

If Malthus Was So Wrong, Why Is Our World In Trouble?

by William R. Catton, Jr.

Minds that have not totally dismissed Malthus may realize that today's serious concern about human-induced global climate change¹ is consistent with an ominously Malthusian inference recently accepted by the authors of an environmentalist classic, the international best-selling book published in 29 languages, *The Limits to Growth* (Meadows et al. 1972). A quarter of a century ago those authors had argued that this planet's biogeochemical tolerance for the expanding human load would reach an ultimate limit within a century if then-current trends continued. Now they have updated their study. Over the years since their earlier book came out, various other writers suggested "resource and pollution flows had [already] grown too far," and when Meadows et al. (1992:xv) had "let our minds fully absorb the message" they concluded "The human world is beyond its limits. The present way of doing things is unsustainable."

Is that enlarged concern true? Has the load imposed on ecosystems by the human population of the world indeed already exceeded global human carrying capacity? If so, why do so many people still doubt it and dispute it (e.g. Kenney 1994; Maurice and Smithson 1984; Simon 1994; Wattenberg 1987) — two full centuries after Malthus (1798)² warned it could happen?

Reversing Malthus

Preconceptions and emotional commitments can easily distort our thinking about such matters. They can cause us to misperceive what was meant by something we hear or read (Durkheim 1982 [1895]:72-74). Even statements that seemed to the speaker or writer to be clear and unmistakable in

meaning can be construed by reader or hearer³ to mean the opposite of what was intended.

Ever since the time of Malthus this potential for distortion and misunderstanding has been operating. Important statements Malthus made have been taken to mean something quite different from what he was trying to say. Because of this, events, conditions and processes since his time that actually lend support to his ideas have often been cited as disproof of those ideas. This reversal of meaning of relevant evidence is seldom recognized.

Not least among such reverse interpretations of evidence is this: vast increases in the earth's human population since Malthus (1798) wrote his famous essay, and more or less commensurate increases in Earth's output of food for human consumption, have been taken as proof that Malthus was just plain wrong (Weeks 1989:64-65; Weller and Bouvier 1981:37).⁴

What did he say that is construed as having been disproved? And how have developments since his day supported rather than refuted his position?

The best known sentences from the 1798 essay on population by Malthus seem to be these: "Population, when unchecked, increases in a geometric ratio. Subsistence increases only in an arithmetical ratio" (Appleman 1976:20). The language is archaic, two centuries old. The same ideas would be expressed today in such words as these: population, apart from environmental resistance, tends to increase exponentially and can potentially outstrip an environment's ultimate capacity to sustain it.

Preconceptions and emotional commitments have kept almost everyone from paying appropriate attention to the particular phrase that, for Malthus, was key to understanding what he was about. What too many readers too easily overlook is the qualifying phrase, "when unchecked." The real aim of his famous essay was to call attention to the importance of the various conditions and processes

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that do, in fact, check population growth — keeping it short of maximum exponential increase. Analysis of the checks and their manner of operating was the aim of much of his essay, and especially much of its later revisions and his subsequent writing. There are such checks; they do operate. Their strength varies in different circumstances, and Malthus was quite aware of this. More has been learned since, and for full appreciation of the enlightenment Malthus tried to provide, we need to extend our understanding of his insights accordingly.

Social scientists are familiar with the distinction he made between “positive” and “preventive” checks. Population increase is “positively” checked by war, pestilence and famine — events or conditions that heighten human death rates. Population growth was “Preventively” checked, as Malthus saw, by misery and vice, which hold down birth rates. And in a revised edition five years later, he added “moral restraint,” meaning principally such behavior patterns as celibacy and delayed marriage. Modern birth control techniques would seem to modern minds to qualify under his heading of moral restraint, though Malthus, in keeping with the temper of his time, would have classified them under “vice.”

A Multi-species Perspective

Population regulation is viewed rather differently by modern ecologists. Their attention is not focused on just the single species, *Homo sapiens*, as was the attention of all too many of Malthus’ readers. The single-species focus still holds for today’s demographers who acknowledge that his “positive” checks have to do with human mortality rates and his “preventive” checks operate through fertility rates. But ecologists, agreeing that the Malthusian *tendency* toward exponential growth is commonly held in check, pay attention to the growth-limiting effects of interactions between species. According, they regard populations of particular species as (a) predator-limited, (b) resource-limited, or (c) self-limited (Lack 1954; Wynne-Edwards 1965). In other words, a population’s tendency to proliferate is held down either by actions of other species that prey upon it, or by limited abundance of other species upon which it depends for sustenance, or by reproduction-curbing ways of interacting with its own conspecifics

There is only partial congruence between ecologists’ three-fold classification of regulative patterns and the Malthusian two-fold classification more familiar to social scientists or demographers. Resource-limited populations are held down by sustenance shortages (but these conditions — famine and misery — may either raise mortality or lower fertility, or both). Self-limited populations are held down by behavior patterns (e.g. dominance hierarchies, territoriality, etc.) These may be animal analogues to “vice” or “moral restraint.” Predator-limited populations are held down by mortality.

Due to familiarity of Malthus’ assertion that “subsistence increases only in an arithmetical ratio,” the issues he addressed have been perceived too narrowly between his time and now. His wisdom deserves to be broadened in two ways. First, too many people have supposed our species could enjoy perpetual growth and progress just by overcoming *resource* limits. Second, the word Malthus used, “subsistence,” seemed to mean food, so too often it has been imagined that resource-limitation only meant food supply limits. Grow enough food and all will be well — so it seems to those who wrongly suppose other limiting factors need not constrain humanity’s future.

Our ancestors long ago developed weapons that enabled escape from control of human population by mortality inflicted by large carnivores. And over the past century, through advances in medicine and hygiene, we have vastly increased our freedom from control by microscopic predators as well. It seems we have largely ceased to be a predator-limited species. But, applying the ecologist’s perspective to the human case, one of the Malthusian “positive” checks, war, turns out to require special consideration. Is it to be classified as an instance of self-limitation or is it replacement for those earlier types of predator-limitation? Since *Homo sapiens* is a single species biologically, war would seem to be a means by which our species inflicts heightened mortality now and then upon “itself,” contributing to our being a “self-limited” species. But humans are differentiated non-biologically into populations differing socioculturally — in religion, language, culture, national identity, etc. It is these differentiated “quasi-species” (Hutchinson 1965) that kill each others’ members in war, so war could be deemed a kind of mutual predation.⁵

What Malthus Did Not Predict

Malthus in 1798 was not predicting an imminent end to world population growth by starvation. If we only remember the sentences where Malthus contrasted “geometrical” and “arithmetical” rates of increase, we are left to assume we have since overcome the self-inflicted mass starvation he was supposedly predicting as humanity’s destiny. But food shortages are not the only resource shortage, and resource shortages are not the only factor in checking population growth.⁶

It is wrong to suppose that Malthus has been refuted by our “successfully” increasing the number of living humans from the roughly 950 million inhabiting this planet when his essay was published to nearly 6 billion today. It is like supposing the circular motions of the planets around the sun refute Newton’s first law of motion. Newton said every moving body would continue in uniform linear motion “by forces impressed upon it.” He did not say no forces were operating. The orbital

happens to live in a largely unexploited land with virtually no competition for life-sustaining resources) then it could double itself in one generation. Such was the experience of European settlers in the American colonies, which Malthus described as an example. Their one-generation doubling time is, in fact, an approximation of the “intrinsic rate of increase” biologists attribute to our species, *Homo sapiens* (Odum 1971:179-183).⁷

Malthus Confirmed

Since the original publication of Malthus’ essay, eight human generations have elapsed. Accordingly, if the kinds of checks on growth he analyzed had not been operating, then the world’s human load would have doubled eight times. If their increase had been unchecked, the 950 million contemporaries of Malthus would have given us (by eight doublings) a present-day world population of about 242 billion. Today’s actual world population of “only” somewhat less than 6 billion shows that some potent checks have indeed been operating.

The “population explosion” we have had (Ehrlich and Ehrlich 1990), however much it threatens our future well-being, was not nearly as explosive as it might have been if Malthus had been wrong about those checks working. Preconceptions and emotional commitments have caused many to suppose growth from 950 million to nearly 6 billion *disproves* Malthus. But even these preconceptions and

commitments cannot obscure the fact that 6 billion is enormously less than 242 billion. And *that* fact is entirely consistent with the core meaning of Malthus’ essay.

But were those checks that have indeed been operating potent *enough*? By holding the potential 242 billion down to a “mere” 6 billion, did they leave us a world not yet overpopulated, or do 6 billion already impose an unsustainable load on the global ecosystem? The question of sustainability is the real issue that was implicit in Malthus’ essay — and that issue has become urgent in the time that has elapsed since he wrote.

Predator-limited Resource Species

Was Malthus wrong in supposing “subsistence” could only grow “arithmetically”? Did his analysis indicate that the vast majority of this increased human load is necessarily condemned to

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revolutions of planets supported rather than refuted Newton, once one accepted his inference that the gravitational mass of the sun was indeed “impressing” a potent centripetal force upon the planets. Newton was never predicting straight line movement of other planets; Malthus was not predicting stoppage of growth by imminent famine. It behooves us to recognize that Malthus, like Newton, was using an axiomatic “law,” together with an observed pattern of data, to infer the operation of a force or forces that could not be directly seen.

So his analysis is not contradicted either by the prodigious growth of population in the two centuries since he wrote his essay, nor by heightened standards of living in today’s industrial societies.

Malthus showed that in certain unusual circumstances wherein a human population *is* very nearly “unchecked” (i.e., when that population

starvation? Here we have even more need to restrain our preconceptions and emotional commitments. We must rephrase the question. The question should be not whether Malthus was right or wrong in depicting growth of “subsistence” as merely linear. Rather it ought to be a question of whether the principle he recognized, that population has an inherent tendency toward exponential growth when unchecked, is applicable only to one species, *Homo sapiens*.

Charles Darwin read the 1798 essay forty years later while struggling to develop a theory of the process by which natural forces might modify species. He recognized that the exponential growth tendency was applicable to *all* forms of life.⁸ All the plant and animal species that provide or constitute “subsistence” for humans have this “power of population” themselves, the potential for exponential increase, *if unchecked*. What was less than clear to other readers of Malthus’ essay, and may have been less than fully clear to Malthus himself, was the fact that human harvesting of these resource species constitutes a powerful check on their numerical growth.

If the reader of the present paper were to spend a minute contemplating a list of the things she or he has eaten today, it would be immediately obvious that most of the items on the list consist of some vital part of one or more species of organism. Often the foods we consume have to do with the parts of organisms involved in reproduction. The flour in our daily bread, made from wheat, uses as human sustenance seeds that thus do not grow to become another generation of wheat plants. Dough for the bread most likely also involves eggs which do not then incubate and hatch to become new chickens. And so on. The milk we drink or make into butter or cheese, obtained from cows, might have nourished young calves and thereby contributed to enlarging the cattle population in its next generation. The fact that, in the two-plus doublings of human numbers that did occur since Malthus, our consumption of these foodstuffs has not driven these resource species to extinction is an indication that Malthus was *right* about “the power of population.” The resource populations had sufficient Malthusian check on their potential increase: the enormous human harvest of their substance.

Then why did Malthus resort to the notion that

food (these products of resource species populations) could only increase linearly? Land, he recognized, was the ultimate resource-base supporting human population through its production of food crop plants and animals. And land was finite. New technology, agricultural chemistry advances, etc., could increase the humanly usable productivity of a given tract of land, but the finite total quantity of land ultimately must limit this potential for increasing food production. So, as a reasonable approximation for purposes of his argument, Malthus took the notion of linear increases of output by farms and pasturelands as the “resultant,” so to speak, of combining the forces of land’s finiteness with the exponential growth tendencies of resource species populations, with the voracious collective appetite of humans for harvesting the resource species, and with the possibilities of technological progress. It was not a bad approximation, given the state of knowledge in his time.

The state of knowledge is much different in our time, so we need a more sophisticated restatement of the basic proposition from Malthus. There had not begun to be an explicit science of ecology in his time. His essay helped instigate later development of that new science, after Darwin saw what Malthus was driving at and used the Malthusian insight to advance his own explanation of the implications of “struggle for existence” in the “web of life.” Ecology began to develop as a systematic study of the interrelations in that web of life less than a century after Malthus wrote his essay, following recognition by Darwin and his successors that life was indeed bound in a web.⁹ It took several decades of ecological study and thought before the web notion was sharpened into the ecosystem concept (Golley 1993).

Three Necessary Uses of Environment

In a particular ecosystem, if we focus on a particular species population — say, humans — their processes of carrying on life require taking materials and energy from other living and non-living components of that ecosystem. As the energy is used by them, the materials are transformed. The transformed substances must go back into the ecosystem somewhere.

Thus every species has to use its environment in three ways: (1) as a supply depot, (2) as activity space, and (3) as a disposal site. Humans are no exception, except that modern industrial technology greatly magnifies human resource demands, enlarges our disposal needs, and even makes us more mobile, thus causing us to require more, not less, space for many of the activities to which we have grown accustomed.¹⁰ Unless the other (living and nonliving) components of the ecosystem can supply a sufficient quantity of the user species' requirements, and can absorb and recycle metabolic products the user species must dispose of, then overuse by the user species will begin breaking down the system — to the ultimate detriment of the user species itself.

As we approached 6 billion, our numbers had already engendered (and we now encounter) many serious clashes between our “from which,” and our “in which,” and our “into which” uses of the planet.¹¹ Because we and our ancestors have not sufficiently heeded the warning Malthus issued two hundred years ago, it is now becoming harder and harder to find separate places for these three functions.

Modern industrial technologies have made per capita human resource appetites and ecosystem impacts colossal. Our cities are running out of disposal sites for solid waste. More and more, our need to draw potable water from rivers and underground aquifers conflicts with our use of land and rivers for disposing of effluents and other end-products of our industrial mode of life. Our need for unpolluted, breathable air clashes with our need to put into the atmosphere the toxic gases from our tailpipes, factory chimneys, power plants (and from the garbage incinerators sometimes glibly proposed as substitutes for available sites for “sanitary landfills”). It is a “SAD” fact that the three uses of the environment (Supply depot, Activity space, Disposal site) were easier to assign to separate locations, free from mutual interference, when contemporaries of Malthus had to share the planet with as few as 950 million fellow Earthlings.

Carrying Capacity: Malthus Updated

The state of subsequent ecological knowledge now permits restatement of the main theme from Malthus in the following terms: Any species using

any environment as its life-supporting base has the potential for increasing beyond the capacity of that environment to *continue* providing the needed support. Construing Liebig's “law of the minimum” (Odum 1989:129-132) broadly, we can say a population is in deep trouble if an environment's capacity to serve any *one* of these three functions has ceased to suffice, whether or not that environment continues to be sufficient for one or both of the other functions.

Malthus, we can reasonably assume, would fully accept such a reformulation if he were living today. A mind as insightful as his would surely recognize that after two further centuries of

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knowledge accumulation, how essential it is to construe “support” as involving all three uses of the environment. It seems clear, moreover, that the consensus of contemporary ecological scientists would endorse the reformulation, apart from some lingering misunderstandings of the meaning of its fundamental term, carrying capacity.¹²

Carrying capacity means, most succinctly, the maximum *sustainable* load. Sustainability is the essential ingredient of the concept. Overuse of an environment can impair its ability to sustain the user population. Extreme overuse can cause breakdown of ecosystem processes (Catton 1995). The maximum load that can be supported without beginning to cause system breakdown is the system's carrying capacity for its users. In 1798 Malthus was not equipped by existing knowledge or vocabulary to make this as plain as can now be done, but this is what his essay was launching us toward eventually recognizing. We owe Malthus an immense debt for getting us started.¹³

Two centuries further along in the development of technology, growth of human numbers, and accumulation of systematic knowledge about ecosystem processes, we have no excuse for

continuing to ignore or refusing to recognize the breakdown effects of overuse when they do occur. They are the indicators of human population's having overshoot carrying capacity — or, stated otherwise, they are symptoms that indicate our passage from a former era of carrying capacity surplus to a much different condition today, an era of carrying capacity deficit.

Taking Serious Effects Seriously

We live in a time when “deficit reduction” has been a matter of intense and widespread discussion. Unfortunately the discussion has too often focused exclusively on fiscal deficits, with too little attention paid to the even more dire implications of uncontrolled growth of ecological deficits.

Given the usual preconceptions and emotional commitments about economic growth, “deficits,” and Malthus, what if I had started this paper not by alluding to *The Limits to Growth* and *Beyond the Limits*, but instead with the Biblical admonition: “Beware of false prophets, who come to you in sheep's clothing but inwardly are ravenous wolves. You will know them by their fruits” (Matthew 7:15,16)? Such an opening text, following the title I chose for this paper, might have led the reader to suppose I was going to offer some dogmatic denunciation of “overpopulation alarmists,” perhaps by insisting limits to growth were an economy-devastating figment of misanthropic attitudes. They are not, and in the context established by what I have said in previous pages, that passage from the Sermon on the Mount can now serve instead to suggest how we can know if our planet is overpopulated (despite the operation of Malthusian checks) — by learning to recognize the *effects* of overload. Know it by its “fruits,” its consequences.

One of the founders of modern sociology re-expressed in non-Biblical language that idea about knowing something by its fruits. Emile Durkheim¹⁴ (1984 [1893]:26-27), almost a century after Malthus' essay, wrote that

...In science we can know causes only through the effects that they produce.

...Science studies heat through the variations in volume that changes in temperature cause in bodies, electricity through its physical and chemical effects, and force through movement.

There are in our time some effects and causes we urgently need to recognize that were unknown to people of past generations.¹⁵ The rising levels of greenhouse gases in Earth's atmosphere, the widening holes in the stratospheric ozone layer, the inexorable drawdown of many aquifers, the escalating depletion of mineral deposits and fossil fuel stocks, the deforestation of vast land areas, the loss of topsoil from farmlands, the spreading of deserts, the accelerating declines of species diversity all around the world — all of these must be seen as effects of populous industrialism (Ehrlich and Ehrlich 1990:58-59; Dietz and Rosa 1997), and should serve as signs we are seriously overusing our planet's ecosystems.

Two centuries after Malthus, it is dangerous to go on denying overpopulation and disregarding the ecological deficit.¹⁶ In the face of the ecological deficit's increasingly discernible effects, no one should mistake the fundamental issues of our time. They are larger than simply the platitude about needing to put “jobs for people” ahead of protecting an “endangered species,” or simply the call to favor “the economy” over “environmental special interests.”

Such cliches are a form of denial. Denial is psychologically attractive, and on this matter it is socially favored, but this is hazardous to our future (Catton 1996). False prophets (e.g., Kahn et al. 1976; Simon and Kahn 1984; Wattenberg 1987; Simon 1994) come to us in the sheep's clothing of technological optimism, encouraging the belief that inevitable progress will dependably overcome whatever problems we generate. These commentators continue to insist that the carrying capacity concept has no relevance for either the population explosion or industrialization.

As they see it, the world cannot be considered overpopulated so long as most of its surface is not yet peopled as densely as, say, London or Tokyo. This overlooks the dependence of each thriving urban center on an environment far more extensive than the territory within its own boundaries, an indispensable hinterland to serve its source and disposal needs.

Humanity's future depends on unmasking these false prophets, and learning to know them by their fruits, by the consequences that would flow from stubbornly continuing to see the world in their Panglossian terms, by the ecosystem damage that

would become ever more overwhelming (and irreversible) if we allow their discounting of Malthus to persuade us ecological foresight is merely a luxury.

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NOTES

¹ Global climate is changing. This is no figment of someone's imagination. The National Oceanic and Atmospheric Administration declares the change is a reality (Warrick 1998). Changing climate will have real consequences for humankind. According to the Intergovernmental Panel on Climate Change, an international group of climate scientists assembled by the United Nations, this already serious problem is caused partly by human activities. Future consequences of continued human injection of CO₂ and other greenhouse gases into the atmosphere are likely to include greater incidence of property-damaging floods, expansion of deserts, disastrous storms, and health-threatening heat waves (Goetze 1997).

² The 1798 essay is reprinted in full in Appleman (1976:15-130).

³ I don't say "listener" because some who hear do not listen.

⁴ For a truly egregious instance of this error, see Kahn et al. 1976.

⁵ Since human populations have almost entirely emancipated themselves from limitation by other large predator species, and in the modern world have even evaded much predation by microbes (pestilence), has war (and other conflict) become a necessary substitute check on population growth for a formerly predator-limited species — a way of substituting human for non-human predators? It must be asked whether other "substitutes" could not serve as well, i.e., moral restraint.

⁶ See Meadows et al. 1992, Chapter 3, and Catton 1980.

⁷ For additional comments on the human "intrinsic rate" and human carrying capacity, see Odum (1989:156-159).

⁸ In fact, it was so applied at least implicitly (and almost explicitly) by Malthus.

⁹ On the history of the science of ecology see Tansley (1939, 1947); Egerton and McIntosh (1977); McIntosh (1985); Golley (1993).

¹⁰ It is essential to recognize that for modern humans, the "sustenance" we require is not just food for our bodies. Human societies require fuels and various materials to "sustain" the myriad exosomatic structures and activities now common. People in industrial societies need to be seen as members of a new quasi-species, *Homo colossus*. The greater our per capita

energy use, the larger our demand for non-food "sustenance" materials (of all kinds) and the more extensive and serious our impact on the environment. The supply depot demands, disposal site needs, and activity-space requirements of *Homo colossus* are indeed colossal compared to those of pre-industrial *Homo sapiens*.

¹¹ Although John Rohe (1997) doesn't express it quite this way, this is very much a theme of his excellent and timely book.

¹² For causes and implications of such misunderstandings, see Catton (1995).

¹³ And we owe a similar debt to Chairman Brundtland (1987) and her World Commission on Environment and Development for insisting in our time that "[m]any of the development paths of the industrialized nations are clearly unsustainable."

¹⁴ Durkheim was studying social solidarity, which was, he said, "an intangible virtuality too elusive to observe. To take on a form that we can grasp, social outcomes must provide an external interpretation of it."

¹⁵ It is a tragic irony, however, that despite sociology's scientific aspirations and the considerable ingenuity of many of its early proponents, it has since developed largely with a worldview that seems to say "nature does not matter." See Murphy (1997).

¹⁶ Is it *overpopulation* or *overconsumption* we tend to deny? Given the expectations (and aspirations) of living people, this is a distinction without a difference. The sustainable number of *Homo colossus* (i.e. humans equipped with powerful "exosomatic organs" — modern industrial technology) on planet Earth must surely be much less than the sustainable number of non-industrialized *Homo sapiens*. Some may argue that 6 billion would be a sustainable world population if all were willing to live at a pre-industrial level, but even if this were true, the prospect for global acceptance of an adequate degree of "voluntary simplicity" is dim. Given the presently occurring symptoms of ecosystem breakdown, it ought to be clear that if the "underdeveloped" Third World were to approach a First World level of living, then 6 billion would constitute overpopulation. And the problem will not be eliminated just by pejoratively labeling such a statement "neo-Malthusian," as the cornucopian-minded and ecologically naive are inclined to do.

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