

Burro Impact On Bighorn Habitat Studied

By Charles L. Douglas

A study of ecosystem alteration within a national park by an exotic species of animal – eight years in the building and still five years from completion – is yielding information vital to the management of bighorn sheep and burro populations in Death Valley, and with implications for management of similar exotic intrusions elsewhere in the National Park System.

The problem of exotics is widespread in the Park System – ranging from mongoose, rats and feral goats in Hawaiian parks to feral pigs in the Great Smoky Mountains and feral burros in Grand Canyon, Bandelier, Lake Mead and Death Valley. Exotic plants, birds and mammals have been established almost everywhere, and unfortunately they often survive at the expense of native species.

Our studies in Death Valley (DEVA) began in 1973. Overgrazing by feral burros had led to reduction in habitat of the endangered desert bighorn, and management needed to understand the nature, severity, and consequences of burro-bighorn interaction there. Burro control stopped in the 1950s and the herd had increased steadily, while the bighorn decreased commensurately.

Burro impact is a degradative process, insidious and severe. It affects plant species composition and cover, promotes aridity by increasing erosion through soil compaction and surface disturbances, and adversely affects water sources by fouling and usurpation.

Subtle changes in the ecosystem such as changes in soil organisms, losses of invertebrate segments of the food web, changes in small mammals, impacts on ground-nesting birds, and overall effects on nutrient and energy exchange, may never be fully understood. Perturbations reverberate throughout the system, and deserts are especially sensitive and vulnerable to changes. Recovery may require centuries; however, enlightened management may be able to shorten the recovery period.

Managers also need information on endangered plants as well as a detailed vegetational map of the park. To amass these data, we started in the southernmost mountains on the east side of the park and then worked counter-clockwise, range by range. Graduate investigators now are completing thesis on flora and community structure in the first two ranges; a third study is underway ... all providing data important in evaluating the extent and condition of bighorn habitat.

We hope within another five years, to complete vegetational mapping, bighorn habitat evaluation, population assessments, and management recommendations for the entire park – an area encom-

passing almost as much terrain as Yosemite, Great Smoky Mountains, and Glacier National Parks combined.

Our two-year telemetry and marking study of burro movements and distribution in the Wildrose area of DEVA showed a disturbed herd with a yearly 18 percent rate of increase. Half of all plants in its 600 square kilometer area showed browse impact, with favored species browsed to the brink of elimination.

A concurrent study by a University of Nevada (Las Vegas) graduate student clarified aspects of burro physiology. This knowledge enabled us to evaluate the herd's past exposure to disease organisms that might be useful for management, and to establish normal blood values of healthy animals.

A second study area — Butte Valley — was chosen for its isolation and because bighorn were thought to be more numerous there. Again, we used telemetry and marking-collars and replicated parts of our research. This was important because conditions were significantly different there; herd density was much higher, home ranges were constricted; emigration of young animals was taking place, and the plant community and burro herd had established equilibrium. Thus, the two study areas represent extremes along a continuum of habitat degradation.

Variation in coat colors throughout the Panamint Mountains made us curious about the extent of movements between burro groups. In some herds, burros had mostly dark coats; others were shades of gray or brown. In Butte Valley, colors ranged from white through browns and grays to black. We realized that if there were high interchange between groups, efforts to remove burros from one area could be negated by influx from adjacent areas.

In 1976, a study of population genetics was conducted. Significantly, we found that burros from five localities were largely isolated from one another genetically. Even herds in adjacent canyons operated as separate breeding units. Explanation lies in the fact that the peak of breeding coincides with the hottest months of summer, when burros are under the most water stress. Consequently, they remain near springs and breed with individuals in the same canyon. In winter, with water stress reduced, adjacent herds intermingle, but breeding in winter is greatly reduced so interbreeding is negligible.

For management purposes, the importance of these results is the discovery that burros are faithful to their home range areas and probably can be removed from small areas without the vacancies immediately being filled by other individuals.

In 1979, the Tin Mountain-Quartz Spring area was found to contain bighorns and burros in sufficient numbers to permit simultaneous study. We are beginning now to unravel some of the complexities of resource partitioning between these species. We consider food, space, and water sources. The studies indicate that burros and bighorns in the Tin Moun-

tain area use some of the same terrain. Bighorn appear to use ridges and upper slopes more than burros; and rams appear less restricted by burros than ewes and lambs are. Such knowledge is fundamental to an understanding of competitive interactions.

Ungulates are either selective feeders, or generalists. Burros probably are more general in their food habits than bighorn. Burros are larger and require much more food and water than bighorns. Burros also can exist on poorer quality forage because they are able to vary the rate of gut clearance by continued eating, whereas ruminants do not have this option.

Food habits of both species are being analyzed monthly. The ability of a ewe to raise a lamb through weaning depends upon adequate water and proper nutrition. Nutrient and energy content of major forage species are being studied so that nutritional stress periods can be identified. Major competition for forage resources could occur during these stressful periods.

Competition between ungulates is difficult to prove. We intend to study the distribution and seasonal use areas of burros and bighorn in the Tin Mountain area for two years, then remove burros and document the responses of bighorn. Bighorn may expand their home ranges and use areas. This is not certain owing to intangibles such as the length of time the bighorn range has been constricted, and the possibility that degraded vegetation adjacent to present bighorn habitat may not be able to support bighorn at this time.

Throughout California, and most of Death Valley, bighorn exist in habitat islands that are remnants of former range. Populations have been fragmented by changes in vegetation caused by overgrazing, by road construction, and by disappearance of traditional watering sources.

Small remnant herds of sheep almost surely will not survive indefinitely. Population geneticists estimate that if a herd remains at 50 animals for

20-30 generations, about 25 percent of their genetic variation will be lost. The smaller the herd, the greater the effects of inbreeding depression, which leads to lowered immune responses and reduced vitality. One obvious sign of such problems is reduced survival of lambs. A herd of 25 animals can experience a 25 percent lowering of reproduction within five years. Most herds in DEVA have fewer than 50 animals. Some have fewer than 25, which makes them extremely vulnerable to extirpation. Diseases also present special and severe threats to small groups. Some herds have died out in California during recent times; others presently are showing almost no survival of offspring. A few herds are doing extremely well.

If bighorn sheep are to be preserved in DEVA for more than another 100 years or so, isolated remnants of the herd must be encouraged to rejoin one another as an interbreeding entity. Restoration of bighorn habitat and reconnection of habitat fragments, by means of corridors, depends upon removing burros. Without burro removal, any habitat restoration for bighorn is likely also to enhance that habitat for burros.

Innovative and aggressive management is required if bighorn are to survive in DEVA. Restoration of burro-impacted areas in bighorn habitat, and rejoining isolates of the herd will require a long-term commitment. But tremendous as the challenge is, it consists equally of opportunity — the chance for NPS managers and scientists, together, to demonstrate that a resource problem of this magnitude *can* be dealt with in an aggressive, cost-effective and timely manner.

Editor's Note: The majority of studies associated with this project are in-house and funded by the CPSU. For additional information on these studies, contact Charles Douglas, senior research scientist and leader of the NPS/CPSU at University of Nevada, Las Vegas, NV 89154. Comm. No. (702) 385-6468; FTS 8-598 6468.



Weighing burros is part of the effort to understand burro behavior and management in Death Valley, NM.