
OPEN DISCUSSION - WHAT ARE 10 THINGS THAT WE DO KNOW ABOUT WILD SHEEP HABITAT AND EFFECTS OF DISTURBANCE ON WILD SHEEP?

MODERATOR: JIM BAILEY

JIM BAILEY, NEW MEXICO: We're supposed to have an audience discussion, and the question is "What are ten things that we do know about wild sheep habitat and the effects of disturbance on wild sheep?" Now's the time to discuss your biases and opinions.

At the first North American Wild Sheep Conference in 1971, there was only one paper on habitat and one paper on disturbance. I think we've come a ways since then, but we'll see how far we've come. The reason for this discussion is to get us started on some ideas for the workshop on Friday when we try to put together a body of knowledge concerning the management of wild sheep in North America.

I thought I'd start this out with an outline that might stimulate some thought and maybe provide a framework for organizing our ideas (Fig. 1).

Fig. 1. Three categories of responses of wild sheep to human activities in their habitats, and expected population effects.

SHEEP RESPONSES	POPULATION EFFECTS
Tolerance, Adaptation	None ¹
Endurance	Negative, including stress
Avoidance, Movement	From limiting range: Negative From non-limiting range: None

Covariables: Sex, age of sheep; season; weather.

¹Human presence may displace predators and have a positive population effect.

I thought we'd start with discussing disturbance. First, the responses of the animals might be adaptation and tolerance of a disturbance in their home ranges. By definition, there would be no impacts or at least no measurable impacts. Second, the sheep might endure and suffer the disturbance, but not move to avoid it. There are measurable impacts on these animals and some of those involve what we call stress. The third possibility is avoidance. Avoidance might be interpreted as bad or as good for sheep. They might be able to move to a range of equal quality in which case, by definition, there would be no impacts, or they might be forced to move to an inferior range situation in which case there would be impacts upon the animals. A lot of factors influence these responses, such as the sexes and ages of the animals involved.

An idea that human presence might in fact benefit a population by causing predators to move out has surfaced in the literature a few times. I'm thinking of bighorn sheep that live in Waterton Lakes Park in Alberta. I think

one of the reasons that the sheep have moved into town is that wolves don't come into town. We thought we found the same thing in another Waterton (Waterton Canyon right out of Denver), when there was construction activity. While the construction activity was going on, we saw a sudden increase in production and survival of animals. The only viable explanation was that all this construction had driven one or more mountain lions out of the canyon for a while.

Are the disturbance characteristics predictable or harmful? It's been said that sheep can adapt and learn to live with disturbances that are both predictable and non-negative in their environment. Negative things, of course, are bad, and unpredictability is also a problem.

Here's another good question: If the sheep are going to adapt to a disturbance, how long is it going to take? How long is necessary for sheep adaptation to get along with people. With that, I'll throw it open to your biases. Who wants to kick this off?

DUNCAN GILCHRIST, MONTANA: I'm on the Board of Directors of FNAWS. I make a living through the written word and through doing video work, and I spend some 30 to 60 days a year filming wild sheep and filming sheep hunting. I spend an equal amount of time filming other species, primarily bear. I live in Montana and I go to the northwest and Alaska and film. I have a few comments about what I have observed over the years about stress and wild sheep contacts with people.

First of all, I have found sheep greatly more approachable and accepting of humans where they're used to us. This was not related to hunting. I know of a population in Montana where I can touch a large ram, even though the population is hunted. I know other populations that are not hunted whatsoever and they don't see many people. They're very nervous and they flee humans. Another correlation is where there's a lot of predation, as in areas that have high lion populations, and I can't get closer than 300 yards.

I do a lot of my photography up close, I do it literally a few feet away. I don't need telephoto capability. Because my primary use is with a camera, I've learned how to approach animals. I don't act like a predator. I never come in on a sheep from above like recommended in the old sheep literature, because "sheep don't look up." My God, if they look up and they see a human, they're gone.

There is one exception. In the spring, when sheep are having their lambs, they don't like people and this is when they can really stress out. It's almost impossible for me to get photographs or video footage of young lambs.

And the final comment, one time I was talking about this with Val Geist. He was talking about monitoring heartbeats in sheep during contact with people and he said their heart rates go way up even though the humans are 200 yards away and the sheep don't appear alarmed.

BAILEY: I think one of the things you said was that hunting does not sensitize the animals to additional human disturbance.

I'll quote Val Geist, too. I think it was in the Boone and Crockett publication that Val expressed concern about harassment of sheep. He said the worst combination was hunters and photographers. Was Val right or wrong?

DICK WEAVER, CALIFORNIA: I want to relate how one biologist, me, changed his mind. When I got started doing sheep work full-time, in San Diego County, Interstate 8 was just completed and they hadn't yet built all the fencing along it. I had all these reports of sheep observations by the construction crews, heavy

equipment operators and others. I couldn't find sheep in that area and I thought that this road has taken a big chunk of sheep habitat and the sheep are gone.

Over a short period of time I came to the conclusion that I was wrong. Sheep were there not in spite of the heavy machinery, but they were there because of the heavy machinery. Sheep want to see anything that might be detrimental, whether it's a coyote or a D8 cat. If they can see it, they may be apprehensive. It's been called curiosity, but it's probably not curiosity. They want to see what might be a problem. If it doesn't develop into a problem, then there is no problem. I had to change my mind on this; it wasn't what I had always believed.

BAILEY: I think you said a couple of things. Sheep can learn and adapt and if the disturbance is predictable and nonnegative, that's the kind of thing that they can adapt to. Does anybody disagree with that? Are there other anecdotes?

KEVIN HURLEY, WYOMING: Jim, during your discussion on avoidance, you asked if sheep are displaced, are they sent to habitats of equal quality? It's an intuitive thing with me but my assumption is if they're moved, they certainly won't go to better habitat. I think they're selecting the best habitats they can find and I am doubtful there are many opportunities for sheep to move to equal quality range. So, I view it that any time they're moved it's to a lesser quality habitat. I'm wondering what other people think of that.

GLENN LORTON, NEW MEXICO: I agree. Basically, any time sheep are moved out of habitat, you're looking at a loss of overall habitat quality.

BAILEY: That's also loss of overall habitat. Doesn't this imply that none of the habitats individually are limiting? Winter range isn't limiting, snow free range isn't limiting, spring range isn't limiting, they're all equally important. Is that what we're saying?

WAYNE HEIMER, ALASKA: I can share an anecdote with you. When we were trapping Dall sheep in Alaska, we went where the sheep were. The sheep were where they either wanted to be or where they had to be. In the Alaskan spring, it was mineral licks. At the time I was trapping, the drop net trap had been developed. If you've ever seen a drop net, you know it's like a circus tent, an incredible visual barrier.

We eventually trapped at a mineral lick where sheep had never seen a drop net. We found they didn't want to go under the net for two years. The first year we couldn't catch any sheep at all. The second year we could catch lambs or yearlings. The third year we could catch any kind of sheep that were in the neighborhood.

Either they had grown accustomed to the net over three years or something else had happened. Traps such as a rocket net (that don't present a huge visual barrier) were much more effective in a much shorter time.

As far as being a non-negative experience being necessary for sheep to adapt to the presence of the "circus tent" under which they had to go to get a lick of natural salt or unnatural salt we had brought in for bait, they had to put up with a fair amount of harassment: having the net dropped on them, being wrestled with in the mud, blindfolded, bled, injected, charted, measured, milked, ear-tagged, and collared. It was not a problem after they had seen the net for a short period of time. There was no initial negative response or negative experience associated with the trap, because they didn't get caught.

Then there's our cumulative experience with development in Alaska. It's pretty depressing to see a bunch of sheep standing underneath the trans-Alaska pipeline. We once assumed they'd had better taste. The revegetation grass is good under the pipeline, but it's not good if they get run over by the semis that go

rumbling by.

Also, we see sheep on the highway down south of Anchorage and once in a while they get hit by cars. I understand they're drawn to road salt, and people feed them potato chips. They've adjusted to all sorts of things that we originally thought would not be a good idea.

I think the way we see disturbance and habituation depends on what we think a sheep is. I note in the papers from this morning that many biologists think sheep are bags of enzymes which, if they can't capture and maintain every last calorie, will perish. That's the nutritional viewpoint.

We have people like Nike who mentioned a population that seems by all accounts to be doing just fine. Nike was concerned that they couldn't drink four times a day because rafters were coming down the river.

Chris suggests that if people don't stay on the trail and remain exactly predictable in their hiking behavior, this could be a problem. Disturbance perception (by humans) is like the blind men seeing an elephant. What you happen to think a sheep is, colors your judgment on what you think habituation is, and whether it's stress or any of these other things.

BAILEY: After you dropped the net and caught the sheep and abused them so many ways, did they come back and get netted again in the same way the next year?

HEIMER: Yes, sometimes even in the same afternoon.

BAILEY: That's been my experience as well.

WEAVER: At the risk of oversimplifying, I suggest if sheep use it, they need it. If you expand on that, the more they use it, the more valuable it is to them.

BILL WISHART, ALBERTA: What I want to comment on is the response of rams to hunting. We have the Sheep River Sanctuary and rams know that. They can tell you just about where the line is. Another place with no hunting, is at Cardinal River Coals. I think the rams have taken up residence on the lease there. When studying ewes at Sheep River, they were approachable in the Sanctuary but not off the Sanctuary in the high country. They behaved differently on and off the Sanctuary.

BAILEY: Do we think hunting sensitizes sheep and makes them more vulnerable or makes them responsive to other kinds of recreation?

WISHART: One more point is that hunters will tell you that when they're hunting rams, they're not out on the open slopes. They're somewhere in the timber.

ROB RAMEY, COLORADO: I'd like to mention that we need more studies like the one Chris just described, and that Nike had some quantitative basis for disturbance of animals. But we need to go a step further, and we need to be able to state at what point the disturbance has a deleterious effect on the animals, and that is a harder connection to make. It's harder, because there's variances, including disease and the range condition that the animals are in.

I'd like to venture that studies of disturbance would be ideally carried out with multiple samplings over a long period of time. That way you're at least able to get a handle on what some of these other factors and what

effect the long-term disturbance may have on the animals. I think a few well-placed studies would do us a great service.

Finally, I would like to venture that we found genetic differences between Rocky Mountain and desert sheep. I think it's probably reasonable to think about these as different categories to be studied and that studies could be broken out under Rocky Mountain and Dall sheep. I think desert sheep react more than Rocky Mountain sheep do to people.

BAILEY: Why do you think so?

RAMEY: I don't know. I'd like to measure it.

HERB MEYR, IDAHO: I talked to Val Geist about the differences between Rocky Mountain and California bighorn sheep. When he tried to study the California bighorn sheep, he found them much more hyper, scared of people and the study did not go well. I echo that desert sheep are different than Rocky Mountain sheep and maybe Dall sheep, and that the species react differently to disturbance.

BAILEY: We don't know whether that's genetic or environmental, populations that are more sensitive may have a different history of whatever causes them to be more sensitive, and it may not be characteristic of the subspecies.

NIKE GOODSON, UTAH: I worked with both Rocky Mountain and desert bighorn sheep in field studies, long-term field studies where I did close observations of their behavior and they basically reacted very similarly; however, I think the experience of the population is a very important determinant of how they react.

When we first started studying the desert bighorn sheep on the Navajo Reservation, if we approached them from the canyon rim, the flight distance was about half a mile. This is because they had been typically approached from the canyon rim over the years by Navajos who poached them.

Now, if we approached the bighorn sheep from the river in a boat, they were very tolerant. They didn't do anything. You had to land the boat to get the sheep to react to you. Because they were very used to people floating down the river in boats, sometimes stopping and watching them, but seldom beaching and bothering them. They were very tolerant of people in boats. These are the same sheep, the same area, and completely different reactions.

We had to habituate the sheep to some extent in order to be able to collect data on foraging behavior and nutrition and we did habituate the sheep. Just like Rocky Mountain bighorn, the longer we worked with them, as individuals, the more tolerant they became of us. We were able to watch them from closer and closer distances.

I think that if there are differences between populations in response to people, basic differences, I do not think they are genetic differences. I think there are differences related to the histories of the populations.

BAILEY: I might add another experience of Nike's that she's forgotten about. Differences in terms of the experience of the animals within individuals in populations. Nike worked with sheep in Rocky Mountain National Park and I know she told me one time that the same individuals in Horseshoe Park where they expected to see lots of people almost all the time were quite habituated to people. Those same individuals in the high country where there was an occasional unpredictable hiker were very sensitive and would go over the

hill when a hiker would show up.

HEIMER: Thank you, Nike and Jim for bringing that up. I would be reluctant to make a big issue of whether one subspecies was more reactive than another because Dall sheep are grandly different and we presume they're all one subspecies.

You can go to equally heavily hunted populations, both at mineral licks, where we presume they need to be, one place they'll put up with you and one place they won't. So that's the same species, we presume, and yet there's a tremendous difference between populations. We don't know what the difference is. Maybe they never met nice people.

JEAN CAREY, YUKON: We've been looking at disturbance as equivalent to increased predator reaction. Perhaps a lot of the differences are in the predator complement. We found great differences between helicopters and fixed wing, because there's a different perception. In some areas, there's no reaction. We've seen different reactions depending upon the composition of the groups. Seems like ewes with lambs are far less willing to move because it's a greater risk to run and lose a lamb than it is with a perceived threat from the helicopter. Also the reaction depends on where they're situated. If they're far from escape terrain, you'll see a much greater reaction than if they're already sitting on the cliffs.

I certainly agree with Nike that a lot has to do with the history of the population and whether they perceive the disturbance as a predation threat.

DALE TOWEILL, IDAHO: We need to be very careful when we ask this question because while we think we know what hunting does, we don't hunt ewes and lambs. They're quite often in the same areas and in many cases more exposed to more humans on foot than are the rams, which are typically the quarry of choice. The rams most heavily impacted are those that don't have a chance to learn and benefit from the exposure to hunters. So what are we trying to measure? That becomes fundamental to addressing this entire question.

In short, asking the question: What is the impact of hunting? I think we need a fairly controlled situation where we can document both the behaviors of the humans and the responses of the sheep by sex and age class. That's a pretty daunting task. Until we can get there, we're going to be talking mostly in anecdotes.

BAILEY: May we end on that? Basically what you're saying is we need more research. That's what Rob said and I'll suggest that we need more experimental research. Our problem is that when we do observational research, we take advantage of the differences among areas, but we are always dealing with confounding differences between the two areas or the two populations. Maybe we need more contrived experiments where we control the nature or the frequency of the disturbance.

JOHN McCARTHY, MONTANA: We hunt ewes and lambs on a regular basis. Twenty-five years ago when we began to do that, one of the biggest comments we received from the public is we'll never be able to approach sheep again.

To this day, most ewes are shot within 400 yards of a highway or road or trail. In one of the studies we did on the Sun River, we collected ewes throughout the year. We collected a fairly large number of these animals and it wasn't a matter of not being able to approach them. It was a matter of after you knocked one down, moving the other ones out of the way so you could actually get in and see the animal.

So I think we need to take a look at what we're talking about here: Is disturbance having an effect on the

population? Is it having an effect on the reproduction and recruitment? What are we trying to determine?

Disturbance is going to vary with how you approach an animal, where you approach it, how much time these animals spend adjacent to highways, how much time they're eating marshmallows out of people's hands. I think we need to be looking at what the effects of the disturbance are, we can't come up with one conclusion that disturbance is either good or bad.

BAILEY: Looking at habitat requirements of sheep in the literature, Val Geist lists seven seasonal ranges in his wild sheep book (Fig. 2). I think Val was the only one that says that rams need or have a pre-rut range. I haven't seen that term come up again in the literature. I added migration corridors and metapopulation connections. Several covariables, including the sex and ages of the sheep, influence the needs for these ranges (Fig. 2).

Fig. 2. Range requirements of wild sheep, at landscape and local levels of resolution.

<u>Landscape Requirements</u>	<u>Habitat Requirements</u>
Pre-rut range - Rams	Security Factors
Rutting range - Rams and ewes	Visibility, Escape terrain
Winter range - Rams, ewes	Forage
Spring range - Rams, ewes	Quantity
Lambing range - Ewes	Continuity, dispersion
Salt-lick range - Rams and ewes	Quality, composition
Summer range - Rams, ewes	Reliability, diversity
Migration corridors - Between ranges	Water
Metapopulation corridors - Between herds	Minerals
	<u>Juxtaposition of factors</u>
Covariables: Sex, age, number of sheep; predator types and abundance; human disturbance; biotic disturbance (e.g. fire), and succession; proximity to domestic sheep; season; weather.	

There may be different needs for these ranges relative to predator abundance or relative to the amount of human disturbance. Fire and vegetative succession are certainly processes that influence these ranges. Then there's the issue that is somewhat new since the earlier publications, the proximity to domestic sheep.

We can also look at local habitat requirements (Fig. 2). Sheep need security features in their habitat, and that's a combination of visibility and escape terrain and these compensate for one another in terms of how the sheep perceive them and respond to them, and how well they fulfill the needs of the sheep.

Obviously, sheep need forage. We've often looked at quantity, but not at continuity of forage, continuity in terms of dispersion of the forage. It's my opinion that sheep operate best in a large group size and a more dispersed forage resource allows sheep to be feeding together and in view of one another while not competing for the same bush.

Quality of forage, of course, is an issue. Then there's reliability, which is related to diversity of the forage resource. I'm thinking of more reliable in terms of quantity and quality forage. In terms of species composition, in particular having both browse and herbage, might provide reliability, through all times of the year. There's value in having forage resources at different sites on different slopes, aspects and elevations, that

reach their peak in quality at different times of the year, and allow the sheep to exploit the diversity.

Water is a factor we might get some arguments on. Free water is proposed as a habitat requirement. Mineral licks are another.

Juxtaposition, the location or the close proximity of all these factors should be considered. Visibility next to escape terrain or in escape terrain, for example.

Covariables will include differences in requirements related to sex and age, size of the animal and nutritional requirements, for example, the size of the sheep population. Whether or not there are predators in the environment; do sheep still need escape terrain if there are no predators in the environment? Human disturbance, fire, and plant succession are additional covariables (Fig. 2).

I hope that's some stimulation. What do we know about the habitat requirements of wild sheep in North America?

PAUL KRAUSMAN, ARIZONA: I'll pick on the water issue, especially since there are a lot of people in the audience who have made a career out of dealing with water and sheep habitat, especially with desert bighorn sheep. This is an area where we need a tremendous amount of research.

If you look at the literature, you'll find very few studies that have documented that free standing water is critical to desert bighorn sheep. I'm not arguing that sheep don't need water. Of course they do. But the ways they get it are somewhat different than the ways a lot of people think.

There are numerous ranges that have been documented to lack free standing water. Productivity and recruitment are just as elsewhere. The Sierra Viejos population in Mexico is an example. Compare the Kofa where there are numerous water sources, and in the Sierra Viejos where two or three water sources have recently been added, and we've been documenting that the sheep aren't using them. They're using barrel cactus and agave.

I'm not saying it in a detrimental manner. It's for consideration. If in fact freestanding water is not a limiting resource, we're spending a lot of conservation time, effort and money in an effort that perhaps could go somewhere else.

BAILEY: I'll add to that. McCarty did a literature review on habitat requirements of desert sheep and the only population response that we could find to the addition of water in desert bighorn environments was the River Mountains case.

A lot of water developments have been put out, and in most cases there hasn't really been any good data for evaluation. Was there a higher yearling/ewe ratio or a higher population? In most cases sheep used the artificial water source. Whether or not anything more than that happened, it really hasn't been looked at or evaluated in most cases.

JOHN WEHAUSEN, CALIFORNIA: I was going to say the same thing that Paul said about water. I've studied populations that have never drunk at all that I can figure out, such as the High Sierra populations.

Also, mineral licks, I would say are not a general requirement. There are lots of populations to our knowledge that have no mineral licks at all. I think that's maybe a Rocky Mountain phenomenon; certainly in the deserts,

I've never seen any evidence of mineral licks.

BAILEY: Do you think that's a function of the environment? Don't some environments have adequate minerals in the forage while others don't?

WEHAUSEN: It's maybe they don't need it as much. Maybe licks are not available.

BAILEY: And they get by fine without it.

WEHAUSEN: I question it as a general requirement, basically.

BAILEY: On the other hand, there are others who say if they use it, they need it.

WEHAUSEN: If they use it, they need it. I'm not sure they're using it in places. I've never seen evidence of dirt in the feces. You can say humans don't need salt, yet they salt their food.

GOODSON: Humans do need salt. That's sodium. They usually eat ten times as much they do need. They do need it. It's basic nutrition.

WEHAUSEN: I would move on to something else: Pre-rut versus rutting ranges. You said nobody has ever come with a pre-rut range. I used to distinguish fall ranges from summer ranges in the Sierra of California, because I saw a change in habitat used by females particularly in the fall. They drop to lower elevations and start seeking nutrition they wouldn't get in summer. So you could call it a pre-rut range. I call it a fall range.

And relative to rutting ranges, I've looked at a lot of populations in the deserts and in the mountains for a lot of years. I have never seen anything that I would call rutting ranges. My interpretation is males find females where they are at the time of the rut. I've never seen anything that suggested that females are going specifically somewhere to rut. It may be a Rocky Mountain phenomenon. I know people have seen that in the Rocky Mountain's.

BAILEY: Geist specified the pre-rut range as a ram need in his book. Let's go on with that. Does rutting generally occur in the same area each year, or do the rams go wherever the ewes happen to be, and that's maybe a different place each fall?

KEN WHITTEN, ALASKA: It's a long time since I read Geist. As I remember it, he wrote about individual animal's seasonal home ranges, and he found that there were certain rams that predictably, from year to year, went to certain ranges during what he called the pre-rut. That particular spot might be another ram's winter range, might be a ewe winter range, might be a lambing range. I think we're confusing something here. At least among his identifiable sheep, there was something that he could call an individual's pre-rut range. It wasn't necessarily a geographic location that all of the sheep used that needed some special protection.

BAILEY: You're right. He was talking about individuals, but he didn't say that sheep needed all seven ranges. He said that rams use up to seven kinds of seasonal ranges and ewes up to, I think, four of those.

RAY DEMARCHI, BRITISH COLUMBIA: I wanted to mention that there's research in the Turn Creek Basin, in the Fraser River Country by Patty Oldman and another research contractor being funded by the local chapter of FNAWS. They found some unique things about this one herd. I'm starting to think that each herd has its own behavioral characteristics, and I note that a lot of Geist's work was done in Banff Park and on

Stone's sheep range in fairly undisturbed situations.

I don't think we can generalize on habitat requirements. The herd in the Turn Creek Basin looked like one population, looked like one herd of ewes, one local group. However, there are actually at least three identifiable groups of ewes. They winter together, but they don't summer together. They migrate in groups. One group moves to the east and another group moves to the west. The group that moves to the west splits off. One part of it summers on top of one mountain, and another part keeps going miles past that mountain and summers on another mountain. They do it every year, regularly as clockwork.

In the fall, they migrate off mountain summer range about the same time, but they don't go back to the winter range at the same time. One group comes off the summer range, goes west to rut and ruts at the same place every year.

If that herd got wiped out, or one local herd disappeared after a mining operation went in, the sheep would lose that knowledge of ranges and migration routes. I don't think they would get it back again, except in geological time, a thousand years, two thousand, whenever.

BAILEY: So you're suggesting that learned traditions are very important in maintaining the use of various seasonal ranges. I suppose that might support Wishart's example of a population in Montana, which I guess was a transplant, and used a rather large amount of range. Somehow you had undiscovered additional range, and the population grew. That additional range was always there, yet due to learning and tradition, it took a long time for those sheep to change their tradition and start using a wider range of habitat.

ERIC ROMINGER, NEW MEXICO: I'd like to change the topic. Every photo series that's been taken in Jackson Hole and Yellowstone Park shows a dramatic increase in the number of conifers. Yet there is very little documentation of the amount of mountain sheep habitat that has been lost over the last century. In fact, the only figure I could find is Krausman's, suggesting two percent per year. My guess is if you take two percent per year from all of our sheep habitats in the West, we have a small fraction of the sheep habitat we once had because of vegetative succession.

In New Mexico, we've had a couple of fires for bighorn sheep. As we move north, is anybody recovering that two percent per year? Since 25 years ago, theoretically, we may have lost 50 percent of the sheep habitat.

Which states are recovering sheep habitat? Are we losing habitat in the juniper and the spruce-fir zones, or is any region getting it back?

TOM RYDER, WYOMING: In Wyoming, the state Game and Fish Department has identified burning as a technique that's very necessary on both BLM and Forest Service administered public lands, especially in primary sheep range. A lot of those habitats for bighorns are within designated wilderness areas. This may be a lead-in for future sessions in this conference, but until recently, we've had a heck of a time working with the U.S. Forest Service in wilderness areas to do human-ignited fires to improve bighorn sheep habitat. It has been changing the last three years, but it's been a slow, painful process. We believe it's a very important thing, but we've had interagency problems getting burns accomplished.

BAILEY: There's a paper addressing that problem of fire in wilderness areas and the reluctance of the Forest Service to use prescribed ignitions in wilderness areas in the 1992 Northern Wild Sheep and Goat Council Proceedings. Bailey and Woolever are the authors.

STEVE HOLL, CALIFORNIA: I can say in the San Gabriels, fire is absolutely necessary to maintain sheep habitat. Without either fire or logging in a number of other ranges, you're losing sheep habitat, so you've got to reinstitute those factors. Those are factors that affect the environment. They affect the amount and quality of sheep habitat and you're remiss in not getting those factors reintroduced.

HARLEY METZ, COLORADO: In the case of fire in wilderness areas, we completed an integrated activity plan, and one of the main objectives is to reintroduce fire into the wilderness areas for the benefit of not only vegetative succession but for the desert bighorn population. In the case of a Rocky Mountain herd within our district on the forest, the main objective of fire is the rehabilitation of bighorn habitat. I think that we are using bighorn objectives as a triggering factor to get prescribed fires used in our areas.

BAILEY: Which area?

METZ: The Uncompahgre, on Battlement Mesa. There has been an emphasis in getting that habitat altered by fires, the only tool available.

BAILEY: You've had prescribed ignitions in wilderness areas?

METZ: Yes. In fact, I mixed the alumina-gel myself.

DAVE SMITH, ARIZONA: The vegetative EIS in wilderness areas for treatment of ponderosa pine, chaparral and other communities, allows the use of prescribed fire in wilderness.

BAILEY: I'm glad that the Bailey and Woolever paper of eight years ago has had some influence. At the time we wrote it, we surveyed the western National Forests, and there was a lot of opposition to prescribed fire in wilderness based on a reference to the Wilderness Act and Forest Service regulations. We're certainly glad to see that that's changing. Thank you all very much.