Management and Conservation Article

A Household Perspective for Biodiversity Conservation

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ABSTRACT Many researchers have implicated human population density in species endangerment, but these correlative studies do not demonstrate causality. We propose that hypotheses implicating human population density in wildlife endangerment at global and national scales owe their public and academic currency as thoroughly to inductive reasoning and repetition as to scientific experimentation. It follows that alternative research hypotheses generated from the same facts should provide equally tenable results. Household density provides such an alternative hypothesis and is growing faster than human population density. We used linear multiple regression models to demonstrate that household density provides a viable alternative statistical hypothesis to human population density for explaining species endangerment (household model, $r^2 = 0.85$; population model, $r^2 = 0.84$). We then suggest adopting a household perspective for biodiversity conservation because 1) social norms and practices render a household approach to conservation more pragmatic than a human population perspective and 2) shifting the focus toward households could facilitate movement from a human-versus-nature ethic to a humans-situated-within-nature ethic (e.g., a land ethic). Wildlife managers and researchers concerned about the negative influence humans have on biodiversity should consider grounding research, theory, and policy decisions in the dynamics of human households as an alternative to human population. (JOURNAL OF WILDLIFE MANAGEMENT 71(4):1243–1248; 2007)

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Chapin et al. (2000) argued that human alteration of the environment has triggered the sixth major extinction event in the history of life, and some conservation biologists attribute every continental extinction in recorded history to anthropogenic factors (Soulé 1983, Diamond 1986, Kerr and Currie 1995). Further research on biodiversity loss supports conflating human existence with human impacts. Researchers have repeatedly sought and found a correlation between human population density and species endangerment threats on national and global scales (Kerr and Currie 1995, Forester and Machlis 1996, Kirkland and Ostfeld 1999, Czech et al. 2000, McKee et al. 2004).

Some may view these studies as bravely disregarding the taboo that prevented serious consideration of human population growth as the central cause of environmental problems (Hardin 1993:4), but the population-as-the-problem paradigm has a long history dating back at least to Malthus' *An Essay on the Principle of Population* (Malthus [1798] 1970). This paradigm can be traced through Malthus' justification of starvation among the poor (Young 1985, Murphy 1999), the atrocities of Social Darwinism and eugenics (Hitler 1943, Ferry 1995), arguments for forced sterilization of all Indian men with 3 or more children in *The Population Bomb* (Ehrlich 1971:151), and Hardin's (1993) lifeboat ethics. For Hardin, beating back the poor from first-world lifeboats was essential to prevent capsizing the boat and drowning everyone. Eric Pianka's recent series of lectures focusing on human population growth as the fundamental ecological disaster of our time provide a contemporary example of this paradigm (Austin 2006). Although Pianka was merely reiterating the population-as-the-problem perspective, talk radio, blogs, and several newspapers suggested he advocated death for most humans as the only means for saving the environment. Pianka defended himself by arguing he does not want humans to die, but a death threat, angry e-mail, and floods of negative press (Austin 2006) reflect some inescapable logic: if population is the problem, then depopulation is the solution.

Although research on relationships between human numbers and biodiversity loss represents a welcome departure from occasional periods of ignoring population-related problems, it does not demonstrate causal relationships. More immediately significant to wildlife managers, it inadvertently builds on a morally repugnant foundation that promotes defensive responses among the general public. Assuming human population density causes species endangerment relies solely on induction (Benton and Craib 2001). The academic currency of this hypothesis owes more to cultural preferences in first-world countries, and to repetition, than to the hypothetico-deductive (HD) scientific method (see Romesburg 1981). Without the replication and experimentation implicit to HD science, correlations can be as meaningless as increasing intelligence tracking shoe size. Because replicated manipulative experimentation (Sinclair 1991, Krebs 2000) on this issue would require socially unacceptable activities such as causing species extinctions and manipulating the number of humans living at a given time, this form of HD science necessarily is unavailable to biologists interested in protecting biodiversity. Instead, the strength of population claims must lie in a lack of viable alternative hypotheses.

Per-capita consumption has long been one alternative to

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Table 1. Coefficient values for independent variables in multiple linear regression models predicting species endangerment in hotspot countries.

	Independent variables								
	Species richness		Household density		Population density		Intercept		
	Coeff.	*P*	Coeff.	*P*	Coeff.	*P*	Coeff.	*P*	r^{2a}
Population vs. household[b]									
Full model	0.79	0.00	0.47	0.06	−0.30	0.26	−0.36	0.09	0.82
Final model	0.85	0.00	NA	NA	NA	NA	−0.57	0.00	
Household density									
Model	0.77	0.00	0.20	0.00	NA	NA	−0.53	0.00	0.85
Population density									
Model	0.77	0.00	NA	NA	0.18	0.00	−0.63	0.00	0.84

[a] r^2 values reflect final models after we removed independent variables with *P* values >0.05.
[b] In the population and household model, we removed household density and population density from the final model by stepwise regression due to high autocorrelation.

the population hypothesis, but its complex multifaceted nature made statistical correlations difficult to demonstrate. Recently, however, Liu et al. (2003) suggested household numbers as a quantifiable variable indicative of per-capita consumption that should be tied to biodiversity loss. Households are the basic socioeconomic and consumption unit globally (Wheelock and Oughton 1996), and not only include the impacts of human density, but also affluence, consumption, and technology (York et al. 2002, Liu et al. 2003).

Evaluating household density as an alternative explanation for species endangerment seems prudent for several reasons. Humans have contributed to species extinction since at least the Pliocene–Holocene megafaunal extinctions (McKee 2001), when the global human population had yet to reach half a billion. Evidence regarding direct mechanisms of extinction is clear: urban development is the second leading cause of endangerment in the United States, whereas human numbers have no direct linkage with endangerment (Czech et al. 2000). Finally, Liu et al. (2003) found that annual rate of growth in the number of households in biodiversity hotspots (3.2%), most of which were in developing nations, was nearly double the rate in non-hotspot nations (1.7%), and household numbers are increasing even where human populations are declining (Liu et al. 2003). Focusing on the growing threat seems prudent.

If the household perspective yields a viable alternative to the population hypothesis, then we should conduct ethical and social evaluations to determine which perspective would most effectively ground public policy designed to ameliorate loss of biodiversity. To demonstrate the existence and potential effectiveness of such an alternative, we 1) use linear multiple regression models to demonstrate that household density—an index to consumption—provides a viable alternative statistical hypothesis to human population density for explaining species endangerment, 2) demonstrate that ethical and social norms render the household perspective more pragmatic than the population perspective for conserving biodiversity, and 3) argue that shifting conservation's focus toward households might facilitate movement from human-versus-nature ethics to humans-situated-in-nature ethics (e.g., a land ethic; Leopold 1949).

METHODS

We developed a linear multiple regression model to determine whether households and human population density could be interchangeable predictors of species endangerment. We replicated the model and methods described by McKee et al. (2004) to facilitate comparisons. The model used species richness, household density, and population density as independent variables for predicting species endangerment in biodiversity hotspot countries (Table 1). We based our analysis on mammals and birds, whose status is best known, and we used the International Union for the Conservation of Nature and Natural Resources (IUCN) Red List (Hilton-Taylor 2000) data for endangerment (critically endangered, endangered, and vulnerable) and World Resources Institute (2003) data for species richness. McKee et al. (2004) also used World Resources Institute (2000) data for species richness, although their paper refers to the United Nations Environment Programme's World Conservation Monitoring Centre Animals of the World Database as the source (J. K. McKee, Ohio State University, personal communication). We used 2003 data for species richness because breeding bird diversity estimates were improved in the more recent version. We included 68 nations containing hotspot areas, eliminating only the smallest island nations (Liu et al. 2003). We compiled household and population data from the United Nations Centre for Human Settlements (2001). We divided all frequency data by each nation's area (in 10^6 km^2) to account for size differences among nations and log-transformed it (base 10) to meet normality assumptions (McKee et al. 2004). We removed independent variables from the multiple regression equation if *t* values for their coefficients were not significant at $P < 0.05$. We chose not to use stepwise procedures because probable collinearity between household and population density could yield multiple regression models with highly significant *F* values, but insignificant *t* values for the independent variables (Ott and

Longnecker 2001). We calculated all statistics using Statistica 6.1 (StatSoft, Tulsa, OK).

Our remaining results rely on logical comparison of the household and population perspectives of biodiversity conservation. All logical arguments require premises, and we rely on 3: 1) pragmatic approaches for biodiversity conservation must be capable of implementation within current sociopolitical contexts because changing dominant social norms is supremely difficult and beyond the scope of wildlife conservation, 2) pragmatic approaches to future biodiversity conservation must reflect dominant social norms, and 3) respect for negative and positive human rights is a dominant social norm. Negative rights only require restraint (e.g., not shooting people, not burning down someone's house; Hospers 2005). Positive rights require action (e.g., education, welfare; Halper 2003).

RESULTS

Statistical Comparison of Household and Population Perspectives for Biodiversity Conservation

As is typically found, species richness predicted numbers of threatened species best (Table 1; McKee et al. 2004). The t values for human household density and population density were insignificant because neither had additional predictive power over the other. The correlates of threatened bird and mammal species per unit area and species richness per unit area, household density, and population density were 0.91, 0.56, and 0.58, respectively. Higher collinearity between population density and species richness, as compared to household density and species richness ($r = 0.50$ vs. 0.45), explained why household density had a higher t value than population density. By themselves, both variables were significant predictors of species endangerment (Table 1). We found no significant correlation between species endangerment and household or population growth rates for 1985–2000. Household density (coeff.: 0.20) and population density (coeff.: 0.18) contribute equally to projected increases in species endangerment in our models.

Pragmatic Advantages of a Household Perspective for Biodiversity Conservation

Because households and human population density are statistically equally powerful predictors of species endangerment, ecologists and environmental managers could legitimately ground policy decisions in either (or both). Without experimentation, neither households nor population should be given preferential treatment in environmental decision making based on HD science. Although the statistical uncertainty poses a challenge, it also offers an opportunity to identify a biodiversity conservation approach consistent with cultural values and social identities.

These values and identities make a household approach to biodiversity conservation less problematic than a human population approach. Dominant social norms suggest humans—and humans alone—have intrinsic value and should not be used as means to an end (Kant [1873] 1949). Therefore, parenthood is often considered an inalienable human right on par with life, liberty, and the pursuit of happiness (O'Neill and Ruddick 1979, Holmes et al. 1980, Philip and Thomas 1986, Moskowitz and Jennings 1996). Houses, however, clearly are means to an end (shelter for humans). American jurisprudence has recognized this fact by shifting from viewing property as an inalienable right to viewing property as a political construct (Horwitz 1992). Although shelter may also be a basic human right, houses, second homes, and specific size, expense, or locations for homes certainly are not.

Within an ideal libertarian state, where maximal liberty is constrained only by interference in the liberties of others, several scenarios dictate regulation of households (e.g., property) but not procreation. Libertarian defenses of property (e.g., households) are based on respect for negative rights—those requiring restraint (e.g., not shooting people) rather than acting (e.g., providing universal health care)—and derive from individual freedom (Horwitz 1992, Hospers 2005). Without property rights, someone could take the fruits of our labor, depriving us of liberty and thus enslaving us (Hospers 2005). Corporations make similar takings claims, rooted in profit loss, when restrictions are placed on their properties (Helvarg 1994, Gunningham et al. 2003). Negative rights perspectives, however, do not preclude regulating households. For example, the products of one's labor can be protected in forms of property other than houses or land, and when houses are used, value can be preserved even if locations and sizes of houses are regulated. Dwelling rights are part of property rights, which are culturally less fundamental than life rights. This places fewer negative-right restrictions on regulation of households than on regulation of birth rates.

Many rights-based perspectives, however, consider positive rights (those requiring action; e.g., education, welfare). Most industrialized societies subsidize healthcare intended to increase human survival and quality of life. Although public healthcare systems in these nations vary from the comprehensive care provided to residents of Scandinavian countries to Medicare and Medicaid in the United States, all suggest that human life is a positive right (i.e., one that imposes an obligation on others or on the state) valued by humanity. Housing programs also are socially subsidized in most industrialized nations, indicating that both the shelter and autonomy provided by a house are valuable positive rights. Although the difference between life and housing is less clear from a positive-rights perspective than from a negative-rights perspective, life still outranks housing.

Regulating net household proliferation does ultimately end in questions about rights (e.g., Does each individual have a right to a house? A large house? An opulent large house?), but not inalienable rights (e.g., life). For example, in both Western Europe and the United States, the rule of law protects private property, but, when necessary to provide a public use, allows environmental statutes and regulations that remove rights associated with ownership (Horwitz 1992, Varner 1994). The Fifth Amendment of the United States Constitution states that private property may be taken for "public use," and a recent Supreme Court ruling

(Susette Kelo et al. *v.* City of New London, Connecticut et al., 23 Jun 2005) defined "use" broadly enough to include economic development plans (e.g., river walks, restaurants, new hotels). Although this last step is controversial, it demonstrates the flexibility of household regulation as a policy tool relative to life regulation. The bitter divisions over when life begins in debates over abortion demonstrate the fragility of a conservation policy rooted in the human population perspective.

Pragmatically, household regulation fits more comfortably within currently dominant ethical perspectives, thereby facilitating more immediate implementation of biodiversity conservation initiatives. Zoning laws protect watersheds, beaches, and parks throughout the world. In the United States, environmental regulations (e.g., the Endangered Species Act of 1973) have limited household development in critical areas and have dictated development location in many communities (Varner 1994; Peterson et al. 2002, 2004). Although many governments are required to pay for private property takings, they have the authority to destroy homes to create refugia for imperiled species. Both national and local governments limit the number of houses per hectare, specify who may or may not build houses, and sometimes destroy houses for the good of the community. Governments restrict the size, shape, location, and efficiency of houses. In addition, governments indirectly reduce household development by increasing costs. For example, the United States Congress enacted the Coastal Barrier Resources Act of 1982 at least in part to increase the cost of building and maintaining houses in the coastal margins of the United States. The Act simply eliminated perverse incentives for development in the coastal margins (e.g., federally subsidized mortgages, loans, and flood insurance).

Western law and policy currently addresses the creation, destruction, and type of houses, but not the creation, destruction, or type of human beings. Governments rarely have the authority to prevent humans from giving birth (nations characterized by extreme poverty and human rights abuses [United Nations 1948] are notable exceptions), and, indeed, have some responsibility for ensuring that such births result in a living child. Governments may not destroy infants after they are born or dictate the size, shape, or color of individual humans (United Nations 1948). Further, with few exceptions (e.g., military bases, wilderness areas), laws in developed countries do not restrict where people can go. Rather than restricting human access to relatively pristine areas, the United States Congress attempted to promote experience with wildlife with the National Wildlife Refuge System Improvement Act of 1997. It acknowledged that wildlife-dependent recreation fosters appreciation for fish and wildlife conservation, and made wildlife-dependent recreation that was compatible with wildlife conservation the priority for general public use of the system (Public Law 105–57, 9 Oct 1997, Section 5).

Finally, a household perspective toward biodiversity conservation has greater spatial and temporal immediacy than a population perspective. Decisions regarding households impact wildlife conservation here and now. A population perspective places the major challenge for biodiversity conservation spatially distant from the centers of Western science (e.g., wildlife management) and money in Europe and North America because natural population growth is mostly occurring in developing nations. The population perspective also makes biodiversity conservation temporally distant in both developing and developed nations because the impacts of family planning take a generation to impose themselves.

DISCUSSION

Hypothetico-deductive science lends equal credence to household and population perspectives for biodiversity conservation. Given this starting point, logic suggests a household perspective has more to offer because it respects both negative and positive rights, and can operate within current political and legal constraints. We have painted ourselves into an ethical corner with the population-as-the-problem paradigm. The personal attacks (e.g., Dr. Death, Dr. Doom, an advocate of eugenics and genocide, etc.), derogatory newspaper articles, and public outcry resulting from Pianka's 2006 population-as-the-problem lectures demonstrate this fact. The human population perspective makes biodiversity–conservation advocates the enemies of humanity in a world where conservation relies on the generosity and empathy of humans. Policy makers and conservationists contribute to psychological isolation between humans and other species when they frame human existence as inimical to biodiversity. Considering the very existence of humans inimical to conservation pits value for human life against value for nonhuman nature: a lose–lose scenario.

Of course, conceptualizing household dynamics as a nexus with biodiversity conservation will not directly reduce species endangerment. The household perspective must work indirectly by changing the way society conceptualizes its interaction with the environment, and may be uniquely situated to do so. Traditional environmental ethics find value either in nature (e.g., deep ecology, some versions of the land ethic) or in specific entities deemed worthy of moral standing (e.g., Kantianism, eco-feminism, animal rights; Light and Rolston 2003). These perspectives make humans master consumers of utility, rights, or value provided by nature (Thompson 2003). In order for biodiversity conservation to resonate with the general public, society requires a moral foundation rooted in human relationships with the environment rather than simply the consumption of utility and rights provided by the environment (Leopold 1949, Thompson 2003). Beyond overcoming the pragmatic constraints of a population perspective toward biodiversity conservation, a household perspective may facilitate movement from this human-versus-nature ethic to a humans-situated-within-nature ethic.

Because community is constructed through social relationships (Hegel 1807 [1977], Peterson et al. 2005), relationship-based environmental ethics provide a necessary context for creating the inclusive land community advocated by

Leopold (1949). Thus, an environmental ethic that recognizes nonhuman beings as members of the community requires cultivation of reciprocal relationships between humans and nonhumans (i.e., most of biodiversity). Agrarianism represents the dominant relationship-based environmental ethic and means of cultivating such reciprocal relationships between humans and the environment in Western culture (Montmarquet 1989, Peterson 1990, Mariola 2005). In agrarian philosophy the relationship with nature formed through subsistence activities (e.g., horticulture, animal husbandry, farming, and forestry) originates value. Human articulation with the land rather than humans "contemplating natural landscapes as if they were cuts of meat or paintings in a museum" creates value (Thompson 2003:78).

Households provide the most tangible contact with nonhuman dimensions of the land community for people in modern industrialized nations. Limiting houses to protect the habitat of endangered species places humans in a reciprocal relationship with the environment because more houses in less space reflects crowding (more houses per hectare) or loss of portions of the land community that no longer fit (the endangered species). Thus, regulating household proliferation, size, density, and location legitimizes human experience within environmental limits, and focuses on reciprocal relationships that people actually have with the land, as well as with other species via their home. A household perspective can enrich studies of extinction risk by focusing on human articulations with nature.

Oikos, or household, is the Greek root of ecology, economics, and related terms, and could serve as the root of a relationship-based environmental ethic. Within such an ethic, the land–house nexus enables tangible interactions with a place, thus promoting trust, reciprocity, and connectedness with that environment. Trust, reciprocity, and connectedness motivate social action and define community in discussions of social capital as an alternative to privatization and command-and-control solutions to the tragedy of the commons (Ostrom 1990, Pretty 2003, Peterson et al. 2004). The household approach provides a socially acceptable and politically practical perspective for biodiversity conservation capable of fostering the land ethic. A household-level focus for conservation also enables deconstruction of the modern environmentalist's paradox—people are bad for the environment, yet conservation is about people being in tight feedback loops with nature.

MANAGEMENT IMPLICATIONS

Given that HD science indicates no reason why natural resource managers should prefer population versus household perspectives toward biodiversity conservation, ethics and practicality should guide management decisions. Our analysis suggests that a household perspective to biodiversity conservation would be more effective than a human population perspective. Research assessing household dynamics over temporal and spatial scales that match the scale of population data is needed to tease apart the influence of household density and population density on wildlife extinction. In the meantime, wildlife and environmental managers concerned about the influence humans have on biodiversity conservation should ground research and policy in household dynamics as an alternative to human population. Research should evaluate how household dynamics (e.g., changes in multigenerational households, family size, and household locations) influence species endangerment, and clarify socio-structural determinants of those dynamics. Household regulation via zoning already occurs at local scales in many parts of the world, and this approach could be effectively scaled up and used in adaptive management strategies at national and international levels. Of course, cultural and geographic differences mandate different land tenure strategies (e.g., zoning) for different contexts. Policy advocacy should stress reciprocal relationships between humans and species endangerment (e.g., how home building influences wildlife survival) instead of inimical relationships (e.g., human existence vs. wildlife existence). This means that managers should think and talk about household dynamics as both a threat and solution to wildlife conservation. It also means abandoning the misanthropic tendency to pit human life against biodiversity conservation in public forums. A household approach to biodiversity conservation positions wildlife managers as advocates for both humanity and wildlife.

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LITERATURE CITED

Austin, L. 2006. Prof. criticized for overpopulation view. Associated Press, 2:50 pm GMT, Tuesday, 4 April 2006.

Benton, T., and I. Craib. 2001. Philosophy of social science: the philosophical foundations of social thought. Palgrave, New York, New York, USA.

Chapin, F. S., E. S. Zavaleta, V. T. Eviner, R. L. Naylor, P. M. Vitousek, H. L. Reynolds, D. U. Hooper, S. Lavorel, O. E. Sala, S. E. Hobbie, M. C. Mack, and S. Diaz. 2000. Consequences of changing biodiversity. Nature 405:234–242.

Czech, B., P. R. Krausman, and P. K. Devers. 2000. Economic associations among causes of species endangerment in the United States. Bioscience 50:593–601.

Diamond, J. M. 1986. The design of a nature reserve system for Indonesian New Guinea. Pages 485–503 *in* M. E. Soulé, editor. Conservation biology: the science of scarcity and diversity. Sinauer, Sunderland, Massachusetts, USA.

Ehrlich, P. R. 1971. The population bomb. Ballantine, New York, New York, USA.

Ferry, L. 1995. The new ecological order. C. Volk, translator. University of Chicago Press, Chicago, Illinois, USA.

Forester, D. J., and G. E. Machlis. 1996. Modeling human factors that affect the loss of biodiversity. Conservation Biology 10:1253–1263.

Gunningham, N., R. A. Kagan, and D. Thornton. 2003. Shades of green: business, regulation, and environment. Stanford University Press, Palo Alto, California, USA.

Halper, T. 2003. Positive rights in a republic of talk: a survey and a critique. Kluwer Academic, Norwell, Massachusetts, USA.
Hardin, G. 1993. Living within limits: ecology, economics, and population taboos. Oxford University Press, New York, New York, USA.
Hegel, G. W. F. 1807 [1977]. Phenomenology of spirit. A. V. Miller, translator. Oxford University Press, New York, New York, USA.
Helvarg, D. 1994. The war against the Greens: the "Wise-Use" movement, the new right and anti-environmental violence. Sierra Club, San Francisco, California, USA.
Hilton-Taylor, C. 2000. 2000 IUCN red list of threatened species. International Union for the Conservation of Nature and Natural Resources, Gland, Switzerland.
Hitler, A. 1943. Mein kampf. R. Manheim, translator. Houghton Mifflin, Boston, Massachusetts, USA.
Holmes, H. B., B. B. Hoskins, and M. Gross. 1980. Birth control and controlling birth: women-centered perspectives. Humana Press, Clifton, New Jersey, USA.
Horwitz, M. J. 1992. The transformation of American law, 1870–1960: the crisis of legal orthodoxy. Oxford University Press, New York, New York, USA.
Hospers, J. 2005. What libertarianism is. Pages 321–389 *in* J. E. White, editor. Contemporary moral problems. Eighth edition. Thomson Wadsworth, Belmont, California, USA.
Kant, I. 1873 [1949]. Foundation of the metaphysics of morals. T. K. Abbott, translator. Bobbs-Merrill, New York, New York, USA.
Kerr, J. T., and D. J. Currie. 1995. Effects of human activity on global extinction risk. Conservation Biology 9:1528–1538.
Kirkland, G. L., and R. S. Ostfeld. 1999. Factors influencing variation among states in the number of federally listed mammals in the United States. Journal of Mammalogy 80:711–719.
Krebs, C. J. 2000. Hypothesis testing in ecology. Pages 1–14 *in* L. Boitani and T. K. Fuller, editors. Research techniques in animal ecology. Columbia University Press, New York, New York, USA.
Leopold, A. 1949. A Sand County almanac and sketches here and there. Oxford University Press, London, United Kingdom.
Light, A., and H. Rolston, III, editors. 2003. Environmental ethics: an anthology. Blackwell, Malden, Massachusetts, USA.
Liu, J. G., G. C. Daily, P. R. Ehrlich, and G. W. Luck. 2003. Effects of household dynamics on resource consumption and biodiversity. Nature 421:530–533.
Malthus, T. R. [1798] 1970. An essay on the principle of population and a summary view of the principle of population. A. Flew, editor. Penguin, Harmondsworth, United Kindom.
Mariola, M. J. 2005. Losing ground: farmland preservation, economic utilitarianism, and the erosion of the agrarian ideal. Agriculture and Human Values 22:209–223.
McKee, J. K. 2001. Faunal turnover rates and mammalian biodiversity of the late Pliocene and Pleistocene of eastern Africa. Paleobiology 27:500–511.
McKee, J. K., P. W. Sciulli, C. D. Fooce, and T. A. Waite. 2004. Forecasting global biodiversity threats associated with human population growth. Biological Conservation 115:161–164.
Montmarquet, J. A. 1989. The idea of agrarianism: from hunter-gatherer to agrarian radical in Western culture. University of Idaho Press, Moscow, USA.
Moskowitz, E. H., and B. Jennings. 1996. Coerced contraception?: moral and policy challenges of long-acting birth control. Georgetown University Press, Washington, D.C., USA.
Murphy, N. 1999. Darwin, social theory, and the sociology of scientific knowledge. Zygon 34:573–600.
O'Neill, O., and W. Ruddick. 1979. Having children: philosophical and legal reflections on parenthood. Oxford University Press, New York, New York, USA.
Ostrom, E. 1990. Governing the commons: the evolution of institutions for collective action. Cambridge University Press, New York, New York, USA.
Ott, R. L., and M. Longnecker. 2001. An introduction to statistical methods and data analysis. Fifth edition. Duxbury, Belmont, California, USA.
Peterson, M. N., S. A. Allison, M. J. Peterson, T. R. Peterson, and R. R. Lopez. 2004. A tale of two species: habitat conservation plans as bounded conflict. Journal of Wildlife Management 68:743–761.
Peterson, M. N., M. J. Peterson, and T. R. Peterson. 2005. Conservation and the myth of consensus. Conservation Biology 19:762–767.
Peterson, M. N., T. R. Peterson, M. J. Peterson, R. R. Lopez, and N. J. Silvy. 2002. Cultural conflict and the endangered Florida Key deer. Journal of Wildlife Management 66:947–968.
Peterson, T. R. 1990. Jefferson's yeoman farmer as frontier hero: a self defeating mythic structure. Agriculture and Human Values 7:9–19.
Philip, M., and L. Thomas. 1986. Planned Parenthood in Europe: a human rights perspective. Croom Helm in association with International Planned Parenthood Federation, Europe Region, London, United Kingdom.
Pretty, J. 2003. Social capital and the collective management of resources. Science 302:1912–1914.
Romesburg, H. C. 1981. Wildlife science: gaining reliable knowledge. Journal of Wildlife Management 45:293–313.
Sinclair, A. R. E. 1991. Science and the practice of wildlife management. Journal of Wildlife Management 55:767–773.
Soulé, M. E. 1983. What do we really know about extinction? Pages 111–124 *in* C. Schonewald-Cox, editor. Genetics and conservation. Benjamin Cummings, Reading, Massachusetts, USA.
Thompson, P. B. 2003. Expanding the conservation tradition: the agrarian vision. Pages 77–92 *in* B. A. Minteer and R. E. Manning, editors. Reconstructing conservation: finding common ground. Island Press, Washington, D.C., USA.
United Nations. 1948. Universal declaration of human right. General assembly resolution 217 A (III). <http://www.unhchr.ch/udhr/index.htm>. Accessed 13 Apr 2006.
United Nations Centre for Human Settlements. 2001. Cities in a globalizing world: global report on human settlements. Earthscan, London, United Kingdom.
Varner, G. E. 1994. Environmental law and the eclipse of land as private property. Pages 142–160 *in* F. Frederick, editor. Ethics and environmental policy. University of Georgia Press, Athens, Georgia, USA.
Wheelock, J., and E. Oughton. 1996. The household as a focus for research. Journal of Economic Issues 30:143–159.
World Resources Institute. 2003. Earth trends data tables: biodiversity and protected areas. <http://earthtrends.wri.org/datatables/index.php?theme=7>. Accessed 17 Apr 2007.
York, R., E. A. Rosa, and T. Dietz. 2002. Bridging environmental science with environmental policy: plasticity of population, affluence, and technology. Social Science Quarterly 83:18–34.
Young, R. M. 1985. Darwin's metaphor: nature's place in Victorian culture. Cambridge University Press, Cambridge, Massachusetts, USA.

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