Wildlife Services

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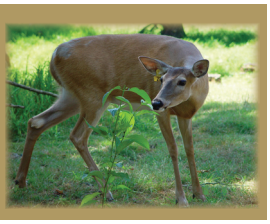
National Wildlife Research Center

FY 2008

Reducing Wildlife Damage to Forest and Riparian Ecosystems



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Major Cooperators

- Oregon Forest Industries Council
- Oregon Department of Forestry
- Oregon Department of Fisheries and Wildlife
- Tres Rios, City of Phoenix
- Washington Forest Protection Association
- Washington Department of Fisheries and Wildlife
- Washington Department of Natural Resources
- USDA Forest Service

Groups Affected By These Problems

- Commercial timber producers
- Gardeners/Landscapers
- Homeowners
- Natural resource managers
- Noncommercial forest land owners
- Orchard managers
- State departments of transportation

NWRC Scientists Develop Methods to Reduce Timber Damage

Wildlife Services' (WS) National Wildlife Research Center (NWRC) is the only Federal research facility devoted exclusively to resolving conflicts between people and wildlife through the development of effective, selective, and acceptable methods, tools, and techniques. NWRC's field station in Olympia, WA, has the capacity to conduct research on most animals associated with forest resource damage. Damage to timber resources at the human-wildlife interface often occurs in a variety of environments, ranging from bottomland hardwood forests to upland conifer farms.

Wildlife impacts on forest resources can be extensive. For example, attempts to replace trees after a harvest or a fire can be complete failures because of foraging wildlife. Reforestation efforts are greatly hindered by deer, elk, mice, mountain beavers, pocket gophers, and voles cutting and gnawing on seedlings during the first five years of tree growth. Other mammals such as bears, North American beavers, and porcupines damage established trees after canopy closure. Mountain beaver (Aplodontia rufa) are an example of a species that directly damage trees during (1-5 years) and after stand establishment (10-15 years).

Select species cause multiple impacts by their behavior and habits. For example, North American beavers are found in upland, lowland, and riparian habitats and they directly destroy trees by their foraging habits. Impounded water created by beaver damming activity floods and kills additional trees. Furthermore, altered water patterns caused by beaver damming erode roads and railways causing danger for human health and safety.

Developing nonlethal methods to manage wildlife damage is a priority in the ongoing research conducted at NWRC's Olympia field station. However, research to improve lethal control methods also is necessary. Scientists are currently conducting research to develop alternatives to lethal control, including repellents, and habitat and behavior modification.

NWRC scientists are working with a variety of natural resource managers to address the most significant wildlife damage problems in forested and riparian areas. The goal is to develop methods to reduce this wildlife damage while promoting ecosystem function. The research that NWRC is conducting is specifically targeted to find solutions to problems found in the Northwestern and Southeastern forests of the United States.

Applying Science & Expertise to Wildlife Challenges

Developing and Testing Repellents to Protect Forest Resources—Use of repellents for protecting trees can be cost prohibitive and results are generally short term. Thus, the need exists for a cost effective and long lasting repellent for application in forest management. NWRC studies evaluated the effects of hydrolyzed casein as a repellent for rodents and ungulates. Initial results showed a simple repellent made from glue and hydrolyzed casein may offer considerable browse protection from deer when alternative forage is available. NWRC scientists also concluded that avoidance of foods treated with animal-based proteins, such as hydrolyzed casein, was mediated by changes in palatability, not fear of predation. Other studies are working to identify genetically-controlled chemical characteristics which promote herbivore avoidance of select tree species.

Understanding Dietary Behaviors—Most problems associated with wildlife occur because of their foraging activities. NWRC researchers are working to determine how select wildlife species respond to chemical components in the plants they eat. Ongoing collaborative efforts will determine which traits can be selected to produce less palatable trees. Concurrently, ongoing studies suggest that when given a choice deer prefer to eat conifer seedlings with low terpene levels. Furthermore, tree breeding programs can be used to produce seedlings with elevated terpenes. Understanding these and other mechanisms that control dietary behaviors aid in the development of management

strategies for decreasing damage and help create models for predicting where damage is most likely to occur.

Manipulating Feeding Responses—Overgrazing of native trees can promote invasion of non-native woody species, thus altering ecosystem function and local diversity. An example of this is where North American beaver (Castor canadensis), native riparian trees (e.g., Salix spp. and Populus spp.), and invasive salt cedar (Tamarix spp.) coexist. Salt cedar is generally avoided due to high content of tannins and sodium chloride. NWRC researchers are working on methods to increase consumption of tamarisk plants while decreasing consumption of native plants. Initial results suggested that deterrent treatment of desirable plant species in wetland areas will facilitate foraging of invasive plants by beavers, including salt cedar.

A New Tool for Managing Mountain Beavers—The mountain beaver (Aplodontia rufa) is a rodent species endemic to the Pacific Northwest and northern coastal California. Unlike a true beaver, it has a short tail and is not well adapted to aquatic life but lives underground and is seldom seen. This herbivore is managed as a pest species because of the impact it has on newly planted Douglas-fir (Pseudotsuga menziesii) seedlings and Douglas-fir trees 10-15 years old. Attempts to manage mountain beavers through repellents, barriers, and trapping are costly and not effective. Results from a series of studies over a five year period at the Olympia field station concluded that chlorophacinone was an efficacious and environmentally safe toxicant with potential as a tool to control mountain beavers. Consequently, special local needs (SLN) labels were approved in Washington and Oregon for the use of Rozol™ (active ingredient chlorophacinone) as an additional tool to manage mountain beavers. Results from additional studies recommend integrating this tool with traditional trapping to increase forest health and reduce economic impacts.

A New Transmitter Design for Monitoring Beavers—Dispersal and long-term monitoring of North American beaver (Castor canadensis) populations has been hampered by the inability to retain external transmitters on the animals and the limited range of internal transmitters. Scientists at the NWRC field station in Olympia, Washington tested several transmitter designs to develop an effective and reliable external transmitter for beaver. A modified ear-tag transmitter fitted with a plastic sleeve and attached to the tail was found efficacious in pen trials. A subsequent field study conducted in Phoenix, AZ found the retention of the sleeve transmitter averaged 343 days, more than triple the time previously reported. This technique will be used to gain new knowledge of beaver behavior and movement in areas where beaver cause damage to roads, agriculture, and forest resources.

Selected Publications:

Arjo, W.M., C.O. Kochanny, J.L. Harper, R. Joos, D. L. Nolte, and D. Bergman. 2008. Assessment of transmitter models to monitor urban beaver populations. Wildlife Biology 14:309-317.

Arjo, W.M. 2007. Mountain Beaver: A Primitive Fossorial Rodent. Pages 309-321 in Subterranean rodents: News from underground (S. Begall, H. Burda, and C.E. Schliech, eds.). Springer-Verlag, Berlin.

Arjo, W.M., R.E. Huenefeld, D.L. Nolte. 2007. Mountain beaver home ranges, habitat use, and population dynamics in recently harvested units. Canadian Journal of Zoology 85:328-337.

Arjo, W.M. and D.L. Nolte. 2006. Boomer or bust: managing a Pacific Northwest pest species. Vertebrate Pest Conference 22:181-186

Arjo, W.M., K.K. Wagner, D.L. Nolte, R. Stahl, and J.J. Johnston. 2006. Potential non-target risks from strychnine-containing rodent carcasses. Crop Protection 25:182-187.

Figueroa, J.A., B.A. Kimball, and K.R. Perry. 2008. Lagomorph and Rodent Responses to Two Protein Hydrolysates. Crop Protection 27:851-854.

Kimball, B.A. and K.R. Perry. 2008. Evaluating New Protein Sources for Development of a Deer Repellent Product. Crop Protection 27:xxx-xxx (In press).

Kimball, B.A. and K.R. Perry. 2008. Manipulating Beaver (Castor canadensis) Feeding Responses to Invasive Tamarisk (Tamarix spp.). Journal of Chemical Ecology 34:1050-1056.

Kimball, B.A., J.H. Russell, J.P. DeGraan, and K.R. Perry. 2008. Screening Hydrolyzed Casein as a Deer Repellent for Reforestation Applications. Western Journal of Applied Forestry 23:172-176.

Kimball, B.A. and V. Billings. 2007. Do Herbivores Associate Flavours with Specific Consequences in Flavour Aversion Learning? Applied Animal Behavioral Science 107:252-261.

Kimball, B.A. and D.L. Nolte. 2006. Development of a New Deer Repellent for the Protection of Forest Resources. Western Journal of Applied Forestry. 21:108-111.

Kimball, B.A. and D.L. Nolte. 2006. Animal Tissue-based Repellents: Scary Odours or Altered Palatability? Advances in Vertebrate Pest Management. IV: 59-72.

Perry, K. R., L. A. Miller, and J. D. Taylor II. 2008. M. avium Bacterium: Is it an Essential Ingredient for a Single-injection GnRH Immunocontraceptive Vaccine? Vertebrate Pest Conference 23:253-256.

Perry, K., W.M. Arjo, K.S. Bynum, and L.A. Miller. 2006. GnRH single-injection immunocontraception of black-tailed deer. Vertebrate Pest Conference 22:72-77.

Rizor, S.E., W.M. Arjo, S. Bulkin, and D.L. Nolte. 2006. Long-term impacts on non-targets vertebrates following a cholecalciferol application to control pocket gophers. Vertebrate Pest Conference 22:166-170.

Runde, D. E, D.L. Nolte, W.M. Arjo, and W.C. Pitt. 2008. Efficacy of individual barriers to prevent damage to Douglas-fir seedlings by captive mountain beavers. Western Journal of Applied Forestry 23:99-105.

Taylor, J. D., D. Bergman, and D. Nolte. 2008. If you build it, they will come – management planning for a suburban beaver population in Arizona. Vertebrate Pest Conference 23:43-46.

Major Assistance Activities:

- WS evaluated efficacy of chlorophacinone as a toxicant for managing mountain beavers.
- WS evaluated the efficacy of hydrolyzed casein as a new repellent for rodents and ungulates.
- WS evaluated flavor aversion learning (FAL) for deterring ungulates from select tree species.
- WS evaluated methods for promoting consumption of invasive Tamarix species by North American beaver.
- WS developed an improved radio transmitter design for North American beaver.