



Ecological Impacts of Federal Public Lands Livestock Grazing

Livestock have done more damage to the Earth than the chainsaw and bulldozer combined. Not only have livestock been around longer than developers, miners, and loggers, but they have grazed nearly everywhere. On mostly arid public lands, hundreds of thousands of non-native livestock (including cattle, sheep, goats and horses) trample vegetation, damage soil, spread invasive weeds, pollute water, steal forage from native wildlife, and even contribute to global warming.

Livestock grazing in riparian (streamside) areas—especially in the arid American West—causes immeasurable damage to riparian resources, including the loss of fish and wildlife habitat, soil erosion, and diminished water quality and quantity.

Public lands livestock grazing occurs not only on the "tree-free" landscapes in the American West, but also in many forested areas. In addition to the proliferation of roads, the scourge of logging and the exclusion of fire, livestock grazing plays a major role in creating unhealthy forests.

Grazing Impacts on Threatened and Endangered Species

Threatened and endangered plant and animal species inhabiting federal rangelands and imperiled by livestock grazing: **more than 175.**¹

Rank of livestock grazing as a cause of species endangerment in

...southern Arizona and western New Mexico	No. 1
...southern Nevada and central Arizona	No. 3
...California	No. 4
...northern Arizona, southern Utah and southern Colorado	No. 5 ²

In the United States, **grazing has contributed to the demise of 22 percent of federal threatened and endangered species**—nearly equal to logging (12 percent) and mining (11 percent) *combined*.³

Livestock grazing is especially harmful to plant species, affecting **33 percent of endangered plants.**⁴

¹ USDI-BLM, USDA-Forest Service. 1995. Rangeland Reform '94 Final Environmental Impact Statement. USDI-BLM. Washington, DC: 26. See also B. Czech, P. R. Krausman, P.K. Devers. 2000. Economic associations among causes of species endangerment in the United States. *BioSci.* 50(7): 594 (table 1) (reporting that authors' analysis of several studies suggests that 182 species are endangered by livestock grazing) and USDA-NRCS. 1997. America's private land: a geography of hope. Program Aid 1548. USDA-Natural Resources Conservation Service: 154 (stating that grazing is a contributing factor in the decline of 26 percent or 161 species on the federal threatened and endangered list). While these statistics are remarkable by themselves, the reported number of threatened and endangered species affected by grazing would be much higher if *livestock production* was considered on the whole as opposed to mere grazing. American livestock production is a pervasive industry that requires millions of acres of open range (public lands) and/or private pastures, feedlots, and related infrastructure and support facilities to feed, water, graze, transport, shelter, butcher, and market livestock. The ecological footprint of this industry is huge. Entire ecosystems and uncountable species are threatened because millions of acres of habitat are converted to monocultural crops of corn, barley, and other livestock food; large-scale agriculture and feedlots deplete aquifers and spoil water quality; rivers are damned and diverted (at public expense) to irrigate forage crops and support ranches in desert environments.

² Flather, C. H. and L. A. Joyce. 1994. Species endangerment patterns in the United States. Gen. Tech. Rep. RM-241. USDA-Forest Service. Fort Collins, CO: 24 (table 9).

³ Wilcove, D. S., D. Rothstein, J. Dubow, A. Phillips, E. Losos. 1998. Quantifying threats to imperiled species in the United States: assessing the relative importance of habitat destruction, alien species, pollution, overexploitation and disease. *BioScience* 48(8): 610.

Sensitive Focal Species Harmed by Livestock Grazing⁵

- Greater sage-grouse
- Gunnison sage-grouse
- Pronghorn (especially Sonoran subspecies)
- Bighorn sheep (California subspecies and Rocky Mountain subspecies)
- Black-footed ferret
- Wolf
- Grizzly bear
- Yellow-billed cuckoo
- Prairie dog (black-tailed, Gunnison's, Utah, white-tailed)
- Mexican spotted Owl
- Lesser prairie chicken
- Aplomado falcon
- Steelhead, salmon, bull trout
- Loach minnow
- Spikedace
- Chiricahua leopard frog

Livestock Competition with Native Wildlife

Forage Allocation

- In one study, scientists found that domestic livestock grazing consumed 88.8 percent of available forage (cattle and [domesticated] horses 82.3 percent, free-roaming horses 5.8 percent, sheep 0.7 percent), leaving 11.2 percent to wildlife species (mule deer 10.1 percent, pronghorn 0.9 percent, bighorn sheep 0.1 percent, elk 0.1 percent).⁶

Forage Use

- It is a simple concept: forage (grass, forbs [wildflowers], shrubs) consumed by domestic livestock is not available as food and cover for native wildlife—species that are important to healthy ecosystems, admired by wildlife enthusiasts, and prized by hunters. Range managers use the rather imprecise animal unit month or AUM to measure and allocate forage. An AUM is the amount of forage necessary to sustain a cow and calf for one month (approximately 650 pounds, although some estimates are more, between 800-1000 pounds⁷). Following are generally accepted AUM equivalents.

⁴ Wilcove, D. S., D. Rothstein, J. Dubow, A. Phillips, E. Losos. 1998. Quantifying threats to imperiled species in the United States: assessing the relative importance of habitat destruction, alien species, pollution, overexploitation and disease. *BioScience* 48(8): 610.

⁵ See, e.g., T. Jones and M. Salvo. 2006. "Mortgaging Our Natural Heritage: An Analysis of the Use of Bureau of Land Management Grazing Permits as Collateral for Private Loans." Distributed report. Forest Guardians, Santa Fe, NM; Sagebrush Sea Campaign, Chandler, AZ.

⁶ Cited in R. R. Kindschy, C. Sundstrom, and J. D. Yoakum, 1982, Wildlife habitats in managed rangelands—the Great Basin of southeastern Oregon: pronghorns, Gen. Tech. Rep. PNW 145, USDA-Forest Service; USDI-BLM, Portland, OR: 6.

⁷ GAO. 1988. Public rangelands: some riparian areas restored but widespread improvement will be slow. RCED-88-105. General Accounting Office. Washington, DC: 12.

Native Wildlife	Animals per AUM⁸	Domestic Livestock	Animals per AUM⁹
Bighorn Sheep	6.9	Cow	1
Pronghorn	10.8	Bull	1.25
Mule Deer	7.8	Horse	1.25
Elk	2.1	Goat	5
Bison	0.8	Sheep	5
Moose	1.2		

- The threatened desert tortoise eats less vegetation in one year than a cow eats in one day.¹⁰
- Livestock grazing degrades grass cover and nesting sites for grassland breeding birds, the most rapidly declining guild of birds in North America.¹¹
- Percentage of prairie dog towns eliminated for ranching in the 20th century: **98 percent.**¹²
- Number of species, including ferrets, hawks, owls, mice and snakes, dependent on prairie dogs and their burrows: **170.**¹³

“Probably no single land use has had greater effect on the vegetation of southeastern Arizona or has led to more changes in the landscape than livestock grazing range management programs. Undoubtedly, grazing since the 1870s has led to soil erosion, destruction of those plants most palatable to livestock, changes in regional fire ecology, the spread of both native and alien plants, and changes in the age structure of evergreen woodlands and riparian forests.”¹⁴

⁸ Willers, B. 2002. Where bison once roamed: the impacts of cattle and sheep on native herbivore. Pages 241-244 *in* G. Wuerthner and M. Matteson (eds.). WELFARE RANCHING: THE SUBSIDIZED DESTRUCTION OF THE AMERICAN WEST. Foundation for Deep Ecology/Island Press. Covelo, CA. (p. 243, *citing* U.S. Dept. Agric., 1976, National Range Handbook; and Wyoming Game and Fish Dept., 1998, internal data); and other sources.

⁹ Willers, B. 2002. Where bison once roamed: the impacts of cattle and sheep on native herbivore. Pages 241-244 *in* G. Wuerthner and M. Matteson (eds.). WELFARE RANCHING: THE SUBSIDIZED DESTRUCTION OF THE AMERICAN WEST. Foundation for Deep Ecology/Island Press. Covelo, CA. (p. 243, *citing* U.S. Dept. Agric., 1976, National Range Handbook; and Wyoming Game and Fish Dept., 1998, internal data); and other sources.

¹⁰ Forest Guardians. undated. Grazing to extinction (factsheet). Forst Guardians. Santa Fe, NM.

¹¹ *Cited in* T. Jones and M. Salvo. 2006. “Mortgaging Our Natural Heritage: An Analysis of the Use of Bureau of Land Management Grazing Permits as Collateral for Private Loans.” Distributed report. Forest Guardians, Santa Fe, NM; Sagebrush Sea Campaign, Chandler, AZ.

¹² Baskin, Y. 1997. THE WORK OF NATURE: HOW THE DIVERSITY OF LIFE SUSTAINS US. Island Press. Washington, DC: 165.

¹³ Miller, B., G. Ceballos, R. Reading. 1994. The prairie dog and biotic diversity. *Cons. Biol.* 8(3): 678 (*citing* R. Reading, 1993, *Toward an endangered species reintroduction paradigm: a case study of the black-footed ferret.* Ph.D. Diss., Yale Univ., New Haven, CT).

¹⁴ Bahre, C. J. 1991. A LEGACY OF CHANGE: HISTORIC HUMAN IMPACT ON VEGETATION OF THE ARIZONA BORDERLANDS. Univ. Arizona Press. Tucson, AZ.

Grazing Impacts on Riparian Areas

Livestock grazing has damaged 80 percent of the streams and riparian ecosystems in the arid West.¹⁵

“Extensive field observations in the late 1980s suggest riparian areas throughout much of the West were in the worst condition in history.”¹⁶

Although they represent only 0.5 to 1 percent of the surface area of federally owned Western arid lands,¹⁷ riparian zones are critically important to over 75 percent of terrestrial species in southeastern Oregon and southeastern Wyoming, and 80 percent of wildlife in the Arizona and New Mexico.¹⁸

Cattle tend to congregate in wet, shady areas for water and forage, and spend 5-30 times more time in cool productive zones than would be predicted from surface area alone.¹⁹

“Improvident grazing...has been the most potent desertification force, in terms of total acreage [affecting 225 million acres²⁰ or 351,562 square miles], within the United States.”²¹

Diversion of water from western streams for livestock watering and forage production reduces water quantity (and even entirely dewater streams),²² while the ditch diversions can also trap and kill fish.

Nearly all surface waters in the West are fouled with livestock wastes that produce harmful waterborne bacteria and protozoa such as Giardia.²³

¹⁵ Belsky, A. J., A. Matzke, S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. *J. Soil & Water Conserv.* 54(1): 419 (citations omitted).

¹⁶ Chaney, E., W. Elmore, W. S. Platts. 1993. Livestock grazing on western riparian areas. Northwest Resource Information Center. Eagle, ID: 5 (fourth printing; published by the Environmental Protection Agency).

¹⁷ U.S. Government Accounting Office. 1988. Public rangelands: some riparian areas restored by widespread improvement will be slow. RCED-88-105. Government Accounting Office. Washington, DC; Ohmart, R. D. 1996. Historical and present impacts of livestock grazing on fish and wildlife resources in western riparian habitats. Pages 245-279 *in* P. R. Krausman (ed.). RANGELAND WILDLIFE. Society for Range Management. Denver, CO.

¹⁸ Chaney, E., W. Elmore, W. S. Platts. 1993. Livestock grazing on western riparian areas. Northwest Resource Information Center. Eagle, ID: 2 (fourth printing; produced for the Environmental Protection Agency).

¹⁹ Roath, L. R. and W. C. Krueger. 1982. Cattle grazing and behavior on a forested range. *J. Range Manage.* 35: 332-338; J. M. Skovlin. 1984. Impacts of grazing on wetlands and riparian habitat: a review of our knowledge. Pages 1001-1103 *in* DEVELOPING STRATEGIES FOR RANGE MANAGEMENT. Westview Press. Boulder, CO.

²⁰ Chaney, E., W. Elmore, W. S. Platts. 1993. Livestock grazing on western riparian areas. Northwest Resource Information Center. Eagle, ID: 5 (fourth printing; produced for the Environmental Protection Agency).

²¹ Council on Environmental Quality. 1980. The global 2000 report to the president of the United States: entering the twenty-first century. Pergamon Press. New York, NY.

²² See G. Wuerthner. Guzzling the West's water: squandering a public resource at public expense. Pages 185-187 *in* G. Wuerthner and M. Matteson (eds.). WELFARE RANCHING. Island Press. Covelo, CA.

²³ Suk, T., J. L. Riggs, B. C. Nelson. 1986. Water contamination with giardia in backcountry areas *in* Proc. of the National Wilderness Conference. Gen. Tech. Rep. INT-212. USDA-Forest Service, Intermountain Res. Stn. Ogden, UT: 237-239. Livestock grazing is the single largest contributor to non-point source pollution in New Mexico, accounting for approximately 15 percent of the water quality impairments statewide. Next on the list is urban runoff, accounting for 12 percent of stream water impairments in the state. About 11 percent of stream-quality problems are due to the loss of streamside habitat, such as shade-providing vegetation and plants that anchor soils, which is exacerbated by livestock grazing. J. Rankin. *Plan to take better care of water quality is earning accolades; conservationists disagree.* Albuquerque Journal (May 15, 2005).

Belsky, et al. reviewed grazing impacts on water quality and quantity...²⁴

- **Water quality:** livestock deposit pathogenic bacteria into streams and increase nutrient content, water turbidity, and water temperatures, all of which harm cold water fish and other species.²⁵
- **Stream channel morphology:** grazing results in streambank downcutting that shrinks the stream channel, widens the waterway, and reduces streambank stability and the number and quality of deep pools and stream meanders that are important habitat for steelhead, salmon and trout.²⁶
- **Hydrology (stream flow patterns):** grazing causes increased runoff, flood water velocity, number of flood events, and peak flow, while reducing (or *stopping*) summer flow and lowering the water table.
- **Riparian soils:** grazing exposes bare ground, compacts soil and causes erosion, while reducing water infiltration and soil fertility.
- **Streambank vegetation:** grazing reduces the cover, biomass, and productivity of herbaceous and woody vegetation, and impedes plant succession.²⁷
- **Instream vegetation:** grazing increases algal populations while causing declines in other, beneficial water plants.
- **Aquatic and riparian wildlife:** grazing reduces the diversity, abundance, and productivity of cold water fish, amphibians, reptiles and invertebrates and alters the composition and diversity of birds and mammals.

²⁴ Adapted from A. J. Belsky, A. Matzke, S. Uselman. 1999. Survey of livestock influences on stream and riparian ecosystems in the western United States. *J. Soil & Water Conserv.* 54(1): 419-431.

²⁵ See also J. Carter. Stink water: declining water quality due to livestock production. Pages 189-192 *in* G. Wuerthner and M. Matteson (eds.). *WELFARE RANCHING*. Island Press. Covelo, CA.

²⁶ See also S. Fouty. 2002. Cattle and streams: piecing together a story of change. Pages 185-187 *in* G. Wuerthner and M. Matteson (eds.). *WELFARE RANCHING*. Island Press. Covelo, CA.

²⁷ **Streamside vegetation is important to riparian health. Trees, shrubs, grasses and forbs retard streambank erosion; filter sediments out of the water; promote infiltration of rainwater into the soil; build up and stabilize streambanks and streambeds; provide habitat for terrestrial species that depend on riparian areas (for example ducks, songbirds, beavers, amphibians, and insects); provide habitat for insect food sources for fish and birds.** H. H. Winegar. 1977. Camp Creek channel fencing – plant, wildlife, soil, and water response. *Rangeman's Journal* 4: 10-12; J. W. Thomas, C. Maser, J. E. Rodiek. 1979. Wildlife habitats in managed rangelands – the Great Basin of southeastern Oregon: riparian zones. Gen. Tech. Rep. PNW-80. USDA Forest Service, Pacific Northwest Research Station. Portland, OR; J. B. Kauffman and W.C. Krueger. 1984. Livestock impacts on riparian ecosystems and streamside management implications...a review. *J. Range Manage.* 36: 685-691; J. B. Kauffman. Lifeblood of the West: riparian zones, biodiversity, and degradation by livestock." Pages 175-176 *in* G. Wuerthner and M. Matteson (eds.). *WELFARE RANCHING*. Island Press. Covelo, CA.

Livestock Grazing and Invasive Species

Livestock cause weed invasion by grazing and trampling native plants; clearing vegetation, destroying the soil crust and preparing weed seedbeds through hoof action; and transporting and dispersing seeds on their coats and through their digestive tracks.²⁸

"At the community scale, livestock may be the major factor causing weed invasions."

Weeds spread on western federal lands at an estimated 4000-5000 acres per day.²⁹

Introduced weeds alter and damage western landscapes by increasing fire frequency, reducing biodiversity and wildlife habitat, and increasing topsoil loss.³⁰

Competition with or predation by alien species is the second-ranked factor for the listing of all threatened and endangered species.³¹

Livestock transport weed seeds into uninfested sites on their coats and feet and in their guts; preferentially graze native plant species over weed species; create patches of bare, disturbed soils that act as weed seedbeds; and destroy microbiotic crusts that stabilize soils and inhibit weed seed germination. Grazing also creates patches of nitrogen-rich soils, which favor nitrogen-loving weed species; reduces concentrations of soil mycorrhizae required by most western native species; and accelerates soil erosion that buries weed seeds and facilitates their germination.³²

Livestock grazing for "weed control" is counterproductive—research demonstrates that grazing harms native species, reduces species richness and vegetative cover, while promoting alien plant growth in many ecosystem types.³³

Cheatgrass, a noxious weed perpetuated by grazing and wildfire,³⁴ is now the dominant species on 100,000 million acres – 158,000 square miles – or one-third of the sagebrush grasslands in the Intermountain West.³⁵

²⁸ Belsky, A. J. and J. L. Gelbard. 2000. Livestock grazing and weed invasions in the arid west. Oregon Natural Desert Association. Bend, OR (citations omitted).

²⁹ Belsky, A. J. and J. L. Gelbard. 2000. Livestock grazing and weed invasions in the arid west. Oregon Natural Desert Association. Bend, OR: 4; Bureau of Land Management. 2000. Use of weed-free forage on public lands in Nevada. Fed. Reg. 65-54544. USDI-BLM.

³⁰ Belsky, A. J. and J. L. Gelbard. 2000. Livestock grazing and weed invasions in the arid west. Oregon Natural Desert Association. Bend, OR: 4 (citations omitted).

³¹ Wilcove, D. S., D. Rothstein, J. Dubow, A. Phillips, E. Losos. 1998. Quantifying threats to imperiled species in the United States. *Bioscience* 48: 609.

³² Belsky, A. J. and J. L. Gelbard. 2000. Livestock grazing and weed invasions in the arid west. Oregon Natural Desert Association. Bend, OR: 3.

³³ See Kimball, K. and P. M. Schiffman. 2003. Differing effects of cattle grazing in native and alien plants. *Conservation Biology* 17(6): 1681-1693 (grazing harms native plant species and promotes alien plant growth in California grasslands); M. L. Floyd, T. L. Fleishner, D. Hanna, P. Whiefield. 2003. Effects of historic livestock grazing on vegetation at Chaco Culture National Historic Park, New Mexico. *Conservation Biology* 17(6): 1703-1711 (native species richness and shrub and grass cover higher inside long-term grazing exclosures than on nearby grazed sites in northern New Mexico); T. L. Fleishner. 1994. Ecological costs of livestock grazing in western North America. *Conservation Biology* 8(3): 629-644 (p. 631, table 1) (native species richness and vegetative cover higher in absence of domestic livestock in a variety of western ecosystem types); A. Jones. 2001. Review and analysis of cattle grazing effects in the arid West, with implications for BLM grazing management in southern Utah: a literature review submitted to the Southern Utah Landscape Restoration Project. Wild Utah Project. Salt Lake City, UT.

³⁴ See E. J. Rawlings, K. K. Hanson, R. L. Sanford, J. Belnap. 1997. The striking effects of land use practices and *Bromus tectorum* invasion on phosphorous cycling in a desert ecosystem of the Colorado Plateau. *Bull. Ecological*

Livestock Grazing Major Factor in Unhealthy Forests

Livestock have actively participated in the destabilization of ponderosa pine and mixed coniferous forests.³⁶

The classic "park-like" stands of ponderosa pine and mixed conifer forests that once blanketed the interior West from British Columbia to New Mexico have changed dramatically for the worse since the introduction of domestic livestock.

Livestock grazing has modified forest dynamics by removing understory grasses, which serve two critical roles in a natural forest.

First, healthy, thick grass out-competes conifer seedlings and prevents the establishment of dense ("dog-hair") thickets of small trees that carry hot, destructive wildfires. The forest floor in pine forests and eastside mixed conifer forests was once carpeted with Idaho fescue and bluebunch wheatgrass, pinegrass and elk sedge. These "old-growth" grasses with their extensive root systems out-competed little tree seedlings for moisture and nutrients. The grasses also served as a source of nutrients and organic matter ("litter") that is critical for slowing surface water flow, enhancing water infiltration, insulating the soil from freezing, and mitigating the erosive force of precipitation.

Second, the natural grass stands served as fine fuels to carry low-intensity, beneficial ground fire across the forest floor, which sanitized forests of pests and disease, and killed tree seedlings, creating healthy forest parklands.

Gone with the grass are these beneficial fires. Dense stands of sapling- and pole-sized fire-sensitive species are now all too common. These species are more susceptible to stress during drought, making them more vulnerable to diseases and insect infestations. Fuel loads have increased ten-fold in the last 25 years.

Belsky and Blumenthal reviewed the scientific literature and found numerous examples comparing grazed and ungrazed (livestock was excluded, but not native wildlife), mostly unlogged forest stands. They found that the ungrazed stands retained their park-like character, in spite of active fire prevention and the absence of logging.³⁷

Soc'y of America 78: 300; J. Gelbard. 1999. Multiple scale causes of exotic plant invasions in the Colorado Plateau and Great Basin, USA. M.S. thesis. Duke University, Nicholas School of the Environment. Durham, NC.

³⁵ Rosentreter, R. 1994. Displacement of rare plants by exotic grasses. Pages 170-175 in S. B. Monsen and S. G. Kitchen. PROC. ECOLOGY AND MANAGEMENT OF ANNUAL RANGELANDS. Gen. Tech. Rep. 313. Intermountain Research Station. Ogden, UT: 170 (citing R. Mack. 1981. Invasion of *Bromus tectorum* L. into western North America: an ecological chronicle. *Agro-Ecosystems* 7: 145-165).

³⁶ Belsky, A. J. and D. M. Blumenthal. 1997. Effects of livestock grazing on stand dynamics and soils in upland forests of the interior West. *Cons. Biol.* 11: 315-327.

³⁷ Ibid.

Predator Control to Protect Livestock

Of the millions of dollars that taxpayers spend annually to subsidize public lands grazing, perhaps **\$5 - \$8 million** is dedicated to killing “predators” to protect livestock grazing on federal lands.³⁸ Native wildlife killed to protect livestock include coyotes, bobcats, wolves, mountain lions, and bears.

- Number of predators Wildlife Services killed in sixteen western states (FY 2007): **71,196**.³⁹
- Wildlife Services spent more than \$61 million of federal funds to control wildlife in FY 2007; more than \$18 million was spent to protect “agriculture” (including livestock) from animal damage; of that amount, \$10,303,903 was spent in the eleven western states with the most federal public land and federal public lands grazing.⁴⁰
- Percent of Wildlife Services predator control budget spent to protect livestock on public lands: **75 percent**.⁴¹
- Percent of predator control budget paid by ranchers: **1 percent**.⁴²
- Percent of cattle and calf losses attributed to predation (including dogs) (2005): **4.7 percent**.⁴³
- Percent of cattle and calf losses attributed to digestive problems, respiratory difficulties, calving complications, weather and other causes (2005): **95.3 percent**.⁴⁴

For more information, please contact Mark Salvo, Director, Sagebrush Sea Campaign, WildEarth Guardians at msalvo@wildearthguardians.org.

³⁸ Wildlife Services claimed to spend \$5.1 million to protect domestic livestock from predators on federal public lands in FY 2004 (**\$5 million**). GAO. 2005. Livestock grazing: federal expenditures and receipts vary, depending on the agency and the purpose of the fee charged. GAO-05-869. Government Accountability Office. Washington, DC: 6. However, this amount may be higher. The agency annually spends approximately \$10.3 million on activities in the eleven western states, and it is estimated that 75 percent of this amount is used to control predators on public land (**\$8 million**).

³⁹ Data compiled by WildEarth Guardians from Wildlife Services data tables for FY 2007. Total count includes black bears, bobcats, coyotes, mountain lions, northern gray wolves and Mexican gray wolves.

⁴⁰ Wildlife Services. 2008. Wildlife Services' 2007 Annual Tables: Table A. Wildlife Services Federal and Cooperative Funding by Resource Category – FY 2007. USDA, Animal and Plant Health Inspection Service, Wildlife Services.

⁴¹ O'Toole, R. 1994. Audit of the USDA Animal Damage Control Program. Cascade Holistic Economic Consultants. Oak Grove, OR: 1.

⁴² Rogers, P. 1999. Cash cows. *San Jose Mercury News* (Nov. 7, 1999): 6S.

⁴³ USDA-NASS. 2006. Cattle Death Loss. USDA-National Agricultural Statistics Service, Agricultural Statistics Board. (May 5, 2006). **Domestic dogs kill as many livestock as mountain lions, bobcats, bears, and wolves, combined.**

⁴⁴ USDA-NASS. 2006. Cattle Death Loss. USDA-National Agricultural Statistics Service, Agricultural Statistics Board. (May 5, 2006).