Managing Wildlife Damage to Timber Resources

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Abstract

Wildlife damage costs the timber industry millions of dollars annually. A 5-step plan for reducing damage is described including, assessing the problem, learning the alternatives, developing a strategy, implementing the plan, and monitoring the consequences of the management program. This paper also summarizes the techniques available for addressing damage problems and provides information on current research developments in wildlife damage management.

Keywords

damage, forestry, timber, wildlife

Introduction

Wildlife damage costs the timber industry millions of dollars annually. Trees are vulnerable to some form of wildlife damage at all stages of growth, but newly-planted stands are vulnerable to damage from the widest range of species. Investments in seedlings, site preparation, and use of effective planting strategies can sometimes result in little more than a quick snack for the local wildlife. Consequences of wildlife damage include low seedling survival, the need for additional reforestation efforts, and reduced growth rates.

We review a 5-step plan for addressing damage problems. We also provide information on new tools and current research in wildlife damage management developed by the United States Department of Agriculture, Animal and Plant Health Inspection Service, Wildlife Services, National Wildlife Research Center (NWRC). Some of the material presented here is a summary of information provided in the manual, "Materials and Supplies for Management of Wildlife Damage to Trees". Reference information for this handbook and several other sources on damage identification

and damage management techniques are listed in the bibliography.

Damage Assessment

Do you really have a problem? Tolerance for damage will vary depending on project objectives, resources available, and agency or company directives on resource management. For projects with unlimited resources and time, the plant and replant method can be an effective strategy. Eventually enough trees will survive to meet project goals. In some cases, tolerating low to moderate damage may be preferable to using the available damage management techniques. For other projects, it may be essential to have initial plants reach maturity as soon as possible.

A site's potential for damage problems often can be predicted using information on the history of similar projects implemented on or adjacent to the target area, the type and quality of habitat available, and the species and density of animals using the site and surrounding areas. The efficacy of some damage management techniques will vary depending on the density of animals present. Management plans should be able to accommodate changes in wildlife populations. What may be tolerable damage levels the first year can become unacceptable after the animals have had a year to reproduce. Habitat quality can influence reproductive and immigration rates, as well as influencing the vulnerability of planted species to damage. Foraging is relative and the damage to the planted crop will depend on the palatability of alternative resources.

In addition to direct visual sightings, the presence of most species can be determined by activity indicators including tracks, feces, trails, and burrow systems. Snowshoe hare (*Lepus americanus*) activity is most commonly identified by the tracks and fecal pellets left at damage sites. Clipped needles, porcupine quills and fecal pellets are commonly found at the base of trees damage by porcupine. Mountain beaver (*Aplodontia rufa*) can have large burrow systems which often collapse underfoot. Fresh dirt and fresh vegetation outside burrow openings are indicators of active systems. Gophers (*Thomomys* spp.) build smaller diameter tunnel systems with fan shaped mounds of dirt and plugged openings to tunnel systems. After the snow melts, trails of dirt called castings can be found in places where gophers had tunnels between the snow and the surface of the ground. A network of small trails with small, open burrow entrances is usually an indicator of vole (*Microtus* spp.) activity. Sites heavily used by ungulates will usually have game trails. Individuals familiar with your area may also have information on the migratory patterns of the wildlife species in your area.

Each species also has it's own way of making lunch out of your trees. Stems chewed by deer (*Odocoileus* spp.) and elk (*Cervus* spp.) usually have torn or ragged edges. Young seedlings with poorly established root systems may be pulled out of the ground by foraging elk. Black bear (*Ursus americanus*) leave large strips of bark around the damaged site and long vertical tooth marks. Beaver (*Castor canadensis*) leave chips of bark and wood at the base of the tree and horizontal tooth marks. Peeled sticks and cone shaped stumps are also good indicators of beaver activity. Porcupine (*Erethizon dorsatum*) damage includes basal barking, clipping small seedlings and branches, and barking of the upper portions of older trees. Snowshoe hare leave a clean-edged, angled cut typical of most rodents, but usually prefer stems with a diameter < 1/4 inch. Mountain beaver can clip small seedlings, or they can climb small saplings and shrubs to clip branches. Girdling by mountain beaver is generally low on the bole and leaves horizontal tooth marks and irregular claw marks. Pocket gophers clip smaller seedlings and tree roots, and girdle the stems and roots of larger trees. Root damage is often undetected until the seedling discolors or tips over. Voles leave pointed stems on clipped seedlings and usually leave a circular or whorled pattern when girdling stems and roots.

Options for Damage Management

The choice of techniques will depend on the project goals, the density and type of animal involved, and the nature of the damage. There isn't any one technique suitable for all situations. Occasionally, the best management option may be "no management". However, like all other strategies, "no management" is an option with ecological, economic, and social consequences. Effective implementation of any management strategy will require knowledge of the biology and behav-

ior of the problem species, the ecological consequences of the selected tools, and the interaction between the local environment on the chosen techniques. Managers should make certain that their options do not conflict with any legal restrictions or agency policies. Particular attention should be given to potential risks to non-target species, especially endangered or threatened species. Additionally, the anticipated reduction in loss should justify the cost of the technique. Finally, managers should consider public attitudes when selecting an approach, including whether the technique is compatible with other site uses (e.g. recreation).

Traps and snares

Traps and snares can be a lethal or non-lethal technique. Trap-and-relocate programs can address problems associated with a few individuals. Although relocation is a socially appealing alternative, care should be taken when selecting this option. Identification of suitable relocation sites is essential. Sites with good habitat often have occupants. Sites without occupants may be marginal or poor habitat. Consideration should also be given to whether the species will need time to prepare a den or food cache for inclement weather. State and federal wildlife agencies often require special permits to trap and relocate animals.

As a lethal control technique, traps can remove specific problem individuals, or can be used to reduce population densities. The use of any lethal control technique can be highly controversial, and this is especially true for the use of traps. However, for some species like mountain beaver, trapping is one of the most effective and efficient means available to address damage problems. Carefully trained professionals can minimize risks to non-target species and reduce injuries to trapped animals. However, some risk will remain.

Toxicants

Toxicants can effectively and quickly reduce high populations of problem animals. However, at present, few products are registered for timber applications. Managers should check governmental and agency regulations before implementing a toxicant program. Toxicants pose a potential hazard to applicators, and non-target animals. Extreme caution should be used when handling, storing, and applying toxicants and in disposing of waste materials. Carefully follow all label instructions and precautions. Ongoing NWRC research on the use of underground strychnine bait to reduce pocket gopher populations indicate that, provided the product is used carefully and in accordance with label restrictions, there is minimal risk to non-target species.

Physical barriers

Physical barriers including fencing, individual seedling protectors, and netting, can protect relatively large areas (e.g. fences) or can just protect the most vulnerable plant parts (bud caps). Drift fences can be used to direct wildlife away from a site, or channel movements of wildlife toward some other control technique. Barriers can be an extremely effective long-term non-lethal solution for some problems, but the cost of labor and materials required for installation and upkeep of the barriers may be prohibitive. Individual plant protectors may require regular maintenance as the plant grows, and may create microclimates that are unfavorable to the growth of certain plant species. Care should be taken to ensure that large exclosures don't disrupt animal movement patterns or exclude animals from limited or critical resources.

Repellents

Repellents are an extremely popular short-term solution for damage problems. Because of the need to reapply repellents, they are best suited to situations where plants are vulnerable to damage during limited periods of time, or where the problem species is present for a brief period (e.g. migrating ungulates). However, repellent efficacy is always relative, and even the best product may not reduce damage if the foraging alternatives are limited, animal densities and competition for resources is high, or if the resource to be protected is a highly-preferred or familiar food. Additionally, there can be substantial variation among species in response to a repellent. NWRC Olympia Field Station studies investigating trends in efficacy of deer repellents indicate that, of the 20 products tested, repellents with active ingredients that emitted sulfurous odors (meat meal, egg solids) generally provided the best results. Products that contained active ingredients which cause pain/irritation (capsaicin, allyl isothiocyanate), or ill-

ness (thiram) were less effective. However, changes in repellent formulation, especially in the concentration of active ingredient, may result in improved efficacy for products that use pain or illness as a mode of action. Products that use a bitter taste (denatonium benzoate) were usually the least effective in reducing damage by herbivores. Repellents that were applied to plant surfaces were generally more effective than capsules or other devices that produced an odor intended to protect a specific area.

Textural repellents are a simple and inexpensive technique developed by NWRC scientists to reduce gnawing by beaver. In pen trials, mixtures of fine sand and paint (140 g sand/1 l paint) effectively reduced gnawing by beaver. Sandpaper sheets wrapped around materials can provide similar protection.

Habitat modification

Habitat modification techniques involve 2 general strategies; 1) decrease the attractiveness of the site so that animals move elsewhere, or 2) increase the availability of preferred resources so animals reduce pressure on the planted crop. Both strategies require detailed knowledge of the life history requirements and foraging preferences of the target species. Removing or reducing critical habitat components will eventually reduce wildlife populations, but time should be allowed for animals to move off the site. Otherwise the primary food available will be the planted crop. For species with poor mobility or species with strict habitat requirements, reducing local resources may really be a form of lethal removal, and thought should be given to the use of alternative removal techniques. Habitat modifications that reduce site attractiveness for one species may aggravate problems with another species. For example, leaving cut slash scattered throughout a site may reduce it's attractiveness to deer and elk, but may be highly desirable habitat for many rodents.

Before enhancing local habitat or starting a feeding program, thought should be given to the long-term consequences of the project. Increased resources may attract additional animals, or may raise the reproductive and survival rates of the existing animals. Territory sizes may shrink for species in high quality habitats. In all cases, the density of animals on the site will increase and can lead to even higher damage problems if the feeding program is not sustained or cannot meet the needs of a rising wildlife population. Provisions should be made to either wean the animals from the supplement or provide the supplement indefinitely. NWRC biologists are completing studies quantifying the potential benefits and long term consequences of the bear supplemental feeding program currently practiced by the Animal Damage Control Program of the Washington Forest Protection Program. Early data indicates that feeding stations may be successful in reducing damage. Age-specific body masses and fat content did not differ among bears with and without feeding stations, indicating that short-term pellet feeding may have no long lasting effect on bear condition or productivity. Although the feeding program does not appear to impact home range size, feeders may concentrate bears at specific locations.

Genetics

Research indicates that certain families of trees may be more resistant to damage than others. Studies of black bear foraging indicate that the bears are sensitive to the ratio of carbohydrates to terpenoids in tree sap. Subsequent research has revealed that for Douglas fir (*Pseudotsuga menziesii*), it may be possible to select families with favorable carbohydrate to terpenoid ratios without necessarily sacrificing tree growth. Caution will be needed when implementing this technique as foraging choices are relative, and animals will damage less desirable trees if no alternatives are available.

Silvicultural techniques

Silvicutural practices (e.g. planting larger stock, site preparation, adjusting the size and shape of the harvest area, etc.) are available that can help mitigate wildlife damage problems and are described in detail in, " Silvicultural Approaches to Animal Damage Management in Pacific Northwest Forests". Recent NWR studies have focused on the impact of certain silviculture techniques on the phytochemicals associated with black bear damage. As mentioned above, black bear are sensitive to the ratio of carbohydrates to terpenoids in tree tissues. Silvicultural practices like thinning and fertilization can increase these ratios and the likelihood of bear damage. Although it may not be viable to forgo these stand manage-

ment practices, knowledge of their impact on plant palatability may help define focus periods for damage management programs.

Chemosterilants

Chemosterilants are intended to help reduce the reproductive rate of a population. At present, there are not any products registered for timber applications, but public interest in the technique is high. Obstacles to chemosterilant use include product formulation and registration, delivery of product to an adequate portion of the population, and the role of immigration in determining wildlife population densities. Even if the obstacles are overcome, the technique will always have limitations. Chemosterilants might keep a population from rising in response to changes in habitat, or slow recovery rates for populations that have been reduced using other methods, but would be unlikely to provide an immediate solution to problems. For example, in long-lived species, several years may pass before a substantial population reduction might be observed.

Develop Strategy

Once the options are known, a strategy can be developed to meet the particular needs of the target site. Plans may involve the simultaneous use of several techniques, use one technique to stop the damage and another to prevent future damage, or may focus efforts on those times in tree growth and stand management when trees may be especially vulnerable (e.g. efforts to reduce bear damage during the period immediately after tree thinning or fertilization). Make certain staff involved in the project have the necessary training and equipment needed to effectively use the chosen techniques. Don't hesitate to get help from experts in the field if you have questions about how to use a technique or about a technique's suitability for a particular situation. Make certain you have any permits, or safety equipment needed to safely and legally use the technique(s).

Implement Plan

If the appropriate preparations have been made, implementing the program should be fairly straightforward. As with all work in natural systems, be prepared to make last minute alterations and changes in your plan. If changes are needed, repeat the first steps in the planning process using the new information. Document the work done, changes made, and resources used for use in developing future management plans.

Monitor Results

Monitoring the results of your program is an essential component of an effective plan. Variations in site conditions, animal populations, and other factors can lead to unanticipated results. Make certain the techniques used are providing the desired level of damage reduction and that there are no unanticipated negative consequences associated with your program.

Conclusions

Public and private damage management programs are subject to increasing scrutiny. Careful planning, a thorough knowledge of the environmental consequences of each management option, and a high degree of professionalism in the application of damage management techniques will be needed to meet these challenges. There will continue to be pressure to ban or eliminate lethal techniques. However, although there are continual advances in the development of non-lethal techniques, at present, these strategies are unlikely to provide similar protection levels as current lethal techniques.

Bibliography

Black, H.C. 1994. Animal damage management handbook. Gen. Tech. Rep. PNW-GTR-332. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 236 pp.

Black, H.C. 1992. Silvicultural approaches to animal damage management in Pacific Northwest forests. Gen. Tech. Rep. PNW-GTR-287. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 422 pp.

Dimock, E.J. II, R.R. Silen, V.E. Allen. 1976. Genetic resistance in Douglas-fir to damage by snowshoe hare and black-tailed deer. For. Sci. 22:106-121.

Hygnstrom, S.E., R.M. Timm, and G.E. Larson. 1994. Prevention and control of wildlife damage. Univer-

sity of Nebraska Cooperative Extension, Lincoln, NE.

Nolte, D.L. 1999. Research accomplishments of the National Wildlife Research Center's bear project (Phase I). United States Dept. of Agric. Anim. and Plant Health Inspection Serv., Wildl. Serv., Nat. Wildl. Res. Center, Olympia Field Station, Olympia, WA.74pp.

Nolte, D.L. 1998. Wildlife considerations when planning plant projects. Pages 118-123 in R.Rose and D.L. Haase eds., Symposium Proceedings Native plants: propagating and planting. Department of Forest Science, Oregon State Univ., Corvallis, OR.

Nolte, D.L., and I.J. Otto. 1996. Materials and supplies for management of wildlife damage to trees. Tech. Rep. 9624-2808-MTDC. Missoula, MT: USDA Forest Service, Missoula Technology Development Center. 48 pp.

Nolte, D.L., and K.K. Wagner. 1999. Non-target impacts of strychnine baiting to reduce pocket gopher populations on forest lands in the United States. Proc. 2nd European Vert. Pest Manage. Conf. Submitted.