 1999). These institutes have flourished, not only because of continuing Wildlife Services support, but also because other federal, state, and

non-governmental organizations are contributing to the effort. In response to concerns expressed by the public, other agencies, and private non-governmental organizations, the Wildlife Services program is involved in a greater variety of wildlife issues than at any time in the history of the agency. Scientists at the Wildlife Services National Wildlife Research Center are internationally recognized as a source of wildlife damage and disease methods development.

Most important, there is a growing recognition by the public, stakeholders, and a variety of elected officials that wildlife damage and disease threats are important, and that the consequences of inaction can be expensive and dangerous (e.g., Baron 2004). The central issue faced by Wildlife Services and other wildlife damage professionals is not how to fend off the critics of their activities. Instead, the issue is where, when, and how to apply integrated strategies to protect agriculture, assist in the restoration of threatened and endangered species, protect human health and safety, and resolve wildlife disease issues that threaten agriculture and agricultural trade. The discussion below provides an outline of what Wildlife Services is contributing to the resolution of this topic.

## **EMERGING ISSUES**

### **Alternative Methods**

The Wildlife Services National Wildlife Research Center and Wildlife Services operational personnel are developing new devices and strategies for non-lethal predation management. Other investigators are improving the selectivity and efficiency of various lethal practices.

Non-lethal methods under development include effective and economical scaring devices (Beringer et al. 2003), cable restraint systems (Shivik et al. 2000), break-away radio-collaring technologies, molecular methods to identify offending individuals (e.g., Williams et al. 2003), and GIS models that predict when and where problems are likely to occur. GIS efforts complement similar efforts ongoing in other laboratories (Treves et al. 2004). Investigations to improve the selectivity, efficiency, and economy of existing lethal tools include an evaluation of coyote vocalizations to assist in the development of more effective auditory attractants, and studies to develop more selective chemical attractants and toxicants (Johnston 2003).

Besides work with predators, the National Wildlife Research Center is developing non-lethal strategies to minimize beaver and deer damage to forest products and other resources (Nolte and Dykzeul 2002). For example, ongoing research seeks to identify new methods to reduce vegetation and structural damage and associated flooding problems caused by aquatic mammals. Avian biologists are producing new tools and techniques (Bryant et al. 2000) to address bird damage to crops (Blackwell et al. 2003, Clark et al 2000), bird predation on fish (e.g., Glahn and Werner 2002), and other bird nuisance and hazard concerns (e.g., Barras 2003, Stevens et al. 2000).

### **Changing Agricultural Practices**

The globalization of agricultural markets has stimulated the development of new crops, and a host of verte-

brate pest concerns (Levine and D'Antonio 2003). In Hawaii, for example, sugarcane fields are being planted to cacao, vanilla, soft tropical fruits, seed corn and soybean, timber, and ornamental plants. Black (*Rattus rattus*), Polynesian (*R. exulans*), and Norway (*R. norvegicus*) rat damage to these crops is significant (e.g., Sugihara 2002). In addition, abundant feral ungulates, introduced species of birds, and invasive amphibians damage crops and threaten trade. Wildlife Services is developing new rodenticide delivery systems for rats, evaluating repellents and selective lethal strategies to manage or eradicate invasive birds, testing efficient multiple capture systems, and studying barriers and lethal control methods for feral ungulates. In addition, a suite of environmentally safe toxicants and heat-treatment strategies are being examined for the management or eradication of invasive amphibians, including Coqui (*Eleutherodactylus coqui*) and greenhouse (*E. planirostris*) frogs.

### **Wildlife Diseases**

The organic legislation (Animal Damage Control Act of 1931, Rural Development, Agriculture, and Related Agencies Appropriation Act 1988) that created the Wildlife Services program specifically directs it to address the issue of wildlife disease (USDA 1994). Wildlife Services participation remains critical to the extraordinary success of the Texas rabies management program (Slate et al. 2002). The National Wildlife Services program developed and tested aerially deliverable baits (e.g., Knowlton et al. 2001), and Wildlife Services specialists deployed distributed baits throughout much of southwest Texas. With emerging concerns over raccoon (*Procyon lotor*) rabies (e.g., Totton et al. 2002), Wildlife Services rabies eradication and control efforts have expanded to other parts of the country, with particular emphasis on raccoon rabies in the eastern United States.

Wildlife Services is cooperating with other USDA-APHIS agencies, the Centers for Disease Control, the Fish and Wildlife Service, and the Southeastern Wildlife Disease Cooperative to address emerging concerns with pseudorabies, West Nile Virus, tuberculosis, brucellosis, salmonella, Chronic Wasting Disease, and a host of other diseases. The National Wildlife Research Center is developing methods to address several of these emerging wildlife concerns. New specialists have been hired and a wing of the Animal Research Building has been modified so that BSL-3 pathogens can be studied. Plans for the construction of a separate BSL-3 facility at the National Wildlife Research Center are in development. Already, the National Wildlife Research Center is an international leader in the area of wildlife disease research and methods development.

### **Invasive Species**

Invasions by invasive alien species are recognized as second only to habitat loss as a threat to global biodiversity (Walker and Steffen 1997). Despite some apparent disagreement (Ash and Adams 2003), key experts and policy makers agree on the occurrence, effects and public-policy implications of non-indigenous

species (Lodge and Shrader-Frechette 2003). This is reflected in an executive order mandating federal agencies, to the extent permitted by law, to prevent the introduction and spread of non-indigenous invasive species into the ecosystems of the United States and its territories. Specific actions to be taken included: a) reducing the risk of introduction of such species, b) reducing the risk of their spread throughout the United States, c) ensuring rapid detection, d) eradication or control in a manner that minimizes harm to non-target organisms and ecosystems, e) minimizes the importation or export of such species into or out of the United States, and f) conduct educational outreach programs. Wildlife Services operations and research, other APHIS agencies and other federal and state agencies are aggressively addressing the invasive species threat. The National Wildlife Research Center will soon begin construction of a dedicated Invasive Species Research building at Fort Collins and research is being conducted on a wide range of species, including rats (*Rattus* spp.), mongoose (*Herpestes javanicus*), nutria (*Myocastor coypus*), brown tree snakes (*Boiga irregularis*), and *Eleutherodactylus* frogs. Methods under consideration include toxicants and new delivery systems, attractants, monitoring and detection methods, multiple capture traps, and field testing of integrated eradication and control methods. Invasive species eradication and control is not confined to island habitats and other native ecosystems. Urban areas previously inhospitable to invasive species have been sufficiently altered to permit their survival. For example, although the desert surrounding Phoenix is formidable to roof rats, residential and urban development have created favorable environments, and ill-advised trap and release of these rodents have spread the invasion to surrounding areas (Nolte et al. 2003a).

As others have noted, the attempts to eradicate invasive species almost always are most effective when action is quickly taken (Simberloff 2003). Wildlife Services operational personnel are already deployed to eradicate or control a wide range of invasive vertebrates nationwide with the aim of preserving or restoring native ecosystems and wildlife, protecting human health and safety, reducing agricultural damage, and minimizing the impacts these species could have on trade. These efforts have been in partnership with other federal and state agencies, and the methods employed have been a blend of effective traditional tools and new technologies as these become available. This is not to dismiss the considerable nature of the challenges to effective damage control. In California, management to preserve channel fox (*Urocyon littoralis*) populations may require the lethal removal of golden eagles (*Aquila chrysaetos*), a species with substantial statutory protection (Courchamp et al. 2003). In Utah or Wyoming, restoration of black-footed ferret (*Mustela nigripes*) populations may mean the removal of charismatic predators. In the Pacific Northwest, management of Caspian tern (*Sterna caspia*) predation may be prerequisite to the recovery of imperiled salmon populations (Roby et al. 2003). No doubt, these actions may generate controversy and lawsuits. But these are simply part of the game; the reality is that the restoration of these species absolutely

requires predation management. The biological reality will not be removed by wishing them away.

### Urban Wildlife

Urban and suburban wildlife concerns are among those most visible to the public, and for that reason, the most controversial. Overabundant white-tailed deer, Canada geese (*Branta canadensis*), growing predator populations, and aquatic rodents are some of the most frequently noticed concerns. Despite substantial and well-organized opposition from animal rights and neo-environmentalist groups, substantial progress has been made to assure healthy sustainable populations of these animals in urban areas wherever appropriate while simultaneously managing wildlife damage and nuisance concerns. Wildlife Services research and operations are evaluating sterilants and contraceptives agents for use with deer and geese (Miller 2002), and the possibility of practical tools for use in some situations appears increasingly likely. In addition, the Wildlife Services operational program and other groups (e.g., White Buffalo) have refined existing methods such as the use of alpha-chloralose, hand goose captures, and selective lethal removal. Many concerns can be resolved safely, effectively, and professionally using these methods alone. Perhaps more important, research has been conducted and continues to evaluate existing and new methods to determine where, when, and if these methods have a potential to successfully resolve problems (e.g., Nolte et al. 2001, Shivik et al. 2003). In each case, the biological realities have forced the eventual development of realistic biological solutions.

### CONCLUSIONS

Overabundant and adaptable wildlife are having impacts unforeseen even a few years ago (Hamilton 1999). Wildlife damage management is expanding field and often essential (indispensable) for the protection of agriculture, native ecosystems, threatened and endangered wildlife, and human health and safety. Today as never before, the best available science is being used to select methods and explain management. It is both true and disturbing that ballot initiatives and emotion can be used to delay needed management actions. Clearly, the judicial system can utterly fail to appreciate rationale attending science and hypothesis testing (Faigman 2002), and this lack of understanding can be manipulated by those opposed to the scientific management of biological resources (e.g., Houck 2003). There are those who question whether or not wildlife biologists should serve as advocates or interpreters of data so that it is more practically useful (e.g., Mills 2000). However, the view presented here is that, regardless of advocacy or the lack thereof, the biological facts are the biological facts and these facts will motivate action. At the end of the day, action will be dictated by the reality of situation. California, for example, has banned cougar hunting since 1971. Recently, even national newspapers including *USA Today* have published editorials advocating a reinstatement of regulated hunting (Stange 2004). Eventually and inevitably, effective damage management will be initiated. The responsibility of wildlife damage manage-

ment professionals is to assure that management actions are planned and carried out efficiently, safely, and with the proper tools so that both the species of concern and human interests are served.

## LITERATURE CITED

- ASH, S. J., AND C. E. ADAMS. 2003. Public preferences for free-ranging domestic cat (*Felis catus*) management options. *Wildl. Soc. Bull.* 31:334-339.
- BARON, D. 2004. *The Beast in the Garden*. W. W. Norton and Company, New York, NY. 277 pp.
- BARRAS, S. C., S. E. WRIGHT, AND T. W. SEAMANS. 2003. Blackbird and starling strikes to civil aircraft, 1990-2001. Pp. 91-96 *in*: G. M. Linz (Ed.), *Management of North American Blackbirds: Proc. Special Symp., The Wildlife Society 9<sup>th</sup> Annual Conference*, Bismarck, ND.
- BÉCHET, A., J-F GIROUX, G. GAUTHIER, J. D. NICHOLS, AND J. E. HINES. 2003. Spring hunting changes the regional movements of migrating greater snow geese. *J. Appl. Ecol.* 40:553-564.
- BERINGER, J., K. C. VERCAUTEREN, AND J. J. MILLSPAUGH. 2003. Evaluation of an animal-activated scarecrow and a monofilament fence for reducing deer use of soybean fields. *Wildl. Soc. Bull.* 31:492-498.
- BLACKWELL, B. F., E. HUSZAR, G. M. LINZ, AND R. A. DOLBEER. 2003. Lethal control of red-winged blackbirds to manage damage to sunflower: an economic evaluation. *J. Wildl. Manage.* 67:818-828.
- BRYANT, B. P., A. SAVCHENKO, L. CLARK, AND J. R. MASON. 2000. Potential for cell culture techniques as a wildlife management tool for screening primary repellents. *Int. Biodeter. Biodegrad.* 45:175-181.
- CHASE, L. C., W. F. SIEMER, AND D. J. DECKER. 2002. Designing stakeholder involvement strategies to resolve wildlife management controversies. *Wildl. Soc. Bull.* 30:937-950.
- CLARK, L. 1998. Review of bird repellents. *Proc. Vertebr. Pest Conf.* 18:330-336.
- CLARK, L., B. BRYANT, AND I. MEZZINE. 2000. Bird aversive properties of methyl anthranilate, yucca, *Xanthoxylum*, and their mixtures. *J. Chem. Ecol.* 26:1219-1233.
- CONOVER, M. R. 2002. *Resolving Human-Wildlife Conflicts*. Lewis Publishers, New York, NY. 418 pp.
- CONOVER, M. R., AND D. O. CONOVER. 2003. Unrecognized values of wildlife and the consequences of ignoring them. *Wildl. Soc. Bull.* 31:843-848.
- COURCHAMP, F., R. WOODROFFE, AND G. ROEMER. 2003. Removing protected populations to save endangered species. *Science* 302:1532.
- CRAVEN, S., T. BARNES, AND G. KANIA. 1998. Towards a professional position on the translocation of problem wildlife. *Wildl. Soc. Bull.* 26:171-177.
- DUBOW, T. J. 2000. Reducing beaver damage to habitat restoration sites using less palatable tree species and repellents. M.S. thesis, Utah State Univ., Logan, UT. 76 pp.
- DUDA, M. D., S. J. BISSELL, AND K. C. YOUNG. 1998. *Wildlife and the American Mind: Public Opinion on and Attitudes towards Fish and Wildlife Management*. Responsive Management, Reston, VA.
- EARLE, R. D., D. M. LUNNING, V. R. TUOVILA, AND J. A. SHIVIK. 2003. Evaluating injury mitigation and performance of #3 Victor Soft Catch traps to restrain bobcats. *Wildl. Soc. Bull.* 31:617-629.
- ETTER, D. R., K. M. HOLLIS, T. R. VAN DEELEN, D. R. LUDWIG, J. E. CHELSVIG, C. L. ANCHOR, AND R. E. WARNER. 2002. Survival and movements of white-tailed deer in suburban Chicago, Illinois. *J. Wildl. Manage.* 66:500-510.
- FAIGMAN, D. L. 2002. Is science different for lawyers? *Science* 297:339.
- GLAHN, J. F., M. E. TOBIN, AND B. F. BLACKWELL. 2000. A science-based initiative to manage double-crested cormorant damage to southern agriculture. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Publ. 11-55-010. 40 pp.
- GLAHN, J. F., AND S. J. WERNER. 2002. Cormorant depredation losses and their prevention at catfish farms: economic considerations. Pp. 138-146 *in*: L. Clark (Ed.), *Human Conflicts with Wildlife: Economic Considerations*. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center, Fort Collins, CO.
- HAMILTON, H. R. 1999. The case for abundant species management. *Human Dimen. Wildl.* 4:74-85.
- HOUCK, O. 2003. Tales from a troubled marriage: science and law in environmental policy. *Science* 302:1926-1929.
- JOHNSTON, J. J. 2003. Development of chemistry-based tools for wildlife damage management. *Pesticide Outlook* 13:250-253.
- KLEESE, D. 2002. Contested natures: wolves in late modernity. *Soc. Natur. Res.* 15:313-326.
- KNOWLTON, F. F., E. M. GESE, AND M. M. JAEGER. 1999. Coyote depredation control: an interface between biology and management. *J. Range Manage.* 52:398-412.
- KNOWLTON, F. F., M. ROETTO, AND D. BRIGGS. 2001. Serological responses of coyotes to two commercial rabies vaccines. *J. Wildl. Dis.* 37:798-802.
- LAUBER, T. B., B. A. KNUTH, AND J. D. DESHLER. 2002. Educating citizens about controversial issues: the case of suburban goose management. *Soc. Natur. Res.* 15:581-597.
- LEVINE, J. M., AND C. M. D'ANTONIO. 2003. Forecasting biological invasions with increasing international trade. *Cons. Biol.* 17:322-326.
- LODGE, D. M., AND K. SHRADER-FRECHETTE. 2003. Nonindigenous species: ecological explanation, environmental ethics, and public policy. *Cons. Biol.* 17:31-37.
- MILLER, L. A. 2002. Reproductive control methods. Pp. 701-704 *in*: D. Pimental (Ed.), *Encyclopedia of Pest Management*, Marcel Dekker, N.Y.
- MILLS, T. J. 2000. Position advocacy by scientists risks science credibility and may be unethical. *Northwest Sci.* 74:165-168.
- NOLTE, D. L., D. BERGMAN, AND J. TOWNSEND. 2003a. Roof rat invasion of an urban desert island. Pp. 481-484 *in*: G. R. Singleton, L. A. Hinds, C. J. Krebs, and D. M. Spratt (Eds.), *Rats, Mice, and People: Rodent Biology and Management*. Australian Centre for International Agricultural Research, Canberra, Australia.
- NOLTE, D. L., AND M. DYKZEUL. 2002. Wildlife impacts on forest resources. Pp. 163-168 *in*: L. Clark (Ed.), *Human Conflicts with Wildlife: Economic Considerations*. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center, Fort Collins, CO.

- NOLTE, D. L., M. W. LUTMAN, D. L. BERGMAN, W. M. ARJO, AND K. R. PERRY. 2003b. Feasibility of non-lethal approaches to protect riparian plants from foraging beavers in North America. Pp. 75-79 in: G. R. Singleton, L. A. Hinds, C. J. Krebs, and D. M. Spratt (Eds.), *Rats, Mice, and People: Rodent Biology and Management*. Australian Centre for International Agricultural Research, Canberra, Australia.
- NOLTE, D. L., S. R. SWAFFORD, AND C. A. SLOAN. 2001. Survey of factors affecting the success of Clemson beaver pond levelers installed in Mississippi by Wildlife Services. *Proc. Wildl. Dam. Manage. Conf.* 9:120-125.
- NOLTE, D. L., T. J. VEENEDAAAL, S. T. PARTRIDGE, C. T. ROBINS, G. J. ZIELGTRUM, AND P. FERSTERER. 2002. Bear response to supplemental feed offered to reduce tree peeling. *Proc. Vertebr. Pest Conf.* 20:330-339.
- OVERSTREET, R. M., S. S. CURAN, I. M. POTE, D. T. KING, C. K. BLEND, AND W. D. GRATER. 2002. *Bolbophorus damnificus* n. sp. (Digenea: Bolbophoridae) from channel catfish *Ictalus punctatus* and the American white pelican *Pelcanus erythrorhynchos* in the USA based on life-cycle and molecular data. *Syst. Parasitol.* 52:81-96.
- PEER, B. D., H. J. HOMAN, G. M. LINZ, AND W. J. BLEIER. 2003. Impact of blackbird damage to sunflower: bioenergetic and economic models. *Ecol. Appl.* 13:248-256.
- ROBY, D. D., D. E. LYONS, D. P. CRAIG, K. COLLIS, AND G. H. VISSER. 2003. Quantifying the effects of predators on endangered species using a bioenergetic approach: Caspian terns and juvenile salmonids in the Columbia River estuary. *Can. J. Zool.* 81:250-265.
- RUID, D. B. 2003. Assessment of four restraining devices for capturing beavers. M.S. thesis, Utah State Univ., Logan, UT. 65 pp.
- RUTBERG, A. T. 2001. Why state agencies should not advocate hunting or trapping. *Human Dimensions Wildl.* 6:33-37.
- SCHLICKEISEN, R. 1999. Lost leadership. *Defenders* 3:5.
- SHIVIK, J. A., V. ASHER, L. BRADLEY, K. KUNKEL, M. PHILLIPS, S. BRECK, AND E. BANGS. 2002. Electronic aversive conditioning for managing wolf predation. *Proc. Vertebr. Pest Conf.* 20:227-231.
- SHIVIK, J. A., K. S. GRUVER, AND T. J. DELIBERTO. 2000. Preliminary evaluation of new cable restraints to capture coyotes. *Wildl. Soc. Bull.* 28:606-613.
- SHIVIK, J. A., A. TREVES, AND P. CALLAHAN. 2003. Nonlethal techniques for managing predation: primary and secondary repellents. *Conserv. Biol.* 17:1531-1537.
- SIMBERLOFF, D. 2003. How much information on population biology is needed to manage introduced species. *Conserv. Biol.* 17:83-92.
- SLATE, D., R. B. CHIPMAN, C. E. RUPPRECHT, AND T. H. DELIBERTO. 2002. Oral rabies vaccination: a national perspective on program development and implementation. *Proc. Vertebr. Pest Conf.* 20:232-240.
- STANGE, M. Z. 2004. When animals stalk humans, hunters should shoot back. USA Today, [http://www.usatoday.com/news/opinion/editorials/2004-02-15-stange\\_x.htm](http://www.usatoday.com/news/opinion/editorials/2004-02-15-stange_x.htm).
- STEVENS, G. R., J. ROGUE, R. WEBER, AND L. CLARK. 2000. Evaluation of a radar-activated, demand-performance bird hazing system. *Int. Biodeter. Biodegrad.* 45:129-137.
- SUGIHARA, R. T. 2002. Rodent damage research in Hawaii: changing times and priorities. *Proc. Vertebr. Pest Conf.* 20:40-45.
- TINDALL, D. B., S. DAVIES, AND C. MAUBOULES. 2003. Activism and conservation behavior in an environmental movement: the contradictory effects of gender. *Soc. Natur. Res.* 16:909-932.
- TOTTON, S. C., R. R. TINLINE, R. C. ROSATTE, AND L. L. BIGLER. 2002. Contact rates of raccoons (*Procyon lotor*) at a communal feeding site in rural eastern Ontario. *J. Wildl. Dis.* 38:313-319.
- TREVES, A., L. NAUGHTON-TREVES, E. K. HARPER, D. J. MLADENOFF, R. A. ROSE, T. A. SICKLEY, AND A. P. WYDEVEN. 2004. Predicting human-carnivore conflict: a spatial model derived from 25 years of data on wolf predation on livestock. *Conserv. Biol.* 18:114-125.
- USDA. 1994. Animal Damage Control Program, Final Environmental Impact Statement. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Washington, D.C.
- WAGNER, K. K., AND M. R. CONOVER. 1999. Impact of snowfall on the Utah preventative aerial hunting program. *Wildl. Soc. Bull.* 27:943-945.
- WALKER, B., AND W. STEFFEN. 1997. An overview of the implications of global change for natural and managed terrestrial ecosystems. *Conserv. Ecol.* 1(2). <http://www.consecol.org/vol1/iss2/art2>. Also in: National Assessment Synthesis Team. 2001. Climate change impacts on the United States: the potential consequences of climate variability and change. Report for the US Global Change Research Program, Cambridge University Press, Cambridge, UK. 620 pp.
- WEBER, E. P. 2000. A new vanguard for the environment: grass-roots ecosystem management as a new environmental movement. *Soc. Nat. Res.* 13:237-259.
- WILLIAMS, C. L., K. BLEJWAS, J. J. JOHNSTON, AND M. M. JAEGER. 2003. A coyote in sheep's clothing: predator identification from saliva. *Wildl. Soc. Bull.* 31:926-932.