
MANAGEMENT OF WILD SHEEP IN NORTH AMERICA

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A workshop was convened at the 2ND North American Wild Sheep Conference to develop guidelines for managing wild sheep in North America. Participants included wild sheep biologists and managers from state, provincial, territorial, tribal, and federal agencies, universities, and research organizations, law-enforcement officers, and members of the public representing organizations that support conservation and management of wild sheep. Much of the experience and knowledge concerning the biology and management of wild sheep in North America was represented.

Working groups for desert bighorn, Rocky Mountain bighorn, California bighorn, and thornhorn sheep developed separate recommendations. These were discussed by the entire workshop and recorded for developing guidelines. Management topics were not wholly prioritized because the most critical management needs will vary among locations and times. Some literature citations have been added to increase utility of the guidelines. However, this is far from a complete review of the literature on wild sheep management. Previous useful literature reviews and management guidelines are found in: Bureau of Land Management (1995a), Trefethen (1975), Monson and Sumner (1980), Wilson et al. (1980), Van Dyke et al. (1983), Krausman et al. (1984), McCarty and Bailey (1994), Bureau of Land Management (1995b) and Valdez and Krausman (1999).

This list of guidelines is long and ambitious. It will tax the resources of many management agencies and organizations. However, it is the goal we must strive to achieve if we are to maintain the benefits of North American wild sheep for ourselves and future generations.

MANAGING WILD SHEEP ENVIRONMENTS

We may be certain that, if civilization continues its attrition of the remaining tracts of primitive country, all of our scientific knowledge and its specialized techniques may come to nothing. Not only the bighorn's existence, but much of his intrinsic value to man as well, depends upon the preservation of his habitat. It is more than likely that a hunter's memory of his stately ram is at least equaled by remembrances of mountain peaks, glittering lakes and green, untrampled meadows. (Smith 1954:104-105).

Habitat Loss and Fragmentation

1. Establish, restore, maintain and protect complete wild sheep ranges, including seasonal ranges and movement corridors for populations and metapopulations.
2. Protect all pristine wild sheep environments where they persist.
3. Provide buffer zones and seasonal activity restrictions to mitigate impacts of oil and gas developments, mining, other industrial activities, and tourism-related impacts upon wild sheep ranges. Promote zoning regulations to minimize subdivision expansion into important foothill and canyon wild sheep habitats.

Habitat Management and Acquisition

1. Where necessary, use easements, land exchanges and acquisitions to establish, restore and protect complete year-round ranges, including movement corridors, for wild sheep populations.
2. Habitat analysis should precede habitat management for wild sheep so that management is directed at limiting factors within sheep ranges, including movement corridors. Limiting factors may differ between ram ranges and ewe-juvenile ranges, and among years with differing weather. Access to a diversity of forage resources and foraging sites with different elevations, aspects and forage types will provide the most stable, year-round nutrition for wild sheep. Management efforts should include evaluation of the effectiveness of habitat manipulation in achieving stated goals for sheep populations and distributions.
3. In many areas, wild sheep habitats are being lost due to encroachment by trees and tall shrubs that restrict visibility (Risenhoover et al. 1988). Managers should be aggressive in developing site-specific prescriptions for treating deteriorated habitats with fire, chemical, or mechanical means (Greenwood et al. 1999, Smith et al. 1999). Repeated treatments of large areas may be necessary. Landscape-level habitat manipulation should be addressed, to avoid small, "patch" treatments that may artificially and adversely concentrate wild sheep. However, caution is advised where California bighorn use open shrub habitats, and pristine thinhorn sheep ranges probably do not require vegetation manipulation.
4. Within wild sheep ranges, reseed disturbed areas with native grasses, forbs and shrubs known to be valuable to local sheep populations.
5. Control introduction of exotic plants on wild sheep ranges by requiring use of certified hay. Educate off-road vehicle users about their potential to inadvertently transport exotic weeds on vehicle undercarriages. Seek to control established exotic plants with chemical, mechanical or biological methods.
6. Where bighorn sheep use natural or artificial waters, restrict access to those waters by livestock and feral burros. Artificial waters should be placed in secure habitats with escape terrain and good visibility. Remove visibility-obstructing vegetation surrounding water sources.
7. Follow Bureau of Land Management fencing guidelines (BLM Manual Handbook H-1741-1-Fencing, Release 1-1572, 12/6/89) on wild sheep ranges and in movement corridors. Remove or modify net wire fences, where possible, in sheep ranges.
8. Seek to place highway right-of-way fences as far from roads as possible, so as not to create a barrier that may keep animals on the roadway.

Human Disturbance

1. With public outreach and interagency coordination, including local governments where appropriate, develop site- and herd-specific regulations for eliminating or mitigating impacts of human disturbance on wild sheep. Where necessary, seasonally restrict recreational use of critical wild sheep habitats and movement corridors. Prohibit hiking with dogs in critical habitats. Agencies should enforce their regulations intended to control wildlife harassment.

2. Identify areas where wild sheep may become attracted to human developments or become a nuisance/hazard (e.g., roadside barrow ditches feeding on exotic grasses, golf courses). Develop habitats to attract sheep away from these areas.

Disease Threats and Management

1. Due to the frequent transfer of *Pasteurella* spp. bacteria, domestic sheep allotments in or near the ranges of wild sheep are a serious threat to the health of wild sheep (McCarty and Bailey 1994:15, Martin et al. 1996). These allotments should be eliminated or, if suitable, converted to cattle.
2. Domestic sheep should be kept at least 13.5 km (9 miles) from desert sheep ranges (Desert Bighorn Council, Tech. Staff 1990; BLM Instruction Memorandum No. 98-140). Greater isolation distances, up to 20 km (12.4 miles) (Singer et al. 2000) or more (Schommer and Woolever 2000) are necessary where there are no effective barriers to wild sheep movements. Movement patterns of wild sheep should be determined for any herd in the vicinity of an existing or proposed domestic sheep pasture. Where possible, maintain dense forest cover as a barrier between domestic and wild sheep. Continue education and outreach with the domestic sheep industry and small "farm flock" operators regarding risks to wild sheep associated with domestic sheep. Use an inter-agency approach, involving domestic sheep permittees and Woolgrower Associations, to analyze risks and potential for interaction and to develop site-specific solutions (Schommer and Woolever 2000).
3. Permanently remove any wild sheep that has interacted with domestic sheep.
4. Do not use domestic sheep or goats for exotic weed control in or near wild sheep range.
5. Remove any feral goats from wild sheep ranges. Discourage recreational pack goats. If used, ensure they are closely tended, are tethered or penned at night, and will not contact wild sheep. Pack goats should not have been in recent contact with domestic sheep. In areas where wild sheep are exceptionally tame and prone to approach humans and pack animals, prohibit recreational pack goats.
6. Prevent, and seek legislation to preclude, the introduction of any domestic sheep, goats or cattle into the pristine ranges of thinhorn sheep, or into the ranges of any bighorn sheep populations that may have persisted without previous contact by livestock.
7. Consider the risks of disease transmission in developing strategies for metapopulations. In some cases, the viabilities of two smaller metapopulations will have to be weighed against the risk of epizootic in a larger metapopulation.
8. Use all opportunities to obtain samples for assessing the health status of wild sheep herds. This is especially important prior to transplanting animals. Maintain a database of herd health and disease-exposure for each herd. All cases of sickness or natural death of wild sheep should be presented to a wildlife disease expert or veterinary diagnostic laboratory for accurate diagnosis. Each state, province, and territory should have a protocol for responding to reports of sick wild sheep, including where to obtain veterinary assistance, tests to be performed and subsequent population monitoring.
9. States, provinces, territories, and tribes should share data on disease exposures and health parameters of wild sheep, possibly through the Western Wildlife Health Cooperative.

10. Develop an internet site or other effective, timely communication for disseminating current knowledge of disease outbreaks and science-based management actions.

Competition from Livestock, Exotic and Native Ungulates

1. No exotic ungulates or domestic livestock should be allowed on pristine thornhorn sheep ranges. Exotic ungulates should be discouraged on all other wild sheep ranges.
2. Manage wild horses and burros on wild sheep ranges within established guidelines. Eliminate other exotic ungulates, especially mouflon sheep, where they have no legally mandated presence.
3. Where cattle graze wild sheep ranges, use management strategies to minimize overlap of range use, especially during critical seasons. Cow/calf pairs are preferred to yearlings, which are more prone to use steep terrain. Partition forage resources between cattle and wild sheep using the best available local knowledge, including food habits and spatial and temporal overlap for both ram and female groups of sheep. Allocate sufficient amounts and kinds of forages to wild sheep to maintain a viable herd of healthy animals.
4. Promptly remove trespass livestock from wild sheep ranges. Monitor allotments for conformance to agreed-upon stocking rates and seasons.
5. Wild sheep are generally subordinate to other ungulates at water sources. Where access to water is a limiting factor, provide separate watering access for sheep by fencing out livestock, horses and burros from at least a part of the water source. Otherwise, provide wild sheep waters in such steep terrain that other ungulates cannot access the sites and/or develop other water sources to draw competing ungulates away from waters developed specifically for wild sheep.
6. Oppose game ranching in which exotic ungulates may unintentionally become established on wild sheep ranges. Where game ranches exist, promptly remove any escaping animals. Require game ranches to provide bonds that will assure removal of escapees. Regular monitoring and maintenance of game ranch fences should be required and there should be penalties for inadequate fence maintenance.
7. Discourage vegetation change, from disturbance or succession, that will create or increase competition from other native ungulates on wild sheep ranges.

Predation

The impacts of predation upon wild sheep populations will depend mostly upon (1) the vulnerability of sheep to predation, as determined by the health of sheep and by habitat security factors (escape terrain proximal to foraging areas, and visibility); (2) predator abundance; and (3) the size of the wild sheep population as it determines whether predation rates are density-dependent, or inversely density-dependent (Solomon 1958). In a multiple-prey system, the predator/wild sheep ratio and the proportion of the sheep herd lost annually to predation may increase as the sheep population declines, even to extirpation. Predator-prey relations are often complex and highly dynamic, and therefore vary among times and places.

1. Predator control is a valid management option, especially for small or newly transplanted wild sheep herds. Predator management strategies should be flexible, adapting to local and temporal conditions,

and should be implemented in ways that allow reliable evaluations of their effects upon wild sheep populations.

2. Many wild sheep habitats need management, particularly removal of tall, dense vegetation, to improve visibility and reduce vulnerability of sheep herds to predation. State and provincial wildlife agencies should be more proactive in encouraging and facilitating habitat management, including wild sheep transplant or population augmentation sites.
3. Water sources in wild sheep ranges should be designed and located, or vegetation near waters should be treated, to decrease vulnerability of sheep to predation by providing escape terrain and good visibility.
4. New transplants of wild sheep are especially vulnerable to predation because there are relatively few sheep and they are placed in unfamiliar territory. Transplant sites should be selected to minimize vulnerability to predation. It is desirable to evaluate predator abundance in proposed transplant sites, and to consider if pre-transplant predator control should be implemented.

Wilderness Management

1. Improved state-federal communications on wilderness management is needed. Federal agencies should assign biologists, as well as recreation specialists, to coordinate with state agencies and wild sheep advocacy groups on wilderness issues. Domestic sheep in wilderness areas with potential or occupied bighorn sheep habitat should be eliminated.
2. If wild sheep are to contribute fully to wilderness values, wilderness management plans must recognize and provide for the natural processes expected in wild sheep populations. Where wild sheep occur in wilderness areas, their populations should be designated as primary wilderness components (Bailey and Woolever 1992). Wild sheep should be reintroduced into all suitable, vacant historic ranges within wilderness areas.
3. Some management intervention will often be necessary in order to maintain the wilderness values of wild sheep populations, especially in the preponderant small wilderness areas. These values include seasonal and metapopulation movements that are necessary for population viability and maintenance of genetic resources. Interventions such as ignition of prescribed fires, monitoring of populations, and the capture and movement of animals are justified to retain these values. Reducing conifer encroachment in prime bighorn range inside designated wilderness should be emphasized.
4. Clear policy guidance should be developed for management of habitats and wildlife populations in wilderness areas and wilderness study areas. Policies should be applied consistently among areas and periods.
5. Based on input from state wildlife management agencies, wilderness management plans should identify time windows when management activities for maintaining wild sheep values, including survey flights, will cause minimal impacts to other wilderness uses and wilderness values.

Research Needs

1. The effects of developing artificial water sources upon the distribution, productivity and survival of wild sheep requires further study. Experimental research, with treatment and control groups, is recommended. In hot climates, artificial waters should be tested periodically for the presence of dangerous *Clostridia* bacteria.
2. Studies of predator-wild sheep dynamics, including systems with multiple prey species, are needed. Wild sheep demographics, including lamb survival and recruitment, should be determined at various combinations of predator and prey population sizes. Experiments should be designed to manipulate predator or prey population sizes, and should include both favorable and unfavorable weather periods for wild sheep.
3. Experiments are needed to determine the minimum fence necessary to hold cattle while allowing safe passage for all sex-age classes of wild sheep.
4. Continue research on the infectious diseases and parasites of llamas, domestic goats and cattle, and their threats to wild sheep.
5. A standardized disease and nutrition sampling and testing protocol should be developed for wild sheep, possibly through the Western Wildlife Health Cooperative. Routine collection and sharing of blood and fecal samples may be used to establish baseline values of nutritional and health parameters for each subspecies and species of wild sheep. Baseline values may then be used to assess herd health, trend of ecological density, and success of habitat management.
6. Conduct experimental as well as observational research on the effects of human disturbance upon wild sheep. Demographic as well as behavioral and physiological impacts should be determined. There is a need for a review and synthesis of existing information on this topic.
7. Review and synthesize information on fire frequencies needed to maintain open wild sheep habitats in many ecosystems. Develop protocols for conducting prescribed fires in wild sheep habitats.
8. Review and synthesize information on effects of aircraft (fixed wing, helicopter and hang gliders) upon wild sheep behavior. Develop guidelines for management.

MANAGING WILD SHEEP POPULATIONS

“The objective of conservation of mountain sheep is to safeguard the future of the species. As a minimum it means the preservation of a diverse gene pool in interaction with a natural ecosystem..... A reserve system would contain representative populations, not only of each subspecies of mountain sheep, but also of different ecotypes within a subspecies..... Such a system would be the backbone of our efforts to conserve mountain sheep and insure the availability of animals and knowledge for present and future management needs.” (Geist 1975:84).

Harvests and Population Reductions

1. Obtain reliable survey information as a basis for allocating wild sheep harvest permits. For large thornhorn populations, conservative harvests can be sustained with minimum population monitoring.

Elsewhere, monitor population trend, abundance, recruitment and ram age structure, at least. Monitor forage conditions in critical habitats. Additional data on sex-age specific mortality rates will enhance understanding of herd dynamics and enhance population modeling efforts (McCarty and Miller 1998). Use long-term data to assess the role of weather in determining herd performance.

2. For large, productive wild sheep herds living in open, continuous habitat, conservative harvest of mature rams has little, if any, population effect (Geist 1975:92). If the number of ram licenses is limited and conservative, horn curl regulations are unnecessary.
3. Removal of ewes may be beneficial in herds that are near forage carrying capacity and are exhibiting symptoms of density-dependent declines in recruitment and animal quality. Symptoms of density-dependence may include lack of yearling breeding and reduced reproduction by 2-4 year old ewes, extended lactation, increased average age of adults, reduced horn annuli growth in rams over the first 3 years of life, and reduced body size of yearling ewes. Density-related changes in herd dynamics should be verified, not assumed. Many herds are controlled primarily by density independent factors, and carrying capacities may vary greatly among years, depending upon weather. If ewes are to be removed, translocation is preferred unless all suitable ranges have viable wild sheep herds. Impacts of ewe removals should be measured with pre- and post-treatment data, or with another experimental design including control and treated populations.
4. All harvests, including state, provincial, territorial, tribal or subsistence harvests, should be reported and recorded in a common database for each metapopulation.
5. Hunter orientation programs are encouraged. These may include identification of legal sheep, regulations and hunter ethics, care of meat and trophies, and biological rationales for harvest levels and methods.
6. Use public outreach to explain the rationales and the economic, cultural, recreational and biological bases for hunting of wild sheep. Do not promote a biological basis (herd management) where none exists (herds below forage carrying capacity; harvest of older rams only).
7. The California bighorn working group supported record-book listings for California bighorn, but only for registered and plugged trophies taken by fair chase, not for pickup heads.

Capture, Handling and Transplants

1. Wild sheep should be reestablished in all vacant historic ranges that still provide suitable habitat.
2. Transplants may be used to establish new herds, augment existing herds, expand existing ranges or create migratory behavior. Transplant strategies should be related to plans for metapopulations of wild sheep. Establishing isolated populations in habitats that do not have the potential to support at least 100 wild sheep is discouraged.
3. Potential transplant sites should be thoroughly evaluated. For historic ranges, consider the possible causes for extirpation and determine that these problems have been rectified. If evaluation indicates potential habitat problems, improve habitat prior to releasing sheep. Evaluate predator abundance, especially where there may be moderate to large deer and cougar populations. If determined appropriate, implement pre-transplant and temporary post-transplant predator control to assist in

establishing new wild sheep populations. Eliminate or mitigate livestock or other large ungulate conflicts prior to release of wild sheep.

4. For each transplant, use the native subspecies where possible, otherwise the most nearly similar ecotype (i.e., similar food habits, similar habitat selection patterns, similar seasonal and daily movement patterns). Cooperation among states, provinces and tribes may be necessary to provide the most appropriate transplant stock.
5. Move at least 30 sheep for any initial transplant. Higher numbers, through multiple transplants, will likely enhance success. Translocation of family or social groups is preferred over the use of individuals captured separately, but genetic concerns from transplanting small numbers of potentially-related sheep should be recognized. Recognize that smaller transplants ($N \sim 10$ head) to supplement existing small bighorn herds are a viable management technique. Also, transplanted sheep may be released at multiple locations within a project area.
6. Do not remove large numbers of sheep from small source herds. Such removals may cause range contraction and inversely density-dependent predation rates.
7. Test source herds for diseases. Minimize potential for transferring diseases among wild sheep ranges. Do not transplant sheep from herds with recent histories of pneumonia. In multiple-source transplants and augmentations, aim to avoid mixing animals with dissimilar disease exposures. If necessary, test for incompatible diseases by exposing a few animals under controlled conditions. Sanitize all handling equipment between capture and transplant operations.
8. Obtain adequate samples for genetics analysis from each group of transplanted sheep.
9. Monitor transplanted sheep for at least a year, most intensively during the first 6 months. Use mortality sensing radio collars, and collar as many animals as possible, with exceptions where wildlife viewing is the primary management objective.
10. Each state, province, and territory should maintain a database of transplant histories, including genetics and disease information.
11. If propagation pens are used to maintain a source herd and provide transplant stock, maintain numbers of sheep with supplemental feed *ad libitum*, if food quantity or quality is suspected to be limiting. Maintain a 1:5 ram:ewe ratio, primarily by removing young rams. Isolate ewes during the lambing season. Periodically obtain samples to monitor genetic diversity of the captive population. Rotate breeding rams to maintain genetic diversity while recognizing potential disease concerns. Periodically supplement the female breeding stock with ewes from external sources. Remove competing ungulate species from the pen. Minimize predation losses with effective fences and predator control, as needed (New Mexico Dept. Game and Fish/Conservation Breeding Specialist Group, 1999:83).
12. Each state, province, and territory should have written protocols for capturing, handling and transplanting wild sheep. There should also be a standard protocol for evaluating animal health. Health and safety of wild sheep must be stressed in all capture and handling operations. Capture teams should include veterinarians. Guidelines of the Desert Bighorn Council Technical Staff (1982) are recommended with one exception: soft release of transplanted sheep, using a temporary enclosure, is not recommended.

13. Transplants are not needed in thinhorn sheep populations.

Taxonomy, Genetics, Ecotypic Variation

1. Although the existing taxonomy of wild sheep is questioned, it should be retained until thorough and extensive genetic analyses have been completed and withstood peer review.
2. States, provinces, and territories should cooperate to monitor the status and trends of wild sheep according to political units, taxonomic units, and bioregions (major ecotypes of wild sheep).
3. The wild sheep of North America have undoubtedly lost much of their original genetic diversity due to extirpations and population declines resulting in genetic drift. Genes interact with environments to determine the genetics of future populations and also the diverse anatomical, physiological and behavioral results of ontogenies. If the remaining genetic diversity of wild sheep is to be preserved, and if its full value is to be realized, wild sheep must persist in a diversity of environments. Therefore, the preservation of ecotypic diversity is equally important as the preservation of taxonomic diversity (Geist 1975:84).
4. In pristine North America, subspecies of wild sheep did not frequently occur as isolated populations. As more historic ranges of wild sheep are being repopulated, genetic exchange between subspecies is again expected. The Desert Bighorn Council and the Northern Wild Sheep and Goat Council should develop guidelines for managing clines between subspecies, and provide suggestions for recognizing categories of wild sheep in hunting-related record books.
5. Genetic studies are needed, not only to refine the taxonomy of wild sheep, but also to determine the genetic diversity that can be retained within subspecies. Biologists should collect, label and store samples for genetic analyses at almost every opportunity. A small number of central storage repositories for these samples is desirable. Samples should be available to qualified geneticists. Protection of samples for individual professional ambitions should not impede comprehensive analyses using a variety of methods.

Threatened and Endangered Classifications

1. Federal funding should be adequate for the recovery of listed subspecies. Prohibitions of the Endangered Species Act against direct take and against indirect take (i.e., habitat destruction) should be enforced.
2. Conservation strategies should be developed and implemented to avoid the necessity for listing imperiled subspecies or distinct populations of wild sheep. These strategies must contain clear commitments to conserve sheep and their habitats, if they are to reduce a need for protection under the Endangered Species Act.
3. Stocks of California bighorn sheep derived from British Columbia do not warrant listing as threatened or endangered at this time.

Management of Metapopulations

1. Metapopulation management plans should weigh the values of demographic support and genetic interchange against the risks of disease transmission among populations.
2. It is imperative to maintain corridors with appropriate habitat qualities (e.g., foraging areas, water sources, security) for unimpeded movement of wild sheep among populations within metapopulations. Likely corridors are areas with steep or broken terrain. Vegetation in these corridors should be managed to maintain visibility. Barriers caused by roads, especially interstate highways, and by canals, fences, and human occupations should be minimized and mitigated.
3. Agency rewards and incentives should not favor the funding and implementation of isolated management projects at the expense of developing and implementing comprehensive metapopulation plans (Bailey 1992).

Research Needs

1. Experimental research on the impacts of inbreeding in wild sheep is needed. There are opportunities for this research whenever a small wild sheep herd is augmented with a novel genetic stock. Pre- and post-transplant reproduction and survival may be compared. Or, if a novel genetic stock of only ewes is introduced, the reproductive successes of native inbred and translocated outbred ewes may be compared within the post-transplant period.
2. Historic records should be used to evaluate the effects of moving transplant stocks into novel vegetation types.
3. Determine the persistence of diseases following dieoffs and the appropriate quarantine period necessary before the affected herd or habitat may be restocked with wild sheep. Evaluate management activities that may reduce this quarantine period.
4. Much research is needed on the population dynamics of wild sheep in single- and multiple-prey predator-prey systems. Opportunities to manipulate the abundance of wild sheep, the abundance of alternative prey, or the abundance of predators should be used in management experiments.
5. The values and disease risks for wild sheep, particularly of contagious ecthyma, from providing baits or salt blocks, including antibiotic, anthelmintic (Miller et al. 2000) or trace-mineral blocks, should be determined.
6. The characteristics of "Fannin" thinhorn sheep should be investigated to clarify their taxonomic, genetic and ecotypic status.
7. Information on the interrelationships of mountain goats and wild sheep should be summarized and the need for further research evaluated.

ADAPTIVE MANAGEMENT

"It is a common pastime in many organizations to collect vast quantities of data on a routine basis . . . with the vague intentions of submitting them to analysis one day. The piles of useful stuff in the files get more

comprehensive, and out of date, as the years go by. Pious intentions to analyze them some day are of little value. If data are not worth analysis at a suitable near date they are rarely worth collection. Data should be collected with a clear purpose in mind. Not only a clear purpose, but a clear idea as to the precise way in which they will be analyzed so as to yield the desired information." M.J. Moroney, source unknown.

1. Management of wild sheep and their habitats should be adaptive, building upon reliable knowledge that is generated by testing management hypotheses with rigorously designed management experiments (MacNab 1983). Designing these experiments is the responsibility of both management biologists and research biologists. To the extent practicable, experimental management should include designated controls, random assignment of treatments, replications, and a commitment to measuring and reporting results.
2. Confounding of multiple experiments on one wild sheep herd or habitat must be avoided if the effects of individual management practices are to be evaluated.
3. Results of management experiments should be analyzed and published in accessible journals, symposia or proceedings.

THE HUMAN ELEMENT IN WILD SHEEP MANAGEMENT

"Perhaps the greatest need of all is for an informed general public willing to accept the responsibility of seeing to it that good conservation practices and a continued program of research are carried out." (Buechner 1960).

Advocacy Groups

1. Wild sheep advocacy groups have important advisory and fund-raising roles. However, management agencies have ultimate decision-making responsibilities.
2. Advocacy groups should be expanded to include a broad range of both hunting and non-hunting publics and organizations.
3. Chapters of the Foundation for North American Wild Sheep, or organizations affiliated with the Foundation, should be established in all states and provinces that have wild sheep. Chapters are also encouraged in states and provinces that do not have wild sheep.
4. Professional biologists should encourage advocacy groups by maintaining regular communications, by providing clear biological rationales and critiques for management options, and by carefully considering and responding to the concerns and needs of advocacy groups.
5. Advocacy groups should be invited to participate in interagency management meetings, especially for land-use planning that impacts wild sheep habitat.
6. In dealing with advocacy groups, biologists should emphasize the commonality of goals among otherwise diverse groups. Attention should be focused upon the maintenance of complete wild sheep habitats and healthy, viable populations and metapopulations.

7. Professional wild sheep biologists should be used to assist in evaluating proposals for project funding by advocacy groups. Each funding organization should develop a comprehensive format to be used for submitting all proposals.
8. Advocacy groups should be strong proponents of hunter ethics.

Fund Raising

1. Continued private funding of many types of projects for wild sheep is needed. These include population management, improvement and acquisition of habitat, education, short- and long-term research, and law enforcement.
2. Funding of wild sheep management by a broad range of advocacy groups and by the general public is appropriate and needed. Hunters have accepted a disproportionate share of the costs of wild sheep management, while the benefits of wild sheep populations are realized by all.
3. Cooperative federal funding of wild sheep management is especially appropriate for un hunted populations on federal lands, such as National Parks. Relying primarily upon hunter/advocacy groups to fund this management is not appropriate.
4. Professional biologists should communicate regularly with advocacy groups, not just when funding of management projects is being requested.
5. When an advocacy group is funding a management or other wild sheep project, there should be a clear, written understanding of the project objectives, including the expectations of the funding organization. Funding recipients are obligated to report management efforts, research findings and management implications from funded projects to their funding organizations.
6. Funds from special sales or auctions of hunting licenses for wild sheep should be used solely for wild sheep enhancement and should not be diverted to other uses (Northern Wild Sheep and Goat Council 1988).

Political Action

1. Political activities for protecting wild sheep and their habitats should be coordinated among advocacy groups and across state, provincial, territorial, First Nation, Native Corporation/Organization, and international boundaries.
2. In order to reduce the threat of pneumonia epidemics in wild sheep, political (e.g., legislative) support from advocacy groups is especially needed to facilitate the retirement or purchase of domestic sheep grazing allotments within or near wild sheep habitats, or to preclude introduction of domestic sheep or goats into pristine wild sheep habitats. Support is also needed for transplants of wild sheep when they are opposed by other special interest groups, and for protection of wild sheep habitats in land use planning.

Education and Outreach

1. Public education programs should emphasize the values of both huntable and nonhuntable populations of wild sheep, the habitat needs of wild sheep and the impacts of land uses upon wild

sheep habitats, including corridors that allow sheep to move within and between sheep ranges. The public should be better informed of the values of genetic diversity within subspecies of wild sheep.

2. Education and outreach programs should be expanded to reach more of the non-hunting public.
3. Watchable wildlife programs should not increase disturbance on wild sheep ranges. Viewing sites should be carefully planned to avoid disturbance, especially during critical seasons of the year. Viewing sites are best located below the sheep and behind a barrier such as a river. Where viewers frequently walk among sheep, restriction of viewers to designated trails is desirable.
4. Public education programs should emphasize the ethics of viewing wildlife.
5. Opportunities to involve youth in wild sheep management projects should be utilized.
6. Biologists should encourage publications on wild sheep for the public by suggesting topics, providing information and providing texts and photos.
7. Advocacy groups should assist in disseminating accurate and timely information on wild sheep management to the broadest possible public.

Law Enforcement

1. Sale or barter of picked up heads should be illegal because poached sheep may be represented as “pickups”. Ownership of all wild sheep heads should be by permit only, and all heads should be registered and permanently marked (i.e., plugged, pinned) for future identification. The North American Wildlife Enforcement Officers Association could assist in developing uniform laws and regulations among state, provincial, territorial, and tribal jurisdictions.
2. Biologists should use all opportunities to photograph, PIT-tag and record characteristics of valuable wild sheep heads, as this information may be used for identification in law enforcement. Horn cores from the plugging process and other available samples should be saved for DNA and mineral analyses.
3. Penalties for illegal taking of wild sheep, including fines, should be consistent with the market values of the illegal products and the public values of illegally-taken sheep.
4. Private ownership, sale, trade or transport of native wild sheep should be illegal (Northern Wild Sheep and Goat Council 1990).
5. There is a need for public education regarding rationales and needs for strict regulations and controls on ownership of wild sheep, trophies, or body parts. Threats to wild sheep populations, loss of genetic potential, and loss of public values should be emphasized.
6. Law enforcement activities should be coordinated among federal, state, provincial, territorial, and tribal enforcement agencies.
7. Law enforcement efforts should be expanded, based upon adequate agency funding. Funding of special law enforcement efforts and programs by advocacy groups is also appropriate.

8. Management biologists should assist and support law enforcement activities.

Interagency Cooperation and Coordination

1. Better interagency communications are needed for the management of wild sheep and their habitats. Annual status reviews, including agency administrators, are desirable. Local projects should be developed using inputs from the variety of resource specialists needed to address the local issues - biologists including wildlife pathologists, sociologists, and physical scientists.
2. Interagency coordination of projects for wild sheep, especially state-federal and province-federal coordination, should be facilitated by having written agreements that facilitate cooperation, cost-sharing and timely exchange of funds to accomplish mutually agreed upon goals.
3. State, provincial, and territorial wildlife agencies should have written, long range plans including goals for the distribution and abundance of wild sheep, and addressing the restorations, land acquisitions or easements necessary to achieve these goals. Plans must be developed with input from land management agencies and interested publics.
4. Historic, current and potential wild sheep ranges, including movement corridors, should be mapped for use in land-use planning. Critical and vulnerable habitats should be identified.
5. Management biologists should work with local, state and tribal governments and nongovernment organizations to assist in planning for the needs of wild sheep in all land use decisions. State, provincial, and territorial wildlife agencies should be involved early in the scoping processes of land use planning. Using agencies merely to review already drafted plans greatly limits their abilities to protect wild sheep habitats. Biologists should monitor implementation of plans to assure that approved protections for wild sheep are not neglected.
6. Biologists should analyze and interpret appropriate data in their files, providing this information for land use planning. Historic and current populations should be compared for evaluating the impacts of past changes in land uses, and as evidence for discouraging continued habitat degradations.
7. Too many wild sheep management plans are restricted to individual populations or are constrained by political boundaries. Metapopulation management and planning are needed (Bleich et al. 1990, Bailey 1992, Armentrout and Boyd 1994). Interagency coordination will be necessary where metapopulations extend across international, state, provincial, tribal, or other administrative boundaries.
8. The needs of wild sheep should be considered in all agency land exchanges.
9. Where necessary, plans of the Bureau of Land Management, Forest Service, Park Service and other land management agencies should be amended to adequately recognize the importance of wild sheep habitats. Threats to these habitats should be identified and mitigation measures should be developed and implemented.
10. Use easements, exchanges and acquisitions of land to develop and maintain complete wild sheep ranges, including movement corridors within and among populations.

11. Biologists should be conservative and proactive in protecting wild sheep habitats, and should anticipate impacts of land uses.
12. Federal grazing and other land use plans should allocate needed amounts, kinds and distributions of forages to meet the year-round needs of wild sheep, in both normal and abnormal years.
13. State and federal agencies should coordinate to address National Environmental Policy Act (NEPA) requirements for wild sheep habitat and transplant projects. For some projects, the state wildlife department, as the project proponent, may be more effective as the lead agency for NEPA activities. Projects covered in prior NEPA documents, such as Habitat Management Plans or other land use plans, may not need additional NEPA analysis. Management decisions should be based upon legal mandates of the agencies, supported by accurate biological and social information developed under NEPA. The NEPA process is not intended to be a "popularity contest." Management decisions should not be directed by special interests that use the NEPA process to publicize and develop support for their personal goals.

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