Catton, Jr., William R.
Overshoot: The Ecological Basis of Revolutionary Change. University of Illinois Press, 1980. (ISBN 0-252-00818-9)

Preface
-“In a future that is as unavoidable as it will be unwelcome, survival and sanity may depend upon our ability to cherish rather than to disparage the concept of human dignity.” (p. vii)
-confusion around human connections to ecological systems does not protect us from the consequences of our behaviour
-Catton’s text is meant to help us understand the nature of our predicament so as to help prevent us from re/acting in ways that exacerbate it
Forward
-the close of World War Two witnessed a growing faith in science and its ability to solve potential problems
-that the ‘atomic’ age would address energy supply issues, that technology could be employed to our ever-increasing advantages, and necessary resources were limitless--Neo-Malthusian pessimists be damned
-predictions for an optimistic future were endless
-technology could and would achieve anything with enough funds and research
-economic growth could proceed indefinitely given inexhaustible energy supplies and a beneficial technical-industrial civilisation would encircle the planet
-the only perceived impediment was a lack of trained scientists and engineers
-technology would provide and resource shortages would be an unnecessary concern
-unfortunately, “we aimed too high because we relied on the assurances of the technologies that we were living in an age in which there were no problems, only solutions.” (p. xiii)
-a ‘return to earth,’ as it were, occurred with the 1970s: African and Asian famines, OPEC oil embargo, etc.
-this necessitates a rethinking of our approach to the world and consideration that our optimism has been an overestimation of science and technology’s capabilities (a conflation of its power with the advantages of cheap energy (oil))
-“...petroleum that was deceptively cheap has played a major role in nurturing the illusion of perpetually expandable abundance.” (pp. xiv-xv)
-“All the evidence suggests that we have consistently exaggerated the contributions of technological genius and underestimated the contribution of natural resources.” (p. xv)
-if we are to accept the need for conservation going forward, the myth of technological optimism needs to be clipped
-we need to recognise our finite planet’s limits and the importance of its resources
-Catton’s text helps us to examine our expectations, particularly from an ecological perspective
-that we have to this point in time been somewhat successful in enlarging the natural carrying capacity of the planet for humans is clear
-we have done this by initially displacing other species
-more recently, we have relied upon technology to drawdown needed geologic reserves of energy and materials
-this has allowed a portion of humanity to increase its living standards significantly but this temporary ‘progress’ “...now means that the future holds for us not merely a regrettable levelling-off of economic growth, but an institution-threatening prospect of some deindustrialization and some decline of population.” (p. xvi)
-our ability to employ technological tools to expand our carrying capacity has resulted in a trap that now threatens the environment and ecological systems we require for our survival

Part I: The Unfathomed Predicament of Mankind

Chapter 1: Our Need for a New Perspective

Competition Across Time

-“Today mankind is locked into stealing from the future.” (p. 3)
-we are ensuring contemporary well-being at the expense of our descendants through our numbers, technology, and ignorance of actions providing only temporary increases in our carrying capacity
-we are unwitting and indirect antagonists to future generations
-“A major aim of this book is to show that commonly proposed ‘solutions’ for problems confronting mankind are actually going to aggravate those problems.” (p. 3)
-we are temporarily evading the limits of a finite planet through our drawdown of reserves
-one indispensable term to help us better understand our predicament is ‘Carrying Capacity’
-we must better understand the ever-changing capacity of the planet to support humanity and the load we place on it due to our numbers and needs
-it is past time we recognise the difference between enlarging and exceeding our carrying capacity
-every species imposes a load on its environment’s ability to supply needed resources and absorb discarded/excreted waste products
-a species’ carrying capacity “is the maximum persistently feasible load--just short of the load that would damage the environment’s ability to support life” (p. 4)
-quantitatively, it is the number that can be supported indefinitely in a given environment
-overusing an environment results in forces that reduce the load it can handle (i.e., reduces the carrying capacity)
-our numbers and technology have so strained finite resources that many solutions to our plight have now been put out of reach
-over our many millennia of existence, humans have expanded their carrying capacity at the expense of other species but we have moved into augmenting it temporarily via technology--eating our seed corn, as it were
-blind to what we are doing, we have embraced and increased the speed with which we are drawing down the finite resources we rely upon

Old Ideas, New Situations

-we need to abandon the old assumptions that are leading to our misunderstanding of what is occurring
-the exuberant growth we have experienced has caused us to overshoot our carrying capacity
-most of this has been possible because of the expansion into a relatively non-exploited hemisphere and leveraging of a one-time cache of story energy reserves (fossil fuels)
-these events have resulted in a general belief in the future always being better than the past
-as population has ballooned and resources depleted a new perspective is required and one that is significantly different from recent history
-like all others species, humans are capable of reproducing beyond its carrying capacity
-unlike others, however, we can think about this fact and ponder its consequences
-nature requires us to reduce our impacts upon the world
-the needed changes are likely to tempt us to prolong our ways regardless of the consequences and probably make the situation worse
-there are likely to be many dehumanising pressures on us as things unfold and we need to fight against these

Plan of the Book

-the book is designed to bring about a needed paradigm shift
-the basic idea of what we are attempting to understand guides what we see, the kind of inquiries we make, and the questions we tend to avoid
-these are influenced by the language we use as it emphasises certain aspects of reality and neglects others
-this text depends upon and uses ecological language

Needed Realism

-it has become increasingly obvious that government cannot achieve the paradise they often promise
-this has resulted in a loss of faith leading governments to become more dictatorial (further eroding faith)
-abandoning our belief that all things are possible (especially because of limitless resources) is one alternative
-Catton says it's imperative we all learn that: “Human society is inextricably part of a global biotic community, and in that community human dominance has had and is having self-destructive consequences.” (p. 10)
-societal aspirations are frustrated by non-political obstacles that are not unique to humans
-by not knowing what is happening to us we are making matters worse
-we have more people than our renewable resources can support
-we’ve created complex societies that rely upon us rapidly using exhaustible resources
-this drawdown is reducing the planet’s carrying capacity
-in addition, the harmful substances created through our life processes are accumulating too fast for the planet to reprocess them, breaking down their capacity to absorb them and further reduce the planet’s carrying capacity
-ignorant of these issues, we have applauded the mechanisms that are making our situation worse

Futile Vilification

-our inability to properly identify our dilemma will likely lead many to point fingers at particular groups/individuals
-there are, however, no villains in this story
-we need to decrease the pressures we are under but we cannot avoid the future
-this book aims “to illuminate the nature and causes of the human predicament, so as to make possible some mitigation of its social, emotional, and moral effects.” (p. 12)
-we need to recognise the ecological basis of our predicament and how important these are (far more than most ‘headlines’)
-an ecologically-based paradigm should help us to see our self-destructive ways as typical of other species (note: it is difficult for adherents from one paradigm to communicate with those of another paradigm) and thus shame/guilt is unnecessary but our humane tendencies may be strained as we encounter the consequences of overshoot
-our excessive success has led us to this predicament

Part II: Eventually Had Already Come Yesterday

Chapter 2: The Tragic Story of Human Success

Origins of Man's Future

-our future will be a consequence of the fact our planet is already overloaded which is a result of our past
-our species has approached its saturation several times since its emergence only to see the limit exceeded by our ingenuity
-initially, limits were raised by displacing others species, which began over two million years ago (since first 'homo' species appeared)
-more recent expansion of our carrying capacity has been via drawing down finite reserves (that cannot replace themselves in human time frames) and it is thus temporary

In the Beginning

-prehuman ancestors (beginning about 2 million years ago) discovered the use of fire to warm themselves, ward off other animals, and render certain food digestible via cooking
-this allowed them to occupy areas not available to forebears
-simple tools were manufactured by hand and offspring taught how to replicate them
-these successes led to successful reproduction and limited expansion based on natural resources and a hunting-gathering lifestyle
-perhaps 3 million existed by about 35,000 BC

Increased Hunting Proficiency

-about 35,000 BC, homo sapiens became better hunters
-the use of spear throwers and bows and arrows allowed exploitation of a greater variety of prey
-this helped propel the population to about 8 million over a thousand or so generations

Learning to Manage Nature

-the next major boost to human carrying capacity arose when plant cultivation began
-this management of a biotic community turned hunter-gatherers into farmers and led to an explosion in human numbers (about 10x) as our carrying capacity increased significantly
-this development also resulted in food surpluses that allowed some of the population to perform other tasks/duties than food procurement
-cultural innovations and complexity increased as a result

Compound Interest

-even with agriculture, the generational increase in population was relatively small, only about 1.5% per generation
-with time, however, such exponential increase does add up
-as culture allowed further adaptation to previously unexploited niches, occasional population surges occurred

Tools, Organisation, and Standard of Living

-by about 4000 BC stone/bone tools began to be replaced by metal ones, allowing increased harvests
-labour divisions appeared as occupation specialisation occurred
-with each cultural innovation our carrying capacity was increased
-about 3000 BC the plow was invented allowing larger tracts of land to be cultivated with aid of draft animals
-around 1000 BC iron replaced bronze
-by about 1 AD population had grown to around 300 millions, based on about 0.75% increase per generation

Firearms

-in the early 14th century, firearms were put into use for military purposes which impacted political organisation (and the way humans thought about their relationship with the world and its resources)
-while portable firearms allowed greater efficiency in meat harvesting, the surge in population numbers occurred for a different reason
-as European land became increasingly occupied, exploration of new lands occurred and culminated with the discovery of a new hemisphere

-the smaller numbers of occupants of the Americas (along with superior weaponry and novel pathogens) allowed for a relatively quick conquering and expansion

Abundance

-the Age of Exuberance that followed, the amount of land/resources available per person increased about 5x

-the sense of stagnation the defined the Old World (due to numbers in a confined area) was replaced by one of limitlessness

-this shifted perspectives/beliefs and behaviour

-growing numbers became literate

-leisure time increased allowing more tinkering and technological innovation (that became to be see as 'progress')

-population doubled over 2 centuries (1650-1850), then again over 80 years, then 45 years

-these increases led to the gap between carrying capacity and resource use-load closing quickly

-the success of this time was undermining its foundation

-for those living through this time, the sense of no limits seemed permanent and previous beliefs 'superstitious'

-as resource use-load increased population pressures did as well along with per capita impact on the biosphere but the expectations of perpetual expansion did not

The Takeover Method

-Europeans took over a world already 'full' for the hunter-gatherer model in use there but from a more densely populated agrarian model it appeared empty

-from an ecological perspective, the Americas could not sustain both models and with their superior tools/weapons the Europeans displaced the Natives

-the same occurred in several regions around the globe, such as Australia, New Zealand, and parts of Africa

-Europeans believed it was proper to put to 'good' use un/under-used lands

-enlarging carrying capacity through this takeover method is almost as old as humans themselves

-initially resources were taken from other species

-ecologically, all of this is known as 'competitive exclusion'

-to better understand our predicament, however, we need to differentiate this approach from the other one we have been relying upon more recently

The Drawdown Method

-around 1800 AD humans greatly expanded their carrying capacity, although only temporarily, with the aid of mechanisation, industrialisation, and fossil fuels

-novel tools powered by fossil fuels increased agricultural yield, allowed food to be transported long distances, gave rise to fertilisers, and expanded irrigation

-"This time, the human carrying capacity of the planet was being supplemented by digging up energy that had been stored underground millions of years ago." (p. 28)

-of course, this is only a temporary boost to carrying capacity and the questions that follow have to do with the consequences of humans expanding their population in response to this increase, especially once oil becomes scarce

-these questions would not be considered within a pre-ecological paradigm as limits are unthinkable and their obvious consequences denied

-this shift occurred so quickly it enabled both a population surge and wealth per capita increase via better living standards

-a "rise in prosperity reinforced the dangerous myth of limitlessness and obscured for a while the hazards inherent in the population increase." (p. 30)

Overshoot Aggravated

-the onset of antiseptic surgery in 1865 began a period of prolonging life, as did increased hygiene, vaccinations, antibiotics, etc. due to the discovery of the role of microorganisms in disease

-this caused human population to increase further

-all of these seeing benefits led to our overshooting our environmental carrying capacity
-people of the time never viewed the world through an ecological paradigm
-from 1800 to 1975 population quadrupled
-this had led to a precarious situation but one unseen by most; population continued to increase but there was no concomitant rise in carrying capacity
-viewing the world through a limitlessness lens, future technologies were imagined to forestall any difficulties that nature's limits might impose
-capitalists to Marxists and all inbetween refused to acknowledge the myth of limitlessness had become obsolete
-technology was also assumed to help enlarge carrying capacity, not reduce it by increasing our drawdown of natural resources

Back to Hunting and Gathering

-industrialism extracted carrying capacity supplements from a one-time cache of resources
-there was only one opportunity for Europeans to discover a relatively resource-filled hemisphere but despite the similarity with finite resources, modern society expects ever-new mineral/fuel discoveries to occur
-the geologic processes that are responsible for these deposits occur at speeds very slow by human standards (thousands to millions of years)
-industrialisation has caused us to become hunters and gatherers of finite resources
-shifting from takeover to drawdown has created excessive success but success predicated upon limited natural resources and blinding us to the eventual consequences of their finite nature

Chapter 3: Dependence on Phantom Carrying Capacity

Other Foundations, Other Limits

-no longer viewing ourselves as hunter-gatherers, we created assumptions that were increasingly false, especially that the only limits for us were our doubts
-warnings were presented early, however
-demographer P.K. Whelpton wrote in 1939 that the US was overpopulated and that technology was no longer serving to enlarge carrying capacity but increasing resource requirements per capita and worsening overload
-the Age of Exuberance assumptions/expectations continued and was pushed by politicians delaying recognition of their obsolescence
-leaders reinforced the idea that everyone across the planet could reap the benefits of limitlessness
-it has not been willpower or institutional strength that has underpinned our achievements but natural resources (especially fossil fuels)
-'uninhabited' lands and 'unexploited' resources allowed increasing expansion and the myth of limitlessness to develop
-the persistence of this myth has hindered our understanding of our predicament

No Longer Hypothetical

-the cultural lag in our awareness/understanding lead to our planet being overloaded by the time many began to voice concerns
-with William Vogt's 1948 Road to Survival, hypothetical warnings began with a few (even into the 1970s) suggesting it was already too late
-"The growth and prospect upon which we looked back with such pride had committed mankind to living on a scale that exceeds the sustainable carrying capacity of the finite planet, and the leaders of nations continued to devote far more effort toward attempting to prolong overshoot than toward undoing it. Reluctance to face facts was driving us to make bad matters worse. The faster the present generation draws down the fossil energy legacy upon which persistently exuberant lifestyles now depend, the less opportunity posterity will have to live in anything like the same way or the same numbers. Yet most

contemporary political proposals for solving problems of economic stagnation or inequity amount to plans for speeding up the rate of drawdown of non-renewable resources." (p. 38)

Invisible Acreage

-Georg Borgstrom (1965) suggested many nations were able to exceed their local carrying capacity by relying upon 'ghost acreage' (i.e., land 'invisible' because it was far away; there is also fish acreage from the sea)

-overpopulated nations can only continue to feed their citizens with surpluses from others and via ocean harvests

-like arable land, fish stocks are finite so as regions began to feel the effects of this limited resource they extended their territorial water claims (from 3 to 12 to 200 miles)

Importing From the Past

-technology has created a 3rd phantom source: fossil acreage

-the vast reserves of fossil fuels created a sense that humans of organic fuels (i.e., biomass in the form of wood)

-humans require energy for all activities

-from 2000-3000 kilocalories from food for basic daily activities

-with fire and animal domestication, additional energy became available

-then water- and wind-derived energy was exploited

-fire extended human range and diet thus enlarging carrying capacity and set us on a path different from animals that relied on their own metabolism

-converting fire's heat energy into mechanical energy significantly increased human ability to exploit long-stored energy reserves

-fossil fuel-powered engines helped to launch the Industrial Revolution and a significant reorganisation of human societies

-the huge apparent quantities of fossil fuels gave rise to the idea of limitlessness (a side effect was the loss of economic value in human slavery)

-this 'abundance' was made possible by the human use of the reserves many, many times faster than they could ever be replaced by natural processes

-the price of them was mostly determined by the cost to extract them as there was no energy needed to produce them

-the exceptionally cheap costs (basically energy inputs) led to a relatively quick reorganisation of society around these resources

-unfortunately, given the finiteness of the reserves, this shift could only ever be temporary

-by the time of this text, humans depend upon this one time, finite cache of energy resources for over 90% of their needs

-this dilemma remained mostly unnoticed by the media until the 1973 oil embargo

-warnings began to surface softly after World War Two that diminishing resources put the Age of Exuberance in jeopardy

Precarious Way of Life

-depending upon phantom acreage for 90%+ of one' energy needs (thanks to technology) is extremely precarious

-Catton suggests an equivalent portion of the population (90%+) cannot be supported without these resources

-the impacts of this dependency were beginning to be recognised but the response/interpretation of these signals were viewed through a lens of limitlessness as was evident in the continued pursuit of energy 'self-sufficiency' by the US

-no one seemed to understand the reliance upon reserves from the distant past to support modern civilisation

-almost all phantom acreage has come to rely upon non-renewable resources (especially fossil fuels)

-humanity's exuberant lifestyles are far more precarious than realised

-slowly people have begun to recognise our predicament
-one signal has been the accumulation of pollutants (particularly the combustion products of burning fossil fuels)
-another has been the increasing difficulty of finding and exploiting the fuels
-cultural lag, however, has delayed a widespread recognition of our dilemma
-price increases were viewed via an economic and political lens rather than an ecological one

Solutions that Aggravate Problems

-“Most of the world did not recognize the extent to which it was dependent on phantom carrying capacity in its use of fossil fuels. Non-recognition of dependence on invisible acreage, or the illusion of self-sufficiency, could lead to disaster, for actions based on illusions are inherently hazardous.” (p. 7)
-when an in-group benefits from overuse of a shared resource, the costs tend to be shared by out-groups
-this reduces motivation by the benefitting group to conserve--competition for scarce resources precludes self-restraint (see Hardin’s Tragedy of the Commons argument)
-the need for food NOW tends to override self-restraint regardless of the awareness of tomorrow’s need; it is easier to continue stealing from yet-born descendants
-and the more ‘modern’ a nation becomes, the more dependent it relies upon phantom fossil acreage
-continuing to use the paradigm of limitlessness, humans have ignored the increasing gap between needed quantities and replacement rates
-such overharvesting leads to eventual exhaustion of the resource (Catton estimates the difference in 1970 was about 10,000 to 1)
-rather than pursue more ‘difficult’ sociocultural/behavioural changes, a worldview of limitlessness meant the ‘solution’ was to look for more reserves
-for a while, new discoveries exceeded extraction rates (mislabelled production) giving further support to the illusion of limitlessness
-despite improved technology, this trend ceased for the US in the 1950s and by 1961 the rate of discovery dropped below the rate of extraction bringing the illusion of sustained yields under greater pressure
-humans have misled themselves in a few ways
-prehistoric ghost acreage has allowed us to believe in the illusion of efficiency increases in our food production
-we have increased ‘productivity’ through the use of fossil fuel-based machinery and pesticides, herbicides, and fertilisers
-it was calculated, in 1973, that some 30% of US fuel consumption was needed to grow, harvest, and transport agricultural goods--more energy was going into food production that was gained via its consumption
-rather than confront the issue of energy inputs, efforts were made to improve technology to locate and extract more fossil fuels

Living on Ten Earths

-estimates of energy reserves, replacement rates, and energy use are possible
-Catton suggests we were using (in the 1970s) about 10,000 times what was being created via geological processes
-agriculturally, we were using ten times the amount being created naturally
-“To become completely free from dependence on prehistoric energy (without reducing population or per capita energy consumption), modern man would require an increase in contemporary carrying capacity equivalent to ten earths” (p. 52)
-this suggests the future will be one of either drastically reduced exuberance or people
-Watt’s steam engine invention paved the way for humans to overshoot their carrying capacity (compounding ‘discovery’ of the Americas that extended that capacity); it also reinforced our illusion of limitlessness
-“Once mankind was committed to heavy reliance on continued use of exhaustible resources such as the deposits of fossil energy, it was certain to be as painful for people to emancipate themselves from their own

technological entrapment as it had been for earlier men to emancipate themselves from owning human slaves." (p. 53)

Chapter 4: Watershed Year: Modes of Adaptation

Illusions and Delusions

-the culture of exuberance has led humans to believe they are exempt from the constraints of nature
-the New World's carrying capacity surplus encouraged a myth of limitlessness
-reassessing the assumptions inherent in this is particularly difficult for Americans who have benefitted from their occupation of it
-the dream of a non-competitive world has been greatly diminished as resources also encounter diminishing returns
-success in this new post-exuberance is coming at the expense of others
-"Modern technological advantages made us dependent on vanishing resources and on precarious economic relations." (p. 59)
-seemingly helpful actions are exacerbating our overload: creation of high-yield crops, foreign economic aid, medical interventions prolonging life

A Spectre Confronting the World

-the notion of limitlessness came crashing to an end in 1973 for Americans with the Arab Oil Embargo
-after about a year the panic lessened and narrative managers were able to focus anger at an obvious out-group: Arabs
-blackmailing Arabs were the scapegoat for both fuel and commodity shortages, as well as food price inflation
-most people went on ignoring the underlying issue: overshoot of the natural carrying capacity
-Americans began to call for restrictions on oil exports not realising the US was already importing 30% of its needs
-hostilities in the Middle East (Arab nations vs. Israel) had escalated and drew in both the US and Soviet Union
-the price of oil rose sharply even after a ceasefire, causing Americans to realise their dependence on foreign oil
-the 'energy crisis' was born at this time
-"Where before there had been almost abysmal ignorance of the physical indispensability of energy as the basis of mankind's myriad activities, there was now astonished awareness." (p. 63)
-the US government continued to ignore the consequences of the drawdown method and govern as if limitlessness existed still and negatives were due to blackmailing Arabs
-as oil began flowing again in 1974, everyone discounted the significance and dependency upon phantom acreage
-higher oil prices were due to oil industry price gouging while exhaustibility of the resources was firmly denied

Repercussions

-limits persist regardless of beliefs to the contrary
-previously ignored/marginal sources suddenly became needed (e.g., Alaska's oil, offshore drilling, shale oil)
-regulations meant to mitigate pollutants were repealed
-in Europe, where reliance on ghost acreage was more intense, the shift was greater
-all hoped shortages were temporary despite an overpopulation and over-engineered world clearly indicating the idea of limitlessness being obsolete

Resistance to Realism

-the idea that these shortages were 'manufactured' reaffirmed the myth of limitlessness
-the temporary nature of drawing down an exhaustible resource was dismissed through various means
-language misuse (e.g., conflating 'production' and 'extraction') and over-production cycles
-some recognised that an age of serious shortages had begun but most, especially government, did not

-the US continued to market an idea of energy independence/self-sufficiency
-in attempts to reduce the dependence on foreign resources, greater efforts were made to exploit domestic sources--drawing down those more quickly
-“It was also hoped, of course, that ‘new sources of energy’ would be ‘found’ by Project Independence, including breakthroughs in nuclear power plant design, geothermal generating facilities, and technological devices for using solar energy. Such hopes amounted to a faith that endless substitutions of one resource for another could prolong limitlessness in the face of resource depletion. Like the family that lives beyond its income and expects to get away with it because next year the breadwinner’s salary *may* be raised enough to cover the debts run up this year, the nation and mankind were increasingly staking their evasion of ecological bankruptcy on hoped-for but uncertain progress.” (p. 68)

Tunnel Vision and Insight

-different people/groups have different views of the issues
-some believe in the need for institutional change, some in technology, sociocultural shifts, and some continued to hold on to limitlessness
-Catton argues two novel ecological perspectives are required to understand our plight
-people differ in their readiness to accept our world is overpopulated and that we've already drawn down much of our reserves
-they also differ in understanding the consequences from these
-eventually, human organisations and behaviours based on an assumption of limitlessness will be forced to adapt to finite limits
-sticking to the old paradigm of limitlessness are ‘Ostriches’ with ‘Realists’ recognising the new ecological paradigm
-these paradigm differences are significant and oftentimes make communication impossible between them

Effects of Disillusionment

-between the ‘Ostriches’ and the ‘Realists’ exist other perspectives on our circumstances (population overshoot and reserve drawdown) and their consequences (organisational and behavioural changes necessary to adapt to finite limits)
-’Cargoists’ accept the circumstance but disregard the consequences, believing technological progress will prevent needed changes
-’Cosmeticists’ disregard the circumstance but partially accept the consequence holding that sociocultural shifts will allow continuation of ‘limitlessness’
-’Cynics’ disregard both the circumstance consequences believing limits have no impact
-ecological reality demonstrates that resources are finite try as we might to deny this
-the early 1960s did, however, witness a growing counterculture

Typical Antinomianism

-antinomian movements are common (defiance of respected norms) and tend to occur in response to exuberant times
-this time, however, it appears the agony that will counter the exuberance is not transient
-changes in attitude can’t extend or expand carrying capacity
-it is only via a true understanding of our predicament that there exists any hope of coping with its consequences

Part III: Siege and the Avoidance of Truth

Chapter 5: The End of Exuberance

Understanding New Circumstances

-abundance and liberty have been possible because of ecological prerequisites
-with these gone, these benefits are in jeopardy
-most of the world will not attain the living standards achieved by those who have benefitted
-liberty/democracy that grew out of expansion of carrying capacity will also be threatened
-historical interpretations prior to an ecological perspective hide our predicament

The American Dream

-Europeans tended to view the Americas as a land of inexhaustible resources early on
-destruction of unwanted plants and animals (including other humans) was commonplace and helped to expand human carrying capacity
-the New World tended to be man vs. other species while the Old World already being saturated with humans was man vs. man
-the idea that a welcoming melting pot could last indefinitely was common

Basis of the Dream

-the Louisiana Purchase further feel the dream, with low population pressures supporting the illusion of limitlessness and liberty
-Catton argues that “a carrying capacity surplus facilitates development and maintenance of democratic institutions, a carrying capacity deficit weakens and undermines them.” (pp. 79-80)
-political and ideological differences between the New and Old Worlds were pointed to as the basis of the opportunities of the Americans, not carrying capacity differences
-the ‘exuberance’ displayed here is common when any species moves into an unexploited habitat
-“As long as the members of an invading species remain far less numerous than the maximum population ultimately permitted by the carrying capacity of a new habitat, proliferation is easy, and competitive pressure upon the members of that species population will be low. Competition within the species may even be negligible when the small population is surfeited with unused resources waiting to be exploited.” (p. 80)
-ecological exuberance (i.e., superabundance) creates in humans an emotional state (i.e., optimism, hopefulness)
-both were temporary as their existence leads to changes in the environmental conditions that caused them
-and democratic institutions that have been founded upon favourable ecological circumstances must also be temporary

The Unheeded Warning

-Yale sociologist William Sumner recognised America’s dilemma in 1896, arguing social well-being was predicated upon resource to population ratios
-this ratio is shifting constantly due to boundary changes, technology, social organisation, and population numbers
-while a region’s carrying capacity is not fixed, it is not infinite
-increasing productivity while population is well below the carrying capacity can mask for a time the inverse relationship between population density and living standards
-human error and social disorganisation wastes carrying capacity
-during an Age of Exuberance this waste is hidden
-“When population density is low, human equality is feasible and even probable. Each individual is economically valuable to others; it is, accordingly, hard for others to subordinate him. Class distinctions fade in such circumstances.” (p. 82)
-democracy is fostered by low population density and resource abundance
-freedoms were misattributed, however, to novel political institutions and laws, and not to reduced population pressure
-Sumner attempted to argue how doctrines can impact perceptions (similar to Kuhn) and reduce carrying capacity mostly because we lack understanding of how things work and thus misusing resources

-doctrines deprive us of facing facts

Besieged and Bewildered

-the New World is no longer new and what we perceive as normal living has placed the planet and its habitats in peril
-the consequences of overshoot abound and living standards are beginning to fall as our numbers rise
-world leaders, however, remain committed to the cornucopian paradigm
-inequitable situations were attributed to politics with no recognition of environmental/ecological impacts (i.e., ghost acreage)
-education and technology were viewed as solutions

Missionaries of Demoralization

-unrealistic expectations can be destructive and cornucopians urging un-/under-developed regions to reach for the unattainable goal of limitlessness in a world in overshoot led to such frustrations/demoralisation

Achieving Chaos

-the illusion of limitless economic growth has persisted partially due to its enshrinement in important documents (e.g., UN Charter, Universal Declaration of Human Rights)
-overshoot and resource depletion were deemed irrelevant to the ideals desired
-“the very possibility that real limits might impede attainment of yearned-for goals in a post-exuberant world was not acknowledged, and apparently not seen.” (p. 86)
-underdeveloped countries were led to believe they could achieve industrialisation with foreign aid and willpower
-leaders of these countries promised more than they could deliver and were soon ousted
-genocide and despotism arose as a result

Whether Recognized or Not

-limits do not recede because they are unseen by an Age of Exuberance mentality
-universal development is unattainable through an ecological lens and its pursuit has had grievous consequences
-poor nations could not enrich themselves and rich nations were on their way to being poor
-post-exuberant reality was making the inevitability of progress more fragile
-“Persistence of an obsolete paradigm caused people to discount the fact that for no species, not even for man, can an Age of Exuberance be more than temporary in a finite world.” (p. 88)
-post-exuberance is bound to be painful and it may get violent, although that will serve no purpose
-utopian dreams are not going to be achieved and working together is going to be needed

Part IV: Toward Ecological Understanding

Chapter 6: The Processes That Matter

Escape from Arrogance

-a fall from the Age of Exuberance has resulted in many blaming 'others' for their loss
-Catton argues we need to abandon such blaming and view this as a natural outcome of a natural process
-we need to view our circumstances as ecological succession and related processes
-there have been innumerable examples of species impacting their own environment so significantly that they perished
-humans have believed themselves to be above such a predicament
-"organisms using their habitat unavoidably reduce its capacity to support their kind by what they necessarily do to it in the process of living." (p. 96)
-blaming others for changed circumstances is a human trait
-our cognitive abilities, however, do afford us the opportunity to recognise our role and to learn from our mistakes

Universal Interdependence

-all life has a similar chemical basis and are interdependent
-we all take and leave environmental substances during our life processes that affects other species (Darwin's 'web of life' and is intricate interconnectedness)
-the field of science that emerged from this awareness is ecology
-everyone should have knowledge of the basic principles of this field
-fundamental to this is the division of all life into two kingdoms (plants and animals) that 'cooperate' in sustaining life
-using sunlight, plants extract carbon that forms organic molecules (that animals use as food) and produce oxygen (that animals breathe and need to oxidise food which releases stored energy)
-animals release carbon dioxide that supplies plants
-plant life processes set the stage for animals (increasing atmospheric oxygen) and future fossil fuels
-increasing animal numbers balanced the carbon dioxide-oxygen ratio eventually for both kingdoms (long before humans emerged)
-like all life before it, human life processes change the environment it relies upon
-as humans and their adaptive tools have multiplied, their impact on their environment has similarly expanded and significantly altered it from what gave rise to them (e.g., huge increase in carbon released into atmosphere upsetting balance of carbon cycle)

Photosynthesis and the Basis of Life

-sun energy is the basis of all life on Earth
-photosynthesis by green plants creates food for the animal kingdom
-plant sustenance is created via abiotic/inorganic substances
-some plant organic matter becomes food for animals and is converted to muscle, blood, etc.
-some animals consume other animals
-plants are producers while animals consumers for the most part; some plants consumer detritus
-some animals consumer both plants and animals
-conversion from one form (plant) to another (animal) is about 10% efficient; it is thus about 10x more difficult to increase the quality of our diet than the quantity

Symbiosis and Antibiosis

-organisms sometimes cooperate in a symbiotic relationship
-herbivores, for example, depend upon bacteria to help breakdown plant matter during digestion
-each species places different demands on the environment
-when species' demands complement each other (one uses what the other puts in), the relationship is symbiotic
-species require different things from the environment and do different things to it

-symbiosis can also occur within the same species when they behave differently and place different demands on the environment
-"The enormous capacity of Homo sapiens for behavioral differentiation turns many ecological principles into sociological principles." (p. 102)
-competitive intensity amongst humans tends to be a function of the ratio of population to resource quantity
-competition between individuals depending upon similar resources are high relative to the population density
-competition increases as population increases
-organisms also put substances into their environment that can impact their own species and others
-these substances could inhibit or promote growth
-when they are harmful to each other species, the relationship is antagonistic (in an impersonal/emotionless sense)
-the emotional counterpart of such a relationship may arise between human groups and thus an age of overpopulation may lead to conflict
-naive liberalism tends to deny valid bases for antagonistic relations including environmental factors such as population pressure or civilisation-created waste products (extrametabolites)

Community, Niche, Succession

-different organisms adapt collectively to a habitat creating a biotic community
-these may be plant communities dominated by plants (with some animals such as pollinators) and are basically self-sufficient; they may be animal communities with animals playing a dominant role and with limited self-sufficiency
-a human community is dominated by humans and displays little self-sufficiency, relying greatly on other species
-an organism's niche is its distinctive role within its community
-these roles may become increasingly differentiated with greater competition (i.e., niche diversification), reducing the number of competitors and leading to more community complexity
-habitats change and adaptive patterns also do in response
-one of the reasons for change is the living processes of the organisms within the habitat
-organisms thus create the reason for a shift in their adaptive patterns
-rarely, organisms may reach an equilibrium where life processes 'balance' and the habitat remains relatively stable
-this 'climax community' requires the various niches to be mutually complementary; it is "an integrated and self-perpetuating community" (p. 105)
-for example, the carbon cycle between plants and animals witnesses carbon fixation via photosynthesis, its oxidisation returned to the atmosphere via respiration
-most communities are not of the climax type and experience continual change with species replacing one another
-human communities cannot now be climax types and by this nature undermines itself (similar to many other species)
-even without habitat changes, one species may outcompete others and result in species succession
-biotic communities change primarily due to the impacts of the organisms in them
-species in a community are in constant flux because of these changes
-we have misunderstood our history by not recognising the ecological patterns, and this has allowed us to overshoot our carrying capacity
-observation of other primates who experience this show that: antagonism and competition brought on by increased population pressure results in more violence and behavioural degeneracy; care for the young falters and they may be treated as intruders; population growth slows; and fear, hostility, and misery pervades life
-"Man has imagined himself to be more unlike other mammals than he really is, so when human behavior has show these same characteristics [increasing violence and behavioral degeneracy, more abrasive status

hierarchies, faltering care for young and treating them as intruders, and increased fear, hostility, and misery], various other explanations have been put forth which have obscured the significance of population pressure itself. In the twentieth century with human numbers enlarged and resource drawdown becoming significant, man went to war. He rioted in the streets. He committed more and more crimes of violence. HIs political attitudes polarized and he created totalitarian governments, some of which gave license to sadistic tendencies. A generation gap widened and deepened. In spite of earnest efforts by human activists to inhibit racism and to rectify economic inequality, disparities between people remained and animosities become more virulent. Standards of decency in behavior toward others and expectations of considerate self-restraint were eroded and degraded in many places." (p. 107)

Man's One World

-humans are part of the animal kingdom and dependent upon the plant kingdom
-we have diverted a good fraction of the plant kingdom's productivity away from other animals for ourselves (1980 estimate of ⅛ of world plant production meaning 3 more doublings will take this to 100%)
-we have significantly altered the planet's web of life with our introduction of agriculture
-the human population has doubled 9 times in ust 400 generations (a more than 500 fold increase)
-we continue to try and divert larger fractions of annual plant production to our own ends but this is getting more difficult due to diminishing returns
-new tools/techniques have given us a competitive edge (since about 1800) allowing us for a time to increase our carrying capacity by taking over resources from other species as we also began to drawdown ancient energy reserves and allowing our population to balloon
-even swifter changes to the web of life came with mechanised agriculture
-drawing down resources also enhanced the takeover method resulting in greater numbers of non-humans losing their sustenance and suffering population crashes and extinction
-humans have long thought of themselves as dominant with respect to other species but has never considered or recognised the implications of this for our future
-natural laws would seem to suggest no species can remain dominant forever
-dominance, however, is not omnipotence, and a dominant species can even undo its position because of its impact on its habitat (resulting in a loss of dominance, migration, or extinction)
-humans have depended upon migration repeatedly over the millennia, moving to uninhabited lands or crowding into relatively sparsely inhabited ones
-the spread over the past few centuries has altered the environment significantly from that which we evolved into (and genetically adapted to)
-natural precedents, however, suggest our dominance is only temporary

New Attitude Needed

-we continue to misunderstand recent history because we interpret through a pre-ecological paradigm
-habitat transformation leads to community succession
-it is natural for us to proceed to an age of overpopulation and trauma after an Age of Exuberance
-the mechanisation of agriculture and Green Revolution may, in retrospect, be viewed as a curse for its huge population increases and environment
-"Nor can a fossil-fueled industrial civilization prevail as a climax, affording affluence forever. Disease, starvation, or another war may possibly decimate mankind, in which case another brief age of exuberant recovery for the survivors might follow--until the losses had been replaced...Hindsight tells us it would have been vastly better had the human population had the foresight to stop its own increase two or more doublings ago." (p. 112)

Chapter 7: Succession and Restoration

From Historic to Nondescript

-humanity's tools have made us much more successful in our competition against other species
-even human communities experience succession in terms of tools/devices (e.g., changes that accompanied introduction and distribution of motor vehicles)

Past Succession
-biotic communities change constantly
-habitat modification occurs due to the life processes of species present
Turning the Tide
-attempting to return a habitat to a previous state takes tremendous effort
-to maintain an ecosystem, such as a garden, similarly requires constant attention to compensate for changes
-to restore a garden means removing successor plants
The Struggle Against Succession
-succession is a powerful process but one humans have been attempting to fight since they began using agriculture
-food production requires a contrived ecosystem where succession must be impeded
-agriculture "is the continual undoing of succession" (p. 121)
-human societies today depend on our continued succession changing climax communities into earlier seral stages with large but precarious carrying capacity
-the drawdown approach temporarily boosts carrying capacity
-it has been assumed that the takeover approach allows permanent increases in carrying capacity but as has been observed via succession this method is also precarious and only potentially permanent
-agriculture requires perpetual maintenance and improvement, and should garner a society's 'investments' over everything else
Succession Misunderstood
-an increasing population becomes more dependent in its ability to undo succession but the Age of Exuberance has made us blind to this
-we have believed we are above the rest of nature and we create our own habitat
-"The culture of exuberance seemed to impute almost supernatural capabilities to *Homo sapiens*. It prevented us from seeing that the process of 'creating our own habitat' might be a trap, that technology might come to enlarge our resource hepatitis instead of our world's carrying capacity." (p. 122)
-sociologists began to apply the notion of succession (based upon plant examples circa 1916) to human communities but missed the fundamental nature of it: through their use of a habitat, occupants make the area unsuitable for its continued use
-being contrary to the notion of limitlessness developed during the Age of Exuberance, sociologists overlooked it as relevant to human ecology
-"The idea that man's dominance of a world ecosystem might be only a pre-climax stage in a sere with other stages to come (no dominated by man) was quite alien to hte culture of exuberance. The idea that industrial man's impact upon his habitat might make it unsuitable for industrial man clashed with the prevalent idea that human control over nature was a great achievement in the exploitation of limitless resources." (p. 123)
-eventually humans were seen as an integral component of nature and its web of life, but only by a handful of sociologists; the public continued to hold onto the belief of limitlessness

Chapter 8: Ecological Causes of Unwelcome Change
Biotic Potential versus Carrying Capacity
--Mathus's 1798 Essay on the Principle of Population concluded that because population increases exponentially but subsistence only linearly, humans were bound to encounter food shortages
-in ecological terms, this argues that problems occur when "the cumulative biotic potential [theoretical number of offspring after several generations] of the human species exceeds the carrying capacity of its habitat." (p. 126)
-understanding this helps one to understand competitive intensification
-carrying capacity is limited by a finite supply of food and other necessary resources (e.g., water and for industrial societies, oil)
-many argue Malthus has been 'proven' wrong but the principle he outlined holds

-we have supposed it was wrong due to two oversights: 1) population for a long time was under the augmented carrying capacity (migrations into New World, fossil fuel-based technological innovations); 2) failure to consider cumulative population impacts (exponential growth)
-Darwin recognised the importance of this principle for all species
-"As a result, there is competition among the members of a species population for use of resources that are in short supply relative to their numbers. Not all competitors will succeed; not every individual will live through all stages of the life cycle. The population, pressing on its limited resources, will suffer attrition." (p. 127)
-Darwin argued this attrition is not random and those with certain advantages will be more likely to survive, reproduce, and care for offspring giving them greater chances to reproduce
-advantages or disadvantages depend on the environment
-that evolution occurs is support for the Malthusian principle, as are food chains (organisms eating other organisms)
-sustained resource extraction is possible with the self-restraint to harvest at a rate slower/equal to resource replacement rates
-extraction above this rate leads to the problems outlined by Malthus
-"One of the great ironies of history has been the notion that our species was somehow exempt from a principle that manifestly applies to all other species." (p. 128)
-despite our cultural heritage that differs from other organisms, we are not exempt from population pressures on a finite planet

Learning How to See

-people (especially Americans/Europeans) have bought into the illusion of a perpetual Age of Exuberance and we have behaved accordingly
-in the 1970s, some began to view what was happening via a different paradigm and it is this ecological perspective that needs to be used to see more clearly

How to Read the Signs

-the relatively recent notion of limitlessness has arisen as a result of a densely populated region suddenly taking over a sparsely populated one and attributing to consequential success to social and political aspects that were distinct from their roots
-too much faith has been put into the permanence of the situation without recognising its temporary nature
-the environmental basis that supported the illusion were undermined by the growth that occurred
-changes have not been recognised as natural succession but been interpreted via a political lens
-the takeover method of resource acquisition soon expanded and went beyond continental boundaries
-the ecological basis for the Age of Exuberance was ending but immigrants continued to flow into the New World and were being viewed as a threat by some
-decision-makers who still saw the situation through a pre-ecological paradigm continued to suggest opportunities were limitless
-eventually some restrictions were put in place perhaps signalling, the twilight of the New World's Age of Exuberance
-racist ideologies certainly influenced such legislation but the ecological basis was real: population pressure leading to increased competition
-from an ecological perspective, these are all common symptoms of succession
-exuberant expansion into the New World eliminated the foundation of exuberant expansion but the culture that developed during the expansion prevented it from being recognised as succession

Environmental Brakes on Exuberance

-modern nations have "staked their future on perpetual harvesting of non-renewable resources. Men now built with steel, concrete, or aluminum, rather than with wood. We had evolved into societies so large and complex that they required quantities of energy too vast to be supplied by contemporary crops of organic fuel. We allowed ourselves to become so numerous that we could not really grow the food we needed without enormous 'energy subsidies,' augmenting sunlight and muscle power in agriculture with industrially

produced chemical fertilizers and fuel-burning machinery for planting, cultivating, harvesting, shipping, and processing...Even agriculture, the ultimate achievement in man's development of the takeover method of carrying capacity expansion, had become converted to drawdown methods." (p. 135)
-our reliance on current photosynthesis (wood) has been replaced by a dependence on past photosynthesis (fossil fuels)
-Britain's industrial revolution could be said to have initiated the transition to coal as their forests became harvested faster than they could replace themselves (used for iron smelting); to access deeper coal layers, the steam engine was developed to help prevent flooding
-steam engine use became distributed for wider applications
-Britain's economy quickly shifted towards trading factory-produced goods for agricultural goods
-population growth was supported through this ghost acreage
-expanding the drawdown method and takeover via trade didn't eliminate Malthus's day of reckoning, ust postponed it
-since WW2 all the leading industrial nations have increased their dependence on fossil energy and committed themselves to liquid fuel-based technology
-"In the meantime, however, the volume of oil reserves discovered by each additional million feet of exploratory drilling was rapidly declining, despite expanded technical knowhow. This showed us that we had already extracted and burned the most accessible supplies, and that the existing and still increasing rate of consumption would virtually exhaust even the less accessible reserves within the lifetime of people already living. The social repercussions were going to be staggering." (p. 136)
-other mineral resources have also encountered diminishing returns
-there arose both socio- geopolitical consequences from this (to say little about the ecological/environmental ones)
-neo-exuberance was beginning to encounter headwinds

The Real Error

-Malthus erred but not in the way critics accuse him
-he was correct that population growth increased exponentially if unchecked and that ordinarily it is not unchecked
-he was incorrect in assuming the checks on growth worked fully and immediately and that the human load could not surpass the carrying capacity
-continuing to mistake overshoot for 'progress' and believing takeover and drawdown are similar, we are making our predicament worse
-carrying capacity can be exceeded, at least temporarily and Malthus's failure to see this actually led him to understate our plight as it neglected the environmental impacts and carrying capacity reduction

Chapter 9: Nature and the Nature of Man

Detachable Organs

-the eventual use of tools by early primates exposed them to a new set of selection pressures
-an enhanced ability to devise and use tools gave reproductive advantage

Man, the Prosthetic Animal

-for some humans, the development of detachable organs (tools) has meant survival
-the use of 'prosthetics' has enabled us to expand across the planet into environments humans could not survive without them
-while this development had enabled a huge population expansion through exploitation of the environment, it contains within it hazards and limitations

Species of Many Niches

-geneticist G. Ledyard Stebbins suggested that humanity's future depended on our tendency for self-deception by occasionally pursuing attractive goals that end up in disaster
-our ability to fill many niches has arisen as a result of us to divide our labour into a variety of specialties
-a homogeneous species has been able to occupy almost all environment due to our wide variety of tools

-unfortunately this ability has led social scientists to believe humans were special and separate from other species, and would be unaffected by the processes common to them (such as overshooting the natural carrying capacity)
-this has made it almost impossible to understand the back and forth impact between humans and their habitat
-tools have allowed humans to do things their organs could only do crudely or not at all

Altered Carrying Capacity

-the advent of agriculture enlarged the carrying capacity of humans
-developments in food production further enhanced it
-once fossil fuels began being exploited, carrying capacity exploded
-this trend of increasing carrying capacity has been with us since we began using tools that permitted us to exploit our habitat more fully

Too Much of a Good Thing

-technology hasn't simply supplemented the takeover method, helping to expand our carrying capacity, but has committed us to the drawdown method
-and our tools have been too successful and succeeded in hastening our extraction speed and amount
-our tools not only allowed us to spread across the planet, but differentiate our occupations to a point where our survival became dependent upon trade with others
-this led to humans being considered resources in and of themselves, and that others could be exploited
-with all of these tools and resources at his disposal, humans expanded their reach and carrying capacity, and developed more complex tools and societies
-our belief in limitlessness could not counter the limits of finite planet and exacerbated our drawdown of resources
-ironically, "technology, which originally had been a means of increasing the human carrying capacity per acre of space or per ton of substance, became instead a means of increasing the space required per human occupant and the substance required per human consumer." (p. 154)
-rather than the Malthusian issue of an increasing population bumping against limits in a finite habitat (or using renewables quicker than their replacement rate), humans were caught with an expanding population and a shrinking carrying capacity due to increasing technological power
-as technology became more potent, each human required more resources and thus more space
-"If we were accustomed to thinking of a human being not just as a naked ape or a fallen angel but as a man-tool system, we would have recognized that progress could become a disease. The more colossal man's tool kit became, the larger man became, and the more destructive of his own future." (p. 155)

Chapter 10: Industrialization: Prelude to Collapse

Unrecognized Preview

-our dependency upon non-renewable resources arose with the Industrial Revolution
-the consequences of our exuberance can be seen when viewing the Great Depression through an ecological lens (keeping in mind that non-renewable resources provide only phantom carrying capacity)

Carrying Capacity and Liebig's Law

-whatever substance is indispensable but inadequate (relative to per capita needs) sets the environmental carrying capacity
-this is known as both 'the law of the minimum' and 'Liebig's law'
-one way to circumvent the is law is via trade [what Tainter terms 'energy averaging'], although this doesn't eliminate the law
-the principle of 'scope enlargement' (with human history showing efforts to implement this often) is an attempt to enlarge the law of the minimum
-improvements in transportation technology and organisation of commerce are two examples of enlarging human carrying capacity

Vulnerability to Scope Reduction

-trade allowed populations to grow beyond local resource supports but increased reliance upon supply chains from distant lands and vulnerable to the disruptions of such trade
-much of this trade had become dependent upon exhaustible resources
-it can also be sent sideways because of social events (e.g., economic dislocation, war)
-World War 1 was such an event
-relations between regions were disrupted and colonial lands (and their ghost acreage) were reallocated
-Germany was cut off from outside supports and reparations demanded that exceeded regional carrying capacity
-hyperinflation was a preview of the financial chaos to come that impacted world trade and put pressure back on local carrying capacities
-in the US, neo-exuberance led to stock market speculation but mostly using borrowed money so when the market fell, bank failures followed and many lost their savings; suddenly, many were having to depend on their local carrying capacity
-farmers had to cut their expenditures and maintenance, many lost their farms to the banks
-increasing urbanisation, however, actually stopped
-"With breakdown of the mechanisms of exchange, various segments of a modern nation had to revert as best they could to living on carrying capacities again limited by locally least abundant resources from elsewhere." (p. 162)

No Fairy Godmother

-the Depression stalled industrialisation and occupational diversification
-ecologically, when niches get filled speciation occurs; humans, in turn, develop new occupations
-nothing, however, guarantees nature will be ready to absorb the excess population
-this may mean a massive die-off for non-humans or occupational retraining for humans (which can be traumatic and often resisted)
-change may result in conflict/tension and persist until adaptation occurs (e.g., culture/future shock)
-as agriculture increased its use of technology, many rural residents moved to cities where industrialisation was occurring (with employment in war-time absorbing many)
-a surplus of farmers and thus production led to falling food prices after the war resulting in less consumption overall
-problematic events were blamed on sociopolitical policies and ecological impacts overlooked
-until industry was ramped up to support the military leading up to and during WW2, the Depression lingered
-war efforts increased certain consumption while 'rationalising' the population's 'sacrifices'
-but the increased industrialisation also increased natural resource drawdown
-the economic interpretation of the times allowed an oversight of the ecological aspects

Circular versus Linear Ecosystems

-having once relied upon organic energy sources (plant fuels and animal power) with some minor contributions from moving water and wind, humanity could 'sustain' itself almost indefinitely but this does not mean infinitely
-local overuse/changes led to migration and Liebig's Law was unimportant so long as such movements could occur into unexploited regions
-with the discovery of fossil fuels things changed and we came to believe we could grow indefinitely mistaking our drawing down of savings for 'income' and not realising the shift could only be temporary
-this drawdown increased energy per capita, reduced the manpower required for agriculture, and expanded occupational niches
-the temporary nature of drawing down savings to grow means a 'collapse' of those aspects that expanded
-a mild preview was provided by the Great Depression: a flourishing followed by a collapse
-many organisms exhibit a similar process when provided with a sudden surge in important resources/nutrients that are temporary in nature: irruption followed by die-off

-“When the earth’s deposits of fossil fuels and mineral resources were being laid down. Homo sapiens had not yet been prepared by evolution to take advantage of them. As soon as technology made it possible for mankind to do so, people eagerly (and without foreseeing the ultimate consequences) shifted to a high-energy way of life. Man became, in effect, a detritovore, Homo colossus. Our species bloomed, and now we must expect crash (of some sort) as the natural sequel.” (p. 170)
-we have been unable to perceive the ecological impacts of our drawdown because of our tendency to view events economically/politically
-there has “been a marked acceleration in our previously begun shift from a self-perpetuating way of life that relied on the circularity of natural biogeochemical processes, to a way of life that was ultimately self-terminating because it relied on linear chemical transformations.” (p. 171)
-our balanced, symbiotic relations with other species had ceased to exist and our degraded habitats have remained degraded

Perils of Prodigality: The Coming Crash

-our expansive use of our savings has allowed our numbers to expand significantly which has led to a great increase in our use of organic matter
-but it would take 100% of contemporary organic matter to sustain us without fossil fuels
-we are well beyond the point of being able to support our current population without drawing down ancient energy stores
-it is increasingly appearing that our descendents will be subjected to a world much different than the one we have creed using up all the energy savings of the past
-this kind of ecosystem exploitation is only seen in species that bloom and crash
-a 1972 UN Conference on the Human Environment was meant to address this predicament and develop plans to avoid the impending collapse
-unfortunately, in attempting to appease all nations, the opportunity was lost
-it may be possible to bring resource demand down within the limits of permanent carrying capacity but it would mean significant sacrifices by those most advantaged by the resource drawdown
-humans tend to be resistant to change and accustomed behaviours persist
-“Moreover, habits of thought persist...people continue to advocate further technological breakthroughs as the supposedly sure cure for carrying capacity deficits. The very idea that technology caused overshoot, and that it made us too colossal to endure, remains alien to too many minds for ‘de-collosalization’ to be a really feasible alternative to literal die-off. There is a persistent drive to apply remedies that aggravate the problem.” (p. 174)
-any sacrifices made by a few would likely result in an uptake by others, before it all collapses
-while those who prepare for a more simplistic life may be setup for the longer-term environment, our dependence upon fossil fuels for high agricultural yields will result in far far less area for human food production once grazing for draught animals (that would be needed to replace fuel-powered machinery) is accounted for

Not Cleared for Takeoff

-so-called ‘developed’ countries have been considered models for the future of ‘underdeveloped’ ones, but this is likely backwards
-the conditions of exuberance that created ‘developed’ regions no longer persist as the stored energy that powered industrialisation has encountered diminishing returns
-not only is the world short of the material resources to raise the underdeveloped to developed status, the capacity of the environment to absorb our waste products has greatly diminished
-governments everywhere have ignored or dismissed these limits to growth and locked us into a pattern of stealing from the future

Learning to Read the News

-viewing events through an ecological lens it becomes clearer that a growing human population and its technology cannot continue to be supported on a finite planet

-C. Wright Mills pointed out how we tend to make history is through infinitesimal actions through their numerous and cumulative impact, although intended by none
-“If we find ourselves beset with circumstances we wish were vastly different, we need to keep in mind that to a very large extent they have come about because of things that were hopefully and innocently done in the past by almost everyone in general, and not just by anyone in particular. If we single out supposed perpetrators of our predicament, resort to anger, and attempt to retaliate, the unforeseen outcomes of our indignant acts will compound fate.” (p. 177)
-what we are experiencing with our “competition-aggravating and crash-inflicting deficit” is fate
-the collapse due to exuberance is the result of innumerable innocent choices, not the conscious choice of some small cabal of people

Section V: Resistance and Change
Chapter 11: Faith Versus Fact
Vain Expectations
-as the New World began to bump up against the limits to continued growth (westward expansion completed, resource 'savings' beginning to deplete, degradation of the environment) emerging problems were viewed as a loss of willpower rather than the ecological limits they were
-as a result, remedies arose that were Cargoist in nature
-instead of confronting the limitations of a finite world, funds/resources were committed towards finding alternative fuels to replace falling domestic oil production
The Millenarian Response
-as dissatisfaction with the situation grew, increasing numbers of people sought solace in millenarian beliefs (i.e., cargo cult-like activities and thinking)
-"Modern faith in science and technology as infallible solvers of any conceivable problem can be, in a post-exuberant world, just as superstitious. The essential parallel is this: the Melanesians were able to believe they would receive cargo because they had no accurate knowledge of how European goods came into existence, or why they came to the islands. The modern Cargoist who expects to be bailed out of this year's ecological predicament by next year's technological breakthrough holds similar beliefs because of his inadequate knowledge of ecology and of technology's role in it. Both Cargoist faiths rest upon the quicksand of fundamental ignorance lubricated by superficial knowledge." (p. 186)
-having overfilled niches once sparsely occupied, we've remained unaware of the ecological basis of our living standards--of the ghost acreage in foreign lands or supplied by ancient, stored energy
-in believing in our political and economic systems as the foundation of our prosperity, we have similarly embraced a cargo cult-mentality of limitlessness
Space Age Cargo Cults
-one commonly held belief has been in the near future breakthrough of some great technological solution to expanding human carrying capacity--faith in faith with "no firmer basis than naive statistical extrapolation--the uncritical supposition that past technological advances could be taken as representative samples of an inherently unending series of comparable achievements." (p. 187)
-this view ignored 'progress' was due to the takeover method from other species and was only ever temporary in its ability to expand perpetually

1. **Unlimited food**

-the creation of high-yield strains of grains, known as the Green Revolution, is one example
-cheerleaders have failed to grasp that the explosion in population this fostered aggravated our situation on a finite planet
-it hastened soil exhaustion and increased dependence upon chemical fertilisers (drawing down fossil fuels and other minerals)
-the takeover method now depended upon the drawdown method

2. **Unlimited alternatives**

-the idea of infinite substitutability proclaimed by economists when demand outpaced resources aimed to alleviate anxieties
-our two non-repeatable successes in expanding human carrying capacity (discovery of the New World and technology to extract fossil fuels) would not be viewed as one-offs

3. **Unlimited energy**

-the pursuit of a perpetual motion machine of some nature has been with humanity for some time in tis attempt to provide energy without need of resources/fuel
-this illusion that supported the idea of a limitless world has arisen from a misunderstanding of simply physical facts
-the notion of a 'breeder reactor' that could produce more energy than consumed is an example
-while it could increase the usable energy derived from uranium, it could not do so to infinity or even a very large amount (perhaps 60x)--but this also ignored significant safety issues

-cargoism overlooks the negative consequences of the technology employed, keeping dreams of the limitless world alive, or assumed they are soluble
-"...expecting energy problems to be solved by fusion was clearly a case of counting upon uncertain-to-hatch chickens." (p. 189)
-a lot of both faith and ignorance went into these beliefs

4. Harnessing the sun

-a novel approach to harness solar energy (via photovoltaic panels as opposed to photosynthesis) has been a fall-back position
-solar has supported humanity's initial explosion via agriculture
-but there are many problematic issue overlooked in humanity's possible increased exploitation of the solar energy hitting the planet
-any increase in use by humans necessarily upsets or takes away from the ecosphere and other species
-the balance established over 4.5 billion years is necessarily impacted by increasing use by humans

5. Other technological escapes

-a belief that we could escape the consequences of our overshoot via space travel is another unrealistic myth
-little consideration is given to the massive resources necessary for such an approach, or the numbers of people that would have to be off-worlded annually to approach planetary sustainability; to say little about the inhospitality of our nearest planets to human life

6. Ideological escapes

-equally belief-centred as the technological 'solutions' were the ideological ones that imagined an equitable redistribution where new lifestyles would save humanity
-this approach, however, is similar to its technocornucopian cousin in that it believed we could escape the consequences of our overshoot by eschewing our competitive nature; and it completely ignores that this competition is a natural consequence of us having changed our habitat and ecological circumstances
-rejecting the corporate state can no better protect us from the bloom and crash nature of our species than any other cargo cult belief system
-there is no consideration of resource limits, ecological antagonism, and/or biogeochemical processes
-it shows a complete lack of any comprehension of ecological overshoot

Looking for Scapegoats

-cargoist beliefs held carrying capacity could be increased again and most assumed technology was the means, although some suggested all that was needed was a behavioural shift and that overshoot was not the cause of our issues
-fact-revealing paradigms were not acceptable and logic, rationality, and analysis were suspect
-while we may well be able to understand our plight, this does not mean we can change them
-this unacceptable circumstance led many to look for culprits, with some pointing their finger at ecologists (and comparing them to Hitler)

Chapter 12: Life Under Pressure

Attaining Perspective

-neo-Malthusian has been a label attached to those raising resource limit concerns, as if this would refute it
-the US was lucky to be an 'emerging nation' when the Old World was experiencing population pressures whereas current 'underdeveloped' ones don't have the opportunity to expand human ecological niches
-other areas are restricted in their ability by climate (e.g., Alaska, northern Canada, Australia)
-any unpressured regions have minimal capacity to prolong human expansion

Pressure and Density

-while population density refers to the number of people per unit of area, population pressure differs by being "the frequency of mutual interference per capita per day that results from the presence of others in a finite habitat." (p. 201)

-any population that depends upon more tools to do things, would tend to experience more pressure as it considers activity and not just numbers
-increased activity has been perceived as progress and not as mutual interference/loss of independence
-an example is seen in the declining population involved in farming and the increase in number of people fed per farmer that has been interpreted as 'progress' rather than increasing dependency
-as the 1970s energy crisis demonstrated "man's chief advantage, his capacity for quasi-speciation within one species, was fraught with a serious disadvantage, the intensification of precious interdependence. (p. 202)

High-Energy Living

-our interference with one another is also reflected in our increasing per capita use of energy and associated increase in resource use
-for example, from 1940 to 1965 US population rose 45% but auto sales increased 150%
-our drawdown was accelerating
-this was not an issue when viewed as a growth of abundance
-as 'sapiens' became more 'colossus', population pressures magnified, as did waste effluent
-another significant shift in our drawdown (and related use of chemicals in manufacturing) was a decrease in cellulosic fibre use, causing an increase in our dependence upon finite fossil fuels
-while this change reduced hunger and increased material wealth, it substantially increased population pressures

Urbanization

-mass migration to cities further increased population pressures via industrial technology growth
-many attempted to alleviate pressures of city through suburban homes but this simply increased drawdown due to transportation needs
-even if a country's density remained stable, pressures increased with urbanisation and associated technologies
-such an arrangement places significant burdens upon not-yet-urbanised portions of land
-while Great Britain lays claim to becoming the first primarily urbanised country (circa 1900), by 1920 most of the world had shifted towards this pattern
-by about 1950, ⅛ of the human population lived in cities
-"Aggravated by urbanism, population pressure was intensifying competitive aspects of human behavior." (p. 207)

Pandemic Antagonism

-our tendency to 'do something' about this situation tended to make it worse
-change sought by one group created issues for another who then sought different changes and so on; mutual interference snowballed
-"Pandemic antagonism was the ecologically expectable result of worldwide population pressure, voracious technology, and carrying capacity deficit." (p. 207)
-desired changes bring with them unwanted ones bring with them unwanted ones
-changed activities result in environmental changes
-environmental changes lead to succession and can threaten human life
-excess population and increasing technology impacts human interaction
-ecological antagonism leads to social and emotional antagonism
-while we yearned for peace and goodwill, we continued to multiply and add technologies creating greater competition and antagonism

<u>Section VI: Living with the new reality</u>

Chapter 13: Backing into the Future

But We're Human!

-"...believing crash can't happen to us is one reason it will. The principles of ecology apply to all living things. By supposing that our humanity exempts us, we delude ourselves...whatever the species, irruptions that

overshoot carrying capacity lead inexorably to die-offs. Irruptions can happen to any species that gains access to a previously inaccessible but highly suitable habitat. All it takes is for the habitat to contain an abundance of whatever resources are needed by the invading species, and for there to be little population-checking pressure from predators and little or no competition from other species having similar niche requirements and living in the same area." (p. 213)
-when overshoot has occurred there is no avoiding the crash
-cornucopian analyses are incorrect in suggesting otherwise but we can learn from pre/historical examples

It Has Happened to Humans

-Easter Island is an example of overshoot and collapse
-a canoe load or two of migrating Polynesians happened upon this 45 square mile, human-free island about 2000 years ago
-it appears that ever-increasing emphasis on religious construction placed more and more stress on food production
-it is possible that a minor social disruption (legend tells of a battle between opposing groups arguing over how to improve agricultural productivity) resulted in disproportional chaos due to the fragile nature of their society
-it does appear that conflict increased significantly around 1680 and persisted, perhaps even to the point of cannibalism
-it was estimated that only 3000-4000 remained when Europeans first arrived (1722) and down to a mere 155 by 1886
-"For the rest of the world, in an age of global overshoot, the task facing mankind is to minimize the severity and inhumanity of the crash toward which we too are headed...If, having overshot carrying capacity, 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. Clean knowledge may forestall misplaced resentment, thus enabling us to refrain from inflicting futile and unpardonable suffering upon each other." (pp. 215-216)

Learning to Disregard Deceptive Differences

-no species is exempt from the die-off of a crash after surpassing the natural carrying capacity, although the means of die-off may vary
-a vivid example was observed on St. Matthew Island in the Bering Sea where 29 reindeer were introduced (1944)
-by 1963, 6000 were estimated to be present with the natural carrying capacity estimated to be 1600-2300
-overshoot leads to habitat damage so a crash would bring numbers down below an area's natural carrying capacity
-by 1966, only 42 reindeer remained

No Protection

-while starvation is one means of die-off, others exist
-Easter Islanders appear to have begun their crash via conflict and then inflicted starvation on survivors through a disruption of food production
-Sika deer on James Island appear to have experienced reproductive inhibition due to the behavioural stress created by high population density
-"In drawing lessons for mankind at large from these varied examples, we must first acknowledge that species differences are no protection from the basic pattern. Second, we must recognize that, even with an abundance of food, crash can happen. Third, as we saw...[previously], we must also recognize that the organized activities so indispensable to supporting huge populations by advanced-technology civilizations can and do break down. Conflict between factions within nations, as well as conflict between nations, can seriously reduce carrying capacity" (p. 217)

Queuing and Queue-jumping

-complex societies require highly organised social mechanisms to sustain food production

-due to their fragility, they are susceptible to breakdown and can reduce carrying capacity resulting in overshoot
-forming queues and taking turns is a unique human social process but can break down in post-exuberant times when faith in fairness of the system is lost (e.g., bank run)
-like a bank with inadequate deposits for increasing withdrawals, nature cannot replace deposits quick enough for the large withdrawals being made
-we have become reliant on savings to supplement our income and are approaching total drawdown of these savings
-with our growing realisation that we had entered an age of overpopulation, social activism grew but most blamed others and overlooked the general nature of the process
-the panic that arose was a natural response to a loss of confidence in the social process of queuing signifying danger, limited escape opportunities, diminished opportunities, and inadequate communication about the danger
-anti-social relations was becoming a common response to the crash that must follow our irruption
-many groups fought for immediate change while others believed time was past for proactive shifts
-demands were non-negotiable and queue-jumping became the norm

Elbowing and Counter-Elbowing

-viewing WW2 from an ecological perspective sheds new light on it
-the genocidal response to severe redundancy that occurred was foreshadowed on Easter Island
-the reparations imposed upon Germany after WW1 basically suggested that Germans were redundant
-the response by the German Workers' Party (later the Nazi Party) sought equality with other nations and land/territory to settle excess population
-it required access to ghost acreage, demanded tightening of citizenship roles, and prevention of excess immigration (those not German)
-these were classic responses to redundancy anxiety (as was much of the 1960s-1970s protests)
-"Queue-jumping and vicious retaliation against actions perceived as queue-jumping eventually became common features of post-war life. The resurgence of violent self-assertion the world over indicated that Hitler's 'final solution' would not necessarily be the world's last experience with a genocidal effort by a mad tyrant or a frustrated people to elbow aside some scapegoat group on which they had decided to blame their misfortunes. Scapegoating was made likely by the pervasive frustrations of an age of colossal pressure. Elbowing and counter-elbowing by individuals, groups, and nations became commonplace." (p. 222)

The De-Civilizing of Homo sapiens

-we're fated to continue our self-destructive proclivities as long as we fail to understand them
-we've learned to be civil over the centuries but as our population has irrupted and the pressure compounded by technology these relations have degraded to become increasingly competitive
-we've reacted in pressure-increasing ways (diminishing of carrying capacity) making our situation worse
-war-like rhetoric has increased as population pressures, have (wars are useful for targeting the 'other' as redundant as opposed to ourselves)
-"In a habitat that was not growing any larger, the continuing increase in either our numbers, our activities, or our equipment would ultimately induce more and more antagonism. Our routine pursuit of legitimate aspirations as individual human beings, as breathing, eating, drinking, traveling, working, playing and reproducing organisms, would increasingly entail mutual interference." (p. 224)

Chapter 14: Turning Around

Partial Reorientation

-in April, 1977, U.S. President Jimmy Carter attempted to inform both the U.S. Congress and American people of a new energy policy focused on conservation
-his was an attempt at a paradigm shift

Transitional Thinking

-Carter argued that the energy crisis was a global one

-he overlooked the root predicament: overshoot
-in doing so he missed highlighting “that further crowding of an already overloaded world would make us all more implacably competitiv.” (p. 228)
-while not complete, Carter’s view was moving towards an ecological perspective
-he argued that ignoring our drawdown of fuel reserves could result in catastrophe
-if Carter had understood the situation more fully from the ecological perspective, he would have better warned everyone that the future would be more crowded with more resource-hungry technology and with more man-made substances in a world of limits
-unfortunately, Carter’s message reverberated with old paradigm thinking and he argued for new production (not realising it would hasten drawdown)
-as a result, the Age of Exuberance continued for many

Persistence of Obsolete Thoughtways

-many clung even more desperately to the cornucopian views Carter attempted to dispel
-some argued that the U.S. could produce its way out of the situation (via new reserves, new technologies)
-yet undiscovered fossil fuels awaited; finiteness was not acceptable
-non-growth was not an option and American inventiveness would solve the issue
-the existence of a post-exuberant environment was largely ignored and options that were dead-ends pushed
-the proposed ‘solutions’, however, would only serve to hasten our drawdown of finite resources and reduce human carrying capacity

Questions for an Old World

-overlooking our predicament does not prevent it from occurring
-we need to not only conserve resources but we need to ask how our efforts to avoid a crash will make it worse
-those entrenched in a pre-ecological paradigm will ignore limits and view attempts to slow growth as antagonistic to ‘progress’
-on the other hand, the ecological worldview could help to guide adjustments so our unravelling is not dehumanising
-some tough questions need to be explored

1) Can we begin to reduce our fossil fuel dependence?

-an answer must go far beyond simply replacing fossil fuels and we can’t turn around and demand more when circumstances ‘warrant’ (e.g., cold weather)
-our best move may be to leave them unexploited as their extraction serves to bolster human irruption and their abandonment avoids more pollutants
-the atmosphere is showing signs of particulates (i.e., greenhouse gases, dust, etc.) that is leading to possibly catastrophic and irreversible climate change
-given how fragile and stretched agricultural production is, a shift in global temperatures too far from an ideal may have a devastating impact

2) Can enough of us recognise the intricate relationships between us and nature (habitat and other species), and respect and nurture more than just ourselves?

-a despoiling of the natural environment reduces or eliminates its ability to sustain human communities (and often other species)
-we need to be restricted in our expansion and exploitation
-the counsel of the Cargoists must be rejected

3) Can we acknowledge that our general affluence cannot continue in the face of our carrying capacity deficit?

-while increased efficiency/conservation could help and need not reduce lifestyle standards, it simply slows the drawdown and eventual resource exhaustion
-it’s kind of “a last-ditch version of Cargoism” (p. 235)

4) Will we accept a return to simpler ways gracefully?

-the growth/development tendency has become very strong
-the counterargument that a simplification may well improve life for many will be harshly criticised [especially by those who benefit from the status quo]

5) Can austerity be learned in the face of constant calls for more?

-we need to suppress the marketing industry that pushes consumption and dissatisfaction with what one has
-the competition that results from those wanting more in a world of depleting resources may create destructive conflict
-the advertising industry must be dismantled
-this would require massive changes to the media world, especially in countries where advertising funds the media

Sapiens? Radical?

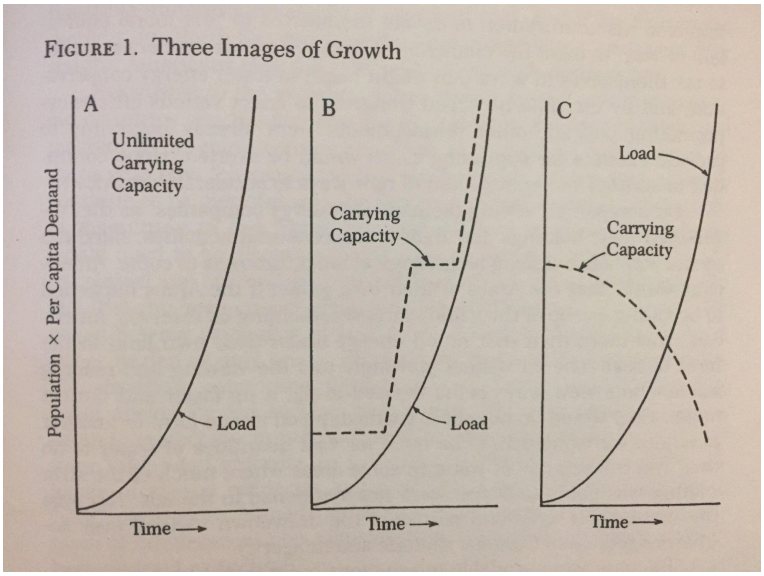
-do humans have the wisdom to contemplate these dilemmas?
-even those who consider themselves informed on such issues rarely recognise the fundamental predicament of overshoot with the pre-ecological paradigm of limitlessness pervading their thinking and 'solutions'
-"Self-styled revolutionaries imagine themselves to be very radical when they propose merely to get rid of capitalist procedures for providing burgeoning populations with economic progress by accelerated drawdown, and to replace them with socialist procedures for providing burgeoning populations with economic progress by accelerated drawdown. In an ecological sense, they leave the problem intact. Proposals are not radical if they accept the continued drawing down of non-renewable resources; there is nothing radical about proposing to speed up that crash-inviting process." (pp. 236-237)
-Carter's energy message should have been interrupted as the beginning of a debate regarding humanity's relationship with nature, especially our perceived excessive dominance
-but the hard questions were ignored and self-destructive activities continued unabated as a Cargoist-perspective remained
-we never considered that we needed to rethink our drawdown reliance and shift to living on income (i.e., contemporary renewable resources), nor what a resulting die-off might look like or if it could be mitigated
-"Bearing in mind the contrast between cornucopian and ecological paradigms, it is easy to understand why most public concern over what to do about 'the energy crisis' either continued to proceed from doubt that the problem was real or persisted in debating the comparative merits of various ways of obtaining more energy--or maintaining access to customary supplies. Steps that would, in the final analysis, aggravate our predicament were still mistaken for solutions." (p. 237-238)
-the internalisation of expectations developed during an Age of Exuberance persisted and have kept us from seeing we now live in a post-exuberant world where everything is different

Paradigm versus Paradigm

-the ecological perspective recognises four basic tenets:
"E1. Human beings are just one species among many species that are interdependently involved in biotic communities.
E2. Human social life is shaped by intricate linkages of cause and effect (and feedback) in the web of nature, and because of these, purposive human actions have many unintended consequences.
E3. The world we live in is finite, so there are potent physical and biological limits constraining economic growth, social progress, and other aspects of human living.
E4. However much the inventiveness of Homo sapiens or the power of Homo colossus may seem for a while to transcend carrying capacity limits, nature has the last word." (p. 238)
-these ideas are quite different from the pre-ecological view developed over centuries of exuberance and assume:
"P1. People are masters of their own destiny; they are essentially different from all other creatures, over which they have dominion.
P2. People can learn to do anything.
P3. People can always change when they have to.

P4. People can always improve things; the history of mankind is a history of progress; for every problem there is a solution, and progress need never cease." (pp. 238-239)
-these Age of Exuberance assumptions not only resulted in a widely-accepted paradigm for viewing our place in the world, but impacted social scientific inquiries that neglected biological imperatives:
"SS1. Since humans have a cultural kind of heritage in addition to and distinct from their genetic inheritance, they are quite unlike the earth's other creatures.
SS2. Culture can vary almost infinitely and can change much more readily than biological traits.
SS3. Thus, since many human characteristics are sicily induced rather than inborn, they can be socially altered, and inconvenient differences can be eliminated.
SS4. Thus, also, cultural accumulation means that technological and social progress can continue without limit, making all social problems ultimately soluble." (p. 239)
-while some truths exist in these assumptions, they can lead to misguided exaggerations
-while we are different from other species, we are not completely different and our cultural inheritance does not exempt us from ecological principles
-while we are capable of learning, we sometimes learn maladaptive things especially for future conditions and our habits/inertia can be difficult to overcome
-while expectations/behaviours/etc. can change, sometimes this is only due to extreme pressure or not at all (and institutional change is even more difficult)
-we need to recognise not all changes are improvements and even good change can carry unwanted side effects (sometimes outweighing 'improvements')
-in a post-exuberant world we need to be very wary of the pre-ecological, Age of Exuberance mindset (and its social science counterpart) and increasingly view the world through an ecological lens so as to better understand our predicament
-interpreting the world this way should not be seen as opening the door to 'solutions' for that is Cargoist thinking

Chapter 15: Facing the Future Wisely
Perilously Persistent Cargoism
-the continued misperception of our predicament increases our peril
-a paradigm shift is required to perceive things differently
-our misperception is causing us to pursue 'solutions' that are making our situation worse
-one issue to be addressed is mistaking Cargoist expectations for Realism
-the difference between Cargoism and Realism gets obscured due to Cargoist expectations of tech fixes and experiences that have shown most problems vanish with time
-while technology pervades Cargoist thinking, it more significantly holds a general belief that we can always expand our carrying capacity via technology
-while this holds some truth to date, such linear projection of the past is dangerous
-the Age of Exuberance has nurtured a view that exponential growth is entirely possible as carrying capacity is unlimited (see Figure 1, A)
-having almost bumped up against limits and then having them raised before significant consequences arose, Cargoists view the future as more akin to this past pattern (see Figure 1, B)
-a post-exuberant world, however, sees carrying capacity diminishing over time as humanresource needs expand and technology serves to reduce capacity further (see Figure 1, C)
-we continue to be Cargoist in our thinking, depending on new technologies to accelerate our drawdown
-technological breakthroughs yet to come were extolled
-new extraction techniques were explored and expanded (of course, the endgame of this expedited drawdown was ignored)
-excuses arose everywhere reigniting neo-exuberant views
-shortages did eventually pass from memory for most



-unnoticed, however, was a decline in the ratio of proven reserves to consumption allowing the view of limitlessness to once again arise

Opportunity Becomes Necessity

-we had room to grow when technological progress stayed ahead of population growth and our resource appetites

-this supported the myth of limitlessness

-with such progress being surpassed by population and resource use, demand for technicians to meet the growth imperative surged

-the circumstances around the Irish Potato Famine are an instructive example

-there were about 2 million people in Ireland a century after the potato was introduced (1700)

-after oat crops failed (1727), potatoes were the primary food for most with many consuming these earlier than usual and succumbing to starvation before winter's end

-then in 1739, an early deep freeze destroyed not only potatoes still in the field but most in storage, resulting in about 300,000 deaths

-reliance on them for dietary needs actually increased and helped to lead to a huge population increase (about 8 million, 1841)

-fossil acreage has similarly supported a tremendous human population explosion

-it has become an indispensable resource for humans

-while the fungus led to an epic crash in Ireland, it is likely the population was well over the natural carrying capacity and with soil degradation a consequence of intensive agriculture it is highly probable that a crash would have occurred eventually even without a virus

-population biologists have witnessed such population crashes among a number of species who rely on rather specific resources or succumb to population density processes (e.g., lynx and snowshoe hares)

-"For any species--human, feline, or whatever--excessive dependence upon a non-constant resource base makes life precarious." (p. 250)

-migration, however, is much more difficult on a planet experiencing overshoot everywhere

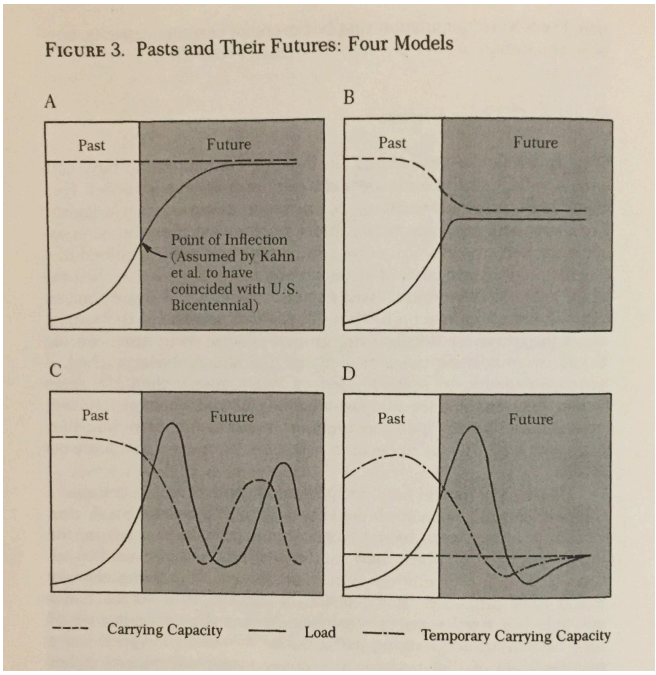
Pasts and Their Futures

-many disregard examples and the prospect of modern society crashing, assuming instead a logistic curve with plenty of growth still to come but ust more slowly (see Figure 3, A)

-technology has allowed us to consume non-renewable finite resources more quickly per capita, resulting in a reduction of carrying capacity by turning potential renewable resource land into ecologically-unproductive use

-some hold if we stop our accelerating growth soon enough and become a steady-state society we can prevent overshooting carrying capacity (see Figure 3, B)

-demographic and technological momentum, however, may have already made this possibility impossible , to say little about resistance to such change



-momentum is more likely to result in panel C with overshoot resulting in a crash (the larger the overshoot, the greater the crash)
-a species reliant on renewable resources could see an eventual increase in population after resources had time to recover to see carrying capacity improve again (see Figure 3, C)
-humans relying upon exploitation of finite and temporary, non-renewable resources to enhance/supplement the natural carrying capacity; have witnessed growth well beyond a level sustainable by renewable resources
-our carrying capacity will actually fall below our natural one due to undermining of renewable resources by such significant overshoot and probably preclude a future cycle of regrowth (see Figure 3, D)
-for Catton, conditions most accurately reflect Figure 3, D

Light from Alaska

-it's often not obvious that our woes result from an increased reliance on vulnerable or finite (thus, temporary) resources
-without an ecological paradigm we can't see resource depletion as a cause but only economics or politics
-with the discovery of oil in Alaska, insurance against a hard crash for the US seemed implausible
-but it may be the research on lemmings coming from Alaska that may be more important than its oil
-the cyclical bloom and crash of lemming populations follow Figure 3, C
-they seem to almost completely disappear every 3-4 years after a huge explosion in numbers
-when abundant in numbers, little vegetation is left uneaten leaving little for subsequent generations and leading to a die-off that allows the vegetation to eventually recover and support a later expansion in population

"We rush toward a destiny we have not paused to discern because, under the influence of the cornucopian paradigm, we readily mistake accelerated drawdown (which shortens our future) for a solution to our predicament." (p. 257)

Back to the Takeover Method

-if we were to abandon our drawdown tendencies and move back to the previously employed takeover method, disaster would still loom given our numbers and consumption
-given the amount of unexploited regions remaining, some argue any restrictions on growth are unnecessary: our technology would allow us more efficient use of ye-to-be-exploited areas of the planet
-jungles and deserts can be converted to farmland and 'lost' solar energy can be converted to electricity

-however, “The more of the earth’s resources we take over for human use (even the renewable ones), the more nearly we reduce the global ecosystem to one that approximates the simplistic polarity of the one in which the lemmings live--and in which they crash.” (pp. 258-259)
-farms are contrived ecosystems that simplify relationship and invites a lemming-like bloom and crash
-the more the takeover method succeeds, the more likely we are to overuse our renewable resources

A Third Way: Modesty

-whether we choose accelerated drawdown or our more traditional takeover method, either “leads to an inhuman future--not toward the lasting solution of temporarily vexing problems, as Cargoists suppose. For any lasting solution, we must abandon both of these ultimately disastrous methods. Drawdown bails us out of present difficulties by shortening our future. Takeover was of lasting value earlier in human history, but that time is past. We must learn to live within carrying capacity without trying to enlarge it. We must rely on renewable resources consumed no faster than at sustained yield rates. The last best hope for mankind is ecological modesty.” (p. 260)

Red Herring or Rubicon?

-nations will be tempted by a return to the takeover method
-only an ecological perspective might discern the ultimate implications
-unfortunately, economies and human ‘needs’ tend to take priority

Our Best Bet: Expect the Worst

-the future is uncertain
-we act in ways we hope will minimise our future hardships but we shouldn’t assume all problems are soluble
-perhaps we need to ask “What must we avoid doing to keep from making a bad situation unnecessarily worse?” (p. 262)
-business as usual may be one of the worst things for us to do (especially assuming we can slow our growth and level off before broaching our carrying capacity--Figure 3, A)
-a swift levelling off of our growth before we go beyond our declining carrying capacity may reduce the negative consequences of overshoot but this assumes we can transition back to the takeover methods; given our numbers and needs, we are just as likely to end up in overshoot (Figure 3, B)
-continuing as normal while carrying capacity is declining due to our exploitation of non-renewable and renewable resources puts us more quickly into overshoot (Figure 3, C)
-without protecting our renewable resources our temporary carrying capacity falls below more permanent carrying capacity with a more precipitous collapse (Figure 3, D); this being our worst-case scenario
-if we assume the worst-case scenario from the outset and plan adaptive strategies based on it we would: protect our renewable carrying capacity from instability by reducing our takeover and drawdown (e.g., ecosystem preservation; stretch out our remaining fossil resources instead of speeding up their exhaustion) by encouraging non-consumptive behaviour and recognising environmental assets
-“Human self-restraint, practiced both individually and especially collectively, is our indispensable hope.” (p. 263)
-we need to protect our habitats from ourselves and we “may be best served by an environment we try to avoid changing. Human self-restraint may serve human purposes better than human dominance of the biosphere can. Mankind derives benefits from ecosystems not dominated by man, benefits that may be unavailable from ecosystems man does dominate.” (p. 264)
-legislative attempts to halt human-caused succession has failed repeatedly
-increasing population numbers, expanding urbanisation, and greater industrial exploitation have all combined to create a perfect storm
-we need to change direction and seek symbiosis with our competitor species
-“Our best bet is to act as if we believe we have already overshot, and do our best to ensure that the inevitable crash consists as little as possible of outright die-off of Homo sapiens. Instead, it should consist as far as possible of the chosen abandonment of those seductive values characteristic of Homo colossus. Indeed, renunciation of such vlaues may be the main alternative to renewed indulgence in cruel genocide. If

crash should prove to be avoidable after all, a global strategy of trying to moderate expected crash is the strategy most likely to avert it.

History will record the period of global dominance by Homo colossus as a brief interlude. Our most urgent task is to develop policies designed not to prolong that dominance, but to ensure that the successor to Homo colossus will be, after all, Homo sapiens. Developing such policies must be so enormously difficult that it is not easy even to accept the urgency of the task. But the longer we delay beginning, the more numerous and colossal we become--thereby trapping ourselves all the more irredeemably in the fatal practice of stealing from the future." (p. 266)