



Conservation

Aldo Leopold, Conservation, & Climate

Aldo Leopold is widely recognized as a pioneer of wildlife conservation in the United States, but what may surprise some is that he was also a prominent figure in the American wilderness movement. Throughout his life, he embraced multiple roles, such as wildlife manager, hunter, husband, father, naturalist, wilderness advocate, poet, scientist, philosopher, and visionary. However, he is most renowned as the author of the influential work "A Sand County Almanac and Sketches Here and There," which went beyond mere descriptions of the natural world and introduced the groundbreaking concept of the "land ethic" - a novel way of thinking and behaving towards the land.

Leopold's notion of a "land ethic" can be traced back to his upbringing on the

bluffs of the Mississippi River near Burlington, Iowa. As a young boy, he developed a passionate appreciation for the natural world, spending countless hours exploring the wild woods, prairies, and river backwaters of Iowa. This early con-

"Conservation is a state of harmony between men and land."

- Aldo Leopold



nection with nature, combined with his exceptional skills in observation and writing, led him to pursue a forestry degree at Yale University.

After completing his studies at Yale, Leopold rose as a forward-thinking figure in the Forest Service. Although initially influenced by Gifford Pinchot's idea of "wise use" of forests - promoting efficient and utilitarian management of public and private forestlands - Leopold gradually moved away from this "economic determinism." Instead, he began viewing the land as a living organism and developed the concept of a harmonious community. This concept laid the groundwork for his role as one of the most influential advocates for conservation.

Through his exceptional powers of persuasion and his ability to articulate the wonders of the wilderness, Leopold convinced his superiors in Washington to adopt

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a groundbreaking idea at the turn of the century - the preservation of wild lands in their natural state. This led to the administrative designation of the Gila Wilderness in New Mexico, spanning three-quarters of a million acres of mountains, rivers, and desert - the first wilderness area managed as such in the world. Following this achievement, Leopold moved to Madison, Wisconsin, where he taught at the University of Wisconsin and authored his seminal work **Game Management** in 1933. This book defined essential skills and techniques for managing and restoring wildlife populations, creating a new interdisciplinary science that integrated forestry, agriculture, biology, zoology, ecology, education, and communication. Leopold's impact was so profound that the University of Wisconsin established a new department in his name - the Department of Game Management - and appointed him as its first chair.

Leopold's unique ability to communicate scientific concepts matched his fervent commitment to putting theories into action. He published numerous articles, papers, newsletters, and letters, but his writings on wilderness solidified his reputation as the nation's foremost advocate for the preservation of wild landscapes and ignited a national conversation about "the wilderness ideal."

In 1935, Leopold and his family purchased a worn-out farm in Wisconsin's sand counties near Baraboo. Here, he put his beliefs into practice, demonstrating how the very tools used to disrupt the landscape could also be employed to restore it. The farm's old chicken coop, affectionately known as the Shack, became a haven and land laboratory for Leopold, his family, friends, and graduate students. It was within these surroundings that Leopold envisioned many of the essays found in **A Sand County Almanac**.

Tragically, on April 21, 1948, Leopold suffered a heart attack while fighting a grass fire on a neighbor's farm, passing away at the age of 61. His legacy as a visionary conservationist, wilderness advocate, and author of the land ethic continues to inspire and shape the field of environmentalism to this day.

I have to wonder, if the western world had adopted Leopold's land ethic would the summer of 2023 been as hot. JCM

Where did all the rabbits go?

Moving to the Santa Rita Mountain Range area for its wildlife, I was happy to encounter some familiar animals. In the Chicago suburbs, I used to see interesting wildlife that thrived in human-made environments. Now, in southeast Arizona, I find the Eastern Cottontail (*Sylvilagus floridana*), the same species that used to raid my garden in Illinois is here, as well as the Desert Cottontail Rabbit, (*Sylvilagus audubonii*), and the Black-tailed Jackrabbit (*Lepus californicus*). However, my favorite among them is the giant Antelope Jackrabbit (*Lepus alleni*), which is impressively large and sometimes grazes in small herds at dusk and early mornings, resembling small antelopes.



The Desert Cottontail or Audubon's Cottontail (*Sylvilagus audubonii*) do not form a social burrow system but are highly tolerant of other individuals. Cottontails give birth to their kits in burrows vacated by other mammals. They sometimes cool off or take refuge in scratched, shallow depressions of their own making. They use their front paws like a backhoe. They forage in the early morning and evening. Cottontails are rarely found out of their burrows looking for food on windy days because the wind interferes with their ability to hear approaching predators, their primary defense mechanism. JCM

In recent years, I noticed a significant decline in the number of Antelope Jackrabbits. These rabbits are one of the largest hares in North America, weighing around 9 to 10 pounds (4.5 kg). They have distinctive features, including large ears edged in white, enabling them to see almost 360 degrees and evade predators by zigzag running, like pronghorn antelopes. They inhabit drier areas of the desert, such as creosote bush flats, mesquite grasslands, and cactus flats, extending into southern Sonora. Their preference for open spaces with sparse grass allows them to spot predators and flee efficiently.

Rabbits and hares, including the Antelope Jackrabbit, are herbivores, feeding on grasses, forbs, mesquite leaves and beans, and cacti for moisture. To avoid the scorching heat, Antelope Jackrabbits rest in the shade of plants during the day, staying active during cooler hours. They have few defenses against predators and rely on their keen senses and speed to survive. Female cottontails, in particular, reproduce at a rapid rate, which compensates for the high mortality they experience during their first year of life.

However, the reason behind the significant decline in the rabbit population by 2021 became evident due to an outbreak of rabbit hemorrhagic disease (RHD) caused by rabbit hemorrhagic disease virus 2 (RHDV2). The disease has affected wild lagomorph populations, including cottontail rabbits and hares, across the southwestern United States since March 2020. RHDV2 has been confirmed in various regions, including New Mexico, Arizona, Texas, Colorado, Nevada, California, and Utah. This outbreak poses a significant threat to the rabbit population, impacting their numbers and distribution in the affected regions.

Moreover, RHDV2 was detected in a Pygmy Rabbit (*Brachylagus idahoensis*) in February 2022. Pygmy Rabbits are of particular concern because they are sagebrush obligates, found only in the US Intermountain West, and are already facing challenges due to habitat loss and high mortality rates. The spread of RHDV2 into their habitats further threatens their already declining populations.

The decline in Antelope Jackrabbit numbers, from the outbreak of RHDV2 in various rabbit and hare species, is a concerning development that needs close monitoring and management efforts to protect these precious wildlife populations.

Kerr et al. studied rabbit hemorrhagic disease virus (RHDV) to understand its origin and how it has evolved over time. They looked at 210 different genetic sequences of the virus to see how it has changed and how it is related to other viruses.

By using a mathematical methodology, they estimated that the virus evolved at a rate of about 3.9 to 11.9 mutations per year for each sequence. This rate was consistent across different sets of data and was not affected by genetic mixing. This made the authors doubt that some old virus sam-

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ples from the 1950s to the 1970s are related to modern ones, even though they look similar.

They also used the same method to calculate when the most recent common ancestor of all the related RHDV viruses lived. They found that date to be 550 years ago for a group of RHDV and other related viruses, and less than 150 years ago for the RHDV viruses that have been spreading worldwide since 1984.

Interestingly, they discovered different lineages of RHDV were circulating before the 1984 outbreak in China, an outbreak that was previously thought to be the start of the epidemic. This suggests that the virus has been evolving and becoming more dangerous for a long time. One group, RHDVa has a slightly different structure, and the greatest genetic diversity, suggests that it may be more successful than other RHDV strains. The high virulence of RHDV probably evolved in the early 20th century.

JCM

References

Anon. 2020. Rabbit hemorrhagic disease fact sheet. History of Arizona state outbreak. <https://agriculture.az.gov/animals/rabbit-hemorrhagic-disease/rabbit-hemorrhagic-disease-fact-sheet>.

ASDM nd. Rabbits and Hares. https://www.desertmuseum.org/books/nhsd_rabbits.php

Crowell, Miranda, Nate LaHue, Elsa Heath, Kevin Shoemaker, and Marjorie Matocq. Chapter 3.7. 2. Detection of Rabbit hemorrhagic disease virus 2 in the Pygmy Rabbit (*Brachylagus idahoensis*) in Nevada, USA. *The Journal of Wildlife Diseases* 59, no. 2 (2023): 342-346.

Kerr, P.J., Kitchen, A. and Holmes, E.C., 2009. Origin and phylodynamics of rabbit hemorrhagic disease virus. *Journal of Virology*, 83(23), pp.12129-12138.

Dead Birds and Powerlines - its not what you think

On August 9, journalist Julie Jung from the [Idaho Statesman](#) published an article discussing the impact of power lines on bird mortality. Utility poles and power lines often stand as the tallest structures in the landscape, serving as ideal perching, hunting, and nesting spots for birds.

The prevalent belief was that electrocution posed the primary threat to birds along these lines. However, Eve Thomason, a research associate at Boise State University's Raptor Research Center, along with her colleagues, embarked on a study to investigate this assumption. Their findings, recently published in the journal *iScience*, yielded surprising results. Out of 175 birds analyzed for



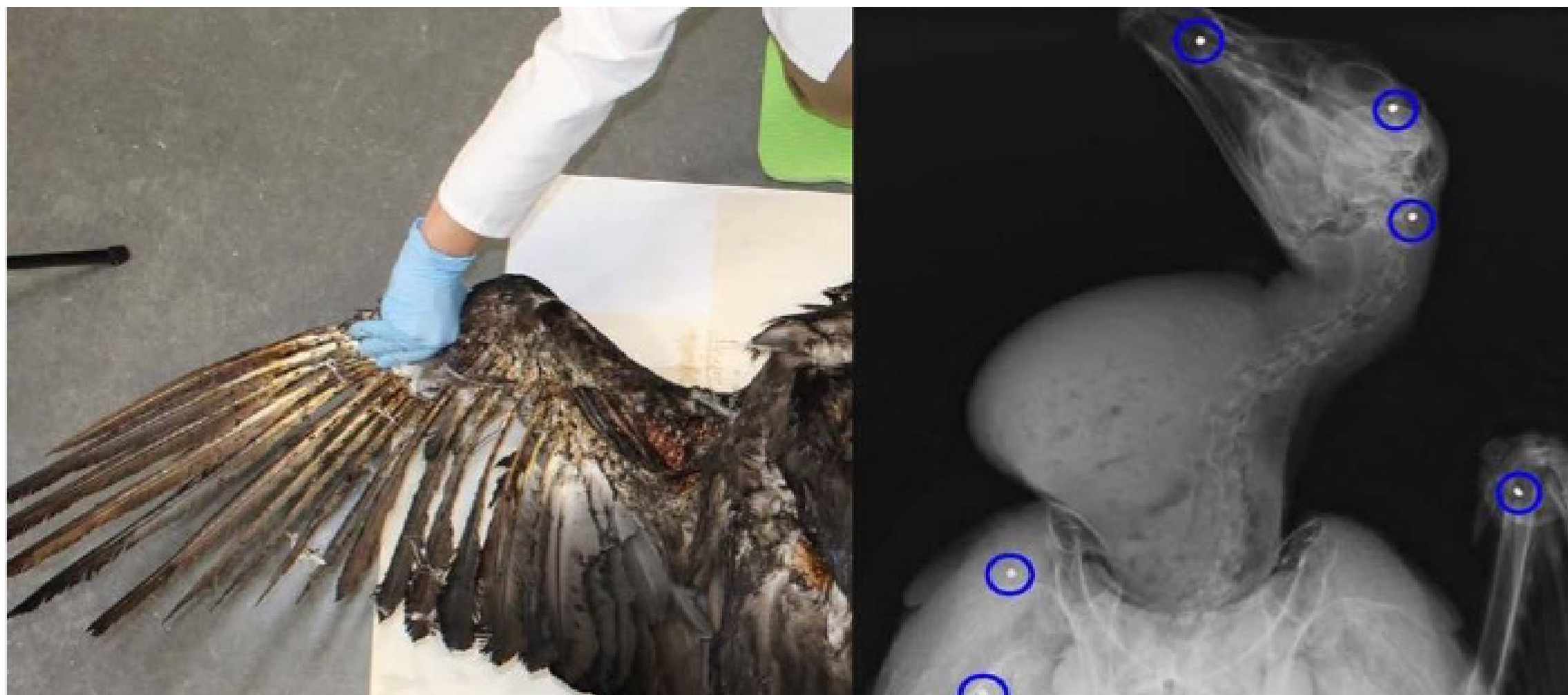
The Antelope Jackrabbit (*Lepus alleni*) is a lagomorph of Neotropical savanna and thornscrub in south-central Arizona, west-central Sonora, and western Sinaloa. Populations in Arizona are most abundant in tropic-subtropical areas of low relief. Their habitat is characterized by Velvet Mesquite with an herbaceous understory (= Sonoran Savanna Grassland), and receives a mean annual rainfall of between 200 and 450 mm, more than 90 mm of which falls during the monsoon. In Mexico, this hare most commonly occurred in savanna grasslands or thornscrub interrupted by open areas receiving between 200 and 450 mm of precipitation per annum. Cacti are important habitat components for the hares and mean annual temperatures were >18.8°C with less than 60 days/year having temperatures below 8 degrees C. Although sympatric with *Lepus californicus* over portions of its range, the two species preferred different habitats and rarely occurred together. *L. alleni* was more prone to occur in social groups than was *L. californicus*.

Brown DE, Babb RD, Lorenzo C, Altemus MM. 2014. Ecology of the antelope jackrabbit (*Lepus alleni*). *The Southwestern Naturalist*, 59(4):577-89.

cause of death, 66% were found to have died from gunshot wounds. In comparison, around 17% of deaths were attributed to electrocution and another 17% to collisions.

Remarkably, these bird shootings were illegal. The victims included protected species under state and federal laws, such as bald eagles, golden eagles, and various hawk species. Thomason and Todd Katzner, a wildlife biologist at the U.S. Geological Survey, explained the legal safeguards in place for these creatures. Protected by acts like the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, these native species receive legal protection at both state and federal levels.

Every bird discovered shot during the study, apart from a single pigeon,



belonged to protected species. This led to a crucial question raised by the research: Why are numerous protected birds falling victim to shootings? While the answer is likely complex, Thomason asserted its intricacy.

The research involved trained observers covering 122 miles of power lines across Idaho, Wyoming, Utah, and Oregon. A thorough examination of 410 dead birds was carried out to ascertain the cause of death. The Idaho Department of Fish and Game Wildlife Health and Forensic Lab played a pivotal role, in conducting thorough investigations including visual inspections, photographs, and X-rays.

Prior studies, primarily centered near Boise, had emphasized electrocution as the primary cause of bird deaths along power lines. However, Thomason and Katzner's study offered a more comprehensive assessment of affected populations. By meticulously examining each bird, including X-raying every carcass found, the researchers uncovered unexpected insights.

A photograph and X-ray taken during an examination of a bald eagle found dead by a power line near Jordan Valley, Oregon, revealed numerous pellets (blue circles) in association with fresh wounds, indicating the bird died from gunshot wounds and contacted power lines as it fell to the ground. Eve Thomason Boise State
[Read more at: https://www.idahostatesman.com/news/northwest/idaho/article277900473.html#storylink=cpy](https://www.idahostatesman.com/news/northwest/idaho/article277900473.html#storylink=cpy)

The study also emphasized the potential implications of these shootings. Aside from the ethical and legal aspects, public safety is at risk. Shooting birds on power poles without proper backstops can lead to projectiles being fired into the air, endangering electric equipment and potentially causing power outages or wildfires.

Furthermore, the economic burden extends downstream, as utilities undertake retrofits to improve safety, with these costs often passed on to consumers through power bills.

The study touched on the broader context of human impact on bird populations, citing previous research that attributed the loss of billions of birds in North America to human activities. A 2022 study highlighted shooting as a significant contributor to anthropogenic golden eagle fatalities. Thomason and Katzner raised questions about the motives behind shooting birds on power lines. While some cases involve recreational shooting or protection of livestock and game animals, the wildlife trade's illicit aspects also come into play.

Overall, the study challenged the notion that electrocution alone is the main cause of bird deaths on power lines, urging a deeper exploration of this issue to build a more accurate ecological understanding.

Ignorant people with guns are everywhere and Arizona is not immune to this kind of behavior. Report wildlife crimes to Arizona Fish and Game.

Meet a sky island endemic A rarely encountered dwarf funnel web spider

Like most spiders, mygalomorph species have eight eyes – one pair of principal eyes and three pairs of secondary eyes. Their chelicerae and fangs are notable for their size and strength, containing venom glands entirely within the chelicerae. Coupled with their robust build, these attributes render Mygalomorph spiders adept predators. Many of these spiders are well adapted to hunting other large arthropods and occasionally prey on small mammals, birds, and reptiles. Despite their formidable appearance and reputation, most mygalomorph spiders pose no threat to humans except for the Australian funnel-web spiders, particularly those of the *Atrax* genus.

While some of the largest spiders are mygalomorphs – *Theraphosa blondi*, for example, attains a body length of 3.9 inches and a leg span of 11 inches. Although most of these spiders are found in tropical and subtropical regions, some extend their range further north, into the southern and western parts of the United States. Despite their current distribution, there's a hypothesis that the Mygalomorphae were once spread across the globe before the breakup of Pangaea.

Out of 175 birds analyzed for cause of death, 66% were found to have died from gunshot wounds. In comparison, around 17% of deaths were attributed to electrocution, and another 17% to collisions.

The Dwarf Funnel Web Spider, *Hexurella apachea* was described in 1979 by Gertsch & Platnick . Dwarf funnel web spiders in the genus *Hexurella* Gertsch & Platnick, 1979 are infrequently encountered and poorly known. In this taxon's first and only revision, Gertsch and Platnick (1979) described four new species in this newly erected genus. This included two species from central and southeastern montane Arizona, one from far southern California, and one from northern Baja California Norte.

These mygalomorphs were found to be very small as adults, ranging in size from 2.5–5 mm, placing them among the most miniature mygalomorph spiders in the world. Gertsch and Platnick (1979) described the genus as uncommon, with two species known only from their respective type localities and the other species known from two or three sampling locations each. At the time of description, the genus was known from fewer than 20 individuals, with sparse natural history information suggesting a vagrant, web-building, cryptic (in litter or under rocks) natural history. Rodrigo Monjaraz-Ruedas and colleagues (2023) have revised the genus using molecular data. The species clustered in Arizona's sky islands is *Hexurella apachea* and low elevation Madrean oak communities between 1400–2075 meters. The other species are in southern California's Mojave Desert, northern Baja, and northwestern mainland Mexico. *Hexurella apachea* is sky island endemic.



The Apache Dwarf Funnel Web Spider photographed by Wyatt Mendez in Cochise County.

References

Gertsch WJ, Platnick NI. 1979. A revision of the spider family Mecicobothriidae (Araneae, Mygalomorphae). American Museum Novitates 2687: 1–32.

Monjaraz-Ruedas R, Mendez RW, Hedin M. 2023. Species delimitation, biogeography, and natural history of dwarf funnel web spiders (Mygalomorphae, Hexurellidae, Hexurella) from the United States/Mexico borderlands. ZooKeys. 2023;1167:109.