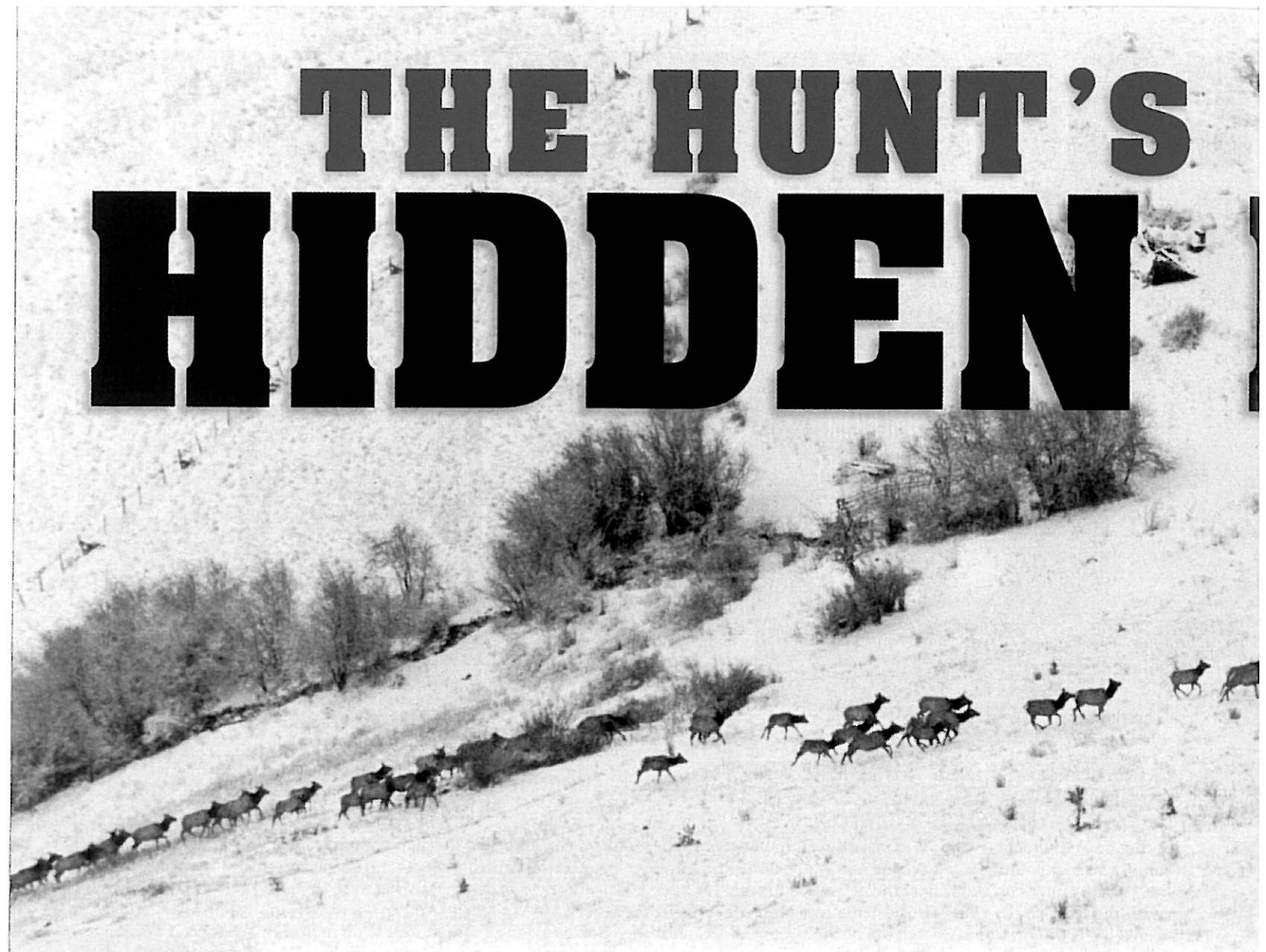
THE HUNT'S HIDDEN



By Wayne van Zwoll
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Last November, like Novembers before, the herd split. It was a gender thing. The cows, with their yearlings and a handful of mature bulls, retreated to the west, while several hundred branch-antlered bulls camped to the east. But rather than hew to the bromide that bull elk stay on the mountain until their egos freeze over, this antlered contingent cruised into low country ahead of the first storm. The cows might have too, but for hunting pressure. In this unit bulls dodged bullets early, but cow season came during migration. The result: Cows waded snow in timber at 8000 feet while bulls lounged on snow-free sage flats at 6000. Elk hunting activity pushed mule deer into cold coverts on north slopes and delayed their trek to winter quarters.

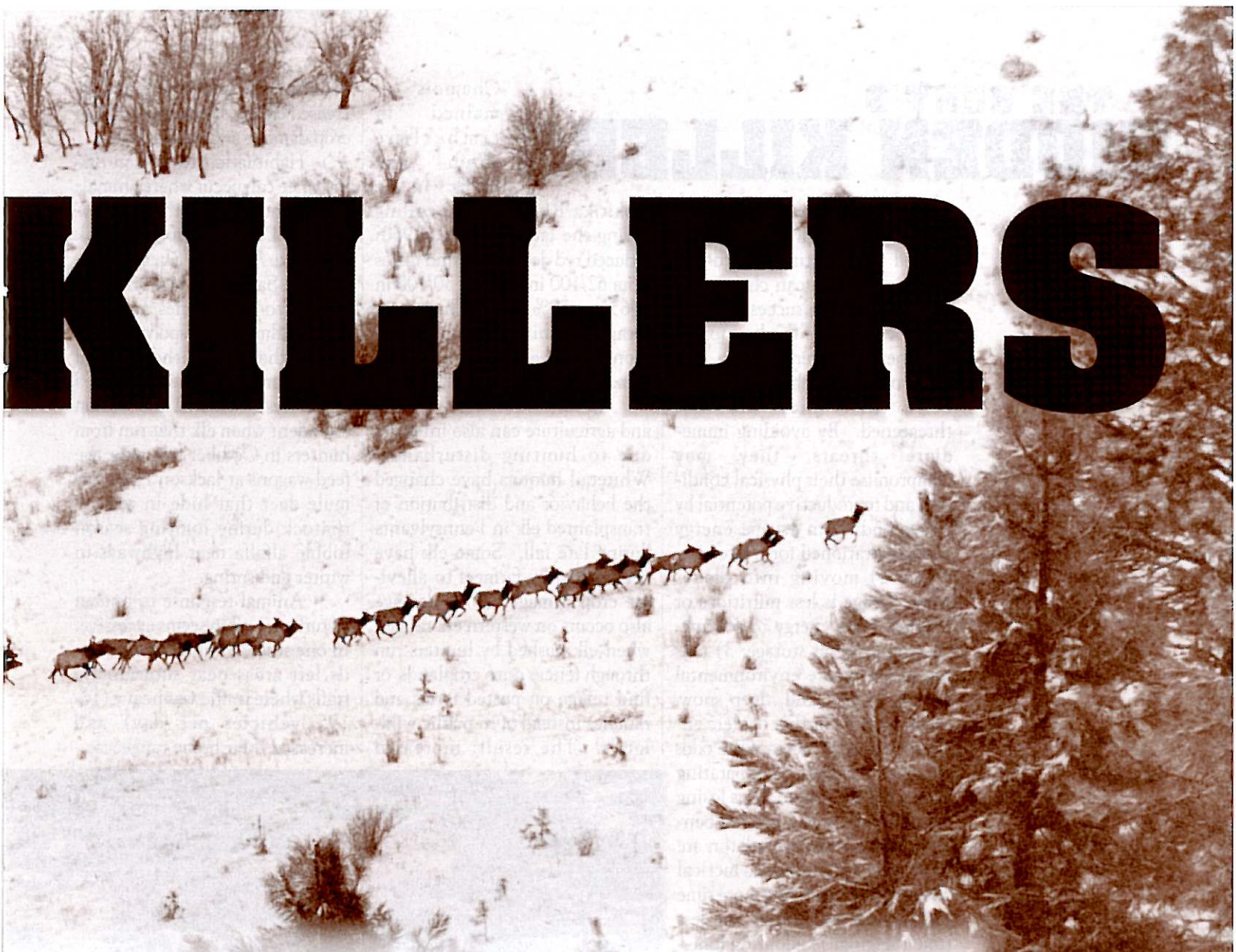
Until recently, animals not shot were considered overflow that went back into the barrel, good as new. That assumption is questioned by scientists who contend that hunting activity can produce stress that affects animal survival and reproduction.

The opening of the American West brought swarms of hunters who shot for subsistence, sport and market - all without limit. After the carnage came rules to restrict take, then laws protecting habitat. The secondary effects of the hunt got no study during restoration of game stocks between the world wars. When hunters had game to shoot in the 1950s and '60s, indirect mortality seemed inconsequential.

The focus of U.S. wildlife management shifted in 1973 with the Endangered Species Act. Research showed that even benign human presence can alarm animals. Valerius Geist described animal behavior as a consequence of human behavior. Roughly half of 166 articles on the effects of nonconsumptive recreation on wildlife at that time included data showing harm to the animals.

Hunters are not alone in triggering behavioral changes, and these changes vary by species. In Alberta, moose numbers declined near ski trails. Elk numbers were not affected in that area. In Denali National Park between 1973 and 1983 a 50% increase in vehicle traffic along the main road was accompanied by a 72% decrease in moose sightings and a 32% drop in grizzly sightings - but Dall's sheep and caribou were spotted as frequently as before.

KILLERS



Three factors influencing the response of disturbed animals are: 1. type. Bighorn sheep take refuge high; elk often plunge into a timbered draw; pronghorn antelope may simply run hard without seeking cover. 2. group size. Animals in large groups flee at greater distances, possibly because there is a greater chance that a big group contains a sensitive animal that takes the group with it. Large groups typically take flight earlier too. 3. age and sex composition. Cow caribou with calves flee earlier than cow-only groups. Bands of caribou bulls typically leave last.

Animal behavior has both innate and learned components. Innate behavior is commonly assumed to be that which promotes animal fitness in the absence of human disturbance. Learned behavior that removes animals from human threat can subject them to other threats or affect other animals. For example, game moving from human disturbance can invade the preferred habitat of a cohabitant species, causing competition that would not otherwise occur. Elk disturbed during a 1972 hunt in western Alberta moved up out of their normal fall habitat onto slopes traditionally used as winter range by bighorn sheep.

Active ("fight or flight") response to human disturbance causes physiological changes in threatened animals. These include increased blood flow to skeletal muscles, faster heart rate and respiration, higher body temperature and blood sugar levels, plus constricted blood flow to skin and digestive organs.

Passive response is mostly evident in small mammals that hide or play dead, but deer and elk also "freeze" when threatened. While less demanding than active response, passive response can elevate stress, interrupt foraging and prompt the animal to move into remote places after the threat is gone. Telemetry has shown that heart rates of bighorns increase when humans appear on a ridge, even if behavior doesn't change.

Any disturbance can influence the social interactions of herd animals. A group of deer or elk surprised by a hunter can split, its members running in several directions to safety and staying separated. Increases in vehicle traffic on forest roads can change foraging patterns and segregate herds that normally cross those

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roads. Animals may thus be kept from choice foraging areas or prevented from mating. Herd size and composition can change, affecting predation success too.

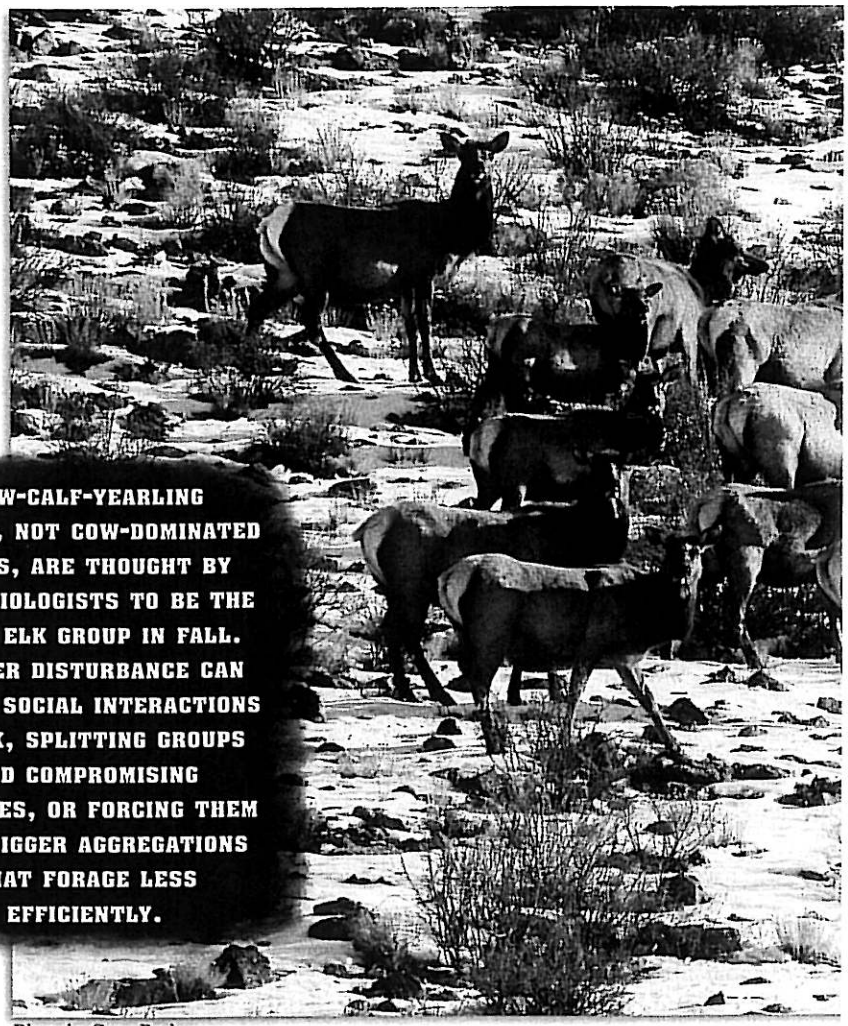
Selection of the best forage and thermal cover by game may occur only when the animals perceive that they are not threatened. By avoiding immediate threats, they may compromise their physical condition and reproductive potential by 1) expending in escape energy normally rationed for winter survival; 2) moving into places where forage is less nutritious or requires more energy to procure, thus limiting fat storage; 3) taking refuge where environmental factors (cold, wind, deep snow, rough terrain) further deplete energy reserves or increase the odds of lethal accidents; 4) separating from a family or herd, thus losing social, foraging and defense benefits; 5) going where predators are more numerous or have a tactical advantage; 6) spending more time looking out for hunters and less time foraging; 7) adopting foraging schedules that expose them less to hunters but also reduce intake or diet quality.

Vigorous control shooting of red deer and chamois in New Zealand in 1957 halved red deer numbers, though chamois kills continued to increase. Ratios of fawns and yearlings to hinds dropped. They did not increase as expected from compensatory response (less competition for limited resources). Reasons: deer became more wary, used poorer habitat and became nocturnal for at least two years after hunting ceased. Chamois remained in timberline shrub and bluffs. In the Hokitika River system, culling during the late 1940s and 1950s reduced red deer fawn/hind ratios from 62/100 in 1959 to 30/100 in 1965 - a 50% drop. Changes in foraging habit were largely responsible. Deer abandoned alpine meadows for steep woodlands.

Conflicts between big game and agriculture can also intensify due to hunting disturbance. Whitetail hunters have changed the behavior and distribution of transplanted elk in Pennsylvania during late fall. Some elk have been killed by farmers to alleviate crop damage. Such damage also occurs on western elk ranges, when elk pushed by hunters run through fences onto croplands or find refuge on posted farms and ranches instead of in public wildlands. The result: increased elk-killing by landowners, and increased elk tag allocations to limit crop damage and complaints.

Habituation to human disturbance can occur where animals are not hunted or otherwise harassed. During periods of peak traffic in Alberta's Sheep River Wildlife Sanctuary, bighorns that saw 25 to 30 vehicles per hour showed almost no response to cars (fewer than 1% withdrew, and fewer than 9% showed increased heart rates). Seasonal habituation is evident when elk that run from hunters in October trot after the feed wagons at Jackson Hole and mule deer that hide in remote rimrock during hunting season nibble alfalfa near highways in winter and spring.

Animal response to human disturbance often seems excessive. In one study, Minnesota whitetails left areas near snowmobile trails where traffic was heavy (10-195 vehicles per day) and increased their home range size -



COW-CALF-YEARLING GROUPS, NOT COW-DOMINATED HERDS, ARE THOUGHT BY SOME BIOLOGISTS TO BE THE BASIC ELK GROUP IN FALL. HUNTER DISTURBANCE CAN AFFECT SOCIAL INTERACTIONS OF ELK, SPLITTING GROUPS AND COMPROMISING DEFENSES, OR FORCING THEM INTO BIGGER AGGREGATIONS THAT FORAGE LESS EFFICIENTLY.

Photo by Gene Brehm

during a season when reduced activity and yarding are natural ways to conserve energy. Wisconsin research showed that whitetails harassed by snowmobiles did not expand their range but often moved away from trails. In surveys of wintering mule deer herds in north-central Washington state, I found deer using my snowshoe trails as thoroughfares between visits, though the animals showed no sign of habituation to my presence.

Reaction to human disturbance varies with the type, frequency and magnitude of human activity, its predictability and timing, and the individual behavior of the people. Activity location relative to security cover also matters. Hunting can magnify or change the effects of other kinds of disturbance. Habituation to innocuous activities like skiing lags in hunted units where humans have proven themselves a threat during fall. Deer trying to "tank up" for winter or move to easier foraging are prevented by a perceived threat from people who pay the deer no mind.

Most ungulates exhibit loose social structures (though hierarchical rank can be strong). A hunter after a lone buck or bull may have little effect on other animals. But game that lives or travels in groups suffer collectively. For example, matriarchal domination of elk herds is usually strongest and most apparent during fall, when most hunting occurs. Disturbance of matriarchal groups may be minimal in "bulls-only" areas. Still, some scientists argue that cow-calf-yearling groups, not cow-dominated herds, are the basic elk social unit and that these families move about unpredictably with other elk during the hunt.

If game is disturbed during rut, conception dates may be pushed back, affecting survival of the next year's young. Disruption of breeding by hunter activity may even depress pregnancy rates. A two-year study showed a decline in frequency of conception rates in female Yellowstone elk near opening day of elk season (October 18-28, 1980, October 17-27, 1981). A bimodal peak in calving dates followed. Productivity may not be affected by changes in breeding dates.

Another cost of human intrusion is territory. In Spain's Donana National Park red deer have been shown to establish definite rutting territories. The earlier the stag claims his territory, the more hinds he can keep in his harem. Reproductive success of the stags is closely correlated with the location of the territories - perhaps because hinds spend more time before rut in choice territories taken earliest by mature stags. By frequenting the best sites, hinds are most available to the strongest, most aggressive stags.

The degree to which ungulate diets overlap determines how cohabitant species will fare when human disturbance intensifies use of their habitat. A dietary study of deer, elk and cattle on the west slope of Colorado's Sangre de Cristo mountains showed a 3% overlap between deer and elk winter diets, a 48% overlap in summer. Deer and cattle diets overlapped 12% in winter, 38% in summer. Elk and cattle shared 30% of their forage in winter, 51% in summer. Hunting or other disturbance that increases overlap increases competition to the detriment of the less able or less aggressive forager.

Moose in northern Idaho typically winter in vigorous stands of chokecherry regardless of disturbance or even snow depth, both of which influence elk distribution. Competition for forage between elk and moose is normally minimal but could increase if elk find refuge from hunters in an area chosen by moose for its forage value.

A classic case of the effects of human disturbance on big game played out in northeastern Oregon. Before 1961 when the state department of fish and wildlife established its Bridge Creek Wildlife Management Area, wintering elk there numbered about 120. Cattle had been pastured without a progressive grazing plan, and their removal led to improvements in range condition, which was thought responsible for an increase in elk numbers to 320 in 1963. Without summer grazing, grasses grew rank, and cattle were reintroduced in a ro-

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tation grazing scheme in 1964. Wintering elk numbers rose to 500. But then snowmobilers found the herd and began harassing it. By the winter of 1969-70 only 325 elk were using the WMA. In 1970 the area was closed to motorized vehicles, and in four years elk numbers jumped to 1191. Annual elk-days on the unit had increased from 15,980 in 1963 to 168,957 in 1974.

Bridge Creek mule deer, which used areas not frequented by cattle or snowmobilers, and which ate forage that was essentially unaffected by grazing, showed a different population track. Their numbers fluctuated in accordance with deer herd levels region-wide and responded directly to winter weather and snowfall.

Movement of game into heavy cover in autumn isn't always the result of hunter activity. For example, elk in northern cedar-hemlock forest typically prefer to forage in seral brush fields and clearcuts in spring and summer, bedding in nearby thickets of lodgepole pine. But during the fall these elk seek succulent forage where the sun hasn't sucked out all the moisture. That search brings them into big timber, coincidentally with the hunt. Hunting pressure may keep them there or put more elk in earlier.

In marginal cover logging has been shown to increase the size of elk home ranges or to reduce elk fidelity to them. Hunting can do the same. In areas where disturbance affects mostly the fringe of heavy cover, elk home ranges may shrink as animals concentrate in the timber. Elk characteristically avoid traveled roads and may leave areas of intensive logging or hunting until the activity has stopped.

Given the relatively long foraging and resting periods of deer and elk, and the economical use of time and energy for daily movements (excluding migration), disruptions in daily routine where forage and weather are already causing stress may well affect physical condition. In many areas hunting pressure changes game behavior. In a few of these the animals cannot find a secure place. At some level of hunter saturation even ideal cover is incapable of shielding game.

The efficiency of modern hunters contrasts sharply with that of men who chased stags in England before the Industrial Revolution. Game learns now, as it did then, which escape tactics best thwart hunters. Still, animals have no new avoidance options. Hunter density bears directly on secondary mortality as well as on direct harvest. Because losses to malnutrition and increased predation often remain hidden until the following spring, they're as difficult to assess as crippling and poaching losses. Low rates of recruitment resulting from impaired reproduction can be even harder to detect, or to attribute to hunting activity.

Area closures to motor traffic reduce disturbance. Road closures allow animals to stay in preferred cover longer, before hunting pressure moves them to less comfortable but more secure

CLEAN KILLS ON BIG BULLS USED TO SATISFY EVERYONE EXCEPT ANTI-HUNTERS. BUT DISTURBANCE OF OTHER ANIMALS BY HUNTERS HAS RECENTLY BEEN GIVEN MORE ATTENTION. HOW DOES HUNTER ACTIVITY AFFECT GAME THAT IS NOT SHOT?

Photo courtesy of Wayne van Zwoll

Photo by Gene Brehm

GAME SEEKING ASYLUM MAY MOVE TO THE PERIPHERY OF ITS RANGE OR EVEN TO NEW RANGE THAT YIELDS LESS NUTRITION BUT BECAUSE OF ITS ISOLATION GETS LESS HUNTING PRESSURE. ANIMALS THAT EAT POORLY IN THE FALL MAY BE FATALLY WEAKENED IN WINTER.

coverts. While road closures eliminate vehicle noise and limit hunter mobility, they seldom trim the harvest. One reason is that big game hunting demands a substantial commitment in time and effort from its participants - especially from hunters who "pack in." If they don't score on the first day they persevere. Animals that would be killed from roads on opening day may thus fall instead on the third or tenth day to persistent hunters on foot. Habitat effectiveness models used to describe the suitability of land and vegetation for game do not show how habitat will protect game from hunters, roads or no roads. They cannot gauge the tenacity or skill levels of hunters.

The purpose or motive of hunters can indirectly affect secondary mortality. In northern Canada, Inuits hunting caribou for subsistence use snowmobiles, all-terrain vehicles and scoped rifles. The numbers of hunters participating, the open nature of the tundra, the vulnerability of caribou to motorized transport and the absence of a closed season all exacerbate disturbance - which doesn't seem to bother the Inuit. Disturbance means little to people who view animals as either alive to replenish the herd or dead to eat. Subsistence hunting may affect caribou behavior, reproduction and rate of population increase. But shooting and wolf predation may account for an overwhelming percentage of caribou mortality.

On the other hand, where markets reward the protection of ungulate populations and the cultivation of a herd structure weighted to mature males, managers have learned to control hunter disturbance as well as harvest. Relatively small ranges and a high investment in each big buck or bull warrant checks on hunting pressure. The Jicarilla Apaches decided to close deer seasons on their New Mexico Reservation for three years to counter a slump in deer numbers.

Most if not all post-Pleistocene extinctions have been caused or accelerated by man. A few of these have been precipitous: results of excessive shooting or large-scale habitat loss. But many others have happened gradually. The glacial pace of some have enabled us to see causal effects only in retrospect. The decline of the Lord Howe woodhen, for example, was attributed to predation by feral pigs - until someone observed that the ranges of the two did not overlap! Hunter disturbance may not be a crucial factor in the survival of any wildlife species. But clearly hunting activity influences animal behavior, which can affect health and reproductive potential.

As sport hunting draws scrutiny from a public increasingly enamored of ecosystems and rare species, the influence of hunting on both could become a pivotal topic. Wildlife policy now aimed at providing sustained offtake might then shift to serve people - hunters as well as those who don't hunt - concerned about the physical, reproductive, social and even the psychological status of animals surviving the chase. Manipulating hunts and hunters to minimize disturbance to nontarget animals could boost long-term harvest through changes in hunting seasons, methods and unit boundaries.