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The Steady State Economy, Habitat Stability, and the Humane Treatment of Wild Animals

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The Steady State Economy, Habitat Stability, and the Humane Treatment of Wild Animals

8 CHAPTER

Brian Czech

Habitat Destruction and Wild Animal Suffering

When we think about the inhumane treatment of wild animals, what typically comes to mind is the trapping of a wolf, the clubbing of a seal, or some other iconic scenario from the annals of animal welfare activism. Invariably these scenarios involve direct, physical, even brutal actions that cause fear, pain, and usually death. We often overlook an extremely important source of wild animal suffering: habitat destruction. Habitat includes food, water, cover, and space. When any of these components is eliminated or degraded, wild animals suffer and many die, often in more insidious, protracted, and torturous ways than if killed or crippled by a hunter or natural predator.

Many wild animals survive an initial onslaught of habitat destruction only to be stranded in a foreign, inhospitable environment. When a food or water source is eliminated or degraded, wild animals may starve, die of thirst, or suffer agonizing debilities associated with malnutrition. When thermal cover is destroyed, wild animals

must expend precious time and energy to regulate body temperatures, decreasing or eliminating other activities such as feeding, playing, or reproducing. When hiding cover is lost, wild animals enter a constant state of fear and stress, instinctively seeking cover, in vain, from predators who may or may not be present. When an area of wild animal habitat contracts, overcrowding and inhumane side effects ensue, culminating in cannibalism, in some cases.

Wild animals who are able to escape to nearby suitable habitats (assuming such habitats exist) face the difficulty of competing with already-established individuals of their own species. The problems faced by these animals are very similar to the problems faced by those who remain in an area where habitat has contracted. In general, populations within an ecosystem tend to fluctuate near carrying capacity, so the immigration of displaced animals results in a stressful attempt for survival by all animals, including the original inhabitants and the immigrating refugees. In other words, the stress, suffering, and mortality of animals resulting from habitat destruction reverberates outward from the center of habitat destruction.

Habitat destruction, meanwhile, occurs in the normal course of human affairs, and we often hear of “human activity” being identified as the cause of many environmental problems. However, it behooves the environmental and animal protection communities to specify what type of human activity is problematic. For example, habitat destruction is not typically a matter of spiritual, intellectual, or political activity, at least not directly. Rather, the habitat destruction human beings cause is virtually always a result of *economic activity*. The process of economic growth simply entails more economic activity and, therefore, more habitat destruction and more inhumane treatment of wild animals.

Economic growth is not intended to kill, torture, or harass animals, and in that respect is not as detestable as various other forms of inhumanity. Yet economic growth is surely the greatest of all forms of inhumanity in terms of the gross amount of wild animal suffering that results. Therefore, for those concerned with the humane treatment of wild animals, perhaps nothing is so important to address as the policy and process of economic growth.

Economic Growth and Habitat Destruction

Economic growth is an increase in the production and consumption of goods and services. It entails increasing human populations, per capita consumption, or both. The size of an economy is generally indicated by gross domestic product (GDP) or gross national product (GNP). (GDP and GNP are referred to collectively as GDP throughout this chapter.) The strengths and weaknesses, uses and misuses of GDP as an economic indicator are assessed in a later section. For now, suffice it to say that GDP is a very good indicator of the size, not the health, of an economy.

The relationship between economic growth and habitat destruction is readily apparent when we consider the causes of species endangerment (Table 1). For example, in the United States these causes include agriculture, domestic livestock production, mining, logging, and other extractive sectors (Czech, Krausman, and Devers 2000). These economic activities imperil species because they remove or degrade the food, water, cover, and space required to sustain wild animals. To put the scale of the problem into perspective, consider how many *individual* animals suffer when an entire *species* is imperiled by these economic activities. Yet this is precisely what has occurred when a species is listed as threatened or endangered pursuant to the Endangered Species Act. As of March 1, 2006, 1,272 species were listed in the United States, including 527 animal species and 745 plant species (U.S. Fish and Wildlife Service 2006), with an additional 935 vertebrate species designated as “candidates” for listing. Now imagine all the individual animal suffering that has led to all this endangerment.

Table 1
Causes of Endangerment for Species Classified as Threatened or Endangered in the United States Pursuant to the Endangered Species Act

Cause of Endangerment	Number of Species Endangered, by Cause
Interactions with non-native species	305
Urbanization	275
Agriculture	224
Outdoor recreation and tourism development	186
Domestic livestock and ranching activities	182
Reservoirs and other running water diversions	161
Modified fire regimes and silviculture	144
Pollution of water, air, or soil	144
Mineral, gas, oil, and geothermal extraction or exploration	140
Industrial, institutional, and military activities	131
Harvest, intentional and incidental	120
Logging	109
Road presence, construction, and maintenance	94
Genetic problems	92
Aquifer depletion, wetland draining or filling	77
Native species interactions, plant succession	77
Disease	19
Vandalism (destruction without harvest)	12

Source: Modified from Czech, Krausman, and Devers (2000).

Another primary cause of species endangerment is urbanization. “Urbanization,” used here in the simplest sense of expanding urban area, reflects the growth of the national labor force and the consumer population as well as a variety of industrial and service sectors. Few types of habitat destruction are as thorough and permanent as urbanization. While the logging of a forest, for example, is a traumatic experience for its wild denizens, some of them are

able to carve a niche out of what is left after the harvest. When a city expands, it usually does so by adding pavement, buildings, and infrastructure, all of which are absolutely inhospitable to most of the area’s original species.

Economic infrastructure extends far into the countryside, too, providing the matrix of a national economy. Roads, reservoirs, pipelines, power lines, telecommunications facilities, and wind farms are examples and constitute another major

cause of species endangerment. Many infrastructure projects are virtual laboratories for the inhumane treatment of wild animals.

It is hard to imagine a more omnipresent danger than roads, upon which countless animals are mangled and left, during their final hours, to be slowly, opportunistically picked apart by vertebrate scavengers and insects. As The Humane Society of the United States (2006, n.p.) noted,

Millions upon millions of wild animals are killed on our nation's highways every year. Some scientists estimate that humans kill more wild animals with their cars than with any other instrument, including guns....The damage that highways inflict on wildlife is not limited to direct mortality. It starts with the destruction of habitat and continues with the construction of the road itself, which causes more wildlife mortality. Chemical and physical alteration of the surrounding environment and introduction of potentially invasive species accompany construction and use of roads....Perhaps the most serious of all the negative effects on wildlife is the highway's fragmentation of habitat. Fragmentation confines wild populations to areas too small for their needs or forces animals to attempt road crossings to locate food, cover, nesting sites, and mates.

Power lines present the menace of electrocution, the outcome of which may be death or permanent crippling. Harness and Wilson (2001) documented the electrocutions of 1,450 raptors representing sixteen species between 1986 and 1996. Golden eagles accounted for the largest percentage of fatalities. Data on power line electrocution are not easy to acquire, and it is logical to assume that a large number of birds, especially, are electrocuted each year on power

lines, electric fences, and other electric infrastructure.

Power line collisions are also a significant source of bird crippling and death. As with electrocution, most instances of power line collision go undocumented, and often documentation occurs only for the most studied species. For example, power line collisions have been documented as a significant source of mortality for waterfowl species in many areas (Erickson, Johnson, and Young 2005).

This is an opportune time to mention an inevitable trade-off that occurs any time a habitat is transformed, lest we be charged with bias. Power lines and power poles, as anyone who has driven a country road can testify, do not only electrocute birds. They also provide perching habitats, as do grain elevators, skyscrapers, and even nuclear plants. All is relative, however, and what concerns us here is the net effect for wild animal welfare. To understand net effects, we must keep in mind what our economic infrastructure has replaced. When a forest, for example, is cleared of its trees, plowed, and fragmented by roads and power lines to feed the local economy, it is inane to conclude that economic growth was good for birds because power lines provide perches. The effects of economic growth on wild animal welfare must be considered in the aggregate and not by looking at isolated, incidental, minor examples.

Wind farms, seen as a great hope for "green" economic growth, are the newest gauntlet in the routes of migratory birds. Wind farms are often situated in areas where winds are favorable not only to harvesting for energy, but also to birds for migrating. Substantial bird death and injury is inevitable. For example, wind turbines at Altamont Pass, California, kill approximately one thousand birds of prey per year, including hundreds of red-tailed hawks, burrowing owls,

American kestrels, great horned owls, ferruginous hawks, and barn owls. Birds of more than forty species have been killed at this single wind farm (Center for Biological Diversity 2006).

Outdoor recreation is another threat to species and may be classified as a distinct economic sector with many subsectors, including hunting, fishing, hiking, biking, four-wheeling, boating, and bird-watching. Americans spent \$108 billion in 2001 on wildlife-related outdoor recreation (U.S. Fish and Wildlife Service 2002). Clearly these various forms of outdoor recreation vary dramatically in their impact on wild animals, but most typically, the direct threat of outdoor recreation to wild animals is trampling, killing, or disturbance. Certain forms and high levels of outdoor recreation have substantial effects on *habitats* in some areas, for example, with off-road vehicle recreation in the Desert Southwest. Outdoor recreation constitutes the fourth most prominent cause of species endangerment in the United States (Czech, Krausman, and Devers 2000).

When we think of human economic activity, we often forget about the "other side of the coin." Pollution is nothing but an inevitable by-product of economic production. Along with the goods and services produced in an economy, pollution may be classified in economic terms as "co-production." Pollution is an insidious, ubiquitous, and constant threat to wild animals, who are mostly helpless to understand when a pollutant has permeated their environment, what the pollutant may do to them, and how to avoid the pollutant, if indeed avoidance is possible. Whether it be respiratory failure stemming from pesticides, bone loss from lead poisoning, or ataxia (loss of coordination) from organic chemicals, or any symptom from a long, harrowing list, pollutants ensure some of the

most torturous deaths in the animal kingdom (Table 2). All else being equal, or *ceteris paribus*, as the economist would say, economic growth means more such torture, more such death.

Non-native invasive species, which disperse largely as a function of international trade and interstate commerce (Erickson, Johnson, and Young 2005), constitute one of the biggest and most rapidly growing threats to ecological integrity and animal welfare. Most wild animals, including native species in pristine environments, live lives of frequent or even constant danger. However, adaptation and evolution have equipped them to deal with other species in their natural ecosystems, and the very existence of a species is an indication of evolutionary success. However, when a totally foreign species is introduced via ship ballast, cargo plane, or railway car, native species may suddenly find themselves in a nightmarish ecosystem, occupied by one or more species before whom they are defenseless. Sea lampreys slowly sucking the life out of lake trout, mice eating seabird chicks alive, and, most recently, giant pythons in Florida, constricting unsuspecting, slow-reacting animals...the fisherman's hook and the hunter's bullet are merciful in comparison. With our focus on habitat destruction, however, we should especially note the wholesale ecosystem transformations resulting in some areas of the United States from the introduction of kudzu, salt cedar, Asian carp, water hyacinth, rats, Old World climbing fern, zebra mussels, wild pigs, and a host of other invasive keystone species. The transformations resulting from the invasion of such species are as life-changing and inhumane for wild animals, as are other transformative activities such as agriculture, logging, and ranching.

Global warming is becoming recognized as another threat to species (Malcolm et al. 2006), although its

Table 2 Overview of Maladies Experienced by Wild Animals Exposed to Environmental Contaminants	
See Sheffield, Sullivan, and Hill (2005) for details.	
Ataxia (Loss of coordination)	Anemia
Muscular weakness	Skin lesions
Tremors	Immunotoxic response
Convulsions	Behavioral effects
Lethargy	Altered behavior
Hyperactivity	Unkempt appearance
Reproductive effects	Hypothermia
Developmental abnormalities	Coma
Reduced fertility	Paralysis
Spontaneous abortions	Internal bleeding
Excretory effects	Dyspnea (Labored breathing)
Excess defecation	Tachypnea (Rapid breathing)
Bloody feces	Eye/Vision problems
Diarrhea	Blindness
Spasmodic contraction of anal sphincter	Contraction of pupils
Emesis (Vomiting)	Dilation of pupils
Anorexia (Weight loss/Emaciation)	Ptosis (Drooping of eyelids)
Excessive thirst	Protrusion of eyes
Nasal secretions	Lacrimation (Excessive tears)
Epistaxis (Bleeding from nares)	Head and limbs arched back
Salivation	Piloerection (Erection of contour feathers)
Edema	

mechanisms are less direct. Temperature is a key variable in ecological functioning and species composition. Global warming is "pushing" polar species (such as polar bears) off the ends of the earth and creating unprecedented niches near the equator that will only be filled through the slow process of evolution. It has also been implicated in increased incidences of human and wildlife diseases (Harvell et al. 2002). Global warming is largely a function of greenhouse gas emissions from the burning of fossil fuels. The large, industrialized economies are primarily fossil-fueled; therefore, global warming is also a function of economic growth. This is the real "inconvenient truth" that even Al Gore skirts around—the eight hundred-pound gorilla in the room where climate change is discussed.

The threats to wild animals are essentially a who's who of the human economy. This is readily explained using basic principles of ecology. The principle of "competitive exclusion," for example, states that no species succeeds except at the expense of other species with overlapping niches (Pianka 1974). Due to the tremendous breadth of the human niche, which expands via new technology, the human economy grows at the competitive exclusion of wild animals in the aggregate. To put it less technically, those skyscrapers we alluded to earlier provide some habitat, especially for pigeons, but not for the forest's worth of species they displaced.

Another relevant aspect of ecology is trophic theory. The entire "economy of nature" (the production and consumption activities of

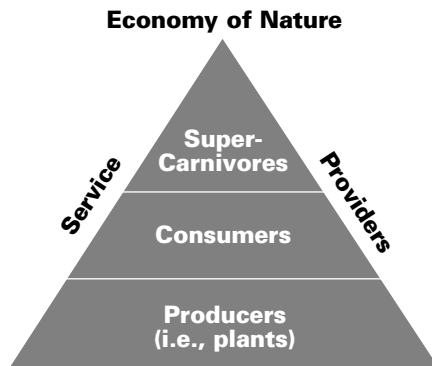
nonhuman species) is founded upon the producers, or plants, that produce their own food via photosynthesis (Figure 1). Primary consumers, or animals that eat plants, constitute the next trophic level. Secondary consumers prey on primary consumers, and so forth. In some ecosystems there may be six or seven trophic levels and, in all ecosystems the top trophic level is called the “supercarnivores.” Mixed throughout this trophic system are

“service providers” that are not readily categorized in trophic levels. These include decomposers, scavengers, and parasites. In addition, many species that do not fit neatly into a particular trophic level also provide incidental services such as pollination, soil aeration, and nutrient cycling.

For our purposes, perhaps the most important thing to be gleaned from trophic theory is that the size of the entire enterprise,

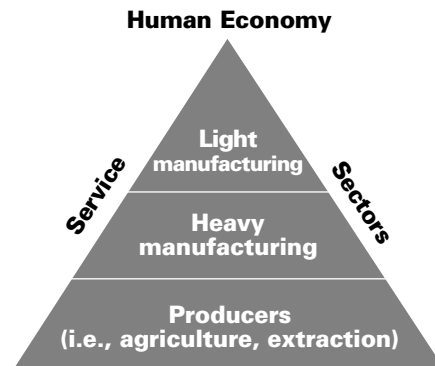
the whole economy of nature, depends on the size of the producer trophic level. Growth in the economy of nature requires growth of the producer trophic level. It requires an increase in primary production (i.e., photosynthesis). There is a limit to the size of the economy of nature imposed by primary production, which in turn is limited by solar energy and the availability of resources such as soils, minerals, and water.

**Figure 1
Basic Trophic Levels in the Economy of Nature**



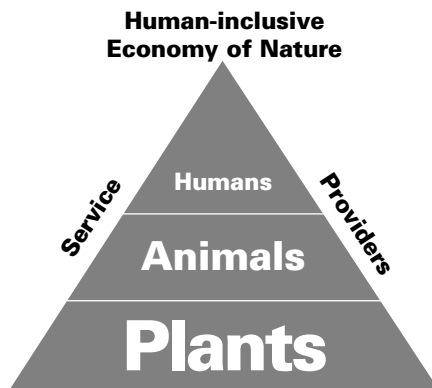
Mixed throughout the trophic system are service providers such as decomposers, scavengers, and parasites.

**Figure 2
Basic Trophic Levels in the Human Economy**



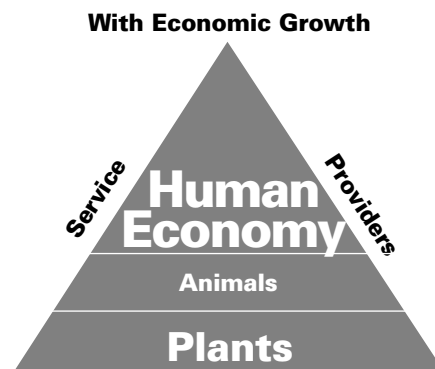
Mixed throughout the trophic system are service sectors such as janitorial, banking, and health services.

**Figure 3
Trophic Structure of Humans and Non-Humans Combined**



Service providers are a mix of human and non-human species. (For example, pest control is conducted by human firms and by many nonhuman species.)

**Figure 4
Economic Growth within the Context of Trophic Levels**



Compare this figure with Figure 3: note the “trophic compression” resulting from economic growth.

The human economy is not immune to the basic principles of ecology. It, too, has a trophic structure, with the entire enterprise founded on agricultural and extractive surplus (Figure 2). As Adam Smith pointed out in *The Wealth of Nations*, the origins of money are in agricultural surplus. “No food, no stock market,” we might say, along with no video games, no outdoor recreation, no sports, etc. The economy is an integrated whole consisting of many and diverse sectors, but none of them grows without concomitant growth in some or all of the others. Most important, more agricultural and extractive surplus is required for the growth of the economy at large.

Philosophically, some prefer to classify humans as part of the economy of nature, in which case they clearly constitute the very highest trophic level (Figure 3). They are the supercarnivore of the supercarnivores. They can acquire for consumption virtually anything edible to them and are rarely threatened themselves by predators, especially in developed nations. As the trophic level comprising humans expands in biomass, it exerts “trophic compression” on the lower trophic levels that comprise the rest of the economy of nature (Figure 4). In other words, the growing human economy puts the squeeze on the very trophic levels that support it, like a building that undergoes continual expansion with no additional foundation. This is another way of illustrating the principle of competitive exclusion that makes it even clearer that there is a limit to human economic growth imposed by the other, underlying trophic levels and, ultimately, by primary production.

Economic Growth as National Policy

Economic growth is a high priority in the domestic policy arena of virtually every nation, indeed the

highest priority in many. In the United States, economic growth has been an explicit bipartisan goal since the Great Depression. The diplomatically dark decades of the Cold War featured an epic struggle in which the score was kept in GDP. For the United States, the logic was stark and brutal. Staying ahead of the Soviets militarily required economic growth to finance the accumulation of weaponry.

When the Soviet Union collapsed in 1988, the drive for economic growth in the United States continued, based on greedier goals with a sheen of nobler aspirations. There is still a significant populace in the United States living in poverty, and instead of instituting progressive reforms for redistributing wealth, the American government has adopted supply-side economics and the logic that “a rising tide lifts all boats.” Supply-siders fail to recognize a limit to the supply of “water” or the number of “boats” in the “tide.”

American economic philosophy, theory, and policy are especially important for several reasons. The American government and society remain the standards of capitalist democracy in many parts of the world, although America’s image has been tarnished in recent years as the capitalist aspect has greatly outpaced the democratic aspect. More important, from the standpoint of humane treatment of wild animals, the United States is by far the largest consumer in the world. The United States accounts for one-fourth of the world’s marketed production and consumption, with GDP over \$12 trillion and per capita GDP at \$41,800 in 2005.

The economic might of the United States gives it tremendous political power and influence over international affairs and economic agreements. For example, the United States controls the big levers in the World Bank, International Monetary Fund, and World Trade Organization (Sardar and Davies 2003).

These levers are set for rapid economic growth of the American and global economies.

There are many scholarly critics of economic growth as a national goal in the United States, but they are suppressed, censored, and censored, and their arguments get very little media attention. The American public seldom hears about the environmental threats posed by economic growth, much less the inhumane treatment of wild animals that accompanies, and in some way exemplifies, economic growth. Roper polls indicate that 58 percent of Americans believe there is no limit to economic growth, and those who believe there is no limit to economic growth will naturally believe there is no conflict between economic growth and the environment, including the habitats that provide for the humane treatment of wild animals.

Conventional Economics and Economic Growth Theory

Economics has a long history of being corrupted by vested interests (Beder 2002). For example, in the United States, economics departments were in their formative stages during a period when land barons were fighting the populist movement, which was based largely on Henry George’s proposal for major land tax reform (George 1929). Mason Gaffney of the University of California-Riverside documented how land barons established or patronized leading economics departments and hired economists to undermine George and the populists (Gaffney and Harrison 1994). Led by J.B. Clark at Columbia University and, eventually, by F. Knight at the University of Chicago, economists denied the importance of land as a distinct factor of production, pointing instead to labor and espe-

cially capital as the key productive forces. The old “land, labor, and capital” of the classical economists rapidly became “labor and capital,” where land was either ignored or considered the lowest form of capital. The result was that land was paid little attention to as the U.S. tax code was being developed.

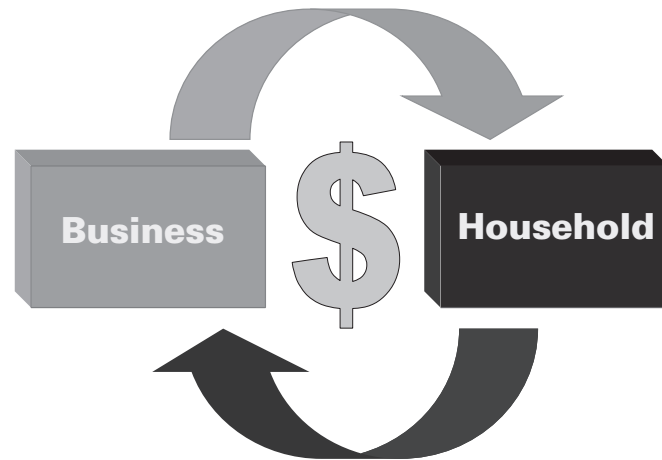
This episode in the corruption of economics also had a profound effect on the economic “production function,” a core concept in macroeconomics. Today, when we open a typical macroeconomics textbook, we find that “ $Y = f(K,L)$ ”—production is a function of capital and labor. With land out of the equation, the corrupted production function constitutes a theory of economic growth that fails to recognize *any* limits to economic growth.

Economic growth theory went through several major stages after the anti-George backlash. John Maynard Keynes and Sir Roy Harrod laid the foundation for modern economic growth theory, and subsequent stages are associated with the work of R. Solow (1950s), R. Lucas (1980s), and D. Romer (1990s). Modern theories of economic growth tend to be centered on the Romer model.

The most important aspect of the Romer model, for our purposes, is Romer’s treatment of technological progress (Romer 1990). In economic terms technological progress refers to increasing output of goods and services per unit of material and energy input. Romer correctly pointed out that labor—the “L” in the production function—includes a portion of the labor force that conducts research and development (“R&D”), which gives rise to technological progress. Research and development, and the resulting technological progress, is required for increasing per capita GDP growth and, therefore (as economists generally assume), increasing human welfare.

It doesn’t take long to identify a startling implication of the Romer

Figure 5
The Circular Flow of Money as the Basic Model of the Human Economy in Conventional or “Neoclassical” Economics



Note the lack of ecological context.

model: the only sure way to get more R&D is to have more people conducting it. Therefore, a common interpretation of the Romer model is that population growth is required for *per capita* GDP growth (Jones 1998). This hypothesis is essentially the same argument made by J.L. Simon for a decade preceding Romer’s work (Simon 1981). Simon, erroneously called an “economist” by fans and foes alike, had an academic background in business. He famously claimed there was no limit to population growth because, as population growth caused environmental problems, more human brains were available to solve those problems. In fact, Simon said, the standard of living would forever continue to increase, along with the population. The Romer model is much more sophisticated, but is just as ecologically unsound as Simon’s “pop economics.” At its core is the corrupted production function and the assumption of unlimited economic growth.

To say there is no limit to economic growth on a finite land mass is mathematically equivalent to say-

ing we can have a stable, steady state economy on a perpetually diminishing land mass. For example, with technological progress, we could have the \$40 trillion global economy contained first on a continent, then in a city, and ultimately in a corner saloon. This is precisely as “ludicrous” as saying there is no limit to economic growth on Earth. Yet, we continually hear, “There is no conflict between economic growth and environmental protection.” It is easy to understand why this is the case when we consider the political economy of growth.

The Iron Triangle of Economic Growth

After President Dwight D. Eisenhower warned Americans of the “military-industrial complex” in his famous 1960 farewell address (Eisenhower 1961), political scientists developed a concept called the “iron triangle.” An iron triangle consists of a special interest group, a political faction, and a

profession or professional society that is well represented in one or more government agencies. Iron triangles dominate policy arenas and fend off all comers. They materialize when interest groups, politicians, and professionals have similar perspectives and mutual interests, especially economic and political interests. They are not necessarily conspiratorial, and probably seldom are, but they are extremely effective in charting the course of public policy.

In the United States, the iron triangle most relevant to the conflict between economic growth and the humane treatment of wild animals is a virtual juggernaut in the policy arena. The “special interest” is the corporate community at large, and the political “faction” is the political community at large. The corporate community is concerned primarily with profits and is served by a national policy of aggressive economic growth, while the campaign-financing system ensures political fealty to the corporate community (Korten 2001). Most Americans have a vague suspicion about this corrupting influence in American politics. That suspicion motivates the occasional movements toward campaign finance reform.

The third side of the iron triangle of economic growth policy comprises conventional or “neoclassical” economics, which feeds the politicians the expedient theory of unlimited economic growth and the corollary that there is no conflict between economic growth and environmental protection. The neoclassical theory of unlimited growth also helps maintain “consumer confidence,” so necessary for hefty corporate profits and good days on Wall Street. The influence of neoclassical economic growth theory has dire implications for the humane treatment of wild animals. In response to growing discontent with neoclassical economics, various academic reform movements, societies, and schools of thought have arisen,

most notably the International Society for Ecological Economics.

Those concerned with the humane treatment of wild animals, however, should use discretion in their critiques of neoclassical economics. Neoclassical economics has produced some valuable approaches to habitat conservation, especially in the realm of microeconomics. Cost-benefit analysis, for example, coupled with studies that demonstrate the economic value of wildlife, has helped wildlife managers make better decisions and illustrate the importance of wild animals to American society. From the perspective of the humane treatment of wild animals, the critique should be targeted primarily toward conventional *macroeconomics*, especially the theory of unlimited economic growth. To make a substantial contribution to the humane treatment of wild animals, we must have a seat at the economic policy table, or at least influence what occurs at that table, but the iron triangle is a formidable barrier.

For accessing the macroeconomic policy arena, a major ally is the ecological economics movement, represented by the International Society for Ecological Economics and its various national chapters. Professional natural resource societies are also beginning to scrutinize neoclassical economics and the implications of economic growth for conservation. The Wildlife Society (2003, 2) published a technical review on economic growth that described a “fundamental conflict between economic growth and wildlife conservation” and adopted a position on economic growth. The U.S. Society for Ecological Economics and the North America Section of the Society for Conservation Biology have taken strong positions on economic growth. The American Fisheries Society, Ecological Society of America, and American Society of Mammalogists were all considering related positions as of late 2006.

The Center for the Advancement of the Steady State Economy (CASSE), a nonprofit organization based in Arlington, Virginia, has been instrumental in these efforts, and its own position on economic growth is often used as a template from which economic growth positions are developed. The CASSE position on economic growth has also been endorsed by several scientific and environmental organizations.

GDP: A Baby and Its Bathwater

A common critique of GDP is that it is not a good indicator of economic welfare, much less of overall human welfare. GDP does not account for the vast collection of health and happiness parameters that cannot be bought. Yet many economists and most politicians commonly assume that GDP is a primary indicator of welfare. In no way does GDP account for the humane treatment of wild animals.

Despite the weakness of GDP as an indicator of *welfare*, GDP is a very good indicator of the *size* of an economy. It reflects the amount of economic activity taking place and, given the trophic structure of the human economy, it also reflects the amount of natural resources reallocated from the “economy of nature” and its wild animals to the human economy. That explains the tight connection of GDP growth with energy and material use (Daly and Farley 2003; Nørgård 2006) and with environmental impacts such as biodiversity decline (The Wildlife Society 2003; Czech et al. 2005).

Accounting for the economy of nature in the process of economic growth allows us to view the circular flow of money in its ecological context (Figure 6). This in turn helps to clarify the impacts of economic growth on the environment and wild animal welfare (Figure 7).

It is not in the interest of the humane treatment of wild animals to advocate abolishing GDP as a federal government calculation. Rather, GDP is a valuable tool and a widely recognized model of consistency that allows scholars and policy makers to develop time series data for monitoring trends in the size of the economy. It is akin to a scale for measuring the weight of a person. The obese person needs to lose weight, not throw away the scale! However, it does behoove us to consistently and vocally note that a bigger economy is not necessarily a better one and, for the humane treatment of wild animals, is almost invariably worse. In other words, GDP is a *negative indicator* of the humane treatment of wild animals.

A good doctor uses not only the scale but also the stethoscope, the blood pressure cuff, and other instruments to monitor health. Likewise, in recent years a number of alternative economic indicators, or indicators of broader social welfare, have been developed and advocated, some of which are highly relevant to the humane treatment of wild animals.

Alternative indicators generally fall under two categories. One category includes those indicators for which the “score” or the indication is expressed in monetary units. These are economic indicators per se. The other category includes indices that are not expressed in monetary terms, but rather involve a nonmonetary “scoring” of variables. These indicators vary widely in their foci but are not generally referred to as economic indicators.

A notable example of an alternative to GDP is the Index of Sustainable Economic Welfare (ISEW), developed by Daly and Cobb (1989). The ISEW incorporates GDP but also accounts for various aspects of economic welfare not represented by GDP, such as the estimated costs of pollution to society and the value of natural

Figure 6
The Circular Flow of Money in Its Ecological Context

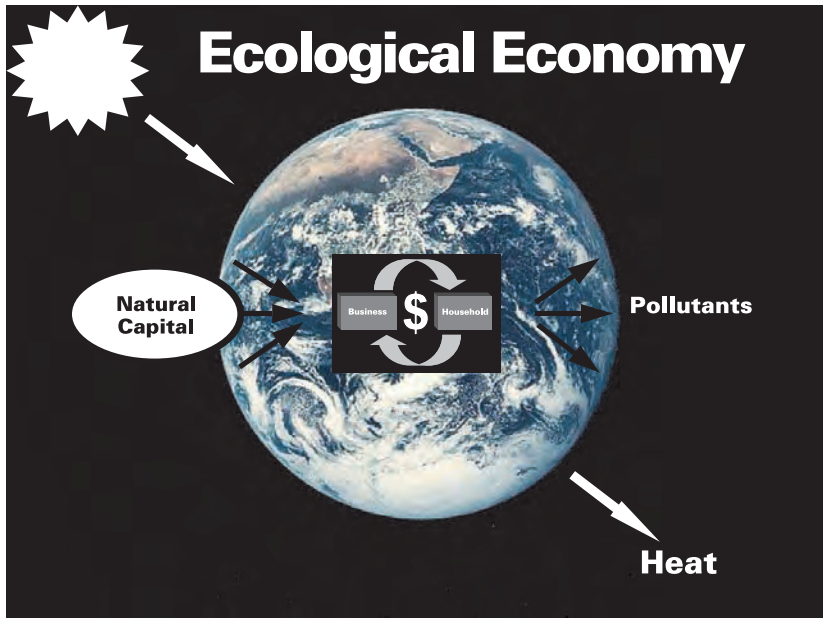
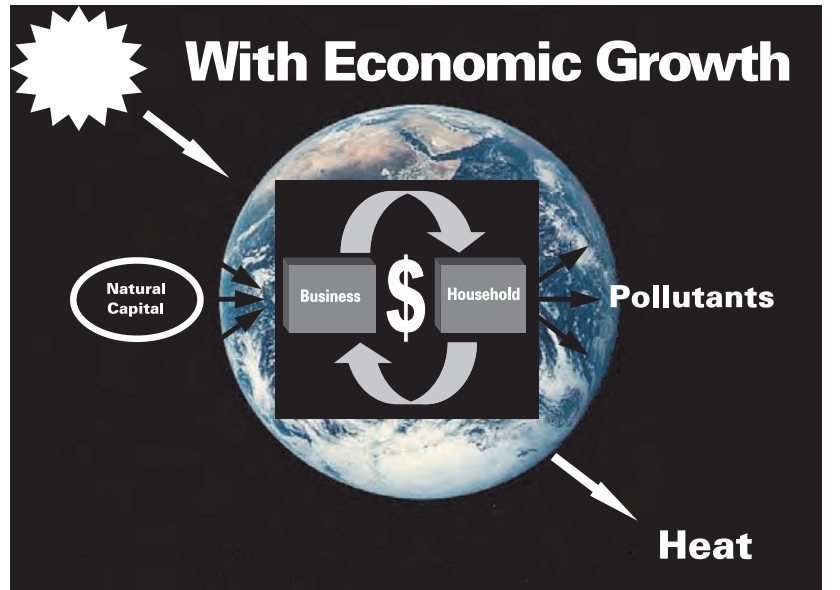


Figure 7
The Circular Flow of Money Expanding in the Process of Economic Growth



Compare this figure to Figure 6: note the depletion of natural capital, the increase in pollutants and waste heat, and the larger “ecological footprint” upon the earth and wild animal habitats.

resources depleted in the process of economic production. The ISEW is not an indicator of economic *growth*, but rather an indicator of economic *sustainability*. As such, it is not so much an “alternative” to

GDP, which measures the size of the economy, but a complement to GDP that measures sustainability.

An equally notable example of an economic indicator of social welfare is the Genuine Progress Indicator (GPI). The GPI considers the monetary value of nonmarketed services such as housework, caring for children and the elderly, and volunteerism. Such activities can be viewed as good for society, despite their having no associated market transactions. As with the ISEW, the GPI is not intended to be an indicator of economic growth and is not so much an alternative to GDP, which measures purely the size of the economy, but a complement to GDP that measures social welfare, or the quality of the economy.

Tracking of indicators such as the ISEW and GPI suggests that, while the economy has continued growing over the past few decades, economic welfare has not, and ecological and economic sustainability has been declining (Daly and Farley 2003; Venetoulis and Cobb 2004). (This is precisely to be expected when we consider the principles of ecology most relevant to economic growth, including competitive exclusion and trophic levels). Alternative economic indicators such as these should be advocated, as long as care is taken not to conflate trends in such indicators with trends in economic growth.

An example of a nonmonetary indicator of social welfare is the Human Development Index (HDI). The HDI incorporates poverty, literacy, education, life expectancy, childbirth, and other factors. It is a standard means of measuring social well-being, with a focus on child welfare. (There is nothing preventing the development of an HDI-derived indicator that would also incorporate considerations of the humane treatment of wild animals.) Since 1993 the United Nations Development Programme has used the HDI in its annual report. The HDI and other non-

monetary indicators of welfare should be advocated as better representing the status of nations with regard to overall well-being. As with alternative monetary indicators such as the ISEW and the GPI, these nonmonetary indicators of welfare are not indicators of economic growth.

The Steady State Economy as an Alternative to Economic Growth

With economic growth as a primary policy goal—and perhaps the mother of all threats to wild animal welfare—it behooves us to consider the alternatives to economic growth. This is not as complicated as it may seem when we keep in mind that economic growth is nothing but increasing production and consumption of goods and services. In fact, there are but two alternatives: *decreasing* production and consumption and *stabilized* production and consumption. Decreasing production and consumption is also known as “recession,” while stabilized production and consumption goes by the less well-known “steady state economy.”

Recession, anathema in social, political, and policy circles, may be referred to collectively as the “political economy.” We consider recession here for two reasons, however, in addition to simply identifying it as an alternative to economic growth. First, given the principles of ecological economics addressed above, recession would generally result in more humane treatment of wild animals. “Generally” means there would be exceptions, for example, if a nation responded to recession by weakening its environmental regulations. However, even this hypothetical response would not necessarily result in a *net* loss of humane treatment, because we do not know

what would be worse for wild animals, a “cleaner” but larger economy or a “dirtier” but smaller economy. Furthermore, a nation would respond in such a fashion largely *because* of its goal of economic growth. It is not logical to judge the effects of a recession when the underlying goal is yet more economic growth. In any event, the negative effects of recession on wild animal welfare must be viewed logically as exceptional and short term when there is a *fundamental* conflict between economic growth and the humane treatment of wild animals. All else being equal, recession would leave more habitat devoted to the humane treatment of wild animals.

The second reason for dwelling a bit on the alternative of recession is that national and global recessions—deep and protracted recessions—may be inevitable. By definition, recession is inevitable for any economy that has exceeded its carrying capacity. Many scholars believe this is the case with the \$40 trillion global economy because of its dependence on petroleum supplies, which appear to be near or at their peak in per capita terms. This is the central issue of the burgeoning literature on “peak oil” (for example, Defeyes 2001). To the extent that recession comes to be viewed as inevitable, a dramatic transformation of the American and global political economy is certain. Those concerned with the humane treatment of wild animals would do well to participate in this transformation and to work toward political solutions that do not entail, for example, scrapping environmental regulations. There are no such solutions in the offing, however, if economic growth remains the higher priority.

At this moment in American political economy, it is unacceptable to advocate a recession for virtually any reason, much less for the humane treatment of wild animals.

This reality brings us to the other alternative to economic growth, the steady state economy.

The phrase “steady state economy” merits some linguistic clarification before discussing policy tools. What is meant by “steady,” “state,” and the combination of the two words with “economy”? The phrase “steady state economy” can be parsed in two ways. Neither is household language yet.

The *steady-state economy* (usually hyphenated), used by neoclassical economists, especially growth theorists, refers to a steady or stable ratio of economic variables, most notably capital and labor. Recall, however, that in neoclassical economics no limit to economic growth is acknowledged, so that the steady *ratio* of capital to labor exists in a condition or “state” of *growth*. Therefore, “steady-state economy” refers to a growing economy with a stable ratio of capital to labor, or “steady-state growth,” a phrase we might consider exceptionally oxymoronic in the long run. This term is highly technical and will presumably remain an obscure bit of economics jargon, similar to “steady-state approximation” in physics.

“Steady state economy” (without the hyphen), more relevant to the humane treatment of wild animals, has great potential for entering into the American and global vernacular, by nature of its broad sweep of political and economic implications. “Steady” refers most directly to population and per capita consumption. All else being equal, then, it refers to a steady rate of the production and consumption of goods and services and is indicated by steady, or stabilized, GDP. Given the principles of ecology outlined above, it should be abundantly clear that a steady state economy provides for a stable, secure, nondeclining base of habitats that are required for the humane treatment of wild animals. This is the only meaning of steady state economy to be used hereafter.

The noun, “state,” is not clearly defined in the ecological economics literature, but by implication it is clear enough. It refers primarily to the political unit, or state, in which production and consumption are steady. Often, “steady state economy” is shortened to “steady state” once the context has been established; we can refer, for example, to an “American steady state” or a “global steady state.”

When the meaning of “steady state economy” is clear, it naturally evokes a number of skeptical, even cynical questions, especially among those with a particular view of “the American way.” Some think that capitalism requires a growing economy for its very existence. The American Constitution establishes a capitalist democracy for the United States, so any policy goal alternative to economic growth is cynically viewed as anti-American. This is a most unfortunate misunderstanding.

Who says a capitalist economic system requires economic growth? One camp comprises corporate interests that want economic growth to be a national goal and, therefore, that portray any other goal as anti-American. The other camp comprises what we might call “green Marxists,” who seek any critique of capitalism. Their argument is that, if economic growth is bad for human welfare, and capitalism requires economic growth, then capitalism is bad for human welfare. Both capitalist and Marxist ideologues claim that economic growth is a prerequisite for a capitalist system, but for very different political reasons.

Czech and Daly (2004) point out that the supposed choice between capitalism and a steady state economy is a false one. All that capitalism truly requires is private ownership of capital, which may be the case in a growing, receding, or steady state economy. The American constitution calls for a capitalist *democracy*, and if the majority in a democracy come to recognize the

dangers of economic growth, it may guide the state to stabilize the production and consumption of goods and services, even with private ownership of capital. A stock market will still exist and will be neither “bullish” nor “bearish”; winners and losers will cancel out in the net. Players’ prospects in the stock market will be better than those in a casino (which has the house advantage), but they will be by no means guaranteed. People will still have bank accounts and other assets. Corporations and other businesses will still make profits. The difference between a steady state economy and a growing economy is that, in a steady state economy, profits will not perpetually increase. Instead, profits in the aggregate will stabilize at a level that is within the regenerative capacity of the ecosystem. This maintenance of profits is most easily understood by considering a renewable natural resource such as timber. Profitable timber harvesting may occur, but profits can only be maintained in the long run if the timber harvest stays within maximum sustainable yield. In a capitalist system, firms will compete for such profits whether or not the economy is growing. Some will win and enjoy the profits, while others will lose and move on to other ventures. The same principle applies to all other renewable resources, such as fisheries, livestock forage, and agriculture crops. Production in these agricultural and extractive sectors, which constitute the trophic foundation of the human economy, ultimately determines the size of the economy.

Still, skeptics ask, doesn’t the establishment of a steady state economy require some type of socialist government? Yes, in the sense that virtually any check on unbridled, laissez faire capitalism is to some extent “socialist.” In the United States, for example, there is social ownership of lands such as national parks, forests, and wildlife refuges. No, in the sense that pri-

vate ownership of land, labor, and capital may still predominate in a nation that sets its macroeconomic policy levers for a steady state economy.

The rhetoric about capitalism versus socialism in macroeconomic affairs has been overblown by ideologues. Such rhetoric is an aftermath of Cold War propaganda, in which the United States portrayed its economy as nearly pure “capitalism,” and the Soviet Union portrayed its economy as nearly pure “socialism.” In fact, both economies had capitalist and socialist elements, as do all modern economies. The so-called socialist democracies of Europe are probably labeled most accurately, as both private and state entities control the factors of production—land, labor, and capital—in a way that adheres to majority support.

Now that we have excised the biggest bugbears beleaguering the steady state economy, let’s consider four of the most frequently asked questions, drawing on the observations of Czech and Daly (2004).

How Is Quality of Life Affected by a Steady State Economy?

A steady state economy is similar to a stable, secure population of wild animals. It stabilizes at or below the capacity of the environment to sustain it, and it avoids the fate of species that often exceed carrying capacity and crash, damaging the environment in the process and compromising the prospects of its progeny.

Wildlife biologists know that a wide variety of social structures may produce stable wildlife populations. The same holds true for a steady state economy. For example, a steady state economy with long human life spans entails low birth and death rates. Most of us would view this as preferable, within reason, to a steady state

economy with short life spans, high birth rates, and high death rates. The same concept applies to capital and durable goods such as automobiles. Most of us would probably prefer an economy with a relatively slow flow of high-quality, long-lasting goods to an economy with a fast flow of low-quality, short-lived goods.

Nothing about a steady state economy precludes economic *development*, where development is defined as a qualitative process. Various sectors may come and go in the development of a steady state economy. For example, organic farms may supplant factory farms, the proportion of bicycles to Humvees may increase, and professional soccer may attract more fans as NASCAR attracts fewer. As long as the physical size of the economy remains constant in the long run, a developing economy is a steady state economy.

Nor would any type of cultural stagnation result from a steady state economy. John Stuart Mill (1806–1873), one of the greatest economists and political philosophers in history, emphasized that an economy in which physical growth was no longer the goal would be more conducive to political, ethical, and spiritual improvements (Mill 1900).

What Happens to Jobs in a Steady State Economy?

In economic discussions, a common qualifier is *ceteris paribus*, or all else being equal. *Ceteris paribus*, a steady state economy means a constant rate of employment. The “all else” remaining equal includes such factors as salary and retirement age. For example, a steady state economy may have higher rates of employment when salary and retirement ages are lower.

Ceteris paribus does not mean, however, that each particular job is retained in perpetuity. Economic

development continues in a steady state economy so that, in the extractive sector, oilfield rough-necks may decrease in number while wind-power facility attendants may increase. In the arts, guitar playing may wax while flute playing wanes. In the sciences industrial chemists may be replaced by wildlife biologists, etc.

Will We Lose Our Retirement Accounts?

For that matter, what will happen to bank accounts in general? Answering this question requires a brief consideration of the origins of monetary income. Income reflects the use of natural resources and, therefore, the loss or conversion of wildlife habitats. This relationship of income to natural resource use is observed most readily in agricultural and extractive industries. However, as pointed out by the physiocrats (predecessors of the classical economists), the origins of all monetary income are in agricultural surplus (Heilbroner 1992). Without agricultural surplus, everyone is too busy acquiring food (hunting, gathering, or subsistence farming) to specialize in the production of other goods (much less “higher” services such as entertainment) for wages. In other words, everyone’s income and expenditure, no matter the sector he or she works in, ultimately depends on the use of natural resources and, therefore, wildlife habitat loss (Czech 2002).

Practitioners of ecological economics often elaborate on this by introducing the term “natural capital” (Daly and Farley 2003, 17). Natural capital is the stock of natural resources (for example, a forest) that yields a renewable flow of goods (for example, perches for birds, timber for humans). The cardinal sin of accounting is to count the liquidation of capital as income, yet our national income accounting (the process of calculating GDP and GNP) routinely adds the money

derived from the liquidation of natural capital. That component of GDP is more representative of reduced wild animal welfare than it is of increased income!

In a steady state economy, the average amount of money in real dollars earned by workers from the current generation to the next remains constant. "Real dollars" means that inflation has been accounted for. Because income reflects the use of natural resources, stabilized income reflects a stabilized "ecological footprint," which is the area of land required to support a human being (Wackernagel and Rees 1996). The ecological footprint is another way of measuring the inhumane treatment of wild animals.

If the steady state economy is established at a relatively low human population level, the potential exists for each worker, and his or her replacement in the next generation, to earn a high income. This scenario is similar to that of a low-density deer population with plenty of forage per deer. If, on the other hand, the steady state economy is established at a high population level, less income is available for the average worker, as with a high-density deer population with little forage per deer.

Certainly for the humane treatment of wild animals, it is important that a steady state economy be established at a relatively low population level. This scenario is conducive to incomes high enough to allow retirement savings and social security (in the generic sense), while providing for the habitat needs of wild animals. If the steady state economy is established within ecological carrying capacity, each new generation may expect its workers to accumulate retirement savings of the same magnitude as those of the previous generation, without continual erosion of wild animal welfare. This points to the importance of estab-

lishing a steady state economy as soon as possible.

How Big Should a Steady State Economy Be?

This question always generates discussion about the ultimate economic carrying capacity of the global ecosystem. Global capacity, indeed, is an important question and a focus of ecological economics. However, for our purposes, we can ask a different question: how much wild animal welfare should we maintain? Presumably many animal protection advocates would answer, "As much as possible of what is left." This gives us the answer to the original question, because maintaining as much wild animal welfare as possible requires the establishment of a steady state economy as soon as possible and as close to the current size as possible. In GDP terms this is an economy of approximately \$11 trillion for the United States.

Some may assume that public conservation lands will be sufficient for wild animal welfare and that the ongoing protection of these lands will result in the establishment of a steady state economy of the appropriate size. This is an unlikely outcome, however, as long as economic growth is a primary, perennial, and bipartisan goal. In the context of a public and polity that prioritizes economic growth, the political boundaries and protective mandates of our public lands are continually contested (Czech 2002). For example, the drive for economic growth has resulted in an ongoing effort to open more portions of Arctic National Wildlife Refuge land to oil exploration and extraction, jeopardizing the welfare of caribou calves and other denizens of the Arctic.

Ceteris paribus, then, there is an optimum size of the economy for society as a whole. There is also an optimal size, and certainly a smaller size, from the perspective of the humane treatment of wild

animals. Humane treatment has not typically been a pressing concern in primitive economies emerging from the wilderness. As an economy grows, however, natural capital is liquidated, wildlife habitats are lost, and wild animal welfare declines. Society begins devoting fiscal resources to conserving wildlife habitats and tending to wild animal welfare, and humane societies thrive. As vast areas become devoid of wildlife, however, there is less wild animal welfare to protect. For those concerned with the humane treatment of wild animals, the time for advocating a steady state economy is upon us.

Economic Growth and Animal Protection

Readers are now familiar with a sequence of logic pertaining to the humane treatment of wild animals. (1) Wild animal welfare requires wildlife habitats. (2) Economic growth occurs at the expense of wildlife habitats. (3) Stabilization of wildlife habitats, and, therefore, the humane treatment of wild animals, requires the establishment of a steady state economy. It remains only to consider some of the means available to animal protection advocates for pursuing the establishment of a steady state economy.

Fortunately, animal protection advocates do not have to start from ground zero in this effort. Wildlife ecologists, conservation biologists, and ecological economists have been developing solidarity on this issue, informally for many years, and formally in more recent years. For example, The Wildlife Society has described "a fundamental conflict between economic growth and wildlife conservation"; the Society for Conservation Biology's North America Section has taken a policy position, "The Steady State Economy as a Sustainable Alternative to

Economic Growth”; and the United States Society for Ecological Economics (www.ussee.org) has a policy position that identifies “an economy with a relatively stable, mildly fluctuating product of population and per capita consumption” (i.e., a steady state economy) as “a viable alternative to a growing economy and...a more appropriate goal for the U.S. and other large, wealthy economies.”

In other words, animal protection advocates have a foundation of professional, scientific findings and positions to stand on in educating the public and policy makers on the threat of economic growth to wild animal welfare. This is a crucial distinction from, for example, the efforts of Friends of the Earth in the 1970s. Friends of the Earth did a remarkable job of raising Americans’ awareness of the perils of economic growth to the environment and wildlife, garnering coverage in such mainstream media as *U.S. News and World Report*, yet the effort seemed not to resonate in the American psyche and certainly made even less of an impact in the public policy arena. Why?

One major reason is that Friends of the Earth had no backing from the professional, scientific organizations that have established credibility over the decades with the public and politicians. That situation has changed, and we can hope that Friends of the Earth retrenches and once again confronts the eight hundred-pound gorilla of economic growth, along with other key conservation organizations such as the National Wildlife Federation, Defenders of Wildlife, and the World Wildlife Fund.

Yet none of those organizations will bring to the table in prominent, urgent fashion the plight of individual, innocent wild animals who are crushed under the plow, poisoned by pollution, or summarily displaced by the roads, factories, and commercial metropolises

that comprise our economies. It is left to animal welfare organizations such as The Humane Society of the United States and The Fund for Animals, the International Fund for Animal Welfare, and the Animal Welfare Institute to occupy this unique niche. There are many reasons beyond animal welfare for developed nations, beginning with the United States, to adopt steady state economies, but there are just as many commercial and political barriers. It will take solidarity on the part of those advocating a steady state economy, and the animal welfare community’s involvement is paramount in developing public support. Aside from the prospects of their own children and grandchildren (prospects that are likewise threatened in the long run by economic growth), many Americans genuinely care about the humane treatment of wild animals. They just need to see how this concern conflicts with the goal and process of economic growth.

One may ask, “But what, specifically, can animal protection advocates do to help in the establishment of a steady state economy?” A thorough answer requires a book of its own, but a short answer is easy and in order. First, animal protection organizations can educate their members on the conflict between economic growth and the humane treatment of wild animals. Once their members are sufficiently conversant with the subject, animal protection advocates can begin to educate the general public, beginning with the civic groups and organizations with which they already partner on other issues. A slightly more advanced step is to develop educational campaigns in cooperation with other animal welfare groups and conservation organizations.

We can expect the public to “get it” because, when we really think about it, this is an issue of common sense. Nothing grows forever. We can’t have our cake and eat it,

too. We can’t kill the goose that lays the golden eggs. The American lexicon is laden with pithy proverbs and apt anecdotes about the fallacies of perpetual economic growth and the perils of pursuing it. The iron triangle of economic growth will defend itself, primarily with a plethora of propaganda, but one dollar’s worth of solid common sense can defeat thousands of dollars of propaganda.

When we have engaged the public’s common sense, there will remain a whole world of political work toward the establishment of a steady state economy through public policy. This will entail macroeconomic policy reform. Fiscal and monetary policy levers will have to be ratcheted down gradually, from the current expansionary settings to the steady state economy.

Macroeconomic policy reform is off in the future, and we can’t get there without the requisite public education and outreach. Yet that future is something to cherish, strive for, and unite us. It’s the only future that is wholly conducive to the humane treatment of wild animals.

Literature Cited

- Beder, S. 2002. *Global spin: The corporate assault on environmentalism*, rev. ed. White River Junction, Vt.: Chelsea Green.
- Center for Biological Diversity. 2006. Altamont Pass Wind Resource Area. <http://www.biologicaldiversity.org/swcbd/programs/bdes/altamont/altamont.html>.
- Czech, B. 2002. A transdisciplinary approach to conservation land acquisition. *Conservation Biology* 16(6): 1488–1497.
- Czech, B., and H. Daly. 2004. The steady state economy: What it is, entails, and connotes. *Wildlife Society Bulletin* 32(2): 598–605.
- Czech, B., P.R. Krausman, and P. K. Devers. 2000. Economic associations among causes of species endangerment in the United

- States. *Bioscience* 50(7): 593–601.
- Czech, B., D.L. Trauger, J. Farley, R. Costanza, H.E. Daly, C.A.S. Hall, R.F. Noss, L. Krall, and P.R. Krausman. 2005. Establishing indicators for biodiversity. *Science* 308: 791–792.
- Daly, H., and J. Cobb. 1989. *For the common good: Redirecting the economy towards community, the environment and sustainable development*. Boston: Beacon Press.
- Daly, H.E., and J. Farley. 2003. *Ecological economics: Principles and applications*. Washington, D.C.: Island Press.
- Deffeyes, K.S. 2001. *Hubbert's peak: The impending world oil shortage*. Princeton, N.J.: Princeton University Press.
- Eisenhower, D.D. 1961. Public papers of the presidents. <http://coursesa.matrix.msu.edu/~hst306/documents/indust.html>.
- Erickson, W.P., G.D. Johnson, and D.P. Young, Jr. 2005. A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions. USDA Forest Service General Technical Report. PSW-GTR-191.
- Gaffney, M., and F. Harrison. 1994. *The corruption of economics*. London: Shephard-Walwyn.
- George, H. 1929. *Progress and poverty*. New York: Vanguard Press.
- Harness, R.E., and K.R. Wilson. 2001. Electric-utility structures associated with raptor electrocutions in rural areas. *Wildlife Society Bulletin* 29: 612–623.
- Harvell, C.D., C.E. Mitchell, J.R. Ward, S. Altizer, A. Dobson, R.S. Ostfeld, and M.D. Samuel. 2002. Climate warming and disease risks for terrestrial and marine biota. *Science* 296: 2158–2162.
- Heilbroner, R.L. 1992. *The worldly philosophers: The lives, times, and ideas of the great economic thinkers*, 6th ed. New York: Simon and Schuster.
- Humane Society of the United States, The. 2006. Wildlife crossings—Wild animals and roads. http://www.hsus.org/wildlife/issues_facing_wildlife/wildlife_crossings_wild_animals_and_roads/.
- Jones, C.I. 1998. *Introduction to economic growth*. New York: W.W. Norton.
- Korten, D. 2001. *When corporations rule the world*, 2d ed. Bloomfield, Conn.: Kumarian Press.
- Malcolm, J.R., C. Liu, R.P. Neilson, L. Hansen, and L. Hannah. 2006. Global warming and extinctions of endemic species from biodiversity hotspots. *Conservation Biology* 20: 538–548.
- Mill, J.S. 1900. *Principles of political economy, with some of their applications to social philosophy*, rev. ed. New York: Colonial Press.
- Nørgård, J.S. 2006. Consumer efficiency in conflict with GDP growth. *Ecological Economics* 57(1): 15–29.
- Ormerod, P. 1997. *The death of economics*. New York: John Wiley and Sons.
- Pianka, E.R. 1974. *Evolutionary ecology*. New York: Harper and Row.
- Romer, P.M. 1990. Endogenous technological change. *Journal of Political Economy* 98(October): S71–S102.
- Sardar, Z., and M.W. Davies. 2003. *Why do people hate America?* New York: Disinformation Company.
- Simon, J.L. 1981. *The ultimate resource*. Princeton, N.J.: Princeton University Press.
- U.S. Fish and Wildlife Service. 2002. 2001 national survey of fishing, hunting, and wildlife-associated recreation. Washington, D.C.: U.S. Department of the Interior.
- . 2006. Box score. *Endangered Species Bulletin* 31(1): 36.
- Venetoulis, J., and C. Cobb. 2004. Genuine Progress Indicator (GPI) 1950–2002 (2004 update). San Francisco, Calif.: Redefining Progress.
- Wackernagel, M., and W. Rees. 1996. *Our ecological footprint: Reducing human impact on the earth*. Gabriola Island, B.C.: New Society.
- The Wildlife Society. 2003. The relationship of economic growth to wildlife conservation. Wildlife Society Technical Review 03-1. Bethesda, Md.: The Wildlife Society.