

Malthus: More Relevant Than Ever

by *William R. Catton, Jr.*

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For the last two hundred years, Malthus' *An Essay on the Principles of Population* has served to define the terms of debate on human population growth and the Earth's capacity to provide subsistence. And, if human civilization lasts that long, William Catton's 1980 book, *Overshoot* *may well turn out to be the definitive statement on this issue for the next two centuries. In this Forum, Dr. Catton elucidates the contemporary relevance of Malthus, by examining the concept of overshoot -- the ability of humans to temporarily expand their numbers at the expense of the natural world's long-term sustainability in the context of Charles Darwin's understanding of population competition.*

Malthus, Darwin, and population competition

In 1798, Thomas Robert Malthus tried to inform people that a human population, like a population of any other species, had the potential to increase exponentially were it not limited by finite support from its resource base. He warned us that growth of the number of human consumers and their demands will always threaten to outrun the growth of sustenance. When Charles Darwin read Malthus, he recognized more fully than most other readers that the Malthusian principle applied to all species. And Darwin saw how reproduction beyond replacement can foster a universal competitive relationship among a population's members, as well as how expansion by a population of one species may be at the expense of populations of other species.

Others were not so perceptive. When I was in high school, the textbook used in my biology class listed "Over-production of individuals" first among "the chief factors assigned by Darwin to account for the development of new species from common ancestry through natural selection" (Moon and Man, 1933:457), but it did not cite Malthus nor discuss his concerns about population pressure. That neglect was typical because, for a while, "it was argued widely that developments had disproved Malthus, that the problem was no longer man's propensity to reproduce more rapidly than his sustenance, but his unwillingness to reproduce adequately in an industrial and urban setting" (Taeuber, 1964:120).

Malthus in the age of exuberance

Most of us can remember learning in school to dismiss Malthus as "too pessimistic." Technological progress and the economic growth resulting therefrom, we learned to assume, can always provide the essential consumables (or substitutes) that have permitted exuberant population growth. One of my college textbooks put it this way: "For conditions as they existed in 1798, Malthus was reasonably sound in his doctrines; but scientific and technological changes in the interval since his day have made Malthusian principles, in large part, an intellectual curiosity in our era" (Barnes, 1948:51).

In graduate school one of my textbooks acknowledged that "Man's tendency to multiply up to the maximum carrying capacity of the land is superficially evident in many parts of the world" (Hawley, 1950:150-151). Its eminent author, who has been called the "dean" of American human ecologists, conceded the likelihood that most lands at most historic times "have been populated to capacity in view of the particular modes of life of their occupants" but insisted (pp. 160ff) changes in such modes of life had made "the Malthusian interpretation of population problems decreasingly useful." The article about Malthus in the International Encyclopedia of the Social Sciences called his theory of population "a perfect example of metaphysics masquerading as science" (Blaug, 1968:551).

Reassessing Malthus inappropriately

When co-authoring an introductory sociology text my colleagues and I began to dissent from these disparaging evaluations of Malthus, but for not quite the right reasons (Lundberg et al., 1968:682): "Despite his inadequate data," we said Malthus "was nevertheless correct in arguing that the food supply fixes an upper limit beyond which the population cannot go at any given time." And we gave him credit for having taken into account "certain social and psychological factors, such as celibacy and moral restraint, which might keep population below that theoretical limit, and in doing this he focused attention," we supposed, "on factors which were frequently overlooked at the time."

Looking back, I now see both of those sentences of ours as inaccurate or misleading. His essay did not fully succeed in directing most people's attention to all the relevant factors, i.e., those checks that would prevent a human population from expanding to its full potential. Further, and more importantly, Malthus's confidence that no population could overshoot carrying capacity, but would only press miserably against the limit, precluded foreseeing the prodigality-based affluence we achieved by running up carrying capacity deficits that would be disastrous later on.

Overshooting Carrying Capacity

Drawing down resources from the future

Contrary to our partial endorsement, (1) Food is not the only component of "sustenance" for modern human living; industrialized human societies rely on continuing flows of many other resources, and a cessation of supply of any essential commodity can be devastating. (2) By drawing down "savings accounts" (i.e., using resources faster than their rates of renewal), populations can (and do) temporarily exceed carrying capacity. When the stockpile runs out, the once-thriving population finds itself in dire straits.

Misunderstanding checks and balances

With respect to our second appraisal sentence, although Malthus meant to focus attention on factors that check population growth, the effort didn't always succeed. Readers' attention seems to have persistently strayed back to the notion that Malthus believed populations would inevitably doom themselves to starvation by growing exponentially, so populations that burgeoned and prospered have been seen as supposed refutations of Malthus.

What most of us just didn't see was that a relatively short feedback loop was assumed by Malthus because of his 18th century perspective on technology. He was not mistaken in attributing exponential growth potential to all populations, nor was he mistaken in recognizing the unlikelihood that required resource supplies would grow apace. He did err in supposing population could never grow significantly beyond a key resource limit. Populations can, and often do exceed carrying capacity, and come to grief only after a delay. Malthus was writing not only before there was a developed science of ecology but also before there were full-blown industrial societies making prodigal use of fossil energy and other nonrenewable resources.

Delayed feedback from the environment

Human over-reproduction may be curbed by its ultimate adverse consequences much less promptly than Malthus assumed, unlike what happens to animals with much shorter maturation times and without technology. Two facts make the feedback loop dangerously longer for us than for most nonhuman species. First, humans have an unusually long period of maturation compared to other species. The lag between birth and the age of maximum resource consumption hardly mattered in 1798. Then as now, people's offspring made small resource demands as infants, and in 1798 their adult demands exceeded those of their infancy by a ratio not much greater than the adult-to-infant resource demand ratio for other animal species (which grow to maturity in only a year or so). Second, a mere eight human generations after Malthus, today's technology and our colossal reliance as adults on exosomatic energy sources (Cottrell, 1955; Catton, 1980; Price, 1995) have enormously magnified that ratio, putting it too far out of adjustment with ecosystem processes that supplied the modest demands of our ancestors.

So continuing to suppose the world can afford all the precious progeny we may produce leads now to serious problems. Babies grow up. In an industrial society, as adults they expect to live lifestyles that involve taking from the environment enormous per capita resource withdrawals and dumping into it vast amounts of life's toxic by-products.

It was no fault of Malthus that in 1798 he did not foresee this magnification. Even today, parents seldom if ever base their decisions about sexual activity on calculations of the lifetime resource demands and environmental impacts of each prospective child that may result. Our affluence, technology, and extraordinary period of maturation combine to obscure and delay but do not avert negative feedback from the environment.

Criticism ignores human capacity for overshoot

Malthus was not wrong in the ways commonly supposed. From his 18th century perspective he simply had no basis for seeing the human ability to "overshoot" carrying capacity. It was inconceivable to Malthus that human societies could, by taking advantage of favorable conditions (new technology, abundant fossil fuels), temporarily increase human numbers and appetites above the long-term capacity of environments to provide needed resources and services. But it is inexcusable today not to recognize the way populations can sometimes overshoot sustainable carrying capacity and what happens to them after they have done it.

Human economic growth and technology have only created the appearance that Malthus was wrong (in the way we used to learn in school). What our technological advances have actually done was to allow human loads to grow precariously beyond the earth's long-term carrying capacity by drawing down the planet's stocks of key resources accumulated over 4 billion years of evolution.

Competition and Overshoot

Human population growth and inter-species competition

Nearly everyone (but not Darwin) ignored crucial parts of the Malthus message. Darwin (1859:63) stands out for understanding Malthus correctly. Just after those two famous sentences about geometric increase of population versus arithmetic increase of food, Malthus ([1798] 1976:20) had said, "Necessity, that imperious all pervading law of nature, restrains them [all species] within the prescribed bounds. The race of plants and the race of animals shrink under this great restrictive law. And the race of man cannot, by any efforts of reason, escape from it. Among plants and animals its effects are waste of seed, sickness, and premature death. Among mankind, misery and vice."

In the third chapter of *On the Origin of Species*, Darwin (1859:60-79) spelled out how checks on the growth of any one species population are exerted by populations of other species associated with it in the web of life. Because every population is part of what we have since learned to call an ecosystem, when a particular species is "fortunate" enough to expand its numbers phenomenally, catastrophic reduction of other species populations must result. "We suck our sustenance from the rest of nature . . . reducing its bounty as ours grows" (Leakey and Lewin, 1995:233). But the "prosperity" of an irrupting population is fatefully precarious, as its own future is imperiled by nature's disrupted balance.

Environmental feedback: mass extinction poses a major threat

We have trebled the human load upon this planet in my lifetime by using the planet unsustainably and this has caused a new era of extinction. According to a recent survey, a majority of American biologists regard the mass extinction of plant and animal species now resulting from human domination of the earth as a grave threat to humans in the next century (Warrick, 1998). We live in a world losing biodiversity at an unprecedented rate (Koopowitz and Kaye, 1983; Wilson, 1992:215ff; Tuxill, 1998). It is high time to see that this consequence was implicit in the 1798 essay by Malthus.

Mankind is not only depleting essential mineral stocks. We are also diminishing the plant and animal resources available to future human generations, and destroying biological buffers against the effects of global climate change (Suplee, 1998). We are stealing from the human future. Had the "moral restraint" of our parents and grandparents been enhanced by understanding Malthus as cogently as Darwin did, a less ominous future might have been their legacy to us (and ours to our descendants).

NOTES

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About the author William R. Catton, Jr. is Professor of Sociology Emeritus, Washington State University. A distinguished educator, he has taught courses in sociology and human ecology at universities in the U.S., Canada and New Zealand. Dr. Catton has authored or co-authored over 100 articles in journals or as chapters of books and four books on sociology, the environment and human ecology, including his 1980 classic *Overshoot: The Ecological Basis for Revolutionary Change*. He can be reached by e-mail at: wrlcatton@aol.com.

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