

OVERSHOOT – by William R. Catton, Jr.

[Introduction: Twenty-eight years ago [William Catton, Jr.](#), published [Overshoot](#), subtitled "The ecological basis of revolutionary change." This is a book you can read more than once and gain new understanding of our predicament each time.]

By [Peter Montague](#)

Why would anyone want to review a book published 28 years ago? Because many people still have not heard of it, much less read it, and so have missed one of the most important books of the 20th century.

On the first page of the book we read, "Today mankind is locked into stealing ravenously from the future. That is what this book is about."

Actually, it's a bit more complicated than that.

To understand what this book is about, you need the definition of "carrying capacity":

"An environment's carrying capacity for a given kind of creature (living a given way of life) is the **maximum persistently feasible load** -- just short of the load that would damage that environment's ability to support life of that kind." [pg. 4]

Or:

"Carrying capacity can be expressed quantitatively as the number of us, living in a given manner, which a given environment can support **indefinitely**." [pg. 4]

The main thread of the book is simple enough: for eons, humans lived within the planet's given carrying capacity and our numbers remained relatively low. At the beginning of the industrial revolution in 1800 there were fewer than one billion humans worldwide. [pg. 18] Then two things happened, both of which increased the Earth's carrying capacity for Europeans:

"The past four centuries of magnificent progress were made possible by two non-repeatable achievements: (a) discovery of a second hemisphere, and (b) development of ways to exploit the planet's energy savings deposits, the fossil fuels [coal, oil, natural gas]." [pgs. 5-6]

These two events created what Catton calls "the age of exuberance" -- a unique 400-year period in human history when Europeans (and, later, others) learned to see the future as one of limitless expansion. This perception of limitlessness "spawned new beliefs, new human relationships, and new behavior." [pg. 24]

Personally, I believe the perception of limitlessness created a religion of growth -- more widely accepted than any other single religion -- that retains its hold on the human mind and spirit today. Believing that limitless expansion could go on forever, humans expanded their numbers rapidly. But by 1980, when Catton wrote **Overshoot**, it was dawning on some people that limitless expansion is

not possible on a finite planet.

Role of Technology

Back to Catton's story: When the New World hove into view, a new source of wealth became available for the taking (requiring only the extermination of indigenous people by [guns and germs](#)). With new wealth, Europeans (and eventually some others) gained more leisure time, which allowed the development of more technical ingenuity. [pg. 25]

Technical development then allowed Europeans to expand Earth's carrying capacity (for Europeans and their lifestyle) by two basic methods:

First, by the "takeover method." With technically superior weapons and tools, Europeans displaced the indigenous people who occupied the New World, and then they displaced much of the wildlife living there as well, converting forests to farms, for example. Somewhat later, Europeans displaced Polynesians, Australian Aborigines, and Africans. Today humans are displacing wildlife at an astonishing pace in what is being called the sixth great [extinction of species](#). The takeover method continues today.

Technology allowed humans to accelerate the takeover method of expanding carrying capacity, but it also created a second way, the "drawdown method" in which non-renewable resources were drawn down for the benefit of the present generation.

The most important of these non-renewable resources were the fossil fuels hidden underground. Fossil fuels allowed us to substitute ancient sunlight for human muscle power, giving each of us (in the U.S.) the equivalent of 80 "energy slaves" to do our work for us. [pg. 43] That is the fundamental basis of our present prosperity.

In addition to fossil fuels, [we drew down highly-concentrated mineral deposits](#) -- iron, copper, chromium, vanadium, titanium, phosphorus, and so on.

With new technologies producing more food and fewer infant deaths, the human population expanded rapidly. Global population doubled to one billion in the 200 years 1650-1850, then doubled again in only 80 years to reach 2 billion by 1930. The third doubling took only 45 years, reaching 4 billion in 1975. [pg. 18] Today global population stands at 6.7 billion and is doubling every 50 years or so. At this rate, population will hit 8 billion by 2030 and 11.5 billion by 2050 (if nothing changes). The world is adding a population the size of the U.S. today (300 million) about every 2.5 years.

The human population could grow at this rapid pace because we seemed able to expand Earth's carrying capacity by relying on "ghost acreage" or "phantom carrying capacity." Catton defines "phantom carrying capacity" as "either the illusory or the extremely precarious capacity of an environment to support a given life form or a given way of living. It can be quantitatively expressed as **that portion of the population that cannot be permanently supported when temporarily available resources become unavailable.**" [pgs. 44-45, emphasis added] By precarious capacity, Catton means things like farming capacity that requires specific conditions, which can be disrupted by drought, flood, swarms of locusts, reduced access to chemical fertilizers or large-scale machinery or bank credit or, in some cases, poorly-paid Mexican labor.

Phantom carrying capacity is created by "ghost acreage" of three kinds:

** **fossil acreage** from long ago (our fossil fuels are the residues of plant life that grew on fertile land long ago, storing sunlight in chemical form, which nature eventually turned into deposits of coal, oil and natural gas).

** **trade acreage**, which is productive land in other countries. Much of 18th and 19th century trade consisted of powerful nations (England, Holland, Belgium, France, and others) convincing weaker nations to use their land to produce [goods for export](#) to Europe at "reasonable" prices. Trade acreage provided the basis of 19th century colonial empires, and still provides the basis of much "free trade" today. Recently the New York Times carried a front-page story about [lithium deposits in Bolivia](#) that Japanese and U.S. car makers are lusting after for lithium-ion batteries for electric cars. Bolivia is resisting, but it seems likely that Japan and the U.S. will eventually end up with Bolivia's lithium and very few Bolivians will end up with electric cars.

** **Fish acreage**. By developing technologies to vacuum the oceans, humans have used ocean ecosystems to expand Earth's carrying capacity for humans.

The use of these three kinds of "phantom carrying capacity" has obscured from us the true nature of our situation: phantom carrying capacity is temporary.

** Fossil acreage is non-renewable, so it can only provide temporary expansion of carrying capacity.

** The same has proven true of much "trade acreage" -- we extracted minerals from highly-concentrated deposits and dispersed them into the biosphere. Nature will not renew these deposits, at least not on a time-scale likely to help humans. So these minerals expanded the Earth's carrying capacity for "modern humans," but only temporarily.

** Fish acreage could be managed sustainably, but this has generally not been done. Humans are decimating marine fisheries, harvesting fish lower on the food chain each passing year, while acidifying the oceans, which is undermining the base of oceanic food webs. Thus, given the way humans have managed it, fish acreage can provide only temporary expansion of carrying capacity.

So... phantom carrying capacity has fooled us into thinking that the Earth can support more of us than, in fact, it will support in the future.

This reflects one of the most important changes brought on by the "age of exuberance" -- humans came to believe in the **permanence of limitlessness**. [pg. 25] Instead of seeing the last 400 years (and most especially the last 200 years) as a special time, created by events that would never be repeated, we began to see limitlessness as the norm. We thought our technology had allowed us to permanently expand the carrying capacity of planet Earth, which is not the case.

Technical advances turned out to be a double-edged sword. For a time, they increased the carrying capacity of the planet for humans. More food could be grown on less land, for example. But technical advances eventually began to impose their own requirements on the planet's resources -- expanding the area needed for waste disposal, for example, thus **reducing** the carrying capacity of the planet for modern people.

In other words, Catton says, technology initially increased the carrying capacity of the planet for Europeans but eventually the situation reversed and technology itself began to expand the foot print of each industrialized human, thus reducing the carrying capacity of the planet for industrialized humans. [pgs. 31, 59, 154, 245]

As the population of industrialized humans continues to grow, each of our "energy slaves" imposes its own requirements on the global ecosystem, including mining, processing, transport, and waste disposal. As Catton says, it would help us understand our situation better if we renamed ourselves from Homo sapiens to Homo colossus. [pg. 155] With our modern technologies, our individual footprint is colossal, and the more colossal it becomes, the fewer of us the planet can support. Meanwhile human population continues to grow.

Unfortunately, the limits of carrying capacity are not easy to see under the best of circumstances. They are also difficult to see because we have temporarily lifted some of them by our reliance on "phantom carrying capacity" -- plus we have been blinded by our belief in the permanence of limitlessness and, as I see it, the religion of growth.

Finally, carrying capacity is not a fixed limit like a concrete wall; carrying capacity **can** be exceeded, at least for a time. A species can **temporarily** exceed the carrying capacity available to it -- by overexploiting and thus degrading the environment (which reduces the carrying capacity available to future generations). [pgs. 138-139] Thus, **exceeding available carrying capacity puts us into direct competition with future generations.**

That is what we humans are doing today -- living beyond our means, borrowing capacity from the future and using it up. We are depleting the base of available capital, not merely living off the interest. This means future generations will have less capital to work with. Soil that we degrade will not be available to our grandchildren for growing crops. Mineral deposits that we mine and disperse into the environment are no longer available for future manufacture. Acidified oceans will not produce the abundance of fish that our heirs could have otherwise expected.

In sum, by exceeding the carrying capacity of the planet for industrialized people, we have put ourselves into direct competition with future generations: it's us or them. You will recall that this is what we were told on the first page of the book: "Today mankind is locked into stealing ravenously from the future. That is what this book is about."

The second important fact about temporarily exceeding the carrying capacity of the planet is that **it is temporary**. If we humans exceed the human carrying capacity of the Earth, this sets into motion forces that will, in time, bring our numbers back into line with available carrying capacity. [pg. 5]

Exceeding available carrying capacity puts us into a condition that Catton calls "overshoot" (the title of the book), and it leads eventually to a "crash" -- meaning a die-off. Denying the likelihood of such a crash will not prevent it from occurring, Catton believes. Instead, "[B]elieving crash can't happen to us is one reason it will." [pg. 213]

It seems clear that we are in overshoot -- our human numbers, and our lifeways, have exceeded Earth's carrying capacity. We are drawing down the future, using up resources faster than nature can replenish them. The [Global Footprint Network](#) estimates that, for all humans to live at the U.S.

standard today would require [6 planet Earths](#) to provide the acreage needed to supply raw materials and places to throw our discards. Therefore the "age of exuberance" -- the age in which we developed expectations of a perpetually expansive life -- is drawing to a close. Furthermore, the attitudes we developed during that age are obsolete, and are preventing the clear thinking needed now.

Today, 28 years after Catton published [Overshoot](#), the evidence of overshoot is everywhere: global warming; the thinning ozone layer; marine fisheries depleted; oceans acidifying (damaging the base of oceanic food chains); humans crowding out other species, causing the sixth great extinction; tillable soils shrinking as deserts expand; forests disappearing; mountain snow pack and glaciers shrinking, jeopardizing fresh water supplies; global-warming-related multi-year drought afflicting large sections of the U.S., China, India, and Australia; human and wildlife reproduction disrupted by industrial poisons now measurable everywhere on earth; and so on. This list could be readily extended.

Where does that leave us? It leaves us facing the specter of die-off. The question is, how will humans manage that specter? The tendency will be for some to lay blame on others -- scapegoats -- even though no one group is responsible for our predicament. As Catton says, "the conversion of a marvelous carrying capacity surplus into a competition-aggravating and crash-inflicting deficit was a matter of fate." [pg. 177] Fate is shaping history, he explains, when "what happens to us was intended by no one and was the summary outcome of innumerable small decisions about other matters by innumerable people." [pg. 177]

"If, having overshoot carrying capacity," Catton says, "we cannot avoid crash, perhaps with ecological understanding of its real causes we can remain human in circumstances that could otherwise tempt us to turn beastly. Clear knowledge may forestall misplaced resentment, thus enabling us to refrain from inflicting futile and unpardonable suffering upon each other." [pg. 216]

As Catton wrote in 1980, "The stakes have become phenomenally high: affluence, equity, democracy, humane tolerance, peaceful coexistence between nations, races, sects, sexes, parties, are all in jeopardy." [pg. 262]

What could we do? Our top priority must be to preserve the biosphere, upon which we humans are entirely dependent. In my opinion, we must use all our science and ingenuity and heart and common sense to try to learn where the crucial limits are and then practice living within them.

Since ecological limits are not always readily discernable (except by exceeding them and observing the damage in the rear-view mirror), we can adopt a [precautionary](#) approach and err on the side of caution, not assuming that our risk assessments and our cost-benefit analyses can provide reliable guidance. History shows us that they cannot.

We can stop insisting that material growth and rapid technical innovation are essential for human well-being. Yes, growth is needed in the third world -- roads, power plants, water supplies and more -- but the overdeveloped world needs to substantially reduce its footprint to make space for that needed growth. Our insistence on growth everywhere and on rapid technical innovation is what is finally destroying the planet as a place suitable for human habitation. Rapid innovation is, by definition, ill-considered innovation.

Back to Catton, who says we could "...insist on strict enforcement of ecosystem preservation policies prescribed by the Endangered Species Act, the National Environmental Policy Act, and many other pieces of protective legislation going back to the Antiquities Act of 1906 and beyond. (We would do this for the ultimate sake of our own species.) We would also do our best to stretch our remaining supplies of fossil acreage, instead of competing to hasten their consumption. We would painstakingly revise our cultural values to reduce resource appetites. We would foster non-consumptive modes of human enjoyment, and **we would reckon our wealth in terms of environmental assets rather than in terms of the rate at which we plunder them.**

"In sum, we would commit ourselves to becoming less colossal with all deliberate speed...

"Human self-restraint, practiced both individually and especially collectively, is our indispensable hope," Catton says. [pg. 263]

And:

"The paramount need of post-exuberant humanity is to remain human in the face of dehumanizing pressures." [pg. 7]... "To keep from dehumanizing ourselves (and even gravitating toward genocide), we must **stop demanding perpetual progress.**" [pg. 9, emphasis added]

Finally, "In today's world, it is imperative that all of us learn the following core principle:

"Human society is inextricably part of a global biotic community, and in that community human dominance has had and is having self-destructive consequences." [pg. 10]

[Overshoot](#) is a book you can read more than once and gain new understanding each time. Is Catton correct? I invite you to read it for yourself ([or listen to it](#)), and you decide.

As I expressed in the first paragraph, I ([and many others](#)) consider *Overshoot* to be one of the most important books written in the 20th century, and certainly one of the most significant that I have ever read.

My hunch is that you will agree.

William Catton died in January 2105. [Michael Dowd](#) posted [an obituary and tribute](#) on his Huffington Post blog and he and his wife, [Connie Barlow](#), collected **tribute quotes, interviews, and presentations by Catton**, which are all available here: "[Tribute to William R. Catton, Jr.](#)" (Audio of 7 of the best tributes, [here](#).)