

Continued from p. 10

"Dieldrin has been outlawed for from five to eight years, depending on location, but it's still showing up in the environment and clobbering eagles."

The Patuxent analysis disclosed a concentration of 5.1 parts per million of dieldrin in the brain of the dead eagle. Former laboratory studies revealed that the lower end of the curve for death due to poisoning is at about five parts per million in the brain. Bald eagle PR-1727 may have died from the concentration of dieldrin, Patuxent researchers say.

Dieldrin is a highly toxic organochlorine insecticide in the class with DDT, heptachlor epoxide, chlordane isomers, mirex, toxaphene and hexachlorobenzene, Elder explained.

Even though dieldrin has been banned from most use, evidence indicates the insecticide is apparently present in the environment of the Great Lakes. Fish-eating birds are especially vulnerable to dieldrin because it accumulates in the aquatic food chain. Thus, eagles that feed on fish can be affected. The demise of bald eagle PR-1727 is a reminder of earlier mistakes made with toxic insecticides. When asked how long dieldrin might hang on in the environment, Elder answered, "No one really knows."

The Beleaguered Desert Bighorn

Lanny Wilson has a philosophy he thinks may help save the beleaguered desert bighorn sheep. "Think like a sheep," he advises. "You've got to put yourself in the old sheep's place."

Wilson, a sheep biologist with the U.S. Bureau of Land Management in Idaho, makes this recommendation after years of experience with bighorn research and transplant efforts. Because transplant efforts are so new, no one can say whether any have really been successful. Wilson is "scared to death" for the future of the sheep. "I think we could damn near lose them in the next 100 years."

In 1974, the total U.S. desert bighorn population numbered 13,000-14,000. Some states have since reported updated figures that indicate more sheep than originally thought, mainly from improved survey techniques and wet years that allowed good vegetation growth for foraging sheep. Despite these optimistic indicators, Wilson and others see the road to salvation for these high-strung, handsome animals strung with complexities, aggravated by the same factors facing biologists and sportspeople during their frustrating, often futile attempts to save a small corner of the country for wildlife.

On a western map, the desert big-

horn's distribution is spotty. This unique aspect, which Wilson terms the "island concept," arises from a drastic reduction in *Ovis canadensis nelsoni's* historic range. Roads, dams, off-road-vehicles, subdivisions, mining, fences, wild horses and burros, and livestock, plus overhunting and disease, have edged the bighorn to this discouraging point, where the only hope may be the success of delicate transplant activities and curtailment of the human encroachment contributing to their demise.

In Nevada, New Mexico, Arizona, Utah, and California, the story is the same. Early explorers, mainly Spaniards searching for the Seven Cities of Cibola, wrote in their journals of great numbers of bighorn sheep living in the rugged canyon country, providing juicy meat for hungry travelers. In Texas, where introductions are underway to restore extirpated populations, bighorn meat fed railroad workers and miners, and was also shipped East. Settlers and more "progress" ate into their habitat. Now, remnant herds cling to tenuous existence on the isolated, precipitous terrain they must have to survive.

Bighorn need space. Although the other three essential habitat requirements—food, water, cover—must be present, space can't be forgotten, Wilson warns. Sheep thrive on grass, cactus pulp, and paloverde beans. They also need escape terrain within easy leap where, using their keen eyesight, they are afforded unobstructed views of their surroundings, as well as adjoining flat land for lambing. While they have adapted to withstand long dry periods, at some point water becomes a limiting factor. But space, says Wilson, is probably the "most important and least understood habitat requirement" of wild sheep.

With few exceptions, bighorn simply do not tolerate competition. They will abandon otherwise suitable areas after cattle, goats, feral horses or burros, or other ungulates enter. National Park Service officials in the Grand Canyon and Death Valley are currently struggling to decide how to eliminate the threat wild horses and burros pose for bighorn. Wilson reports that during his research in Utah, a sheep herd reoccupied an area as soon as domestic cattle were removed. While other animals are of serious concern, say biologists, human intruders unquestionably exert the strongest negative pressure on bighorn.

As Bill Montoya of the New Mexico Department of Game and Fish puts it: "You can't grow sheep in a housing development." To give sheep the isolation they need, a sizable buffer must be provided. Introduce a road into sheep range and "you might as well write off that herd," Montoya says. Off-road-vehicles, roaring through prime bighorn territory, may also force the wary animals to forsake their homes. If 20 sheep are crowded onto an area with a carrying capacity of only 10, the population will certainly drop, Montoya points out.

Even less active recreational pursuits must be regulated. Campers and hikers can disturb the bighorn, unused as it is to human activities. All these disturbances create barriers to migration that lead to further isolation of the bighorn. Although he lacks documentation (and consequently, the support of other biologists), Wilson has a hunch that this isolation precipitates inbreeding and possibly less healthy populations. Rams move great distances to reach ewes, and if their movements are hindered by a highway or a new lake, the gene pools of separate herds cannot mix, suggesting to Wilson that inbreeding "might have been an important factor in the extinction of some historically-isolated populations." Other genetic factors he thinks deserve more research are reproduction, harvesting of less cautious animals, and susceptibility to disease and parasites.

Bighorn research needs are many. In Arizona, utility-funded research is being done on effects of a local electrical transmission line on bighorn. Five-hundred-kilovolt lines under construction from a nuclear power plant near Phoenix will dissect some of the best range for the state's estimated 3,000 bighorn. Robert Weaver of the Arizona Game and Fish Department explains that the study is giving good information on "things we only had an inkling of before." The transmission line itself is not of as much concern as the increased vehicular access it will permit. He believes the sheep probably could adapt to the lines, but increased human presence at certain times of the year, particularly during lambing and rutting seasons, is beyond their powers of adjustment.

Weaver hopes two relocation efforts on the drawing board will take. This fall, young sheep captured from the Black Mountains west of Kingman will be enclosed on public land in northwestern Arizona's Virgin Mountains. Similar releases are underway or planned in Utah, Nevada, and New Mexico.

Bighorn reintroductions generally follow a standard procedure. Once habitat is located and rated for suitability, an area is enclosed to hold new sheep. In this paddock, young sheep can acclimate to unfamiliar surroundings. They have just been loaded off a dark truck after being "shot" with "cocktails" to immobilize and tranquilize them, relieving stress from contact and commotion.

Two- or three-year-old sheep from the same herd are ideal transplant candidates, because they can better adjust to new surroundings, says Wilson. This is the time to remember his adage "Think like a sheep." They are looking for someone to talk to," he says, and are going to stay together if they know each other. These younger animals have not yet had a home range thoroughly imprinted on them through the learning process passed from older to younger animals.



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