KANSAS HERPETOLOGICAL SOCIETY
POSITION PAPER REGARDING RATTLESNAKE ROUNDUPS

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Approved by the KHS Executive Council
January, 1994

Section 1. Purpose

The Kansas Herpetological Society, on the occasion of its twentieth annual meeting in Emporia, Kansas, November 6, 1993, voted unanimously to adopt a resolution reaffirming it's opposition to "rattlesnake roundups" in Kansas and elsewhere. It is the intent of this paper to support, using the available literature, the resolution and the reasoning upon which it is based.

KHS Resolution Opposing Rattlesnake Roundups

Be it hereby resolved that the Kansas Herpetological Society, a 200-member organization dedicated to conservation and education concerning amphibians and reptiles, on the occasion of its twentieth annual meeting in Emporia, Kansas, November 6, 1993 reaffirms its opposition to "rattlesnake roundups". The KHS has been on record since 1974 as opposing events of this type because they are environmentally destructive, because of their cruel and inhumane treatment of snakes, because of the danger to participants and spectators from careless snake handling, and because they present attitudes toward wildlife that encourages its over-exploitation and destruction.

We also oppose the Kansas commercialization of prairie rattlesnakes (*Crotalus viridis*) enacted by Senate Bill 137 in 1993. Life history information suggests that commercial harvest cannot be sustained. Studies of the effects of "roundups" on western diamondback rattlesnakes (*Crotalus atrox*) in Texas indicate significant long-term consequences for those populations. Thus we recommend the State of Kansas make funds available for continuous research to address what effects additional mortality will have on Kansas populations of prairie rattlesnakes, and to further investigate the biology of the species.

If "rattlesnake roundups" must occur, we encourage Kansas Department of Wildlife and Parks to adopt conservative regulations regarding bag and possession limits, humane treatment of snakes, length and timing of season, minimum and maximum size limits, and area and extent of any such hunts. The KHS supports protection against commercialization of reptiles and other wildlife in Kansas, including KSA 32-1002, which makes it unlawful to take wildlife, including reptiles, for sale, exchange, or other commercial purposes, and KAR 115-20-2, which establishes a possession limit of five for reptile species.

Section 2.1. Environmental concerns - Harvest at non-sustainable levels

"It's not an endangered species, and it never will be."
John Shaddix, snakeskin dealer

The original intent of rattlesnake roundups was to rid certain areas of rattlesnakes. The goal was (and still is, in many instances) to gather and destroy as many rattlesnakes as possible. The incentive has since shifted from eradication of a perceived threat to the gaining of profit, but the ecological ramifications remain the same, if not worse. Seven rattlesnake species have been listed as threatened or endangered in one or more of fifteen different states, owing fully or in part to commercial exploitation (Ashton 1976).

Roundup proponents often cite the large and sometimes increasing numbers of snakes harvested each year as evidence of harvest sustainability. However, the increase, or at least lack of decrease, in the number of western diamondback rattlesnakes (*Crotalus atrox*) harvested in Texas each year is likely a function of increased hunting effort (i.e., more hunters covering a larger area and using more intrusive methods) rather than being evidence of harvest sustainability (Campbell 1989). Comments by hunters at Freer, Texas, indicated that many snakes had been brought in from long distances, and that most had been collected using gasoline (see section 2.2). It is also common for snakes to be stockpiled for several weeks prior to the actual roundup, and some roundups purchase "leftover" snakes from earlier roundups (Fitch and Pisani 1988). These factors make accurate counts of the actual take unattainable.

Snakeskin dealer John Shaddix claims that western diamondbacks are so prolific they will never be hunted to extinction: "There are numerous areas so overpopulated that we'll never be able to hunt the rattlesnake out. Ever. Not ever." (Shaddix 1989, quoted in Weir 1992). Recall that similar claims were made with regard to the American Bison. Any such claims by roundup sponsors or snake dealers must be questioned due to the fact that these people typically have no formal education in population biology, they have done no scientific research on the population dynamics of snakes, and they all have a financial incentive to make such claims. In another example, rattlesnake "hunter" Marie Harris suggested that there should be no bag limit on rattlesnakes in Kansas, and supported her position on the assertion that a decrease in prairie dog populations has caused an increase in rattlesnake populations (Kans. Dept. Wildlife & Parks, Minutes of Comm. Mtng., May 13, 1993). The Western (Prairie) Rattlesnake (*Crotalus viridis*) native to Kansas feeds on prairie dogs and used their burrows for shelter (Collins 1993). Any decrease in the availability of food and shelter for a species will cause a decrease in populations of that species, not an increase. Ms. Harris has succeeded in demonstrating her ignorance of population biology. Any species, no matter how prolific, can be hunted to extinction.

Indiscriminate collection of the western rattlesnake (*Crotalus viridis*) may cause drastic reductions in their numbers (Parker and Brown, 1974). The western rattlesnake may be particularly vulnerable due to a high concentration of animals at winter dens, late maturity of females (1st reproduction at age 4 or 5 years), and a bi-annual reproductive cycle. Den raiding, a common means of procuring snakes for roundup events, may be particularly detrimental to populations of *C. viridis*. Klauber (1972) reported on seven *C. viridis* dens that were raided repeatedly for a period of 14 to 24 years. At the onset, these dens produced as many as 89 snakes in a single raid. In later years, three of the dens no longer contained any snakes, and the maximum number obtained in any single raid was 8.

Strict regulations regarding harvest may not be sufficient to protect some species from eradication. In Pennsylvania, harvest of the timber rattlesnake (*Crotalus horridus*) is limited to two snakes per day or in possession, and roundup participants are encouraged to release them immediately and unharmed in the area of capture (Brown 1993). Despite the strict regulations, the timber rattlesnake is listed as a candidate species for threatened or endangered status in the state (*C. horridus* is already listed as endangered in Connecticut, Massachusetts, New Hampshire, New Jersey, Virginia, and Vermont, and threatened in New York and Texas (Brown 1993)). Research suggests that fully 75% of the rattlesnake dens in Pennsylvania are below population levels considered viable (Martin et al., 1990; Smith et al. 1991). Essentially, these dens are doomed to extinction regardless of future action. This is a direct result of harvesting at non-sustainable levels, particularly the high exploitation of reproductive females which occurs during organized roundups (Martin et al., 1990).

Large-scale, localized harvesting associated with rattlesnake roundups can have drastic long-term effects on snake populations. As population density decreases, the reproductive output of the population decreases. This is not only a function of there being fewer snakes, but also of the increased difficulty of finding mates. Snakes do not run or fly. The limited ability of snakes to move over long distances may pose a significant barrier to locating potential mates in populations of low density.

Low population numbers often also means lowered genetic diversity. Small populations are also more profoundly affected by genetic drift, a random process that tends to reduce genetic diversity. Whenever the genetic diversity of a population is reduced, that population becomes more susceptible to disease, flood, drought, and other environmental changes.

The effects of overharvest are not limited to the rattlesnakes themselves. In Kansas, 16 species of hawks, kites, falcons, owls, and eagles feed on snakes (Thompson and Ely 1989). This does not include other non-bird-of-prey species that feed on snakes, nor does it include species not found in Kansas. As a predator, an individual rattlesnake will feed, on average, once every two weeks (Klauber 1972), thus any one snake may eat 15 to 20 rodents per year. The Sweetwater, Texas, rattlesnake roundup (advertised as the world's largest) has resulted in the capture and killing of up to 18,000 snakes at a single weekend event (Weir 1992). In effect, Sweetwater allows 360,000 rodents to survive and propagate each year. Warwick et al. (1991) estimate that the annual take of rattlesnakes in the United States tops 500,000. Rattlesnakes are an integral part of their natural ecosystems, as both predator and prey, and the removal of large numbers of snakes may have a significant effect on other species.

Section 2.2 Environmental concerns - Gasoline Usage

"Some hideouts would take an Exxon Fuel Truck to gas."
Rick Womack, Lancaster, Texas, 1993

One means of coercing an animal from its hiding place is to spoil the place. For rattlesnake "hunters" this is frequently accomplished with the nearly effortless squeeze of the trigger on a garden sprayer filled with gasoline and aimed down into any suspect hole, crack, or crevice. "Conscientious hunters" insert a tube-like listening device into the hole prior to "gassing" to

determine the presence or absence of an animal (Williams 1990). When an animal is discovered, the spray nozzle of the device is placed in the hole. Careful to aim for the back of the hole (to drive the animals forward as opposed to back further into the hole), gasoline is injected into the earth. The fumes and drowning effect of the gasoline force dazed and poisoned animals from their homes as easy prey to hunters. This technique has been broadly discussed by interviewers with hunters and the conclusions are all the same: although it is blatantly illegal, the majority of the snakes brought into long-standing roundups are captured using gasoline (Lawler 1993). In fact many veteran "hunters" have expressed concern that novices use too much gasoline and ruin the collecting site for years (Campbell 1989). Veteran "hunters" are still using gasoline, but in more sparing quantities. "...gas was used in excess when getting them out of the dens, possibly a lot were killed at that time, needlessly." (Henson 1993). In effect, they have discovered habitat destruction. Some, in attempt to appease concerned parties, have switched from gasoline to ammonia (Lawler 1993), which has its own suite of potential environmental hazards.

The intentional spillage of hazardous materials is against fire safety regulations and wildlife protection laws in numerous states including Oklahoma (Oklahoma 800:25-7-7) and Kansas (Kansas Department of Wildlife and Parks Amphibians and Reptile Regulation 115-20-2). This activity is illegal for a variety of reasons, not the least of which is the threat of groundwater contamination, the risk of igniting a fire or explosion, and the high potential for the demise of other animals, including threatened and endangered species. In addition, the sale of meat drenched in gasoline is also likely illegal because of possible health risks associated with consumption. Cox and Meinzer (1991) note that gassed snakes may absorb potentially carcinogenic hydrocarbons.

It has repeatedly been shown that gassing has ill effects on not only the target animal (i.e., rattlesnakes) but also those which share its habitat.

Many species make use of the burrows which the snakes frequent. Thus "hunters" are likely to poison residents such as skunks, fox, opossum, small mammals, amphibians, and other reptiles. Threatened and endangered species also fall victims to this gassing practice. For example, gopher tortoises (*Gopherus polyphemus*), a federally threatened species (Williams 1990), and indigo snakes (*Drymarchon corais*), a threatened species in Florida, Georgia, and Alabama (Ashton 1976), have been gassed inadvertently (Clarke 1978; and Speake 1980). In fact, gopher tortoise burrows are the main target for gassing in the southeast, as they are a critical habitat of eastern diamondbacks, *Crotalus adamanteus* (Conant and Collins, 1991). Additionally, because the habitat is polluted, it is no longer fit for use by other animals, including federally protected species. Burrowing owls, for example, use the burrows as nest sites (Thompson and Ely 1989). Egg laying and the underground hatchling stage occur throughout the spring, when rattlesnake roundups primarily occur. It is noteworthy that the distress call of the subterranean hatchlings closely mimics the rattling of the prairie rattlesnake, *Crotalus viridis* (Martin 1973). Thus, many animals with similar life behaviors are unfortunately mistaken for the target species.

Furthermore, the toxic effects of gasoline on the animals is significant enough that many die or suffer from a reduced capability to provide for themselves. In an experiment by Campbell et al. (1989), rattlesnakes, other snake species, lizards, toads, and crickets lost sensory perception and motor control when exposed to gasoline. The foraging capabilities of exposed lizards and toads were also tested, which revealed a strong correlation between exposure and food intake. The toxin permanently damages the sensory systems of the animals, which results in a reduced ability

to carry out life functions such as feeding, locating shelter, and ultimately reproducing. Thus, it can be deduced that even those animals that survive the gassing event may have a severely reduced life span. Gassed animals retained in captivity typically have a maximum life span of one year (Warwick et al., 1991).

Section 2.3 Environmental Concerns - Habitat Destruction and Species Eradication

"The broad-ranging destructiveness of these roundups is well known..."
Warwick 1992

A great deal of popular concern is focused on the broad ranging causes and effects of habitat destruction. While no single action necessarily destroys a habitat, each erodes the integrity of the system. An example would be soil erosion. Each rainfall washes away only a small amount of topsoil. But overall, the United States loses 6.4 billion tons of soil to erosion each year. The same is true for natural habitats which are encroached upon by urbanization, agriculture, and consumptive use of resources.

The once extensive habitats of many species of rattlesnakes, including the timber (*Crotalus horridus*), eastern diamondback (*Crotalus adamanteus*), western diamondback (*Crotalus atrox*), and western (*Crotalus viridis*) rattlesnakes most commonly targeted by roundups, have been largely destroyed or fragmented by urbanization and agriculture. Urbanization destroys rattlesnake habitat. Cities supply no suitable food or shelter for rattlesnakes. Agriculture tends to fragment the available rattlesnake habitat. Rattlesnakes, like all animals, require both food and shelter to survive. Cropland may provide a food source (rodents), but provides essentially no shelter. Rattlesnakes require specific types of shelter, particularly in winter when they must remain below the frost line to avoid freezing. Hibernacula usually consist of mammal burrows or crevasses in rock outcrops. Plowing destroys both such habitats, restricting snakes to rangelands where there remains an abundance of mammal burrows, rocks, and other suitable shelter.

One widely accepted method of locating snakes is to overturn every conceivable shelter, such as rocks, fallen trees, and so forth. Examination of "hunting" areas in the vicinity of Waurika, Oklahoma, revealed that 76% of potential snake shelters were investigated by roundup participants. Of these, 96% were misplaced so that they lay flat on the ground and were no longer suitable shelters (Warwick et al 1991). Some shelters may be rendered unsuitable even without physical disturbance. Timber rattlesnakes may abandon prime habitat for five years or more if exposed to repeated human harassment (Brown 1993). Presumably the snakes leave to escape human odors, trampled vegetation, and rattlesnake musk, all of which will be present in an area where rattlesnakes are taken for roundups.

The existence of rattlesnake roundups has created a profound human intrusion into the remaining fragments of suitable habitat. The systematic removal of many individuals from an area (section 2.1), the use of gasoline and other chemicals to force animals from their shelter (section 2.2), the excavation of holes and rock outcrops, and the mere increased presence of humans associated with roundups may all contribute, ultimately, to habitat degradation and localized extirpation of rattlesnakes.

Section 3.1 Public Health Concerns - Increased Risk of Bites

"...and you will strike his heel."
Genesis 3.15

"...a self-professed teacher of safety, he has been bitten 42 times..."
Weir 1992, referring to a Sweetwater Jaycee's showman.

Proponents of rattlesnake roundups frequently defend their actions as means of reducing the incidence of snakebite. Their logic is that fewer snakes will lead to fewer bites. There is not, however, any indication that rattlesnake roundups reduce the number of snakebites to humans (Lawler 1988). In fact, rattlesnake roundups may increase the number of snakebites. Approximately two thirds of all reported snakebites are considered "non-accidental", the victims were either handling a venomous snake or otherwise knowingly placing themselves in the immediate proximity of a venomous snake (Wingert and Chan 1988; Curry et al. 1989).

In addition to increasing the risk of snakebite by default (i.e., by holding the event in the first place), roundup sponsors actually encourage high-risk activities such as collecting by hand, sacking contests, and lifting contests. Fitch and Pisani (1988) observed two people bitten as they participated in a "sacking contest" at a Waurika, Oklahoma roundup. A Texas snake handler was bitten on the lip while kissing a rattlesnake (Lueck 1975). In a similar incident, a 43 year old man spent several days in intensive care after suffering five rattlesnake bites, including several to his tongue and lip. The bites occurred as he was biting the head off of the snake because "it bit me first" (N.C.S. News 1993). Such activities unquestionably run counter to the mission of reducing snakebites.

The severity of envenomation appears to be related to the level of arousal of the biting animal. Handling or otherwise antagonizing an animal produces more aggressive biting behavior, resulting in deeper fang penetration and the injection of more venom. Non-accidental bites thus tend to be more severe than accidental bites (Dart et al. 1992). Examination of the seasonal distribution of permanent disability following pit viper envenomation shows the highest frequency (50%) during the months of January, February, and November, and the lowest frequency (10-20%) in April through October. This is of particular interest because bites sustained in January, February, and November are undoubtedly non-accidental due to the seasonal inactivity of the snakes. In addition, those people who handle venomous snakes risk envenomation to the upper extremities, trunk, and head (see examples above). These areas are more likely to suffer permanent disfigurement and dysfunction than are the lower extremities typically affected in accidental cases. Venom lethality and biting aggressiveness seem to peak during the summer (roundup) months (Gregory-Dwyer, et al. 1986). It may be non-accidental bites occurring in the summer that are most serious (Dart, et al. 1992).

Death following pit viper envenomation occurs in 10-25% of patients when appropriate medical care is not available (Dart et al. 1992). With appropriate medical treatment, mortality is typically less than 1%. Unfortunately, the medical profession is sometimes little educated in the treatment of snakebites, and there are many inappropriate treatments available (Lichtenhan 1993). In addition, many hospital emergency departments, hospital supply departments, pharmacies, and cities do not have available the quantity of antivenin necessary to treat severe envenomation (Snyder and Knowles 1988). Furthermore, many reported deaths may have been due to

inappropriate treatment of bites rather than to direct action of the venom itself (Smith 1982). In spite of the fact that medical treatment is often less than adequate, roundups continue to be centers of daredevil antics and foolhardy bravado. At least two deaths can be attributed to bites sustained during roundup activities (Williams 1990; Dart et al. 1992). Death, however, is not the only serious consequence of snakebite. Permanent effects of pit viper envenomation include, but are not limited to, the loss of part or all of the bitten extremity, contractures, joint stiffness, partial blindness, tetanus, and acute renal failure (Dart et al. 1992). In addition, a victim of serious snakebite can expect medical costs of, on average, $15,000. This should be of particular concern to those small communities struggling to save their failing economies. Sponsoring organizations, hometown businesses, and individuals are at risk of litigation.

Perhaps the most discomforting aspect of rattlesnake roundups from a public safety perspective is that many such events are advertised as family entertainment. The Sharon Springs, Kansas, rattlesnake roundup advertises "children's displays", and invites the public to "bring the whole family". The Fangs and Rattlers group from Granbury, Texas, advertises their carnival-like show as "family oriented". Their advertised "safety talks" consist of walking barefoot among rattlesnakes, displaying snakes fangs, allowing children to pet rattlesnakes that are coiled and pressed between two hands, and placing a person in a sleeping bag with about twenty rattlesnakes and then kicking, stomping, and shaking the sleeping bag while cracking well-rehearsed jokes (Reiserer and Reber 1992). Children learn to idolize those who display reckless machismo with regard to rattlesnakes. Inevitably some children will try such things themselves. The death or disfigurement of a child is a steep price to pay for a weekend of "family entertainment".

The severity of a snakebite is related to the amount of venom received relative to the size of the victim. Bites to children are therefore typically more severe than those to adults. Children may require up to five times as much antivenin as an adult (Klauber 1972), increasing the risk of serum-related complications as well as making the treatment much more costly.

Notwithstanding the proponents' claims of decreased incidence of snakebite, rattlesnake roundups cause snakebites, and these bites are often more severe than those that occur accidentally. Children may be placed at increased risk as they are taught to idolize those who engage in reckless tricks and antics with live rattlesnakes.

Section 3.2 Public Health Concerns - Gasoline Usage

The hazards of intentionally spraying gasoline into the ground are not limited only to wildlife. People and livestock are also placed at risk by this tactic. According to Paul Belt, supervisor of the Hazardous Spills Division of the Kansas Department of Health and Environment, purposeful dumping of gasoline is illegal in Kansas (KAR 65-71-D, KAR 28-48-1, KAR 28-48-2) because of the potential groundwater pollution and increased risk of fire or explosion (Belt, pers. comm.).

Any chemical introduced into the ground will eventually leach into the groundwater. In many rural areas, groundwater is the principal source of drinking water for humans as well as livestock. More directly, people who eat the meat of snakes captured with gasoline may be at even greater risk. Campbell et al. (1992) list some potentially hazardous components of gasoline.

These include aromatic and paraffinic hydrocarbons, which have caused tumors in the liver, skin, and kidneys of laboratory animals; benzene, which has been linked to higher incidence of leukemia in humans; and ethylene dibromide and ethylene dichloride, both of which may cause genetic mutations and tumors. Leaded gasoline also contains tetraethyl lead, which is toxic to the nervous system, blood, blood forming tissues, gastrointestinal tract, liver, pancreas, and kidneys. Gassed snakes may absorb dangerous amounts of one or more of these chemicals (Cox and Meinzer 1991). Consumption of water or meat exposed to gasoline places humans and livestock at considerable risk.

The chances of fire and explosion are greatly increased by gasoline usage. When gasoline is sprayed or dumped into the burrows and tunnels which rattlesnakes inhabit, it is no longer controlled. Therefore, it could travel throughout the tunnel system or the groundwater system. The high degree of overlap in areas hunted during a roundup increases the likelihood that one hunter will drop a cigarette where a previous hunter sprayed gasoline. Gasoline ignited on the ground will cause a fire; gasoline ignited in the confines of an animal burrow will cause an explosion.

Section 3.3 Public Health Concerns-Handling of meat

"Try it, it tastes just like chicken!"

There are numerous laws regarding the butchering and sale of meat. According to Jerry Vornholt of the Kansas Department of Health and Environment, the Bureau of Environmental Health Services, the Food and Drug Division, meat that is sold in Kansas must undergo rigorous inspection prior to sale. The butchering process, including the butchering facility, and the composition and nature of the meat itself must be approved by the Kansas Department of Health and Environment (KS. Public Health Law 65, Article 6a). If it is suspected that meat is tainted by gasoline, or any other substance such as ammonia, it must be tested in a laboratory prior to sale (Jerry Vornholt pers. comm.). Sale of such "adulterated" meat for human consumption is a felony offense (65-6a40). In essence, the meat at the Sharon Springs rattlesnake roundup is from an unapproved source, and therefore is illegal to sell for human consumption. Other states undoubtedly have similar laws.

Additionally, the discovery of the presence of Salmonella in snakes calls for increased concern over the handling and consumption of rattlesnake meat. The bacteria have been found on both living and non-living parts of snakes and, salmonellae have been found in wild populations of *Crotalus viridis* (Grier, et al. 1993). Salmonellosis has been, in the past, a significant enough public health issue to change laws regarding the sale of turtles in pet stores and even the cooking of eggs in restaurants. The public, in general, has been advised to use extreme caution in handling meats such as poultry. Thus, it is conceivable that the Kansas Department of Health and Environment would also have grave concerns about the sale of meat which potentially harbors the Salmonella bacteria.

Section 3.4 Public Health Concerns-Potential Spread of Rodent-Borne Diseases.

Rattlesnakes feed almost exclusively on rodents. It is estimated that the annual take of rattlesnakes in the United States tops 500,000 (Warwick et al. 1991). An individual rattlesnake will eat, on average, 15 to 20 rodents per year (Klauber 1972). In effect, each year rattlesnake roundups allow ten million rodents to survive and reproduce.

There has been some concern that drastic, localized reduction in rattlesnake populations, and the subsequent rise in rodent populations, may increase the incidence of rodent-vectored diseases, specifically, the rodent-vectored hantavirus (Toplikar 1994). There is currently no evidence to support or refute this claim. In Kansas, both rattlesnake roundups and hantavirus are relatively new developments. To date, there have been two rattlesnake roundups and two fatalities from hantavirus. It may be worthwhile to monitor the future incidence and geographic distribution of hantavirus in relation to that of rattlesnake roundups.

Section 4. Cruel and Inhumane Treatment

"...he will strike your head,..."
Genesis 3.15

Rattlesnake roundups are often condemned on the grounds that they are cruel to the animals. In turn, some roundup proponents claim that scientists are cruel to snakes by cooling them in ice water prior to examining them, by force-feeding them, by placing them on long-term public display, and by sacrificing them to museum collections. It is important to distinguish the stress and discomfort inflicted on animals for the greater good of education and scientific discovery from the pain and suffering inflicted for amusement purposes. Essentially, scientific research is justifiable, sadistic cruelty is not. Although what may constitute sadistic cruelty is largely subjective, certain aspects of many roundups are inarguably such.

A nearly ubiquitous practice at roundups is the stockpiling of snakes for several weeks prior to the actual event in order to maximize the number of snakes on public display. Sponsors assume that more snakes will attract more people and thus generate more income. However, research on Texas rattlesnake roundups indicates that there is no correlation between the number of snakes taken and public attendance (Adams et al, 1991). Nevertheless, animals are crowded into crates and kept without food or water until the crates are opened on roundup weekend. In some cases, the enclosed snakes are found dead and in advanced stages of decay. Death of boxed snakes may be due to suffocation beneath the accumulated mass of snakes, fatal capture-related injuries, or envenomation by other snakes (Fitch and Pisani 1988). This type of cruelty occurs largely out of ignorance. When questioned about why captive snakes were not fed or watered, an Oklahoma snake handler stated that rattlesnakes only eat once per year and that they obtain moisture from the air with their tongues (Clarke 1978), when in fact the animals may feed 20 times per year, and drink the equivalent of their own body weight in liquid water per year (Klauber, 1972). The people who "care" for the snakes simply do not understand the requirements of animals in their care, and the animals suffer as a result. Other types of mistreatment are more overt and deliberate.

Snake handlers at various roundups have been observed breaking the fangs out of live snakes; using excessive force to stretch prize-winning snakes during measurement (Wille 1976); burning snakes with cigarettes; funneling snakes full of liquor; cutting the rattles off of live snakes; using a golf club to "putt" coiled snakes; and juggling live snakes, allowing them to drop to the floor (Clarke 1978). In general, care and caution are ignored in a vulgar display of machismo, resulting in unnecessary rough treatment of the animals. Snake handlers in Waurika, Oklahoma, routinely sew shut the mouths of several snakes to be used as props. The process is done with the animals fully conscious and is undoubtedly a painful and traumatic experience for the snake (Fitch and Pisani 1988). Lawler (1988) observed a device consisting of a sharpened barb pointing outward and welded into the crook of a standard snake hook. The only possible purpose of such an instrument is to deliberately puncture the snakes handled with it. At the conclusion of a roundup in Texas, all remaining snakes were thrown into a pile, doused with gasoline, and burned alive (Lueck 1975).

Many roundup participants view the roundups as an insidious revenge on the rattlesnake. Numerous individuals become agitated and even hostile at the suggestion of some consideration for the snakes. Promoters at a Whigham, Georgia, roundup even expressed surprise at concern for a gopher tortoise whose shell had been crushed by careless excavation (Lawler 1988). A public address announcer at a Sharon Springs, Kansas, roundup reminded the public that these are the biblical serpents, cursed throughout the ages (Edds 1992).

One particular concern with regard to the mistreatment of animals is that many roundup events are advertised as family entertainment. Children who attend roundups are taught that wildlife is there for humans to use and abuse as they see fit. Children (especially boys as they watch the "tough guys" juggle snakes and burn snakes with cigarettes) are taught that "real men" can prove their masculinity by abusing, and thus "conquering", animals many perceive as dangerous. In Sharon Springs, Kansas, children were invited to participate (for a small fee of course) in the torment of rattlesnakes via "balloon fishing" (Reiserer and Reber 1992). Not only did young children antagonize the animals by waving inflated balloons over the snake's heads, but the attendant stomped directly and repeatedly at the animals in an effort to elicit a strike.

One goal of the Kansas Herpetological Society is to encourage conservation of the world's wildlife by instilling an appreciation and understanding of the natural world in our children. This goal is shared by other organizations, zoos, museums, and wildlife agencies around the world. The insensate nature of rattlesnake roundups seriously undermines our success in reaching these goals.

Section 5. Promotion of negative attitudes towards snakes

"...cursed are you among all animals..."
Genesis 3.14

Perhaps the most profound negative effect of rattlesnake roundups is that they promote attitudes toward wildlife that encourage its over-exploitation and destruction. The roundups typically show a blatant disregard for sound wildlife management practices and hunter ethics. In addition, the cruel treatment of snakes for entertainment purposes reinforces the archaic and inane idea

that snakes are "bad" animals and deserve to be treated inhumanely. Furthermore, roundup promoters and showmen are often deliberately fraudulent in an attempt to generate animosity toward rattlesnakes and to justify their own actions.

The original intent of the first roundups was to exterminate rattlesnakes. "In 1958, a group of ranchers got together to rid the area of rattlesnakes....Thus was born the rattlesnake roundup." (Sweetwater Jaycees, 1990). This hardly constitutes sound wildlife management. Roundups continue to encourage overharvest of snakes, regardless of any laws prohibiting such. In April of 1991, a Moscow, Kansas, man was cited by Kansas Department of Wildlife & Parks officials for possession of 86 prairie rattlesnakes. The man said he planned to take the snakes to Oklahoma to sell at a roundup. At the time the possession limit for prairie rattlesnakes in Kansas was five, and commercial harvest was illegal (Shoup 1991).

As with the large numbers taken, the methods of take also run counter to the ethics of sport hunting. Chief among such methods is the practice of gassing. Weir (1992) had the following comments with regard to gassing and hunter ethics: "Spraying snakes while they are sleeping in their dens is not sport; it is slaughter by chemical extermination. An analogous form of deer hunting would be to fence the woods, leaving only a narrow opening at one end, and then burn the forest, shooting the deer and other animals as they run through the gate. Such methods are hardly sport." As long as irresponsible "hunting" persists, people will continue to believe that snakes are not a resource worth conserving.

In addition to subverting concern for sustainable harvest and ethical hunting, roundups also send the distinct message that snakes are "bad" and are not worthy of such concern. In fact, teasing, prodding, kicking, and even throwing are the norm for the way these animals are treated at roundups. Public perception of a species is primary to responsibly managing that species. As long as abusive treatment persists, people will continue to believe that snakes are not worthy of anything more. Ultimately, the public is led to believe that snakes somehow deserve to be abused and exterminated.

Many roundup promoters and showmen deliberately attempt to turn the public against rattlesnakes through their gross exaggerations of the threat the snakes pose to human interests. Foremost on the list are the exaggerations of the risk of being bitten. Judie Withers, Co-Chair of the Wallace County (Kansas) Rattlesnake Roundup Committee, stated that the people of Wallace County "generally live in fear of the prairie rattlesnake." (Withers 1992). Perhaps residents do live in fear, but such fear is certainly unjustified. Contact with hospitals in northwest Kansas revealed the following with regard to the incidence of snakebites: "haven't seen any for a long time" (Northwest Kansas Medical Center, Goodland, Kansas); "maybe one in five years, never anything very severe" (Greeley County Hospital, Tribune, Kansas); "none in five years or more" (Citizens Medical Center, Colby, Kansas); "none in a long time" (Colby Family Health Clinic, Colby, Kansas); "not any, really" (Wichita County Hospital, Leoti, Kansas); "one in early fall, 1992" (Cheyenne County Hospital, Cheyenne, Kansas. Apparently this man received some medical treatment one week following the bite. It is interesting that the first Wallace County Rattlesnake Roundup was held September 4-6, 1992). It is clear that the testimony of Ms. Withers is unreliable, no doubt owing to her vested interest in the continued abuse of local wildlife. Ms. Withers also stated that a large rattlesnake was killed on a local grade school playground. Contact with that school revealed that a total of four rattlesnakes were found near the school, one of which was on the road, two were run over with lawnmowers, and none of

which were found on the playground. Apparently all four of these animals were found in September and October of 1992, shortly after a total of 75 (Edds 1992) prairie rattlesnakes were brought, in association with a rattlesnake roundup, from the surrounding ranches into the more populated areas of Wallace County. Others associated with the Wallace County roundup are equally misleading, deliberately exaggerating the threat posed by snakes. In September of 1992, snakeskin dealer John Shaddix warned spectators that a cottonmouth would crawl into a boat and attack the occupants (Reiserer and Reber 1992). At the same event, public address announcer Barry Walker proclaimed that the purpose of the rattlesnake roundup was the extermination of these vermin as he warned of the danger to humans and livestock in western Kansas (Edds 1992).

Roundup proponents often cite loss of livestock to snakebite as rationale for large-scale extermination of rattlesnakes (Sweetwater Jaycees 1990; Grund 1992; Edds 1992; Reiserer and Reber 1992). Such claims are unsubstantiated by evidence. Rattlesnakes rarely bite livestock, and, when they occur, bites to livestock are seldom fatal. Klauber (1972) reported a study of *C. viridis* bites to livestock undertaken from 1936-1948, when the snake populations were probably larger than they are now, at the San Joaquin Experimental Range in Madera County California. The annual snakebite frequency in a herd of 190 cattle on 4600 acres was 1.4% of the herd, with a mortality rate of 0.22%. Recovery was rapid and complete in most cases, even those involving calves. Klauber also polled 134 Texas County Agricultural Agents and found that none of them considered damage to livestock from snakebites a serious problem. One Kansas livestock veterinarian stated that using livestock loss as justification for roundups was "pretty lame" (pers. comm. 1993).

It is important to consider that the purpose of rattlesnake venom is to kill prey, consisting mainly of small mammals, quickly. The usual prey of rattlesnakes, typically two pounds or less body weight, succumbs quickly to the amount and potency of venom injected in a single bite. Humans, generally weighing from 100-200 pounds, normally survive bites from rattlesnakes. It is questionable whether an average rattlesnake is even capable of killing a 2000 pound cow or horse.

As a conservation organization, the Kansas Herpetological Society takes great effort to shape a realistic and appropriate public perception of snakes. Generation of unnecessary hysteria on the part of roundup sponsors and showmen, whether incidental or deliberate, serves only to promote negative attitudes toward snakes.

Section 6.0. Commercialization

"At the bottom of the fetid, smoldering ashes of the 1993 legislative session is an odorous blob of ooze called Senate Bill 137."
Steve Harper, Wichita Eagle Beacon, June 13, 1993.

Laws such as the Endangered Species Act (1973) were established to protect dwindling wildlife from business ventures interested in as large a take as possible in as minute an amount of time possible, in essence, industrialized hunting. The foresight of these legislators is commendable. Unfortunately, it was not before numerous animal species had been hunted to the verge of

extinction that such laws were enacted. It is critical to acknowledge the keen difference between the weekend sportsman and the stockpiler of animals and their parts for the purpose of trade. A hunter takes an active interest in the functioning of the natural world, fascinated by its intricacies yet respectful of his place. A commercial "hunter" sees nothing but the money at the end of the process. He thinks of an endless stream of wants and desires that the current marketplace accommodates. The thrill of the hunt is merely the pleasure of making another quick buck; sport is eliminated. The term "harvest" is inapplicable here because one can only "harvest" with advanced planning based on a detailed understanding of the "crop". "Harvest" also implies a plan for sustained yield. Little to nothing is known about the population dynamics of *Crotalus viridis* in the face of intense commercial pressure. Thus, commercial "hunters" and stockpilers are merely taking blindly from the wild, they are not harvesting.

The commercialization of *Crotalus viridis* in Kansas is likely to lead to larger takes than previously occurred. The practice of killing rattlesnakes on sight which, some claim, the roundup has reduced, involved only locals and chance encounters with snakes. It did not involve and influx of people and active searching for snakes. The financial incentive to overharvest is real as a prairie rattlesnake can bring in $35 to $70 by the time the parts are all dispersed to dealers (Peterson 1993). This only adds to the difficulty of enforcing laws designed to promote sustainable take. Furthermore, as the market expands, pressure will be put on legislators to allow the industrialization of the taking of other species. As more big business-ventures step into the arena, laws which currently protect other native Kansas amphibians and reptiles will be legislated moot.

Kansas Senate Bill 137 is clearly in the European tradition of mass marketing any and all natural attributes deemed resources. The bill provided for the commercial take and trade of a species for which the effects of such a take are not currently known. The bill also set a terrible precedent for the commercialization of other species in the future. Since the legislators who voted this law into effect were not foresighted enough to realize that they did not have any background that would warrant them making decisions as such, we, the public, are left to deal with the ensuing mishaps that are bound to follow. (It is unfortunate commentary to be compelled to write that law makers are often called upon by their constituents to make unfounded provisions without the advice of scholars specializing in the issue.) In the interest of preserving both the species and the integrity of "the hunt", those responsible for the logistical details of KSB 137 must carefully consider the fate of the Bald Eagle, the American Alligator, and the Gray Wolf (and numerous other species), and the tremendously costly efforts that have had to be expended by government agencies in order to remedy the detrimental effects of long-standing policies that promoted the overharvest of animals.

Section 7. Issues of enforcement

"Everybody uses gas, we make like we don't, but we do."
J. P. Jones, founder, Opp Rattlesnake Rodeo

Regulations pertaining to the take of snakes often go unenforced. Lack of enforcement may be due to lack of enough enforcement officers or officers with appropriate training, prejudice against snakes on the part of enforcement officers, or blatant pandering to the whims of those wishing to take rattlesnakes.

Lack of sufficient manpower to enforce laws becomes a significant problem when hundreds or in some cases thousands of roundup participants are collecting snakes over an area often encompassing several counties. Capt. Wayne Chappell of the Texas Parks & Wildlife Department stated, with regard to the illegal take of reptiles, "We stop what we can, but with 444 game wardens for the entire state, we get spread a little thin." Ken McCloud of the U.S. Fish and Wildlife Service estimated that the best efforts of state and federal law enforcement stop only five percent of the illegal trade of reptiles (Frazer 1990). Brown (1993) indicated that poaching of timber rattlesnakes is rampant in Pennsylvania, and that the licensing and reporting procedures are a failure due to lack of enforcement. Release of animals does not in practice occur as recommended.

Lack of officers with appropriate training is also a major problem. Most, if not all, officers lack appropriate training to measure venomous animals safely, and therefore are not expected to do so. Minimum size limits cannot be enforced. Many officers also lack sufficient knowledge to accurately identify non-rattlesnake species, and are largely ignorant of the laws pertaining to these species. At a Sharon Springs, Kansas, roundup, several participants collected Western Hognose Snakes (*Heterodon nasicus*), a species listed by the Kansas Department of Wildlife & Parks as in need of conservation and protected by state law (KAR 115-15-2). No citations were issued for these violations in spite of the fact that 20 conservation officers were on duty in the area, in addition to several members of the Wallace County Sheriff's Department (D. Reber pers. obs.).

Prejudice against snakes in general and rattlesnakes in particular on the part of law enforcement officers is also a problem. In 1992, a timber rattlesnake (*Crotalus horridus*) was killed by a state park visitor in northeast Kansas (D. Reber pers. obs.). Two Kansas Department of Wildlife & Parks law enforcement officers openly refused to pursue the issue in spite of the fact that there was no question as to who had killed the animal. These officers acknowledged that the timber rattlesnake was listed as a species in need of conservation in Kansas and was therefore protected by state law (KAR 115-15-2), and that hunting was explicitly prohibited in the state park. Furthermore, these officers stated that they too killed any snake on sight in the park because "the people don't want them around, and we're gonna get them outta there." One officer even went so far as to brag about a shovel he carried in his truck specifically for that purpose. Ironically, this particular officer was assigned to monitor the roundup in Sharon Springs only two months later. Prejudice against snakes runs deep, even among those we would expect to be more enlightened. For this reason, we may rightly derive little comfort from local "monitoring" of roundup events.

Perhaps the worst aspect of the enforcement of laws pertaining to snakes is that some state wildlife agencies pander to the whims of roundup sponsors and participants. In Oklahoma, any person wishing to take snakes must have a valid Oklahoma hunting license, unless the take is being done in association with a roundup (Wille 1976). There is no logical reason, from the standpoint of wildlife management, for roundup participants to have an exemption from buying a hunting license. There is a law by the Texas Water Commission prohibiting the introduction of deleterious substances into the ground, yet the Sweetwater Jaycees include a "pressurized spray can (approximately three (3) gallon size with 10'x1/4" copper tubing extension on hose)," as recommended equipment for the "hunt" (Weir 1992). In Kansas, the organizers of the Sharon Springs rattlesnake roundup "misread" the laws pertaining to licensing, and assumed that a person with a license from any state would qualify for a lower-priced commercial harvest permit.

They subsequently advertised their 1993 event under those terms. Surprisingly, the Kansas Department of Wildlife & Parks, by the order of KDWP Secretary Theodore Ensley, allowed the roundup to proceed as advertised rather than enforcing the licensing requirements. Such leniency was in direct violation of K.S.A. 1992 Supp. 32-319 and K.S.A 1992 Supp. 32-988 which require hunters of Kansas' wildlife to have a valid Kansas hunting license. The roundup sponsors claimed that the wording of the law was unclear, in spite of the fact that it was written, by their local senator and Senate Majority Leader Sheila Frahm, specifically to accommodate their event. It is intolerable that a wildlife agency would cater to those unable to comprehend written laws.

Section 8.0. Recommendations

The Kansas Herpetological Society has repeatedly sent representatives to speak at Kansas Department of Wildlife and Parks Commission meetings, sent letters of concern to KDWP Commissioners, and have made attempts to work independently with those involved with the planning of the Sharon Springs (Kansas) Rattlesnake Roundup. We have advocated moderation at every step in the process, by opposing Kansas Senate Bill 137 due to its obvious aim at denying the inherent biology of the species for the sake of a few quick bucks, and by encouraging lawmakers to pursue research in the population biology of *Crotalus viridis*. (This is very different from the information obtained by Dr. Henry Fitch at the roundup. Furthermore, the overall findings of Dr. Fitch at the Sharon Springs Rattlesnake Roundup are useful only if they are interpreted and considered by lawmakers .) As concerned citizens, we have merely asked that lawmakers consult with specialists in herpetology (the study of amphibian and reptiles) and population biology. For these reasons and for the sake of completion, KHS has conducted the only type of scientific research possible in a brief period of time (a year and a half) a review of all available scientific literature pertaining to the issue. We emphatically challenge KDWP to conduct its own field research in an effort to make responsible decisions regarding the harvest, not just the taking, of this species. As a conservation organization, we find the mass slaughter of any animal for amusement and financial purposes to be unproductive and counter to all environmental legislation in the past twenty years. (It is apparently impossible for humans to collectively learn from past incidents such as the slaughter of millions of Bison and Passenger Pigeons.) However, in support of true sport hunting, we offer the following guidelines, based on available information as discussed previously, that are aimed at promoting sportsmanship a sustainable yield of *Crotalus viridis*.

With regard to commercialization:

> We ask that Kansas all amphibians and reptiles be protected from commercialization. Thus, the snakes are hunted for the sake of "the hunt" as opposed to hunting for commercial profit. (See Section 6.0)

With regard to possession limits and the area and duration of the hunt:

> We ask that the bag limit be reset at five snakes per day. There is no evidence that more animals could be found in one day. In fact, at the last two roundups, the average take per hunter was fewer than two snakes per day (Fitch, 1993). Thus, the only motive for seeking a higher number is to allow for lawful stockpiling.

We ask that KDWP establish and strictly enforce laws that are aimed at the prevention of snake "stockpiling". Senate Bill 137 established a possession limit of 30 animals. Allowing a possession limit that is fifteen times higher than the average daily take per hunter is unacceptable. Doing so serves only to promote stockpiling.

We ask that the area of the hunt be restricted to Wallace County and those counties which are immediately adjacent. This makes law enforcement more feasible and also safeguards against stockpiling. Fitch (1993) indicated that nearly 40% of the animals stockpiled prior to the 1993 roundup were from distances of 90-225 miles from Sharon Springs.

We ask that the duration of the "special event" be defined as only those days that the roundup is officially taking place. There is no logical reason to extend the taking period, and doing so will only promote stockpiling.

With regard to size limits:

We ask that size limits be more in line with age (and correlatively size) of reproduction. More than 50% of the snakes taken at the 1993 Sharon Springs roundup were three years of age or younger (Fitch, 1993), and were thus likely below reproductive age. The largest of the three year age class were approximately thirty inches in length. We feel that 24 inches is a reasonable minimum size limit. We also suggest a maximum size limit of 40 inches to protect the large females that contribute most substantially to the population.

We ask that size limits be made meaningful by prohibiting the possession of animals outside the legal limit, and specifying snout-to-vent (excluding tail and rattle) as the length measured. Current regulations allow the possession of animals below the minimum size provided the animals are released at a later time. This system has proven to be a complete failure in other states (Section 6.3). The standard scientific procedure for measuring snakes is to measure the snout-to-vent length. This method eliminates bias resulting from sex-related differences in relative tail length and tail loss due to injury. All available life history information is based on snout-to-vent measurements, thus it is important that the laws recognize this as the accepted measure of size.

With regard to public safety:

We ask that "hand" not be a legal method of take. Rattlesnake bite is a serious risk associated with rattlesnake roundups (section 3.1). Kansas has a superior record of promoting safe hunting through hunter education programs, and it would be unfortunate to backslide by allowing unnecessary risk-taking while hunting rattlesnakes. We ask that taking by hand and all other manual handling of rattlesnakes (other than that associated with enforcement and research efforts) be prohibited.

We ask that daredevil antics be prohibited. Carnival-like daredevil shows serve only to promote reckless behavior, cause snakebite injuries, and generate unnecessary hysteria about rattlesnakes. Such antics have no place in true sport hunting.

Literature Cited

Adams, Clark E., Kelly J. Stmadel, Stephen L. Jester, and John K. Thomas. 1991. Texas Rattlesnake Roundups. Unpublished report to Texas Parks and Wildlife Department, 74p.

Ashton, Ray E., et al. 1976. Endangered and Threatened Amphibians and Reptiles in the United States. SSAR Herpetological Circular No. 5. Stephen R. Edwards and George R. Pisani, eds.

Brown, William S. 1993. Biology, Status, and Management of the timber rattlesnake (*Crotalus horridus*): A guide for conservation. SSAR Herpetological Circular No. 22.

Campbell, Jonathan A., Daniel R. Foramanowicz, Jr., and Edmund D. Brodie, Jr. 1989. Potential impacts of rattlesnake roundups on natural populations. The Texas Journal of Science, Vol. 41 No. 3, 1989.

Clarke, Victoria S. 1978. A report on rattlesnake roundups in Oklahoma and other parts of the United States. Bull. Oklahoma Herpetological Society, Vol. 2, No. 4.

Collins, Joseph T. 1993. Amphibians and Reptiles in Kansas, 3rd Ed. University Press of Kansas.

Conant, Roger and Joseph T. Collins. 1991. A Field Guide to Reptiles and Amphibians: Eastern /Central North America. Houghton Mifflin Company, Boston, Massachusetts.

Cox, J., and W. Meinzer. 1991. Reptilian Rodeos. Texas Parks & Wildlife, March, 1991.

Curry, S. C., D. Horndung, P. Brady, R. Requa, D. B. Kunkel, and M. V. Vance. 1989. The legitimacy of rattlesnake bites in central Arizona. Arizona Ann. Emerg. Med. 18:658-663.

Dart, Richard C., Jude T. McNally, Daniel W. Spaite, and Richard Gustafson. 1992. The sequelae of pit viper poisoning in the United States. IN Biology of the Pitvipers, Jonathan A. Campbell and Edmund D. Brodie, Jr., Eds. Selva Press, Tyler, TX.

Edds, David. 1992. Observations on the 1992 Sharon Springs Rattlesnake Roundup. Kansas Herpetological Society Newsletter, No. 90, November, 1992.

Fitch, H. S. 1993. Unpublished report to Kansas Department of Wildlife & Parks on the Sharon Springs rattlesnake roundup, May 1993.

Fitch, H. S., and G. Pisani. 1988. Report to Oklahoma Department of Wildlife Conservation on the 1988 Rattlesnake Roundups.

Frazer, Lance. 1990. Lethal Trade: Illegal collecting jeopardizes reptiles. Outdoor Ethics, Vol. 9, No. 1.

Gregory-Dwyer, V. M., N. B. Egen, A. Bianchi Bosisio, P. G. Righetti, and F. E. Russell. 1986. An isoelectric focusing study of seasonal variation in rattlesnake venom proteins. Toxicon, 24:995-1000.

Grier, James W., Marty S. Bjerke, and Lisa K. Nolan. 1993. Snakes and the *Salmonella* situation. Bull. Chicago Herp. Soc., 28(3):53-59.

Grund, Jerry. 1992. Untitled letter to Dr. Dwight Platt, President, Kansas Herpetological Society. Kansas Herpetological Society Newsletter, No. 90, November, 1992.

Henson, Jim. 1993. "A Snake Hunter and Proud Of It!". N.C.S. News: A Quarterly Publication of the National *Crotalus* Society. Vol. 1, Iss. 3.

Klauber, Laurence M. 1972. Rattlesnakes: Their Habits, Life Histories, and Influence on Mankind. 2 Vol. University of California Press, Berkeley, CA.

Lawler, Howard E. 1988. Rattlesnake Roundups in Georgia: An Environmental Travesty. The Collected Papers of the Tucson Herpetological Society, 1988-1991. David L. Hardy, Sr., ed.

Lichtenhan, Brad, M.D. 1993. 20th annual meeting of the Kansas Herpetological Society (Abstracts). Nov. 6-7, 1993. Emporia State University.

Lueck, Brigitte. 1975. Rattlesnake roundups: inhumane and dangerous. The National Humane Review, November, 1975.

Martin, Dennis J. 1973. A spectrographic analysis of burrowing owl vocalizations. Auk., 90:564-578.

Martin, W. H., W. H. Smith, S. H. Hartwig, R. O. Magram, and R. Stechert. (1990). Distribution and status of the timber rattlesnake (*Crotalus horridus*) in Pennsylvania. Unpubl. Rep. to Carnegie Mus. Nat. Hist. and Pennsylvania Fish Comm. 29 pp.

N.C.S. News. 1993. Man Bites Back. N.C.S. News: A Quarterly Publication of the National *Crotalus* Society, Vol. 1, Issue 3.

Parker, William S., and William S. Brown. 1974. Mortality and weight changes of great basin rattlesnakes (*Crotalus viridis*) at a hibernaculum in northern Utah. Herpetologica, 30:234-239.

Peterson, John. 1993. Prairie town hopes snake hunt is road to fame. The Kansas City Star. February 14, 1993.

Reiserer, Randall S., and David L. Reber. 1992. Comments on the Wallace County Rattlesnake Roundup. Kansas Herpetological Society Newsletter, No. 90., Nov. 1992.

Shoup, J. M. 1991. Rattled Poacher. Kansas Wildlife & Parks Magazine. 48(4): 19.

Smith, Robert L. 1982. Venomous Animals of Arizona. Cooperative Extension Service, College of Agriculture, University of Arizona, Tucson.

Smith, W. H., W. H. Martin, S. H. Hartwig, R. Steichert, and R. Magram. 1991. Range and status of the timber rattlesnake in Pennsylvania. SSAR/HL Joint Annual Meeting, Pennsylvania State University. (Abstract).

Snyder, Clifford C., and Robert P. Knowles. 1988. Snakebites: guidelines for practical management. Postgraduate Medicine, 83:6.

Speake, Dan W. and Joseph A. McGlincy. 1980. Response of indigo snakes to gassing of their dens. Proc. Ann. Conf. S.E. Assoc. Fish & Wildlife Agencies. 35:135-138.

Sweetwater Jaycees. 1990. History of the Sweetwater Jaycees. Sweetwater Jaycees, Sweetwater, Texas.

Toplikar, Dave. 1994. Snake kills might aid hantavirus. Lawrence Journal-World, Feb. 27, 1994.

Thompson, Max C., and Charles Ely 1989. Birds in Kansas Vol. 1. University Press of Kansas.

Warwick, Clifford, Catrina Steedman, and Tricia Holford. 1991. Rattlesnake collection drives-their implications for species and environmental conservation. Oryx, Vol. 25, No. 1.

Weir, Jack. 1992. The Sweetwater rattlesnake round-up: a case study in environmental ethics. Conservation Biology, Vol. 6, No. 1.

Wille, Chris. 1976. Rattlesnake roundups. Outdoor Oklahoma, Vol. 32, No. 7.

Williams, Ted. 1990. Driving Out the Dread Serpent. Audubon, Sept. 1990.

Withers, Judie. 1992. Untitled letter to Eric M. Rundquist, Editor, Kansas Herpetological Society. Kansas Herpetological Society Newsletter, No. 90, November, 1992.

Wingert, W. A., and L. Chan. 1988. Rattlesnake bites in southern California and rationale for recommended treatment. West. J. Med. 148:37-44.

Womack, Rick. 1993. "In My Opinion". N.C.S. News: A Quarterly Publication of the National *Crotalus* Society. Vol. 1, Iss. 3.

Last updated on 25 July 1997