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The research cited below has demonstrated the following: 1) the benefits of managed grazing on the environment, habitat, wildlife, plant communities, and biodiversity; 2) grazing is a natural method of fuels reduction for grasslands and forests; 3) environmental loading assumed to be caused by cattle grazing needs to be considered in tandem with environmental loading caused by wildlife; 4) cattle grazing is often assumed the cause of ecological degradation, when, in fact, many environmental factors, such as annual precipitation, climate change, evolutionary modification, and wildlife impacts, need to be considered as well; 5) all interested parties can agree on the value and need for open space. Everyone would rather see ranches and rangeland than development and subdivisions.

Allen-Diaz, B., Jackson, R.D. 2000. Grazing effects on spring ecosystem vegetation of California's hardwood rangelands. Journal of Range Management 52: 215-220.
Summary: Species composition is not sensitive to existing grazing. Spring vegetation composition appears resistant to changes in both grazing and climatic conditions.

Allen-Diaz, B., Jackson, R.D., Bartolome, J.W., Tate, K.W., Oates, L.G. 2004. Long-term grazing study in spring-fed wetlands reveals management tradeoffs. California Agriculture. Vol. 58, No. 3: 144-148.
Summary: Grazing influences ecosystem productivity, and is therefore an important control on ecosystem services. Some degree of herbivory, though not intensive grazing, appears desirable from an ecosystem function perspective. Removal of livestock grazing from spring-fed wetlands resulted in decreased plant diversity, increased nitrate levels, and reduced methane emissions. Grazing, historically by wildlife and now by both wildlife and domestic grazers, is an integral part of spring-fed wetlands that has evolved as part of the entire ecological system.

Anderson, W.E. 1993. Prescription grazing to enhance rangeland watersheds. Rangelands. 15: 31-35.
Summary: Grazing can benefit rangelands when moderate utilization is employed to maintain stubble and residue cover. A rest rotation of grazing is used to build root systems and plant vigor in order to optimize vegetation cover, production and reproduction. A lack of grazing results in less quality herbaceous forage, forcing wild herbivores to relocate to areas where re-growth has occurred.

Atwill, E.R., R. Phillips, F. Rulofson. 2002. Environmental loading rates of the waterborne pathogenic protozoa *Cryptosporidium parvum* in certain domestic and wildlife species in California. Univ. of Calif., Davis. pp. 241-243.
Summary: There is a wide difference in oocysts excretion between young-stock and adults in cattle populations. Therefore, strategic management can be implemented to reduce the risks of infection from this parasite. Wildlife in this study (striped skunks, coyotes, California ground squirrels, and yellow-bellied marmots) produced considerably more oocysts per individual animal than either beef or dairy cows. The researchers stated that it would be prudent for regulatory attention concerning environmental loading of watersheds with *C. parvum* to more equally focus on the role of wildlife.

Atwill, E.R., E. Johnson, and M. das Gracas C. Pereira. 1999. Association of herd composition, stocking rate, and calving duration with fecal shedding of

***Cryptosporidium parvum* oocysts in beef herds. J. Am. Vet. Med. Assoc. 215: 1833-1838.**

Summary: Cattle from herds with a high number of young calves, a high stocking rate, or a longer calving season were more likely to shed *C. parvum* compared with cattle from herds with opposite characteristics. Researchers concluded that reproductive management resulting in shorter calving season and the use of a lower stocking rate may be associated with reduced risk of *C. parvum* shedding.

Atwill, E. R., S. Maldonado Camargo, R. Phillips, L. Herrera Alonso, K. W. Tate, W. A. Jensen, J. Bennet, S. Little, and T. P. Salmon. 2001. Quantitative shedding of two genotypes of *Cryptosporidium parvum* in California ground squirrels (*Spermophilus beecheyi*). App. Environ. Microbiol. 67: 2840-2843.

Summary : Sixteen percent of California ground squirrels were found to be shedding an average of 53,875 *Cryptosporidium parvum* oocysts/g of feces. Male squirrels had a higher prevalence and intensity of shedding than female squirrels.

Barry, S.J. Managing the Sacramento valley vernal pool landscape to sustain the native flora. California Vernal Pools. 236-240.

Summary: Threats that can directly alter the infiltration, drainage, and general hydrology of a vernal pool include urban development, water supply/flood control activities, and conversion of land to intensive agricultural use. Complete rest from livestock grazing may indirectly alter vernal pool hydrology and threat its native plant species. Additionally, complete rest may alter the soil surface and decrease the diversity of vernal pool microecosystems. Finally, without livestock grazing around vernal pools certain exotic annual species, such as Annual Ryegrass and Medusahead, may be promoted.

Boarman, W.I. 2001. Effects of livestock grazing on a community of species at risk of extinction in the San Joaquin valley, California. USGS. http://www.werc.usgs.gov/sandiego/lokern/lokern.htm

Summary: When compared to ungrazed control plots, cattle in this study have reduced the overall vegetative cover on the treatment plots, especially the density of the invasive exotic grass, red brome. Population sizes of endangered species on control versus treatment plots were random. The arid environments of these plot areas vary greatly in rainfall from year to year, which influences vegetative cover and species populations and diversity. This is a continuing study in which the researchers hope to distinguish more of the long-term effects of rainfall versus grazing on these rangelands.

George, M.R., Larsen, R.E., McDougald, N.K., Tate, K.W., Gerlach, J.D., Fulham, K.O. Cattle grazing has varying impacts on stream-channel erosion in oak woodlands. 2004. California Agriculture. Vol. 58, No. 3: 138-143.

Summary: Streambank erosion was not detected as a result from any of the grazing treatments applied. Researchers found that cattle trails are an important mode of sediment transport into stream channels. Researchers stated that cattle impacts on stream channels can be limited by management practices such as reducing the distance between foraging sites and water sources. Researchers stated their preference for these practices over more restrictive options such as reducing stocking rates, terminating grazing leases, fencing riparian areas, or even total livestock

exclusion. Livestock exclusion limits the ability of land managers to use grazing to manage wildlife habitat, fire fuel loads, and weed infestations.

George, M.R., Larsen, R.E., McDougald, N.K., Tate, K.W., Gerlach, J.D., Fulham, K.O. Influence of grazing on channel morphology of intermittent streams. 2002. Journal of Range Management. 55: 551-557.

Summary: Stream morphological responses were averaged across years to assess potential alteration of stream channel morphology due to cattle grazing. Morphological parameters included channel width, distance to right and left bank, maximum depth, mean depth, cross-sectional area, and width-to-depth ratio. The results indicated that grazing had little effect on the morphology of the bedrock limited, intermittent stream channels.

Harper, J., Tate, K., George, M. 2004. Fact Sheet No. 14: "Grazing Effects on Riparian Areas." University of California Cooperative Extension. http://danr.ucop.edu.uccelr/h20.htm

Summary: When given the opportunity, cattle will spend longer amounts of time in riparian areas than drier upland areas. Observations and studies have shown the effects grazing can have on riparian areas, such as channel widening, higher stream temperatures, change in vegetation, etc. Permanent removal of grazing will not guarantee maximum plant production. Well-managed grazing produces much fewer impacts than abusive grazing.

Hayes, G.F., Holl, K.D. Cattle grazing impacts on annual forbs and vegetation composition of mesic grasslands in California. 2003. Conservation Biology. Vol. 17, No.6: 1694-1702.

Summary: In general, the numbers of species in grazed and ungrazed sites were similar. However, the number of native and exotic annual forb species was higher in grazed sites, while the number of native perennial forb species was higher in ungrazed sites. Studies are cited which agree that species richness responds positively to grazing. When determining an ecosystem's response to grazing, evolutionary history and amount of precipitation must be considered. The research demonstrated that a disturbance such as grazing may have positive and negative aspects on conservation of different native guilds and even different species within each guild.

Hoar, B., E. R. Atwill, and T. B. Farver. 2000. Estimating maximum possible environmental loading amounts of *Cryptosporidium parvum* attributable to adult beef cattle. Quan. Microbiol. 2: 21-36.

Summary: This cross-sectional survey on California beef cows generated a prevalence of infection of 1.1% of *Cryptosporidium parvum.*

Krueger, W.C., Sanderson, M.A., Cropper, J.B., Miller-Goodman, M., Kelley, C.E., Pieper, R.D., Shaver, P.L., Trlica, M.J., Allen, V.G., Fisher, D., Havstad, K.M., Sims, P.L. 2002. Environmental impacts of livestock on U.S. grazing lands. Council for Agricultural Science and Technology. No. 22

Summary: Properly managed grazing lands can provide a multitude of environmental benefits, including the provision of clean water supplies, the capacity to sequester atmospheric carbon, and the potential to maintain biodiversity. Livestock grazing is unique as a management tool because it acts as a natural resource manager for developing and maintaining desirable plant

community structures, decreasing fuel loads to reduce wildfire risks, and regulating nutrient cycling in the ecosystem. Grazing may stimulate basal shoot production in grasses and lateral branching in shrubs. Production of seed may decline, while vegetative reproduction may increase. One problem associated with excluding livestock grazing from ecosystems that evolved with grazing is a decrease in biodiversity through competitive exclusion of certain plant species. As much as 75-95% of the nutrients consumed by a grazing animal as herbage and supplement may be returned to the pasture in feces and urine.

Lile, D.F., Tate, K.W., Lancaster, D.L., Karle, B.M. 2003. Stubble height standards for Sierra Nevada meadows can be difficult to meet. California Agriculture. Vol. 57, No. 2: 60-64.

Summary: Stubble height standards are an annual grazing management tool, designed to achieve general riparian resource protection, not a long-term management goal. Direct links between stubble height and riparian resource goals are not evident in published scientific literature. The effect of weather patterns on plant height should be factored into the annual application of stubble height standards.

Maestas, J.D., Knight, R.L., Gilgert, W.C. 2003. Biodiversity across a rural land-use gradient. Conservation Biology. Vol. 17, No. 5: 1425-1434.

Summary: Researchers compared the nature of avian, mesopredator, and plant communities between nature reserves, cattle ranches, and exurban developments. Tree nesting bird populations were higher on exurban developments than reserves or ranches, while ground and shrub nester populations were higher on ranches and reserves than on exurban developments. Ranches had plant communities with more native species diversity and less non-native species and cover, than other land use types. The results stated that ranches are important for protecting biodiversity, and that future conservation efforts should focus more on private working lands than on reserves.

Marty, J. 2004. Vernal pools are at home on the range. National Wetlands Newsletter. Vol. 26, No. 4: 12-14.

Summary: Livestock grazing can be beneficial to vernal pools by reducing the cover of invasive non-native species, and by replicating ecological disturbance processes vital to local ecosystems. This process can thereby help prevent the loss of species dependent on the processes of native herbivores. Researchers observed that removing grazing had significant negative effects on the pools' native plant communities, hydrology, and aquatic invertebrate communities. Grazing can help maintain biodiversity.

McInnis, Doug. 1998. "A Change of Heart." ***Beef Magazine,*** **1 Feb.**

Summary: The biggest threat to western ecology is development. Urbanization is spreading and often the best wildlife habitat is converted to development. All parties involved in this project agreed they would rather see rangeland being used by ranchers for grazing, than built into subdivisions.

Pyke, C.R., Marty, J. 2005. Cattle grazing mediates climate change impacts on ephemeral wetlands. Conservation Biology. Vol. 19, No. 5: 1619-1625.

Summary: Researchers conducted experimental manipulations to quantify the interactions between climate changes and local resource management. The study revealed that grazing played an important role in maintaining the hydrological suitability of vernal pools for endangered aquatic invertebrates and amphibians, such as the fairy shrimp and (California tiger) salamander. Land management must be considered when measuring the ecological results of climate change.

Reiner, R.J. 1999. Protecting biodiversity on grazed grasslands in California. AAAS.
Summary: Results showed that if grasslands in a mixed grass prairie were subjected to moderate levels of disturbance, they contained greater biodiversity. Therefore, species may be lost when grasslands are excluded from fire and grazing. The researcher concluded that the long-term interests of organizations concerned with protecting biodiversity and those making a living raising livestock are not mutually exclusive.

Robbins, Scott. "The Maino Ranch Project." Coastal San Luis Resource Conservation District. 2000. 5 Jul. 2006. http://www.coastalrcd.org/Maino.html
Summary: The resting of land associated with eliminating grazing is not "natural." During rest, old plant material gradually decomposes through oxidation and weathering. When the soil surface is not disturbed, new plants don't easily replace dying plants. Proper grazing practices can maintain grassland communities by retarding a shift towards woods species, covering of the soil, and increasing the diversity of grass species. Grazing can also enhance the water cycle by creating healthier and more stable root systems and improving soil surface water.

Stelljes, KB. 1995. Rangeland can improve with grazing. Agricultural Research. 15.
Summary: A 50-year study in Oregon showed that degraded rangeland can recover just as quickly with managed, moderate grazing, as with no grazing at all. Rangeland recovered with managed grazing provided habitat for wildlife as well.

Tate, K.W. 2005. Confirmation of riparian friendly grazing project results and development of achievable, site specific reference conditions for grazed riparian areas. USDA Western Sustainable Agriculture Research and Education Program.
Summary: Implementation of simple livestock distribution tools, such as herding and salting away from streams, is associated with increased riparian health. Potentially negative impacts of grazing can be overcome with technically simple, low infrastructure-dependent techniques. Producer adoption of these techniques is likely because of the simplicity and intuitive nature of the recommendations.