TRAPS, TRAPPING, AND FURBEARER MANAGEMENT: A REVIEW

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Traps, Trapping, and Furbearer Management: A Review

The Wildlife Society

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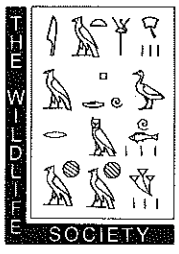

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Foreword

Presidents of The Wildlife Society occasionally appoint ad hoc committees to study and report on selected conservation issues. This has worked reasonably well, but experience indicated a need to standardize the procedures. Per advice from the Publications Committee in 1989, the Society's governing Council agreed to refine its oversight role, to appoint an editor or editors to assist the committees, and to establish standard formats for the committee reports.

The reports ordinarily will appear in 2 related series called either Technical Review (formerly "White Paper") or Position Statement. The review papers present technical information and the views of the appointed committee members, but not necessarily those of their employers or The Wildlife Society. Position statements are based on the review papers, and their preliminary versions ordinarily are published in The Wildlifer for comment by Society members. Following the comment period, revision, and Council's approval, the statements will be published as official positions of The Wildlife Society.

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SYNOPSIS

The controversy over trapping has existed for more than 60 years. Some trapping opponents object only to certain trapping methods, particularly the steel-jawed foot-hold trap on land, but others morally object to killing animals or oppose the concept of wildlife as a resource and the practice of sustained yield management of wildlife.

Evidence of trapping pre-dates recorded history. Throughout the history of traps, numerous efforts have been made to improve efficiency and reduce animal escapes and injuries. These efforts continue and have accelerated in the past 15-20 years. Throughout much of North America, foothold traps are the most commonly used type, followed by Conibear-type killing traps, neck snares, and cage traps, respectively.

Trap efficiency varies by trap type, effectiveness, selectivity, animal response; and trapper technique, knowledge, and skill.

Selectivity of traps depends upon the objectives of the trapper (e.g. single-species control or multi-species fur harvest), trap type, trap site, type of set, type and presentation of bait, time of year, and trapper experience and technique. Various exclusion devices and techniques are available for several traps and species to reduce capture of unwanted animals.

Trap-related injuries to captured animals have concerned wildlife managers for years, and studies of injuries and methods to reduce them have increased. Recent trap research has concentrated on improved killing traps, padded foot-hold traps, and foot and neck snares. Killing-trap research has identified several traps or modifications with potential to meet established humane criteria in Canada and 1 trap has met standards for pine marten (*Martes americana*). Commercially produced padded foot-hold traps have been shown to significantly reduce injury, and in tests of efficiency have been comparable to unpadded traps for some species and regions.

Trappers are predominantly male (≥98%) and age characteristics vary geographically and over time. They come from a variety of occupational backgrounds and few rely solely on trapping income, although many rate trapping income as important. Trappers, as a group, are highly knowledgeable on wildlife issues and have a high degree of affection and concern for wildlife and natural habitats, but they also believe in using animals for human benefit and have little empathy for ethical objections to such use.

Trapping provides raw materials for the fur industry. Not including fur ranchers, this industry involves about 500,000 trappers in the United States, 100,000 trappers in Canada, 25,000-30,000 local fur buyers, and 250,000 persons involved in production, marketing, processing, and manufacturing. The fur industry periodically undergoes major demand swings that influence trapper effort. The amount and distribution of trapper effort in turn affects wildlife management planning and decisions.

The North American fur harvest is valued at up to $250 million annually, not including the value of meat or other ancillary products. Although recreational values and motives are important to many trappers, total trapping effort is related directly to prevailing fur values.

Subsistence trapping is culturally and economically important to peoples in northern Canada and Alaska, particularly aboriginals, as well as to residents in some areas of the contiguous United States.

Total economic damage caused by furbearers has not been measured, but estimates of losses to beavers (*Castor canadensis*) (Southeast U.S. only) and coyotes (*Canis latrans*) (entire U.S.) are as high as $180 million annually. Traps are one of the primary tools for controlling problems in both operational and extension programs of wildlife damage control.

Other predator control methods that supplement trapping have been evaluated, and include cyanide guns (M-44's), strychnine,

compound 1080, hunting, aerial gunning, antifertility agents, dogs, electric fencing, chemical repellents, and scare devices. Hunting and toxicants also could be considered potential alternative harvest techniques, but shooting is not effective for many species and there are no legal toxicants for most furbearer species.

The effects of trapping on wildlife diseases are poorly understood, but appear to vary with the intensity of removal efforts. Intensive population reduction programs that have the specific objective of controlling disease may be relatively effective, but are expensive and single purpose. High furbearer harvests may reduce the intensity, if not the frequency, of rabies outbreaks at little cost while maintaining furbearer populations that provide additional benefits. Moderate or low harvests appear to have little effect on rabies outbreaks.

The sustainability of regulated harvests has been demonstrated by the generally increasing populations and harvests of most furbearer species in North America during this century. Compensatory processes are common features of these populations, but additional biological data are needed for most species before optimum or maximum sustained yield management principles can be rigorously applied.

Furbearer populations are sometimes managed to enhance populations of other species, either directly through reduced predation or competition; or indirectly through furbearer influences on habitat. Management for harvest and nonharvest uses of furbearers often can be accomplished simultaneously, and there appears to be a high, but largely untapped, potential for furbearer viewing and other uses.

Most regulation of trapping is at the state or provincial level, and has been put in place since the turn of the century. Federal and local governments regulate trapping to a lesser extent, and some practices are tied to international treaty obligations (e.g. CITES). Types of regulations include seasons, licensing, zones, registered traplines, limits, quotas, and restrictions on traps and trapping techniques.

Antitrappers appear to have characteristics similar to antihunters, and antitrapping attitudes also probably are similar. The attitudes appear to be linked both with urbanization trends and with trends away from dependency on primary resources as a livelihood. These attitudes are related to perceptions of humaneness, animal rights, and competition for a common resource (hunter/trapper conflict). Animal welfare and humane concerns center primarily on the uses of some trapping methods, particularly steel-jaw foot-hold traps on land. Animal rights concerns, on the other hand, generally involve moral opposition to killing or using animals. Nearly 300 animal welfare or animal rights organizations have been identified worldwide.

Most antitrapping activity in the United States occurred during the 1930s and during 1972-82. From 1925 to 1939, 18 states attempted to ban the foot-hold trap and five succeeded, but all 5 bans were lifted by 1948. From 1973 to 1977, 2 states banned foot-hold traps entirely and 4 others severely restricted their use. Since 1977, only New Jersey has imposed a statewide ban on the foot-hold trap. Recent antitrapping and antifur efforts have concentrated on international issues and fur markets.

There was little organized trapper education in North America before 1970. Concern about trapper competence and behavior rose in the 1970s along with rising fur prices, higher numbers of trappers, and increasing intensity of antitrapping attitudes.

By 1984, 26 states and 10 provinces and territories had some type of trapper education program; nine were mandatory. These programs commonly emphasize ethics, fur handling, humane trapping techniques, and regulations. Public education efforts specifically on trapping have developed mainly as a part of, or in response to antitrapping pressure. Despite high awareness of trapping, the public is not well informed on most wildlife issues and requires objective, accurate information to make informed judgments on management decisions.

INTRODUCTION

Traps of various types are used extensively in wildlife management, particularly in managing furbearers. That use is the focus of this paper. The term furbearers, as used herein, includes only those species of wild mammals that commonly are sought by trappers and that are of commercial significance in the North American fur trade. Traps include various types of mechanical devices used to capture alive or kill furbearers for fur, food, damage control, recreation, disease control, population regulation, population restoration, benefit of other species, or research.

Traps and trapping have been a source of controversy for more than 60 years (Gentile 1983, 1987). Organized opposition to trapping dates at least to the 1920s in the United States (Gerstell 1985) and the 1940s in Canada (Barrett et al. 1988).

Much of the controversy over trapping centers on the use of the leg-hold or foot-hold trap (referred to as foot-hold throughout the remainder of this paper) (Chapman et al. 1978; Gentile 1983, 1987), but moral and ethical objections to the killing of animals also are involved (e.g. Kellert 1978, 1980*a*; Herscovici 1985). Some of the concerns about trapping and furbearer management differ only in degree from similar concerns about hunting, fishing, and wildlife management in general. These concerns involve strong disagreement with the sustainable harvest of wild animals and with the concept that wildlife is a renewable resource to be used (e.g. Humane Society of the United States 1977, Gentile 1983, Defenders of Wildlife 1984). This portion of the conflict transcends the methods or purposes of trapping and goes to the very core of managing wildlife for "consumptive" use.

The Wildlife Society's (1988) current position statement on trapping was adopted in 1978. A request to review this position was received by The Wildlife Society Council in 1985. Council agreed that a review was desirable and requested preparation of a review document to summarize technical information on traps and trapping. An Ad hoc Technical Advisory Committee on Trapping was appointed by President E. C. Meslow in August 1985.

That committee was charged to prepare a report that would "... focus on steel leghold traps but also deal with snares, killtraps, livetraps, and other devices... that generally would be regulated under trapping regulations." In addition, the charge was to provide some review of "the economics (animal damage, health, fur value) and sociological/cultural implication of trapping...." This review summarizes current information on traps, trapping, and furbearer management in the United States and Canada, including discussion of associated biological, social, and economic issues.

TRAPS AND TRAPPING

Modern trapping devices can be classified into 4 general categories: foot-hold traps, killing traps, cage traps, and snares. Foot-hold, killing, and cage traps are available in numerous sizes with various modifications. Snares include self-closing body/neck types and powered (spring-activated) neck and foot snares. The development of traps has been an ongoing evolutionary process involving numerous refinements in design, construction, and materials.

Trap History

General.--Depictions of animals in traps have been found in Paleolithic artwork more than 25,000 years old and such traps may have pre-dated the bow and arrow (Bateman 1971). Animals originally were taken for food, clothing, and shelter (Bateman 1982), but expanding human populations in Europe during the Renaissance created a need for improved traps to protect food crops (Novak 1987*a*).

North American Indians relied on a variety of snares and deadfalls for capturing animals (Phillips 1961). The origin of the steel foot-hold trap can be traced to torsion traps widely used in Asia, Africa, and Europe about 4,000 years ago, but the earliest record

of a foot-hold trap is from the 1300s (Gerstell 1985). Most early North American foot-hold traps were imported from Europe and were first used to protect livestock from predators. By the early 1600s, steel foot-hold traps also were being used by fur trapping companies (Gerstell 1985).

Although Sewell Newhouse, Miles Standish, and others began manufacturing quality traps in the early 1800s, mass production of traps did not begin until 1851-85 (Gerstell 1985, Novak 1987*a*).

Foot-hold traps.--Numerous modifications to foot-hold traps were developed in the late 1800s and early 1900s in attempts to reduce animal injuries and escapes. Variations on the steel-jaw design included double jaws, multiple jaws, "webbed" jaws, and slotted jaws (Novak 1987*a*). Some inventors tried substituting chains for the rigid jaws (Bailey 1932, Gerstell 1985), but they were not successful. Rubber-shod foot-hold traps were invented in England at the turn of the century. The Diamond Brand No. 22 longspring had 4 offset rubber disks on each jaw to protect the trapped foot or leg from injury (Drahos 1951). Charles Briddell's Cush-In-Grip was invented in 1936, but production was discontinued after a short time (Novak 1987*a*).

Attempts to improve the foot-hold trap have continued to the present. Increasing anti-trapping sentiment led Woodstream Corporation to discontinue manufacture of all tooth-jawed traps in 1975; in 1985, following 6 years of development, the company began marketing a new padded jaw "Soft Catch" trap (Gerstell 1985).

Unless otherwise specified, references to "padded" traps in this paper refer to Woodstream Corporation's "Soft Catch" traps. It should be noted that, in addition to rubber-like padding on the jaws, these traps differ from most "standard" foot-hold traps in the following ways: reduced spring strength; shock absorbing chain spring; center mounted bottom swivel; and offset jaws.

Killing traps.--A major departure in trap manufacturing and trapping occurred in the latter part of the nineteenth century, with new developments in killing traps. Numerous "quick-kill" traps were developed and marketed around the turn of the century, but the most significant invention was Frank Conibear's killing trap developed in 1929 (Novak 1987*a*). Although commercial production of the "Conibear" trap did not begin until 1957 (Novak 1987*a*), this trap (and similar variations) presently is the most commonly used killing trap in North America. Much of the recent focus of trap research and development has been on killing traps, particularly in Canada (Barrett et al. 1988 -- see Trap Injury Section).

Trap Use

There are no good data providing figures on trap use and ownership for all North American jurisdictions, and the following figures are not all comparable. However, foot-hold traps appear to be the most common type used by trappers. For example, Kansas trappers in 1985 used an average of 35 traps, of which 66% were foot-hold traps, 19% killing traps, 13% snares, and 3% cage traps (Hamilton and Fox 1987). Novak (1975) reported that 95% of Ontario trappers used foot-holds, 80% used Conibears, and 41% used neck snares. In Alberta, registered trappers owned 4 times more foot-holds than Conibears in 1977 (Meredith and Todd 1979). In Georgia, 80% of all trappers in 1976-77 used less than 30 traps/night and kill-type traps were used by 42% (Marshall 1981).

Some foot-hold traps are used as killing (i.e. "drowning") sets and some are used as live-holding devices. No data are available on the relative proportion of such uses; however, >80% of the furbearers trapped in North America are semiaquatic or water-associated animals (see Fur Industry Overview Section).

Trap Effectiveness and Efficiency

Trap effectiveness is a measure of a trap's ability to adequately hold or kill (depending on its intended function) a captured animal. Effectiveness can be preliminarily evaluated under laboratory or confinement conditions, but must be verified by field testing, (e.g. Federal Provincial Committee for Humane Trapping 1981, Rowsell et al. 1981, Linhart and Linscombe 1988).

Efficiency of a trap is the rate at which a trap catches the intended species (Novak 1987*a*), usually expressed as the number of

captures/100 trap nights (Baker and Dwyer 1987). Measurement of efficiency also requires testing traps under field conditions. An additional component of efficiency involves the relative time and effort required to make a set with different trap types.

Regarding the relative capture efficiency of foot-hold traps and Conibears, Hill (1981) found that foot-holds caught more raccoons (*Procyon lotor*) and fewer opossums (*Didelphis virginiana*) than Conibears did on the ground, but Conibear sets captured fewer unwanted species. Palmisano and Dupuie (1975) and Linscombe (1976) concluded that foot-hold traps caught significantly more nutria (*Myocastor coypus*) than Conibears did. In New Jersey, Penkala (1978) concluded that Conibears were more efficient than foot-holds for trapping muskrats (*Ondatra zibethicus*) at den entrances. Parker (1983) in New Brunswick, found that foot-holds had a higher capture rate for muskrats, except that Conibears set in burrows during spring were more efficient.

Several studies have evaluated the comparative efficiency of padded and unpadded foot-hold traps. Tullar (1984) found similar capture rates using Woodstream Corporation's padded Soft Catch and unpadded traps for red (*Vulpes vulpes*) and gray (*Urocyon cinereoargenteus*) foxes and raccoons during field testing in New York. However, Linhart et al. (1986) found a higher coyote catch rate for unpadded traps (73.3%) than for either the padded Victor 3NR (50.8%) or the Soft Catch No. 3 (48.6%). Linscombe and Wright (1988) found comparable capture rates for gray foxes and opossums in padded and unpadded traps in a 9-state field test. Padded traps caught fewer bobcats (*Felis rufus*), raccoons, and coyotes than unpadded traps did, and results were mixed for red fox. However, improper manufacture of trap pads, trapper bias, and trapper inexperience with setting padded traps all were implicated as possible contributors to the observed lower efficiency of padded traps (Linscombe and Wright 1988). Skinner and Todd's (1990) more recent 2-year study demonstrated that efficiency of padded traps improved as trapper experience with devices increased; in the second year, capture efficiency of padded traps for coyotes increased from 55% of that of unpadded traps to 91%.

Novak (1981) compared results of 2 trappers using Novak foot snares and foot-hold traps set primarily for fox and coyote in southern Ontario in the fall. He found no difference in capture effectiveness for those species, but for striped skunks (*Mephitis mephitis*), effectiveness was lower for foot snares. Skinner and Todd (1990) tested Novak and Fremont foot snares for coyotes both before and after freeze-up in Alberta and found greatly reduced capture efficiencies for foot snares compared to foot-hold traps. Berchielli and Tullar (1980) tested Ezyonem foot snares for red foxes in New York and also found reduced efficiency for foot snares.

In urban areas, cage or box traps are useful for capturing nuisance animals such as raccoons, skunks, opossums, and domestic dogs and cats (e.g. Timm 1983). Cage traps do not perform as efficiently as foot-holds or Conibears for some species such as nutria (e.g. Robicheaux and Linscombe 1978).

Trap Selectivity

Trap selectivity is the extent that traps capture "wanted" versus "unwanted" species and can vary depending on the objectives, techniques, and skill of the trapper. Factors that affect unwanted-capture rates include trap type, trap site, type of set, type and presentation of bait, time of year, and trapper technique (Novak 1987*a*). Selectivity directly affects trap efficiency because traps that capture unwanted animals are not available for wanted species until the traps are re-set. In addition to trappers and wildlife managers, segments of the general public also are concerned about nonselective use of traps (e.g. Defenders of Wildlife, 1984).

Novak (1987*a*) presented a comprehensive summary of more than 25 studies reporting capture rates of wanted and unwanted animals. Results varied from no unwanted captures to more than 2 unwanted animals per wanted furbearer caught.

Definition of an "unwanted" animal frequently confounds the selectivity issue. Typically, only one or a few species are the target of research or control trapping, but several furbearer species may be sought by fur trappers. For example, an unpublished 1974 coyote research report by Chesness and Bremicker (Coyote Res. Workshop, Denver)

frequently is cited as an example of trap nonselectivity and such results have been equated to trapping for furbearer harvest (e.g. Gentile 1983, Defenders of Wildlife 1984). In that unpublished study, 87% of captures were not coyotes, but only 8% were not furbearers. It is not appropriate to equate selectivity of trapping for research or damage control purposes with selectivity of trapping for fur harvest.

Effective techniques have been developed for excluding many species of unwanted animals in control or research programs where capture of only a single species is desired. Turkowkski et al. (1984) reported that unwanted captures in traps set for coyotes could be reduced without loss of efficiency by using shear-pins, curved leaf springs, or other devices that prevent the trap from tripping until a minimum amount of pressure has been applied to the pan and thus excluding lighter-weight animals. Pan tension devices are used routinely to exclude unwanted animals from wolf (*Canis lupus*) traps in research and damage control programs in Minnesota (T. Fuller and D. Kuehn, Minn. Dep. Nat. Resour., and W. Paul, U.S. Dep. Agric., pers. commun.). Trapper education programs also encourage the use of trapping systems (a combination of trap type and size, accessory equipment, and technique) that increase selectivity (Todd and Boggess 1987).

Injury by Traps

Trap-related injuries have concerned wildlife managers for years (Castro and Presnall 1944, Atkeson 1956), and studies of injury caused by foot-hold traps and ways to reduce it have increased dramatically since the late 1970s.

A trend today among trappers toward use of smaller traps and daily, early-morning checks have helped to reduce injury to trapped animals (Novak 1987*a*). Kuehn et al. (1986) compared injury to wolves captured in 4 types of unpadded foot-hold traps. Tranquilizer tabs on traps have been shown to reduce injury to coyotes, but results were variable and depended on the type and dosage of tranquilizer used (Balser 1965, Linhart et al. 1981). Also, suitable drugs are not available to the public and dosages are difficult to control.

Much recent trap research has focused on padded foot-hold traps, foot snares, and killing traps and snares. Injury generally is evaluated by veterinary pathologists who necropsy specimens and assign numerical values based on a standardized scale first proposed by V.F. Nettles and later modified (e.g. Tullar 1984; Olsen et al. 1986, 1988). Tullar (1984) in New York found that injury to red and gray foxes was reduced compared to standard traps by using No. 1-1/2 padded traps manufactured by the Woodstream Corp. Saunders and Rowsell (1984) concluded that No. 1-1/2 and No. 3 padded coil spring traps reduced injury rates for both fox and coyote by 80-85%. Olsen et al. (1986) concluded that 3 types of padded traps reduced coyote injuries by 48-71% compared to unpadded traps.

In a 9-state field test, "Soft Catch" padded traps, with few exceptions, significantly reduced limb injury to coyotes, red and gray foxes, bobcats, and raccoons (Olsen et al. 1988). In British Columbia, Saunders et al. (1988) found that both the No. 1 1/2 padded trap and an experimental No. 1 padded foothold trap reduced injuries to raccoons, and that injury was further reduced by checking traps at least once per 24 hour period. In Alberta, mean injury scores for coyotes taken in unpadded traps were more than 2.5 times those for padded traps (Onderka et al. 1990).

Englund (1982) compared Swedish foot snares with standard No. 2 and No. 3 Victor double longspring foot-hold traps and with similar traps with jaws covered by plastic tubing. He found a higher rate of dental and maxillary injuries to red fox with both types of foot-holds. He also concluded that the plastic tubing on foot-hold traps did not reduce injury.

Novak (1981) reported that 4 of 184 (2%) animals captured in foot snares sustained cut skin or worse injuries, compared to 46 of 88 (52%) in foot-hold traps. By contrast, Onderka et al. (1990) reported that both the occurrence and severity of injuries to coyotes and nontarget animals were significantly reduced in the Fremont foot snare but not in the Novak foot snare, compared with unpadded foot-hold traps. No differences in oral injuries were found among the foot snares and foot-hold traps evaluated (Onderka et al., 1990).

Development of Killing Traps

Much of the effort in killing-trap development has occurred in Canada. Beginning in 1956, the Canadian government became involved in trap research, developing and listing a number of killing-trap prototypes that later did not prove acceptable (Barrett et al. 1988). In 1968, the Canadian Association for Humane Trapping (CAHT) joined with the Canadian Federation of Humane Societies to form a Humane Trap Development Committee (Unpubl. rep., 37th Midwest Fish and Wildl. Conf., 1975).

Subsequently, the Federal Provincial Committee for Humane Trapping (FPCHT) was formed and conducted studies during 1973-81. The committee's original mandate was to recommend, within 5 years, traps and trapping techniques that would provide the greatest humaneness possible in holding or killing furbearers. This program concentrated on encouraging innovation and invention, evaluating the humane aspects of killing traps, and creating standards for mechanical performance of such traps. The FPCHT gathered scientific data on mechanical properties of killing traps, "kill thresholds," and behavior of specific furbearers approaching and entering traps. After spending 7 years and $1.3 million, 16 of 348 killing-trap ideas or prototypes were judged as having "humane potential." Half of the killing traps judged as offering humane potential were rotating-jaw "Conibear-type" traps and the remainder were either planar striking bar or "mousetrap-type" devices (Federal Provincial Committee for Humane Trapping 1981).

Rowsell et al. (1981) found that neck snares made of multiple-strand wire caused rapid unconsciousness in anesthetized bobcats, snowshoe hares (*Lepus americanus*), and red squirrels *(Tamiasciurus hudsonicus*), but were less effective on red foxes. In terms of being able to kill captured animals within established standards, their field evaluation on traplines indicated "poor" snare performance for coyotes, foxes, and bobcats. These types of research have continued since 1984 under an extensive evaluation program established by the Fur Institute of Canada and have been expanded to include some live-hold trapping systems (Barrett et al. 1988). One killing trap for pine marten, the experimental Conibear 120 Magnum, is the first trap to meet all performance requisites of the Canadian General Standards Board, including field effectiveness and efficiency (Barrett et al. 1989; Proulx et al. 1989*a*, *b*). Although approved only for marten, preliminary field data indicated potential applications of the trap for harvesting additional species (Barrett et al. 1989).

Alternatives to Traps

Most research on techniques that are considered by some as potential alternatives to trapping has involved control of predation, particularly that caused by coyotes. Balser (1964), Linhart et al. (1968), Beasom (1974), Guthery and Beasom (1978), and Wade and Connolly (1980) evaluated a number of predator control methods including M-44's (cyanide ejectors), hunting, strychnine baits, and antifertility agents. In recent years, the toxicant 1080 also has been used. Cain et al. (1972) and Linhart (1983) summarized some information on nonlethal damage-control methods including use of dogs, electric fencing, chemical repellents, and scare devices.

Although hunting and toxicants also could be considered potential alternative harvest techniques, shooting is ineffective for many species because of their behavior or habitat preferences, and toxicants have been prohibited for most furbearer species (e.g. Timm 1983).

SOCIOECONOMICS OF TRAPPING

Trapping and Fur Trappers

Relatively few investigations have characterized trappers, their motives and the importance of trapping to individual lifestyles. Todd and Boggess (1987) reviewed these subjects in depth and highlighted some areas where knowledge is deficient.

It is difficult to generalize about North American trappers, but some trends are evident from existing studies. Nearly all trappers (≥98%) are male (Boddicker 1981, Pen-

kala 1981, Samuel and Bammel 1981, Todd 1981*a*). Age characteristics of trappers vary among jurisdictions (Erickson and Sampson 1978, Penkala 1981, Samuel and Bammel 1981, Todd 1981*a*), but data may be biased by regulatory provisions that exclude certain age classes from permit requirements (Todd and Boggess 1987) or by lower response rates for younger trappers (Penkala 1981). Kellert (1980*b*) reported that U.S. trappers were younger than the general population (38 vs 44 years). In Alberta, however, Todd (1981*a*) reported licensed trappers as older than other adults (47.5 vs 42 years).

Age characteristics of trappers also may vary over time. In Missouri, fewer younger ($\bar{x}$ = 43 years) individuals trapped in 1956 (a period of relatively low fur prices) than in 1976 ($\bar{x}$ = 36 years) during a market resurgence (Erickson and Sampson 1978). Trapper recruitment during high market periods appeared heaviest among young age classes. This has implications regarding the relative knowledge and competence of trappers during different market phases, with corresponding needs for education and regulation.

Trappers represent a variety of occupational backgrounds. In New Jersey, blue collar workers (33%) and students (28%) predominated among trapping permittees (Penkala 1981). In Georgia, retired/disabled (20%), laborer (19%), farmer (18%), and construction (12%) occupational categories were reported most commonly (Marshall 1981). Student (25%) and commercial fisherman (22%) were predominant occupations of trappers in Prince Edward Island (R. Dibblee, pers. commun.). Boddicker (1981) reported skilled laborer (37%) and student (17%) as primary occupational categories of trappers in his U.S.-wide magazine survey.

Few trappers rely solely on trapping income for their livelihoods. Trapping is largely a seasonal, part-time pursuit in which the majority of participants are employed in other occupations, even during trapping seasons (Marshall 1981, Penkala 1981, Samuel and Bammel 1981). Investigations in Canada suggest greater reliance upon trapping and trapping income than in the U.S. (see discussion by Todd and Boggess 1987).

Despite trapping income frequently being supplemental to other income, it is significant to individual trappers. Boddicker (1981) reported that 53% of the respondents to his magazine survey viewed fur sales income as an "important" element of their annual income. Trapping contributed an average of 17.8% of the income of those respondents and was of greatest significance to trappers in low income categories. In Georgia, most trappers (63%) derived less than 5% of their total income from trapping whereas 7% of them reported that at least half of their annual income came from trapping.

Trappers have been found to be unusual in their exceptional degree of knowledge of and affection and concern for wildlife and natural habitats (Kellert 1981). However, they also have a highly pragmatic orientation towards the use of animals by humans, with little empathy for ethical objections to such use (Kellert 1981).

Fur Industry Overview

Trapping provides important raw materials for the fur industry in North America. This industry is unique in several respects. Despite its relatively small size, the fur industry routinely bridges international boundaries and currencies, it depends on wild as well as captive-reared animals, and it shapes and responds to modern fashion. In the process, it influences rural lifestyles and wildlife management planning and decisions.

Demand for furs stimulated much of the early settlement of North America (Monk 1981, Hubert 1982) and the harvest of North American furbearers has been intertwined with economics throughout postexploration history. Furs provided frontier currency and were readily exchanged for goods among traders, trappers, and native people. This liquidity has made furs attractive as a medium of foreign exchange, even in modern times (Pursley 1978).

A complete accounting of the annual value of the wild fur trade since settlement is unavailable; however, historical accounts suggest relative values in both cash and commodity terms (Ahern 1922, Seton 1925, Sampson 1980, Monk 1981). More recently, several sources portray the North American wild fur industry as one that has fluctuated in both number of animals harvested and value, but that has shown a generally increasing trend

since the turn of the century (U.S. Fish and Wildlife Service 1934-69, Deems and Pursley 1978, Novak et al. 1987*b*, Obbard et al. 1987).

Annual U.S. harvests during the period from 1970-71 to 1975-76 ranged from 7.3 to 13.2 million pelts with corresponding annual pelt values from $19.0 to $123.4 million (Deems and Pursley 1978). Canadian harvests for the same period ranged from 2.2 to 2.9 million pelts with values from $10.6 million to $29.6 million. In 1982-83, the U.S. harvest was 14.9 million pelts worth $203.1 million, compared to a Canadian harvest of 2.8 million pelts valued at $46.4 million (Shieff and Baker 1987).

The value of ancillary products of the fur harvest (e.g. meat, castoreum, glands, teeth, bones) has not been determined on a continental basis, but may be substantial. For example, meat used for human consumption from Ontario's furbearer harvest was valued at $5.0 million annually (Monk 1981), and 4 species in Louisiana alone had a combined meat sales value of $326,750 in 1979-80 (Deems and Pursley 1983).

Direct payments to fur harvesters represent only part of the economic significance of the wild fur industry (Shieff and Baker 1987). Foner (1982) traced the origin and flow of pelts from capture and collection through dressing, manufacturing, and retailing. Market channels are varied and designed to accommodate the collection and marketing of all furs. In the U.S., an estimated 25,000-35,000 fur buyers manage operations that vary greatly in size and disposition of annual collections (Foner 1982). Industry sources report 250,000 persons involved in the production, marketing, processing, and manufacture of fur garments, in addition to at least 500,000 trappers in the United States (Wagner et al. 1984) and 100,000 in Canada (Todd and Boggess 1987). Trappers harvest most pelts used by the fur industry (Foner 1982); however, harvests by hunters are significant for some species (e.g. raccoon, fox, coyote) and regions.

Supply and demand influences are very evident and affect fur values. Demands have fluctuated widely through time in response to fashion trends; from 1930 to 1980 there were 3 major demand swings in the wild fur trade (Sampson 1980). Consequently, in much the same way that the popularity of felt hats in Europe historically influenced demand for beavers, modern market observers may see fashion preferences change from short- to long-furred articles, from dyed to natural colors, or from ranch-reared to wild species. Organized opposition to the wearing of fur, including protests, demonstrations, and intimidation directed towards fur wearers and retailers, also may be affecting demand.

External factors also are important. Fuel costs may affect harvest efforts. The relative value of international currencies may affect the status of nations as importers and exporters. Interest rates influence all segments of the industry. Although sometimes overlooked, regulations that restrict or liberalize harvests also affect supply of furs. Rising pelt values are generally followed by increased recruitment of fur harvesters, increased harvest effort, and increased harvests of the species in greatest demand, population levels notwithstanding (Erickson and Sampson 1978).

FURBEARER MANAGEMENT

Furbearer managers face a combination of economic, biological, and managerial factors not encountered by most other wildlife managers (Fritzell and Johnson 1982). One major difference is the economic component: pelts, meat, and other parts of furbearers (e.g. castors of beaver) generally can be sold. In addition, much of the debate about furbearer management stems from the controversy over trapping itself, as well as controversy over specific trapping methods (Todd 1987).

Management Objectives

Although furbearer management objectives can be grouped into 8 general categories, management programs typically address multiple objectives. These general categories are reviewed in the following discussion.

Economic Benefits from Fur Harvests.--In North America, approximately 80% of an average annual production of about 25 mil-

lion pelts is derived from wild furs (Shieff and Baker 1987). This contrasts with the global fur trade where ranched furs comprise approximately 50% of the furs used in garment manufacture (Foner 1982). U.S. wild fur harvests exceed those of Canada in both volume and total value. Although 27 species of furbearers are involved in the commercial fur trade in North America (Deems and Pursley 1978), the wild fur harvest is dominated by a few species. In 1975-76, 5 species (muskrat, raccoon, nutria, opossum, red fox) accounted for 92.3% of the volume of the U.S. harvest and five (raccoon, muskrat, nutria, red fox, coyote) contributed 87.6% of the harvest's value (Boggess 1982). The U.S. leads in harvest of muskrat, raccoon, bobcat, red fox, badger (*Taxidea taxus*), river otter (*Lutra canadensis*), skunk, coyote, mink (*Mustela vison*), gray fox, opossum, nutria, and ringtail (*Bassariscus astutus*); whereas Canada dominates harvest of beaver, fisher (*Martes pennanti*), arctic fox (*Alopex lagopus*), lynx (*Felis lynx*), pine marten, red squirrel, and short-tailed weasel (*Mustela erminea*) (Deems and Pursley 1983). Together, the U.S. and Canada market most of the world's wild furs. They may be rivaled in production only by the Soviet Union. Russia exports little fur and few details are known about Russian fur production (Pursley 1978, Shieff and Baker 1987).

Recreation.--Few studies have assessed the recreational value of trapping. This value is difficult to determine because, for most North American trappers, no single motive is wholly responsible for their participation. Recreation, challenge, outdoor experience, and other similarly phrased reasons were primary motives cited by participants in studied populations of U.S. trappers (Bailey 1981, Boddicker 1981, Marshall 1981, Samuel and Bammel 1981). Income generation was an important secondary factor. In Canada, financial considerations may be a more significant motive, particularly among registered trappers. Cultural barriers complicate interpretation of motives in native communities where reliance upon wildlife may be so basic an element that it prevents definition in the sense of terms such as "sport," "income," and "tradition" (Todd and Boggess 1987).

Although U.S. trappers rarely acknowledged economic gain as the primary motive for trapping, prevailing fur values profoundly affect trapper numbers, total trapping effort, and harvests (Erickson and Sampson 1978), at least for certain species (Erickson 1981).

Subsistence.--Subsistence trapping is culturally and economically important to peoples in northern Canada and Alaska, particularly to aboriginals, as well as to residents in some areas of the contiguous United States (e.g. "Cajuns" in Louisiana -- see review by Todd and Boggess 1987). Trapping provides 2 basic benefits to such peoples: (1) food from furbearing animals such as beavers, muskrats, lynx, raccoons, opossums, and snowshoe hares; and (2) cash from the sale of pelts. A majority of northern Canadians likely depend to some degree on subsistence activities (Todd and Boggess 1987). Some northern residents, particularly aboriginals, depend on the land's resources throughout the year, although the majority now live in settlements and subsistence activities are seasonal. In Alberta, trapping income comprised about 20% of total annual income for trappers, and was the sole source of winter income for 44% (Todd 1981*a*).

Comprehensive economic studies of northern communities have shown that subsistence activities contribute 33% or more of annual community incomes (Bodden 1981). In such studies, the value of subsistence foods characteristically exceeds fur value. Furbearers themselves may provide 25-50% of the biomass of "country foods" consumed by residents of the Boreal Forest and Canadian Subarctic (Rogers 1966; Bodden 1981, 1982).

Northern peoples subsisting directly from the land's resources do so because they want to (Berger 1977, Fox and Ross 1979). Such people, predominantly aboriginals, may prefer the freedom of subsistence lifestyles to the regimentation of wage employment, or the "emptiness" of social assistance (Todd and Boggess 1987). This preference has both cultural and social significance, and sometimes is obscured by considering only income.

Living costs can be reduced greatly while living even partly from the land (Smith 1971). This stems from the use of "country foods;" reduced costs for shelter, recreation, and luxury goods; and use of fur and leather goods for bedding, personal garments, or handicrafts to be sold (Todd 1981*a*).

Aboriginal trappers in northern regions are characterized by limited formal education, advanced age, large family size, and seasonal reliance on trapping for income (Meredith and Todd 1979, Todd 1981*a*). Jobs may be scarce in small northern communities, and aboriginals may compete poorly for the wage employment that does arise (Todd and Boggess 1987).

Control of Damage by Furbearers.--Virtually all furbearers can cause direct economic losses or nuisance problems (Deems and Pursley 1983; A.W. Todd, unpubl. rep., Alta. Environ. Cent., Vegreville, 1985). Coyotes and beaver appear to cause the most economic loss. To illustrate, sheep losses to coyotes in the western U.S. were reported to average 4-8% of lambs and 1-2.5% of ewes during 1972-78; the economic loss for 1977 was estimated to be between $19 million and $38 million (U.S. Fish and Wildlife Service 1978). More recent (1984) estimates of 2.4%, 9.0%, and 26.0% predator losses in the 17 western states for sheep, lambs, and goats, respectively, totaled a direct loss of about $60 million annually (Pearson 1986). Cattle and calf losses to coyotes in 1977 resulted in an estimated 115,000 fewer calves marketed and a direct loss to producers of $20 million (U.S. Fish and Wildlife Service 1978). For beaver, estimated economic losses in the southeastern U.S. alone exceeded $4 billion over the past 4 decades (an average of $100 million annually) (Arner and DuBose 1982).

Trapping is a commonly used tool in furbearer damage control. Organized wildlife damage control programs follow 2 general approaches: "extension" and "operational." Each uses trapping, among other techniques, to address certain types of conflicts. The programs differ primarily in how and by whom control measures are applied.

Extension programs provide information, education, and training to people who then are expected to be able to resolve their own problems. The control of individual offending animals is emphasized. Actual control is undertaken by the trained individual, sometimes using equipment purchased at cost or borrowed from the sponsoring agency. Extension programs in Kansas (Henderson 1983) are an example of such efforts. An extension type of approach predominates in many agencies in the eastern U.S. Animal removal actions generally begin after losses occur and usually are corrective rather than preventive. However, most State Cooperative Extension Service educational programs stress both preventive and corrective measures that property owners can take to help avoid the need for animal removal (Timm 1983).

Sixteen of 22 states west of the Mississippi River have operational control programs administered by state or federal agencies, and some have cooperative funding from state, federal, and private sources (Juve 1986). In these programs, professional personnel perform the control work, rather than the individuals who are experiencing the damage. Operational programs emphasize coyote control (U.S. Fish and Wildlife Service 1978) and many take a more preventive removal approach by attempting to control local populations before damage occurs. Canadian efforts parallel those in the U.S. and vary in form among the provinces (U.S. Fish and Wildlife Service 1978).

Case studies have demonstrated that coyote control can reduce predation frequency, but data do not allow identification of the relative contribution of trapping or generalization beyond local study areas (U.S. Fish and Wildlife Service 1978). Moreover, Cain et al. (1972) noted an inadequate basis from which to appraise the economic effectiveness of predator control efforts. Juve (1986) calculated U.S. livestock producer and consumer benefits from control at $116 million and $251 million, respectively. Sampson and Brohn (1955) reported an 81% reduction in predator-caused losses after control training and initiation of trapping in an extension program in Missouri.

The foot-hold trap is widely used in organized control programs. It accounted for 37% of the total number of coyotes taken, 44% of the budgetary expenditures, and 56% of the manpower in the U.S. Fish and Wildlife Service animal damage control program in fiscal year 1976 (U.S. Fish and Wildlife Service 1978) and is the principal device used in federal coyote predation control programs (Connolly 1978). Foot-hold traps also are the primary tool for controlling predator problems in extension programs for coyote damage control (Henderson 1983). Despite their frequency of use in operational programs, traps were relatively expensive per

coyote taken (U.S. Fish and Wildlife Service 1978). Trapping ranked 6th ($89.64 per coyote taken) of 7 techniques, outperforming only neck snares ($137.13 per coyote taken). Nonetheless, the predominant use of traps can be explained by their suitability over a broad range of environmental conditions, their lack of environmental and safety risks compared to toxicants, and their effectiveness and practicality of application compared to techniques such as shooting or aerial gunning. This versatility makes traps especially well suited for the corrective control actions frequently required in extension and operational programs (Cain et al. 1972).

Two reports qualitatively assessed the merits of various predator control procedures, including nonpadded foot-hold traps. Cain et al. (1972) viewed traps as "very good" in their relative lack of negative environmental impacts; "good" in humaneness (if properly used), economy, safety, and effectiveness in corrective removal situations; "fair" in prophylactic effectiveness and specificity (ability to take offending individuals); and "poor" in selectivity (ability to take only target species). In a similar assessment (U.S. Fish and Wildlife Service 1978), traps were described as presenting "slight" environmental risks and were classified "excellent" in safety, "good" in efficiency in taking offending individuals, "fair" in selectivity, and "poor" in population reduction efficiency, humaneness, and social acceptance.

Trapping was highly selective in capturing offending coyotes damaging poultry and watermelons in Arkansas, but was less selective in livestock damage situations (Gipson 1975). Traps remain as versatile, sometimes essential tools for animal damage control (Linhart 1985).

Disease Control.--The effects of trapping on the frequency of occurrence, incidence, or transmission of wildlife diseases are poorly understood. Further confusion is added when discussions of this issue fail to distinguish the differences between organized disease control programs vs. normal furbearer harvests, or between remedial vs. preventive control efforts. Although numerous diseases are known to affect furbearer populations and public health, most have been little studied. Rabies has received the most study and is used as the basis for this discussion.

Disease incidence in wildlife populations often is density-dependent. For example, rabies outbreaks in Florida raccoons during 1969-71 were reportedly associated with raccoon populations concentrated by land development (Bigler et al. 1973). Similarly, an increase in skunk rabies incidence in Illinois followed an apparent increase in the skunk population (Bartlett and Martin 1982).

Density-dependent theory postulates that factors tending to reduce population density, even temporarily, also should reduce the incidence of the dependent factor (such as disease). Bogel et al. (1981) in Europe stated that the absolute number of rabid foxes at the height of an epizootic is smaller if rabies spreads into a reduced population than into one that has not been reduced. In New York, a state program for controlling rabies in wildlife neither eliminated the disease nor prevented its spread, but did appear to lessen its incidence (Parks 1968). Most recently, Rosatte et al. (1986) and Pybus (1988) concluded that skunk population reduction via intensive removal programs (involving primarily trapping and poisoning) was effective in controlling rabies in the removal areas.

There are differences, however, between intensive removal programs targeted specifically at disease control, and regulated trapping or hunting harvests. Because intensive removal programs are difficult and costly, Todd (1981*b*) suggested that preventive regulation of carnivore populations at moderate levels by hunting and fur trapping was preferable to remedial control.

The effects of fur harvests on furbearer populations and disease incidence are not clear. Most regulated furbearer harvests are designed to prevent long-term suppression of furbearer population densities. However, there can be short-term suppression because the primary depressing influence on the population from harvest mortality occurs during winter, generally also the time of greatest stress on individuals. This depressing influence usually is temporary, because most populations can compensate for these losses in the following reproduction period. (see Regulation and Restoration of Furbearer Populations section).

Despite the temporary nature of population suppression there is evidence that high fur-

bearer harvests can reduce the intensity, if not the frequency, of disease outbreaks. MacInnes (1987) concluded that overwhelming evidence from Europe and Ontario showed that "normal" levels of harvest have little effect on the course of rabies outbreaks, but that "heavy" trapping reduced the severity of such outbreaks. In Ontario, rabies occurrence in red foxes decreased with increasing harvests, and in high harvest areas rabies levels were low and outbreaks short-lived (Voigt and Tinline 1982). However, the disease was not eradicated by trapping in any area.

The efficiency of disease control varies with the timing, intensity, nature, duration, extent, and location of the control effort in relation to epizootiological factors of the disease outbreak itself (S. B. Linhart, unpubl. rep., Denver Wildl. Res. Ctr., 1985). If the primary objective of a program were population suppression for rabies control, trapping would be far less effective than organized poisoning or gassing of dens (MacInnes 1987). However, the public may no longer accept mass destruction of a species (at least a native species), no matter the public health benefit (MacInnes 1987). If the objective were to attempt to eliminate rabies from geographic regions, mass vaccination of wildlife vectors using orally administered vaccines in baits appears to be the most promising technique (MacInnes 1987). All such intensive programs would be extremely expensive and narrowly defined (single objective). More research on the potential effects of fur harvests and trapping in preventing or ameliorating the effects of rabies and other disease outbreaks is needed.

Regulation and Restoration of Furbearer Populations.--Caughley (1977) presented 3 main objectives of population management: increasing population density, sustaining yield from harvest, and stabilizing or reducing a population. Much of furbearer management involves maintaining sustained-yield harvests, although most jurisdictions have insufficient population data for more precise management based on optimum or maximum sustained yields (Dixon and Swift 1981). Increasing the densities of furbearers (e.g. reintroduction/recovery efforts) or decreasing densities (e.g. control efforts) also are sometimes program objectives.

Trapping has been important in live capture for reintroduction of furbearers, including fisher, pine marten, and river otter (Berg 1982), as well as for transplanting gray wolves (Fritts et al. 1985).

Sustained yield harvesting is based, at least in part, on the theory of compensatory interactions between various mortality, natality, and other factors. Compensatory processes are a common feature of furbearer populations, but few data are available to quantify the degree of compensation in population processes (Storm and Tzilkowski 1982).

The concept of compensatory mortality (i.e. a number of animals proportional to the number harvested by trapping would die from other causes if there were no harvest) often has been used by biologists and others to justify annual harvests (Fritzell 1987). Although empirically untested (Romesburg 1981), comparable mortality rates in exploited and unexploited populations lend support to the hypothesis of compensatory mortality in muskrats (Errington 1946, Clay and Clark 1985), beavers (Payne 1984), and coyotes (Davison 1980). Both natural mortality and reproduction in bobcats appear to respond in a compensatory manner to harvest (Lembeck and Gould 1979, Zezulak and Schwab 1979). Storm and Tzilkowski (1982) reviewed evidence for compensatory changes in fox populations, and Keith (1974) concluded that compensation in wolves may be more clear-cut and of greater magnitude than in coyotes and foxes.

Compensatory mortality is just one of several factors that may be operating in furbearer populations. Others include compensations in reproduction, emigration or immigration, and intercompensations with biotic and abiotic environmental factors (Storm and Tzilkowski 1982). There perhaps has been too much reliance on and oversimplification of the compensatory mortality concept. Fritzell (1987) concluded that prudent population management does not require an assumption of compensatory mortality, and that exploitation based on either optimum or maximum sustained yields (e.g. Dixon and Swift 1981) would be sufficient and probably more accurate.

The sustainability of regulated harvests has been demonstrated by the generally increas-

ing populations and harvests of most furbearer species in this century (Obbard et al. 1987). Populations of muskrats, nutria, raccoons, coyotes, red foxes, and others are quite resilient (e.g. Errington 1946, Connolly and Longhurst 1975, Kinler et al. 1987, Sanderson 1987, Voigt 1987) and management often is directed at increasing harvests to increase economic and recreational benefits or to reduce damage to property or habitats. Other species such as fisher, marten, beaver, otter, lynx, and bobcat can be less resilient (e.g. Brand and Keith 1979, Powell 1982, Douglas and Strickland 1987, Melquist and Dronkert 1987, Novak 1987*b*, Rolley 1987) and more restrictive regulations often are required to maintain sustained harvests and prevent overharvest.

The natural regulation of wild furbearer populations is poorly understood. Carefully planned, long-term studies are needed to test hypotheses about the relative roles of trapping and hunting compared to the other mortality, natality, emigration, and immigration factors in furbearer population regulation.

Enhancement of Other Species.--This management objective includes programs where regulation of furbearer populations is desired to meet management objectives for other species (including endangered species), guilds, or communities, either faunal or floral. Two forms of such enhancement are recognized here: (1) benefits to populations of other species by altering populations of furbearers that are either predators or competitors, or both, and (2) habitat improvement via furbearer population management.

In the first category, wildlife managers may seek to either decrease or increase furbearer populations. Examples of the former include reductions of predators such as the gray wolf to enhance ungulate populations (Peterson 1986), removal of arctic fox from the Aleutian Islands to permit recovery of the endangered Aleutian Canada goose (*Branta canadensis leucopareia*) (Springer et al. 1978), removal of raccoons to protect the threatened loggerhead sea turtle (*Caretta caretta*), or predator control at Grays Lake National Wildlife Refuge to improve success of cross-fostering endangered whooping cranes (*Grus americana*) to sandhill cranes (*G. canadensis*) (Baldacchino 1981). Although so far untested, examples of increasing furbearer populations to benefit other species include biological control of arctic fox by red fox to protect the Aleutian Canada goose (Schmidt 1985), and suppression of red foxes by coyotes to enhance waterfowl populations (A.B. Sargeant, USFWS, pers. commun.).

Habitat improvement examples include: the manipulation of muskrat numbers to influence marsh vegetation and thus enhance waterfowl use and productivity (Neal 1977); reductions of beaver populations to decelerate the beavers' effects on forest succession (Todd 1981*b*) or to reduce detrimental effects on trout habitat; and increases in beaver populations to produce wetlands that benefit waterfowl (Ermer 1984).

Nonharvest Use.--Management objectives for both harvest and nonharvest use often can be accomplished simultaneously (Payne 1980). The potential for nonharvest use of furbearers merits additional consideration due to high human preferences for these species (A.W. Todd, unpubl. rep., Alta. Environ. Cent., Vegreville, 1985; Todd 1987), the broad distribution and diverse makeup of the group (Fritzell and Johnson 1982), and their potential for viewing at baits (Pittaway 1978, Johnson and Todd 1985).

RESEARCH

Traps frequently are used by research biologists for obtaining many different types of data (see Novak et al. 1987*a* for a compilation). This includes the use of various types of cage or box traps for some species (McCabe 1949, Butterfield 1954, Simpson and Swank 1979, Buech 1983, Melquist and Hornocker 1983), as well as foot-hold traps and snares. Tissues and organs from trapped animals are examined to clarify taxonomic or zoogeographic relationships, to investigate physiological parameters, or to obtain reproductive and age data for assessing population dynamics and management options. Determining the incidence and effects of disease or the nutritional status of furbearers often is dependent on tests of fluids, tissues, or organs from trapped animals. Movement, home range, behavior, and social interactions of furbearers are studied by trapping and

either marking and releasing them or by affixing and monitoring radio transmitters. Trap, release, and recapture techniques also are used to obtain estimates of population size, and telemetry has been indispensable for study of endangered species such as red (*Canis rufus*) and gray wolves. Data derived from catch records are commonly used for assessing and monitoring the relative abundance of furbearers, their relationships to prey, and whether populations are increasing, decreasing, or stable. Such data are used by wildlife managers to make harvest recommendations. Trapping is a major technique used by mammalogists and research biologists to advance knowledge of wildlife.

TRAPPING REGULATION

Regulation of traps and trapping by state and provincial wildlife agencies has evolved with contemporary wildlife management programs. Early trapping regulations were legislatively mandated and designed to encourage removal of "undesirable" animals (mainly predators) through payment of bounties. The first bounty law in North America was adopted in 1630 by Massachusetts (Young and Goldman 1944). Somewhat later, jurisdictions protected "desirable" species such as beaver, river otter, mink, and muskrat by establishing closed seasons or zones. Although some states and provinces established closed seasons, there was no systematic approach to the problems of wildlife conservation prior to 1872 (Poole and Trefethen 1978). By 1880, all states and provinces had enacted laws for the protection of some species of fish and wildlife, and most had hired "game protectors" (Leopold 1933). Licensing programs followed to help fund administration and enforcement efforts.

By 1923, all states had established comprehensive wildlife conservation programs (Gottschalk 1978). Not all states initially included furbearer management in their wildlife programs (Ashbrook 1925). However, by 1939, 47 states had implemented trapping seasons and provisions for legal trapping methods (Gentile 1987). Ashbrook (1941) made a plea to consider fur animals and economics in any general plan for wildlife management. By 1980, all states (except Hawaii which has no furbearers) and all provinces had implemented regulations on the use of traps (Animal Welfare Institute 1980) and trapping seasons for some species (Deems and Pursley 1983, Novak et al. 1987*a*).

Legal Authorities

Federal.--Sources of federal authority for the development of wildlife law in the U.S. are the treaty, property, and commerce powers of the federal government (Bean 1978). Federal involvement in regulating trapping is limited primarily to situations involving interstate/interprovincial commerce, threatened or endangered species, species listed under international treaty agreements, or trapping on certain federally-owned lands. The situation is similar in Canada (Novak 1987*b*).

The Lacey Act of 1900 prohibited interstate transportation of wildlife taken in violation of state laws and marked the U.S. federal government's first significant step into wildlife regulations (Bean 1978). The federal Game Export Act of Canada serves to control the import and export of furbearer pelts in Canada (Novak 1987*b*). The U.S. Endangered Species Act of 1973 provided for federal involvement in the management of wildlife listed as endangered or threatened (e.g. eastern timber wolf, *Canis lupus lycaon*). The most extensive furbearer management by the U.S. Fish and Wildlife Service occurs on national wildlife refuges (Baldacchino 1981). The Refuge Administration Act of 1966 authorized hunting and trapping on federal refuges, but recognized state wildlife management authority by stating "...regulations permitting hunting (including trapping) and fishing of resident fish and wildlife within the System shall be, to the extent practicable, consistent with State fish and wildlife laws and regulations" (parenthetical phrase added)(16 U.S.C.S. 668dd(d)(1)).

Additional federal involvement in trapping and hunting of resident furbearers in North America occurred as a result of the 1975 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). CITES was designed to regulate

international trade in endangered species and species that could be confused with endangered species. In the United States, CITES gives the federal government authority to review and determine whether fur of listed species (bobcat, lynx, river otter, gray wolf, etc.) may be exported from the country without either jeopardizing populations with extinction or leading to confusion in international trade with similar-appearing species that are threatened or endangered.

Other efforts to influence trapping in the U.S. and Canada through international treaties have been attempted. An international "animal rights" charter has been proposed that would define acceptable devices for taking wild animals, among other things. Treaties are particularly significant because countries with little or no wildlife or wildlife management have the same voting power as countries with abundant resources or advanced management programs. Also, according to the Supremacy Clause in Article VI of the U.S. Constitution, a treaty is the Supreme Law of the Land (Johnson 1980*a*) and, even though congressional ratification of treaties is required, the text and obligations of such agreements can often be changed without congressional approval (Johnson 1980*b*).

State and Provincial.--Primary authority for regulating trapping is vested with state or provincial governments. In the U.S., a case heard by the Supreme Court (*Geer* vs. *Connecticut*) in 1896 became the bulwark of states' rights to regulate wildlife. Justice White concluded that states had the "right to control and regulate the common property in game... as a trust for the benefit of the people" (Bean 1978). In Canada, the British North American Act of 1867 granted the provinces control over furbearers (Novak 1987*b*) and this authority was reaffirmed by the Constitution Act of 1982. Most state and provincial management programs address the biological, recreational, economic, and wildlife damage factors relating to trapping. Other factors such as selectivity of traps, humaneness, safety, public health, ethics, and even local traditions also are involved in determining the makeup of the trapping laws. For these reasons, trapping regulations are highly variable among jurisdictions.

Local.--Regulation of trapping by local governments has increased (Gentile 1987). In most states and provinces, local governments cannot regulate or prohibit trapping without legislative action, unless public safety is involved (J. R. Hanson, unpubl. rep., Wildl. Conserv. Fund Am. 1981; Novak 1987*b*). Despite legal precedents in many states upholding state preemption of authority to regulate wildlife harvests, few states have statutes that specifically limit local government authority concerning wildlife (J. R. Hanson, unpubl. rep., 1981). In parts of Canada, local bylaws passed by townships, regional governments, towns, and cities under enabling provincial legislation commonly restrict the discharge of firearms and restrict the use of certain traps in a few cities (Novak 1987*b*). As broader attempts to ban specific trapping devices have failed, there have been increasing efforts by trapping opponents to obtain local (city, township, county) restriction of trapping, especially in urbanized areas.

Types and Purposes of Trapping Regulations

A variety of laws and regulations are used to implement management programs and achieve objectives. Not all regulations are applied in all jurisdicitons. The following is a generic listing of the most common types and purposes of regulations:

Seasons.--Timing and season length may be used by wildlife managers to: (1) encourage increased harvest, or reduce the likelihood of over-harvest of the population; (2) restrict harvests to a certain period when furs are "prime" or of greatest value; (3) provide protection during breeding or rearing young; (4) provide recreational opportunities; (5) distribute harvest among hunters and trappers; or (6) allow harvests when weather conditions normally are most conducive to achieving desired harvests.

Licenses.--Licenses facilitate enforcement of furbearer laws and provide a source of revenue for furbearer management. In many states, licensing also provides the sampling basis for estimating total furbearer harvests. In addition, a growing number of states and provinces are using licensing to assure that trappers have met minimum requirements of training or experience (see Education Section).

Zones.--Zones are established in some states and provinces to provide for geograph-

ic differences in furbearer distribution, density, and fecundity; harvest pressure; weather or climate; onset and duration of fur primeness; habitat types or conditions; human populations; recreational values; or other variables.

Trapping Areas.--On registered traplines in Canada and on some refuges and wildlife management areas in the U.S., trappers are assigned exclusive trapping areas and are responsible for maintaining appropriate levels of furbearer harvests and populations.

Traps and Trapping Devices.--Regulations on traps and trapping devices are highly variable and are intended primarily to address issues of safety, selectivity, and injury. Examples include restrictions on trap sizes, toothed jaws, killing traps, deadfalls, pitfalls, snares, foot-hold traps, cage traps, multiple-catch traps, and maximum numbers of traps. Some regulations, such as trap identification, are designed to facilitate enforcement of other trapping laws. Currently, Canadian and U.S. representatives are working along with other countries under the auspices of the International Organization for Standardization (ISO) to establish international standards for mammal traps. These standards would not be binding, but could potentially become the basis for additional regulation of trapping devices.

Techniques.--A variey of trapping techniques are regulated in many jurisdictions. Examples include restrictions on trap-checking intervals or times; use of or setting traps near exposed baits; disturbing or setting traps in or near dens, houses, and burrows; use of dogs; and distance traps may be set from roads or building.

Season Limits.--For some high-demand, low productivity species, a limit is sometimes established on the number of animals a trapper can take per season. These limits are designed to limit total harvests to an acceptable level, to provide for a more equitable distribution of a limited resource among harvesters, or both.

Quotas.--Quotas are used in some states and provinces, and differ from limits in that quotas establish a maximum total allowable harvest for a particular geographic area for the season. Administration of quotas usually involves either issuing only a limited number of permits or closely monitoring harvests and stopping the harvest once the quota has been reached. On registered traplines, minimum or maximum quotas are sometimes established. This is usually done in consultation between trappers and government managers.

THE CONFLICT

Advocacy Organizations

A recent directory (Association for Biomedical Research 1984) listed nearly 300 animal welfare or animal rights organizations; of those, about half were based in the United States and about half elsewhere in the world. In addition, a myriad of affiliate or independent groups exist at local levels. Linhart (1985) categorized these groups into 3 kinds based on a classification first proposed by R. Carmichael: (1) animal welfare proponents who oppose some trapping techniques (e.g. foot-hold traps), (2) animal rights advocates who extend a philosophy of human rights to other animals, and (3) a "commercial protest industry" that exploits the trapping controversy to raise revenue.

Techniques used by these groups include legislative influences, demonstrations and boycotts, influence of public opinion through various media, and advocating substitutes for fur products (Gentile 1983, Linhart 1985). In addition, these groups use litigation to challenge existing authorities, policies, and laws. In some states, the initiative petition process also has been attempted.

Pro-trapping organizations include private trapping and hunting organizations, the fur industry, state and federal wildlife and natural resource agencies, and some private and public agricultural interests or agencies (Linhart 1985).

Characteristics of Antitrappers

Characteristics of trappers in North America have been summarized earlier in this review and contrast with those of individuals who oppose trapping. Although there are few

studies of antitrappers, they likely share many of the socioeconomic characteristics of antihunters (i.e. primarily female, live in urban areas, and have little direct experience with and poor knowledge of wildlife in general), and are sincerely committed to their beliefs (see review by Todd and Boggess 1987). Antitrapping attitudes also appear similar to those of antihunters (Todd and Boggess 1987).

Gentile (1983) described the antitrapping movement as a "classic resource conflict." It is certainly not a new phenomenon. In 1901, New Hampshire attempted to prohibit spring-operated traps, and "inhumane" trapping devices were temporarily banned in Massachusetts in 1930.

Antihunting and antitrapping attitudes are linked with urbanization trends (Leonard 1972, Shaw 1974, Applegate 1975, Hendee and Potter 1976, Kellert 1976, Shaw et al. 1978, Gentile 1983). Boggess and Henderson (1981) suggested that urban residents do not have the same awareness of life and death processes as their more rural counterparts and that this may lead to an "anti-kill perception." Gentile (1983) found that support for trapping in a state did not necessarily depend on the proportion of the state's population that was urban. For example, Arizona, Nevada, Oklahoma, Texas, and Utah are all over 70% urban in terms of population, yet none has ever attempted to ban trapping statewide. There was a correlation with dependence on primary resources as a livelihood; trapping support increased with dependence on primary resources and decreased with employment in the tertiary or service-oriented sector. However, within states that had attempted trapping bans, there was a strong positive correlation between population density and support for the ban, and a statistical analysis of voting patterns in the Massachusetts, Ohio, and Oregon antitrapping referenda showed that in all cases support for a trapping ban was highest in the urban centers (Gentile 1983). Childhood experiences (e.g. exposure to anthropomorphic literature) also are important determinants of adult attitudes regarding consumptive use of wildlife (Yoesting and Burkhead 1973, More 1977).

Antitrapping issues often center on the concepts of humaneness or animal rights (Defenders of Wildlife 1984, Herscovici 1985), or on conflicts with other wildlife users, primarily fox and raccoon hunters (Reiger 1978, Boggess and Henderson 1981). The conflict between furbearer hunters and trappers is most pronounced in the southeastern United States, where hunting raccoons and foxes with hounds is extremely popular and where real or perceived competition for these animals is intense (Todd and Boggess 1987).

Humane concerns primarily involve some uses of foot-hold traps. For example, the American Veterinary Medical Association recognizes that steel-jaw foot-hold traps may be used legitimately in some aspects of wildlife management and predator and pest control. However, they also recognize that such traps may cause extensive injury and they recommend discontinuance of their use as soon as acceptable alternatives become available (American Veterinary Medical Association 1988). Some humane or animal welfare proponents do not necessarily object to the use of animals for human benefit, as long as the animals are treated "decently" (unpubl. 1975 rep., Canadian Association for Humane Trapping; Holzer 1983).

Animal rights proponents, on the other hand, advocate that nonhuman vertebrates, and possibly invertebrates, have the same basic rights as humans (Herscovici 1985). These rights include not being killed, eaten, or used for sport or research, or abused in any way (Morgan 1982). The sentience of animals, or their ability to feel pleasure and pain, is considered to be a fundamental moral consideration by animal rights advocates (Singer 1977).

Antitrapping attitudes have been categorized as follows: (1) *antitrapper* -- objections to trapper conduct or behavior; (2) *antitrap* -- objections to capture methods used by trappers, particularly the foot-hold trap; and (3) *anti-kill* -- objections to killing animals, based on individual value systems and personal ethical principles (Todd and Boggess 1987). Most animal welfare and humane groups would fit in category (2); animal rights groups in category (3); and most furbearer hunters who oppose trapping in categories (1) and (2).

Education, regulation, and technology research and development will help address the

concerns of categories (1) and (2), but likely will have little influence on those who are morally opposed to killing animals (category 3) (Todd and Boggess 1987). However, despite Kellert's (1980*a*) finding that a majority of Americans are at least uncomfortable with the foot-hold trap, the failure of referenda to ban trapping in Ohio and Oregon (following initial polls indicating overwhelming support for a ban) suggests that a large proportion of the public may not have a firm position on this issue.

Antitrapping Actions

Most antitrapping legislation in the U.S. has occurred east of the Mississippi River. Since 1900, over 450 antitrapping bills have been introduced at federal (30%), state (50%), and local (20%) levels (Gentile 1983). Three hundred and fifty (78%) of these bills were introduced from 1968 to 1982. Most of the antitrapping activity occurred in the 1930s and during 1972-82 (Gentile 1987). Using prevailing fur values as an index to "trapping intensity" there appeared to be a strong positive relationship between trapping intensity and antitrapping events (Gentile 1983). Since 1968, there has been an increase in activity at the local level and a decline federally (Gentile 1983). Between 1968 and 1982, at least 90 local governments banned some form of trapping (Gentile 1987). The Defenders of Wildlife (1984) encouraged antitrappers to concentrate efforts at local or state levels. In particular, they advised organizing efforts at the county or city level to promote passage of local antitrapping ordinances. They reasoned that achieving changes at national and state levels would be time-consuming and expensive and that battles at county and city levels are "more readily winable" (Defenders of Wildlife 1984).

At the state level, 18 states attempted to ban the foot-hold trap between 1925 and 1939; five were successful, but by 1948 all statewide bans had been lifted (Gentile 1987). Antitrapping referenda have been brought to vote in Massachusetts (1930), Ohio (1977), and Oregon (1980). The Massachusetts effort passed but was subsequently reversed; the others were defeated by 2:1 margins.

New Jersey banned foot-hold traps through legislative action that took effect early in 1986. In 1985, a coalition of 38 organizations filed suit against the New York Department of Environmental Conservation (DEC) in an effort to impose a statewide ban on the foothold trap. The suit was based on an alleged violation of New York State Agricultural and Markets Law, which addresses the humane treatment of animals ". . . whether wild or tame." Although the court ruled in favor of the DEC, the suit challenged state authority to use trapping as a wildlife management tool. Because most states have similar humane laws, a legal precedent might have been established had the plaintiffs been successful (Gentile 1987).

Since 1973, 3 states have banned the foothold trap entirely (Florida, 1973; Rhode Island, 1977; New Jersey, 1986), and 4 others have restricted its use to water sets, in burrows, near buildings, or on personal land (Massachusetts, 1975; Tennessee, 1975; South Carolina, 1976; Connecticut, 1977) (Gentile 1987). The New Jersey action represents the only significant statewide restriction on foothold traps in the past 12 years. In Canada there have been no antitrapping bills, but wildlife management authorities in 3 provinces have prohibited use of conventional foothold traps in land sets for most furbearers (Barrett et al. 1988), except canids, felids, and wolverines.

In 1984, the U. S. House Subcommittee on Health and the Environment held hearings on H.R. 1797, a bill to ban interstate shipment of leg-hold traps and furs taken with those traps. The bill had 125 co-sponsors and received a hearing for the first time since 1975 (Sechak 1984), but it received no further consideration beyond the subcommittee hearing.

Recent tactics by those opposed to trapping appear to be concentrating on international issues. An unsuccessful attempt was made in 1983 to have CITES parties support a resolution to prohibit export of furs from all countries permitting use of the "steel-jaw leg-hold trap." Similarly, the 1988 meeting of the International Union for the Conservation of Nature (IUCN) was presented with a resolution urging that "steel-jaw leg-hold traps" be eliminated throughout the world. That resolution also did not pass, but may be considered again in the future. The issue has gone beyond antitrapping to "antifur" (whether trapped, hunted, or ranched). Antifur cam-

paigns have been launched in the Netherlands, Switzerland, and Great Britain (Barrett et al. 1988).

Carefully designed and implemented omnibus surveys would be valuable in providing quantitative data on trappers, trapping methods, public and advocacy group attitudes, and other furbearer management related issues, both in North America and abroad. Lack of geographically or demographically representative information on many facets of the trapping/furbearer management issue contributes to the controversy and hinders enlightened decision-making by governments (Todd and Boggess 1987).

EDUCATION

Trapper Education

Little organized trapper education was conducted in North America before 1970 (de Almeida and Cook 1987). Increases in fur prices and harvests, trapper numbers, and animal welfare concerns during the 1970s resulted in greater emphasis on the knowledge, competency, and behavior of trappers among publics, wildlife management agencies, and trapper organizations.

Minnesota statistics illustrate the magnitude of some changes that have occurred. In 1971, trapping license sales were the lowest recorded since 1925 (5,908). Yet within 8 years, as fur values (uncorrected for inflation) reached a record high, trapper numbers quadrupled (to 24,005), reaching the highest level since 1948 (Minn. Dep. Nat. Resour., unpubl. data). After 1980, fur prices and trapper numbers again declined significantly concurrent with similar trends across the United States. The membership in and number of trapper organizations also varied with fur prices and demand.

Many individuals who began trapping in the 1970s lacked experience and few had access to reliable training and sources of information (Boggess and Henderson 1981). The magnitude of the increase in trapper numbers and effort associated with the high fur prices resulted in increased activity by inexperienced trappers. Because of this, trappers supported programs to improve the competency and behavior of all fur harvesters. Kellert (1981) reported that 72% of trappers supported a requirement for mandatory education, and Boddicker (1981) noted that trappers preferred mandatory education programs to voluntary ones.

Trapper education programs help allay concerns about and improve trapper behavior and conduct (Todd and Boggess 1987). Education also will resolve some concerns about trapping methods as trappers adopt traps or trapping systems that increase selectivity and reduce injuries. However, trapper education may not have much effect on trapping antagonists who oppose trapping on moral or ethical grounds (Todd and Boggess 1987).

In 1958, Manitoba became the first North American jurisdiction to offer a formal trapper education course; the first state was Louisiana in 1970 (de Almeida and Cook 1987). For reasons previously discussed, trapper education programs increased rapidly in the 1970's, especially in Canada. In 1976, R. Ellicker surveyed all North American states, provinces and territories; 6 of 43 responding states and 7 Canadian provinces or territories reported having active trapper education programs (unpubl. rep., N. J. Div. Fish, Game, and Shellfish. 1978). By 1983, the number of states reporting either voluntary or mandatory trapper education programs had grown to 25, whereas by 1984, 10 of 12 Canadian provinces or territories offered basic level courses (de Almeida and Cook 1987).

Trapper education programs commonly emphasize ethics (behavior), fur handling, humane trapping techniques, and regulations. Other topics such as furbearer biology and management, health, safety, hunting, first aid, and survival were included in some programs (L. B. Fox, unpubl. rep., Kansas Fish and Game Comm. 1983; de Almeida and Cook 1987).

In the U.S., state wildlife agencies have primary responsibility for trapper education programs, although trappers' associations and the Cooperative Extension Service also are involved (L. B. Fox, unpubl. rep., Kansas Fish and Game Comm. 1983). In Canada, all education courses are jointly administered

by provincial or territorial governments and trapper associations (de Almeida and Cook 1987). Funding sources vary for trapper education; in the U.S., funds are provided wholly or in part by state wildlife agencies (66%), state trapping associations (32%), students (28%), or other agencies (16%, primarily extension service/4-H) (L.B. Fox, unpubl. rep., Kansas Fish and Game Comm. 1983).

Interest also has been growing for compulsory trapper education programs. British Columbia (in 1975) and Washington (in 1977) were the first jurisdictions to make trapper education mandatory for first-time trappers (de Almeida and Cook 1987). By 1984, 7 more jurisdictions in North America had this requirement (New Jersey, 1978; Ohio, 1978; New York, 1980; Ontario, 1981; Connecticut, 1982; California, 1983; and Kansas, 1983) (L. B. Fox, unpubl. rep., Kansas Fish and Game Comm. 1983; de Almeida and Cook 1987).

Public Education

Public education programs that deal with trapping have been less organized and less extensive than trapper education efforts, although general wildlife education programs cover some of the principles of managing furbearing mammals. Wildlife management agencies have focused primarily on the resource management aspects of trapping and generally have left moral or ethical considerations to individual judgment. Mass media efforts mainly have developed either as a part of, or in response to, antitrapping pressures.

Opinion surveys have shown that the U.S. public generally is not supportive of trapping and the use of wildlife as a source of furs (Dahlgren et al. 1977, Arthur and Wilson 1979, Kellert 1980*b*). However, limited data for Canada indicate that appropriately regulated fur trapping is more widely accepted than sport hunting (Todd and Boggess 1987). Despite high public awareness of trapping, the public is not well informed on most wildlife issues (Kellert 1980*b*). Before publics can make informed judgments on management decisions, they must learn objective, accurate information through effective educational systems (Boggess 1982).

CONCLUSIONS AND RECOMMENDATIONS

The issue of trapping in furbearer management programs is complex and controversial. Much of the controversy is related to opposition to certain trapping methods, particularly to some uses of the steel-jawed foot-hold trap. Another aspect involves objections to some purposes for trapping, especially to the trapping of wildlife as a source of fur. An increasing element of trapping opposition is related to the concept of "animal rights" -- moral objections to the use or killing of animals for human benefit. Regarding the latter argument, several prominent antitrapping organizations have expressed strong opposition to wildlife management programs that consider wildlife and fish as renewable natural resources to be used on a sustained basis for human benefit. This component of the controversy obviously has implications for wildlife management that extend beyond the trapping/fur issue.

A significant body of information regarding the biological, technological, economic, social, and cultural aspects of trapping has been collected, and much of it has been reviewed in this paper. As a result of this review, the Committee offers the following conclusions and recommendations:

Traps and Trapping

Considerable trap research and development has indicated a significant potential for reducing injury and stress to trapped animals and for increasing selectivity of traps. This can be accomplished by adopting the use of new live-holding and killing devices and by modifying or employing new methods of using existing devices.

Animals can be injured by some live-holding traps and trapping systems, particularly by some uses of the foot-hold trap. However, regulatory and educational programs can reduce the number and extent of injuries. Also foot-hold traps may offer advantages over other devices in terms of efficiency, safety to humans and domestic animals, re-

lease of accidental captures, and lack of adverse environmental impacts. In addition, acceptable and effective alternatives currently are not available for all such trap uses, although padded foothold traps appear to have potential for greatly reducing injury while maintaining comparable efficiency levels for some species.

Wildlife professionals should support the continued development of improved traps, trapping systems, and alternative methods of taking furbearers. In addition, they should encourage the implementation of safe, selective, efficient, and environmentally acceptable capture techniques that result in the least injury and stress for captured animals.

Socioeconomics

Trapping and the fur industry in North America remain important economically, socially, and culturally to many people. Trapping provides needed income for some and an outdoor lifestyle and recreation for others. It is vital to the subsistence lifestyles of some peoples in remote regions, especially many aboriginal Canadians in subarctic and arctic regions who rely on hunting, fishing, and trapping for much of their total income. Similar conclusions apply to people in much of Alaska and in many rural regions of the contiguous 48 states.

Much of the opposition to trapping appears to be associated with urban-oriented cultures, particularly those that do not depend on primary resources for a livelihood and that are dominated by tertiary or "service-oriented" employment. This contrasts with the more rural orientation and the greater dependence on primary resources of those who primarily practice, benefit from, or support trapping. This dichotomy of cultures, lifestyles, and values aggravates the conflict and creates barriers to understanding.

Wildlife professionals should encourage and support research on the knowledge, attitudes, and socioeconomic characteristics of trappers and other publics. The objectives should be to advance understanding and to facilitate resolution of social and cultural issues and problems associated with trapping and furbearer management.

Furbearer Management and Research

Furbearers are managed to provide economic benefits, recreation, subsistence, damage control, disease control, population regulation, population restoration, enhancement of other species, or nonharvest values. Although the achievement of multiple objectives frequently is desirable in furbearer management programs, often not all objectives can be achieved simultaneously and some (e.g. disease suppression and nonharvest use) may be mutually exclusive.

The sustainability of regulated furbearer harvests has been adequately demonstrated, but questions remain regarding the specific effects of such harvests on population regulation, disease suppression, damage control, and enhancement of other species or habitats. Regardless of the overall effects of regulated harvests, however, the use of traps for specific applications in these areas has been successful. In furbearer harvest programs, traps are more versatile and efficient than hunting or any other known technique, with the possible exception of toxicants. However, toxicants have been prohibited for use on most furbearer species. In furbearer damage control, despite extensive efforts to develop effective nonlethal damage control and prevention methods, there currently is no acceptable substitute for trapping in many situations. Intensive trapping, with the specific objective of suppressing furbearer diseases, has been shown to be effective, at least for rabies, but regulated harvests appear to have less effect except under "heavy" harvest conditions. Therefore, regulated harvests would not be the technique of choice if the sole objective of a management program were to suppress disease. However, there is evidence that, in multiple objective management programs, such harvests can, at times, provide some disease suppression value at no added cost, while maintaining and perpetuating populations of furbearers that provide additional economic and social benefits.

Part of the reason that these relationships are not understood more clearly relates to the diversity of furbearer species and the fact that effective censusing, indexing, and harvest monitoring techniques are either unavailable or difficult and expensive to apply. For many furbearer species, there have not been thorough, well-designed stud-

ies to evaluate competing hypotheses regarding the relative effects of trapping and other factors on populations, diseases, and interactions with other species and habitats. These types of research should be given higher priority and funding. Results of such studies then should be more vigorously applied, with the ultimate objective of providing for optimum sustained yield management of furbearers. In addition, the implications of those results to furbearer damage and disease control should be evaluated and applied.

Education

The need for education of trappers now has been recognized and implemented in most Canadian provinces and territories and more than half of the states. This also is one of the few areas of common ground where trappers and some animal welfare advocates are essentially in agreement. Trapper education programs offer high potential for decreasing animal injury and stress, and for increasing selectivity. These programs are needed both for existing trapping devices and to assure proper use of new devices and techniques. Wildlife professionals should promote and provide mandatory and voluntary programs of trapper education that cover appropriate trapping techniques, proper fur handling, and furbearer management.

Surveys have shown that the public holds definite opinions on trapping, but that most people lack objective information on trapping and wildlife issues. Although the public will judge management decisions regardless of their knowledge of the subject, an effective educational system that provides objective, accurate information should lead to more informed judgments.

Conclusion

Trappers and trapping opponents will continue to disagree on furbearer management issues, particularly on use of steel-jaw foothold traps. It is apparent that many antitrapping and animal rights-organizations will continue to use whatever means they can, including the courts, to erode governmental authority for maintaining regulated trapping programs. Conversely, protrapping factions insist that this authority is essential to maintain the benefits that trapping provides and to properly manage furbearers. Some common ground appears to exist. Some animal-welfare and humane organizations, particularly in Canada, are not opposed to trapping per se, but only to some of the methods used. Additionally, despite some public opinion polls indicating opposition to trapping, many people apparently do not hold a firm position one way or the other on the trapping issue. Wildlife professionals must be fully cognizant of the various perspectives and support actions that will benefit wildlife resources and the public to the greatest extent. Comprehensive resolution of trapping issues will require application of well-designed and sensitive research, management, and education programs.

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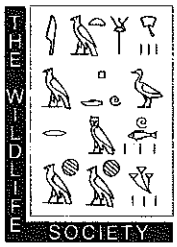

THE WILDLIFE SOCIETY
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