

BLACK BEAR FOREST DAMAGE IN WASHINGTON STATE, USA: ECONOMIC, ECOLOGICAL, SOCIAL ASPECTS

GEORG J. ZIEGLTRUM, Washington Forest Protection Association, 724 Columbia Street NW, Suite 250, Olympia, WA 98501, USA, email: gziegltrum@wfpa.org

DALE L. NOLTE, USDA, Animal Plant and Health Inspection Service, Wildlife Services, National Wildlife Research Center, 9730-B Lathrop Drive, SW, Olympia, WA 98512, USA

Abstract: Black bear (*Ursus americanus*) damage to coniferous forests can be detrimental to the forest products industry in Washington state. Value of timber damage, west of the Cascade Mountains is millions of dollars every year. The Washington Forest Protection Association's (WFPA) Animal Damage Control Program (ADCP) manages bear damage in cooperation with the Washington Department of Fish and Wildlife (WDFW). Bears can significantly affect the viability of other wildlife, for example, elk (*Cervus elaphus*) calf predation on calving sites. Conversely, bear-damaged trees add to the snags and dead wood on the ground, which provide important habitat and feeding opportunity for cavity nesting birds and many other species. Social conflicts among forest managers, farmers, animal rights activists, and hunting organizations have escalated in the last few years because lethal black bear control is highly controversial in Washington. Law and policy changes in this state reflect these conflicts. The ADCP concentrates therefore on non-lethal control of bears but retains all lethal options, such as hound hunting, foot snares, and hunting over bait. The supplemental bear feeding program has great public support.

Ursus 12:169–172

Key words: Animal Damage Control Program (ADCP), American black bear, damage management, ecological impact, economics, social conflict, supplemental bear feeding, timber damage, *Ursus americanus*, Washington Forest Protection Association (WFPA)

American black bear damage to domestic livestock and beehives in western Washington is a much less widespread problem than it was 100 years ago, although it can still be substantial locally. However, damage to trees is a relatively new phenomenon that intensified with tree farming practices since the 1940s.

Intensive forest management has also increased the need to protect young, second growth forests from animal damage, and in the 1950s a cooperative was formed to minimize black bear damage in western Washington. The principal objective of the Washington ADCP is to reduce spring black bear damage to Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), and western redcedar (*Thuja plicata*) to an economically acceptable level. The ADCP also provides expertise and technical assistance in reduction of tree damage caused by a broad range of wildlife species, including beaver (*Castor canadensis*), mountain beaver (*Aplodontia rufa*), porcupine (*Erethizon dorsatum*), deer (*Odocoileus* spp.), elk, and other species.

Many black bears strip bark from coniferous trees during spring to feed on newly forming vascular tissue, which may contain up to 5% free floating sugars (Kimball et al. 1998, Nolte et al. 1998). Damage inflicted through this behavior can be detrimental to the health and economic value of timber stands (Kanaskie et al. 1990). Complete girdling is lethal, and partial girdling reduces growth rates and provides avenues for subsequent insect and disease infestation. The severity of timber loss is compounded because bears tend to select the most vigorous trees in either the most productive stands or where stand improvements, such as thinning or fertilization, have been implemented (Mason and Adams 1989, Nelson 1989).

Damage generally starts with conifer bud burst early in

the spring (Radwan 1969). Bears remove the bark with their claws and teeth, then scrape the sapwood (phloem) from the heartwood (xylem) with their incisors (Poelker and Hartwell 1973). Bark stripping generally occurs on the lower bole of Douglas-fir and hemlock stands 15–30 years of age (Schmidt and Gourley 1992). Preference of bears for a particular tree or tree species may change with the phenological stage of the tree (Raine and Kansas 1990). However, any age tree is vulnerable and occasionally an entire tree is stripped. Hemlocks are generally damaged earlier in the spring than Douglas-fir because of an earlier bud burst of the fir in coastal areas (R.H. Flowers, WFPA retired, Olympia, Washington, personal communication, 1994). Damage generally ceases during early July as salmonberries (*Rubus spectabilis*) and other foods become more available (Ziegltrum and Nolte 1996).

Damage inflicted by bears is easily identified. Stripped bark, with claw penetrations on the inner bark, is found on the ground around the base of the tree. Vertical tooth and claw marks are generally visible on the bole. Beaver and mountain beaver also girdle the bole of similar age trees near the ground, although damage inflicted by these species is generally easily distinguished from bear damage. Conical shaped stumps and large wood chips are good indicators of beaver. Mountain beavers leave irregular claw marks, they girdle a tree bole generally within 50 cm of the ground, and their tooth marks are horizontal and smaller than bears'. Porcupine damage occurs higher in the tree canopy; their quills and fecal material are often found at the base of the tree.

Timber stands with tree damage can be identified through aerial surveys in the spring. Trees completely girdled the previous year appear red as their vigor declines and their needles become discolored (Ziegltrum and Nolte

1996). Partially girdled trees appear light green to yellow and are generally physiologically stressed. Gray trees indicate mortality from previous years. Areas suspected of having bear-damaged trees can be mapped from the air and verified on the ground. A greater number of damaged trees are generally revealed during ground verification than originally detected from the air (Ziegltrum and Nolte 1996).

Washington has a healthy bear population, which may exceed 30,000 (Tirhi 1996). Methods to manage black bear damage have prompted public concerns in Washington State for many years. The conflict among bear hunters, forest managers, and animal rights activists has led to debates, lobbying efforts, and even to vandalism. Hunting methods have prompted considerable political activities in the state. Animal rights activists strongly opposed the use of hound dogs and bait to hunt black bears during regular sport-hunting seasons. In 1996, voters approved Initiative 655, which outlawed hunting bears and wild native cats with dogs or bait. Following passage of this law, only 844 bears were killed statewide in 1997, a substantial reduction from previous years. In 1998, the bear harvest increased to 1,802 bears, of which 1,064 were taken east of the Cascade Mountains. Initially, low bear kills west of the Cascades concerned forest landowners because increasing bear populations could significantly increase damage to young, thinned timber stands.

ECONOMICS OF BEAR DAMAGE

The total land base in Washington is 17.3 million ha, of which 8.7 million ha are forested. Privately owned forestland in Washington totals 3.1 million ha (36%), of which WFPA members own and manage 1.9 million ha (22%, Munson 1999). Black bear damage on privately owned land is considered unacceptable by many land managers because one bear may peel bark from up to 70 trees a day (Schmidt and Gourley 1992).

Tree stocking on industrial forestland averages 1,000 trees/ha after precommercial thinning, representing an average future value of approximately \$50,000/ha (J. Todd, Weyerhaeuser Corporation, Aberdeen, Washington, personal communication, 1997). Vulnerable stands may have 5–10% tree damage each year (Ziegltrum 1994). The cost of tree damage is calculated by discounting from the expected harvest age back to the year when the damage occurred. Based on this method, the annual present cost of damage is conservatively estimated at \$5 million. Over the next 20 years, private landowners will annually manage 0.4–0.6 million ha (Adams et al. 1992) of young timber stands with bear damage potential. Landowners are currently not compensated by the state for black bear tree damage.

In 1985, the ADCP developed a non-lethal program to prevent damage (Flowers 1986), and it quickly became a preferred alternative to hunting and killing bears. Supplemental food is provided only in the spring when bears forage on trees, and is discontinued when the salmonberry crop is ripe in late June. Bears are weaned off the feeders shortly after. Bears feed consistently on feeding stations during the spring but do not necessarily gain more weight than bears without access to feeding stations (Partridge 2000). There is no indication that bears on feeders have a higher mean litter size than bears off feeding stations (Partridge 2000). In 1999, the ADCP supplied 210,000 kg of pellets to 900 feeding stations in western Washington, protecting vulnerable stands on approximately 385,000 ha at a cost of \$300,000.

Gamer harvest statistics from Washington Department of Fish and Wildlife show that bear sport hunters killed 1,310–1,735 bears in Washington annually in 1991–95 before Initiative 655 became law. With significantly lower sport harvest rates in 1997, bear damage complaints from smaller private forestland owners, honey producers, apple orchard owners, and private rural citizens increased. This may also in part reflect a change in the reporting format used by the Washington State Department of Fish and Wildlife. The ADCP and the WDFW have attempted to investigate each complaint, resulting in increased program costs for both organizations.

ECOLOGICAL CONSIDERATIONS

Bears create and use snags, which benefits many species of wildlife. Large snags are used for overwintering and raising cubs. Decomposed snags and dead and down woody material host invertebrates, an important source of protein and fat for bears throughout the year. Snags are used by over 100 species of birds and mammals, of which at least 53 are cavity dependent; cavity nesting birds may account for up to 45% of the total bird population (Raphael 1980). Bats, martens (*Martes americana*), fishers (*Martes pennanti*), and raccoons (*Procyon lotor*) use snags for denning, hunting, and to raise young (Brown 1985).

As logs decompose in western Washington, they increase and maintain forest floor moisture content and provide habitat for reptiles and amphibians. Nitrogen-rich material from decomposition on the ground serves as an excellent natural regeneration substrate for some species of tree seedlings (Brown 1985).

Black bear damage in thinned timber stands promotes open patches over time. Dead and dying trees within these patches allow more sunlight to reach the forest floor and encourage diverse vegetation growth, which becomes excellent feeding habitat for elk and deer. Black bears, how-

ever, also prey on elk calves and deer fawns. The decline of an elk herd in the Green River watershed east of Tacoma, Washington, from over 650 animals to about 200 in 4 years was partly attributed to bear and cougar (*Felis concolor*) predation in addition to sport harvest and a declining habitat quality (Spencer 1997). Although cougar prey on both young and adult elk, bears search for motionless, hiding calves on traditional elk calving grounds (Schlegel 1976).

SOCIAL CONFLICT

At the turn of the century, bears were plentiful in the state of Washington. Harvest data from 1949–65 show high sport harvest success; recreational hunters killed 9,100 bears in 1954 (Tirhi 1996). The bear, in these years, was considered a pest. It received no protection and there was no bag limit. In 1969 the black bear was protected as a game animal through hunting regulations and seasons. At the same time, professional bear hunters hired by private and state forest land managers tried to minimize bear damage by reducing bear populations in high damage areas. Damage control kills of ≈ 600 bears during spring were common. In the 1960s, there was no public outcry over these relatively high bear kills, so evidently it was not a large public concern. However, public attitudes changed in the early 1980s, and it became far less acceptable to kill bears solely to benefit timber. In response to public pressure, the forest products industry developed a non-lethal approach to minimize tree damage. In 1987, the supplemental feeding program, aimed at attracting bears away from vulnerable timber stands, was field tested at the Weyerhaeuser Snoqualmie tree farm in King County, which had heavy damage from bears. Surveys in summer of 1987 showed no additional bear damage on the tree farm where feeding stations were used (R. Flowers, WFPA, Olympia, Washington, USA, personal communication, 1994).

Bear populations started to decline rapidly in the early 1980s, after years of heavy hunting pressure (Tirhi 1996). As a result, ADCP's lethal control efforts during the spring months dropped sharply, and professional bear hunters were no longer needed.

Lethal black bear damage management and hunting methods are still controversial in the state of Washington. In 1995 animal rights activists launched Initiative 655, which successfully banned recreational bear hunting with hound dogs and the use of bait. All hunting methods continued to be legal to protect public health and safety and private property. Hunting organizations fought hard against the initiative. Washingtonians, mostly in urban areas, overwhelmingly (63.7%) voted in favor of the proposed law. Black bear hunting success during the regular hunting season dropped significantly the first year because

hound and bait hunters had been very successful, traditionally harvesting 50% of the bears.

Increased bear damage was reported to the ADCP by foresters since 1997 and 151 bears were killed in 1998 to control damage. Bear tree damage affected owners of small farms, which represent over 1.2 million ha of forest land (Munson 1999), especially hard. Conflicts of interest between animal rights activists and forest land owners were often unavoidable. In early 1999, 5 bills were introduced to the Washington State legislature to amend Initiative 655 to increase bear and cougar harvest. All bills failed, despite heavy lobbying efforts from hunting organizations.

CONCLUSIONS

Growing and harvesting trees is a way of life in the Pacific Northwest and an attractive investment strategy for many rural citizens. Black bear damage to coniferous forests is, in the perception of forest managers, an economic problem in western Washington. Damage control matters, however, need to be handled in a publicly sensitive and acceptable way. Supplemental feeding programs have reduced the need for lethal damage control on private lands. Still, economic, ecological and social problems have erupted since 1990 with increasing black bear protection in Washington State and, at the same time, an increased demand of land managers for aggressive damage management. Coordinating and balancing the interests of landowners, animal rights activists, and hunting groups is, and will continue to be, a real challenge in Washington.

LITERATURE CITED

- ADAMS, D.M., R.J. ALIG, AND D.J. ANDERSON. 1992. Future prospects for western Washington's timber supply. College of Forest Resources, Contribution Number 74. University of Washington Press, Seattle, Washington, USA.
- BROWN, E.R. 1985. Management of wildlife and fish habitat in forests of Western Oregon and Washington. Part 1. U.S. Forest Service Pacific Northwest Region R6-FWL 192.
- FLOWERS, R.H. 1986. Supplemental feeding of black bear in tree damaged areas of western Washington. Pages 147–148 in Symposium proceedings: Animal damage management in Pacific Northwest forests. Washington State University, Pullman, Washington, USA.
- KANASKIE, A.J., CHETOCK, G., IRWIN, AND D. OVERHUSLER. 1990. Black bear damage to forest trees in Northwest Oregon 1988–1989. Pest Management Report 90-1. Oregon Department of Forestry, Salem, Oregon, USA.
- KIMBALL, B.A., D.L. NOLTE, R.M. ENGEMAN, J.J. JOHNSTON, AND F.R. STERMITZ. 1998. Chemically mediated foraging preference of black bears (*Ursus americanus*). Journal of Mammalogy. 79:448–456.

- MASON, A.C., AND D.L. ADAMS. 1989. Black bear damage to thinned timber stands in northwest Montana. *Western Journal of Applied Forestry* 4:10–13.
- MUNSON, M. 1999. Forest facts and figures. Washington Forest Protection Association, Olympia, Washington, USA.
- NELSON, E.E. 1989. Black bear prefer urea-fertilized trees. *Western Journal of Applied Forestry* 4:13–15.
- NOLTE, D.L., B.A. KIMBALL, AND G.J. ZIEGLTRUM. 1998. The impact of timber management on the phytochemicals associated with black bear damage. *Proceedings 18th Vertebrate Pest Conference* 18:In Press.
- PARTRIDGE, S.T. 2000. Nutritional ecology of black bear conifer damage in Washington forests. Thesis, Washington State University, Pullman, Washington, USA.
- POELKER, R.J., AND H.D. HARTWELL. 1973. Black bear of Washington. Washington State Game Department, Biological Bulletin 14, Olympia, Washington, USA.
- RAPHAEL, M.G. 1980. Utilization of standing dead trees by breeding birds at Sagehen creek, California. Dissertation, University of California, Berkeley, California, USA.
- RADWAN, M.A. 1969. Chemical composition of the sapwood of four tree species in relation to feeding by the black bear. *Forest Science* 15:11–16.
- RAINE, R.M., AND J.L. KANSAS. 1990. Black bear seasonal food habits and distribution by elevation in Banff National Park, Alberta. *International Conference on Bear Research and Management* 8:297–304.
- SCHLEGEL, M. 1976. Factors affecting calf elk survival in North Central Idaho. *Western Association of State Game and Fish Commission* 56:342–355.
- SCHMIDT, W.C., AND M. GOURLEY. 1992. Black bear. Pages 309–331 in H.C. Black, editor. *Silviculture approaches to animal damage management in Pacific Northwest forests*. Technical Report PNW-GTR-287.
- SPENCER, R. 1997. GMU 485 elk mark/recapture population estimates. Final Washington State Report of Fish and Wildlife Report, Olympia, Washington, USA.
- TIRHI, M.J. 1996. Environmental impact statement for the Washington State management plan for black bear. Washington State Department of Fish and Wildlife, Wildlife Management Program, Olympia, Washington, USA.
- ZIEGLTRUM, G.J. 1994. Supplemental bear feeding program in Western Washington. *Proceedings 16th Vertebrate Pest Conference*, 16:36–40.
- , AND D.L. NOLTE. 1996. Black bear damage management in Washington state. *Eastern Wildlife Damage Management Conference* 7:104–107.