

Economic Growth, Ecological Economics, and Wilderness Preservation

Brian Czech

Abstract—Economic growth is a perennial national goal. Perpetual economic growth and wilderness preservation are mutually exclusive. Wilderness scholarship has not addressed this conflict. The economics profession is unlikely to contribute to resolution, because the neoclassical paradigm holds that there is no limit to economic growth. A corollary of the paradigm is that wilderness can be preserved in a perpetually growing economy. The alternative, ecological economics paradigm faces a formidable struggle for credibility in the policy arena. Wilderness scholars are encouraged to develop research programs that dovetail with ecological economics, and wilderness managers are encouraged to become conversant with macroeconomic policy implications.

Economic growth is an increase in the production and consumption of goods and services. It refers primarily to national economies and is usually measured in terms of gross domestic or gross national product (GNP). Economic growth is achieved via increasing population, per capita consumption or both. It is highly valued by the American public and is a goal of the United States government.

Economic growth has also been identified as the limiting factor for wildlife conservation at the national level, because virtually all cases of species endangerment are a function of economic growth (Czech 1997; Czech and Krausman 1997a; Czech and others 2000; Wilcove and others 1998). Economic growth entails the liquidation of natural capital such as forests, aquifers, and mineral deposits (Czech 2000a; Jansson and others 1994). Many of the economic developments that threaten species simultaneously threaten wilderness, and economic growth may be considered the ultimate challenge to wilderness preservation.

An argument that is commonly employed against this view states that economic growth is necessary to produce institutions that preserve wilderness. Proponents of this argument point to the lack of wilderness designations in developing countries, and they contrast that lack with the relatively outstanding wilderness preservation system in the highly developed United States. However, this argument overlooks three anomalous characteristics of the United States.

First, the United States contains vast tracts of rugged landscape that have been resistant to development. One would not expect the United States to be a bastion of

wilderness preservation if, for example, it consisted entirely of arable land. The lack of tallgrass or Palouse wilderness is evidence for the susceptibility of arable lands to development, as is the high percentage of designated wilderness that is rugged, arid or otherwise difficult to develop.

Second, the United States contains an unrivalled wealth and diversity of natural resources. Few of these resources were employed at the dawn of American history, partly because the Native American tribes had been decimated by diseases that swept the continent ahead of the European immigrants (Stannard 1992). The extremely high ratio of natural resources (including acreage) to humans allowed the new American civilization to quickly amass vast amounts of money, which could then be spent on wilderness preservation and other “amenities.” While this history supports the notion that economic growth once contributed to wilderness preservation, it does not support the argument that it still does. The ratio of natural resources (especially acreage) to people that existed during frontier America cannot be replicated today, especially as technology has made it possible to develop previously uninhabitable environments. The marginal returns to wilderness preservation provided by economic growth are diminishing.

Third, the United States has been successful in exploiting foreign labor and injecting its economy with money liquidated from foreign natural capital. This has had the effect of shifting wilderness preservation potential from other nations to the United States.

In addition to the anomalous nature of the United States as a wilderness preserver, the argument that economic growth is necessary for wilderness preservation commits the “fighting fire fallacy.” One may fallaciously argue that the cause of a disastrous fire can be traced to the lack of a promptly employed backfire, without acknowledging that the backfire would have never been needed were it not for the original fire. Neither economic growth nor anything else would be necessary to protect wilderness, were it not for the threat to wilderness originally posed by economic growth.

Congress implicitly acknowledged the impact of economic growth on wilderness when it passed the Wilderness Act of 1964 (Public Law 88-577):

In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring source of wilderness.

Despite the primacy of economic growth as a threat to wilderness, wilderness scholarship has been nearly silent about economic growth. This silence may result from several phenomena. First, it probably reflects a lack of interest.

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Brian Czech is Conservation Biologist, U. S. Fish and Wildlife Service, 4401 N. Fairfax Drive, Room 670, Arlington VA 22203 U.S.A.

Wilderness scholars and managers presumably have more interest in natural history, ecology and outdoor recreation. In any profession, some people practice primarily for the enjoyment derived from working with the subject. The fact that economic growth is the limiting factor for wilderness preservation may be overlooked by those preoccupied with enjoying wilderness while it lasts.

Second, the silence probably reflects wilderness scholars' lack of macroeconomic expertise. Many wilderness scholars are concerned with the threat of economic growth to wilderness, but they feel powerless to address this threat because they have studied neither the history nor the theory of economic growth. Scholars work in a peer-reviewed world where expertise is essential for making assertions, and they seldom conduct research on topics not covered in their graduate curricula. Alternatively, scholars with limited macroeconomic expertise may naively subscribe to the aforementioned argument that economic growth is prerequisite to wilderness preservation.

Some wilderness scholars may avoid the economic growth problem because they perceive it as self-evident. They may be concerned about economic growth but assume that the problem is so obvious that it merits neither research nor discussion. They are evidently unaware of the content and influence of neoclassical economic growth theory (as discussed below).

Finally, others may avoid the topic because they think solutions are unattainable. They may hope that economic growth will taper off in time for the sake of wilderness preservation, but fatalism prevents them from believing that their research or management can be used to affect the outcome.

The purpose of this paper is to familiarize wilderness scholars and personnel with the issue of economic growth vs. wilderness preservation, so that they may enter into more productive macroeconomic dialogue with economists, policymakers and the public. My objectives are to summarize the literature on economic growth and wilderness, describe the institutionalization of economic growth in the United States, outline competing theories of economic growth, introduce the nascent field of ecological economics, and provide recommendations for conducting and applying ecological economics research to wilderness preservation.

Economic Growth in the Wilderness Literature

I used the University of Arizona's Sabio □ literature referencing system and found 2,775 entries indexed with the key word "wilderness." I added the keyword "economic," and the list was reduced to 15 articles, then to three articles when I added the keyword "growth." All were book chapters: one description of wilderness valuation in Scotland (Hanley and Craig 1991), one third-world critique of wilderness preservation (Guha 1995), and one discussion of the threats of the property rights movement to wilderness (Chisholm 1996). None of these chapters (or any of the other 12 indexed under "wilderness" and "economic") was primarily about the threat of economic growth to wilderness, much less possible solutions. These chapters were revealed by the literature search

simply because they were found in books that contained other chapters related to economic growth.

International Journal of Wilderness (IJW), the only academic journal devoted to wilderness issues, is not indexed by Sabio. I therefore reviewed the 137 articles that have been published in IJW since the inaugural issue. The only one that focused technically on economic growth provided a confusing message about its propriety. Power (1996) disputed the argument of some anti-wilderness interests that wilderness designation tends to dampen the economic development of surrounding areas. He noted that economies neighboring wilderness have more potential for growth because workers and businesses are attracted to beautiful and natural surroundings. He identified a resulting conundrum: "The economic problem we need to be focusing upon is how to keep attractive natural environments from being destroyed by the growth they stimulate, not how to fight economic depression caused by protecting natural areas and wilderness." But he provided no suggestions as to how this problem might be addressed and proffered instead, "The point is that people care where they live... This is important to the future development of our nonmetropolitan areas. In the competition to attract both new residents and new businesses, the quality of the natural and social environment is going to be important. Wilderness protection, by granting permanent protection to those landscapes that are most unique in a region, can be an integral part of such an economic development strategy." These statements are consistent with the view that continued economic development around wilderness is appropriate (as were a series of presentations delivered at a 1989 wilderness conference; Lime 1990). As to the "permanent protection" afforded by wilderness designation, the Director of the National Park Service provided a pivotal point: "The same democracy that raised the wilderness system can also raze it" (Kennedy 1996).

Democracies and other governments that lack the aforementioned anomalies of American history may raze the wilderness before wilderness systems are ever raised. In Namibia, for example, "Wilderness must be planned in a way that ensures that its total economic value, realizable by both local land holders and society as a whole in Namibia, is higher than the value of alternative nonwilderness land uses. Failure to ensure this will mean that, as demand for rural land and income generation grows, wilderness will be converted to these other uses" (Barnes 1998). In other words, because Namibians lack the high standard of living enjoyed by Americans, Namibian wilderness preservation is already dependent on a market favorable to it. But Barnes (1998) explored neither the possibility that economic growth eventually drives the value of alternative land uses beyond "realizable" wilderness value nor that realizable wilderness value in a growing economy will eventually be extracted at an intensity high enough to "de-wild" the wilderness.

The only other IJW author who explicitly addressed economic growth was Clugston (1998), who noted that "A preoccupation with economic growth and consumption is fundamentally contrary to awakening the ecological sensibility that we are striving to cultivate." As a solution, Clugston (1998) proposed spiritual transcendence. Similarly, Oelschlaeger (1995) spoke of the "folly of sustainable development" and claimed, "But there is an alternative to

sustainable development, one that places wildness at its center.” The alternative was a biocentric spiritual plane, and the recommendation for reaching it was devoid of research and policy recommendations. Neither Oelschlaeger nor Clugston proposed economic alternatives to economic growth.

In stark contrast to Oelschlaeger (1995), Faries and Cervigni (1998) took neither a spiritual approach nor denied the validity of sustainable development. Curiously for an IJW article, Faries and Cervigni (1998) never used the term wilderness either, as if to acknowledge that the “parallel goals of sustainable development and increased investment in biological capital” led simultaneously to economic usurpation of wilderness. Like Barnes (1998), they suggested that integrating ecological values with the market economy was the key to conservation. Whereas Barnes thought that the market could operate to conserve wilderness, however, Faries and Cervigni settled for applying the goal of conservation to “biological resources.”

Several IJW articles that did not address economic growth nevertheless held implications therefor. For example, Roush (1995) classified population growth as the biggest threat to wilderness. Roush also acknowledged the importance of economic growth implicitly by stating, “Surely, we could reduce our consumption and stretch the world’s resources,” but concluded, “The problem finally is numbers.”

Population is an important factor indeed, because it complements per capita consumption as one of the primary components of economic growth. Were it not for the economic activity associated with each human life, however, the raw abstraction of human numbers would threaten nothing. Furthermore, even if the American population were stable, technological development would enable it to liquidate an increasing acreage of wilderness for economic purposes. While population growth is problematic, it makes little sense to view it as more problematic than per capita consumption; both threaten wilderness, and either may increase regardless of the other. The concept that embodies the synthesized impacts of population and per capita consumption is economic growth.

Kelson and Lilieholm (1997) inventoried land activities that were deemed problematic by managers when conducted adjacent to wilderness areas. Their list included logging, road construction and maintenance, livestock production, pollution, urbanization, fire management and various forms of recreation. All of these categories were noted by Czech and Krausman (1997a, 2000) and Czech and others (2000) as major causes of species endangerment in the United States. The remaining categories reported by Kelson and Lilieholm could be rearranged and renamed to mirror the other causes of species endangerment summarized by Czech and Krausman. Kelson and Lilieholm, however, drew no inference to economic growth, and stated that, “Only a few activities were consistently thought to have serious impacts on wilderness... Some high-profile activities, such as industry smoke plumes and oil and gas extraction, are perceived to have little impact on wilderness.”

Kelson’s and Lilieholm’s assessment obscures the fact that industry (including petroleum extraction and refining), whether adjacent to wilderness or not, occurs for the purpose of fueling the very activities (among others) that do occur near wilderness and do diminish wilderness values. Instead of pointing to the perils of economic growth, Kelson

and Lilieholm essentially supported the argument that economic growth is not a problem as long as the right sectors grow. That commonly employed argument fails to acknowledge the complex integration of the economy as a system that expands and contracts more or less as a whole (Boulding 1993), with various sectors only gradually fading in significance.

Managers also appear reticent on economic growth. In a special IJW report on the status and prospects for wilderness in the United States, leading wilderness officials from the four major wilderness managing agencies provided their views of the future (Henry 1996; Jarvis 1996; Jerome 1996; Stokes 1996). None of them even mentioned economic growth. Barnes (1997) reported the results from the Sixth National Wilderness Conference in Santa Fe, where managers joined with academicians in 1994 “to develop consensus on the actions needed to guide wilderness stewardship over the next decade.” Broad categories included policy, administration, cooperation and education. Economic growth was neither a category nor mentioned under any of the categories.

This critical review does not imply that the aforementioned authors were unreasonable in their assessments. The purely spiritual approaches of Clugston (1998) and Oelschlaeger (1995), for example, were appropriate because each wrote for IJW’s “Soul of the Wilderness” feature. Given more room, Barnes (1998) may very well have elaborated on the limitations of marketing conservation in a perpetually growing economy. Power’s (1996) development-accommodating article nevertheless identified economic growth as the real challenge to wilderness. Roush’s (1995) neglect of economic growth per se does not negate the fact that population growth is a crucial challenge to wilderness. While these few authors contributed some important points, this critical review suggests that economic growth constitutes an almost negligible topic in the wilderness literature. Even when the topic is broached, practical recommendations are rarely produced. From the perspective of economic growth as the limiting factor for wilderness preservation, the literature gives the appearance that wilderness professionals have been laboring in futility.

Economic Growth as an American Institution

Despite many clear attempts to alleviate problems caused by economic growth in the legislative and executive branches of government (including the formation and administration of the National Wilderness Preservation System), there has been no coordinated program to slow economic growth, much less to establish a stable gross national product. Politicians and high-level executives jockey to convince constituencies that they will produce the most growth. During the nationally televised vice presidential debate of 9 October 1996, Republican candidate Jack Kemp exhorted, “We should double the rate of growth, and we should double the size of the American economy” (Washington Post 1996). Vice President Al Gore, who authored the ecologically economic *Earth in the Balance* (1992), nevertheless sanctioned the growth race by replying, “Well, the economy is growing very strongly right now... The average growth rate is also coming up. It is

higher than in either of the last two Republican administrations” (Washington Post 1996).

In her annual report for fiscal year 1992, the Republican Secretary of Commerce, Barbara Hackman Franklin (1992) reported that her department had adopted “a seven point agenda for fostering economic growth.” In his annual report for fiscal year 1994, the Democratic Secretary of Commerce, the late Ronald Brown (1994), characterized the activities of his department as “promoting economic growth through [a variety of measures].”

Even in agencies that play an active role in natural resource conservation, economic growth may supersede. The Army Corps of Engineers is the oldest natural resource agency in the federal government and is responsible for much of the nation’s water quality and wetlands conservation. Since the 1970s, the Corps has defined its mission in terms of four programs; National Economic Development, Regional Economic Development, Environmental Quality, and Social Well-Being. In 1983, consistent with President Reagan’s emphasis on regulatory impact assessment, the Corps prioritized economic development (Graves 1995).

One politically popular concept is “sustainable development.” As used in government programs, nationally and internationally, “development” has long been a cryptic term that highlights the measurable benefits of economic growth while ignoring the unaccounted costs (Robinson 1993; Willers 1994). It is the proverbial win-win solution, suggesting that we can have economic growth and ecological sustainability. According to its February 1999 Internet site, “The Department of Commerce promotes job creation, economic growth, sustainable development, and improved living standards for all Americans...” (<http://204.193.243.2/public.nsf/docs/mis-sion-statement>). Yet sustainable development as process is an oxymoron (Botkin 1990). The only legitimate “sustainable development” is one in which development is a noun, where the process of development has ceased, and where a steady state of maintenance has commenced (Czech and Krausman 2000).

The embrace of economic growth by politicians and high-level administrators is readily understandable in light of three interrelated phenomena. First, Americans value economic growth highly; as much as property rights and species conservation (Czech and Krausman 1999). Second, nearly all American noneconomists with a rudimentary education in economics have been taught that economic growth is one of the primary goals of macroeconomic policy (Czech 2000b). For example, in their introductory textbook, Ekelund and Tollison (1988) taught, “The overall goal of macroeconomic policy is the achievement of economic stabilization... to attain maximum economic growth in the present and future.” Third, industry relies on economic growth for increasing profits, so corporate lobbies defend neoclassical teachings about the propriety and perpetuity of economic growth.

There is no reason to view the institutionalization of economic growth as an insurmountable obstacle, however. Slavery and segregation are examples of deeply entrenched American institutions that have been overcome or greatly alleviated as norms evolved. Caucasian women, Native Americans, and African Americans eventually obtained suffrage. Economic sectors from market hunting to organochlorine manufacture have virtually been terminated. Disposal of the public domain officially ended in 1976. The underlying

motivation in each case was the recognition, first by an enlightened few and then by the many, of the great damage done by the erstwhile institutions. The American public values the availability of resources for posterity more than it does democracy, economic growth or property rights (Czech and Krausman 1999). Economic growth is not impervious to a paradigm shift, but the amount of wilderness to be preserved is a function of how soon that shift transpires.

Competing Theories of Economic Growth

Economic growth theory has been through three major episodes (Czech 2000b). During late 18th-century France, an influential academic movement called physiocracy held that agriculture was the foundation of all economic growth. This was a politically motivated theory; its proponents were the landed nobility who were accumulating the ire of the bourgeoisie. Nevertheless, physiocracy contained elements of profound common sense. Among other things, it implied that economic growth was limited by the availability of land. Few physiocrats would have claimed that wilderness could be preserved in a perpetually growing economy.

After Adam Smith’s *Wealth of Nations* was published, physiocracy rapidly lost influence. Land was identified as only one factor of production, and its primacy was not clear. The importance of labor and especially capital could be seen firsthand in the midst of the Industrial Revolution. This new economics would eventually become “classical.” Adam Smith entertained the notion of an end to economic growth, but had no reason to dwell thereon. Thomas Malthus and, to a lesser extent, David Ricardo did dwell on it, but their agriculture-based theories were refuted by the evidence of industrialization and ultimately disregarded. John Stuart Mill’s vision of the “stationary state” failed to ring with the masses like Marx’s alternative utopia. With capitalism and socialism vying for world domination, at a time when natural resources were relatively plentiful, the competition between economic systems was largely about producing faster growth.

From 1885 to 1908, Alfred Marshall synthesized classical economics and modified it with theories of cost, value, distribution and marginal utility. *Principles of Economics* (1890) became one of the most influential textbooks of all time, and Marshall’s tenure at Cambridge University is identified as the dawn of “neoclassical” economics. There have been no widely accepted paradigm shifts in the economics discipline since then, unless one so classifies John Maynard Keynes’ departure from *laissez faire*.

Economic growth was not a major topic of neoclassical economics in its early stages. After the Depression and the wide acceptance of Keynesian macroeconomic manipulation, however, economic growth became a relatively major subdiscipline. One of today’s most widely cited models was developed by Nobel laureate Robert Solow (1970). Solow’s focus was “human capital,” that is, intelligence, education, training and experience embodied in ideas, technology and processes. He saw no reason why human capital could not perpetually substitute for natural resources or, therefore, why economic growth could not continue perpetually.

Observations like this, in the context of species endangerment and wilderness disappearance, led many noneconomists

to doubt the validity of neoclassical theory. When the Club of Rome produced *The Limits to Growth* (Meadows and Club of Rome 1972), critique of neoclassical economics came into vogue. *The Limits to Growth* itself has not held up well to economic scrutiny, but an increasing cadre of professional and amateur economists argue that economic growth is indeed limited. These economists generally fall under the rubric of “ecological economics.” While their practice is relatively new, there already exists an International Society for Ecological Economics (ISEE, Solomons, Maryland) that encourages the integration of economics and ecology into a transdiscipline focused on sustainability.

In contrast to neoclassical economics, ecological economics offers a model of economic growth consistent with wilderness preservation (Czech 2000b). It incorporates the natural sciences, especially physics and ecology, to conclude that unchecked economic growth will lead to widespread ecological and therefore economic damage. Essentially, ecological economics builds a model of human economy consistent with the wildlife biologist’s concept of animal population growth (and, in many respects, with physiocracy and classical economics). While natural resources are plentiful, the human economy will grow rapidly. As resources, including space, become scarce, the economy may behave either like a K-selected or an r-selected species. It may either speed past carrying capacity and crash amidst a wasted environment, or it may gradually equilibrate around carrying capacity. For wilderness conservationists, neither of these scenarios is desirable. Wilderness requires that humans engineer an economy that equilibrates at a level sufficiently below carrying capacity to accommodate undeveloped areas.

Research Recommendations

For researchers who intend to produce knowledge “for its own sake,” recommendations beyond those of scientific methodology are impertinent. In selecting research topics that can help build knowledge to assist in wilderness conservation efforts, however, researchers should identify threats to wilderness and then design research that will enable society to address those threats. Threats to wilderness may be proximate or ultimate. Encroaching subdivisions, intensifying ecotourism and infrastructural developments threaten many wilderness areas proximately. Traditional ecological research results may readily be used by managers to reduce or mitigate the effects of these threats. However, reduction and mitigation of impacts does little to affect the occurrence of proximate threats, much less the ultimate threat of economic growth. As Reed and others (1990) noted, “Wilderness will not be preserved if managers adopt a policy of curing rather than preventing problems.”

Wilderness preservation may depend on creative, transdisciplinary research that addresses economic growth as the ultimate threat. The first, most general recommendation is for wilderness scholars to become versed in basic macroeconomics, with a focus on economic growth theory. Wilderness scholars should be familiar with the contrast between neoclassical and ecological economics, particularly their visions of economic growth and the limits thereto. Because ecological economics is a nascent transdiscipline, there is an opportunity for wilderness scholars versed in the

natural sciences to participate in constructing a more ecologically informed economics. ISEE, with its journal *Ecological Economics*, may help facilitate this contribution.

One promising topic for wilderness scholars is the relationship of gross national product to wilderness loss in the United States and other nations. The importance of this topic inheres in its ability to document and illuminate a relationship that has been largely a theoretical construct. Lack of a statistical analysis of this relationship has opened the door for neoclassical adherents like Simon (1996) to claim that wildland acreage in America has actually increased with economic growth (supposedly because the economy has become more urbanized).

Another promising area for study was revealed by Barnes (1998): “For direct use values there is likely to be an optimal size for a wilderness area, beyond which the values per unit of land from recreation and consumptive uses begin to diminish.” Barnes mentioned that this economically optimal size depends on ecological characteristics and on surrounding land use practices, implying that optimal size would change over time. Presumably optimal size decreases as a function of economic growth in the surroundings because wilderness uses comprise a luxury in an economy based on the extraction of natural capital and requiring space for expansion (as all economies ultimately are and do, respectively). Development of models that display this relationship would be helpful for predicting the wilderness impacts to be caused by economic growth. Such predictions would assist wilderness preservation advocates in local policy arenas.

Research that would fall under the rubric of “environmental economics,” which may be classified as a branch of neoclassical economics that specializes in natural resources, may also be useful for wilderness preservation. Valuation of natural capital is the endeavor in which environmental and ecological economics overlap the most, philosophically and methodologically. In some cases, valuation of wilderness amenities can help wilderness advocates in defending the designation and retention of wilderness.

Wilderness values may derive from use or nonuse. Use values derive from direct and indirect use. Virtually by definition, few types of direct use value inhere in wilderness. The best example of direct use value would be equivalent to the amount expended on access fees, which typically do not exist on public lands. The cost of wilderness hunting and fishing permits, guiding fees and other in-wilderness services also qualify as direct use value. From a local government’s perspective, a nearby wilderness can be directly “used” to procure federal payments in lieu of taxes, depending on the management agency involved. In cases where livestock grazing is allowed, grazing fees can be classified as direct use value, but this value results only from compromising wilderness integrity. Loomis (this volume) discusses wilderness direct use value.

Given the relative paucity of direct use values that derive from wilderness, economic defense of wilderness depends heavily on valuation of indirect use and nonuse. Indirect values include costs incurred in traveling to the wilderness, goods purchased for purposes of wilderness use, nearby lodging fees and other services procured around the wilderness.

For direct or indirect use values, costs incurred often underestimate wilderness value. Because public land

management is generally funded through federal taxes, users are not asked to pay market value. Travel costs also tend to be less than wilderness visitors would be willing to pay. Willingness-to-pay studies can help researchers estimate actual use values. Loomis (this volume) provides state-of-the-art information on such studies and additional recommendations for research.

Nonuse values include option, bequest and existence value (Barnes 1998). Theoretically, these too may be estimated with shadow pricing techniques, especially contingent valuation (Loomis this volume), but the propriety of using any type of pricing system for expressing these values is questionable. Valuation research can backfire if it gives the impression that the merit of wilderness designation is to be judged exclusively or even primarily by real or shadow prices. One of the incentives this impression gives wilderness managers, especially in a growing economy, is to promote wilderness use. Increasing demand for wilderness use provides wilderness with higher economic value, but if the demand is realized, wilderness is increasingly impacted. Wilderness preservation will probably always entail defending values that evade monetary pricing.

One approach to a nonmonetary valuation of wilderness is the relative importance method, where respondents rate entities along an importance spectrum. Czech and Krausman (1997b, 1999, 2000) and Czech and others (1998, 2000) used this technique to "value" (relative to each other in nonmonetary terms) such institutions and concepts as democracy, economic growth, property rights, ecosystem health and species conservation. Publics may similarly be asked to rate the importance of wilderness preservation relative to economic growth. More specific studies may address the relative importance placed by the public on preserving a specific acreage of a particular wilderness vs. increasing the scale of a particular local economy a specific amount.

In a functional democracy, wilderness preservation depends on the extent to which a majority comes to value wilderness more than economic growth. For example, if retaining X hectares of wilderness (holding the ecological integrity of the wilderness constant) were more important to the majority than growing the economy past Z trillion dollars gross national product, the majority would mobilize to protect wilderness and would force the economy to stabilize at Z. In economic terms, if the marginal disutility of economic growth to wilderness and other values exceeded the marginal utility of economic growth to material welfare, economic growth would cease. The gradual erosion of wilderness values, in other words, is evidence that additional economic growth is valued more than the current level of wilderness preservation (unless the market is dysfunctional for wilderness preservation—a distinct possibility). Meanwhile, wilderness scholars have established a tradition of public education research. *International Journal of Wilderness*, for example, hosts a regular section on education. Research designed to determine what the public knows about economic growth, why it values economic growth so highly, and how best to impart the principles of ecological economics would be useful for educators and wilderness managers.

Because research on ecological economics education is a new field for exploration, the first studies should attempt to answer very basic questions, like how versed the public is in

economic growth and ecological economics terms. For example, it seems plausible that a majority is aware that economic growth is a function of population size and per capita consumption. If this assumption were errant, however, some very basic education would be required to establish a cogent public discussion on wilderness/economic growth issues. On the other hand, if research revealed that people were already familiar with, for example, the concept of steady state economy, education efforts would more productively commence at a higher level of sophistication.

Finally, research on economic growth theory has tremendous implications for wilderness. While ecological economics has come far in constructing theory and compiling evidence for the existence of an economic carrying capacity, it has not provided an integrated model that is intellectually accessible to the public. If a model was developed that showed clearly, concisely, and inarguably that economic growth was limited and that the problems caused by approaching that limit were already accumulating, the probability that concerned citizens would support a steady state economy would increase (Czech 2000b). As long as the neoclassical model of unlimited economic growth is credible among the public and in policy circles, efforts to curb economic growth are unlikely. Research on economic growth theory is beyond the call of even the most conscientious wilderness scholars, however, and therefore poses a special challenge to natural resources economists or other economists with an interest in wilderness preservation.

Management Recommendations

Wilderness managers should also become versed in ecological economics and economic growth theory. This will enable them to refute the misguided claims of politicians and other policymakers who, intellectually or for the sake of political expedience, subscribe to the neoclassical theory of economic growth. Although managers are obligated to deal with everyday proximate threats to wilderness, they should maintain an awareness of the ultimate threat lurking in the background. Maintaining this awareness will produce opportunities for educating the public and policy makers about the perils of perpetual economic growth. Such opportunities may arise via the Internet, newspaper columns, advocacy group meetings, public hearings, and briefings with government officials. Finally, managers can encourage researchers to redirect their efforts to addressing the challenge of economic growth.

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