Wild EARTH

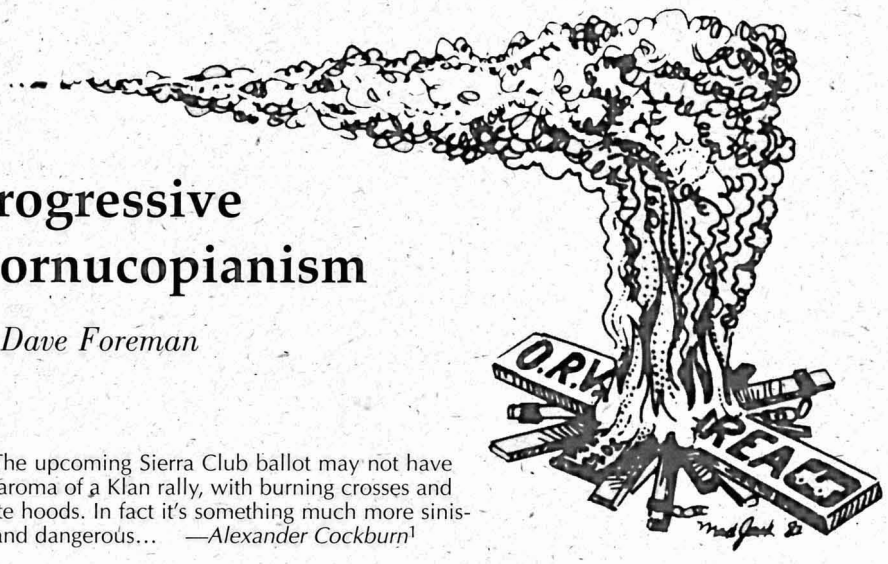
$4.95 US

Winter
1997/98

environmental impact = population + affluence + technology

I=PAT

Around The Campfire



Progressive Cornucopianism

by Dave Foreman

The upcoming Sierra Club ballot may not have the aroma of a Klan rally, with burning crosses and white hoods. In fact it's something much more sinister and dangerous... —*Alexander Cockburn*[1]

...the Sierra Club had taken over the country and had decreed that henceforth only its native-born members would be allowed to remain....

When one man, chased across Toulumne Meadows, cried that he was more important than a snail darter, the two Sierra Club Envirocops who arrested him only smiled at the poor man's delusion and threw him into a truck with the others.... —*Al Martinez* [2]

Lordgawda'mighty. What's going on in the Sierra Club? Has David Duke been elected its new president? Has the Sierra Club outings program launched Palmer-style raids to round up anyone without Daughters-of-the-American-Revolution credentials and deport 'em?

Well, not quite.

This winter Sierra Club members will be asked to vote on a measure that reads:

Shall the Sierra Club reverse its decision adopted 2/24/96 to "take no position on immigration levels or on policies governing immigration into the United States"; *and adopt a comprehensive population policy for the United States that continues to advocate an end to US population growth at the earliest possible time through reduction in natural increase (births minus deaths), but now also through reduction in net immigration (immigration minus emigration)?*"

This milquetoast little resolution is what leaves Mr. Cockburn bug-eyed and rolling on the floor, and what causes Mr. Martinez to awaken with the cold sweats.[3] Goodness. How, I wonder, might they froth were they to read the population policy of The Wilderness Society? It closes with:

One-half to two-thirds of US population growth results from domestic births and longer life spans. One-third to one-half is due to immigration. To bring population levels to ecologically sustainable levels, both birth rates and immigration rates need to be reduced.

Better get back on your medicine, boys.

continued on p. 2

1 "Column Left" *Los Angeles Times* 10/2/97
2 "Listen to the Wind..." *Los Angeles Times* 10/7/97
3 What makes these breathless *LA Times* columnists so laughable is that the majority of the Sierra Club establishment—the executive staff, the Board of Directors, the Council of Club Leaders—strongly opposes the immigration ballot question.

About Wild Earth and The Wildlands Project

Wild Earth *(POB 455, Richmond, VT 05477; 802-434-4077) is a quarterly journal melding conservation biology and wildlands activism. Our efforts to strengthen the conservation movement involve the following:*

- We serve as the publishing wing of The Wildlands Project.
- We provide a forum for the many effective but little-known regional wilderness groups and coalitions in North America, and serve as a networking tool for wilderness activists.
- We make the teachings of conservation biology accessible to non-scientists, that activists may employ them in defense of biodiversity.
- We expose threats to habitat and wildlife.
- We facilitate discussion on ways to end and reverse the human population explosion.
- We defend wilderness both as concept and as place.

Wild Earth ***and The Wildlands Project*** *are closely allied but independent non-profit organizations dedicated to the restoration and protection of wilderness and biodiversity. We share a vision of an ecologically healthy North America—with adequate habitat for all native species, containing vibrant human and natural communities.*

The Wildlands Project *(1955 W. Grant Rd., Suite 148A, Tucson, AZ 85745; 520-884-0875) is the organization guiding the design of a continental wilderness recovery strategy. Through advocacy, education, scientific consultation, and cooperation with many regional groups, The Wildlands Project is drafting a blueprint for an interconnected, continental-scale system of protected wildlands linked by habitat corridors.*

WILD EARTH

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cover art: California artist Sarah Lauterbach produced this striking image on scratchboard to win *Wild Earth*'s first cover art contest.

continued from inside front cover

Now, my purpose here is not to argue in favor of a YES vote on the Sierra Club ballot question, though I am honored to appear as a sponsor of it in the distinguished company of David Brower, Paul Ehrlich, Anne Ehrlich, and former United States Senator and father of Earth Day, Gaylord Nelson. I want to use this polarized issue, instead, to show the threat of a fervid cornucopianism from leftists and liberals that is ultimately more dangerous to efforts to stabilize population than is the cornucopianism of right-to-lifers and no-limits economists on the right. Let me first point out that while there are race-baiting extremists like Cockburn and Martinez (and worse) among the Progressive Cornucopians, there are also nice people. Mistaken, yes, but some of them are friends of mine.

Before we begin, let's define some terms. When it comes to describing political categories, the most simplistic and inaccurate model is the most common one—the single political spectrum from left to right. Political scientist Theodore Lowi offers a more sophisticated and far more accurate dresser of sock drawers by arguing that there are three independent political spectrums in American politics:

1) Left (Marxist) from Old Left to New Left.
2) Liberalism (non-socialist) from Old Liberalism (Libertarianism) to New Liberalism (New Deal-type Regulatory State).
3) Conservatism (Transcendent Order) from Patrician (secular) to Populist (religious).[4]

What I am concerned with here is a cornucopianism combining both the Left and New Liberalism. I'm going to call it Progressive Cornucopianism, though I'd prefer to call it Politically-correct Cornucopianism. The latter term is a little snotty, so, in the interest of being a kinder and gentler Dave Foreman, I'll use the former. Progressive Cornucopianism is based on political correctness, nonetheless, which I define by the following traits:

1) Multiculturalism—persons are not defined as individuals, but by their group identity; all cultures, except for those based on Western Civilization, are equally valid and good.
2) Victimization—the world is divided into an oppressor class (white, heterosexual males and corporate executives) and the oppressed class (everyone else).
3) Progressive Humanism—people (as a mass and as individuals) are good and ultimately perfectible (if individuals do bad things, it's because they've been oppressed at some point); institutions and corporations are bad.
4) Guilt—upper-middle-class, educated whites should feel guilty for their privileged status and for the injustices done to the oppressed classes over the last 500 or so years.
5) Social Justice—at its extreme, resources should be equitably redistributed (from each according to his means, to each according to his needs).

4 See Theodore Lowi's *The End of the Republican Era* for a thoughtful discussion of political categories.

Libertarian Cornucopianism argues that resources are infinite and that everyone would have plenty if only government would quit stifling entrepreneurial creativity. Progressive Cornucopianism argues that there is plenty for everyone if only resources were fairly distributed and the privileged class would reduce consumption.[5]

Conservationists have worried about overpopulation for decades. With David Brower's sponsorship, Paul Ehrlich brought these concerns to a mass audience in the late 1960s. Even then, the Left, in the person of the "Pollution Man," Barry Commoner, argued that unfair distribution of resources was the problem, not population. (Commoner also chided defenders of wilderness and wildlife, arguing that pollution cleanup and human health were more important.) Despite Commoner's influence and despite the New Left origins of many Earth Day environmentalists, traditional conservation groups and the newer environmental groups made overpopulation a major issue. Today, over a quarter of a century later and with more than two billion additional humans on the planet, conservation and environmental groups alike shy away from speaking out on overpopulation and especially quail from discussing immigration's role in making the United States the fastest growing of any modern, industrialized nation.

This chilling effect has come from browbeating by Progressive Cornucopians. It hamstrings the efforts of conservation/environmental groups to forthrightly address carrying capacity issues.

Many urban environmentalists are more concerned with pollution, social justice, and corporate accountability than they are with wilderness and Endangered species. They are *environmentalists* and not *conservationists*.[6] They are people-oriented and believe that social justice and human rights are fundamental to the mission of the Sierra Club and other conservation/environmental groups. Other social justice activists have joined the Sierra Club because the Club is an effective political force and they want the Club to work on their issues. For example, in the 1996 election the California Sierra Club formally supported an initiative to raise the minimum wage and opposed the initiative to end affirmative action. Now the relative merits of these issues are irrelevant. The question for conservationists is—should the Sierra Club and other conservation groups be taking positions on these and other issues that are peripheral to protecting Nature?

Instead of trying to do something about overpopulation, Progressive Cornucopians argue instead that overconsumption is the problem and we should practice "voluntary simplicity." Some Sierrans are even pushing a ballot initiative to make support for a vegetarian diet official Club policy. (By the way, the extremist animal rights group, People for the Ethical Treatment of Animals (PETA), has essentially taken over the New York City group of the Sierra Club and heavily influences some California chapters. They are raising Cain about the Sierra Club's outreach to hunting and fishing groups.)

Some Sierra Club members see conservation/environmental groups as part of some sort of "progressive coalition." They fear that if the Club supports limiting immigration, Democratic members of Congress from Los Angeles will no longer support the Sierra Club on pollution control, wilderness, and Endangered species issues. Indeed, a high official in the Club told me that some of these politicians had pretty much threatened the Club about this. Should a conservation group ever tolerate such linkage demands from a politician? Well, I may be old-fashioned, but my answer is No—Hell No. By the way, this identification with liberal Democratic Party politicians and with "progressivism" is one of the reasons conservation and environmental groups find it so hard to find supporters in the Republican Party.

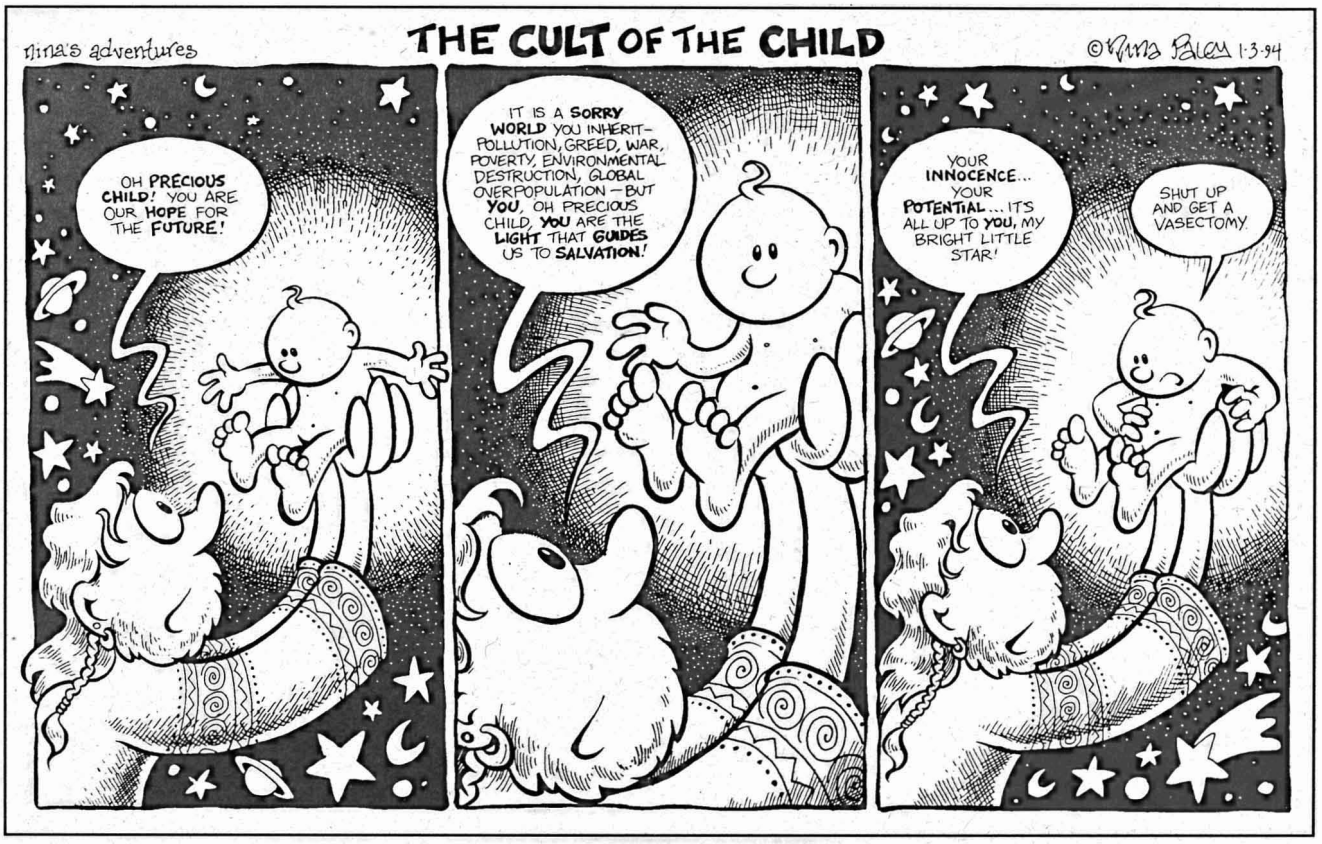
We're told that if the Sierra Club takes a position in favor of reducing immigration, we will alienate urban ethnic groups who are "the Sierra Club's best source for coalition building and future members."[7] Never mind that public opinion polls show strong support among Blacks and Hispanics for limiting immigration. For example, a recent poll in Texas shows "some 59% of Hispanic-Americans supported curbs on immigration." Even in the politically-correct bastion of California, "47% favored, while 39% opposed, immigration cutbacks." And—look here, "lower-income Hispanics have the greatest anti-immigrant sentiment...."[8] Yes, Virginia, there is a political difference between real people and their ambitious self-appointed leaders. And, yes,

5 Please note that I am not describing all liberals or progressives here. I am describing political correctness. And, of course, I understand that resources are not fairly distributed and that many people need to reduce consumption. Nonetheless, it is the sheer mass of humans that are wasting the natural world. Even without the tony lifestyles of Americans, Europeans, and Japanese, six billion and more humans will squeeze the wildness and integrity out of Nature, and will cause the eventual extinction of large mammals and many other species.

6 I apologize for generalizing. It is the only way to write without larding each sentence with a flock of qualifiers. There are many people who consider themselves liberals or who live in urban areas or who are concerned about human rights and social justice who do not run away from the hard issues of overpopulation and who are not trapped in political correctness. My fellow signers of the immigration ballot question—the Ehrlichs, Brower, and Nelson—are good examples. Alan Kuper, the sparkplug behind the Sierra Club ballot issue, is another fine example. There are also dedicated conservationists who disagree with me on this issue.

7 I'm taking these quotes from an August 26, 1996, document put out by Sierrans opposed to the immigration ballot question.

8 *Investor's Business Daily*, September 9, 1997.



Democrat politicians can be irresponsible demagogues as much as can Republicans.

Trying to turn the debate about limiting immigration into a question of immigrant bashing and racism is irresponsible, but effective. One group, the Urban Habitat Campaign, which unfortunately seems to be linked to Earth Island Institute, ran a hate-laced, distorted ad in the Sierra Club's San Francisco newsletter, the Yodeler, accusing Population-Environment Balance of using "apocalyptic 'facts' about global population growth which aim to fuel white fears of a brown planet." Maria Sepulveda, executive director of Population-Environment Balance, calmly responded that, given she was the daughter of Chilean immigrants, this was not their concern.

For the past year, I've used "Around the Campfire" to look at the psychology behind the human War on Nature. Abiologism (disbelief that biology applies to humans), Immaturity (irresponsibility and a rejection of limits), and Fear of Nature (running the gamut from not caring about other species to loathing of the wild) are behind the historic looting of the American wilderness and behind the anti-conservation movement today. But, frankly, abiologism, immaturity, and fear of the wild are also characteristics of Progressive Cornucopianism.[9] Fear and loathing of the wild? Take a gander at Martinez's crack about snail darters. It's worthy of Helen Chenowith. (Martinez is a Sierra Club member, by the way.) As an example of how Progressive Cornucopians are driven by abiologism and immaturity, the Sierra Club immigration ballot opponents argue that "overconsumption and unsustainable business practices, not population numbers," caused the extinction of the Passenger Pigeon. Actually, historians have shown that rapidly growing urban centers fueled the pigeon slaughter (some wholesalers in New York City were marketing 15,000 pigeons a day by the 1850s—this was cheap food for the urban working class). Overpopulation is not merely living cheek by jowl; it is when a population of any species exceeds the carrying capacity of its habitat. (Yes, we are animals and, yes, we have habitats and, yes, we are subject to carrying capacity.) Left, right, liberal, libertarian cornucopians all discard the notion of carrying capacity for humans. Humans are special, they all agree.

I hope this brief and incomplete discussion of the Sierra Club ballot issue helps to illustrate the danger of Progressive Cornucopianism. We, who recognize that human population growth is the greatest threat to the ecological health and integrity of Earth—and therefore to social justice and human rights as well, need to turn more and more of our energy to confronting head-on these Progressive Cornucopians.[10] It is unpleasant to do

9 See David Ehrenfeld's masterwork, *The Arrogance of Humanism*, to understand how secular progressives stand above Nature.

cartoon by Nina Paley

so, since there are substantive issues of social justice, human rights, and racism that need attention.

In closing, let me acknowledge that there are plenty of racists howling about immigration, and that I regret that many non-racist advocates of limiting immigration have based their campaigns on social and economic arguments, instead of on ecological carrying-capacity arguments. There is nothing anti-immigrant inherent in the Sierra Club's ballot proposition. Rather, it is based on the simple recognition that:

- burgeoning numbers of people are degrading the natural world;
- Americans as individuals and collectively may have the greatest impact on Nature of any people;
- immigration is the major source of population growth in the United States;
- the world cannot afford more Americans.

I am sad that the race-baiting hooligans of the Left (many of whom are opportunists trying to build a political base by peddling fear of racist oppression among immigrant communities) make it nearly impossible to have an intelligent discussion about immigration or overpopulation. We need a discussion that is not racist or immigrant-bashing or emotional, but one that is honorable, decent, and fair—one that is based on science and the profound negative effects of a growing human population on our life-support system and on the wild things and wild places that make up our only home.

—Dave Foreman
Boulder Mountain, Utah

Note: I'll be looking more closely at Progressive Cornucopianism in my forthcoming book, The War on Nature.

10 Many fine people in the Sierra Club oppose taking a stand on immigration because it is such a divisive issue for the Club. I fully respect their position and do not mean to imply any criticism of them. These people include several dear friends and otherwise allies of mine. Some of the people who believe immigration and even overpopulation are not a problem are decent, sincere individuals—I am criticizing their views and not them as persons. There are also racist demagogues, whining bleeding-hearts, and people who hate the natural world in the pro-immigration movement. If I've offended them, well, shucks...

Wild Earth Update

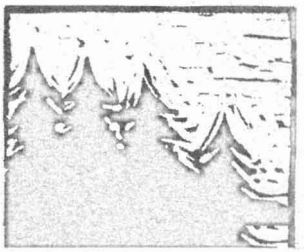
"Change is good," former co-worker Erin O'Donnell-Gilbert would reassure us as the time of her departure became imminent. Her attitude may be a healthy one to adopt whenever confronted with inevitable loss. But some changes that are perceived by the many as inevitable need to be tenaciously fought by the few, as is the case with human-caused habitat loss.

The reasons why our plant and animal compatriots face a decreased land base each year are many and varied, but human population growth is certainly one of them. Five hundred species are already known to be extinct in the US, with at least 9,000 others at risk of vanishing. Extinction may be forever, but habitat loss need not be. It remains possible that land-use management decisions could change over time to consider the needs of species beyond the one that now dominates the landscape, and that the human population could stop growing (or even decline) if more of us chose to work actively toward solutions to the problem of human population growth.

Founders Dave Foreman and John Davis recognized from its inception that *Wild Earth* could contribute to this end. "Population Problems" was thus established as a regular department with the journal's first issue in 1991; since then, *Wild Earth* has published over 30 articles that specifically address overpopulation [see *WE* Population Problems Index, p. 104]. This long-standing commitment to population coverage continues in this special theme issue, funded in part by the Weeden Foundation and dedicated readers Fred Stanback and Richard Grossman; with it, we seek to reinvigorate and broaden the population debate in hopes that the human footprint across the continent might decrease to the point where North America's native flora and fauna once again flourish.

—Monique Miller

A Wilderness View

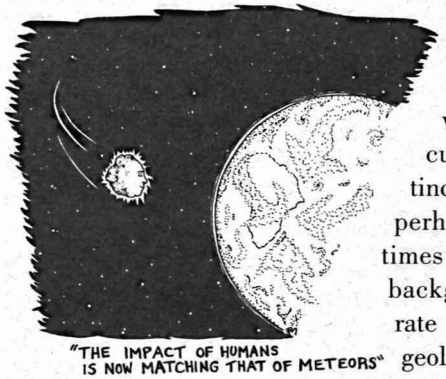


Scaling Back the Human Enterprise

Wild Earth is notable and unusual for its ongoing coverage of the problems associated with human overpopulation. Outside the few periodicals specifically devoted to the topic, there has in recent years been virtual silence on population issues in the broader conservation/environmental press. Why is this? Is it not obvious that most of the challenges we face—loss of wild places, extinction, urban sprawl, poverty, economic globalization, ethnic tensions, war, hunger—are caused or exacerbated by a bloated humanity?

Of course, there are reasons for this timidity among environmentalists, some of which Dave Foreman explores in Around the Campfire. Indeed, there is probably no other contemporary issue that arouses such passionate and vitriolic rhetoric, and, as Bill McKibben notes [Maybe a Conversation] where one entering the conversation (read: squabble) is "as likely to be attacked from the left as from the right." So why should WE shake this hornet's nest?

Because, as lovers of wilderness and wildlife, we are PRO-LIFE—and from the genetic to the landscape level of organization, life on Earth is imperiled. The activities, both mundane and frivolous, of six billion humans have borne an ecological holocaust, the sixth great contraction of biological diversity in Earth history and the first caused by one species out of balance. Stuart Pimm [*WE* Interview] tells us that current rates of extinction are hundreds, perhaps thousands of times higher than the background extinction rate as recorded in the geological record.



In this issue of *Wild Earth*, we'll explore population-driven threats to wildlife in both marine [Salmon Were Not Meant to Be Farmed; The Least Navigable Craft] and terrestrial ecosystems [Tabby Go Home; Trouble and Opportunity in Paradise] as we seek to flesh out Paul Ehrlich and John Holdren's famous I=PAT formula, where I (environmental impact) is the sum of P (population, or numbers of people) x A (affluence, or consumption) x T (technology, or energy expended in producing each unit of consumption). Gretchen Daily and Paul Ehrlich remind us herein that conservationists accustomed to focusing attention on endangered *species* need to worry also about *populations* [Population Extinction and the Biodiversity Crisis]. Stephanie Kaza and Kirkpatrick Sale address the consumption and technological amplifiers, respectively, in the I=PAT equation, and other cogent thinkers [Sandy Irvine, Stephanie Mills, Virginia Abernethy, Kelpie Wilson, Eleanor Berger, Roy Beck] explore various aspects of the cultural and ecological crises that human overpopulation represents.

Too often discussion of population problems devolves into a recitation of statistics: 5.8 billion humans, 1.2 billion Chinese, 270 million Americans consuming 40 times as many resources per capita as the Bangladeshis.... Such numbers are abstractions—incomprehensible, at least to me. What is tangible is increased traffic, a new housing subdivision down the road, the logging trucks rolling past our house. Talk of population growth, fertility rates, and immigration levels means nothing to the bears and fishers living in the surrounding forests. But human numbers and actions threaten their continued existence, and make the recovery of wolves and catamounts in these mountains either possible or unattainable—for them, scaling back the human enterprise is literally a matter of life and death.

○

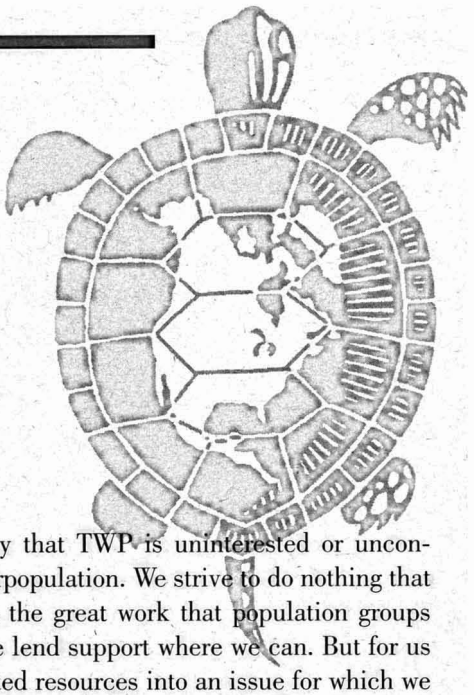
With this issue we bid farewell to longtime Wild Earthling Erin O'Donnell-Gilbert. To Erin, whose contributions to *WE* are inestimable, and to her husband Tom Gilbert, a leader in the Vermont conservation community, we extend our thanks and best wishes as they return to their home state. Vermont's loss is Pennsylvania's gain, and we expect that regional conservation efforts there will benefit from the arrival of these two exemplary activists.

New assistant editor Jennifer Esser, who comes to *WE* after internships at Redwood National Park and South Africa's Kirstenbosch National Botanic Gardens, was recently teaching at the University of Michigan's Natural History Writer's Project when board member Stephanie Mills introduced her to *WE*. Through a fortuitous chain of events, Jennifer landed in Vermont, at Erin's desk. Welcome Jennifer! —*Tom Butler*

cartoon by Rob Messick

The Wildlands Project Update

by Steve Gatewood



At The Wildlands Project clearinghouse office in Tucson, we receive many and diverse inquiries from people from all walks of life. Some questions are easy to answer; some difficult. When posed with questions of conservation science such as "What are the habitat requirements of wolverines?" or "How does forest fragmentation correlate with declines in mid-size forest carnivores?" we are likely to be able to provide guidance and direction for further research in the scientific literature.

But some questions—especially in philosophical or strategic matters—don't have a *right* answer, or may be unanswerable. These are often the kind of questions that, no matter what we say, we are unable to satisfy the individual posing the question.

The intractable and thorny question of human population growth poses such a dilemma. We are occasionally asked "What are you doing about the population issue?" and "Won't an increasing human population completely overwhelm any wildlands reserve network?"

Although our sister organization *Wild Earth* has worked consistently over the years to address human overpopulation, The Wildlands Project does not work directly on population issues because we have our hands full in the reserve design and rewilding arena—the thrust of our mission. As essentially the only group designing an interconnected system of conservation reserves on a continental scale (although many organizations and individuals do the actual work on specific building blocks of the system), TWP is filling a narrow but important niche. We recognize that within the broad spectrum of conservation and social change movements, there must be a division of labor where each organization focuses its efforts on the specific area for which it was designed and created, and where it can have the most effect.

This is not to say that TWP is uninterested or unconcerned about overpopulation. We strive to do nothing that might undermine the great work that population groups are doing, and we lend support where we can. But for us to divert our limited resources into an issue for which we have no training or expertise would be a disservice to our cooperators working on ecosystem conservation and to the very species and landscapes we seek to protect.

And that brings me to the second question. Yes, if the juggernaut of human population growth is not brought under control and even reversed, all of our efforts will be in vain. There is no single greater threat to the ecological integrity of Nature than the relentless pursuit of resources to sustain and raise the standard of living of the roughly 250,000 new humans added to the planet each day. Without population stabilization, the conservation reserve system we design today will become the extractive reserve system of tomorrow. The sad truth of the matter is that in a world racked by famine, disease, fear, and competition for resources, protecting Nature will play second fiddle to providing food, water, and shelter for humans.

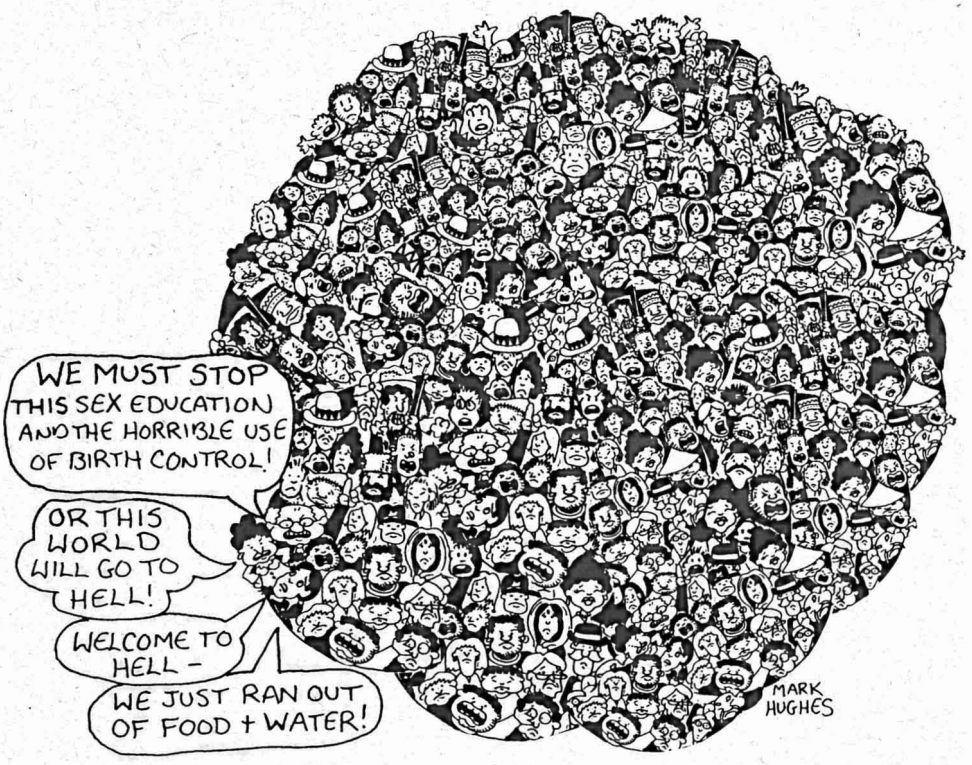
Does that mean we throw up our hands in despair? No. Like organizations confronting overpopulation, we face tremendous challenges ahead, but as wilderness and wildlife advocates working with The Wildlands Project, we must increase our resolve to complete the reserve design process—and then to begin to implement an ecological reserve network—as soon as possible. For if we don't do this part of biodiversity protection, who will? ▮

Steve Gatewood is executive director of The Wildlands Project. For more information contact TWP at 1955 West Grant Rd., Suite 148A, Tucson, AZ 85745; 520-884-0875; wildland@waonline.com; http://www.wildlands.org.

The Great Denial

Puncturing Pro-natalist Myths

by Sandy Irvine



A remarkable feature of human population growth is the abundance of people who deny that human numbers count. Across the spectrum of public opinion, there is near unanimity that the notion of overpopulation is either a silly fantasy dreamed up by a few ecofreaks or a temporary phenomenon, affecting only a few places in the Third World, and one that will dissipate of its own accord. In the latter case, recantation of the phrase "demographic transition" is usually thought sufficient to dispel the specter.

Examples abound of the mental and moral affliction that might best be christened the Overpopulation Denial Syndrome (ODS). At the time of the first Earth Day in 1970, for example, there was considerable concern about population increase, partly due to the writings of ecologist Paul Ehrlich. Since then, the global population has shot up by 1.6 billion people (a 43% increase) yet during the 1990 Earth Day week there was virtual silence on the subject.

The 1992 Earth Summit largely ignored population problems. Friends of the Earth, Greenpeace, and most mainstream environmental organizations hardly address the issue. The political parties, "green" ones included, are silent. None of the green lifestyle guides mention overpopulation, even though the parenting of children is the most significant environmental choice any couple makes.

Beyond silence or ambivalence lie the anti-abortion groups, pro-growth economists, right-wing "libertarians" and the like, who militantly deny the problem. Julian Simon, with his view that humans are the ultimate resource, argues that in the longer run, "additional people lead to less pollution." And there are religious baby boomers. The opposition of the Catholic Church (or, rather, powerful groupings within it) to "artificial" birth control is well known but other religions share its commitment to procreation, including the Mormons, Orthodox Zionists, Rastafarians, and Muslims.

Unfortunately, these folk are not alone in their delusions. The scientist and former US presidential candidate Barry Commoner argues that "it is a totally spurious idea to claim that rising population anywhere in the world is responsible for the deteriorating environment" (*Utne Reader*, January 1988). Many social ecologists, ecofeminists, and liberation ecologists now focus on "reproductive rights," arguing that a woman should have complete freedom to choose

illustration by Mark Hughes

how many children she has (rather than concentrating upon, say, the provision of free contraception and sex education). The left-wing world development magazine *New Internationalist* even argues that "with population due to stabilize at *merely* twice the current numbers, there would appear to be little cause for concern" (October 1987, emphasis added). Third World charities like Oxfam vociferously denounce those who dare to suggest that population growth might be a factor in the rising level of human misery across Africa, Asia, and Latin America.

Many ecofeminists share the same stance. The Women's Environment Network in the UK circulated a pamphlet that discusses the "myth of overpopulation." Some go further. Farida Akher's *Depopulating Bangladesh* even suggests that there is a sinister plot by family planners to depopulate the country. Ynestra King similarly claims that "overpopulation is a hoax by wealthy, privileged white males" (*Utne Reader*, January 1988). *Whose Common Future*, a special issue of the leading green journal *The Ecologist*, implied that overpopulation was a myth promulgated by technocrats (needless to say, white and male ones).

Add to the ranks of the pro-natalists the many governments around the world who actively promote population growth. In 1988, for example, the Quebec government offered a $500 premium for the first child, $1000 for the second, and $4500 thereafter; there was a 6% increase in the number of babies born in 1989. In Zimbabwe, which experienced one of the highest population growth rates in the world after independence, the government's Health Minister attacked family planning as a "white colonialist plot" to limit black power.

Sometimes population growth takes the form of a demographic race, as in the case of Israel trying to squeeze in as many Jews as possible in order to keep pace with the rapidly growing population of Arabs within and around its borders. At other times, stabilized or even falling birth rates are perceived as a sign of national weakness, a fear that often takes the form of warnings about an aging population. Occasionally individuals or groups take up the campaign. In the Czech Republic, for example, there is an anonymously financed billboard campaign urging Czechs to produce more children. It depicts, erroneously, the composer Bach with 20 male children.

ODS sufferers cross the political spectrum: Marxists, social democrats, conservatives, liberals, etc. share the same basic faith in industrial growth. They may quarrel bitterly about the best means—collective planning versus private enterprise, for example—but at their core lies the same vision of techno-industrial progress—and the same hostility to the thesis of overpopulation.

In the next six seconds,
there will be an extra 24 people.
In the next 48 hours,
the net increase in human numbers
will be enough to fill a city
the size of San Francisco.
Each year there's another Mexico
of mouths to feed
and in nine years' time
another India.
Yet few people see that the
gestation of the macrocosm—
overpopulation—takes place
in the microcosm
of individual procreation.

MISCONCEPTIONS

The delusions of ODS sufferers are sustained by a rich diversity of false assumptions and non sequiturs. These misconceptions about population problems pop up in everyday conversation, are recycled by commentators and analysts in the mass media, and make regular appearances in learned textbooks. A number of popular fallacies and half-truths underlie the syndrome.

Some are based on bad ecology and a failure to take the mathematics of the situation seriously. Others stem from a focus on only part of the picture, e.g., birth rates but not death rates. Sometimes, a blind optimism leads people to treat decreases in population growth *rates* as if they were actual decreases in population *levels*. The pernicious nature of the following ten myths stems from the fact that they do contain a measure of truth. The pro-natalist lobby, however, uses these snippets of truth to conceal or deny more important truths.

Myth 1:

Affluence is the answer.

The classic myth, argued by social scientists and many others, is that the population problem will solve itself due to economic and social changes collectively known as the "demographic transition." This theory suggests that as people become healthier and wealthier they will parent fewer children. This, it is argued, explains the decrease in family size in Europe over the last two hundred years. Poverty begets large families, they argue. Affluence, it is said, is the best contraceptive.

No matter how popular and pervasive the theory, it is still a simplistic, one-sided view of reality and a bad one on which to build hopes of a demographic "happy ending." The global environment simply could not supply the volume of resources nor assimilate the attendant pollution required to generalize the level of affluence characteristic of materially richer countries. For example, if the world's population rises to 11 billion before stabilizing, as predicted, and if each person were to live like today's North Americans, almost half of our 24 key minerals would be exhausted within 35 years. Environmental degradation and pollution would rise to catastrophic levels.

The same story repeats itself at the level of individual countries. Average annual income in Ethiopia today is $120; at a 3% growth rate, it would take 60 years to raise it to $700 per annum, by which time there wouldn't be a crumb of fertile soil left in the country due to population pressure in the meantime. Contrary to the demographic transition theory, family planning is beginning to succeed in poor countries like Bangladesh, even though there has been no general rise in affluence.

Furthermore, the post-war baby boom took place during an unprecedented increase in per capita consumption, when parents could afford more children. A switch to smaller families took place later—as opportunities for easily accessible education, careers, and wealth decreased. In Britain, a decrease in family size was more pronounced amongst working class rather than more affluent middle class couples in recent decades.

More generally, there are no automatic links. In Sri Lanka, average per capita income is about $400 and average family size is 2.5 children. In Libya, average per capita income is much higher—over $3,000 per annum—yet most women have more than five children. In recent decades, France has gone from non-growing to a growing demographic situation. In Sweden, too, there are signs of a return to larger families.

Contrary to the demographic transition theory, extremely affluent individuals often parent more children than those lower on the economic ladder. Britain's Queen Elizabeth is apparently the richest woman in the world but she and Prince Philip ignored the demographic theory and conceived four children. The late corporate raider Sir James Goldsmith was one of the world's richest men...and father of eight children.

Finally, in the short period of two generations improved health and income in countries such as India and Turkey has led to faster population growth. It may level off, but in the meantime, it will have quadrupled the size of these countries' populations, and therefore quadrupled every problem they face. As Garrett Hardin and other scientists have shown, increased supply of resources tends to be converted into a larger population. In the 1950s, for example, land redistribution in Turkey (in itself a good thing) encouraged formerly landless peasants to increase significantly the size of their families. Among African Sahel pastoralists, deep-water wells drilled by donor countries in the 1950s and 1960s prompted larger herds of cattle and goats, earlier marriage (because bride-prices were paid in animals and the required number became easier to accumulate), and, thereby, higher fertility. But disaster soon followed because the basic ecological constraints of the region had not changed.

Myth 2:

Affluence is the problem.

A popular way of evading or denying the population problem is to blame the world's woes on overconsumption by the richer sections of global society. It is certainly true that the small segment of the world's population in the overdeveloped industrial states consumes a grossly large slice of the world's resources, and therefore has a disproportionate impact on the global environment and economy. However, this simply demonstrates that such countries are overpopulated and, using the metaphor of cancer, even more cancerous than less profligate nations. This reality does not alter another fact, namely, that most other people aspire to the level of affluence of that minority.

Furthermore, the not-so-affluent already are creating unsustainable impacts that most figures underestimate because official statistics like the GNP record quantifiable data, especially monetary transactions. The not-so-affluent often function on the edges of, or outside the formal economy; their activities go under-recorded. The biggest cause of deforestation, for example, is the cumulative impact of small-scale nibbling at forests by settlers and peasant farmers. Most data, however, report the impacts of the timber trade, dam construction, cattle ranching projects and other aspects of the formal economy. Often myths surround these issues, especially the exaggerated "hamburger" connection to deforestation (an observation not intended to let the burger barons off the hook).

Myth 3:

Country X has a high population density but it isn't starving.

Pro-natalists often point to densely populated but nonetheless affluent countries like the Netherlands or Britain, and sometimes newly rich localities such as Singapore, arguing that population density does not produce ruin. Yet the populations of such places can only survive by exploiting the resources of other lands, both as "wells" of raw materials and "sinks" to dispose of its wastes and excess peoples. If not for the new worlds of the Americas and Australia, the population of the UK would have reached 70 million by 1900.

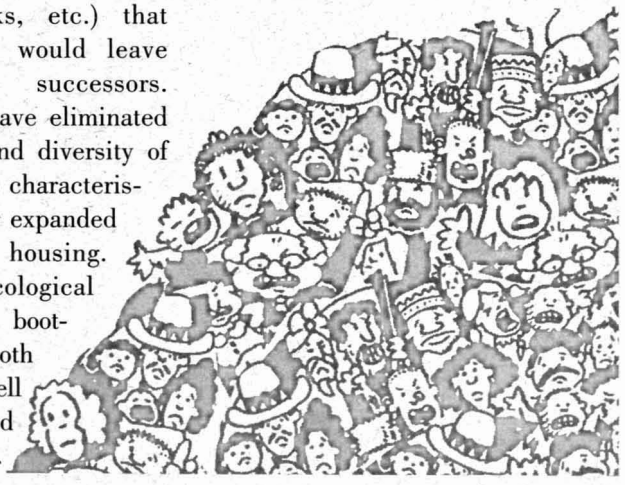
The density argument is in fact rather dense, overlooking the fact that the resource base drawn upon often does not coincide with the political boundaries of a given population. The British, Dutch and other such peoples escape poverty and starvation largely because they use "ghost" acres and fisheries beyond their borders as well as draw down the natural capital (soil fertility, naturally regenerating forests, healthy fish stocks, etc.) that responsible people would leave intact for their successors. Furthermore, they have eliminated both the richness and diversity of flora and fauna once characteristic of their lands for expanded agriculture and housing. These societies' ecological footprints, or rather boot-prints, are huge, both geographically as well as temporally, and hugely unsustainable.

Myth 4:

Malthus got it wrong so Neo-Malthusians are wrong.

The Reverend Thomas Malthus was the father of modern fears about population growth exceeding resource supply. Of course, the population-induced starvation he predicted did not happen. In particular, he did not foresee refrigeration and other technological developments that make possible long-distance food shipments from colonized lands.

Malthus did, however, get a number of things right. From his analysis of population and food resources, for example, he predicted that over the next 200 years human numbers would not grow to more than seven and a half times that of his own time, the 1800s. The actual increase was some 5.5 times the population of 1800, a remarkably accurate prediction for someone widely reviled for getting his sums wrong. His real triumph, however, was to recognize that our species is just as dependent upon the Earth's biogeophysical systems as any other species, an insight many people still fail to heed.



Myth 5:

There are more than enough resources to go 'round.

Amongst "progressive" folk, including major pressure groups and charities, it is an article of faith that the real problem is *misallocation* of resources. The world obviously is a very unfair place, with the comparative few hogging most of the world's resources. To an extent, the proposed solution—redistribution of land, food, and other resources—can buy vital breathing space.

Yet an equitable distribution of available resources does not make the population problem disappear. Ongoing expansion, be it in human numbers or per capita consumption, must eat up the benefits from any sharing of wealth. Studies in Guatemala, for example, show that the benefits of land redistribution would disappear within a generation simply because of population growth and increased demand for land. Even in the frequently praised Indian state of Kerala, where there has been genuine social progress and the growth rate of the state's population has been cut to 1.7%, the population will still double on that basis in just 47 years. In other words, the population-resource crunch would reappear within half a century.

Part of this myth is the notion that since resource prices haven't risen as rapidly as predicted (and even have fallen in some cases), there is no need to worry about resource availability in the future. However, the environmental crisis is not simply a shortage in the near future of specific resources, though already there are growing conflicts over water rights and certain minerals in some regions. In the short term, greater efficiency and the substitution of more abundant resources for scarcer ones will likely keep factories running.

Prices only reflect the interaction of buyers and sellers in a given market. Timber may sell for a pittance, but its low price doesn't mean that forests are abundant and healthy. Our economic system ignores the preferences of those without spending power, those yet to be born, and those physically unable to join the bidding (spotted owls are not known for their intervention in the timber market). This system also discounts many intangibles, things on which no price can be put: a stable climate, an intact ozone layer, water retention on forested slopes, the existence of species that cannot be eaten or otherwise directly used, human health, etc. Economists may try to put "shadow" prices on such priceless assets but normally the exercise is an absurdity. In short, trends in energy, food, and mineral prices are no sure guide to future prospects. Basic geology and ecology give better guidance. Furthermore, one day geologically finite and non-renewable resources must run out or become too expensive to tap; we are now "mining" supplies of freshwater, fish, fertile soil, and forests to such an extent that we will likely exhaust them long before we run short of coal.

A more formidable resource barrier is the depletion that would result from attempts to spread across all countries the lifestyles prevalent in regions like western Europe. If the rest of Asia, for example, were to achieve the same ratio of cars to people as Japan (which is not high compared to America), the number of cars in the world would double. Yet the Earth is already choking on present traffic levels. To give China the same number of computers per head as in the US in 1993 would require some 315 million more machines. Yet even now, computerization is causing many serious ecological problems, such as water pollution around circuit board plants.

The fundamental ecological problem is not short-term scarcity, but the degradation resulting from resource extraction, processing, manufacture, consumption, and disposal of goods and services. Our concern about coal, for example, should not be the size of untapped deposits but the consequences of continuing to burn them on anything like the current scale.

The Earth's crust may contain large quantities of useful minerals. The crunch would come from attempting to tap them. Mineral processing usually consumes vast amounts of energy and water whilst producing equally enormous amounts of pollution. The extraction and processing of currently worked deposits is already causing great damage to soil, water, wildlife, and human health around the world, and such damage will only worsen as miners attempt to exploit less accessible and poorer grade sources. The production of one ton of copper from an open pit site, not a deep mine, creates over 500 tons of waste. Annual world production of gold and silver produces some 900 million tons of rock waste. The annual fueling of a typical nuclear reactor with uranium requires 100,000 tons of rock to be brought to the surface, most of which is dumped as waste tailings, where 90% of the original radioactivity in the rock remains. In the main, the horrific damage to Nature is not the product of mismanagement but the inevitable entropic by-product of energy and material throughput in the human economy.

Myth 6:

If waste were eliminated, there would be adequate resources for everyone's needs.

This is an extension of myth #5. People rightly point to the colossal waste of resources on war and preparation for war, amongst many other follies. If the energy and raw materials squandered on such destructive activities were diverted to socially useful things such as food production and health care, the argument goes, there would be enough for everyone's needs.

Again, there is much truth in this argument yet it contains a deadly fallacy. It thoroughly muddles the ecological and thermodynamic accounts. For example, though health spending is doubtless more beneficial to the human good than arms expenditure, building ambulances clocks up the same debts in Nature's accounts as building tanks. Similarly, ecological processes do not distinguish between fertilizer spread on golf courses and that used on farmland.

It might be added that the term "needs" often goes undefined. One person's luxury is another's necessity. Different people have their eyes on that same military budget as the means to resolve the health care crisis, to fund more education, boost the arts, abolish homelessness, eradicate poverty and so on.

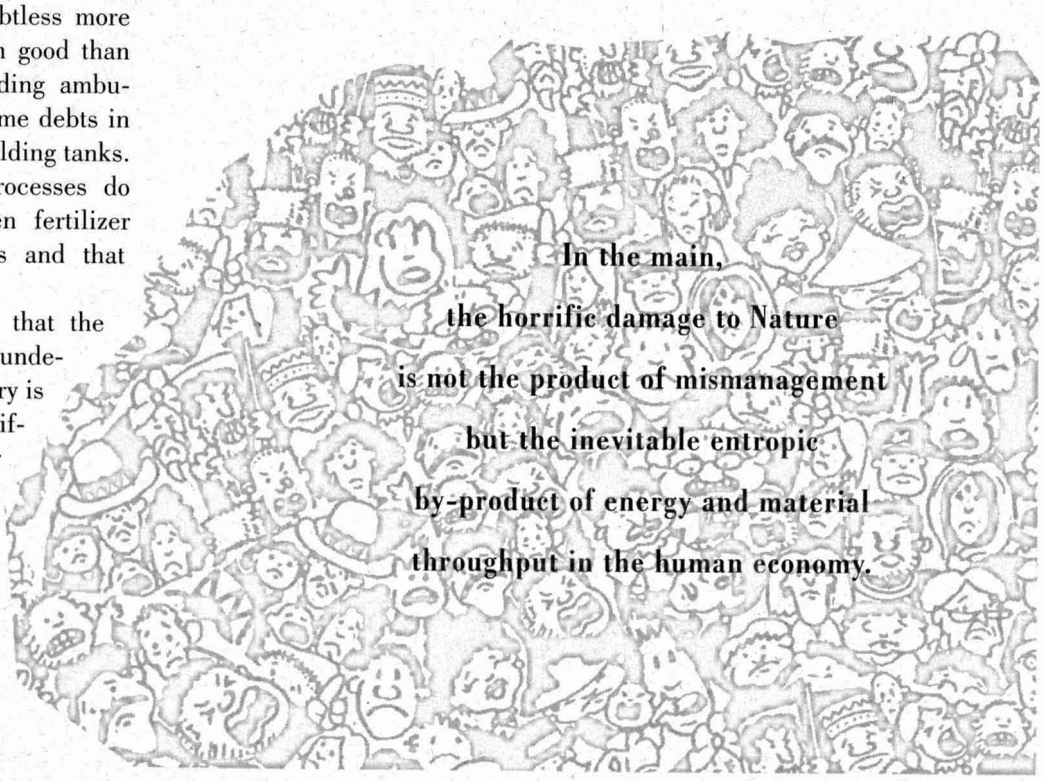
Myth 7:

Putting food production first can cure hunger.

A close cousin of the Redistribution Fallacy is the belief that there is more than enough food to feed everyone if only the cake were cut evenly. This argument is powerful and pervasive, with high profile advocates such as Francis Moore Lappe. They argue that hunger could be eradicated and any danger from overpopulation dispelled if land were devoted, first and foremost, to food cultivation. Some go further and argue that much more food would be available if meat consumption were to be reduced. They correctly note that the more conversions a foodstuff undergoes (e.g., grains fed to cows), the more energy is lost, en route, to the dinner table.

Again, this argument touches a responsive chord. Its influence is aided by the sight of food surpluses being burned and otherwise dumped simply to maintain market prices. Many people rightly find it obscene that people starve while, nearby, good farmland is being used to satisfy the indulgences of the rich. Countries such as Britain and the US, it is claimed, have neither need nor right to use "ghost acres" in the poorer countries to supply themselves with exotic fruits and vegetables, cut flowers, or downright dangerous substances like tobacco and opium.

The Food First argument is persuasive but erroneous. It wrongly takes for granted current levels of food production. High output agriculture is fast undermining its very foundations via soil impoverishment and erosion, aquifer deple-



tion, dependence on chemical inputs, and other unsustainable impacts with which it is inescapably linked. The needed adoption of organic and other less destructive farming methods will initially reduce yields since fewer inputs (e.g., synthetic fertilizers) must mean lower output, at least until soil fertility can be restored.

The Food First argument also ignores the likely diminishment of future food supplies due to increased pollution and UV radiation, and climatic disruptions associated with global warming including a rise in sea levels that may engulf some of the world's most productive cropland.

Current, let alone projected, increases in population make even a basic diet for everyone a difficult target. The official goal of the Chinese government is to raise annual egg consumption per person from 100 to 200. Soon there will be 1.3 billion Chinese. Assuming that a hen can lay 200 eggs a year, that goal would require 1.3 billion additional birds. Feeding them would require more than the total grain output of Australia.

Moreover, land devoted to cultivation of any crop (staple or luxury) produced conventionally or organically means fewer natural forests, wetlands, and other wildlife habitats. China's Hunan Forestry Research Institute estimates, for example, that the country's annual growth rate of 28 million additional people leads to the destruction of 1-1.4 million hectare of forest annually. Such habitat conversion is disastrous for biodiversity, of course, but in the long run, it is also bad news for people since wild or comparatively unmodified ecosystems are vital to a healthy Earth, the prerequisite of all human activity—agriculture included.

Myth 8:

More people means more workers and more production.

This myth has taken many forms. One manifestation was Marx's Labor Theory of value. More recently, the right-wing economist Julian Simon has revived it as the theory of People as The Ultimate Resource. The underlying fallacy remains the same, however. The simple fact of life on Earth is that humans do not create wealth. They transform what is made available by the Earth's biogeochemical systems and by external solar energy. Humankind depends on green plants for the process of photosynthesis. The wastes inevitably created by human activities are not eliminated by people but are reabsorbed by those same ecological systems. There are geological, thermodynamic, and ecological limits to all stages of what we arrogantly call wealth creation and those limits are now being transgressed. More people only increases those transgressions.

This "extra hands" myth also confuses what might be true at an individual or household level, especially in the short term, with overall gains and losses, especially in the long term. A family of farmers might gain from an extra worker in the fields. However, this additional pair of hands might lead to increased forest clearance, the grazing of more cattle and goats, or intensified tillage which, on balance, will lead to greater soil erosion as well as fewer resources for non-human species.

Myth 9:

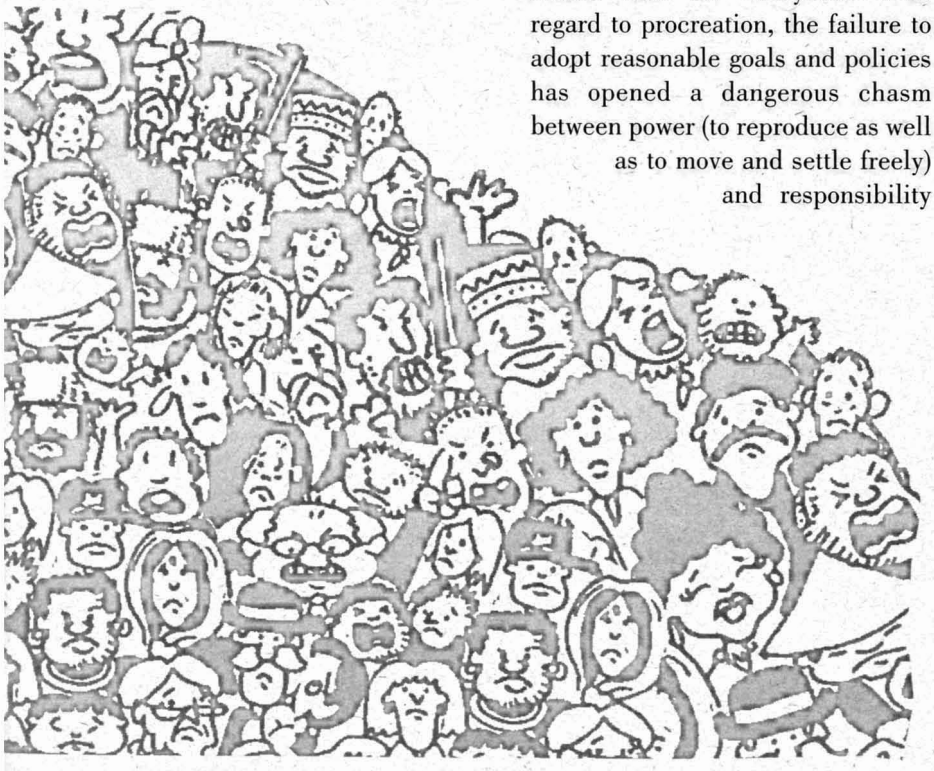
Technological innovation makes population growth irrelevant.

A pervasive fallacy is the assumption that science and technology have exempted humans from the influences and constraints to which other species are subject. Virtually all problems are soluble, it says, mostly by technological innovation. The 19th century radical writer Friedrich Engels, for instance, did not hesitate to claim the progress of science "is just as limitless and at least as rapid as that of population...We are forever secure from the fear of overpopulation." This myth was more recently popularized by the American biologist and socialist Barry Commoner in his book *The Closing Circle*.

While some people see technology as salvation, others perceive it—or the forms it has taken—to be a source and amplifier of our ecological problems. Think of technomonsters like nuclear power, ozone-depleting and cancer causing chemicals such as CFCs and PCBs, or mundane technologies like cars and computers and contemplate the vast disruptions to the natural world they have wrought.

Reformers will tout increased efficiency and appropriate technology, but fail to recognize that all technologies have an environmental impact, so a rising population with the same per capita consumption must eventually cancel out the benefits of more resource-efficient and less polluting technologies.

The potential for technological reform is usually grossly exaggerated. Many studies of life-cycle, cradle-to-grave impacts of different goods—virgin/recycled, "natural"/synthetic, non-renewable/renewable—have shown that the differences are not as great as commonly supposed. Pollution control does not make pollution go away: it just changes pollutants from one form, place, or time to another, perhaps making them safer but often at the expense of increased energy consumption. Pollution is simply the by-product of energy and material conversions and processing, so ultimately it too is related to population levels. Moreover, the impacts of a growing humanity are not limited to the depletion of finite resources or the generation of pollutants. Also important is general environmental degradation (soil erosion, deforestation, wetland drainage, hydrological disruption, introduction of exotic species, etc.) for which pollution filters and the like provide no cure.



Myth 10:

Reproductive rights are the most basic of freedoms.

The very mention of population policy spotlights one last myth employed by pro-natalists—namely, that freedom to reproduce is the most fundamental of rights. The United Nations Universal Declaration of Human Rights treated the individual as having an unqualified right to parent as many offspring as desired. In many countries, this has been socially underwritten, with welfare benefits not limited to, say, the first two children.

Yet rights are not abstractions, divorced from contexts and consequences. *Rights only have real meaning if the conditions in which they are exercised can be sustained.* Otherwise, they are just license to create ruin for everyone. With regard to procreation, the failure to adopt reasonable goals and policies has opened a dangerous chasm between power (to reproduce as well as to move and settle freely) and responsibility (to control family size and to avoid overcrowded areas).

The pretense to a right to reproduce without limits is an arrogant presumption. In effect, it makes unlimited claims on this and future generations of people, on other species, and on Earth's natural habitats and processes without their consent. Furthermore, an open-ended right to reproduce in a finite, interconnected world can only mean the reduction of other rights. Freedom in a finite world is not indivisible. In other words, there are many other liberties, most of which decrease as human numbers increase.

For instance, the democratic "weight" of each voter goes down as the number of voters in an electorate goes up. Or, to take a more fanciful example, if everyone in the UK exercised their "right" to go to the coast on the same hot summer day, they would enjoy 10 cm of seaside. (Of course, they would not get there because of the traffic gridlock their numbers would cause.) The population-liberty trade-off can be seen most clearly in cities where all kinds of planning controls and other restrictions are necessary simply because so many people are packed together.

In the case of extreme examples of population limitation measures such as China's one-child policy, it should be remembered that however distasteful they might be, and no matter how odious possible side-effects (e.g., female infanticide), the alternative—mass starvation and social breakdown—would be far worse. It should be noted as well that if China had encouraged family planning much earlier (instead of denouncing it as an imperialist trick as happened under Mao), there would have been no need for such drastic steps.

PRO-GROWTH PREJUDICE

Though it is possible to refute with reason every delusion experienced by ODS sufferers, unfortunately we are arguing with deeply held beliefs, not evidence. Assertions that the Earth's life-support systems cannot sustain current (let alone projected) human population levels run counter to the core, often unspoken, articles of faith of modern society. Ours is a civilization addicted to the notion that unlimited growth is both possible and desirable. As American biologist Garrett Hardin puts it, "growth, change, development, spending, [and] rapid turnover [are] viewed as goods without limits." Such ideas have been all-pervading in modern times. The futurist Herman Kahn, co-author of the study *The Next Two Hundred Years* (1976) had no doubts that this was possible and that, in 2176, people would be "numerous, rich and in control of the forces of nature."

Such notions of progress and human potential have at their heart a virulent individualism. Egotistical gratification is central in contemporary culture. Symptomatic is the rhetoric about personal choice that is invoked by all kinds of individuals and groups from the gun lobby to those supermarkets who defend their sale of "environmentally friendly" goods next to decidedly ungreen products on the grounds that it is a matter of consumer choice. Correspondingly, there is a pathological hostility to anything that threatens the right to do one's own thing. No threat cuts to the quick more than the idea that individuals are subject to ecological constraints since it affects every space of our being and none more so than reproductive preferences. The right to parent without limit—aided by technology if so desired—is deemed to be an inalienable personal right which, it is widely believed, only ecofascists could question.

A CULTURE OF DENIAL

There are other reasons why so many people refuse to countenance the ecological case, including the decay in general awareness and understanding. But perhaps the most significant reason for human blinkeredness was originally christened by Garrett Hardin as The Tragedy of the Commons (though perhaps a better name might be the Tragedy of Commonplace Decisions. People generally discount their own individual choices and actions as affecting the common welfare. "I'm just one person. What difference does my car, computer, child, etc. make?") Most people do not actively seek to create a world overflowing with humankind. Nor is there some sinister organization, a global Pro-People Hive, brainwashing and otherwise manipulating people into producing more offspring. Population growth is the product of a myriad of single, everyday actions, whose result is childbirth, planned or otherwise.

Whatever the motivation, whatever the circumstances, the result is the same: More people. In the next six seconds, there will be an extra 24 people. In the next 48 hours, the net increase in human numbers will be enough to fill a city the size of San Francisco. Each year there's another Mexico of mouths to feed and in nine years' time another India. Yet few people see that the gestation of the macrocosm—overpopulation—takes place in the microcosm of individual procreation.

There are roughly 5.9 billion people in the world today. Some 7-8% of all humans ever born are alive today. More humans have been added to the total world population in the past 40 years than in the previous 3 million years. In the year 2000, there will be over one and a half billion women of child-bearing age, the highest in all history. And it is probable that such figures are an underestimate.

It is no wonder that we are called the human race. There is overwhelming evidence that we must reverse these trends if the Earth is to retain its capacity to sustain both our lives and those

of the scores of other species now threatened with extinction. Population limitation policies will benefit women whose health is threatened, opportunities restricted, and rights violated by all the economic, social, and cultural pressures to produce more offspring. Similarly, unemployment, homelessness, traffic congestion, demands on education and welfare services, ethnic rivalries, urban sprawl, rural land use conflicts, resource depletion, pollution, wildlife destruction...all these problems and more would be less severe and more solvable if human numbers were not so great. To paraphrase Paul and Anne Ehrlich, whatever your cause, it will be a lost cause without, first, the stabilization and then reduction of human numbers. ▌

References

Briggs, V. 1992. Despair Behind the Riots: The Impediment of Mass Immigration to Los Angeles Blacks, Carrying Capacity Network Bulletin, 10: 3-4.

Catton, W. 1980. Overshoot: The Ecological Basis of Revolutionary Change (Univ. of Illinois Pr.).

Catton, W.R. 1993. Can Irrupting Man Remain Human?, Focus, 3 (2): 19-25.

Crosby, A. 1986. Ecological Imperialism: The Biological Expansion of Europe, 900-1900 (CUP).

Ehrlich, P. & A. 1990. The Population Explosion (Hutchinson).

Estrada, R. 1993. The Impact of Immigration on Hispanic-Americans, Focus, 3 (2): 26-30.

Galle, O.R. et al. 1972. Population Density and Pathology; What are the Relations for Man?, Science 176: 23-30.

Grant, L. ed. 1992. Elephants in the Volkswagen (Freeman).

Kyllonen, R.L 1967. Crime Rates versus Population Density in United States Cities: A Model, General Systems, 12: 137-145.

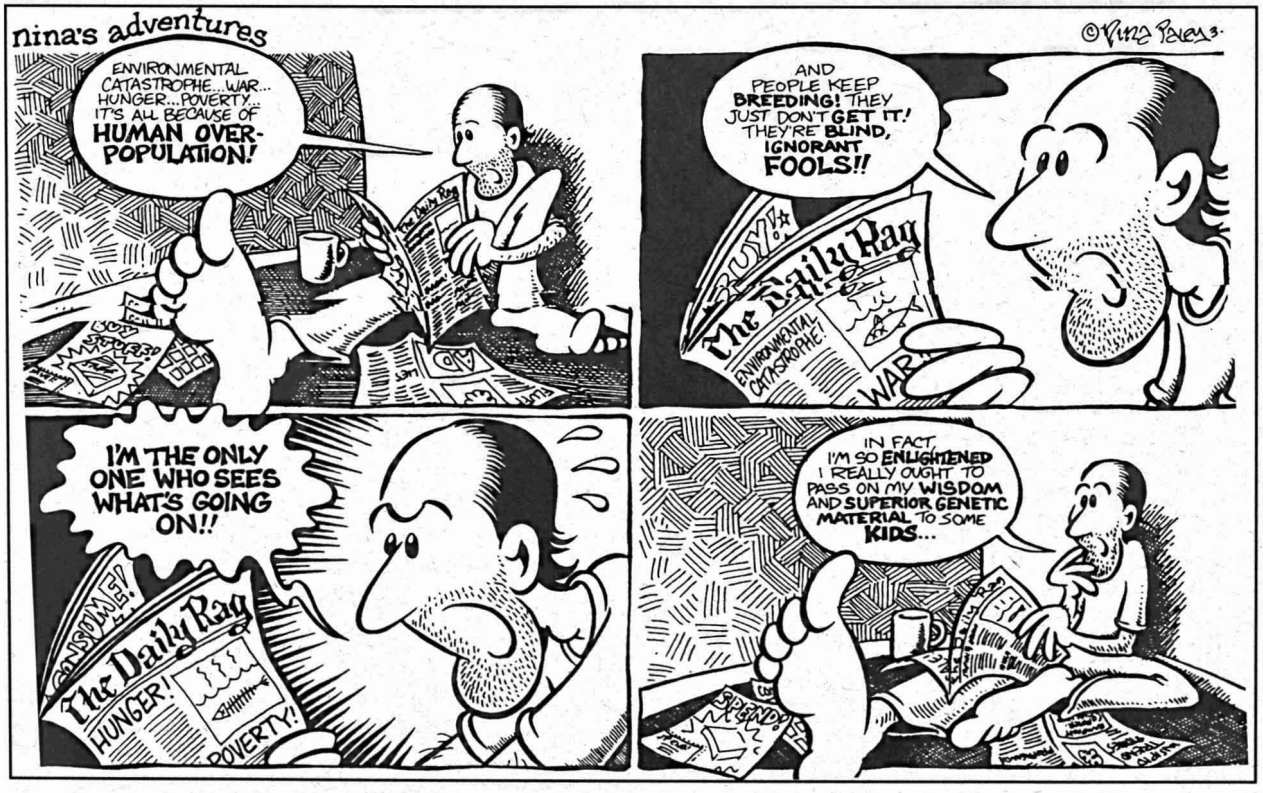
Hardin, Garrett. 1993. Living Within Limits: Ecology, Economics, and Population Taboos (Oxford University Press).

McGraw, E. 1984. Population Misconceptions (Population Concern).

McGraw, E. 1990. Population: The Human Race (Bishopsgate Press).

Wisniewski, R.L. 1980. Carrying Capacity: Understanding Our Biological Limitations, Humboldt Journal Soc. Relations, 7 (2): 55-70.

Sandy Irvine teaches Media Studies at the City of Sunderland College in England. He is co-author of A Green Manifesto *(London: Optima, 1988) and co-edits the quarterly magazine* Real World. *A technophobe, he is reluctantly embarking on the construction of a "deeply ecological" website. Contributions for posting will be gratefully received. He can be contacted at 45 Woodbine Road, Gosforth, Newcastle Upon Tyne, NE3 1DE, England.*



cartoon by Nina Paley

Nulliparity and a Cruel Hoax Revisited

by Stephanie Mills

Awhile back at my regular weekly womens' meeting, I sat among friends. One woman, lacking child care, had brought her new baby daughter. While Mom ventilated the emotional strains she was experiencing as a single parent, baby Felicia captured every heart in the room. Most of the women could barely restrain themselves from snatching her out of the arms of whoever was cuddling her at the moment. It was a sweet, primal disturbance of our adult conversation. Then another woman, a tough-minded news hen and something of a jock, spoke of the pangs she felt putting her youngest child on the school bus for the first time and wept.

Clearly, mother love is a force of nature, easily trumping mere reason. Dave Brower used to say that you couldn't reason prejudice out of a person because it didn't get in that way. Reason is a pip-squeak, the melting tip of the iceberg of mentality. Which kind of makes me wonder why, back in 1969, I was so sure that I could and would get through my natural female life without becoming a mother.

I became a notorious non-mother when I shocked the media and my classmates at our graduation ceremonies with a commencement address titled "The Future is a Cruel Hoax." I declared that given the seriousness of all the eco-catastrophes then gaining momentum, "the most humane thing for me to do would be to have no children at all." An amazing amount of uproar ensued but my gesture manifestly didn't launch a mass anti-mass movement—not if all the baby-having going on around me, or the absence of overpopulation as a subject of concern in the public mind is any indication.

While I consider myself to be a stone feminist, the largest system about which I can care is not womankind or humankind but Earth's evolutionary processes. Because it's axiomatic that wilderness preservation, restoration, and expansion are the minimum conditions necessary for this process to continue, my ultimate loyalty is to the wild.

Ecocentric, biocentric, animist, alone in a world of wounds—strange is the lot of those who chance into the deep-ecological mindset, who believe that "our community" means the ecosystem, watershed, bioregion, biome, continent, planet—all our relations; that every living thing is as important as any person; that they all could get along fine without *Homo sapiens* but not us without them. It's humbling and troubling; makes one feel like a grinch and superfluous all at once.

*Ladies Tresses (*Spiranthes cernua*) by Gary Eldred*

Population is, let's face it, a horrible issue. It's quantitative, parsing the richness and pathos of human life on Earth in incomprehensibly large numbers. It's an observable reality, but because exponential growth is not a sudden event, overpopulation remains somehow below the threshold of being perceived as catastrophic. As Garrett Hardin observed, "Nobody ever dies of overpopulation."

Here in northwest lower Michigan our pretty rural landscape—never mind the howling wilderness—is dying of overpopulation. Perhaps it's progress that nobody around here is in favor of just plain growth any more. They want the sustainable kind. I'm about the only person I ever hear wishing that people would quit having children. And because it really is an offensive thing to say, I do so only rarely.

In my community, baby-having and child-rearing automatically justifies all manner of hyperconsumption, from the use of disposable diapers to acquisition of a family van, to trips to Disney World and a succession of pairs of $100 sneakers. In the utterly atomized nuclear family, "parenting" seems to have become a major job of work, for mothers, mostly, and therefore warrants such indulgence. Whereas among those unselfconscious, backward ecosystem peoples we hear that babies weren't the individual's or couple's property, privilege, or sole responsibility. There were fewer, happier, less fashionable babies (and slicks of baby poop on the cave floor, probably). I have found that not having children is a great time-saver and an easy way to shrink one's ecological footprint. In conjunction with authorhood, a notoriously unremunerative calling, non-motherhood has kept my ecological footprint positively dainty.

I have found that not having children is a great time-saver and an easy way to shrink one's ecological footprint. In conjunction with authorhood, a notoriously unremunerative calling, non-motherhood has kept my ecological footprint positively dainty.

In an interconnected world the decision to bear a child isn't only a personal matter, nor does it pertain only to one's moment. Won't even the wanted, cared-for children feel betrayed to discover (assuming that such thoughts are still thinkable in the future) that previous generations ignored the problem of overpopulation and dodged the difficult choices in favor of a comfortable, conventional existence whose price included migratory songbirds, large mammals, old-growth forests and polar ice shelves?

I bite my tongue a lot. I don't want to risk alienating my friends, or nowadays their daughters, by arguing against their childbearing, except in the obliquest ways. Regardless of which birth it is, first, second, or third, I wind up congratulating new parents, especially mothers, warmly. At that point the horse is out of the barn. New parents have plenty of crap to deal with, even without a population bomber's disapproval, and children need and deserve to feel welcome once they're here.

As I push my grocery cart down supermarket aisles of sugar-frosted fiber puffs, over-lit thoroughfares grid-locked with parents often rudely, and sometimes abusively attempting to appease or curb the advertising-inculcated desires of their TV-transmogrified kids, I find myself wishing that it were somehow possible to get my fellow Americans to be at least as thoughtful and caring about these children they've already had as they are about their cars.

In my youth I came across a womens' magazine interview with illustrious non-mom Katherine Hepburn. In it Hepburn said she didn't think she could be as good as she wanted at being an actress and a mother both, so felt she had to choose between them. Fortunately for film fans, she went with acting. It struck me as eminently reasonable—that one should assess oneself and one's society realistically then make a considered decision as to the likeliest way to spend one's life.

Thus when women of my cohort and younger bewail the difficulty of combining motherhood and a career; or how hopeless it is to get their husbands (if said husbands are still around) to take on some responsibility for doing the wash or schlepping the kids around, I have to bite my tongue prit' near off. I'm sure that parenthood is exhausting. I agree totally that in contemporary circumstances the gender-based divi-

sion of labor is grossly exploitative of women. But I have to wonder whether these women imagined that the revolution would be accomplished before the end of their pregnancy.

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People refuse to believe the rules apply to us, that human beings are subject to biological constraints. The reasons for this exceptionalism are various—theological, ideological, technotopian. Me, I'm a Rules Girl. And minus human exceptionalism things are looking grim.

As the most hard-nosed population biologists have been patiently pointing out all along, if we do not address overpopulation by using birth control, Nature will deal with it by overriding death control. Given global climate change, sprawling megacities, declining nutrition, assaults on our immune systems, drug-resistant pathogens and, with GATT, the prospects of no impediments to the worldwide movement of agricultural commodities and their hitchhiking pests, to say nothing of the possibility of rogue bugs bolting from germ warfare or genetic engineering labs, an awful lot of epidemics may be in store. The current opinion seems to be that death itself should be curable and whenever it befalls, it's a tragedy. When the myth that modern medicine has conquered, or should be able to cure infectious disease is shattered, we will have a lot of philosophical maturing to do.

"Fear of individual death and grief," wrote Gregory Bateson, "propose that it would be 'good' to eliminate epidemic disease and only after 100 years of preventive medicine do we discover that the population is overgrown" ("Time is Out of Joint" in *Mind and Nature: A Necessary Unity*). These days, as forensic anthropology attempts to probe our deep past, some say that the growth of human population has steadily driven the series of technological changes—extinction of Pleistocene megafauna, thus hunting and gathering, then agriculture, and civilization, industrialization and imperialism—now approaching apogee. Thus checking epidemic disease is only the most recent factor in the long, lurching history of our species' expansion. However Bateson's insight that "fear of individual death and grief" are driving forces of our disproportion with the rest of life illuminates the core dilemma of overpopulation. Among individual human beings birth brings joy and death brings sorrow. Forgoing children and suffering natural death will always be very tough to sell, given the abstract, almost absent nature of the rewards for such an ethic.

I've got a friend in her seventies who's dying of cancer. She's been relentlessly introspective, inquisitive and iconoclastic for the decade of our friendship and is facing her demise right in character. When I asked her what is the meaning of life?, her answer, was, more or less: It's no big deal. She intends no argument for living carelessly, but it's an interesting summation of a life of self-examination, spiritual exploration, artistic creativity, philanthropy and humanism. Not nihilism, but liberation into a detached, non-anthropocentric relation to the cosmos. Fine for her, but what about those of us left to mourn her? It's going to take some pretty heavy philosophizing to get the human race to consciously check its will to love and will to live.

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If a lot more women—say 90%—would follow my sterling example of nulliparity it would unravel the biological family, seed-syllable of human culture, and make for a wrenching, possibly disastrous discontinuity for our kind. Yet the need to contain, restrain and minimize our species *vis-a-vis* more-than-human-nature is extreme. Earth's in a highly unnatural state of affairs. Can we be unnatural enough to regain our just proportion to all the rest of life? Which is the greater distortion of human essence—not to reproduce, or to live in a completely anthropogenic environment, every terrain dominated and depleted by the human species?

Deep down inside, population is nothing if not a womens' issue. Personally, I wish that billions of women would just say no to motherhood and set up Amazon republics instead. All men have to do then is take their matters into their own hands. Of course it would be marvelous if ecocentric men would organize "snip-ins"—mass vasectomy festivals. To reinforce and reward this behavior urologists could tattoo a beauty mark on the vasectomee's face above the beard line once he's flunked the sperm test. Kind of an antithesis to the semiotics of the wedding ring.

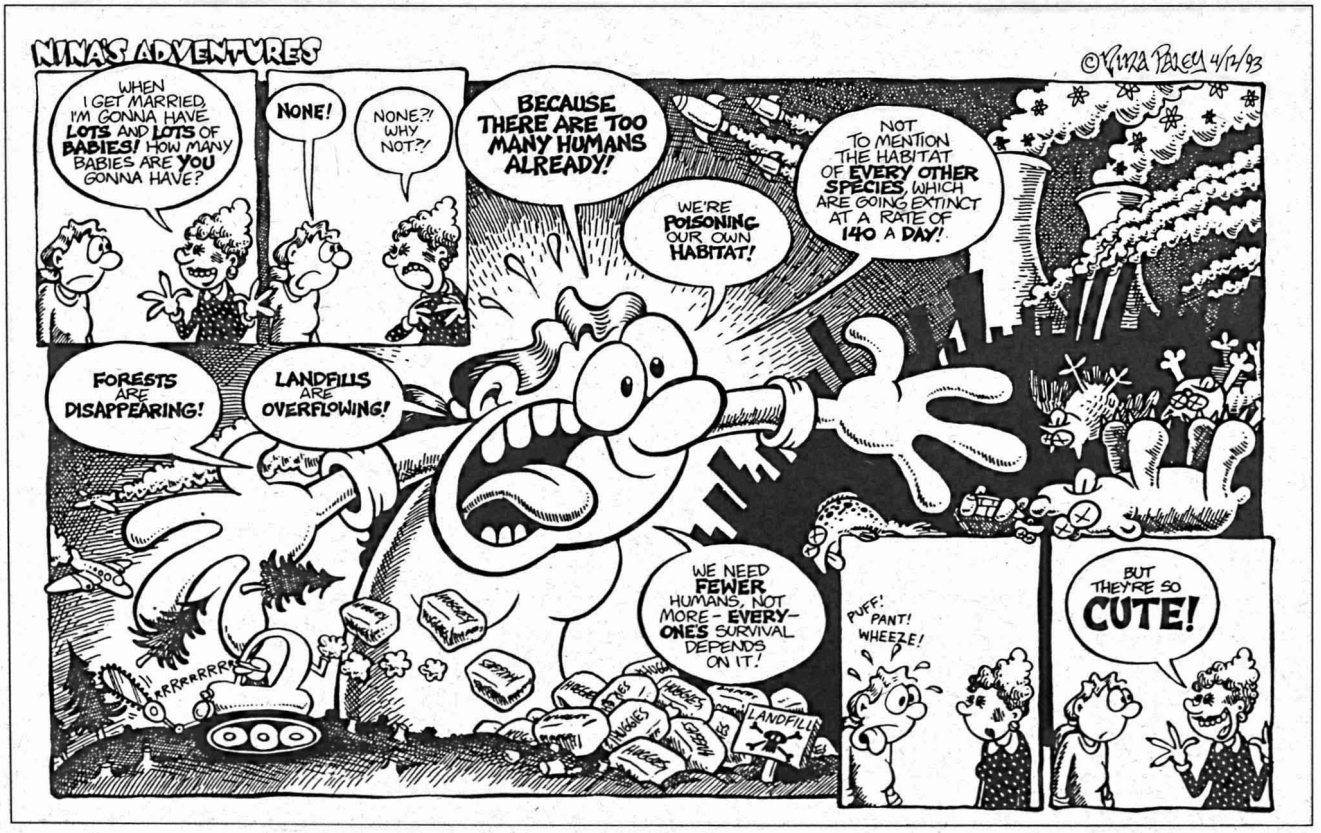
Once birth control and abortion are universally and freely available and the various pronatalist policies tucked away in the tax code have been abolished, but artfully, so that children don't wind up deprived as a result, propaganda might be the one acceptable means of civic action available to deal with overpopulation: an all-out attempt to change public opinion about reproductive behavior. And I'm not talking about a "stop at two" or even "one is plenty" campaign, but "Don't Do It!" There needs to be a steep decline in human numbers. Our last chance for it to be volitional rather than apocalyptic is for the vast majority of people now on earth not to reproduce.

The trouble with propaganda for non-parenthood is that it has tended to be tacky and materialistic, dissing children and gushing about all the fun you can have (read money to spend) if you're not buying magnetic alphabets for your refrigerator door. Economic calculus has yet to vanquish the drive for procreation. For just about everyone but the Amish, children are a major expense, non-contributors to the household economy. Still *Homo economicus* keeps on making babies. I would like to think that this means that our hearts are still flesh, even if everything else about us is bent by economism.

Of course, if the idea of persuading people not to reproduce is too heartless and objectionable, another way to attack the problem would be to promote, even insist on BreathAirianism. BreathAirianism is drawing your sustenance from breath alone. Although to date its most prominent practitioners have been unmasked as fakers, not fakirs, given to gobbling candy bars off-camera, genuine BreathAirianism might be a way to dodge the birth control bullet. OK—no more gloomy talk about overpopulation. Have all the children you want, just nobody eat anything. Or go outside. ❙

Wild Earth *board member Stephanie Mills is a writer and bioregional activist whose books include* In Praise of Nature, Whatever Happened to Ecology?, *and* In Service of the Wild.

Postscript. A note on immigration: Yes, it's a problem, but the nation-state, in the long run, is no friend of anything wild, however necessary and expedient it may seem at the moment to petition its governments and reify its borders. Human carrying capacity is a watershed issue and in the world I'm hoping for, carrying capacity will be understood and observed by the watershed's commonality. Fair trade policies, international minimum wage and labor standards, revoking the charters of corporations and reining in the buccaneers of global finance who demolish ecosystems and human communities would be the top-down policies I'd endorse to deal with immigration—not militarized borders and xenophobic, tight-fisted social agendas. —*SM*

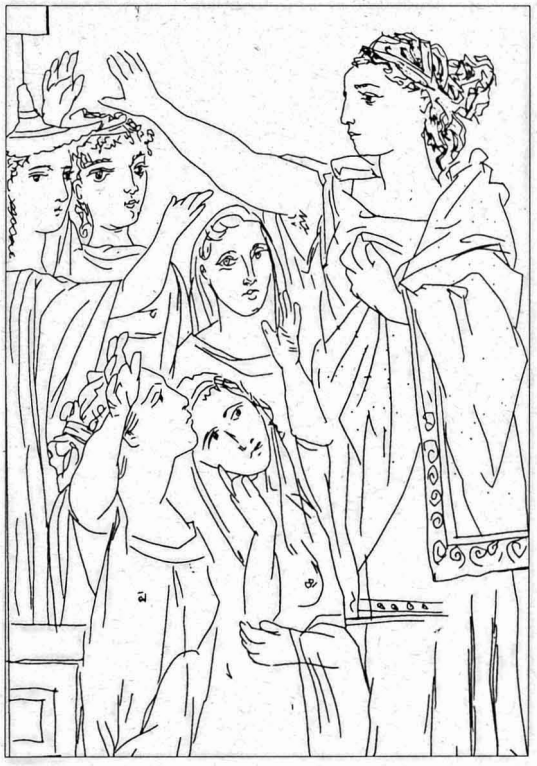


cartoon by Nina Paley

The Lysistrata Strategy in the Postmodern Age

by Kelpie Wilson

illustrations by Pablo Picasso



What is it that makes the overpopulation problem so difficult? The solution is trivial in the mathematical sense: people just need to quit having so many babies. Stopping at one would do the trick, but that can be like trying to eat only one potato chip. It takes willpower. If we had the will, we women could seize control of the situation by simply stopping up our wombs for awhile. With 6 billion and counting, someone's got to take charge. Could women do it? The only precedent I can think of is a literary one: the classical Greek comedy *Lysistrata*, by Aristophanes.

Lysistrata—whose name means "she who disbands armies"—organizes Athenian and Spartan women in a sex strike in order to force their men to abandon war. The women are tired of losing sons and husbands. Lysistrata's bold plan works quickly because the men, befuddled by horniness and tripping over erections, give in and decide they prefer to make love, not war.

Lysistrata may have been based on an actual revolt by Athenian women against the debilitating Peloponnesian wars. In reality, the Lysistratan strategy of withholding sex could have worked to stop the long-term cause of internecine war in Greece, if only the women had held out long enough to cut off the flow of new infants and reduce population pressure on the crowded and ecologically depleted peninsula. Then a new era of plenty might have encouraged Athens and Sparta to live in peace.

But in the play, as soon as the men promise to end hostilities, the women are back in their arms. Aristophanes' women were after immediate gratification—they wanted their sons and lovers back. Their other main gripe about war was that it left so many young women unmarried (and unbred). Lysistrata

We could humanely reach an optimum global population in two generations, because exponential growth works both ways. If every woman on earth had no more than one child, the number of people of reproductive age would halve in one generation.

laments: "A woman has but one summer. She blooms just once. If no one plucks her—then the flower fades. And afterward she lives alone, spending her days with oracles, which never send her a husband." The play ends in a celebration of pan-Hellenism with Athenians and Spartans singing of their common battles against the Persians who are "numberless as the sand on the shores." Even if Athenian women would have identified overpopulation as a cause of war among Greeks, a reduced population would only have made Greece more vulnerable to Persian conquest. To really end war, a Lysistrata would have needed to organize Persian women in a sex strike as well.

Lysistrata's direct action strategy is an interesting approach, but it would need to be taken further to really end war. Human history since the dawn of civilization has been the story of endless expansion and conquest. The only way to stop a runaway dynamo like that is to choke the source of its fuel—excess population. As Aldous Huxley put it: "The stork is the bird of war."

War, whether tribal conflict or the total war of civilization, has more often than not been justified either as a quest for *lebensraum* or as a defense against an overwhelming horde in search of the same. Examining the origins of war in his book *Cannibals and Kings*, anthropologist Marvin Harris disparages the idea that war is caused only by innate human aggression and emphasizes the functional aspects of war as both a response to and a relief from population pressure: "Raids, routs and the destruction of settlements tend to increase the average distance between settlements and thereby lower the overall regional density of population" (Harris 1977).

During the long, 100,000 year era of the hunter-gatherer, before the human diaspora was complete, any group that was being harassed or dominated by another would usually have had the option to move on and find a new territory to occupy. It was the genius of these hunter-gatherers that allowed them to run off and learn to adapt to a new environment rather than stay and fight (and die) for the old territory. And so, slowly but inevitably, humanity expanded to fill every possible habitat on Earth, from the heat of the desert to the ice of the arctic.

Eventually, perhaps by about twelve thousand years ago, every niche was filled and a new human era began, the era of resource intensification, or agriculture. Andrew Bard Schmookler, in his book, *The Parable of the Tribes*, notes that: "Primitives all over the world, it has been found, have possessed the understanding necessary for domestication without choosing to implement it." The implication is that agriculture was adopted not as a better way of subsistence, but because population pressure had reduced the availability of new hunting grounds. Sedentary agriculture was a way of life so radically different from what had gone before, that it changed everything, including human strategies of reproduction.

In ecology, there are two main strategies for reproductive success. Humans and other primates are the ultimate k-strategists, where "k" stands for parental care for the young. This strategy usually depends on maternal care and investment in the rearing process of a small number of progeny. In contrast, rate, or r-strategists broadcast as many progeny as possible into the environment, hoping that an increased rate of reproduction will guarantee success. Rabbits are the paradigmatic "r" strategists. This difference in strategies recapitulates within a species: the male pumps out his sperm swarm while the female tends her carefully cozened eggs.

The post-Neolithic Revolution adoption of the settled life by most humans prompted a profound transition—the skewing of reproductive strategy from the "k" over into the "r" range. Studies of modern hunter gatherers like the !Kung people of the Kalahari show that the average woman bears four children. Only two survive to reproduce, keeping numbers stable. A long period of nursing serves to suppress ovulation so that pregnancies are spaced by four to five years. Called lactational amenorrhea, this is the critical factor in keeping birth rate down, but it exists only under certain conditions: nursing must be constant and regular, and a woman's body fat percentage must be low (Harris 1987). When agricultural grains are substituted for broad spectrum gathering, body fat increases and natural contraception is destroyed.

Intensive, grain-based agriculture had another effect besides increasing women's body fat; it also gave an incentive to produce large families. More hands to thresh and sow meant more grain produced and the ability to feed more mouths. The invention of ceramics allowed food to be boiled and fed to infants who were weaned at an earlier age and left in the care of elders, freeing mothers to work in the fields and to bear more children. Here we find the true genesis of the "too many potato chips" problem.

The stork is the bird of war. —Aldous Huxley

Populations grew and soon developed war technology. Metallurgy and the horse merged with large scale food production, storage, and redistribution systems to form the first expansionist empires of the Near East. With agriculture as sower and war as reaper, humanity became locked into the patriarchal large family system, or "r" strategy of reproduction and survival.

Civilizations soon formalized their new survival strategy in the first written codes of law. Gerda Lerner (1986) has analyzed four of these codes, the Codex Hammurabi, Middle Assyrian law, Hittite laws and biblical law. She found that up to fifty percent of these laws concerned the reproductive and sexual behavior of women. Under Middle Assyrian Law, for example, abortion was a capital crime with the worst official punishment reserved for a woman who practiced it: public impalement and refusal of burial. So much for reproductive choice. The "r" strategy was enforced at the point of a stake.

In the pre-modern world, women's reproductive function was the foundation of politics because a man was powerful in proportion to the number of kin he could rally to his cause. But outside the empires, in small-scale, tribal societies, this political power took a completely different shape. Maximizing the number of offspring was not always the best strategy, because as a couple's progeny increase, the balance of power in the community begins to shift and kinsmen begin to feel threatened.

In tribal societies, family size was limited by politically motivated ritual that was ultimately based on resource limitations. The cross-cultural practices of menstrual seclusion and avoidance of wives by their husbands can be explained as a response to the dilemma of female fertility and its threat to both political equilibrium and the unstable resource base. Many tribal societies practiced the seclusion of women in special huts during the time of their menstrual periods because of the view that menstruating women were unclean and could pollute the food they prepared or threaten a man's hunting luck. In these pre-agricultural societies, menstruation would actually have been rather rare for women, since for much of their reproductive lives they would have been either lactating or pregnant. Menstruation was a vivid sign of fertility. Woman's fertility was seen as polluting at the same time that it was highly valued: "The elaborate pollution practices of unstable societies can be interpreted as tactics of ritual disinterest in a wife's fertility that are part of a larger complex of tactics of ritual disinterest in wealth and power" (Paige and Paige 1981). A society that can't effectively store surplus production can't afford any of the larger manifestations of greed, whether for power or for goods. The potlatch giveaways of the Pacific Northwest Indians are another example of a ritual refusal of accumulation.

Because population limitation in tribal societies was so critical, there was also a lack of privacy in family life: sex and babies were everybody's business. With the coming of big agriculture and the military state, inhibitions on family size were loosened. Family

life became private, under the control of the patriarchal head of the family who alone was answerable to the state as a citizen.

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Blundell (1995) has shown that conflict between the private and public spheres was a prominent subject in Greek drama of the classical period. One of the themes of *Lysistrata* is the men's denial of women's right to an opinion on political matters like war. Lysistrata must point out to them that women make a contribution to war—their sons—and so have the right to a say in the matter. Aristophanes used the device of inverting the established order (putting women in charge) to dip into the domestic sphere for feminine values to apply to the problem of war. In the end though, the spheres remain separate and the problem of war in real life remains unsolved.

The Greeks, like every other civilization of the time, were locked into an "r" strategy. Not to produce cannon fodder would lead to their downfall. Through their literature, however, we know that they valued the egalitarianism of a small-scale society. Aristotle was among the first to advocate limiting population. He advised abortion for parents with too many children, writing in *Politics* that "...neglect of an effective birth control policy is a never failing source of poverty which in turn is the parent of revolution and crime." Democracy itself is a holdover from small-scale, tribal society, not a hallmark of civilization at all. Ultimately, Greek democracy was devoured by internal warfare that weakened its ability to fight off conquerors from outside. Within 200 years of Aristophanes, the Greeks were nothing but a backwater Roman colony.

Our modern form of civilization has been advanced by people who lift their ideals from Greek rationalism and democracy and who hope for an end to war and injustice. These hopes have been based on a projected end to scarcity brought about by technology. Modern liberal humanists often take the position that overpopulation will end only after development is brought to the world and poverty is ended.

What most liberal humanists don't seem to realize is that overpopulation among the poor is strategically beneficial to the wealthy classes. There is a long history of the upper class pursuing a "k" strategy of reproduction while forcing an "r" strategy on the class of slaves and laborers. The French term, *proletariat*, literally means "breeders." Marvin Harris and Eric B. Ross provide enlightenment on this issue in their important history of population regulation, *Death, Sex and Fertility, Population Regulation in Preindustrial and Developing Societies* (1987). The fabled Irish potato famine is used to illustrate the impact of economic exploitation on population growth. The potato was an established food crop in Ireland long before the famine of the 1840s and did not by itself cause the Irish population boom. The population boom was brought about by landlords who wanted to switch from cattle grazing to grain production, which required a larger work force. Landlords manipulated population growth through the tax structure. They encouraged peasants to marry earlier by allowing them to grow potatoes tax-free in order to feed their large families. But only a few decades later, landlords switched back to grazing to cash in on the market for meat to supply the English colonial armies that were metastasizing all over the world. At the very height of the famine, shiploads of Irish grain and meat were delivered to England's shores while English politicians and men of letters blamed the profligacy of the starving Irish.

Modernity has seen the final shift of political power from kinship relations to the bureaucratic control of large populations of workers and slaves. The corporate state profits from a surplus of people and has every reason to encourage breeding among the masses. Otherwise how will wages be kept so low? Elizabeth Gurley Flynn was an American labor radical and an early proponent of family planning who articulated this relationship back before 1920: "The large family system rivets the chains of slavery upon labor more securely. It crushes the parents, starves the children, and provides cheap fodder for machines and cannons" (Flynn 1987).

Flynn, Margaret Sanger, and a host of others responsible for the modern family planning movement have attempted to be modern Lysistratas. But they had to be very subtle in their approach or pay the consequences. Flynn's life is a good example. She explicitly made the connection between overbreeding and the unequal distribution of wealth. She and other members of the IWW were brutally suppressed by the government out of fear that their call for equality would be heeded by workers.

In our day, capitalism finds its cheap labor among the teeming masses of the third world, so there's no immediate threat to the system by stabilizing population in the so-called first world. But as women step out of enforced motherhood and into other societal roles, the backlash against reproductive choice is coming from a different segment of the patriarchal power structure. As Susan Faludi points out, the leaders of the anti-abortion movement are often working class white men whose relatively privileged place in society has recently evaporated. Without the little woman under their thumb, they have no basis for self esteem (Faludi 1991).

In the United States, fundamentalist terrorists have robbed women of their choices. Abortion and family planning services are ever more scarce. The US is the fastest growing industrialized nation in the world and only one-third of that growth comes from immigration. We also have one of the highest teenage pregnancy rates in the world. Here in my rural Oregon community, where the problem is particularly acute, almost 30% of the female high school students are pregnant or already mothers. Teenagers are less likely to use contraceptives effectively, but for a teenager in my community to obtain an abortion she would have to travel between 75 and 200 miles, depending on which clinics were open. And the fundamentalist right has managed to stigmatize abortion to the extent that most of these teens would not even consider it. Conception happens, and even for responsible adults, abortion will always be a necessary option.

Ginette Paris, in her provocative book, *The Sacrament of Abortion* (1992), gets to the heart of the matter: "Men have the right to kill and destroy, and when the massacre is called a war they are paid to do it and honored for their actions. War is sanctified, even blessed by our religious leaders. But let a woman decide to abort a fetus that doesn't even have the neurological apparatus to register suffering, and people are shocked. What's really shocking is that a woman has the power to make a moral judgment that involves a choice of life or death. That power has been reserved for men."

In the less developed world, women need more than just attitude changes to give them choices. The 1994 UN Population Conference in Cairo reached a consensus fairly easily on what is required: Women need basics such as food, clean water, health care and access to contraceptives and abortion. The Cairo Conference concluded that providing better reproductive care worldwide would cost $17 billion annually, which is less than the world currently spends *each week* on armaments. Again, we might follow the example of Lysistrata who knew that a sex strike alone wouldn't be enough—she had her women seize the treasury of Athens as well.

But if the stakes in these matters of sex and war were high before, they are even higher now. In 1969, Stephanie Mills, in her speech as college valedictorian, declared that she would refrain from bringing any children into the world since overpopulation was threatening global ecological collapse. Since then, a few more women have made such public declarations, and an unknown number have privately decided to forgo or limit childbearing out of ecological considerations. But, there has been no large-scale, public "procreation strike." The reasons for this, I believe, are partly found in the public/private dichotomy that is an integral part of patriarchy. It is not socially acceptable to interfere in the reproductive decisions of families, even by verbal persuasion. Even the pro-choice movement defends abortion by using the right to privacy. But given the threat to biodiversity and ecological integrity that is posed by our increasing population, a truly *pro-life* movement is desperately needed to beat the drum for voluntary limits on reproduction.

We could humanely reach an optimum global population in two generations, because exponential growth works both ways. A population can experience decline just as fast as growth. If every woman on Earth had no more than one child, the number of people of reproductive age would halve in one generation. By the second generation, we could achieve what Anne and Paul Ehrlich (1990) estimate is the optimum population for the planet: two billion. Think of what a bright new day it would be for those two billion people and the other species they share the planet with. There would be a chance of stopping the human war against Nature and the ongoing holocaust of species extinction. There would be enough of everything, including clean air, clean water and wilderness. Imagine what life would be like if everything wasn't always getting more crowded, dirtier and poorer every day!

What it comes down to on an individual level is this—if you bring two or more children into the world, you are saying that the world is OK exactly the way it is. Growth, pollution, species extinction, racial and class injustice, and continued warfare are something you and your children can live with. If you have only one child (or none) you are casting a vote for a radical new world and a veritable utopia. It's that potato chip thing again. Do we have the will to stop at one? If so, we will survive and even thrive. If not, we'll soon see a greasy, bloated end. That is the message that the postmodern Lysistrata needs to take to the women of the polity. ▮

Kelpie Wilson (POB 1444, Cave Junction, OR 97523; kelpie@siskiyou.org) is a veteran ancient forest activist living in Takilma, Oregon. She has worked for the Siskiyou Regional Education Project since 1991. When she can find time away from the task of protecting wildlands in the Klamath-Siskiyou Bioregion, she writes on population issues and works on developing an overpopulation card game called "Choice or Chance?"

References

Blundell, Sue. 1995. Women in Ancient Greece. Cambridge: Harvard University Press, 178-179.

Ehrlich, Paul R. and Ehrlich, Anne H. 1990. The Population Explosion. NY: Touchstone.

Faludi, Susan. 1991. Backlash. NY: Crown, p. 401-421.

Flynn, Elizabeth Gurley. 1987. Words on Fire. Rutgers University Press.

Harris, Marvin. 1977. Cannibals & Kings. NY: Vintage, p. 56.

Harris, Marvin and Ross, Eric B. 1987. Death, Sex and Fertility: Population Regulation in Preindustrial and Developing Societies. NY: Columbia University Press, pp. 23-25.

Lerner, Gerda. 1986. The Creation of Patriarchy. Oxford: Oxford Press.

Paige, Karen Ericksen and Paige, Jeffery M. 1981. The Politics of Reproductive Ritual. Berkeley: University of California Press, p. 228.

Paige, Karen Ericksen and Paige, Jeffery M. 1981. The Politics of Reproductive Ritual. Berkeley: University of California Press, p. 228.

Schmookler, Andrew Bard. 1984. The Parable of the Tribes. Boston: Houghton Mifflin, p. 65.

Maybe A Conversation

Addressing Overpopulation One (Child) Family at a Time

by Bill McKibben

Somehow the population debate has gotten stuck in this country, even as family planners have met with great success in other parts of the world. Birth rates are falling fast across great swaths of the developing world—not fast enough, and perhaps the declines began too late, but still there is real progress, real change. In the space of a generation, the average woman in a developing country has gone from having six kids to having less than four, and that's *excluding* China.

In America, however, our birth rates remain high by the standards of the industrialized world, well above Europe and Japan's. Combined with the impact of immigration, those birth rates will raise our population to roughly 400 million by 2050 on the current trajectory. And for me, since I'm most concerned with the largest-scale global problems like climate change, that's ominous news. Ominous because population is *not* the only problem—it's population multiplied by consumption and by efficiency, two more categories in which we also trail Europe and Japan.

So why have we changed so little here? In part, of course, because it's harder to see the effects of our growth. Our great wealth allows us to import what we need, and cushions the cost of new people. We just push the suburbs out another mile, and buy more comfortable cars, and get used to it.

More, though, I think it's because in our society we usually discuss fertility levels in the abstract. In other parts of the world, activists focus on family size and its effect on the life of the family; soap operas, for instance, work these themes into their plots, apparently with considerable effect. But in America we discuss birth rates and resource depletion and so on, ad infinitum. We talk about this issue as if we each had birth rates, when what we actually each have (or don't have) are kids. Try doing a soap opera about carbon emissions.

I waited many years to write directly about the subject of population. Partly that was from not wanting to enter this unproductive and vitriolic fight (the only battle where you are as likely to be attacked from the left as from the right). But more it was out of a sense that I didn't have some way to help move this debate off the rock where it had foundered.

illustration by Audra Loyal

Then a few years ago I began to do some research on the subject of only children, partly because I had one. And I soon realized that this was one new way to approach the topic, one that held real promise. Consider this statistic: If Americans dropped their birth rate to 1.5 kids on average (that is, if as many Americans had one kid as two), and if we also cut immigration somewhat, then our population in 2050 would be 230 million, not 400 million.

So here's an opening for a conversation, not a polemic. How many children are each of us going to have? It's the closest thing to a taboo topic left in this society—we have dozens of books on what to name our kids, but few on how to think about how many kids to have in the first place.

We have dozens of books on what to name our kids, but few on how to think about how many kids to have in the first place.

And then consider this—the single most common reason that Americans give for having a second child is so that their first child won't be screwed up. I've spent much of the last couple of years researching all the psychological studies on this topic, and can say with real confidence that it's an unfounded fear: only children do just fine on every measure of achievement, adjustment, and sociability.

I made that research on only children the first part of my new book because I think it's the only way to get the debate underway. Few if any parents are going to limit their reproduction because of the infinitesimal percentage of CO_2 that each new addition will provide; in fact, if I'd discovered that only children were actually destined to become selfish social cripples, I think we might have had another ourselves. That's what being a parent does to you.

And it's folly to think that government will provide the necessary push. Even if you thought it was fine for politicians to dictate (or coerce through tax breaks and such) the size of our families, it *will not happen* in a democratic society until the vast majority of people are already convinced it's a good idea. (At which point it probably won't be necessary—having spent time in the southern Indian state of Kerala, which has a lower birth rate than ours without the slightest coercion, I'm a believer in education and social justice as more important parts of this process.)

There's no way, in other words, to avoid having a *conversation*, as opposed to a ritual exchange of slogans. Part of that conversation should be about global warming and aquifer depletion and species protection, but part of it has to be about families too. It has to be about what it might mean to have only one child, which is not a zealot's notion, but a straightforward possibility for most of us. We've never had that conversation; I'm convinced that starting it may be key to stabilizing our numbers in the decades ahead. ❙

Author, father, and Sunday school teacher Bill McKibben lives with his spouse and daughter in NY's Adirondack Mountains. His books include The End of Nature, The Age of Missing Information, *and* Hope, Human and Wild. *His new book,* Maybe One: A Personal and Environmental Argument For Single-Child Families, *will be published by Simon and Schuster in May.*

WE Interview

Stuart Pimm

Editor's note: Stuart L. Pimm (Dept. of Ecology and Evolutionary Biology, University of Tennessee, Knoxville, TN 37996) is recognized as one of the leading authorities on the patterns and rates of global extinctions. A native of Great Britain, he has traveled throughout the world—to the Pacific basin, the South American tropics, Europe, Florida's Everglades, and elsewhere—conducting ecological research.

In an interview on 25 July 1997, John Davis and I asked Dr. Pimm to discuss the magnitude of the global extinction crisis, where it is most severe, and how human overpopulation helps fuel the diminishment of biodiversity that this crisis represents. —TB

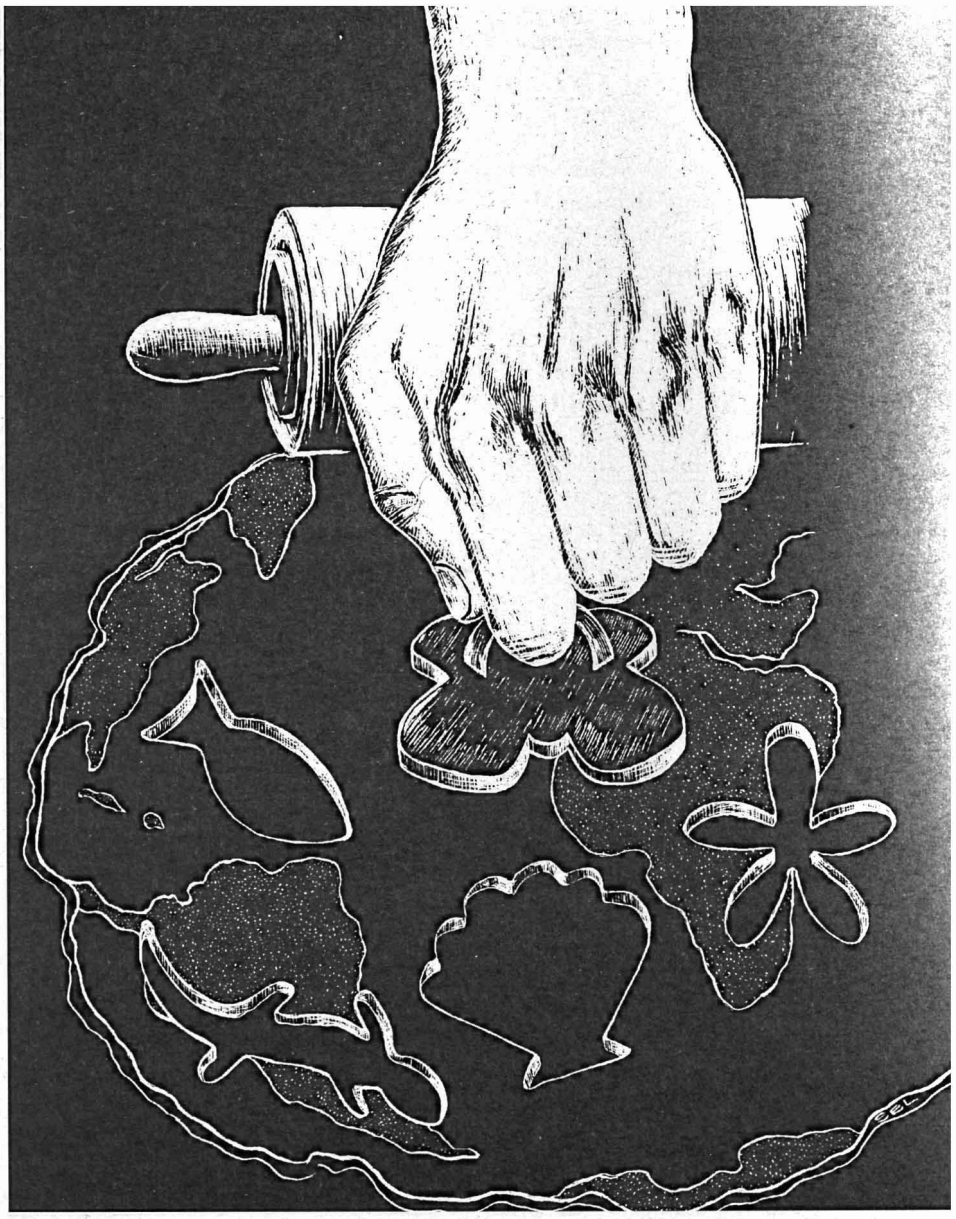
THE EXTINCTION CRISIS

SP: Many people have recently commented on the extent of the global extinction crisis. One often hears numbers such as three per day, or thirty, or even three hundred species going extinct per day. One of the reasons (though not the only reason) why there has been criticism by skeptics about the validity of the extinction crisis is that if you say it's either three or thirty or three hundred, it gives the impression that one doesn't know what one is talking about. In fact, those numbers are *all the same number*. The reason for the variance is that they are based on very different assumptions about how many species the planet holds.

Species have always gone extinct, but today they're going extinct hundreds, maybe even thousands of times faster than they should be.

Currently, there are roughly 1.5 million species known to science; that is, life-forms that have been deemed distinct species, classified taxonomically, and given scientific names. A very conservative estimate of the *actual* number of species is around ten million, and there are estimates as high as one hundred million. So anytime you try to come up with an absolute number of extinctions, like so many per day...one is thwarted by this enormous uncertainty we have about the total number of species the planet holds.

What I've begun to do is to focus on the groups that we know. This is important because there are critics, mischievous and even malevolent critics like Julian Simon, who say, *Well you scientists can say for certain that only one or two species are going extinct per year, and given how many species there are, who the hell cares*? And there are people like [*US News and World Report* assistant managing editor] Stephen Budiansky, for example, who calls talk of a global extinction crisis another doomsday myth. Perhaps the debate doesn't really belong in science, because these people like to distort numbers for their own political aims. Nonetheless, they can be



answered scientifically. The way one does this is to take a statistical sample. That idea is common in economics, too. If you talk about a consumer price index, it's based on a few grocery baskets around the country; the economists don't actually measure the price of everything.

When you take samples you can formulate a useful measure of extinction rates—the number of species going extinct per year relative to however many species there are in the group studied (be it thousands or tens of thousands of species). You then have a number as a fraction of some bigger number averaged over a period of a year, or a decade, or a hundred years, etc. We can then compare that number to the Background Rate of Extinction—the rate at which species have gone extinct throughout geologic time, as shown in the fossil record, excepting the cataclysmic extinction spasms like the one that eliminated the dinosaurs. A very conservative estimate of that background rate is one in a million; that is, if you watched a million species for a year, you'd expect to see just one extinction. Similarly, if you looked at ten species for a hundred thousand years, (fewer species but more years) you'd again expect to see one extinction. Or, if you watched ten thousand species, you would expect to see an extinction about every hundred years.

Once you've got that concept, it's quite easy to compare current rates of extinction among well-studied taxa to the background rate. For example, we know birds very well, and we're seeing avian extinctions at the rate of one, two, or three species per year. That means that over the course of a century you're seeing several hundred extinctions—thus, the rate of extinction is *several hundred times* what it ought to be. So we can say to the skeptics who claim extinction is normal and natural and thus there is no problem...yes, species have always gone extinct, but today they're going extinct hundreds, maybe even thousands of times faster than they should be.

Unfortunately, this alarming phenomenon is not just true of birds; it's true of mammals, butterflies, flowering plants, fishes, it's true of a whole variety of different samples, and those samples have *absolutely nothing in common*. This, I think, is the key

illustrations by Sarah Lauterbach

result. Samples taken from across the spectrum of biodiversity will show extinction levels hundreds of times the background rate. Wherever you look, you find these very, very high extinction rates.

ON ENDEMISM AND THE GIANT COOKIE CUTTER

What features are common to all these extinction black spots? It's clearly not the vertebrates vs. invertebrates, not animals vs. plants, not islands vs. mainlands and so on. The key factor is that within each one of those groups—birds, mammals, insects, whatever—the great majority of extinctions are in places where there are large numbers of endemic species: species that have small geographical ranges.

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For birds, a hotspot of endemism is the Pacific islands. For flowering plants, a key area is the Cape Province of South Africa. For fish, think of the incredible number of endemics found in the Mississippi River basin and the lakes of eastern Africa. Amazingly, for mammals, you go to the deserts of Australia, where there are lots of species found nowhere else.

The global extinction crisis is driven by losing species from areas like these where there are large numbers of endemics. Why should this be? I sometimes liken humanity's disruption of ecosystems to some giant, malevolent cookie cutter, stamping out destroyed lands across the globe. If, as the cookie cutter slams down upon the Earth, it lands on habitats containing species that are widely distributed, they may become extinct where the cookie cutter lands, but they will survive outside. However, if the cookie cutter hits an area rich in endemics—species that live there and only there—then it will cause a great number of extinctions.

That image is very useful in rebutting people who naively look at eastern North America and say, *Look we've been on the landscape for three hundred years, we chopped most of the forest down and yet we haven't conspicuously lost a lot of species.* (Nefarious critics like Stephen Budiansky note this perceived discrepancy between extensive damage and relative lack of extinctions and conjure an extinction hysteria plot hatched by Ed Wilson, the well-known conspirator and plotter!)

Yes, it's true that we chopped all of our forest down, but we didn't chop it down *all at the same time.* At any time in our recent history, at least half of eastern North America's forests have been intact. The question we must ask is: how many species should go extinct if we chop down half the forest? In general, what is the relationship between the area destroyed by the cookie cutter and the number of species that go extinct? If none of the forest remains, then all of the species will become extinct, obviously. What happens for a fraction of the forest remaining requires an unfortunately complicated formula called the species-area relationship.

The relationship comes from counts of species on areas of different sizes. We ecologists have a passion for going to oceanic islands—in the Caribbean, Polynesia, etc. (particularly in January or February). We take our binoculars, plant presses, and butterfly nets and we count the numbers of species on islands of different sizes. If you see us on the beach in the afternoons, it's because we are taking a time-out from field work to compile our observations. (You might think otherwise, but I could not possibly comment.) Ecologists have compiled a great deal of data on the species-area relationship. It shows, for example, that an island half the size of a larger island will have 85% of the species of the larger island. That is, it will be missing 15% of the larger island's species count.

This observation has an obvious extension. If you were to convert eastern North America into a set of forest islands—which is what we have done—and you destroy half the forest, then you should have caused the extinction of about 15% of the species. Here's where you have to play the endemism card. Imagine if we had cut every last tree from Maine to Florida and out to Kansas—leveled the forest. How many species in eastern North America would have become extinct? Again, we'll look at a group we know well—birds—and the answer is a small number, around 24 or 25. That's the number of bird species endemic to eastern North America. If you chop down half the forest, the species-area predictions say you will lose 15% of 24 species, or

3.6—and we know that that is almost exactly the right answer. The actual number is four: the Passenger Pigeon, Ivory-billed Woodpecker, Carolina Parakeet and Bachman's Warbler have gone extinct since Europeans arrived here. So when these critics of conservation say, *Look, we chopped down all the forests in eastern North America and there was no calamity...what's all the fuss over deforestation in the tropics*?, they're missing the point. The tropics are important both because they have *more* species, and extremely vulnerable because they are hugely rich in endemic species.

For example, one area of forest along the Atlantic coast of Brazil and a little south contains about 160 species of endemic birds. In Sumatra, Borneo, up to the Philippines there are 500 species of endemic birds, some with ranges limited to a particular island. Obviously deforestation there will cause species loss and indeed, the data show that there are very large numbers of species in southeast Asia teetering on the brink of extinction.

OVERPOPULATION AND CONSERVATION PRIORITIES

The fundamental cause of the extinction crisis is: Human impact. Whether for agriculture, industry, transportation infrastructure...for whatever purpose, when we convert natural habitats to human use, there will be some effect on biodiversity. Where are these impacts, and thus the extinction crisis most severe? In these biological hotspots. What groups of organisms are most imperiled worldwide? All of them are! All groups of organisms, at least all of the ones that we know about, tend to have Human population growth and the concomitant degradation of ecosystems diminishes biodiversity. Where the human cookie cutter lands on these areas of endemism, we are causing very high extinction rates. Now within these statements, there is both good and bad news. Obviously, deforestation in Madagascar or the Philippines, or pollution of rivers in the Mississippi drainage will have huge impacts on biodiversity simply because species are so concentrated there.

But, the bright side of this problem of endemism is that we can identify priority areas for conservation. Let me give you a global perspective—we are currently setting aside in National Parks and other protected natural areas about 5% of the planet's surface. If you're only going to save a random 5% and anticipate that in 20 years anything not in a park is going to be pretty well trashed, then the species-area relationship predicts you'll lose roughly 50% of your species—which is a massive, colossal rate of extinction equal to the five previous major extinction events in Earth's history, including the one that wiped out the dinosaurs.

However, if you picked the 5% sensibly, being careful to ensure that you would protect biological hot spots—centers of endemism—you'd lose far less species. We can, at the regional, national, and international level, set sensible priorities.

I'll make another obvious point. Many people say we ought to set aside 10% of the landscape in protected areas. I don't know where that 10% figure comes from but suspect it's simply twice 5%; 5% is what we're doing now and we ought to be able to do twice as good as that. Clearly that relatively small increase in percentage of the landscape protected as wildlands can make a big difference in saving biodiversity; it's worth that extra effort to go for 10%. Conservationists trying to push up that percentage are doing the right thing.

But we also need to be sensible about how we allocate our resources and establish reserves not on the basis of political expediency but on ecological criteria. Most of the big National Parks in the US are in Alaska. Alaska is a beautiful place, but it's not where any taxa have particularly high levels of endemism. There are some egregious omissions in where we have parks in this country, the most obvious example being the lack of protection for the prairies.

FINAL THOUGHTS

The bottom line is yes, there is an extinction crisis and it is huge. Very large numbers of species are going extinct and doing so at rates that are already hundred of times faster than they should be. Making reasonable extrapolations based on the relationship between habitat destruction

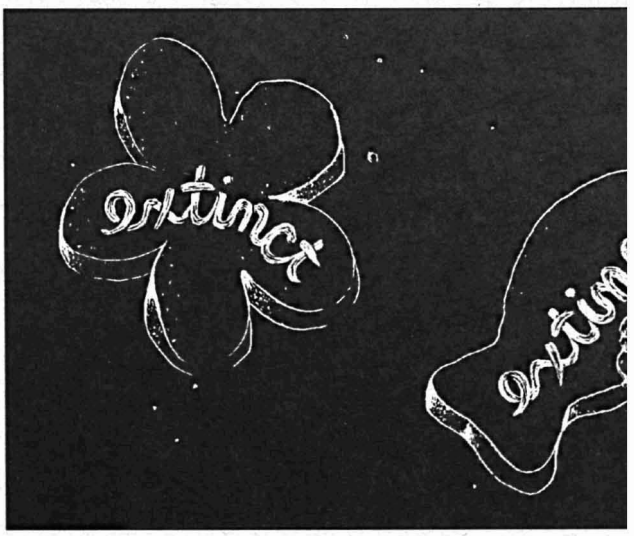


illustration by Sarah Lauterbach

and species loss, it's not hard to imagine that in 25 years time we may well have sent one-fourth to one-third of all the species on the planet on their way to extinction.

While focusing on hot spots and endemism is not the whole answer, it's clearly the first step. We must expand our protected areas and locate them wisely, while trying to impact the rest of the landscape as little as possible. If we are to have an international commitment to protect biodiversity—and I think there are practical and moral reasons why we should—areas like the Philippines and Madagascar, which have huge numbers of endemic species, are logical priorities for international investment.

Within the US, we must allocate our resources wisely. There are areas that should get more conservation dollars than others. The Hawaiian Islands have huge numbers of endangered species because of their high levels of endemism. So do parts of California, so do many of the rivers in the Mississippi drainage. I think the top three states for endemism and therefore extinction are Hawaii, California, and Alabama, and thus should be national conservation priorities.* As individuals, as communities, and as a nation, we must recognize that the global extinction crisis is real, it is happening now, and that we must work cleverly and tenaciously to begin to reverse the ecological holocaust humanity has wrought. ▮

Science Ed. Note: Florida is third in endemism by most accounts based on state boundaries. According to a recent World Wildlife Fund study, the North American ecoregions richest in endemism of vascular plants, land snails, butterflies, amphibians, reptiles, birds, and mammals are Hawaiian moist and dry forests and southern conifer forests; the latter ecoregion covers most of Florida and small portions of Georgia, Alabama, and Mississippi. —*RFN*

What I Would Tell at Confession

After I killed the snake and drove on,
something told me, Look left, *and I did.*

I was thinking about the deer
near Paradise I didn't kill
but came upon, bunched in the shadowed
shirring of the highway, hobbled
like a collapsed table
and how a young man turned back
to help ease her from the road.
Likely she's fat from spring, *he said,*
as I cupped her white,
heavy belly, white and heavy
as the moon, still warm, workable
as clay or dough.
All the mark she carried
was a scarlet trickle, at the head.
Hands can tell a life.
I hear they die same time, *he said,*
meaning to comfort.
After he rode on I kept pressing,
to stir the fawn from sleep.
It was not ready for this world.
Which can't be said
for the snake, who lay among
warming rocks of the grade,
every scale open to the red-rising sun.
I had bent, squeezed
from the doe's nipples
pearl beads of colostrum, more glue
than nectar, and drank.

Now, to my left, below
in a flat meadow redolent
with tufted hair-grass, with
long-plumed avens, cranesbill, through which
a small creek chortled across its stones—
in the creek, in fact, a moose
paused its creekside grazing of cress
and bluebells to look at me.
Her coat was rich
chestnut, shining like steeped
mahogany, so
she appeared to have just risen
from the center of the earth, and was
cooling. Nothing stood between her
and fire. At the throat
her bell rang and rang.

The way she gazed at me
held not one flicker of blame.

—Janisse Ray

Population Extinction and The Biodiversity Crisis[1]

by Gretchen C. Daily and Paul R. Ehrlich[2]

Van Brunt's Jacob's Ladder *by Robert M. Smith*

INTRODUCTION

During the last decade the public has become increasingly aware of the accelerating loss of species from Earth's biota. But the loss of species is only one aspect of the extinction crisis, and in many parts of the world may not be the most important facet of the decay of biological diversity. The focus among biologists upon the conservation of species (see, for example, Pimm and Gittleman 1992, Reid and Miller 1989, Scott et al. 1987, Wilson 1989) is somewhat ironic because debates have raged (and persist) over how to define a species along the continuum of differentiation between organisms (Ehrlich 1961, Ehrlich and Raven 1969, Masters and Spencer 1989, Mayr 1970, Patterson 1982, Wiley 1981, Willis 1981). This paper examines the implication of the extinction of populations and attempts to assess its importance relative to the extinction of species.

Biodiversity is the diversity of life at all levels of organization, ranging from the genetic, population and species levels to the community and ecosystem levels. In this hierarchy of structure, populations constitute not only the subunits of species but also the subunits of ecosystems. The populations in an area make up the biological community which interacts with the physical environment to make up the ecosystem.

How much biodiversity is there and how quickly is it being lost? The standard approach to answering this question is to estimate first the total number of species that inhabit the planet and then the rate of species loss. The actual answer to the first part of the question is that no one knows how many species there are to within an order of magnitude. Roughly 1.5 million species have been formally described (Stork 1988, Barnes 1989, Hammond 1992), but, also ironically, there is no centralized computer index of these known species, whereas the US Library of Congress has detailed computerized entries for each of several million books. Without such a species catalogue, it is difficult to elucidate the patterns and processes that determine Earth's biodiversity (May 1988).

This situation led Terry Erwin to approach the question "How many species are there?" in a brute force way. He used an insecticidal fog to "knock down" the arthropods living in tropical rainforest trees. His findings revealed the startling possibility that there may be as many as 30 million tropical arthropods alone, and on the order of 100 million species total (Erwin 1982, Erwin 1983, Erwin and Scott 1980), although others consider this estimate much too high (Stork 1993).

Determining the rate of species loss requires coupling information on the global distribution of species with regional rates of habitat destruction, the most important cause of biodiversity loss. Biologists know that at least 50% of the planet's species live in tropical moist forest (which covers seven percent of the Earth's land area), since the two overwhelmingly species-rich groups, the angiosperms (flowering plants) and arthropods, are concentrated there. For example, from a single tree in Peru, E.O. Wilson retrieved 43 ant species belonging to 26 genera, greater ant diversity than found on all of the British Isles (Wilson 1989).

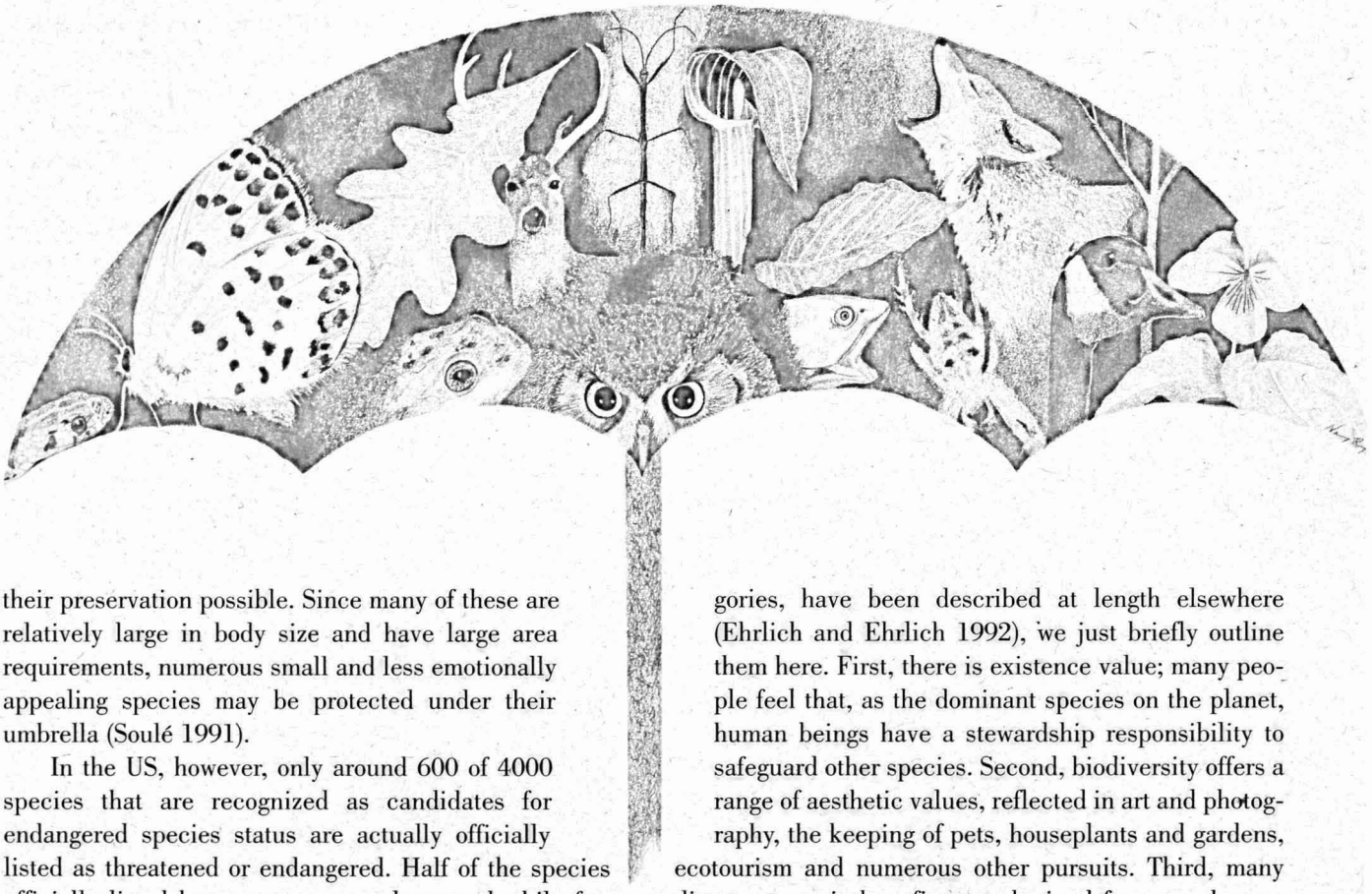
At present, tropical moist forest is being destroyed at a rate of about 110-20 million hectares annually. Assuming very conservatively that two million species are confined to tropical moist forest (for a world total of no more than four million) and that 10 million ha tropical moist forest is lost annually, then the rate of species loss is approximately 4000 to 6000 species per year (Wilson 1989). How does the rate of species loss compare with the rate of speciation? Assuming that about half of the extant species evolved in the last 5-100 million years and that about half of all extant species will be driven to extinction in the present 50-100 year period, then present rates of speciation are about one million times slower than rates of extinction (May 1988).

CONSERVING BIODIVERSITY

The goal of the current approach to conserving the planet's biodiversity is to save as many species as possible. In theory the means of accomplishing this goal in the tropics is to identify and protect areas with high levels of endemism. In practice, however, conservation organizations are usually left with the task of managing as best as possible whatever scraps of habitat remain after resource extraction and agricultural and urban development have converted the areas best suited to those purposes (Gilbert 1988, Saunders et al. 1991). In theory, the means of accomplishing this goal in temperate zone, developed countries is to identify threatened species and preserve sufficient habitat for each to maintain a viable population. In practice, the situation is basically the same as in the tropics. Typically, only the most charismatic species garner enough public attention to make

1 An earlier and shorter version of this chapter appeared as Ehrlich and Daily (1993).

2 We greatly appreciate the helpful comments on an earlier draft of the manuscript provided by Carl Folke, Karl-Göran Mäler, and Charles Perrings (The Beijer Institute) and Anne H. Ehrlich, Dennis Murphy, and Thomas Sisk (Center for Conservation Biology, Stanford). This work was supported in part by a grant from the W. Alton Jones Foundation and by donations from private individuals.



their preservation possible. Since many of these are relatively large in body size and have large area requirements, numerous small and less emotionally appealing species may be protected under their umbrella (Soulé 1991).

In the US, however, only around 600 of 4000 species that are recognized as candidates for endangered species status are actually officially listed as threatened or endangered. Half of the species officially listed have no recovery plans, and while few species are actually recovering, an equal number may already be extinct. Worldwide, a mere three percent of the land surface has protected status in 5000 reserves and protected areas; many of these areas are protected on paper only and are rapidly deteriorating (Soulé 1991).

Some of the practical problems with this approach to conserving biodiversity are very difficult to correct, such as the general lack of control over which and how much land is afforded protection. At least as serious is a theoretical problem with the goal. The value imputed to biodiversity is a function of the extent to which it is perceived to benefit humanity. Attempting to maximize the number (or even diversity) of species saved in itself is probably not optimal in the long run and, even in the short run, will not maximize the benefit of biodiversity to humanity. Why not? The most important anthropocentric values of biodiversity derive from a diversity of populations (of species) in healthy ecosystems and could not be delivered by a few remote pockets of species diversity alone.

The importance of population diversity becomes evident when considering the values of biodiversity in general. As these values, often classified into four categories, have been described at length elsewhere (Ehrlich and Ehrlich 1992), we just briefly outline them here. First, there is existence value; many people feel that, as the dominant species on the planet, human beings have a stewardship responsibility to safeguard other species. Second, biodiversity offers a range of aesthetic values, reflected in art and photography, the keeping of pets, houseplants and gardens, ecotourism and numerous other pursuits. Third, many direct economic benefits are obtained from non-human species, including all of our food, about a quarter to a third of our modern pharmaceuticals, virtually all traditional medicines (upon which the majority of the human population depends), and a variety of industrial products, including lumber, paper, fibers, lac, natural rubber, and natural oils. Finally, the most important value of biodiversity from an anthropocentric point of view is the providing of ecosystem services, for which substitution on the scale required for human survival is not possible. These services include maintenance of the gaseous composition of the atmosphere, regulation of the hydrological cycle, pollination of crops, control of the vast majority of potential pests, and the generation and maintenance of fertile soils.

With the projected doubling of the human population (PRB 1992), the quintupling of global economic activity (Brundtland 1987), and the associated habitat conversion, much more biodiversity will inevitably be lost. Given this situation, there is no hope of realizing the potential value of biodiversity by simply maximizing the number of species remaining on the planet. In the extreme, making the tradeoffs required to achieve this goal would mean sacrificing a diversity of populations for

illustration by Nancy Roy

a diversity of species maintained in a relatively few remote areas analogous to natural zoos. Since the primary incentive for protecting biodiversity at all is the expectation of realizing its values, maximizing the biodiversity saved requires maximizing the values derived from it. Doing this demands greater attention to population diversity.

POPULATION DIVERSITY

Ecologists and evolutionists use the term "population" in several different senses that involve technically difficult issues. The two most common definitions refer to related kinds of geographic collections of individuals. One is a demographic unit (Brown and Ehrlich 1980), which is simply an interbreeding group sufficiently isolated from other such interbreeding groups so that changes in its size do not greatly influence the size of nearby groups, and vice-versa. The other is a Mendelian population which is, in essence, a genetically defined entity that evolves independently of other such units. (That is, its evolutionary future is not primarily determined by flows of genetic information from other populations.) Both of these kinds of populations often exist as parts of continua of isolation and differentiation (just as do many species). Demographic units may be Mendelian populations and vice versa, but the two are not necessarily congruent. The key point for our purposes here is that populations are geographic entities within species that may be defined either ecologically or genetically.

Taxonomists also recognize entities between the level of population and species, called subspecies (or "races"—the terms are generally synonymous). These are simply geographic units (normally suites of populations) that have evolved sets of differences that a taxonomist feels deserving of formal recognition with a Latinized name. Division of species into subspecies is a very subjective process, heavily dependent on the characteristics on which the division is based (Wilson and Brown 1953). Thus, the original division of human beings into subspecies was based largely upon skin color, but using many other equally valid attributes produces entirely different results (Brown 1959, Ehrlich and Holm 1964, Ehrlich and Feldman 1977). Skin color just seems like a 'natural' basis because of the limitations of human sensory systems that emphasize sight over other senses (Ornstein and Ehrlich 1989).

While they are of limited interest to evolutionists because of their arbitrary nature, subspecies are politically important in the United States because they can be protected under the Endangered Species Act, and thus may serve as a tool for protecting everything from population diversity to ecosystems. Congress extended protection to recognized subspecies of vertebrates, invertebrates, and plants, and to populations of vertebrates. Thus, for example, environmentalists have attempted to use an endangered subspecies, the Northern Spotted Owl *(Strix occidentalis caurina)* (Ehrlich et al. 1992), to save old-growth ecosystems, the genetic diversity within which may be critical to the long-term future of the logging industry in the Pacific Northwest of the United States.

Populations of species in ecosystems can be considered analogous to rivets in an airplane wing; some species are more critical than others in maintaining the present functions of the system, but the continued deletion of populations, like the prying of rivets from a wing, will eventually lead to collapse.

Why should one care if populations go extinct? Population diversity is essential for two sets of reasons: first, it is clearly important to the preservation of species diversity; second, it is critical to realizing any of the four general classes of values of biodiversity. These two points are discussed in turn.

The probability of species persistence is a function of the number, size, and diversity of extant populations. A species cannot go extinct unless all of its populations are extinct, and the extinction of component populations influences the probability of the entire species disappearing. Multiple populations, in addition to providing demographic insurance, supply interpopulation genetic variation that also enhances the chances of a species persisting. Populations differ in genetic structure because of random divergence and adaptation to different environmental conditions. The genetic variability represented by geographically disparate populations

helps assure the ability of the entire species to respond evolutionarily to environmental change. If, for example, there is rapid climatic change, a widespread species with many populations is more likely to include individuals that are genetically suited to new conditions than a species with just a single local population.

The vulnerability of a species to extinction may be very difficult to assess from characteristics of its populations. Some species, such as the well-studied bay checkerspot butterfly *(Euphydryas editha)* may suffer the loss of many component populations without becoming threatened globally (Ehrlich and Murphy 1987). In other cases, however, reduction in numbers and sizes of populations may doom a species to extinction long before it becomes scarce, as was true for the Passenger Pigeon, *Ectopistes migratorius*. That bird was once the most abundant in North America (perhaps in the world); populations contained up to several billion birds and their dense nesting colonies could be 10 kilometers wide and over 70 km long. It was also economically important. Market hunters slaughtered huge numbers; three million were shipped east from Michigan (its last stronghold) by a single hunter in 1878. The bird went to "economic extinction" when populations of thousands still existed in large stretches of suitable habitat. Nonetheless, the species rapidly declined to biological extinction thereafter, presumably because large, dense populations were required for successful breeding (Blockstein and Tordoff 1985).

Population diversity is critical to realizing any of the three general classes of values of biodiversity.

(1) First, some people simply consider morally objectionable the extent and permanence of the conversion of natural habitat (supporting populations of wild species) to spreading urban and agricultural areas.

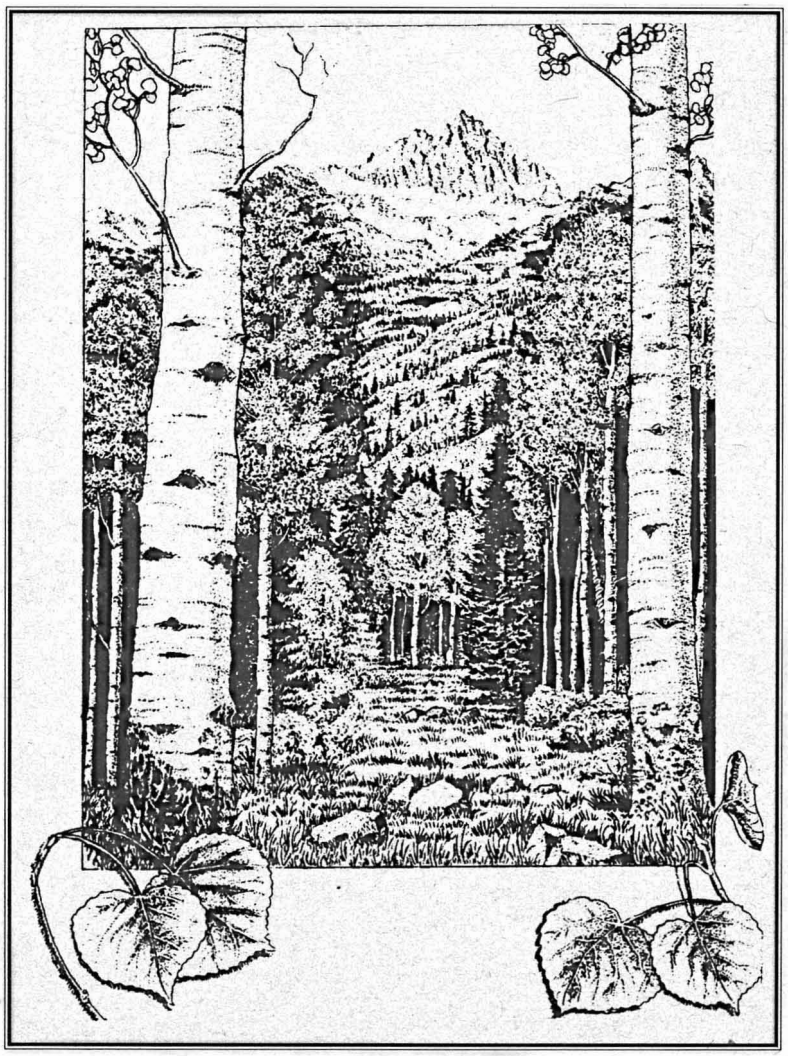
(2) Second, the aesthetic value of a species diminishes as its populations disappear. People's lives are poorer without the spectacular dawn drumming displays of male Heath Hens, the graceful soaring of White-tailed Eagles, the thrill of being in the presence of grizzly bears, American bison, and wolves, and the fascination of watching Eskimo Curlews and Diana fritillaries,even though wild populations of these species stil lexist in places inaccessible to them. Fifty years ago butterfly enthusiasts could find a diversity of species in many localities that are now under concrete. Many North American wetlands that once housed Henslow's Sparrows to delight birders have been drained and developed, and the birds must now be sought by expedition to one of a few limited localities. Even people unfamiliar with such organisms pay an opportunity cost in not being able to experience and develop an appreciation for their beauty.

(3) Third, the direct economic value of a species is generally reduced as its stocks (populations) are exterminated. Consider the numerous species hunted and fished to economic extinction, including the bison, the Pacific sardine, the right whale, the Passenger Pigeon, and the Great Auk. The continued existence of the former three is largely irrelevant to those who once depended for their livelihood upon harvesting large populations thereof—populations that no longer exist.

Furthermore, interpopulation genetic variation is of direct value to humanity. Different populations of the same species may produce different defensive chemicals (e.g., Dolinger et al. 1973), key medicinal resources for humanity (e.g., Ehrlich and Ehrlich 1981, 1992, Myers 1984, Eisner 1992). Interpopulation genetic variability also increases the probability that new crops and domestic animals can be extracted from nature's "genetic library," maintaining resistance to drought, pests, and disease in present strains and breeds (Ehrlich and Ehrlich 1981, 1992, Myers 1983).

Wild species are not ordinarily immediately transferable to domestic use. Plants that have potential as crops need to have their desirable properties (e.g., yield, ease of cultivation, etc.) enhanced and their undesirable ones (e.g., presence of anti-herbivore poisons in parts otherwise edible) suppressed before they can go into commercial production. Human beings could obtain little nourishment from the wild ancestor of wheat or the poisonous ancestors of cucumbers; selective breeding produced the nutritionally rich crops we now consume. The raw material for selective breeding is genetic variability, much of which occurs between populations. For example, in developing the pigeon pea, a protein-rich, economically valuable crop suited to semi-arid parts of the tropics, 7000 varieties were screened before discovering one with the necessary trait to permit rapid selective breeding (Anon 1992).

It is not logistically possible to maintain much interpopulation variability in zoos or botanical gardens; indeed much of that variability is a response to existence in complex natural communities under varying physical



conditions. Furthermore, defensive chemicals that could be of use medicinally may not be discovered in "captive" individuals because they are only produced by the plants when "provoked" by the assault of herbivores (Eisner 1992).

Perhaps the most important reason for caring about the extinction of populations, however, is that ecosystem services are provided by populations (Ehrlich 1992a) on global, regional, and local scales—and those services constitute the most important source of benefits received by humanity (Ehrlich and Ehrlich 1981, 1992). On a global scale, for example, destruction of the vast majority of tree populations, without wiping out any tree species, might add enough additional carbon dioxide to the atmosphere to make the difference between relatively slow climatic change resulting from global warming and a change that is very rapid and catastrophic for agriculture. On a regional scale, the species of micro-organisms that once made the Rhine a self-purifying waterway may all be extant; but that does not help those now dependent on the river for potable water. Similarly, though the degree to which deforestation can be implicated is in dispute, the continued existence of the tree species whose populations once blanketed the Himalayas, helping control runoff precipitation, was irrelevant to the recent devastating flooding of Bangladesh.

A dramatic example of the importance of local populations is provided by the salinization of the Australian wheatlands. The Mediterranean vegetation of much of southwestern Australia was cleared for wheat cultivation. The native shrubs and trees had deep roots, and continually transpired water so that the level of groundwater was kept low by their perpetual "pumping." When the native flora was cleared the groundwater level climbed, bringing with it the salt that had been spread over the area over millions of years by the winds off the southern oceans. Eventually the salt reached the shallow root zone of the wheat, and the salinized fields became infertile. In a visit to the Tammin area in 1991, we met a group of farmers who have organized themselves to restore local populations of trees and shrubs in between salinized fields. Once those populations are re-established, the water table is again pumped down, rain leaches the salt deep into the sub-soil, and wheat production can be resumed.

There is often the tendency to downgrade the importance of the extinction of populations on the assumption that other populations of the same or similar species elsewhere can supply the same service(s). The foolishness of such a position was expressed well by Folke and his colleagues (1991), who point out in connection with indifference toward the degradation of the Baltic Sea region: "(it) implicitly assumes that it is possible to substitute food resources and other life-support goods, services, and functions provided by these ecological systems with imports derived from ecosystems in other regions. However, as the scale of human societies is continuously growing and as environmental degradation does not only take place in the Baltic Sea Region, such a substitution is, in the long-term sustainability perspective, nothing but an illusion."

A pressing question in ecosystem ecology today is the degree to which species diversity is required to maintain ecosystem services. Will, for example, a "weedy" world, with only a small fraction of today's population or

Quaking Aspen (Populous tremuloides) *by Claus Sievert*

species diversity, be able to maintain the gaseous quality of the atmosphere, generate and maintain soils, dispose of wastes, recycle nutrients, control potential pests, and carry on the many other critical functions of natural ecosystems (Ehrlich 1993)? The answer to this question is not yet fully known. However, several lines of evidence suggest that it will be "no."

First, the quality of local ecosystem services appears to be quite tightly tied to exactly what populations are in a given area. For example, the cycling of nutrients by (and overall productivity of) lakes depends upon the precise species composition of the small crustacea and other organisms inhabiting them (Hairston 1992, personal communication). The value of such species in maintaining the integrity and functioning of natural ecosystems is often very difficult to assess. Ecologists are just beginning to understand the degree to which the extirpation of a population of one species can lead to a cascade of extinctions (Gilbert 1980). In a classic case, removal of a starfish that was a top predator in a marine community on a rocky shore allowed one mussel species to outcompete and exterminate populations of other species (Paine 1966). Relatively subtle interactions may be more common, however. For example, the persistence of populations of two swallow species in some montane communities in Colorado depends on a co-occurrence of at least four elements in a keystone species complex: aspen trees, certain shrubby willow species, Red-naped Sapsuckers, and a fungus that causes heartrot in aspen (Daily et al. 1992). The sapsuckers provide old nest cavities to the swallows, excavated only in aspen with heartrot that are situated within approximately 50 meters of the willows (an important sapsucker food source).

Second, the loss of diversity in an area implies a loss of "ecosystem plasticity"—an analogue of phenotypic plasticity in individuals. In theory, of course, a monoculture of trees might evolve to meet the challenges of a changing environment. But the generation times of trees are long and environmental changes can be rapid. Analogously, a diversity of populations of different species can allow a forest to "adapt" to a rapid change in climate. The component species will differ in their abilities to tolerate new environmental conditions and to migrate in response to them. A forest supporting a diverse mix of species whose abundance and distributions are able to shift in response to environmental change will be able to maintain forest cover better than a monoculture. So, while the level of diversity required to sustainably provide ecosystem services is not certain, the only conservative strategy is to assume it is high until proven otherwise since loss of diversity is usually irreversible.

EVALUATING POPULATION DIVERSITY

How does the biodiversity crisis look when viewed from the perspective of population diversity? We are presently conducting a detailed, technical analysis of the global distribution and abundance of distinct populations. Such a study is difficult because intraspecific variation has not been thoroughly investigated in temperate regions, and there is only sparse information from tropical areas in general, and from rainforests in particular. Furthermore, the groups known to be most speciose, the large orders of insects and in particular the beetles (Coleoptera), have been the subject of far fewer studies of geographic variation than much less species-rich groups such as the birds. In addition, extremely species-rich groups like the mites and nematodes remain essentially unstudied at the intraspecific level. The entire project necessarily involves considerable sampling and extrapolation error and, therefore, cannot be regarded as more than a first order assessment of a critical biological problem. We hope soon to have a reasonably comprehensive evaluation of what is known.

So far we have sampled the tropical African, the tropical South American, and the temperate North American mammal faunas, as well as numerous bird families in tropical South America and North America. Based on this sampling, we find that while species diversity declines as one moves toward the poles, the geographic range of each species, on average, appears to increase, following Rapoport's Rule. The average range of temperate zone species is between two and three times larger than that of their tropical counterparts. Thus there are almost certainly more populations (however defined) per animal species in temperate, subarctic, and arctic regions than in the tropics. At the moment it seems safe to say that biodiversity as a whole represents billions of populations.

In many parts of the world the extinction of populations, rather than of species, may be the most important facet of the decay of biological diversity. Therefore, consideration only of species extinctions may greatly underestimate the rate of loss of organic diversity as a whole. Although the rates of population and species extinction are related, at the moment it appears that extinctions of animal populations are, in proportion to species extinctions, more frequent in temperate and polar regions than they are in the tropics.

Our analysis suggests that the average extra-tropical species could suffer many more population extinctions before becoming threatened globally than could the average tropical species (see also Reid and Miller 1989). This would account for the relatively few species that have been observed to go extinct in temperate zone mainlands. Even after losing a substantial fraction of their populations, organisms like the gray wolf (*Canis lupus*), the brown bear (*Ursus arctos*), and the Machaon swallowtail (*Papilio machaon*) are in no danger of species extinction at present. Much attention in developed nations is focused on the disappearance of entire species, especially those living in distant tropical rainforests. Meanwhile, population extinctions are usually ignored in those same nations, where they are the most serious cause of the erosion of biodiversity (e.g., Ehrlich et al. 1992).

If species alone are considered, the rate of loss of diversity in the temperate zones may seem no cause for alarm. If, on the other hand, population extinctions are considered, then an entirely different picture emerges. This can be seen by considering the history of the butterfly fauna of Great Britain. Butterflies are perhaps the best single group of animals to use as indicators of ecosystem health. They are more closely tied to the plant community than vertebrates, and yet are "popular" enough with amateur naturalists so that for some areas quite accurate records of their populations through time are available. Great Britain is one such area.

The maps in the excellent *Atlas of Butterflies in Britain and Ireland* (Heath et al. 1984) show the distribution of 62 species, the entire butterfly fauna of the British Isles. Each map shows the "pre-1940" distribution, constructed from historical records over roughly the last century, and the distributions in the periods 1940-69 and 1970-82, the latter two derived from careful field records. The early records do not, of course, indicate the changes that occurred during the original deforestation of Britain. That act of human intervention almost certainly expanded the range of many British butterflies, since most temperate-zone butterflies prefer meadow and forest-edge habitats to forests themselves. At the same time it undoubtedly reduced populations of forest dwellers such as the purple hairstreak (*Quercusia quercus*), the speckled wood (*Pararge aegeria*), and the white admiral (*Ladoga camilla*). However, the response of the butterfly fauna to more recent events, especially changes in land management practices, has been dramatic and obvious. Paving over of habitat, drainage of marshes, replacement of deciduous woodlands with conifer plantations, treatment of pastures and heathlands with fertilizers and herbicides, increased use of synthetic insecticides, and perhaps even acid rain have contributed to a general decline of the butterfly fauna.

Four species have gone extinct in the last 140 years, the most recent being the large blue (*Maculinea arion*) in 1979. All four still are found on the European continent, where there are also populations of an additional 18 species that have suffered 'major contractions of range' (i.e., numerous population extinctions) in Britain. Six other species have contracted and then, to one degree or another re-expanded their ranges, and 34 others have maintained roughly the same distributions. Many of the latter "have declined in abundance within their ranges." Since those ranges are plotted on a grid of squares 10 km on a side, that means that many of the declines in abundance were caused by population extinctions (Erhardt and Thomas 1991). Such extinctions have also been documented at that scale in the butterfly *Euphydryas editha* (Ehrlich and Murphy 1987).

Looking at the overall picture in Britain gives little reason for cheer. More than six percent of the species in the historic butterfly fauna have already disappeared, and an additional 29 percent have suffered massive population extinctions. Many of the remaining species seem to be declining, but it is impossible to partition that decline between reduced numbers within populations (demographic units) and loss of entire populations. We must agree with Heath et al., (1984) who state: "There seems little prospect of maintaining sufficient habitats for many of our butterflies within our highly agricultural countryside, except in areas set aside for the purpose."

The existence of continental European populations of the same species that occur in Britain is also little reason for optimism, since conditions in much of Europe are moving in much the same direction as those in Britain. Experience of researchers from the Center for Conservation Biology in Spain, Greece, and Austria suggests that in those nations many species are surviving as scattered small populations in fragments of threatened habitat surrounded by vast areas of agricultural and other disturbance (Murphy and Ehrlich unpublished). Many populations (and probably many species) that may have existed in the once well-watered Mediterranean basin obviously have been gone since Roman times. The disappearance of lion and European bison populations from Europe was recorded, but the toll of less charismatic organisms that disappeared because of habitat destruction and alteration will never be known.

As illustrated by the decline in butterfly diversity,

Britain, and much of the rest of Europe, is now biologically depauperate; the trend that began with the biological destruction of the Mediterranean basin (e.g., Hughes 1975) in ancient times is continuing today. Much of temperate Asia, especially China, is in even worse condition. North America appears to be traveling the same course now. The avifauna serves as a sort of 'miner's canary,' signaling the state of habitats in both temperate North America itself and in Central and South American breeding grounds. The story is one of populations largely in decline. Physical habitat destruction and modification (including import of exotics into North America) is a prime factor in the decline of roughly 80% of the some 150 avian species and subspecies recognized as imperiled (Ehrlich et al. 1992) and is involved to one degree or another in the decline of about 90% of those and numerous other species not yet registered as imperiled.

The extinction of populations and the fragmentation of continuous habitat are closely related problems. However, the habitat fragmentation problem is approached primarily within the context of global species loss. While this is important, much greater attention should be given to the contribution of habitat fragmentation to population extinctions, both through the outright destruction of populations in the areas destroyed between the fragments and through the population extinctions that occur through faunal collapse within the fragment. [Instead of legislation in the form of the US Endangered Species Act, we need a habitat maintenance and restoration act that would give priority to habitat supporting globally endangered species, but would also offer protection to all habitat types.] The conservation goal should be the preservation of a minimum ratio of natural to human-dominated habitat in all regions. This is the way to maximize the benefits from biodiversity.

THE ECONOMICS OF PRESERVATION

There is a substantial and growing literature on the economics of the preservation of species (e.g., Ciriacy-Wantrup 1968, Bishop 1978, 1979, IUCN 1980, Randall 1986, Tisdell 1990) that, while well-meaning, is to us unsatisfactory. First of all, for the vast majority of (if not all) species, the social uncertainties in future values imputed to the species and the biological uncertainties in what is required to preserve them are overwhelming. On one hand, for example, only a few percent of vascular plant species have been screened reasonably carefully for just one of the most biologically active (and useful) groups of compounds, the alkaloids. On the other hand, the problems of determining what is required to maintain minimum viable populations of species are at present essentially intractable (e.g., Soulé 1987), especially when one considers the increasing probability of rapid global change (Ehrlich and Ehrlich 1981).

Thus benefit-cost or safe minimum standard (minimax loss or minimax regret) analyses (Tisdell 1990) are unlikely to be useful. In fact, detailed economic evaluations of the pros and cons of conserving any single species is almost certain to be an exercise in "crackpot rigor" (detailed mathematical analysis of an intractable problem) or "suboptimization" (doing in the very best way something that should not be done at all). It is, indeed, depressing to see some of the exercises undertaken in this cause (see discussion in Ehrlich 1992b, Daily 1992). Much the same can be said of analyses of the loss of populations, since to all the uncertainties inherent in the species problem must be added those involved in determining the uniqueness of the population, the probability of the loss being reversible, and the impact of the loss on the probability of the entire species going extinct.

Perhaps the solution to this dilemma is for both ecologists and economists to focus upon the overall values of ecosystems, and otherwise eschew evaluations of the costs and benefits of extinction. Ecosystems are the units that provide most of the services to humanity, and that maintain the genetic library that supplies the rest. Populations of species in ecosystems can be considered analogous to rivets in an airplane wing; some species are more critical than others in maintaining the present functions of the system, but the continued deletion of populations, like the prying of rivets from a wing, will eventually lead to collapse.

Both the present great uncertainties in how much biodiversity is required to maintain humanity's life support systems and the irreversibility of any mistakes call for an extremely conservative approach. The burden of proof (cf. Tisdell 1990) should be shifted to those who promote the loss of biodiversity for short-term gains. In addition, economists should focus on strategies to monetize the known values of ecosystem services so that ways can be found to internalize them.

Policies such as "no net loss of wetlands" sound good, but are open to very abusive practices, including redefinition of wetlands to suit the desires of developers (as recently occurred in the United States) and substitution of relatively depauperate, restored wetlands for undisturbed wetlands. When humanity corporately starts working toward a goal of "no further development of rel-

atively undisturbed areas and restoration of degraded ecosystems," then we believe the level of caution consistent with the long-term interests of individuals and society will have been achieved. It will indicate, at long last, that the oxymoron of "sustainable growth" will have been expunged from the human vocabulary.

CONCLUSIONS

The great emphasis given to the issue of species extinction is in part an historical artifact. Important as is the loss of species, it should not obscure the intimately related and equally important problem of the extinction of populations. The health of the human economic system depends as much or more on the maintenance of population diversity as it does on the maintenance of species diversity. We do not know how much population and species diversity can be lost without severely impairing ecosystem services, and we may never know. The best policy guideline remains the "rivet popper" analogy (Ehrlich and Ehrlich 1981). Society should no more assume abundant functional redundancy among populations and species and exterminate them *ad lib* than a pilot should pop rivets from the wing of an aircraft and sell them based on a similar redundancy assumption. Any other assumption amounts to taking a gigantic gamble with the future of civilization. ▌

Gretchen C. Daily is Bing Interdisciplinary Research Scientist at Stanford University. Paul R. Ehrlich is Bing Professor of Population Studies and professor of biological sciences at Stanford University.

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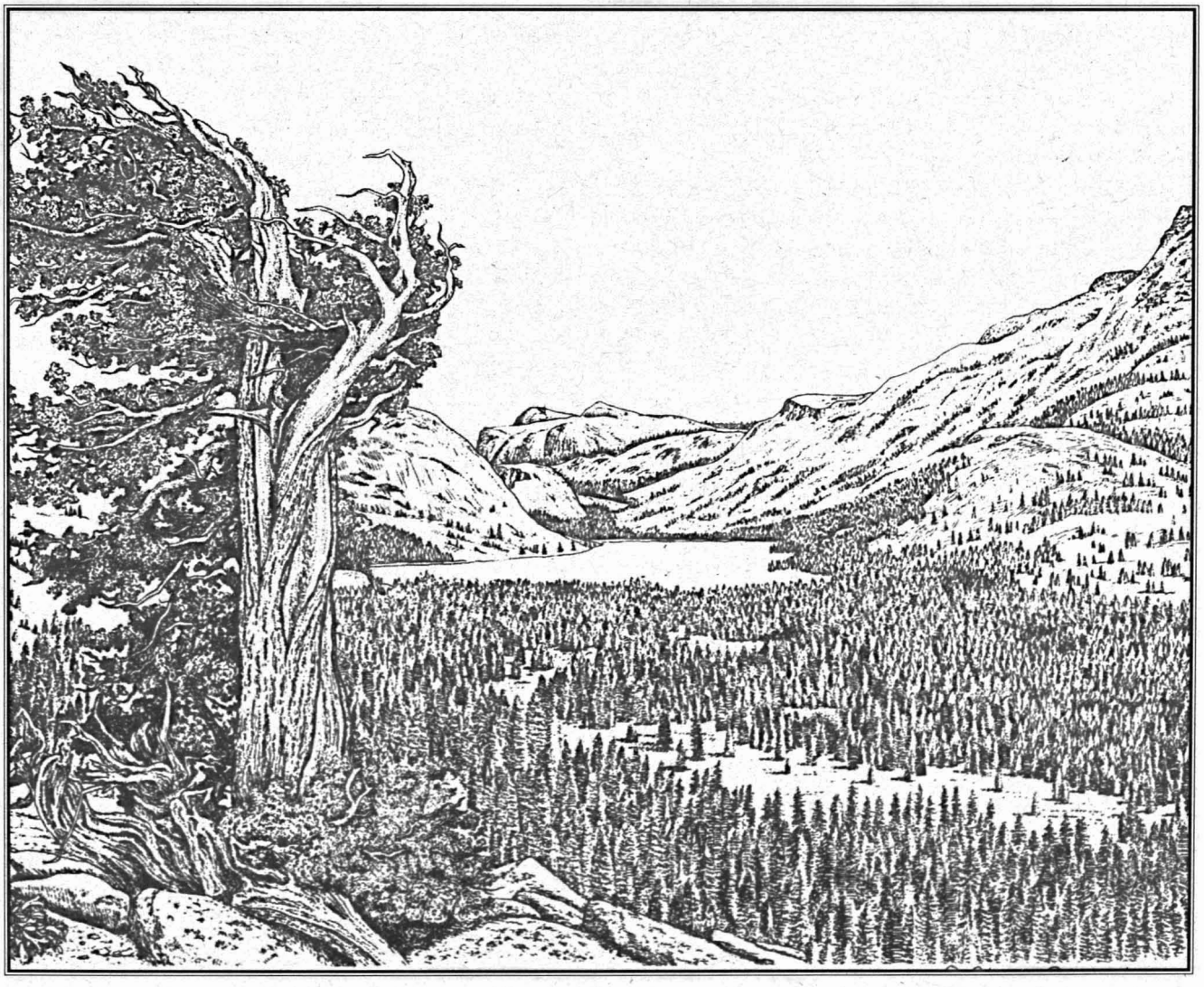


illustration by Claus Sievert

References

Anon. 1992a. Enklare fiskebestämmelser, Jordbruksdepartementet, Ds 1992:70, Stockholm.

Barnes, R.D. 1989. Diversity of Organisms: How Much Do We Know? American Zoologist 29: 1075-84.

Bishop, R.C. 1978. Endangered Species and Uncertainty: The Economics of a Safe Minimum Standard, American Journal of Agricultural Economics 57: 10-18.

Blockstein, D.E. and Tordoff, H.B. 1985. Gone Forever: A Contemporary Look at the Extinction of the Passenger Pigeon, American Birds 39: 845-851.

Brown, I. and Ehrlich, P. 1980. Population Biology of the Checkerspot Butterfly Euphydryas chalcedona, Structure of the Jasper Ridge Colony, Oecologia 47: 239-251.

Brown, W.L. 1959. Some Zoological Concepts Applied to Problems in the Hominid Lineage, American Scientist 46: 151-158.

Brundtland. 1987. World Commission on Environment and Development. Our Common Future, Oxford University Press.

Ciriacy-Wantrup, S.V. 1968. Resourse Conservation: Economics and Policies, University of California Press, Berkeley.

Daily, G.C. 1992. Accounting for Uncertainty in Natural Systems, Paper presented at the International Society for Ecological Economics Conference, Stockholm, 30 July-2 Aug 1992.

Daily, G.C. and Ehrlich, P. 1993. How Many Populations Are There? Stanford University, mimeo.

Daily, G.C., Ehrlich, P., and Haddad, N.M. 1993. A Double Keystone Bird in a Keystone Species Complex, Proc. Nat. Acad. Sci. 90:592-594.

Dolinger, P., Ehrlich, P., Fitch, W., and Breedlove, D. 1973. Alkaloid and Predation Patterns in Colorado Lupine Populations, Oecologia 13: 191-204.

Ehrlich, P.R. 1961. Has the Biological Species Concept Outlived its Usefulness? Systems Zoology 10: 167-176.

Ehrlich, P.R. 1992a. Population Biology of Checkerspot Butterflies and the Preservation of Global Biodiversity, Oikos 63: 6-12.

Ehrlich, P.R. 1992b. Ecological Economics and the Carrying Capacity of Earth. In Jansson, A.M., Hammer, M., Folke, C. and Constanza, R. (eds.) Investing in Natural Capital, The Ecological Economic Approach to Sustainability, Island Press, Washington, DC: 38-56.

Ehrlich, P.R. 1993. Biodiversity and Ecosystem Function: Need We Know More? In Schulze, D. and Mooney, H. (eds.) Biodiversity and Ecosystem Function, Springer-Verlag, Heidleberg: vii-xi.

Ehrlich, P.R., Dobkin, D. and Wheye, D. 1992. Birds in Jeopardy: The Imperiled and Extinct Birds of the United States and Canada Including Hawaii and Puerto Rico, Stanford University Press, Stanford CA.

Ehrlich, P.R. and Ehrlich, A. 1981. Extinction: The Causes and Consequences of the Disappearance of Species, Random House, New York.

Ehrlich, P.R. and Ehrlich, A.H. 1992. The Value of Biodiversity, Ambio 21: 219-226.

Ehrlich, P.R. and Feldman, S. 1977. The Race Bomb: Skin Color, Prejudice, and Intelligence, New York Times Books, New York.

Ehrlich, P.R. and Holm, R. 1964. A Biological View of Race. In Montagu, A. (ed.) The Concept of Race, Free Press, New York.

Ehrlich, P.R. and Murphy, D. 1987. Conservation Lessons from Long Term Studies of Checkerspot Butterflies, Conservation Biology 1: 122-131.

Ehrlich, P.R. and Raven, P. 1969. Differentiation of Populations, Science 165: 1228-1232.

Eisner, T. 1992. Testimony before the Subcommittee on Environmental Protection of the Senate Committee on Environment and Public Works, on the Occasion of Hearings on Reauthorization of the Endangered Species Act, April 10.

Erhardt, A. and Thomas, J.A. 1991. Lepidoptera as Indicators of Change in the Semi-Natural Grasslands of Lowland and Upland Europe. In Collins, N.M. and Thomas, J.A. (eds.) Conservation of Insects and Their Habitats, Academic Press, San Diego: 213-236.

Erwin, T.L. 1982. Tropical Forests: Their Richness in Coleoptera and other Arthropod Species, Coleoptera Bulletin 36: 74-75.

Erwin, T.L. 1983. Tropical Forest Canopies, the Last Biotic Frontier, Bulletin Entomological Society America 29: 14-19.

Erwin, T.L. and Scott, J.C. 1980. Seasonal and Size Patterns, Trophic Structure, and Richness of Coleoptera in the Tropical Arboreal Ecosystem: the Fauna of the Tree Luehea Seemannii Triana and Planch in the Canal Zone of Panama, Coleoptera Bulletin 34: 305-322.

Folke, C. 1991. Socioeconomic Dependence on the Life-Supporting Environment. In Folke, C. and and Kåberger, T. (eds.) Linking the Natural Environment and the Economy: Essays from the Eco-Eco Group, Kluwer Academic Publishers, Dordercht.

Gilbert, A. 1990. Natural Resource Accounting: A Case Study of Botswana. In Dixon, J.A., James, D.E. and Sherman, P.B. (eds.) Dryland Management: Economic Case Studies, Earthscan, London.

Gilbert, L.E. 1980. Food Web Organization and the Conservation of Neotropical Diversity. In Soulé, M.E. and Wilcox, B.A. (eds.) Conservation Biology, Sinauer, Sunderland, M.A.: 11-33.

Hammond, P.M. 1992. Species Inventory. In Groom-bridge, B.(ed.) Global Diversity: Status of the Earth's Living Resources, Chapman and Hall, London: 17-39.

Heath, J., Pollard, E. and Thomas, J. 1984. Atlas of Butterflies in Britain and Ireland. Viking, New York.

Hughes, J.D. 1975. Ecology of Ancient Civilizations, University of New Mexico Press, Albuquerque NM.

International Union for the Conservation of Nature (IUCN), 1986. Tradition, Conservation and Development. Occasional Newsletter of the Commision of Ecology's Working Group on Traditional Ecological Knowledge, 4, Gland.

Masters, J. and Spencer, H. 1989. Why We Need a New Genetic Species Concept, Systematic Zoology 38: 270-279.

May, R.M. 1988. How Many Species are There on Earth? Science 241: 1441-1449.

Mayr, E. 1970. Populations, Species, and Evolution: An Abridgement of Animal Species and Evolution, Harvard University Press, Cambridge MA.

Myers, N. 1983. A Wealth of Wild Species, Westview Press, Boulder.

Myers, N. 1984. The Primary Source, Norton, New York.

Ornstein, R. and Ehrlich, P. 1989. New World/New Mind: Moving Toward Conscious Evolution, Doubleday, New York.

Paine, R.T. 1980. Food Webs: Linkage Interaction Strength and Community Infrastructure, Journal of Animal Ecology 49: 667-685.

Patterson, C. 1982. Classes and Cladistics or Individuals and Evolution, Systematic Zoology 31: 284-286.

Pimm, S.L. and Gittleman, J.L. 1992. Biological Diversity: Where Is It? Science 255: 940.

Population Reference Bureau. 1992. Washington, DC.

Randall, A. 1991. Total and Nonuse Values. In Braden, J.B. and Kolstad, C.D. (eds.) Measuring the Demand for Environmental Quality, Amsterdam, North Holland: 303-322.

Reid, W.V. and Miller, K.R. 1989. Keeping Options Alive: The Scientific Basis for Conserving Biodiversity, World Resources Institute, Washington DC.

Saunders, D.A., Hobbs, R.J. and Margules, C.R. 1991. Biological Consequences of Ecosystem Fragmentation: A Review, Conservation Biology 5: 18-32.

Scott, J.M., Csuti, B., Jacobi, J.D. and Estes, J.E. 1987. Species Richness: a Geographic Approach to Protecting Future Biological Diversity, BioScience 37: 782-788.

Soulé, M.E. (ed.) 1987. Viable Populations for Conservation, Cambridge University Press, Cambridge.

Soulé, M.E. 1991. Conservation: Tactics for a Constant Crisis, Science 253: 744-750.

Stork, N.E. 1988. Insect Diversity: Fact, Fiction, and Speculation, Biological Journal of the Linnean Society 35: 321-37.

Stork, N.E. 1993. How Many Species are There? Biodiversity and Conservation 2: 215-232.

Tisdell, C. 1990. Economics and the Debate about Preservation of Species, Crop Varieties and Genetic Diversity, Ecological Economics 2: 77-90.

Wiley, E.O. 1981. Remarks on Willis' Species Concept, Systematic Zoology 30: 86-87.

Willis, E.O. 1981. Is a Species an Interbreeding Unit , or an Internally Similar Part of a Phylogenetic Tree, Systematic Zoology 30: 84-85.

Wilson, E.O. 1989. Threats to Biodiversity, Scientific American 261: 60-66.

Wilson, E.O. and Brown, W.L. 1953. The Subspecies Concept and its Taxonomic Application, Systems Zoology 2: 97-116

TROUBLE AND OPPORTUNITY IN PARADISE

Population Growth and Conservation in Florida

by Steve Gatewood

In nature there are neither rewards nor punishments—only consequences.

—Robert Ingersoll

The state of Florida, a unique peninsula extending from a temperate land mass into subtropical ocean waters, is a land of ecological riches. From eastern deciduous forests and pine savannas of the northern highlands, through subtropical palmetto prairies and Everglades wetlands of the southern lowlands, to tropical hammocks and coral reefs of the Keys, Florida supports a stunning variety of flora and fauna, much of which is endemic to the state.

Because of its balmy climate, long sandy coastline, and lush natural environment, it has also been subject to extraordinary population growth. Although the Native American population was relatively large and diverse, it was systematically eliminated through colonization. Since establishment of the first permanent European settlement in the US in 1565, population grew slowly until the early 1900s. The real boom has come in the last 60 years and Florida is now the third most populous state.

So how do millions of people affect paradise? Clearly the direct impacts from conversion of land for human use have been substantial. Florida has several of the nation's most imperiled natural communities and a disproportionately high number of federally listed threatened and endangered species. In another sense however, the very presence of these people has precipitated the creation of the most aggressive land acquisition and resource conservation program in the country. People are the cause of Florida's environmental problems, but their willingness to support programs and spend money to protect natural resources has been unprecedented.

PARADISE LOST

At the time of initial exploration during the early 1500s, there existed a fairly large population of Native Americans in local tribes spread throughout the state, but concentrated near the coastline, on rivers and lakes, and on the fertile red clay soils of the north-central highlands. Rapidly decimated by disease and genocide, not a single known representative of the original Florida tribes remains. Even the well known Seminole Indians are fugitives from persecuted tribes farther north that arrived as early as the 1700s and ultimately were driven into the dense forests and wetlands of extreme south Florida.

Settlement by colonists was steady, but initially very slow. Estimated at around only 500,000 residents in 1900, the population grew to roughly 1.7 million by 1936. Most of these people lived in the coastal towns of central and north Florida: Tampa, Jacksonville, Pensacola. Some were attracted to south Florida; Miami and the southeast coast, with a population of just 22,000 in 1900, was subject to boom and bust land speculation. The area's population swelled to over 250,000 by 1936.

World War II, air conditioning, and mosquito control all combined to really kick population growth into high gear. Because of its favorable year-round climate, many new military installations were built for the war. Large numbers of military personnel were trained in or shipped through the state and found that they liked it there.

Retirees and people with health problems were also "discovering" the benefits of south Florida's subtropical climate. Mosquito control made life outside bearable in the evening, and air conditioning provided daytime respite from the summer heat and high humidity. The result was a steadily increasing influx of people; by the early 1980s, net population growth averaged 900 per day. It has since dropped back to around 750 per day, but the statewide population surpassed 14 million by 1995.

To accommodate this alarming rate of growth (roughly equivalent to adding two new Talahassees to the state each year), 19 acres of forest or farmland are cleared and an additional 4,500 gallons of water are consumed, every hour. By the year 2000, almost 15 million people are projected to reside in the state, and like the indigenous peoples before them, the new Floridians want to live near the water. Almost 90% of the population lives within 25 miles of the coast or near a lake or river. In the ten year period between 1970 and 1980, coastal counties increased their populations by 44%, the highest rate in the US. Tourists and snowbirds (winter season residents) also contribute substantially to the mass of humanity. Although the exact number of seasonal residents is unknown, some portion of them are counted in the 40+ million tourists and visitors to the state each year.

The natural environment continues to attract residents and tourists alike. Of the 41 million tourists tallied in 1990, 12.9 million

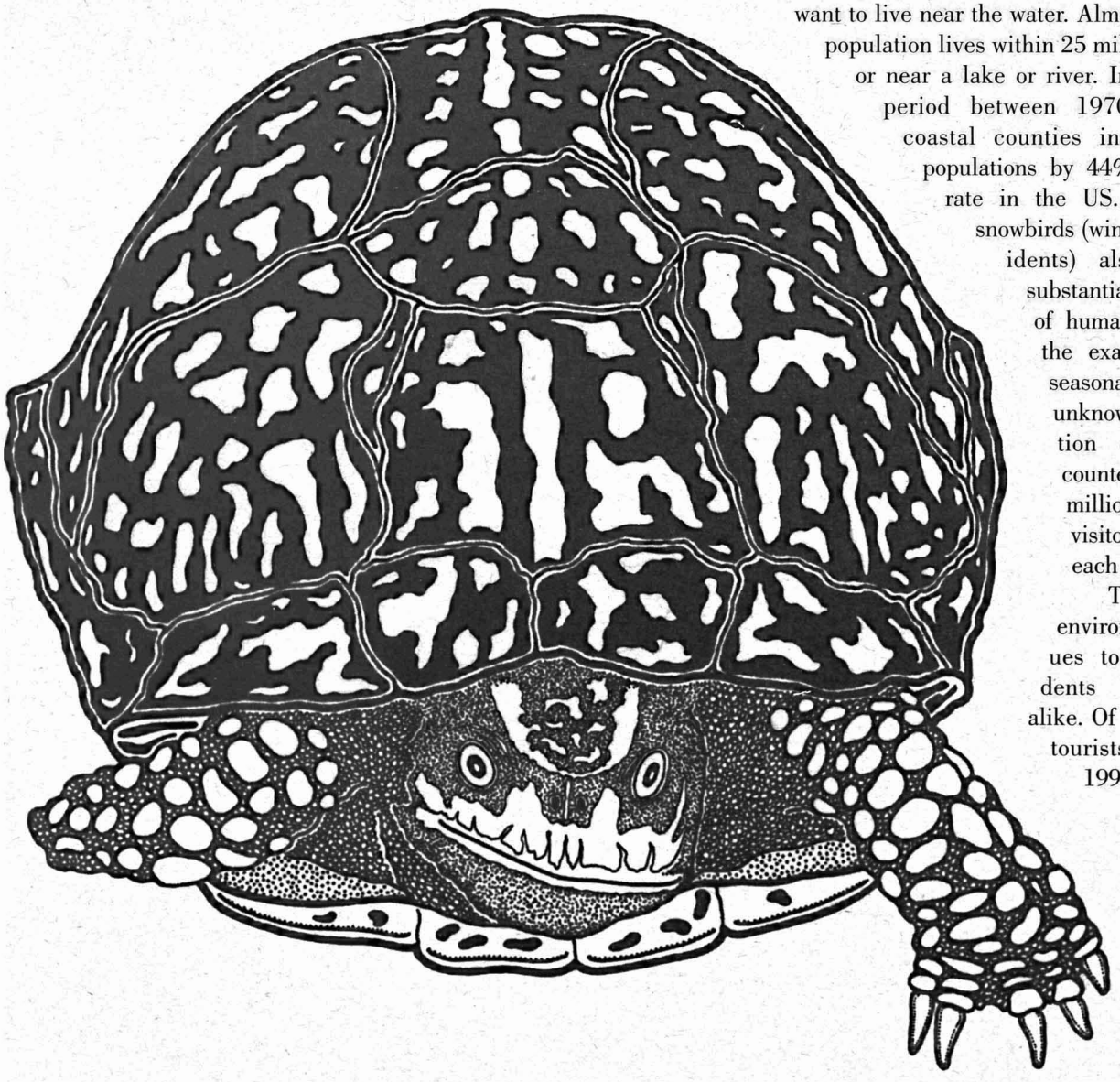


illustration by Rob Messick

visited state parks, and over 8 million visited national parks, seashores and monuments. But impacts of population growth and associated development (urban areas grew to 4.6 million acres by 1990) have devastated many natural communities and species. Wetlands and longleaf pine forests illustrate the magnitude of these impacts (Figure 1).

Florida's estimated 20.3 million acres of original wetlands covered over 54% of the state's surface area. By 1980, the US Fish and Wildlife Service determined 9.3 million acres (46%) had been lost, more acreage than any other state. Marshland alone dropped from just over 7 million to just under 3 million acres. Of the remaining 11 million wetland acres, over half have been severely degraded by partial drainage, polluted runoff, or other activities in their surrounding watershed. Although ostensibly protected by federal and state regulation for several decades, thousands of acres continue to be lost each year.

Longleaf pine forests accounted for around 45% of all upland forested communities in 1936. Over a period of 50 years, the area of natural longleaf pine forest declined from 7.6 million acres to just 0.95 million, an 88% decrease. (A substantial but unmeasured amount of longleaf pine was also lost prior to 1936.) In addition to replacement by urban and agricultural land uses, large areas of natural forest have been converted to slash pine tree farms. Upland forested communities have no form of regulatory protection.

As if the direct conversion of natural lands were not enough (15.4 million acres of urban, agricultural and pasture land created by 1980), the indirect effects of human occupation at the magnitude Florida supports have been just as serious. Exotic species invade many natural areas, especially aquatic communities, and slowly destroy them from the inside. Extensive and prolonged groundwater pumping for domestic, industrial, and agricultural use lowers regional groundwater tables with resultant shifts in ecosystem composition, structure, and function—drought from below in a climate with an average 55" of rain each year. And from above, acid rain and air pollution move across the landscape with negative long-term impacts, some known and some unknown, on the state's native biodiversity.

PARADISE REDISCOVERED

As this intensive level of development progressed, residents and visitors began to notice that, other than the weather, the very things that attracted them to the state were being lost. Beaches were being developed, natural areas cleared, wetlands drained, waters polluted, wildlife habitat destroyed, and the overall environmental quality of the state's ecosystems degraded.

As early as the 1920s, scientists were exposing the catastrophic effects of routine development on this subtropical paradise. In 1929, John Kunkle Small, a renowned photographer and botanist with the New York Botanical Garden, produced a small book on the destruction of the Everglades and southeast Florida coast. *From Eden to Sahara: Florida's Tragedy* chronicled the accelerating drainage and development of the Miami region and documented it with before and after photographs of many well known locations.

Another milestone came in 1945 with publication of *Everglades: River of Grass* by Marjorie Stoneman Douglas. A writer with the Miami Herald, Douglas was able to weave lyric prose about the natural world with biting commentary on the ecologically illiterate people trying to subdue it. It was fitting that the Everglades ecosystem became the centerpiece of initial Florida conservation efforts for it was being strangled by urbanization from Miami/West Palm Beach on the east, water management associated with the massive Central and Southern Florida Flood Control Project to the north, and agricultural development to the west. In their campaigns to protect the Everglades and Florida Bay to the south, conservationists were faced with a microcosm of most of the ailments affecting the environment (with the exception of industrial forestry).

From these initial Everglades concerns, awareness and interest spread to

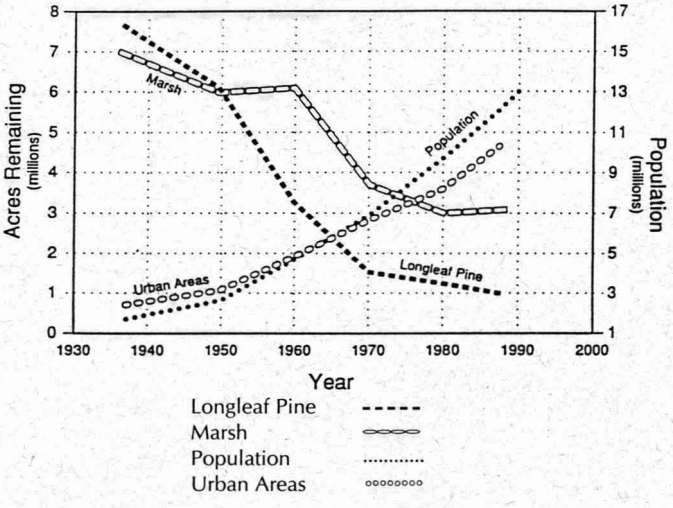


Figure 1 **Florida Trends: 1930 to 1990**

ecosystems and natural areas throughout the state. Loss of wetlands and other natural areas, availability of water (too much or too little), and declining wildlife populations (game and endangered species) were the three primary factors around which advocacy for environmental action began to converge. As threats to the environment intensified with population growth, outdoor recreationists, hunters and fishermen, conservationists, scientists, and resource management staff began to alert the public to the rate at which resource destruction was occurring. Since the losses were tied to population issues, it was easy to generate concern because of the extraordinary population growth through the 1950s, 60s and 70s.

Two massive water resources public works projects designed to foster more growth actually sparked coordinated conservation efforts—the Cross Florida Barge Canal and channelization of the Kissimmee River. The barge canal, conceived during WWII to protect allied shipping, was gearing up in the late 1960s to dredge a canal across the middle of the state. It would gut the Ocklawaha and Withlacoochee Rivers and intercept groundwater aquifers of the central ridge, through which it would cut. Channelization of the Kissimmee river was completed in 1970, turning a 105 mile meandering river with 56,000 acres of floodplain wetlands into a 36 mile ditch with 12,000 acres of impoundments. Each of these projects received statewide and national attention. Something had to be done. Public sentiment against these and other assaults on the natural environment began to grow, and politicians knew it.

PARADISE PROTECTED

Starting in 1972, landmark environmental legislation was passed to protect water resources, initiate growth management planning, and protect land through acquisition and enhanced regulatory programs. Included was the Florida Land Conservation Act, "which shall have as its purpose the conservation and protection of environmentally unique and irreplaceable lands as valued ecological resources of the state." Later that year, the *voters* approved a $240 million bond referendum to fund the program. Over the next 18 years, several new initiatives were passed, including:

- Save Our Rivers—around $30 million per year
- Save Our Coasts —$200 million one-time bond issue
- Save Our Everglades—a portion of existing programs
- Conservation and Recreation Lands—around $40 million per year
- 13 counties passed local bond referenda—$350 million total

By 1989, after spending in excess of $500 million on land acquisition, a survey found that 88% of Floridians believed that state government should give more attention to the environment and 63% favored spending more money on environmental protection.

illustration by Patrick Dengate

This public support set the stage for passage of the Preservation 2000 program in 1990. Conceived and designed by The Nature Conservancy of Florida, and initially publicized in a report from the Commission on the Future of Florida's Environment, this creative proposal was further promoted in the unsuccessful reelection campaign of one of the few Republican governors ever elected in the state. Under P-2000, a total of *$3 billion* would be allocated over 10 years to *supplement* existing land acquisition programs. It would be paid for through bonds and would require approval of annual appropriations of $300 million from the legislature. Although most state agencies had experience purchasing conservation lands, they recognized that this opportunity was different. In order to strategically invest these larger amounts of money for maximum ecological benefit, they would need to carefully focus their process of project identification, evaluation and approval.

As part of a "needs assessment" for P-2000, a small team of 43 biologists, land managers, and other technical specialists convened a mapping workshop in 1991 to identify priority conservation lands that should be protected with the land acquisition funds. This group went a step further and drafted a map of Ecological Resource Conservation Areas that represented a conceptual statewide reserve design of ecologically significant natural areas and associated landscape linkages. The resulting proposal (Figure 2) advocated the addition of 3.17 million acres to the existing 8.02 million acres of public land. An additional 6.28 million acres were identified as areas of conservation interest where conservation easements, tax incentives, zoning, regulation, or acquisition should be used to maintain natural resource values. In all, approximately 46% of the state was identified as worthy of protection in order to maintain a healthy "green infrastructure."

Since 1991, several other projects have been completed that refine the specifics of a conservation reserve network. The state Game and Freshwater Fish Commission produced "Closing the Gaps in Florida's Wildlife Conservation System" and the appointed Florida Greenways Commission

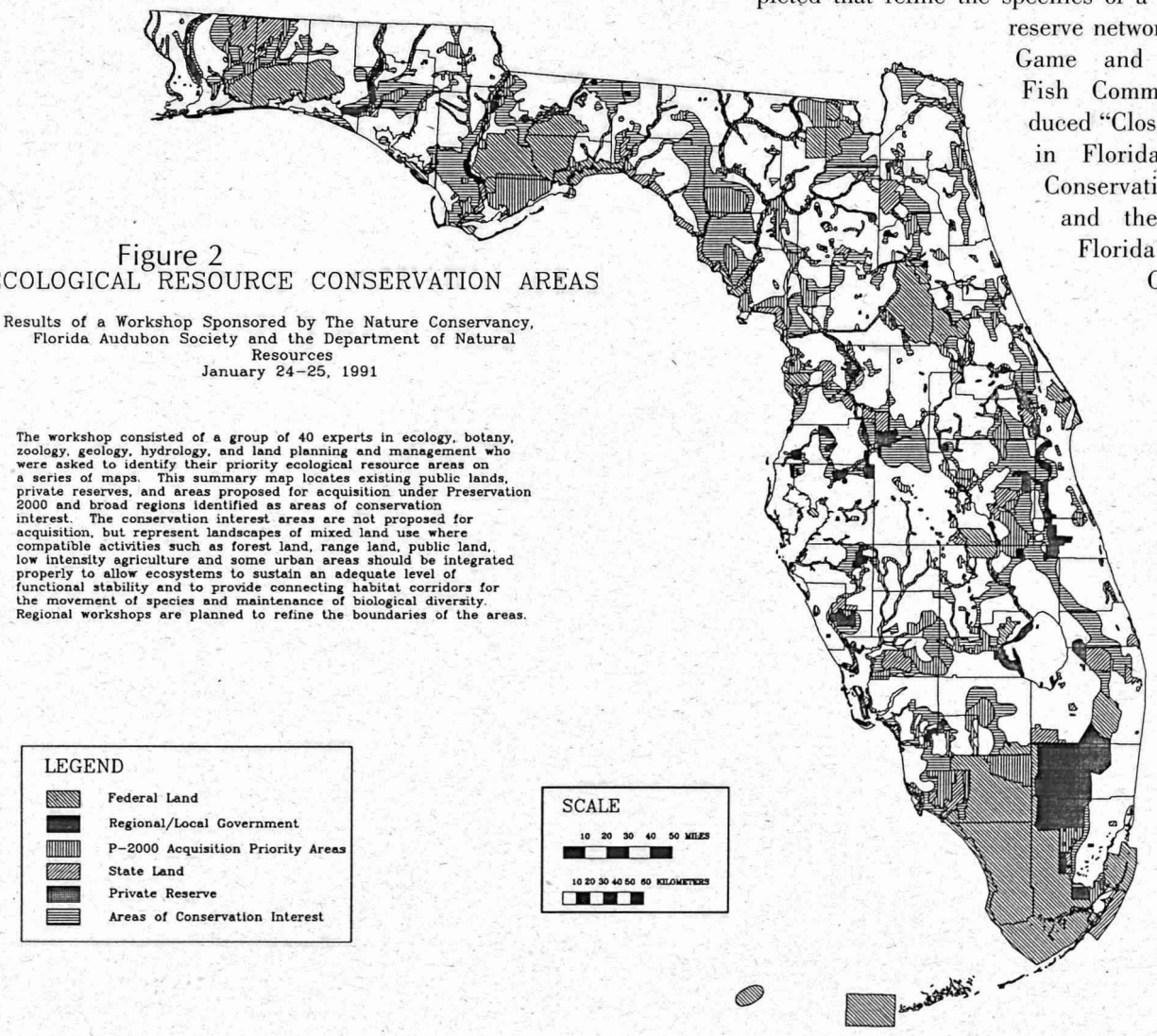


Figure 2
ECOLOGICAL RESOURCE CONSERVATION AREAS

Results of a Workshop Sponsored by The Nature Conservancy, Florida Audubon Society and the Department of Natural Resources
January 24–25, 1991

The workshop consisted of a group of 40 experts in ecology, botany, zoology, geology, hydrology, and land planning and management who were asked to identify their priority ecological resource areas on a series of maps. This summary map locates existing public lands, private reserves, and areas proposed for acquisition under Preservation 2000 and broad regions identified as areas of conservation interest. The conservation interest areas are not proposed for acquisition, but represent landscapes of mixed land use where compatible activities such as forest land, range land, public land, low intensity agriculture and some urban areas should be integrated properly to allow ecosystems to sustain an adequate level of functional stability and to provide connecting habitat corridors for the movement of species and maintenance of biological diversity. Regional workshops are planned to refine the boundaries of the areas.

produced "Creating a Statewide Greenways System." Several others are currently underway. By 1995, the state had cumulatively spent in excess of $1.5 billion to purchase more than 975,000 acres, laying the public land foundation of these conservation reserve networks.

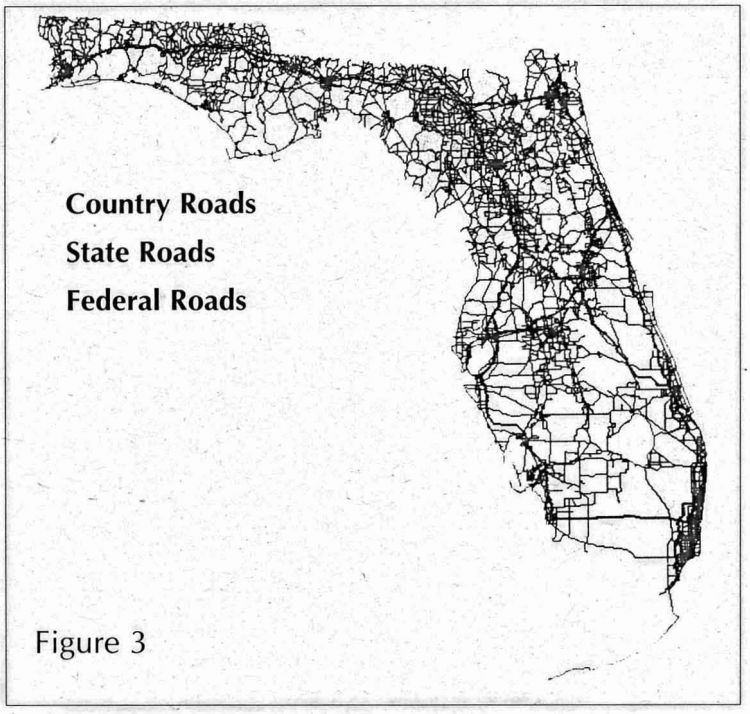


Figure 3

THE FUTURE OF PARADISE

Even with aggressive land acquisition and resource conservation programs, Florida may be unable to adequately protect its ecological integrity. Already, the vast majority of the state has some level of disturbance. Probably less than 100,000 acres of old growth or undisturbed habitat exists, about 0.2% of the state. Most large predators have been eliminated and the rest reduced to tiny, isolated populations. Continued alterations to surface and groundwater hydrology affect natural systems on a regional scale. Ecological processes like natural fire regimes and nutrient cycling have been disrupted.

Figure 3 shows the major transportation network in 1990. Fragmentation and isolation of habitat patches are significant and increase with growth, such that only a few opportunities remain to create core reserves greater than 250,000 acres. And most threatening of all, if the existing homesite lots platted and approved in county growth management plans are ever occupied, Florida would have a population in excess of *90 million* people. Hopefully long before that level is reached, politicians will implement effective controls on growth. If not, resource limitations such as water availability should cap the human population well below that number. But the damage to Florida's already tattered natural heritage from even one-quarter of that number would likely be devastating beyond restoration.

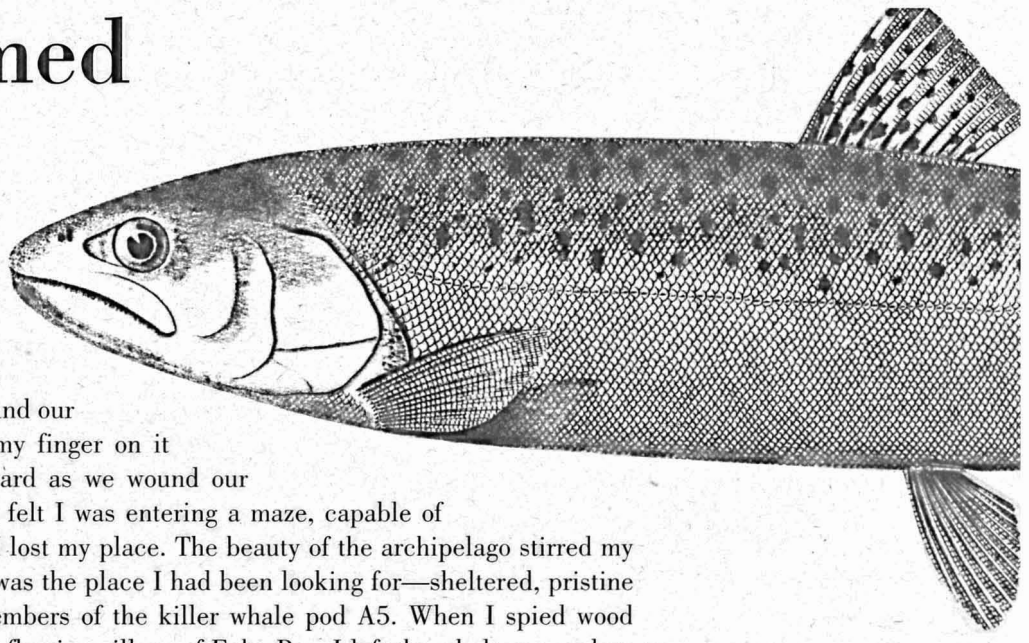
The future lies with the very people who are the problem. They have demonstrated their interest in and dedication to environmental protection in the past and will probably continue to do so. This enlightened constituency has supported, and often demanded, wildlife underpasses on I-75 and other road reconstruction projects; an ecosystem level mitigation program for wetlands impacts; habitat protection for endangered species; protection for remaining large predators and reintroduction of extirpated ones; and aggressive land acquisition programs.

Population growth and associated development is the number one threat to species, ecosystems, and ecological processes in Florida and throughout North America. Until social, political, or other systems are in place to adequately manage growth, we must cultivate any and all who would offer protection to natural systems. Only time will tell if we started soon enough and can turn things around, or if we are so far down a black hole of growth that the world we leave our children is one they accept from us with bitterness instead of thanks. ❙

Steve Gatewood, before becoming executive director of The Wildlands Project (1955 West Grant Rd., Suite 148A, Tuscon, AZ 85745), was the protection ecologist for The Nature Conservancy, capping a 25 year career working on natural resources identification, protection, management, and restoration projects in Florida.

Salmon Weren't Meant to Be Farmed

by Alexandra Morton



The rain fell heavily as I followed the Orcas into the narrow channel. I found our place on the chart, placed my finger on it and carefully inched it forward as we wound our way deeper into the inlets. I felt I was entering a maze, capable of swallowing me up forever if I lost my place. The beauty of the archipelago stirred my soul, and I fell in love. This was the place I had been looking for—sheltered, pristine waters frequented by the members of the killer whale pod A5. When I spied wood smoke curling above the tiny floating village of Echo Bay, I left the whales to explore the possibilities of living there. Thirteen years later, I would never choose Echo Bay in the Broughton Archipelago to study whales, because there are none.

I spent my first three years in Echo Bay following whales through silent waters as they pursued their way of life. The inlets were a place for them to feed and sleep. I listened for their calls 24 hours a day through an underwater microphone and a speaker in my house. Several times a month their calls shook the walls and rattled the windows. Then in 1987, a curious new structure appeared in tow behind a small tug boat. It was the first salmon farm.

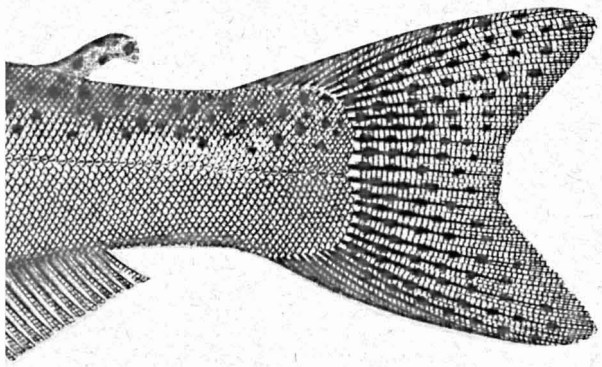
The farm looked benign and promised new jobs and families. The occasional arrival of new families is important to our community because its tiny population of less than 50 is barely enough to keep the one-room school open. Very quickly, though, more farms appeared, some in prime salmon and prawn habitat. Government guidelines had promised those areas would be kept farm-free, and the first shadows of doubt crept over the community. Then the epidemics began.

In 1990, chum salmon appeared leaping wherever you cast an eye, but never made it the few short miles to their spawning grounds. Salmon farms on their migration route had a "problem" with bacterial kidney disease, to which chums are highly susceptible. In 1991, the same company stocked their pens with Scottish Atlantic salmon infected with furunculosis. That fall wild coho salmon returned with the disease. Nearby a small enhancement hatchery lost 28% of its broodstock before the remaining fish could be medicated.

In 1993, another company stocked their pens with Atlantics infected with furunculosis, but this time the strain was resistant to all antibiotics approved for use in British Columbia salmon farms. The disease spread in the currents, infecting another farm within days. Both farms were located in chinook salmon rearing grounds. That spring the local chinook population crashed across all age classes; they have not returned. Over-fishing and habitat destruction deplete successive generations, but disease can kill all ages simultaneously.

Chinook salmon

In addition, prawn fishermen found their traps placed near salmon farms devoid of prawns or other life; such traps often became fouled with a stinking ooze. Gunfire became common and the corpses of seals, Steller's sea lions, birds, and otters floated away from farms. When the waters turned red one summer, a



neighbor felt his face go numb while spraying his boat. I sent a sample away for identification and we learned it was the first recorded bloom in the archipelago of the toxic algae Heterosigma. It has become an annual event.

Fishermen reported increasing catches of Atlantic salmon. Gill-netters found sockeye salmon on one side of their nets heading inshore to their rivers and Atlantics on the other side headed out to sea. Sport fishermen began catching Atlantics throughout BC rivers, and Alaskan fishermen found them among their catches even though Alaska has banned salmon farms.

Fish biologists warn that introducing non-indigenous salmon can destroy native populations. The relationship between a salmon and its river is as finely tuned as a key to a lock. Add a competing exotic species and that relationship begins to erode. Hundreds of thousands of Atlantic salmon are put in pens in the Pacific Ocean annually and thousands escape every year, amounting to "biological insanity." The threat of importing an exotic parasite or pathogen increases with every Atlantic entering the Pacific.

Unfortunately, using local stocks is no better. When local stocks are domesticated, their escape and mixing causes irreversible genetic damage to their wild cousins. Norway is collecting sperm of the last wild fish, because so many escaped farm fish are blundering along their coast that genetic swamping threatens to effectively eliminate native stocks.

In an effort to keep seals away, farmers are broadcasting louder and louder sounds, capable of damaging marine mammal ears. As a result, several species of whales that formerly foraged in the Broughton Archipelago no longer do. Dispersing whales in this manner violates the Canadian Fisheries Act. Consequently, I decided the government must not be aware of the broad ecological damage of salmon farms, so I compiled information from the hatchery, fishermen, and my own database on declining whale presence and sent it to the federal Department of Fisheries and Oceans. They denied responsibility and sent me to another level of government, which in turn headed me off in another direction. I soon discovered salmon farming is a political hot potato. No one wanted responsibility for what was becoming painfully evident: Salmon farms, under current management, are threatening the entire BC coast.

As I reviewed the scientific literature on the industry, I found that my observations were common to coasts everywhere salmon are farmed. Salmon farms are considered responsible for destruction of the beloved Irish sea trout runs. After years of pleading, Irish fishermen sued the Minister of the Marine for his failure to protect the stocks. Norway imported Scottish Atlantic salmon carrying a new strain of furunculosis so virulent it spread to 74 rivers in 7 years killing 500 tons of salmon a year. My heart sank as I learned this, because the first introduction of infected Atlantics into the Broughton Archipelago was from Scotland in the same year as Norway's importation.

An entire Scottish town protested a farm site, but their cries fell on deaf ears. Someone finally resorted to vandalism. Danish researcher Marianne Holmes confirmed "macro-invertebrates," such as shrimp and prawns, could not survive in salmon farm waste. Denmark wisely restricted how much waste a salmon farm could dump on the sea floor; as a result, salmon farming is not big in Denmark. After measuring the effluent from salmon farms in tons, the Swedish Environmental Protection Agency describe aquaculture as "environmentally dangerous." In Japan, a correlation between aquaculture and toxic blooms was suggested.

Most species, whether terrestrial or aquatic, cannot survive corporate farming practices. Marine farming is particularly problematic because farm effluent, including tremendous waste loads, toxic pesticides, diseases, and often the fish themselves, is not contained by the rearing pens. Because the farms are sited in the highest quality habitat available, this lethal effluent flows directly into contact with numerous wild species.

Seven years and 9000 pages of letters after first contacting the Canadian Department of Fisheries and

Oceans, a temporary moratorium on new salmon farms in BC is in place and an environmental review of the industry underway, but the outcome is very uncertain. The salmon farms are owned by some of the world's biggest international corporations, which wield considerable political influence. As countries around the world recognize the impact of salmon farms and tighten regulations on their waters, pressure mounts to lift the moratorium in BC.

In British Columbia, native groups, Greenpeace, Sierra Legal Defence Fund, sport fishermen, and commercial fishing unions together submitted a set of recommendations to the Environmental Review Board, including (1) importations of Atlantic Salmon must end; (2) the farms must move onshore into tanks where effluent can be controlled. The technology for this exists and is being used at aquaculture facilities in the US, Scotland, and the Middle East. Tank farming would protect farms from predators and other limiting factors, and reduce threats of toxic blooms, exotic parasites, and low oxygen levels to wildlife; but it is more expensive. However, the costs are borne by the producer, not the environment. If tank farming is too expensive for the farmer, farmed salmon are too expensive for the planet.

○

Salmon live high in the food chain; they are predators. It takes approximately four pounds of wild fish to make one pound of farmed fish. The farmers are trying to reduce this ratio, by using grains and animal products such as chicken feathers, but this raises serious health issues. Farming salmon is comparable to killing chickens to farm wolves. It is not sustainable on a planet with shrinking food reserves.

Although a few species such as carp and tilapia have been farmed successfully for centuries, and farming oysters and mussels appears relatively benign, other forms of aquaculture are also causing enormous environmental degradation. To farm shrimp, mangrove forests are cut and huge ponds excavated. Fences appear with armed guards in watch towers to exclude fishermen. The larval shrimp are most commonly caught from the wild, not raised in hatcheries. Five tons of non-marketable

It is becoming clear that we cannot have farmed shrimp and salmon as well as their wild counterparts. We are destroying the productive coastlines of this planet...

illustration by Audra Loyal

species are killed for every one ton of shrimp transferred to the farms. The shells discarded during processing have polluted once productive bodies of water. The farms appear to trigger devastating algae blooms, and almost inevitably after six years of operation disease breaks out in the densely populated ponds. The farmer moves on, leaving behind a wasteland too polluted for replanting. In December 1996 India banned shrimp farms, giving them until March 1997 to leave.

It is becoming clear that we cannot have farmed shrimp and salmon as well as their wild counterparts. We are destroying the productive coastlines of this planet the same way we are destroying the world's forests. The forests are our lungs and the oceans feed us. Wild fish are the last drug-free, genetically intact, untampered natural food we consume. Do we dare trade it for fish raised with antibiotics, swimming in pesticides, fed flesh colorants (without these additives farm fish flesh is gray) and many other chemicals?

When the impact of salmon farming became evident, I thought it was a small weed, easily contained. But as I started pulling I discovered its roots spread deep and are entwined with other corporate activity. If the people of the west coast of North America can be weaned off wild salmon, and the fisheries closed, there will be no voice for the wild salmon. If those salmon should slip away, the watersheds of this coast will be completely opened to exploitation. Logging, mining, hydro projects, smelters, massive diversions, and freshwater sales could all go ahead. Salmon farming is a corporate darling and has enjoyed considerable political favor, whereas wild salmon are the farmers' economic competitor.

As I watch one family of whales after the next turn away from their waters, I feel shame. If they are but a fraction as intelligent as they appear, they know my species is responsible for the wall of noise and declines in their food sources. I want to apologize and tell them: please keep testing these waters; one day they will be silent again, save for the swishing of silver schools of wild salmon.

WHAT YOU CAN DO

Refuse to eat or purchase farm salmon and explain your reasons to restaurant owners and markets.

According to Net Loss, a report by the David Suzuki Foundation (2219-2211 W. 4th Ave., Vancouver, BC V6K 4S2 Canada), the world stocks of wild salmon are not all plummeting. Salmon are only threatened in specific areas; Alaska, Japan, and Russia are harvesting record numbers of salmon because their stocks are still strong. Return of salmon to Alaskan rivers is actually increasing. The best way to control the destructive spread of salmon and shrimp farming is by limiting its market. If you wish to preserve your own health and that of the planet, do not eat farmed salmon or shrimp and inform your market of your choice. In addition, write to your legislators and make certain whales and porpoises are not forced out of coastal waters by the farm's underwater acoustic harassment devices. ▮

Bibliography

Keller, B.C. and Leslie, Rosella M. 1996. Sea Silver: Inside British Columbia's Salmon Farming Industry. Victoria, BC: Horsdal & Schubart Ltd.

Alexandra Morton (Raincoast Research, Simoon Sound, British Columbia, Canada V0P 1S0), a Connecticut native, began researching communication among killer whales in 1978. While salmon farms have brought her research to a temporary halt, she hopes to help the whales return. Her books SIWITI: A Whales Story *and* In The Company of Whales: From the Diary of a Whale Watcher, *were published by Orca Books in Victoria, BC.*

THE LEAST NAVIGABLE CRAFT

Whales at the Millennium

by Phoebe Wray

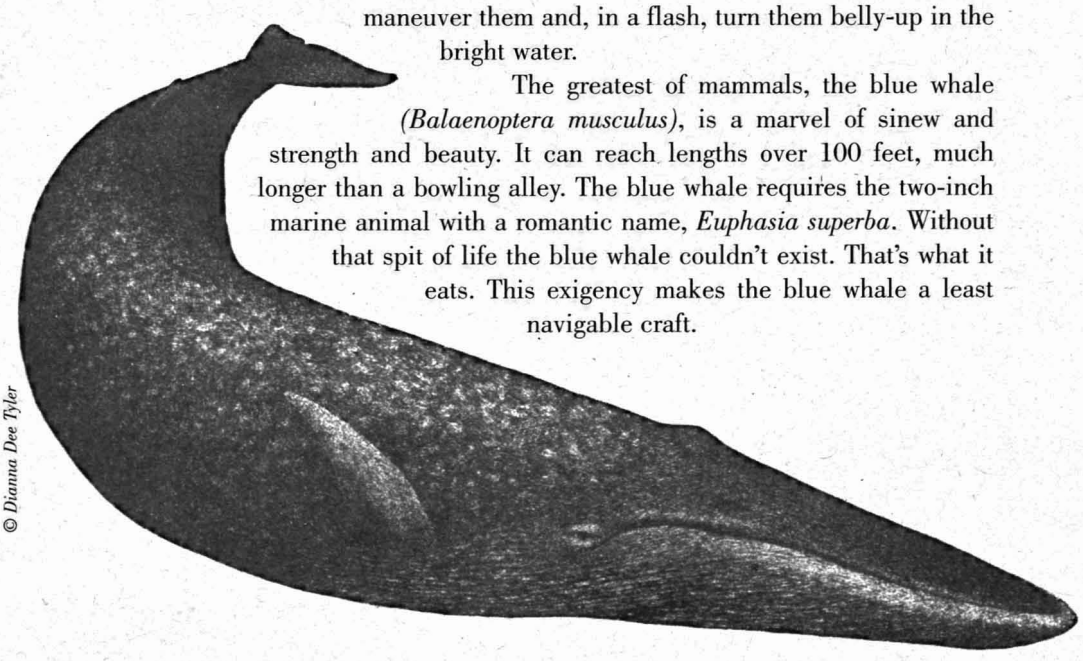
The oceans cover about 71% of the Earth's surface. They contain an estimated 301,471,060,000,000,000,000 gallons of water. What is striking about this figure is not the enormity of it but the fact it can be measured. The seas are finite. They are not the "limitless resource" our fables would have us believe, but a measurable entity with numbers of the kind we have come to bandy about in this age of computers and rockets into the Universe.

Standing on the shores, we measure the oceans against our own bodies and are rightly humbled. They seem big enough to never die, big enough to feed us all, big enough to hold both our endless wastes and our hope. Despite what many scientists, naturalists, and soothsayers tell us about the dying seas, we embrace our memories of the time of hardy, independent people clinging like barnacles to their watery towns: braving storms, mourning their unreturned dead, writing sad songs to the Mother Sea. We say the sea has secrets. We know the sea has laws.

One sacred, which is to say consistently acknowledged, law of the sea is that the least navigable craft has the right of way. Surely, at the end of the 20th century, whales are the least navigable craft. We can herd them into shallows, throw nets across their passage, outrun them in the open ocean, stop them dead with our weaponry, spy on them from satellites. We do all these things. But the design of a fin whale drives a marine engineer to despair. Our vessels are not as sleek, as resilient, as radical in design, as simple, as the simplest, most primitive cetacean. But we can outmaneuver them and, in a flash, turn them belly-up in the bright water.

The greatest of mammals, the blue whale *(Balaenoptera musculus)*, is a marvel of sinew and strength and beauty. It can reach lengths over 100 feet, much longer than a bowling alley. The blue whale requires the two-inch marine animal with a romantic name, *Euphasia superba*. Without that spit of life the blue whale couldn't exist. That's what it eats. This exigency makes the blue whale a least navigable craft.

ONE SACRED LAW OF THE SEA IS THAT THE LEAST NAVIGABLE CRAFT HAS THE RIGHT OF WAY. SURELY, AT THE END OF THE 20TH CENTURY, WHALES ARE THE LEAST NAVIGABLE CRAFT.



Blue Whale *by D. D. Tyler*

Euphasia superba is one of the largest of the minute sea creatures known collectively as "krill." It resembles a shrimp. Krill is a prime candidate to be harvested in enormous volumes for people food; although 75% water, it is 13% protein. Whales eat it by the ton. The Japanese and Russians are already processing krill into something edible for humans. This animal is the thick soup of the oceans, the staple of any number of marine species. It is not spread uniformly (nothing is), but is particularly abundant in the Antarctic, where whalermen's guns have reduced krill-eating blue, humpback, and fin whales to insignificant numbers.

The vast and growing human population needs to be fed, thus we go more and more to sea. We compete increasingly with aquatic life for food and space. Our conquest of the land relatively complete, we approach the seas with questionable credentials and with the knowledge that random, unregulated exploitation and alteration of the hydrosphere is dangerous and unthinkable. At least some people, sensitive to the size and finiteness of this planet, think so.

Most of our fisheries technology is based on the principle of maximizing profit. Such an idea leads resolutely to degradation of the resource. It has encouraged, for instance, the "walls of death" nets, drifting miles long, drowning everything that swims against them, commercially "valuable" or not. There is much "or not," including dolphins, other marine mammals and turtles, and millions of fish that are discarded. It also encouraged over-exploitation of the great whales until a halt was called to the slaughter by the moratorium on commercial whaling, passed with some protest by the International Whaling Commission (IWC) in 1982, taking effect in 1986.

Since the passage of the moratorium, a concerted attack against it has been launched by the remaining whaling nations, Japan and Norway, abetted by Iceland and by small nations such as the Solomon Islands and Dominica, recruited by Japan. This attack is not just pursued at annual meetings of the IWC, but throughout the year, enhanced by several well-funded Non-Governmental Organizations (NGOs) who claim to be adherents of the neo-Cartesian philosophy dubbed, inexplicably but ironically, "wise use." Under the banner of reasserting commercial whaling interests as rights, the wise use groups claim that whale populations are increasing as a result of protection, and ought to be killed by anyone who wants to use them. Whaling is presented as a traditional human endeavor; its appropriateness is not questioned. And much of the wise use agenda is based on economics, fisheries economics.

Here at the end of the millennium, if we have learned anything it is that all life is a complex, interconnected web, and that diversity sustains the structure. In our expanding fisheries exploitation, we would do well to remember that variety in Nature is not the spice, it is the meat and potatoes. The educational effort to promote such an idea is incomplete and inadequate, and people still speak of "desirable" and "undesirable" species. Predicating the existence of all that is not human on whether or not one group of people happens to like it, finds it edible, pretty, or capable of becoming something useful when dead, is an arrogance the planet should not have to endure. Such philosophy is not wisely useful.

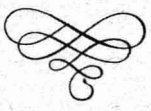
Even in the face of a hopeful trend—the growing support for the establishment of marine ecological reserves—this utilitarian bent is evident. As scientists and conservation activists work to establish such reserves, it is apparent that thus far the support of governments and fishing industry representatives is driven by a concern to restore depleted commercial fisheries to exploitable levels, not to restore ecosystem functioning itself.

At the IWC meeting in Dublin, Ireland, in 1995, a helpful summary paper was distributed called "The International Whaling Commission Now." It was written by the IWC Secretary, Dr. Ray Gambell. The first paragraph of his conclusions deserves quoting in full:

Commercial whaling has a long history of over-exploitation of each species and stock of whales as they were discovered or the technology advanced to permit capture. No regulations have been successful in preventing this in the face of the economic demands from the industry.

Not only have no whaling regulations been successful, for years the regulations were based on questionable data. During the most intense years of commercial whaling, the former Soviet Union habitually lied about the numbers of whales it took. This falsification was only revealed by a courageous and respected Russian scientist in 1993, when the political climate allowed the release of secret data showing that Russian fleets operating in the Antarctic routinely took nearly double the number of whales they reported, including protected and endangered species. They did this, even while Japanese "inspectors" aboard the ships presumably monitored the killing. More than 90,000 whales were killed but not reported. The illegally killed whales were, it is said, sold by the Russians to the Japanese at sea for cash.

HERE AT THE END OF THE MILLENNIUM, IF WE HAVE LEARNED ANYTHING IT IS THAT ALL LIFE IS A COMPLEX, INTERCONNECTED WEB, AND THAT DIVERSITY SUSTAINS THE STRUCTURE. IN OUR EXPANDING FISHERIES EXPLOITATION, WE WOULD DO WELL TO REMEMBER THAT VARIETY IN NATURE IS NOT THE SPICE, IT IS THE MEAT AND POTATOES.



Whales are the least navigable in other ways. Climate change may be affecting them. Southern right whales have been seen with sunburn (likely attributable to ozone depletion). Whales that come close to shore encounter toxins and heavy metals at dangerous levels; the Mediterranean is notable for such pollution. Vessel traffic in migratory paths used both by whales and humans has increased exponentially, resulting in collisions and death to the whales. This is especially harmful to the slow-moving, greatly endangered Atlantic right whale, present off the North American coast and now represented by a few hundred animals. [See R.D. Stevenson's "Humans Threaten the Extinction of the Northern Right Whale," *Wild Earth* fall 1997.] Lobster pots and fishing nets tangle and drown whales around the world.

The California gray whale, a success story in conservation, where protection has resulted in what appears to be complete recovery of the species, is off the endangered list but still threatened at both ends of its long annual migration between the Bering and Chukchi Seas and Baja California. The gray whale journeys to the salty shallow lagoons of Baja to breed and to bear its young. Huge and expanding salt mining operations that threaten the breeding lagoons are sanctioned by the Mexican government and are funded partially by Mitsubishi, the ubiquitous Japanese mega-company. In the north, American gas and oil exploration continues. The migratory path is busy and noisy with vessels of all kinds.

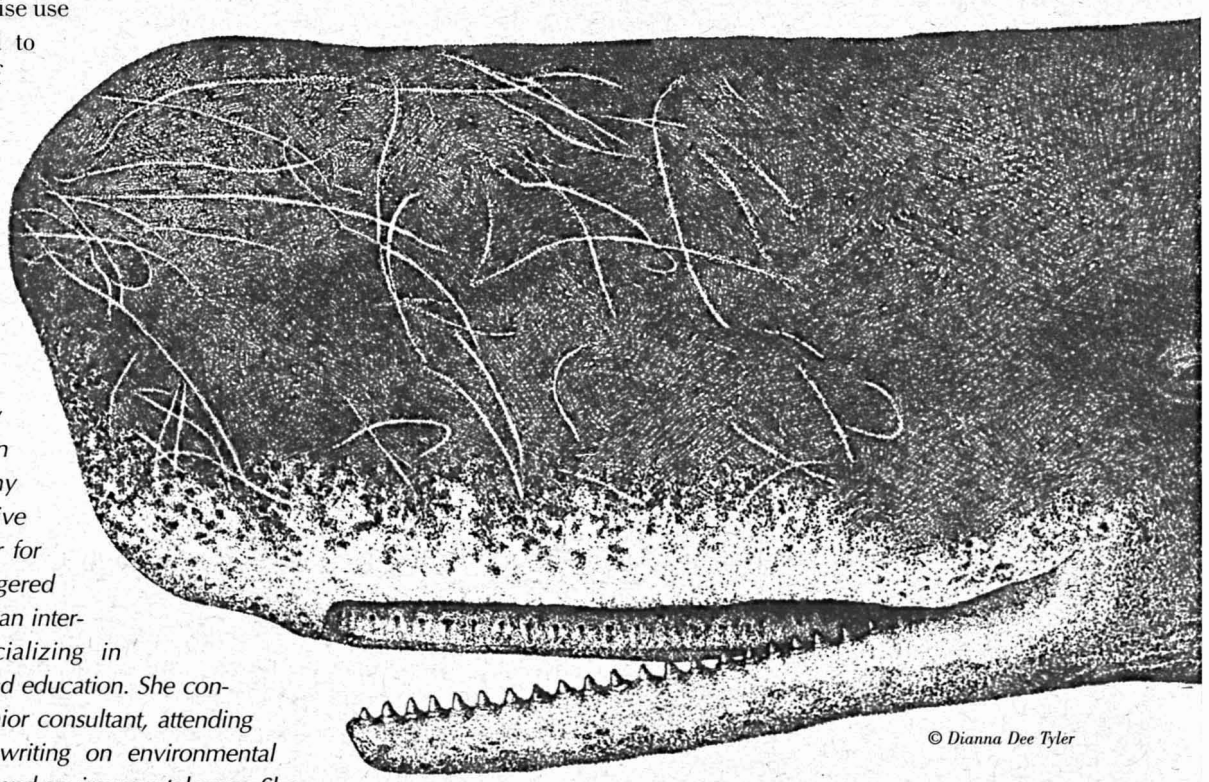
The indigenous people of Russian Siberia use the gray whales, under special quota from the IWC, primarily as food for their mink farms but do not kill the whales themselves; government catcher boats take the whales for them. In 1996, Russia reported its kill to the IWC and revealed the whales were taken with an anti-tank gun and assault weapons, using thousands of bullets—in one case, 700 rounds of ammunition on one whale. IWC nomenclature categorizes this slaughter as "aboriginal subsistence whaling."

A new threat to the gray whale has surfaced from a small Washington State Native American tribe, the Makah, who are petitioning the IWC to be granted a quota of five gray whales annually (the petition actually asks to be allowed to strike up to ten whales to capture at least five the first year of their quota) so that they may revive a long-abandoned hunt. Whales and whaling are central to the Makah oral and artistic tradition and tribal identity. The Makah, however, have not killed whales in over seventy years and no longer remember how to do it, and the majority of tribal elders oppose the hunt; but an aggressive group within the Makah is actively pursuing a quota, adamant to assert its rights, and, encouraged by the United States government, is seeking advice and support from the Russians, Japanese, and Norwegians as well as other tribes to the north and wise use groups.

The Makah asked for a quota at the 1996 IWC meeting in Aberdeen, Scotland, but could not find international support for their re-invention of a hunt they will pursue in cedar canoes backed up by a powerboat and scuba divers. The whale will be harpooned, the Makah say, then dispatched with a .50mm anti-tank gun. There is no mention of the rigorous spiritual preparations of the whaling crews clearly mandated by their tradition, and the tribe cannot cite nutritional need. (The first commer-

cial signboard encountered, entering the Makah Reservation on the Olympic Peninsula, is one for pizza delivered.) The whales will be taken in or near the Olympic Coast National Marine Sanctuary, from whose regulations the Makah are exempted. The tribe, backed by United States government policy-makers and using a $200,000 federal grant, vows to present the demand to the IWC again in 1997, and has sent lobbying representatives to many countries to bolster their case.

The lives of whales are not random. They are loyal to their breeding and feeding areas, their migratory paths and sheltered bays, and have social structures so visible and remarkable even the open-boat whalers were aware of them. They do not adapt as humans adapt. For most of the historic time shared by whales and humans, the human population was small and the whales many. They could outrun us; they could hide; they could fight back. That changed in the 19th century, and with technological innovations, whaling became a holocaust in the 20th. Now we are many, with sophisticated weapons of pursuit and death, and they are few, still plying the same waters for the same ends, a least navigable craft among the huge and magnificent flotillas crowding the waves. To assure their continued existence into the 21st century, surely it would be a wise use of sea-law to extend to the whales a right of passage. ▮



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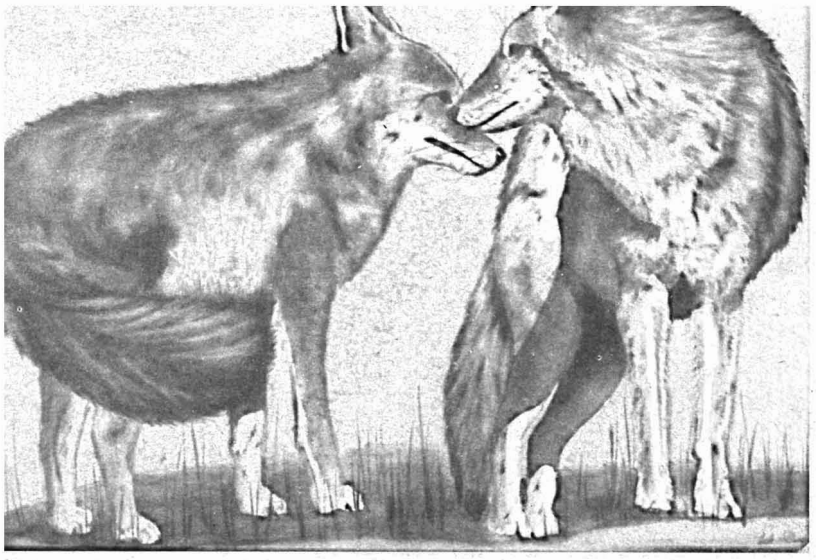
Phoebe Wray was the founder (in 1973) and for many years the executive director of the Center for Action on Endangered Species in Ayer, MA, an international NGO specializing in public information and education. She continues to serve as senior consultant, attending IWC meetings and writing on environmental issues for the popular and environmental press. She is also a professor at The Boston Conservatory and an adjunct at Bradford College.

Sperm Whale *by D. D. Tyler*



Tabby Go Home

House Cat and Coyote Interactions in Southern California Habitat Remnants

by Kevin Crooks

The ecological effects of human beings go beyond the direct impacts of our species. As human populations explode, so do populations of our pets, extending our already far-reaching influences. The collective impact of an estimated 400 million domestic cats (*Felis catus*) worldwide (Jarvis 1990) is especially devastating.

Fed and cared for by humans, cats are maintained at numbers up to 100 times or more the typical abundances of wild cats and other mid-sized predators (Churcher and Lawton 1987, Coleman and Temple 1993). These superabundant, exotic felines can wreak havoc in ecological communities that border human developments. Cats are recreational hunters that kill for fun, even if they are nutritionally subsidized by humans (Davis 1957, George 1974, Warner 1985). Consequently, even when prey reach dangerously low levels, cats will continue to hunt and kill, sometimes decimating local populations of birds, small mammals, and reptiles. In contrast, native predators often switch to alternate prey as a preferred species becomes scarce.

I estimate that outdoor cats surrounding the typical, moderately-sized canyon kill nearly 1000 rodents, over 500 birds, and over 600 lizards per year. These figures, although only rough approximations, are also surely underestimates...

The numbers can be staggering. Extrapolations from a study in an English village (Churcher and Lawton 1987) estimated that Britain's six million cats kill about 100 million prey items annually, 35% of which are birds (May 1988). In Michigan, one rural cat killed over 1600 mammals and 60 birds in 18 months (Bradt 1949). A cat predation study on songbirds in Virginia estimated 28 kills per urban cat and 91 kills per rural cat each year. Using these numbers, the estimated one million cats in the state kill up to three million birds annually (Mitchell and Beck 1992). In rural Wisconsin each year, the 1.5–2 million outdoor cats kill an estimated 47 million rabbits and up to 219 million birds annually (J.S. Coleman and S.A. Temple, unpublished data).

When introduced to islands, cats can be particularly damaging, especially when preying upon animals that have not evolved adequate defenses to such efficient hunters. Incredibly, 375 cats on Macquarie Island near Australia were able to kill an estimated 56,000 rabbits and 58,000 ground-nesting seabirds each year (Jones 1977). On Marion Island in the sub-Antarctic, five cats were introduced as pets in 1949; by 1975, the population of about 2000 cats killed 450,000 burrowing petrels (a seabird) annually and were suspected to have driven another petrel species to local extinction (Bloomer and Bester 1992). In the most infamous and perhaps most extreme example known, the lighthouse-keeper's pet cat on Stephen Island, off the coast of New Zealand, arrived in 1894 and within one year completely exterminated the Stephen Island Wren (Stiling 1992).

Coyotes *by Lezle Williams*

I am currently studying the ecology of cats, as well as of native predators, in urban coastal southern California. Exponential population growth and intensive development in this region over the past century have destroyed most of the native coastal sage scrub and chaparral habitats. The massive human disruptions of ecosystems, combined with the existence of many species of plants and animals that don't occur elsewhere (endemic species), have helped create a "hot-spot" of endangerment and extinction in the region (Myers 1990, Dobson et al. 1997). Some patches of habitat still remain, however. The San Diego region generally consists of large coastal mesas dissected by steep-sided ravines. These so-called "canyons" are generally too steep for development; as islands of habitat immersed in the urban sea of Southern California they are important refugia for wildlife. A series of scientific surveys over the past decade has recorded a diverse array of native species in the canyons including plants, insects, reptiles, amphibians, birds, small mammals, and mammalian predators, some of which are of conservation concern in the region (Soulé et al. 1988, Langen et al. 1991, Soulé et al. 1992, Bolger et al. 1997).

Are these household pets affecting the fate of the native birds, mammals, and reptiles? To find out, I distributed thousands of questionnaires to people living on the edges of canyons in the San Diego region, asking cat owners about the sex, age, reproductive condition, numbers, and activity patterns of their household cats, as well as how often their cats brought back prey items to the residence. Second, willing owners were asked to collect all the returned prey so I could identify which species, both native and exotic, cats were killing. Third, baited track stations and remotely-triggered cameras allowed monitoring of the movements of cats, as well as of native predators, in the canyons. Lastly, I radio-tracked pet cats to provide detailed data on their spatial and temporal movements both in habitat fragments and in the surrounding neighborhoods.

Questionnaire responses indicated that nearly one-third of residents bordering canyons own cats; these households, on average, had 1.7 cats, and about three-quarters of cat owners let their pets outdoors. Thus, depending on the size of the canyon, there are likely to be tens to hundreds of outdoor cats with access to each urban habitat fragment. In comparison, the canyons often harbor only one or two pairs or family groups of native predators such as coyotes or foxes.

What do these pets eat, and what is their impact on prey populations? Roughly 85% of outdoor cats brought back kills to the residence. Cats did occasionally kill non-native species, such as house mice and black rats, which is actually beneficial since these exotic rodents are considered urban pests and can themselves compete with and prey upon native species. Unfortunately, though, many of the cats' prey were natives, including a wide variety of birds, rodents, and lizards. Survey respondents reported that on average, each outdoor cat that hunted returned about 24 rodents, 15 birds, and 17 lizards to the residence each year. Using these estimates, as well as data on cat ownership from my questionnaires, I estimate that outdoor cats surrounding the typical, moderately-sized canyon kill nearly 1000 rodents, over 500 birds, and over 600 lizards per year. These figures, although only rough approximations, are also surely underestimates since cats certainly do not bring back all prey that they kill. Indeed, one study estimated that only 50% of kills are actually returned to residences by cats, with the other half eaten by the cats or scavenged by other animals (George 1974). Thus, the actual number of prey killed may be twice the above figure. We must remember that populations of native species in these urban habitat remnants already can be quite small. For instance, population sizes of some scrub specialist birds likely don't exceed 10 individuals in the smallest San Diego canyons (Bolger et al. 1991). Such small populations are particularly vulnerable to extinction from a variety of demographic, environmental, and genetic factors. So, even a modest increase in predation from subsidized predators may tip native species, especially rare ones, over the extinction brink.

In the face of such predation pressures by exotic felines, prey species have an unlikely ally—the coyote (*Canis latrans*). I have found that coyotes can modify the behavior of both cats and their owners in the San Diego area. Coyotes certainly kill domestic cats, as evidenced by cat remains both in the canyons and in the scat of coyotes. Track surveys, camera monitoring, and radio-telemetry all indicate that domestic cats seldom visit the interior of large habitat remnants where coyotes occur. Since cats primarily frequent canyon edges and neighboring yards, cat predation can be considered one of the many edge effects that emanate from human developments. Consequently, the impact of cats on wildlife populations will intensify as natural landscapes become increasingly fragmented. It seems that experienced cats learn to avoid canyons when coyotes are present, whereas naive pets who do venture into the canyons where coyotes occur often meet a violent end.

Although coyotes directly affect cats, perhaps the

strongest impact of the presence of coyotes is on the behavior of cat owners. About two-thirds of questionnaire respondents realized that coyotes were a threat to cats, and nearly half of all cat owners in areas with coyotes reported that coyotes had attacked or killed their cats. Further, cat owners in coyote country, especially those that had previously lost pets to predation, were less likely to let their cats outdoors; two-thirds of all cat owners who believed coyotes to be in their canyon somehow restricted their cat's outdoor activity. Methods of restriction included keeping the cat as an indoor pet, letting the cat out only during the day, restricting the cat to a patio or fenced yard, and even leashing the cat when out. This is encouraging—just the threat of native predators in the neighborhood is enough for some people to restrict their cats' wanderings.

Consequently, the presence of coyotes in urban natural areas may benefit small, native species by reducing the numbers and activity of these non-native and superabundant felines. Coyotes may act as a "keystone predator" in such regions. The disappearance of top predators can cause an ecological unbalance that ripples down the food web through small predators to smaller prey. Unfortunately, of all the wildlife affected by urban development and habitat fragmentation, it is the predators that are most vulnerable to local extinction due to their relatively large home ranges, low densities, and "control" (eradication) by their human neighbors. Unless strong reasons exist to do otherwise (such as coyote predation on threatened or endangered species), conservationists should oppose the control of large carnivores in these systems. It is also essential that urban habitat fragments maintain connectivity to larger natural areas that currently support source populations of coyotes and other large predators. Where functional movement corridors are not retained across the urban landscape, many wildlife populations, particularly carnivores, will eventually disappear.

How can we curtail predation on wildlife by domestic cats? Collar bells don't necessarily work because native wildlife may not associate bells with being stalked, and declawed cats can still kill prey (although admittedly bells and declawing are likely better than no protective measures at all). A number of animal welfare organizations and local governments have recently advocated reducing feral cat "colonies" by trapping, sterilizing, vaccinating, and then returning cats to where they were found, to be fed thereafter by humans. Although such programs are certainly well-intentioned and may even reduce numbers of feral cats in some circumstances, they are also generally misguided. Even a few reproductive cats in a population, or a continuing source of newly abandoned cats, are sufficient to maintain populations of cats, and even sterilized, vaccinated, and well-fed cats still hunt and kill.

It is also important to realize that cats themselves often suffer when left outdoors. Cars, coyotes, dogs, other cats, and even sadistic humans are all deadly threats. Further, outdoor cats, through contact with wild animals and other pets, are exposed to infectious diseases such as feline leukemia, feline distemper, and rabies. Cats themselves can also infect native animals, other pets, and humans with parasites such as ringworm, hookworms, and toxoplasmosis (Proulx 1988). In sum, outdoor cats require more medical treatment, are more at risk, and live shorter lives than do indoor cats.

MITIGATION MEASURES

Enforcement of leash laws, compulsory registration of cats, incentives for spaying and neutering, and eradication of feral cat colonies would all help to alleviate the problem. Such measures, however, are controversial. Education is the key to gain public support for the control of free-ranging cats (May 1988, Proulx 1988). Most people are unaware of the damage caused by domestic cats, as well as the threats faced by pets that are left outdoors. In southern California, the majority of cat owners bordering natural areas let their cats outdoors, and less than half of respondents believe that cats are a major predator in the urban habitat fragments. Education of risks both to cats and native species may increase public concern.

Further, we must foster more positive attitudes toward native predators, especially in urban settings where human-carnivore interactions are intensified. Kellert et al. (1996) provide general recommendations to increase public acceptance of carnivores. They emphasize that rather than simply providing more factual information on a species, education should directly target negative attitudes or perceptions concerning carnivores. For instance, in southern California we could focus on the public's negative, and often exaggerated, beliefs concerning the threat of predators to humans and pets. Potential educational options include information dispersal through the local media, distribution of pamphlets and flyers to residents bordering natural areas, and the development of local school programs. Kellert et al. (1996) also stress that education must emphasize all values represented by these species. Although the

importance of predators is often couched in terms of their presumed ecological or economic significance, we must emphasize also the many aesthetic, visceral, and even spiritual values provided by these charismatic animals.

Encouragingly, the questionnaires I distributed to southern California citizens generally indicated that the majority of residents enjoyed wildlife, including mammalian carnivores, in adjacent wildlands and were concerned for their protection. Although many residents realized that coyotes were a threat to pets, more than 90% of respondents wanted coyotes in neighboring natural areas. Residents also demonstrated considerable knowledge of the wildlife in their backyards—their reported observations corresponded well to our field surveys on the actual distribution and abundance of carnivores in the area.

The domestic cat has been a household pet, a cherished companion—indeed, a member of our extended family—for literally thousands of years. Understandably, we are hesitant to blame them for the extirpation of native fauna, but the unfortunate truth is that large numbers of outdoor cats can imperil wildlife,* particularly in small natural areas surrounded by developed land. Perhaps we are even more hesitant, however, to implicate ourselves for the integral role we play in this ecological crisis. Although labeled as "feline delinquency" (May 1988), it is our own negligence that should be of greatest concern. Indeed, only through legislative and educational programs aimed at limiting delinquency of cat *owners*, not of cats themselves, can we best protect both our pets and our native biodiversity. ▮

Kevin Crooks is a Ph.D. candidate in the Biology Department at the University of California, Santa Cruz (95064).

Literature Cited

Bloomer, J.P., and M.N. Bester. 1992. Control of feral cats on sub-Antarctic Marion Island, Indian Ocean. Biological Conservation 60:211-219.

Bolger, D.T., A. Alberts, and M.E. Soulé. 1991. Occurrence patterns of bird species in habitat fragments: sampling, extinction, and nested species subsets. The American Naturalist 137:155-166.

Bolger, D.T., A.C. Alberts, R.M. Sauvajot, P. Potenza, C. McCalvin, D. Tran, S. Mazzoni, and M.E. Soulé. 1997. Responses of rodents to habitat fragmentation in coastal southern California. Ecological Applications 7:552-563.

Bradt, G.W. 1949. Farm cat as predator. Michigan Conservation 18:25-26.

Churcher, J.B., and J.H. Lawton. 1987. Predation by domestic cats in an English village. Journal of Zoology (London) 212:439-456.

Coleman, J.S., and S.A. Temple. 1993. Rural residents' free-ranging domestic cats: a survey. Wildlife Society Bulletin 21:381-390.

Davis, D.E. 1957. The use of food as a buffer in a predator-prey system. Journal of Mammalogy 38:466-472.

George, W. 1974. Domestic cats as predators and factors in winter shortages of raptor prey. The Wilson Bulletin 86:384-396.

Jarvis, P.J. 1990. Urban cats as pests and pets. Environmental Conservation 17:169-171.

Jones, E. 1977. Ecology of the feral cat, *Felis catus* on Macquarie Island. Australian Wildlife Research 4:249-262.

Kellert, S.R., M. Black, C.R. Rush, and A.J. Bath. 1996. Human culture and large carnivore conservation in North America. Conservation Biology 10:977-990.

Langen, T.A., D.T. Bolger, and T.J. Case. 1991. Predation on artificial bird nests in chaparral fragments. Oecologia 86:395-401.

May, R.M. 1988. Control of feline delinquency. Nature 332:392.

Mitchell, J.C., and R.A. Beck. 1992. Free-ranging domestic cat predation on native vertebrates in rural and urban Virginia. Virginia Journal of Science 43:197-207.

Myers, N. 1990. The biodiversity challenge: expanded hot-spots analysis. The Environmentalist 10:243-256.

Proulx, G. 1988. Control of urban wildlife predation by cats through public education. Environmental Conservation 15:358-359.

Soulé, M.E., D.T. Bolger, A.C. Alberts, R. Sauvajot, J. Wright, M. Sorice, and S. Hill. 1988. Reconstructed dynamics of rapid extinctions of chaparral-requiring birds in urban habitat islands. Conservation Biology 2:75-92.

Soulé, M.E., A.C. Alberts, and D.T. Bolger. 1992. The effects of habitat fragmentation on chaparral plants and vertebrates. Oikos 63:39-47.

Stiling, P. 1996. Ecology: Theories and Applications. Prentice Hall, New Jersey.

Warner, R. 1985. Demography and movements of free-ranging domestic cats in rural Illinois. Journal of Wildlife Management 49:340-346.

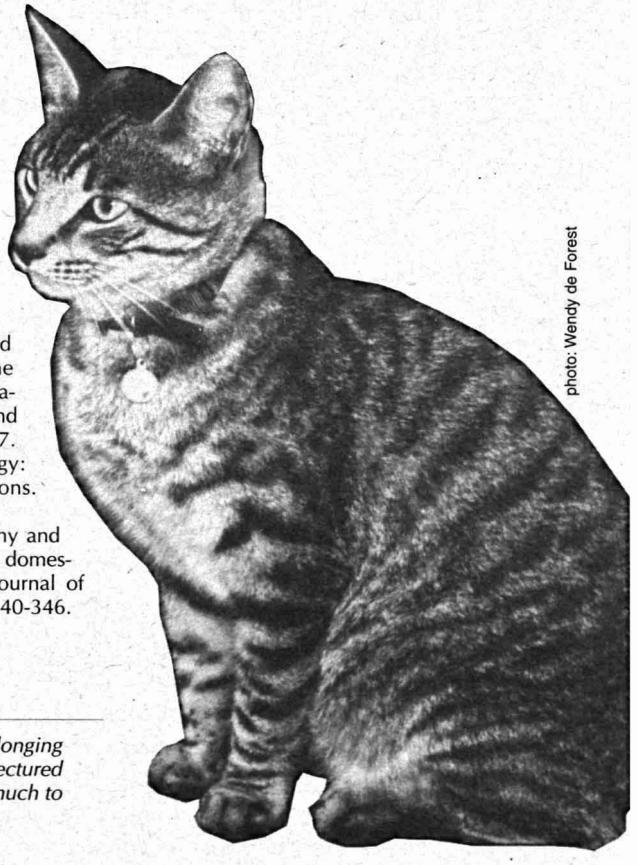


photo: Wendy de Forest

*Editor's note on the editor's cat: Fisher [pictured above], is a case in point. Despite belonging to an ecologically informed household, being compelled to wear a bell, and repeatedly lectured to prey only on exotics, Fisher and his brother Hudson sometimes kill native wildlife—much to their owners' shame. —TB

What Have We Done to Carrying Capacity?

by William R. Catton Jr.

illustration by Evan Cantor

Carrying capacity is the maximum population of a given species that a particular environment can support indefinitely (i.e., without habitat damage).

HUMAN NICHES

No less truly for humans than for other organisms, our living depends on taking needed substances (and needed energy) from other components of the ecosystems of which we are part. Living involves using the energy to interact with each other (in culturally patterned ways, in the human case) and with other ecosystem components. These interactions transform the materials and dissipate the energy. The transformed materials become, then, new components of the ecosystems in which our lives occur.

But as ecosystem components we humans differ from other organisms, just as they differ from each other, in the particular requirements of our way of living. So, to understand our (or their) lives as ecosystem components, we need to understand the niche concept.

A niche can be defined as the role that an organism of a given kind plays in an ecosystem. Although technically this involves many dimensions (Hutchinson 1965), for our purposes it is important simply to distinguish three aspects of an organism's way of relating to its environment:

1. the kinds of nutrients it takes from its environment;
2. the kinds of relationships with other organisms it must have to go on living;
3. the kinds of things it must do to its environment in the process of living.

In short, environments serve organisms in three ways: an organism needs an environment *from which* to take sustenance materials (and energy); it needs an

environment *in which* to carry on its interactions with others; and it needs an environment *into which* to put the products of its life processes.

Unlike other species, whose niche requirements are so largely determined by their genetically based traits, our culturally varied and diversified traits and activities make us a multi-niche species. Human niches today are vastly different from human niches 10,000 years ago.

Nevertheless, the environment of even a human population is finite. That is to say, a given environment can supply only limited quantities of the substances needed by a user population. Likewise, it affords only limited space in which their accustomed interactions can take place. And likewise again, its capacity for absorbing (and recycling) the transformed materials that particular user population must dispose of is limited.

However inadequately measured may be these environmental limits, they are real. And they are what is connoted by the phrase "carrying capacity."

DEFINING CARRYING CAPACITY

On our way to developing a clear definition of carrying capacity, and clarifying its applicability to humans, let us consider what is involved when one species population—as a component of the environing ecosystem—is used as a "resource" by another species population. We are talking of the predator-prey relationship. It applies no less to vegetarians (for whom plants are their prey) than to carnivores or omnivores. It also applies to autotrophic plants for whom abiotic material—e.g., soil nutrients, water, etc.—are their "prey."

One of the most vital scientific discoveries of all time was the recognition by Thomas Robert Malthus ([1798] 1976) of the vast significance of the fact that the human species was capable of reproducing in excess of the level required in usual circumstances for replacement of each mortal generation. The importance of that principle of reproduction-in-excess-of-replacement was enhanced when Charles Darwin ([1859] 1964) shifted the emphasis from one species to all species. (Malthus had explicitly recognized excess reproduction as characteristic of all species but had used the principle entirely to devise a prognosis for humankind.) The enhanced importance from Darwin's shift of emphasis lay not just in the basis this provided for discerning the evolutionary significance of intraspecific competition; it also consisted of the fact that a basis for understanding the feasibility of "cropping" resource species was now provided. It is from this understanding that the concepts of carrying capacity and sustained yield would emerge.

It is possible for a predator species to "harvest" a prey species generation after generation—so long as the amount of prey taken by each generation of predators does not exceed the "surplus" reproduction of the corresponding generation(s) of prey species. The "crop" taken must not preclude the leaving of sufficient "seed" to provide future crops.

When a human population lives by a culture that involves human *management* of a portion of the ecosystem (as in farming and animal husbandry), it can successfully go on raising and harvesting a crop of biotic material at the conclusion of each growth cycle so long as the "capital" is not depleted. The extent of a resource species' ability to over-reproduce is finite. Over-harvesting—using a resource species to an extent that precludes full replacement—must eventually deprive the user population of its former bounty. This is the basis for the carrying capacity concept.

Graze too many cattle in a pasture so that the grass cannot regrow as fast as they consume it, and it cannot continue to support them—and they, in turn, cannot continue to support the herdsman and his clients. As Ross Perot might say, "It's that simple!" Carrying capacity thus ought not to be a difficult concept, though I would bet Perot's vocabulary doesn't include it. It is missing from the thoughtways of most people.

Now for a basic definition. Carrying capacity is:

> *the maximum population*
> *of a given species*
> *that a particular environment*
> *can support indefinitely*
> *(i.e., without habitat damage).*

I have separately indented the phrases included in this definition so as to clarify the several aspects of the concept. For different user species and for different environments, the capacity to withstand use and remain usable would differ. Each species has its own way of using its environment—its own particular *from which, in which,* and *into which* requirements. So the number of members of a species that a particular environment could support indefinitely would be different for different species, just as it would be different for different environments.

Homo sapiens, however, is a multi-niche species. This means a simple head-count version of the carrying capacity concept will be misleading. The definition

requires modification in the human case. We must therefore define human carrying capacity as:

the maximum human population
equipped with
a given assortment of technology and
a given pattern of organization
that a particular environment
can support indefinitely.

Again the separate indentation of the several phrases in this definition should make clear the multiple dimensions of human (or cultural) carrying capacity.

CHANGING HUMAN CARRYING CAPACITY

The difference between the two definitions (reflecting the fact that human carrying capacity is a special case of the general concept) arises from the fact that as our ancestors became human they began to loosen the bonds of a fixed niche. As technology changed, and as ways of organizing a human population for ecosystem use changed, the niches available for supporting human life changed.[1] For a long time these technological and organizational changes had the overall effect of increasing the niches available for human occupancy. But even this would change.

EFFECT OF TECHNOLOGY ON CARRYING CAPACITY

The rows in Table 1 represent various time periods in which the relation of humans to ecosystems differed. In the time period in the top row, our ancestors lived much as did other predatory animals; although aided by primitive tools and by the use of fire, they depended on resource species Nature made available. Given the forces then operating to keep human mortality rates almost equal to their rates of reproduction, human over-reproduction was so slight that for these hunter-gatherers the average doubling time was more than 18,000 years. Population increase was too slow to have been noticed even by the most

TABLE 1

Population increases following major technological breakthroughs

Time period	World human population at start and finish	Average years required to double population	Most advanced means of getting a living	Additional special influence	Type of resource mainly relied on
35000 B.C. to 8000 B.C.	3,000,000[a] 8,000,000	18,750	hunting and gathering		renewable
8000 B.C. to 1500 A.D.	8,000,000[b] 350,000,000	1,745	horticultural and agrarian		renewable
1500 A.D. to 1800 A.D.	350,000,000[c] 969,000,000	205	agrarian	expansion into the New World	renewable
1800 A.D. to 1865 A.D.	969,000,000[d] 1,371,000,000	130	industrial	fossil energy tapped	some non-renewable
1865 A.D. to 1993 A.D.	1,371,000,000[e] 5,506,000,000[f]	64	industrial	death control	mostly non-renewable

a Boughey 1975:251
b Coale 1974:43
c Petterson 1960:872
d Midpoint of range of estimates evaluated by Durand 1968
e Estimate obtained by interpolation, using midpoints of ranges of estimates given by Durand for 1850 and 1900; constant exponential growth assumed in that half century interval.
f World Almanac and Book of Facts 1994:499

1 The change from hunting and gathering to horticulture was, says Gibbs (1989:144), a "major turning point in human evolution...the most important step in the evolution of human sustenance activities." Such prior innovations as the spear thrower that enhanced hunting efficiency, he notes, had "probably reduced the human mortality rate and created the first demographic transition." Relying on data from George Peter Murdock's comparison of 915 human societies in a "World Ethnographic Sample," Lenski and Lenski (1982:91) say: "One of the most basic consequences of technological advance, according to evolutionary theory, is growth in the size of both societies and the communities within them." But they discern circular causation, for population size is one of seven factors they list that influence rates of technological innovation (pp. 64-68).

Textbooks on population tend to be cautious in discussing possible causal linkages between technological change and population growth. For example, Weeks (1989:30-39), in presenting a "Brief History of World Population," considers some ways technology may raise or lower fertility and mortality rates as he addresses the following questions: "How fast can population grow?" "Why was early growth so slow?" "How fast is the world's population growing now?" "Why are recent increases so rapid?" He then goes on to examine "Redistribution of the World's Population through Migration," "European Expansion," and "The Urban Revolution."

astute individuals of that period. It could not have been a topic of conversation, and would not have been a factor in their day-to-day plans for living.

The second row of the table represents the immediate effects of what amounted to human takeover of ecosystem management, otherwise known as the horticultural revolution. People had begun to arrange the growth of plant and animal species useful to them, instead of relying on unmanaged Nature to provide substances to be hunted and gathered. Population doubling time was reduced almost by a factor of 11. Even then, in a village of, say 300 persons, only about ten additional residents would be added to a population over a lifespan of three-score-and-ten, and most people would not live that long anyway. So population growth would still be almost entirely unnoticed.[2] Even though growth as such might remain unrecognized, by the end of the time period represented in the second row of the table, European population was pressing on what must have been Europe's agrarian-level carrying capacity. Competition for the resources required by the then prevalent means of making a living was a fact of life, making life hard.

The third row represents a period of blessed relief from that competitive pressure, following discovery of "the New World." Opportunities for expanding into new territory (and for the exploitation of its resources even by stay-at-home Europeans) outstripped for a time even the increasing pace of population growth. Doubling time dropped again, in response to this enormous increment of carrying capacity, this time dropping to less than one eighth of the previous average doubling time. Now growth might actually be noticeable—but it would be overshadowed by the greater increase in opportunities. It would take several generations to fill up this enlargement of carrying capacity, so in the meantime the idea of limits could remain unthinkable.

In the time periods in the first three rows of the table, then, the underlying experiences of technological progress and organizational elaboration repeatedly facilitated increased human appropriation/exploitation of shares of what the biosphere had to offer. Human numbers increased after each breakthrough, eventually filling the new niches to the point where the raised limits again exerted pressure.

Before considering the 4th and 5th rows of the table, let us note that from time to time local carrying capacities were reduced (rather than enlarged) as a result of misuse or overuse of other ecosystem components by the local human population (or by humans elsewhere who controlled the local people's activities). Whenever and wherever this happened, a toll of human suffering was an expectable consequence. Loss of carrying capacity by a population constituting a load that already matched it had to inflict hardship.

Hughes (1975:156) has shown that history provides "many examples of ancient peoples who failed to adapt themselves to live in harmony with the ecosystems within which they found themselves, who depleted their environment, exhausted their resources, and exist today only as ruins within eroded and desiccated landscapes." He inferred that their fate "might also await our own civilization...on a global scale." Specifically, according to Hughes (1975:42):

The hillsides of Persia, like those of Lebanon, were deforested and subjected to erosion. Persian fields, like those of Mesopotamia, suffered salinization. Wildlife was gradually eradicated.

The Persians, said Hughes, "illustrate a general principle of human ecology, that is, that a good attitude toward nature is not enough. Combined with a good attitude must be accurate knowledge of the workings of nature and the ability to control and direct human impact upon nature in channels which will help, rather than hinder, the balance of nature." Even people whose religion defines their world as a sacred place, he said, could still "manage to make their surroundings a scene of deforestation and erosion."

The most glaring example of the tragedy of overuse of a finite ecosystem, showing the catastrophic results of the ensuing carrying capacity collapse, is the story of Easter Island, as vividly told and amply documented by Bahn and Flenley (1992). To a small band of emigrants from some overpopulated Polynesian island elsewhere in the central Pacific Ocean, this forested volcanic island was, together with its immediately surrounding waters, all the world there was for them after they landed their seafaring canoe(s) and took onto this new habitat a starter flock of chickens, some plantable kumaras, their Polynesian artifacts and the cultural norms and knowledge from whence they came. In a thousand years their proliferating descendants completely deforested Easter Island and depleted its other vegetation. This would have caused serious soil erosion and damaged the island's barely adequate repositories

2 Of course almost nobody in those centuries would have been thinking globally about population. Local conditions might have rendered population increase within an individual's lifetime noticeable within some villages, and it is possible that population growth or decline would have been a matter of concern in feudal rivalries.

of fresh water. From such destruction of the life support system upon which their ability to be fruitful and multiply so manyfold had depended, there followed cultural collapse and a momentous population crash. (See *Wild Earth* summer 1994, 73-83.)

Even before all the research upon which Bahn and Flenley based their account was complete, William Mulloy (1974), whose career as an anthropologist at the University of Wyoming was largely devoted to the archaeological research on Easter Island, had explicitly pointed out that it should indeed be a warning to the larger world. For other examples of ecosystem destruction by overuse of resources, see Merchant (1980).

We can come to grief not only from overusing (and thereby diminishing and even destroying) carrying capacity. We can also come to grief by either willfully or inadvertently diminishing carrying capacity prior to using it. There are important examples of this in historian Alfred Crosby's (1986) *Ecological Imperialism: The Biological Expansion of Europe, 900-1900.* Crosby writes of the "neo-Europes"—North and South America, Australia and New Zealand—far distant from Europe but settled by Europeans (who displaced the prior populations) and brought with them various European plant and animal species. He shows how the spread of European disease and pestilence to areas and populations vulnerable to them prepared the way for European conquest of these areas and subjugation of remnant populations. Local carrying capacities for the prior inhabitants were, in effect, curtailed before the main waves of settlers arrived bringing new resource species with them and thereby establishing new carrying capacities for their European-derived lifestyles.

We can come to grief not only from overusing (and thereby diminishing and even destroying) carrying capacity. We can also come to grief by either willfully or inadvertently diminishing carrying capacity prior to using it.

illustration by Chris Billis

But it was not just the obvious pathologies brought by Europeans that helped Europeanize the neo-Europes. The technology (and other aspects of culture) developing both in Europe and the neo-Europes would change *the world*—launching the unprecedented rates of population growth in the bottom two rows of Table 1. This technology (of the industrial era) greatly magnified the resource appetites and environmental impacts of modern societies, thereby commencing the serious global reduction of human carrying capacity—just as the human load reached more gargantuan dimensions than ever. It made us dependent upon increasing use of non-renewable resources, upon using renewable resources faster than their rates of renewal (from the Malthusian over-reproduction characteristic of all species), and upon inflicting ever increasing disposal pressures upon our environments.

DISTORTION OF THE CARRYING CAPACITY CONCEPT

So, what have we done to carrying capacity? The question that serves as this paper's title is really two questions: (1) What has human use of the Earth done to its human carrying capacity? and (2) What have we done (or are we doing) to the carrying capacity *concept*? After briefly summarizing what I have been saying in response to the first version of the question, I shall take up the second version.

What has human use of this planet done to its human carrying capacity? The answer is that we repeatedly increased it by technological and organizational changes in our species' ecosystem roles. But now, in the industrial era, we are globally doing swiftly what we have occasionally done locally and more gradually in the past: we are reducing it. Reduction of Earth's human carrying capacity entails consequences so dreadful that few are willing to contemplate them. And that fact leads to the other version of the question.

What have we done to the carrying capacity *concept*? For too long, too many have remained oblivious to it. Some writers who may have heard of it choose to ignore the concept (e.g., Wattenberg 1987); others deny its meaning and its relevance (e.g., Simon and Kahn 1984:45). Today there are manifest effects of Earth's human carrying capacity having been exceeded (Postel 1994) but there continue to be efforts to deny the reality of such effects and to condemn concern about them as fraudulent (Kenny 1994).

Even when used, the concept has often been weakened or distorted, particularly in social science literature. For example, there have been many studies of "recreational carrying capacity" of wildland areas; some have used the term "social carrying capacity," and most have missed the essential idea of ecosystem use within limits of sustainability. In two papers, Burch (1981, 1984) insisted that two decades of "social carrying capacity research has produced few valid generalizations" and has provided only a dubious metaphor to be used in wilderness management. He doubted the empirical applicability of the carrying capacity concept to higher primates and humans.

A short book by Shelby and Heberlein (1986) elaborated various sub-types of recreation areas' capacity to accommodate human use, but they muddied issues pertaining to ecosystem limits and sustainability. In a paper in *Acta Oecologia*, Andre Dhondt (1988) declared carrying capacity "a confusing concept." He suggested dropping the term altogether, leaving wildlife biologists to define the goals of their population management efforts without recourse to the term.

However, there is also indication that evisceration of the concept may not be total and irreversible. An effort to restore the meaning of carrying capacity by reformulating it as a "limits of acceptable change" approach to wilderness management (Stankey and McCool 1984) reflects lingering recognition of the idea of ecosystem vulnerability to overuse.

Most recently, there has appeared a disturbing tendency to stretch the meaning of carrying capacity to make it seem to refer to other kinds of limits someone wishes to impose on some objectionable behavior, as if, then, there would be a scientific basis for declaring that "nature abhors" this or that activity that the speaker happens to dread. For example, the phrase "cultural carrying capacity" has begun to take on a very unecological meaning. Disregarding the sense in which Hardin (1986) used the expression to refer to Earth's limited capacity to endure the load imposed by technologically (culturally) equipped humans, speakers at the Second National Carrying Capacity Issues Conference (convened in June 1993 in Arlington, Virginia, under sponsorship of Carrying Capacity Network, Inc.) misused "cultural carrying capacity" to mean the limited power of American culture to withstand intrusion of alien ways, brought by unwanted immigrants (see CCN's Clearinghouse Bulletin, vol. 3, August 1993). That may well be an anthropological issue that ought to be studied in its own right (see, e.g., Abernethy 1990; 1993), but such usage is a serious distortion of the meaning of carrying capacity. The term

is too valuable (as used in ecological literature) for such distortion of its meaning to be tolerable. For ecology, carrying capacity must continue to mean the amount of use an ecosystem can withstand before its processes begin breaking down.[3] Misuse of the concept to stigmatize immigration by the "wrong kind" of people could so stigmatize the concept[4] that further efforts to implant its profoundly important ecological meaning in the thinking of non-ecologists would succumb to humanity's already stubborn denial tendency.[5] ❙

William R. Catton Jr. is Professor Emeritus at Washington State University and author of the classic work on transcending carrying capacity, Overshoot: The Ecological Basis of Revolutionary Change *(University of Illinois Press, 1982).*

References

Abernethy, V. (1990). Editorial: Immigration Increases Suffering. Population and Environment, 11 (Summer):241-243.

_____. (1993). Jobs, Politics, and Immigration. Carrying Capacity Network Clearinghouse Bulletin, 3 (November):1-2, 7.

Bahn, P., and Flenley, J. (1992). Easter Island, Earth Island. London: Thames & Hudson.

Boughey, A.S. (1975). Man and the Environment (2nd ed.). New York: Macmillan.

Brown, Lester R. (1981). Building a Sustainable Society. New York: W. W. Norton and Company.

Burch, W.R., Jr. (1981). The Ecology of Metaphor—Spacing Regularities for Humans and Other Primates in Urban and Wildland Habitats. Leisure Sciences, 4 (No. 3):213-230.

_____. (1984). Much Ado about Nothing—Some Reflections on the Wider and Wilder Implications of Social Carrying Capacity. Leisure Sciences, 6 (No. 4):487-496.

Carrying Capacity Network, Inc. (1993). Clearinghouse Bulletin, 3 (August):1-3, 6.

Catton, William R., Jr. (1996). The Problem of Denial. Human Ecology Review, 3 (Autumn):53-62.

Chase, Allan. (1976). The Legacy of Malthus: The Social Costs of the New Scientific Racism. New York: Alfred A. Knopf.

Coale, A.J. (1974). The History of the Human Population. Scientific American, 231 (September):41-51.

Crosby, A.W. (1986). Ecological Imperialism: The Biological Expansion of Europe, 900-1900. New York: Cambridge University Press.

Darwin, C. ([1859] 1964). On the Origin of Species [facsimile reprint of the first edition]. Cambridge, MA: Harvard University Press.

Dhondt, A.A. (1988). Carrying Capacity: A Confusing Concept. Acta Oecologia/Oecologia Generalis, 9 (No. 4):337-346.

Durand, J.D. (1968). The Modern Expansion of World Population. Proceedings of the American Philosophical Society, 111 (June):136-159.

Gibbs, Jack P. (1989). Control: Sociology's Central Notion. Urbana: University of Illinois Press.

Hardin, G. (1986). Cultural Carrying Capacity: A Biological Approach to Human Problems. BioScience, 36 (October):599-606.

Hughes, J.D. (1975). Ecology in Ancient Civilizations. Albuquerque: University of New Mexico Press.

Hutchinson, G.E. (1965). The Ecological Theater and the Evolutionary Play. New Haven: Yale University Press.

Kenny, A. (1994). The Earth Is Fine; The Problem Is the Greens. The Spectator, (12 March):9-11.

Lenski, Gerhard, and Jean Lenski. (1982). Human Societies: An Introduction to Macrosociology, 4th ed. New York: McGraw-Hill

Malthus, T.R. (1798] 1976). An Essay on the Principle of Population. New York: W. W. Norton & Company, Inc.

Merchant, C. (1980). The Death of Nature: Women, Ecology, and the Scientific Revolution. San Francisco: Harper & Row.

Milbrath, Lester W. (1989). Envisioning a Sustainable Society. Albany: State University of New York Press.

Mulloy, W. (1974). Contemplate the Navel of the World. Americas, 26 (April):25-33.

Petterson, M. (1960). Increase of Settlement Size and Population Since the Inception of Agriculture. Nature, 186 (June 11):872.

Postel, S. (1994). Carrying Capacity: Earth's Bottom Line. pp. 3-21 in Lester R. Brown et al., State of the World 1994: A Worldwatch Institute Report on Progress Toward a Sustainable Society. New York: W. W. Norton & Company, Inc.

Shelby, B., and T.A. Heberlein. (1986). Carrying Capacity in Recreation Settings. Corvallis, OR: Oregon State University Press.

Simon, J., and H. Kahn. (1984). The Resourceful Earth: A Response to Global 2000. New York: Basil Blackwell Inc.

Stankey, G.H., and S.F. McCool. (1984). Carrying Capacity in Recreational Settings: Evaluation, Appraisal, and Application. Leisure Sciences, 6 (No. 4):453-473.

Wattenberg, B.J. (1987). The Birth Dearth. New York: Pharos Books.

Weeks, John R. (1989). Population: An Introduction to Concepts and Issues. Belmont, CA: Wadsworth Publishing Company.

World Almanac and Book of Facts 1994. Mahwah, NJ: Funk & Wagnalls.

3 The essence of the ecological carrying capacity concept is the issue of sustainability. Usage of the phrase ought to be based on the following axiom: For any use of any environment there is a use-intensity that cannot be exceeded without reducing that environment's future suitability for that use. In our time, "Overfishing, overgrazing, and deforestation have become widespread," says the head of the Worldwatch Institute (Brown 1981:6). "As demand exceeds the sustainable yield of biological systems, we begin to consume the productive resource base itself, engaging in the biological equivalent of deficit financing." When human loads exceed carrying capacity, they impose stress on ecosystems. Because human societies are inescapably dependent upon ecosystems, stressed ecosystems translate into economic and social problems, including hunger, demoralization, forced migration, higher infant mortality, and reduced life expectancy (Brown 1981:132). The greater the ecosystem stress, the more intense these problems. Sharpened group conflict can result, and may lead to repressive government (Milbrath 1989:37). These vital ideas may be lost if "cultural carrying capacity" comes to be used in a merely chauvinistic sense.

4 For a glaring example of this reaction, see Chase (1976).

5 For analysis of the denial tendency, see Catton (1996).

Population Planning in a Premodern Context

by Virginia Abernethy

INTRODUCTION

The human biological potential for childbearing is probably about 10 or 11 births per woman. But a far lower fertility rate typically occurs, whether in historical, contemporary, modern, or premodern societies. Averaging nearly 10 children per woman, early Hutterite settlers in the open, productive lands of the northwestern United States stand out as exceptional. Fertility rates lower than the biological potential suggest that a voluntaristic, purposive motive or a cultural adaptation operates universally.

An analysis of traditional, undisturbed societies reveals numerous cultural as well as biological strategies for keeping fertility low. Populations have remained stable over long periods of time; and *not* because of inordinately high adult mortality, but because cultures have evolved to maintain population size within the carrying capacity of local environments. While some of the strategies used may seem repellent to contemporary, western observers, their efficacy is well established.

The prevalence of strategies for limiting fertility has major theoretical significance. It means that birth control does not depend upon modernization. Birth control is a longstanding human adaptation that allows individual families to exist over the long term, more or less in balance with the carrying capacity of their environment. So long as *perceptions* about carrying capacity are accurate, huge oscillations in population size are usually avoided. Societies where timely feedback from the local environment influences family size preference seldom see either rapid population growth or periodic collapses.

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CULTURAL BRAKES ON FERTILITY

Within biological limits, children are born or not as the result of particular human actions. Abstinence, mating, contraception, and induced abortion are voluntary behaviors that determine whether a woman will be exposed to pregnancy and, if pregnant, whether she will carry to term.

People in every society know that sexual relations between a man and woman can lead to pregnancy. People in some cultures do believe that it takes repeated acts of intercourse to make a baby. In other cultures, a woman is thought to be impregnated by totemic spirits that reside in sacred places. But everyone also understands that reproduction takes a man and a woman. Magic alone will not do it.

Men, women, and sometimes their families make the decisions affecting pregnancy and birth. A woman may have many more children than *she* wants, but that usually means someone else is in control. *Wanting* more children is a principal reason that some people have large families, while others have small ones or voluntarily forgo childbearing altogether. The idea that family size preference is the most likely determinant of how many children a woman has is not new. The surprise is how much preferences matter. Wanting fewer or more children matters so much that access to modern contraception seems to make little difference. Lant Pritchett (1994) of the World Bank suggests that preferences account for 85% of completed family size.

Perhaps because westerners are used to distinguishing between recreational and procreational sex, and to a pattern in which almost every young person is sexually active, we can hardly envision ways to limit births that do not rely on contraception. Overreliance on modern biological methods results in overlooking cultural and social patterns that affect a threshold factor: exposure to the risk of pregnancy.

This western blind spot can have serious consequences. For example, it encourages the assumption that modernizing will help Third World countries to control their population growth. Traditional beliefs and behaviors may be attacked simply because they are not modern. The possibility that they have helped limit population growth is generally overlooked.

Undisturbed, intact societies usually do well on their own; without modern contraception, they still manage to keep fertility rates low and population size in balance with available resources. Traditional so-

A Shipibo (from Paul Marcoy's Travels in South America from the Pacific Ocean to the Atlantic Ocean, *1875)*

The Shipibo: Modernity Begets Fertility

Some tribes of the Peruvian and Brazilian Amazon became extinct in the centuries after contact with western civilization. The survivors, however, are experiencing very rapid population growth even as their traditional lands are destroyed by roads, deforestation, and development.

The Peruvian Shipibo and the Brazilian Bororo, Xavante, and Yanomama, like many other Brazilian tribes, traditionally practiced abortion, infanticide, and sororal polygyny (a man marrying sisters). As many as 50% of all marriages were polygynous in traditional Yanomama villages, but it is much less common in more acculturated groups. In the 1970s, only about 10% of reproductive-age Shipibo women were in polygynous marriages, and the practice was declining.

Epidemiologist Warren Hern (1991) makes a strong case that polygyny is one of the key mechanisms for limiting fertility in traditional cultures. He found that Shipibo women in polygynous unions have longer intervals between births—4.5 months longer—than monogamously married women. The traditional Yanomama average 40 months between births, at least partly because of widespread polygyny. The length of birth intervals affects fertility. Polygynously married women that Hern studied averaged one to two fewer births than their monogamous counterparts. Hern sees "an almost straight line negative relationship" between village fertility rates and the proportion of polygynous birth intervals. The greater the fraction of women whose childbearing occurs in a polygynous context, the lower the fertility rate.

Postpartum sex taboos and breastfeeding are both likely to last longer in polygynous marriages. Breastfeeding itself delays the return of ovulatory menstrual cycles, adding to the effect of limiting women's exposure to pregnancy. Emphasis on the taboo may also increase abortion and infanticide, because children conceived in illicit sexual activity are not wanted.

All these practices are abandoned as South American Indians become more attuned to western values. Shipibo fertility has soared, edging close to ten live births per woman in some villages. Hern estimates that villages are growing at about 4% annually, which suggests

that populations are doubling every 17 years. The increase seems entirely due to changes which come about as Shipibo and other Indians' jungle homes become the fringe, and then are absorbed by modern settlements.

Bereft of traditional folkways, Shipibo women take desperate measures to avoid closely spaced pregnancies. Some use a caustic substance for contraceptive purposes which, says Hern, contributes to their very high mortality from cervical cancer. One fairly concludes that Shipibo women would be receptive to modern contraception. Whether the family power structure and/or their husbands' approval would allow it to be used, if available, is a separate question, one that can be answered only by research.

First steps into a more modern world have not brought much good to the Shipibo. Modernity intruded on them. It did not seduce them. The development process itself probably fueled fertility. Hern concludes, "From this and other studies, I think one should expect higher fertility in tribal societies making the transition from traditional to peasant to urban societies, and it appears unlikely that the native Amazonians will be able to escape the process."

—*Virginia Abernethy*

Hern, W. 1991. Effects of Cultural Change on Fertility in Amazonian Indian Societies: Recent Research and Projections. Population and Environment *13(1):23-44.*

cieties do not have natural fertility, that is, all the children that every woman can bear in her natural lifetime. Anthropologists have noted many beliefs, rules, and behaviors that depress fertility. Most of them involve limiting women's exposure to pregnancy, rather than birth control or abortion. A woman who is prevented from being sexually active during all, or even most, of her adult life will not have a large family.

DELAYED CHILDBEARING

Delaying age of first birth, the traditional European pattern, is, in fact, quite common. First, emphasis on virginity before marriage limits young women's chances of becoming pregnant. Then, if marriage is delayed into the late twenties, or if some women never marry, average fertility remains low even if a few women have very large families.

Various African and Muslim societies have particularly harsh ways of enforcing premarital virginity. Some do not flinch at documenting virginity by hanging out bloody sheets from the marriage bed. Other societies, including nomadic Somali clans and some in North Africa, leave little to chance: A girl is infibulated; the labia of the vagina are sewn together when she reaches puberty. In European countries as recently as the nineteenth century, a premaritally pregnant woman would be disowned by her family, condemned to a life of destitution and probable early death.

Delaying marriage is another major strategy for limiting fertility. One way to delay marriage is to require property accumulation or a demonstration of economic stability before marriage. A vestige of this tradition exists in a suitor explaining his financial prospects to the

Undisturbed, intact societies usually do well on their own; without modern contraception, they still manage to keep fertility rates low and population size in balance with available resources.

prospective bride's father. Bride-price and dowry serve the same purpose. Another brake on marriage is having complex rules about who can marry whom. Such rules are effective where populations are small because it is difficult to find an eligible partner.

CHILD SPACING

Even after marriage, exposure to pregnancy can be limited by physiological or behavioral mechanisms. Breastfeeding, for example, delays the return of ovulatory cycles for an average of 13 months after delivery. The full contraceptive effectiveness of nursing depends on several factors, however. The most important is frequency because suckling depresses the hormones which trigger ovulation. The mother's nutritional status and whether the baby gets supplementary feeding also make a difference. Nursing on demand, and often, is most likely when the baby is carried everywhere during the day and sleeps beside its mother at night—common in polygynous marriages because the husband is not present.

Polygyny, the practice of one male having multiple wives, is often associated with long postpartum sex taboos, also a way to avoid closely bunched pregnancies. The postpartum sex taboo is often reinforced by beliefs that a malevolent magical influence is triggered by resuming sexual relations too soon or that the mother's milk will be poisoned by another pregnancy, causing the nursling to die.

Both prostitution and polygyny—popularly called polygamy—make it easier to observe long postpartum sex taboos. The pressure on women to resume sexual relations after childbirth is less, simply put, if men have more than one wife or sexual partner. Wife-sharing among traditional Eskimo has the same effect. In societies that infibulate, a woman may be reinfibulated for a time after each birth.

CELIBACY

The mirror image of polygyny is polyandry. Practiced in Tibet, polyandry depresses fertility because many women cannot find a husband when it's common for several brothers to share a wife. The paternity of children is attributed sequentially; brothers "pass the arrow." In pre-Communist times, up to 30% of Tibetan women remained unmarried and childless because a large proportion of the marriageable men were either in polyandrous unions or dedicated to the celibate Buddhist priesthood.

Other ways of limiting women's exposure to pregnancy are not benign. Divorce or widowhood can end both a woman's marriage and her life, socially or in fact. Rules prohibiting female remarriage are the least onerous of this set. Many subcultures still depersonalize widows even where discrimination against women is officially illegal.

High-caste Hindus in India carried women's marital monogamy to an extreme; *Suttee*, voluntary or not, meant immolation on the husband's funeral pyre. A New Guinea tribe, the Enga, had a similar custom: Within 24 hours of becoming a widow, a woman was strangled by her husband's brother. Suttee in India was outlawed in the 1920s under British colonial influence. Nevertheless, it persisted in remote areas until at least 1960, and rumblings about it still are heard.

The reproductive effect of not letting women remarry varies. If a woman is divorced or widowed very young and cannot remarry, she is unlikely to have many children. A young girl married to a very old man might not even reach puberty before being widowed. Anthropologist Mahinder Chaudry (1990) states that during the 1960s, the average age of Indian women being widowed was 35, whereas earlier, in the 1930s, women were widowed by age 29. The six extra years let the 1960s woman have two or three more children than her counterpart would have had 30 years earlier. Thus, the ethos of modernization, which challenges arranged marriage, contributes to population growth.

Voluntary behavior that limits women's exposure to pregnancy can have various rationales. People may accept prohibitions on sex during festive and ritual occasions. Planting, harvesting, expeditions for fishing, hunting, war, and certain lunar phases are all reasons, in one society or another, to avoid sex. In the extreme case, where sex is taboo more often than it is permitted, the likelihood of pregnancy is probably cut by about two-thirds. Accounts of some traditional societies, e.g., the Yap, suggest that coital frequency averages as little as once every six or seven weeks.

Whether or not a cultural belief system encourages fairness in reproductive opportunity, individuals can be counted upon to act in their own perceived best interest. Thus, a fisherman avoids sex because he believes this behavior will improve the catch or, perhaps make waves less likely to swamp his boat. Sexual self-restraint is bolstered by a whole constellation of beliefs, which are usually part of the male, rather than the female, culture.

For example, a devout member of the Brahman (Hindu) caste would ideally sleep once with his wife and would on that occasion father a son. His main incentives are belief that

abstinence in life increases the chances of reaching Nirvana, and fear of losing his health by succumbing too often to sex. Many Asian and Pacific cultures contain beliefs that blood and semen are interchangeable body fluids: Both are thought to be finite in quantity and nonrenewable. A man could shrivel up and turn black when his supply is gone, so he should not call on his reserve too often.

NONPROCREATIONAL SEX

Impediments to sexual intercourse are the principal, but not the only, ways of avoiding reproduction in premodern cultures. Coitus interruptus (withdrawal) is used for birth control in many societies and was known by the time of Augustus Caesar, the first Roman Emperor. Pessaries, plugs placed against the cervix to block sperm from the uterus, are another widely known device. Sometimes, pessaries are used with ointments that supposedly have spermicidal properties. Intrauterine devices have a long history and may have been tried as well.

ABORTION

Abortion is known and used by women essentially everywhere. The most common methods are mechanical, including internal probes, blows to the stomach, jumping from heights, and violent exercise. In some societies—including those of American Indian and Pacific peoples—women moved into a separate house on a monthly basis, supposedly for menstruation. So-called menstrual huts are known as a way to protect other members of a society at a time when women are ritually unclean. But retirement for the menstrual period is far from being a burden to women; it is an opportunity for rest and sociability and, if need be, creates an opportunity for discreet abortion. Menstrual huts provided privacy, help from other women, and time to recuperate.

Prescriptions and potions to induce abortion are also common, but not many have proven to be both effective and safe. Most concoctions that would cause elimination of the fetus also poison the mother. Indeed, the British penal code first mentioned abortion in 1803 in connection with the Poison Laws.

Occasionally, a chemical method turns out to be both effective and safe. A lush creeping plant of the family Asclepiadaceae is known to women in Bangladesh. A twig, inserted through the cervical canal and left protruding into the uterus, brings on cramping and abortion within 72 hours. The method was tested by Dr. A.F.M. Burhan-Ud-Din, then with the United Nations, in trials with 108 women who wished to terminate pregnancies ensuing from rape during the 1972 Pakistan-Bangladesh war. Burhan-Ud-Din reported successful abortion in all cases, although the procedure was accompanied by severe abdominal cramps, elevated temperature, and bleeding. Without treatment by ergometrine and broad-spectrum antibiotics, some women might have died from excessive bleeding.

An overview of traditional abortion practices suggests that they are usually on par with the crude midwifery or quack medicine practiced in countries where abortion remains illegal. The chances of complicating infections are high, so sterility and mortality are severe risks.

INFANTICIDE

Infanticide is another extreme means of changing reproductive outcomes. No societies rely on it, but in periods of stress or in certain individual circumstances, it is a last resort. Unwed mothers are perhaps the most likely to commit infanticide, both in traditional societies and in the United States. Neglect of prenatal care as well as of the infant is common and increases the risk of infant mortality.

Infanticide may be tacitly approved but still practiced surreptitiously. Bugos and McCarthy (1984) state that although the unwed Ayoreo (South American Indian) woman is not punished, she still tries to keep infanticide a secret. Sometimes infanticide is ignored even if illegal. Although classed as murder in Great Britain and continental Europe, infanticide was relatively common up through the nineteenth century. Dead babies could be found on the garbage heaps of every large European city through the nineteenth century, but no mother was ever convicted of murder. The greater part of official action in Europe was to outlaw taking a baby into an adult's bed. The law was meant to eliminate the excuse "I rolled over and smothered him—by accident."

Infanticide may also be condoned. For example, Early and Peters' ethnography (1990) of the Mucajai Yanomama (South American Indians) reveals that 43.6 percent of all infant mortality is due to deliberate parental behavior. Twinning (among the Australian Aborigines) or a congenital anomaly often triggers infanticide, which may be a parental or paternal right, or even a duty, in some societies.

Nomads who walk and carry all their possessions over vast territories have no alternative to infanticide if the physiological suppression of ovulation induced by breastfeeding fails them. Aborigine mothers in

their traditional habitats carried their young on long desert treks, and two at once were too much to handle. The African !Kung of the Kalahari Desert used infanticide as a backup method for spacing children, but abandoned the practice when they stopped their nomadic migrations and became settled agriculturalists.

Netsilik Eskimo, another people who needed to cope with an unusually harsh environment, practiced infanticide as necessary. The link to poverty (effective overpopulation) is strong: Groups with the lowest sled dog-to-human ratio—meaning that they led a near-marginal existence—had the highest ratio of men to women. More boys than girls are born as a rule, but Eskimo men had high occupational mortality, so more females should survive into adulthood. The more the sex ratio favors men, the stronger the indication of female infanticide.

Female infanticide is the most common type in Third World countries. Sons tend to be valued because their lifelong labor is usually available to their family of birth, and they often have ritual funerary responsibility to parents. But daughters tend to leave home, and marrying them off can ruin—literally ruin—a family in societies where dowries must be large.

The fact is, traditional societies limit reproduction in ways that may be bitter: Women and babies are often victims. Men are luckier. Some religious vocations demand temporary (Buddhist) or lifelong (Roman Catholic) celibacy, but only a fraction of men take the cloth when celibacy is lifelong. Their cost is no more than suppression of sexual drives. Even that can be mitigated, sometimes, by redirecting energy to nonprocreative contexts, including use of prostitutes and homosexuality.

MALE METHODS

With an exception for vasectomy, culturally sanctioned physical impairments of men's ability to procreate are rare. Eunuchs formed a class of professional bureaucrats in the Ottoman Empire. Castration so that choirboys did not lose the falsetto singing voice was practiced up to the nineteenth century in Italy. And certain Australian Aborigine tribes practiced subincision. Subincision was part of the rite of passage from puberty to full manhood. A stone knife laid open the underside of the penis, lengthwise from base to tip. The urethra was allowed to heal so that an opening remained near the base; henceforth, urine and semen discharged through this orifice. Physiologist S.J. Segal (1972) suggests that such anatomical rearrangement would result in low conception rates because "the semen flow, mainly, is diverted and lost."

Eskimo Family at Hopedalf, Labrador, 1864
from Alpheus Spring Packard's The Labrador Coast, *1891*

Aborigine men explain subincision as (1) making them more like their totem, the kangaroo, which has a bifid penis; and (2) making themselves more attractive to women. Women are said to prefer subincised men because the plateau and ejaculation phases in sex last longer. Each of these explanations is supported by evidence, and the rationales are not mutually exclusive. But the birth control function of subincision may explain why it was rigorously practiced in the desert interior of Australia—where the population carrying capacity is extremely low—and was merely an option available to men in the rich coastal regions of the continent.

Subincision illustrates the point that behaviors which lead to low fertility are often built into the culture as tastes and conventions. They usually do not require specific decisions about family size but depend on beliefs and rules that are rationalized in ways other than by conscious reproductive goals. Since a successful society (one that lasts) has adjusted over time to the limits and opportunities of a particular environment, the fertility level actually realized is likely to be adaptive to local conditions.

CONCLUSIONS

Culture has put, is putting, the brakes on population growth in many settings. Anthropology and history do not justify the belief that out-of-control population growth is a necessary human condition. Those who think it is, or believe that modernization is the best corrective, see only a tiny slice of human experience.

The rapid population growth that occurred worldwide during the twentieth century can be attributed to several factors. Most often noticed is the control of disease and premature mortality by public health measures and modern medicine. But fertility rates also rose.

The rise in fertility was caused in part by the disruption of traditional cultures that had built-in control mechanisms. But in addition, preferred family size increased. In case after case, one sees that families began to believe in a richer resource base or more productive technology that would allow them to afford and successfully raise more children.

More realistic perceptions of carrying capacity are returning as, worldwide, per capita grain production declines and potable water is in ever shorter supply. Moreover, societies that are successfully industrializing are beset by an unforeseen and unwanted accompaniment of modernization: the consumer culture. Consumerism means that, however much one has, it is insufficient. The ironic, redeeming feature of consumerism is that it fosters—however artificially—the sense of scarcity. My work suggests that the single feature of modernization that reliably depresses family size is this sense of not having enough, i.e., scarcity. The desire for goods impels people to postpone and limit childbearing, because children compete for available resources.

Carrying capacity means more than some person-to-resource ratio. It includes intangibles such as standards and desired quality of life. Sensitivity to carrying capacity appears ubiquitous among humans and, I think, perceptions about the resources to which one has access is, universally, the regulator of desired family size. ▮

References

Abernethy, V. 1979. Population Pressure and Cultural Adjustment. New York: Human Sciences Press.

Abernethy, V. 1993. Population Politics. New York: Plenum Press.

Bugos, P.E., Jr., and McCarthy, L.M. 1984. Ayoreo Infanticide: A Case Study. Infanticide, G. Hausfater and S. Hrdy, eds. New York: Wenner-Gren Foundation for Anthropological Research Inc.

Chaudry, M. 1990. Role of the Social and Cultural Factors in Human Fertility in India. Population and Environment 12(2):117-138.

Early, J.D. and Peters, J.F. 1990. The Population Dynamics of the Mucajai Yanomama. San Diego: Academic Press.

Pritchett, Lant. 1994. Desired Fertility and the Impact of Population Policies. Population and Development Review 20(1):1-55.

Riddle, J.M. and Estes, J.W. 1992. Oral Contraceptives in Ancient and Medieval Times. American Scientist 80:226-233.

Segal, S.J. 1972. Contraception Research: A Male Chauvinist Plot? Family Planning Perspectives 4(3):21-25.

Virginia Abernethy, Ph.D., is professor of psychiatry (anthropology) at Vanderbilt University Medical Center and editor of the journal Population and Environment *(Vanderbilt University School of Medicine, Department of Psychiatry, Nashville, TN 37232-2647). This article is adapted from her book* Population Politics *(Plenum Press, 1993).*

Immigration-driven Population Pressures Threaten America's Natural Environment

by Roy Beck

For three decades, Americans have demanded that their government protect and restore the country's natural environment so that it could continue to meet human needs for health, food, recreation, psychic or spiritual nourishment, and commerce.

A nation's concern for the natural resources within its borders is, at its heart, concern for the descendants of the present inhabitants. It anticipates the pain that our great-grandchildren might feel if we destroy their chance of ever experiencing or using parts of our present natural endowment. Frequently conflicts described as pitting the needs of people against the needs of the environment are actually conflicts of the needs of *today's* people versus the needs of our descendants.

At enormous cost, as taxpayers and consumers, the average American since 1970 has slashed his or her destructive impact on the country's environmental resources. The results in aggregate are impressive: rivers no longer catch fire or run in brilliant colors (as I witnessed when I first began covering the environment for newspapers in the 1960s); the air in our cities is far cleaner, even healthy much of the time; the Bald Eagle has been rescued from oblivion.

But we have fallen far short of our goals. Forty percent of America's lakes and streams remain unfishable and unswimmable. Several of the nation's most biologically rich natural areas—including Chesapeake Bay and the Everglades—teeter in precarious environmental health. Thirty-five states are withdrawing groundwater faster that it is being replenished. In 1988, fifteen years after passage of the Endangered Species Act, five hundred plant and animal species still were listed; by 1993, the number had increased to more than seven hundred, and many conservationists believe that listed species represent only a fraction of the species of plants and animals that are gravely imperiled.

The most important factor that has so counteracted all the positive efforts to restore and preserve the environment is this: an additional 65 million US residents. If we were still the 203 million Americans of 1970 whose government committed itself to environmental protection, most of our conservation goals would have been met by now. But there are now more than 268 million of us!

Immigration has been a substantial cause of the negative environmental news that must be mixed among the good. This is not because immigrants are environmentally bad people, but because they are people. Like the Americans they join, immigrants flush toilets, drive cars, use public transportation, require land to feed, clothe, and house themselves, and to provide the materials (and space) for their commerce, recreation, and waste disposal. As additional people, they require more roads, more parking lots, more industrial infrastructure of all sorts, the development of which leads to loss of farmland and wildlife habitat. More than one million acres are blacktopped each year.

Not only do immigrants place additional strain on the remnants of wild Nature in the US, but they add to global environmental problems by emitting far more hydrocarbons into the air than they did in their home countries.

Having already destroyed some 50 percent of its wetlands—the prime incubators of biodiversity—the United States is filling in another 300,000 acres annually to accommodate its expanding population. With over 90 percent of northwestern old-growth forests gone, there is intense pressure to log much of the rest.

US immigration policy, combined with the much higher fertility rate of immigrants, has been the number-one cause of population growth since 1970. Using recent US Census Bureau data and projections, demographer Leon Bouvier of Tulane University estimates that immigrants and their descendants since 1970 have comprised more than half of US population growth. They will be responsible for 90 percent of the population expansion between now and 2050, if current fertility and immigration rates remain constant.

Thus, to whatever extent environmental problems can be blamed on population growth, the preponderance of that blame rests on US immigration policy. Changing the composition of the immigration stream—whether by skill, country of origin, education, etc.—will not diminish the threat. Only a reduction in numbers will reduce the problem.

The fight against air pollution may be America's greatest environmental success story. Despite Herculean cleanup efforts, however, about 40 percent of Americans live in metropolitan areas that fail to meet some of the Environmental Protection Agency's health standards. How different would this statistic be if there were 65 million fewer Americans driving cars and using electricity? And it only gets worse. Each year, the US population grows by another 3 million people, most of them immigrants and the descendants of recent immigrants.

As expensive as it has been to clean up the air thus far, that was easy and cheap compared with what lies ahead. Every additional one percent decrease in air pollution now becomes much more expensive than before, both in money and restrictions on personal freedom. Because 65 million more people are contributing to air pollution, the emissions *per person* must be cut another 30 percent just to make the air as clean as it would have been if our population had remained at 1970's 203 million.

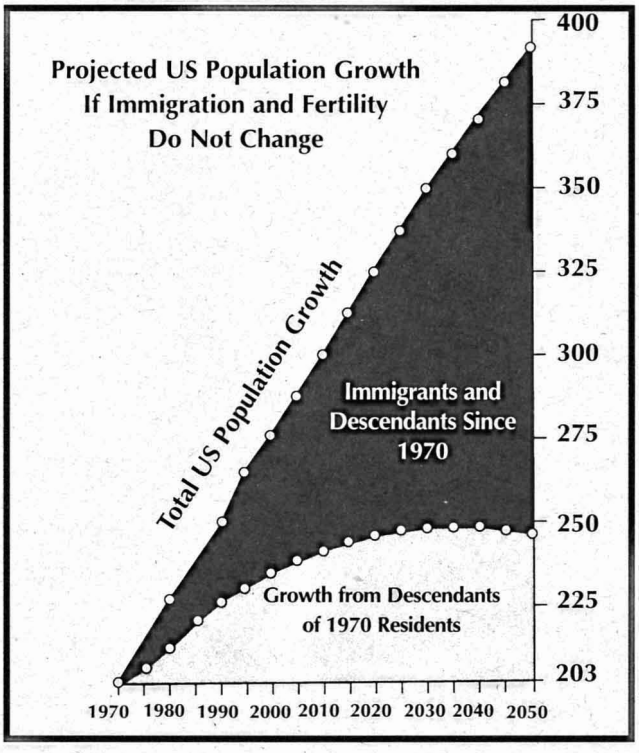
That will take care of this year. But what about next year, and the decades afterwards? The US Census Bureau currently considers the most likely population scenario to be one of fertility continuing close to the present rate and of immigration running slightly below recent levels. Under those assumptions, it projects a population of nearly 400 million Americans by 2050; 130 million more Americans, almost all of them resulting from post-1970 immigration policies.

Such figures pose a chilling threat to biodiversity, farmland, recreational spaces, and air and water quality in the United States. To avoid further degradation of these resources, federal and state governments would need to enforce deep cuts in material standards of living and in individual freedoms (such as choices of transportation and where to live) to accommodate another 130 million people. Nothing in the current political climate suggests that such cuts will occur. The more likely direction now appears to be toward cuts in environmental standards and enforcement.

According to conservation biologist Thomas Lovejoy, the United States doesn't have a lot of environmental leeway. An adviser to the US government who has been decorated by the Brazilian government for his decades of work with the rainforests, Lovejoy says the United States is "demonstrably losing biological diversity.... On top of the general threat of pollution and other stresses, we have some areas which are really close to 'last-minute' situations.... Population growth is probably the single most important factor in the ability to protect biological diversity and manage the environment."

The United States has pledged itself in international arenas to move toward environmental sustainability. That would mean that the total environmental impact of

Cloud Peaks, Rocky Mtn. NP *by Evan Cantor*



all Americans would not diminish the ability of future Americans or citizens of other countries to enjoy at least the level of lifestyle of today's inhabitants. But if sustainable living can be defined as enjoying the fruit without harming the tree that produces it, then there is ample evidence that 268 million Americans are hacking fairly vigorously at the trunk today.

It is immigration-driven population growth perhaps as much an any other factor that gives many Americans the feeling that they are running in place when it comes to efforts to protect the environment. Conservation efforts too often merely slow the rate of destruction.

The geopolitical analyst George Kennan wrote in *Around the Cragged Hill* that there is an "optimal balance, depending on the manner of man's life, between the density of human population and the tolerances of nature. This balance, in the case of the United States, would seem to me to have been surpassed... the question is not whether there are limits to this country's ability to absorb immigration; the question is only where those limits lie, and how they should be determined and enforced...."

A poster-sized chart of the above population growth graph is available as a visual aid. An accompanying immigration video cassette is also available for a tax-deductible contribution of at least $10. Send contributions to: The Video Immigration Project, P.O. Box 98285, Washington, DC 20077-7688. <www.NumbersUSA.com>.

Immigrants and their descendants since 1970 have comprised more than half of US population growth. They will be responsible for 90 percent of the population expansion between now and 2050, if current fertility and immigration rates remain constant.

Kennan suggested that the optimal population has already been surpassed. Apparently most Americans tend to agree. In 1992, by a ratio of 7 to 1, respondents to a Roper poll felt that the United States was suffering from too many people. In fact, by their own behavior, Americans have been opting for a stabilized population since 1972 by having less than the average 2.1 children per woman that eventually leads to a level population size.

For three decades, Congress has run a government-induced population growth program through immigration that has negated the low-fertility decisions of America's citizens. Among the winners have been those who profit from converting natural ecosystems and agricultural land into urban development. The losers have been all who sought to protect America's natural diversity from the assault of an endlessly increasing human population, and the wildlife displaced from disappearing habitats. And the day of environmentally sustainable living in the US has been pushed much farther into the future.

If Congress had run a replacement-level immigration program (matching in-migration to out-migration) to go along with Americans' replacement-level fertility after 1972, US population never would have reached 250 million, peaking below that mark during the 2030s, according to Bouvier.

Instead, we're already above 265 million people and headed toward 400 million by 2050. Virtually every aspect of US environmental protection and quality, and of the quality of life for America's inhabitants—both human and wild—is threatened by this dangerously exploding human population. ▮

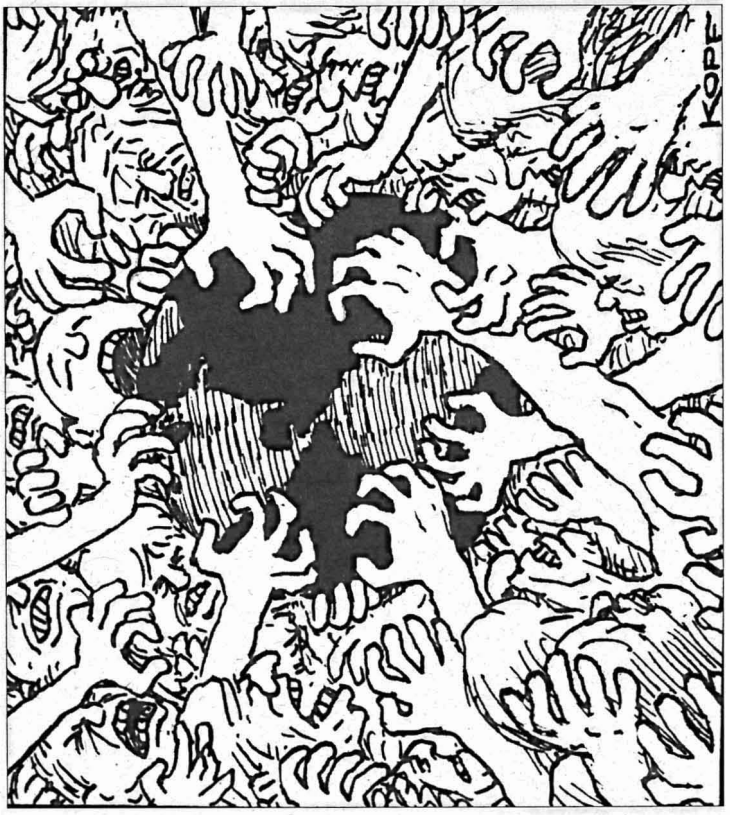
Roy Beck is the Washington editor for the quarterly journal The Social Contract *(1601 N. Kent St. #912, Arlington, VA 22207) and author of* The Case Against Immigration *(W.W. Norton & Co., 1996) from which this article is adapted.*

The Not-So-Hidden Costs of Consumption

by Stephanie Kaza

Abstract: *High rates of consumption in the industrialized nations drive high rates of resource extraction and ecosystem degradation. Market theory assumptions justify relentless production, especially of mass-produced items that generate a high profit margin. Globalization of American products and advertising stereotypes can displace local cultures and values, promoting a social monoculture based on consumption values. The production and consumption of large quantities of material goods leaves behind an enormous ecological wake of habitat destruction, toxic waste, and species decimation.*

The global consumption system is perpetrated by five major players: producers, advertisers, media, government, and transnational corporations. Together they have placed global trade and the cultural ideology of high consumption at the top of the world agenda. Projects challenging this agenda include education, active resistance, changing structural policies, and rebuilding culture and community.



Hummingbird placemats, an iguana mouse pad, a stuffed bald eagle toy... I glanced through the latest compendium of consumer baubles from the National Wildlife Federation. It's fall catalog season and I'm inundated by slick stacks of alluring advertisements. Who makes all these things, I wonder? Who needs them? And why, pray tell, are there so many of them? Just this week at my local right-thinking food co-op, I was assigned to stock dozens of flavors of spritzers and then even more varieties of tea. Spare me! The mad plague of consumerism seems to be everywhere. In an airline magazine I read how even REI and L.L. Bean are aggressively seeking to attract customers. The new Seattle REI store (a $28 million project) has increased business by offering in-store entertainment—a climbing wall, a campstove lab, adventure travel computer center, a raintest room, a mountain bike track, and a hiking trail, plus a 100-seat cafe. Not to be outdone, L.L. Bean has opened a 17,000 square foot L.L. Kids store, complete with 40 foot waterfall, resident trout, interpretive trails, and mountain bike simulators. Like Niketown and Planet Hollywood, these magnetic shopping lures are the latest escalation in the challenge to keep consumer dollars flowing.

illustration by L.J. Kopf

Figure 1. **Per Capita Resource Consumption in the United States, Mid-1990s**

Material	Pounds Per Day
Stone and cement	27
Coal	19
Miscellaneous minerals	17
Oil	16
Farm products	12
Wood	11
Range grass	10
Metals	8
Natural gas	1
Total	**121**

from Stuff: The Secret Lives of Everyday Things, *Ryan, John C. and Durning, Alan T., 1997, Northwest Environment Watch, Seattle.*

How much do we shop? In one year (1990), over 12,000 new products were introduced to American drugstores and supermarkets alone—an average of 33 per day (Kanner and Gomes 1995). The World Resources Institute calculated that each American, German, Japanese, and Dutch person uses the weekly equivalent of 300 shopping bags of natural resources or 45-85 metric tons per year. Americans consume about their average body weight—120 pounds—every day in materials extracted and processed from farms, mines, rangelands, and forests (Ryan and Durning 1997 p5). [*See Figure 1.*] In the United States, the number of shopping malls (close to 35,000) eclipsed the number of high schools in 1987 (Durning 1992 p130). The largest shopping center in the world is in Bloomington, Minnesota and offers four department stores, 400 specialty shops, a walk-through aquarium, a Camp Snoopy theme park, a two-story miniature golf course, and 13,000 convenient parking spaces (Durning 1992 p130).

Though the impacts of consumption are mostly invisible to consumers, they are more than obvious in the far-flung resource bases beyond the shopping malls. Clearcut forests replace paper plantations in Thailand, toxic oil pollutes native lands of Ecuador, women earn poverty wages to produce computer chip boards in Malaysia—the stories are not as pretty as the products. Since the Rio Summit in 1992, representatives of southern countries have spoken up loudly, insisting the North examine its high rates of consumption. This, they say, is driving the escalating resource extraction and ecosystem degradation across the planet far more than population rates.

The ecological wake of consumption is enormous: example after example delineates the destruction of habitats, the breakdown of ecological processes, the increase in toxic waste and pollutants, and the rise in carbon emissions.

In this article I explore the current conversation about consumption and its global impact. Much is involved here. To look closely at consumption means to look closely at capitalism and market theory, as well as the highly developed manifestation of greed in the human character. Drawing on the very recently emerging literature, I will review some of the economic assumptions behind consumerism and the proliferation of consumer products and values across the globe. In a preliminary systems analysis, I describe the agents most responsible for driving consumption toward its inevitably destructive end. It is important to recognize that those who benefit most from this system—the world's 202 billionaires and over three million millionaires—wield great political and economic power. To resist their agenda is daunting but critical environmental work. I conclude by reporting on some of the creative efforts now underway to provide a different vision of the future.

CONFRONTING MARKET THEORY

Behind the familiar consumer sales pitches are some serious flaws in market theory assumptions. Neoclassical economics emphasizes efficiency as a core value, the means to "maximization of utility." This has historically held pervasive moral appeal: being efficient meant less waste and more effective delivery of necessary goods and services. But utility, in practice, is hard to define or measure, so economists substitute instead "maximization of consumption" (and therefore production). In other words, the amount people buy indicates how satisfied they are. More is always better on these terms. The economic system thus presses ever forward with "a goal of increasing consumption with no built-in concept of 'enough'" (Goodwin 1997 pxxxi).

A strong market relies on a series of assumptions about consumers that helps to rationalize the relentless production of stuff. Market theorist Raymond Benton Jr. (summarized in Goodwin et al. 1997 p201) lists seven key assumptions:

1. Consumers derive satisfaction from consumption.
2. Consumers seek to maximize satisfaction given their income constraints.
3. Consumers act rationally.
4. Consumers are capable of judging their tastes and preferences for all products under consideration.
5. Consumers use the price of a good as the sole measure of the sacrifice involved in obtaining it, and price plays no other role in the purchase decision.
6. Consumers develop individual preferences, which are not influenced by other people.
7. Consumers' wants and needs are unlimited and can never be fully satisfied.

Every one of these assumptions can be challenged. By deluging consumers with an overwhelming selection of choices (the teas and spritzers, etc.), advertisers confuse consumers' sense of wants and needs. How can they know which product will satisfy them when there are so many to try? Certainly people need the basics of food, water, clothing, and shelter in order to survive. But *how much* is enough? In the state of confusion and insecurity induced by consumption itself, people easily fall prey to artificial wants (Benton in Goodwin et al. 1997). Since producers assume from the start that consumers can never be satisfied (#7 above), they churn out an endless variety of goods to tempt the never-quite-content consumer. Range of choice is then identified with the rhetoric of freedom, confusing politics with economics, and any sense of "enough" is eradicated by ideologically promoted greed.

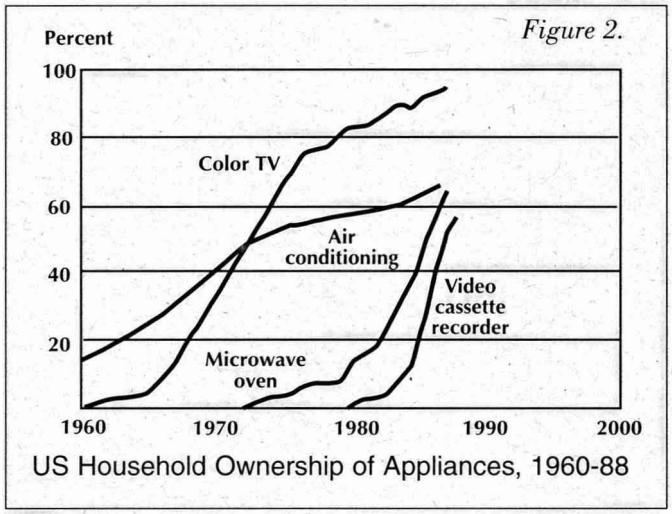
David Loy (1997) suggests that consumption may receive less attention in the I=PAT environmental impact equation because it has become the new world religion. The two unshakable and unchallengable statements of faith in this religion are 1) that growth and enhanced world trade will benefit everyone, and 2) that growth will not be constrained by the inherent limits of a finite planet. Loy challenges the so-called "natural" or inevitable character attributed to our economic relationships, describing the current system instead as singular

cartoon by John Jonik

emphasis on one particular way of valuing the world. From a religious perspective, the power of this worldview lies in its extremely effective conversion techniques. "Buy me and be happy"—the seductive message of product after product captures the secular masses, replacing other religious approaches to the pursuit of a satisfied life. Calvinist Protestantism even aligns itself with the new religion, reinforcing economic success as a demonstration of God's favor. According to Loy, one basic flaw of economic religion is that it depletes "moral capital" (p283). Though the market requires character traits such as trust in order to be efficient, it simultaneously tends to erode personal responsibility for other people such as laborers, consumers, and communities affected by toxic by-products. Loy points out that much as the market depends on the biosphere to regenerate natural capital, it also depends on the community to regenerate moral capital (1997 p283). To confront the impacts of consumption is to confront this moral deterioration, and this would threaten the very underpinnings of the entire system.

If the market system is not necessarily "natural," then how did it come to dominance? The consumer society we know today took shape in the 1920s with the emergence of brand names and packaged, processed foods for a growing urban culture. Economic theory supported mass consumption beyond basic needs as key to economic and political success for the United States. Supporting the economy was (and still is) painted as a patriotic duty. During the Depression and World War II the rising tide of consumption stalled temporarily—but

Figure 2.



US Household Ownership of Appliances, 1960-88

Reprinted with permission from How Much is Enough?, *Alan Durning, 1992, W.W. Norton, New York.*

after the war, the boom was on. Spurred on by the stunning success of wartime production, government leaders expanded their vision of the US as a major world economic leader. President Eisenhower's chief economic advisor proclaimed that the ultimate purpose of the American economy was "to produce more consumer goods" (Durning 1992 p30). With vast forests in the south and west, untapped mineral sources, a hefty supply of oil and hydroelectric power, and a breadbasket to feed the world, the US economy seemed unstoppable.

A significant factor driving increasing consumption has been the steady commercialization of the household economy. In earlier days, people managed their own laundry, cooking, gardening, food storage, and clothes-making. Now, as women householders have shifted into the labor market, these production functions have been assumed by the money economy. Car trips to day care, foil and foam-wrapped takeout meals, disposable diapers, designer running shoes—each of these adds to the impacts on the natural world. The increase in home appliances reflects this trend. [*See Figure 2.*] By 1987 two-thirds of American homes had air conditioning, which depended on ozone-depleting chemicals and used 13% of US electricity (Durning 1992 p32).

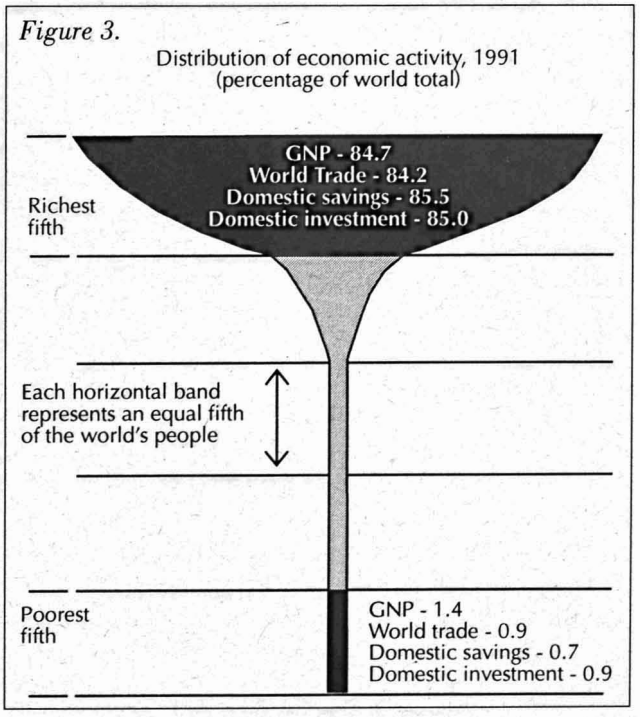
Consumerism has now moved far beyond American borders. Per capita consumption of processed foods doubled in Europe in the 1980s; the Japanese now own four times as many cars per capita as in 1950 and eat double the amount of meat they ate in 1975. Coca-Cola products can be found in over 170 countries around the globe; each day McDonald's opens a new fast food diner somewhere in the world (Durning p31). Mass marketing techniques perfected in the US are now employed on every continent, pushing not only American products but the American way of life. Globalized American products and advertising stereotypes often displace local cultures and values, eroding individual and cultural self-esteem.

For example, to meet the white western urban model, women around the world use chemicals to lighten their skin and hair; Asian women have surgery to make their eyes more western. In rural areas of the Philippines, any city over 20,000 will have a supermarket, offering such products as Spam lunchmeat, Pringles potato chips, Hershey's Kisses, Cheeze Curls, and Colgate toothpaste (Gallagher in Goodwin et al. 1997 p301).

Helena Norberg-Hodge has documented the rapid erosion of local values in Ladakh and Bhutan (1997). Here contact with goods from outside the culture has increased the desire to buy them: this is the so-called "demonstration effect" (Duesenberry in Goodwin et al. 1997). Local people come to see their internal standards of value as secondary to the high status represented by American goods. Locally adapted agricultural practices are being replaced by industrial scale, chemically dependent cash cropping systems to supply consumer desires in northern countries. For Norberg-Hodge, economic globalization through promotion of consumer goods is establishing a social monoculture, destroying cultural as well as ecological diversity in its wake.

But let's look closely here—*whose* consumption is having the greatest impact? In 1991, the United Nations Human Development Program charted the world economic activity by five income sectors. [*See Figure 3.*] The top or richest fifth accounts for 85% of global income, trade exchange, and savings. After that it drops

Figure 3.



Reprinted with permission from The Consumer Society, *Goodwin et al., © 1997, Island Press, Washington, DC & Covelo, CA.*

dramatically. Members of the top fifth are mostly from the northern and western industrialized nations, where comfort and choice are everyday givens. Global marketers are especially interested in the rapidly expanding second fifth that represents parts of Brazil and Costa Rica, much of Eastern Europe, and rising East Asian nations such as Thailand and Malaysia.

Alan Durning (1992) characterizes these groups into three broad classes based on degree of environmental impact: what he calls the consumers, the middle income, and the poor. [*See Figure 4.*] He sees the very wealthy as a subset of the consumer class, even though many in the top fifth feel deprived in comparison to the rich. It is the top and bottom fifths that have the greatest ecological footprint—the top for its extravagant use of resources, the bottom for its desperate poverty and overuse of limited local resources. He argues that sustainability for everyone might be achievable if the rich reduced consumption to emulate the middle income class and the poor were assisted enough to become more self-supporting.

Figure 4.

Category of Consumption	Consumers (1.1 billion)	Middle (3.3 billion)	Poor (1.1 billion)
Diet	meat, packaged food, soft drinks	grain, clean water	insufficient grain, unsafe water
Transport	private cars	bicycles, buses	walking
Materials	throwaways	durables	local biomass
Lodging	climate-controlled electrified buildings	some electricity	huts and shanties
Income/year	above $7500	$700-7500	below $700
% World Income	64%	33%	2%

from How Much is Enough?, *Alan Durning, 1992, W.W. Norton, New York.*

ECOLOGICAL IMPACTS OF CONSUMPTION

What exactly are the ecological costs of producing and consuming so many material goods? The impacts are widespread and well-documented, though the links are not always traced back to specific products or consumers. Air, water, and soil are polluted and rendered dysfunctional from petroleum by-products, pesticides, nuclear waste, and acid precipitation. Natural habitats are disrupted and degraded by dams that generate energy for production, roads that transport wood products, farms for growing food. Human health is eroded by sweatshop labor conditions and pesticide-induced sterility. The rich evolutionary gift of untold millions of species in complex ecosystems is sacrificed to make paper, plastic, potato chips, and Barbie dolls. Each product creates a significant ecological wake in its trail of production and distribution. The combined impacts are well on their way to generating a global ecological holocaust. Meanwhile, on the micro-scale, people keep making small everyday choices that nibble away at the not-so-infinite web of life.

Let us consider two examples from Ryan and Durning's book *Stuff* (1997) that illustrate the far-reaching impacts of North American consumption. Many hard-working dedicated environmental activists (among others) drink coffee to keep going. Two cups a day requires 12 coffee trees producing 18 pounds of beans per year. To keep these personal addictions satisfied, coffee farmers

will apply 11 pounds of fertilizer and pesticides to these trees each year. Forty-three pounds of coffee pulp will be released into rivers, consuming oxygen needed by fish as it decomposes. The beans will travel to the US and be roasted using natural gas from Texas. After being packed in multi-layer bags, they will be shipped by trucks (getting six miles to the gallon) to a regional warehouse. Coffee is the second leading export crop after oil and is the second largest source of foreign income for developing nations. So these cups of coffee mean a lot for cash croppers. In the cool highlands of Costa Rica, Brazil, Columbia, and other Latin American countries, thousands of acres of biologically rich tropical forest have been cleared to support the current boom in espresso shops.

How about the daily newspaper? An average newspaper is printed on a half pound of newsprint with two grams of petroleum and soy-based inks. Tracing production routes in the Pacific Northwest, Ryan and Durning (1997) found that half the newsprint was from recycled sources, the other half from Engelmann spruce or subalpine fir trees in central British Columbia. Ninety per cent of Canadian logging takes the form of clearcutting, with the attendant logging roads, erosion, and polluting pulp mills. Half of each log is cut into lumber; the remaining chips and sawdust are cooked into a pulp and bleached with chlorine dioxide. Some of the chlorine reacts to form highly carcinogenic dioxins and furans. At the paper mill in Spokane, virgin pulp is combined with recycled and de-inked pulp and spun into one ton rolls of paper that are then hauled by truck to Seattle and Portland. While 38 million newspapers are recycled every day in the United States, 22 million others are thrown away. The US consumes 72% of the world's supply of newsprint (Ryan and Durning 1997 p68).

What about food? While the hungry poor in the bottom fifth subsist on grains and root crops and often contaminated water, the middle income class have enough calories and protein for healthy nutrition. They, however, suffer from parasites and food poisoning because they lack refrigeration. People in the top fifth, Durning's consumer class, have access to fresh safe food year round, including an ever-increasing variety of processed foods, meats and beverages. By eating the lion's share of the world's meat, this top class consumes in one form or another 40% of the world's grain (p68). Thus they are responsible for almost half the eroded soils, depleted aquifers, and pesticide-polluted streams in the US. Food processing, packaging, distribution, and storage in the US use 17% of all energy (p69). One-fourth of US aluminum is used to make cans for food and almost half of these end up in landfills. Food packaging makes up 20% of US municipal solid waste by weight (p70). An average bite of American food travels 2000 kilometers from field to fork (p73). Orange juice from Brazil, grapes from Chile, apples from New Zealand, cocoa from Malaysia, bananas from Costa Rica—all are shipped to the United States for our dining pleasure while pesticides pollute soils and streams and petroleum supplies burn up in jet deliveries.

CONSUMER CLASS CULPABILITY

In *How Much is Enough?*, Alan Durning (1992) compares the consumption rates and ecological impacts of various materials and resources for each income class. The evidence mounts up to point a strong finger directly at the top fifth—the consumer class. Compare the rates of carbon dioxide emissions, for example: the poor release .1 ton/person/year, the middle income group .5 ton/person/year, but the consumer class releases seven times this or 3.5 tons, or 11 tons if you're among the richest tenth of Americans. The average resident of an industrial country consumes three times as much fresh water, ten times as much energy, and 19 times as much aluminum as someone in a developing country (p51). The consumer class is responsible for 90% of the chlorofluorocarbons destroying the ozone layer, and 96% of the world's radioactive waste. Fossil fuel use for energy is conspicuously highest in the United States. Habitat loss and pollution as well as the toxic wastes from refining such fuels are extensive and increasing. If everyone in the world used the same amount of metal, lumber, and paper as the consumer class, mining and logging activities and their devastating ecological consequences would more than triple.

Those privileged enough to be in the consumer class do, of course, have the option to choose low-ecological impact products and services. One can buy in-season fruit grown locally rather than exotic imports flown in from the tropics. One can buy locally produced furniture rather than tropical hardwood products. One can even choose voluntary simplicity, like Thoreau, and limit the sheer quantity of owned items. But consumer

choice depends on consumer knowledge and motivation. Too often, greed, gullibility, impulse, and ignorance are the primary determiners of consumer purchases. Consumption for personal pleasure and self-soothing supports tremendous markets for small and large indulgences—from designer clothes to specialty wines.

Behind each product sold to the consumer class lies a significant "wake," casting an ecological shadow on the middle income and poor classes. Very few items in the US have not drawn on labor or natural resources from the global reaches of the world. Producing countries may even raze their own forests to attract First World business. Transnational corporations specialize in finding the cheapest labor, most accessible resources, and most lax regulations across the span of the globe, moving jobs easily where they can save money. The ecological wake of consumption is enormous: example after example delineates the destruction of habitats, the breakdown of ecological processes, the increase in toxic waste and pollutants, and the rise in carbon emissions. Social impacts only compound the tragedy: environmental injustice in global sweatshops, erosion of local culture and community, loss of moral resources—all are justified in the goal of feeding the spiraling addictions of the consumer class.

Per Capita Consumption of Steel, Paper, Cement, and Energy, in Selected Countries, Late Eighties[1]

Country	Steel (kilograms)	Paper	Cement[2]	Energy[3]
United States	417	308	284	10,127
Soviet Union	582	36	470	6,546
West Germany	457	207	476	5,377
Japan	582	222	665	4,032
Mexico	93	40	257	1,689
Turkey	149	8	436	958
China	64	15	185	810
Brazil	99	27	167	798
India	20	3	53	307
Indonesia	21	5	73	274
Nigeria	8	1	31	192
Bangladesh	5	1	3	69

1 Steel, 1987; paper, 1989; cement, 1990; energy, 1989.
2 Per capita production.
3 Kilograms of coal equivalent.

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DRIVING FORCES ACCELERATING THE SYSTEM

How is the colossal consumption system perpetrated and accelerated? The emerging literature on consumerism and globalization points to five major groups of players who collude in various ways to promote ever-increasing levels of consumption. These are 1) the producers—i.e., businesses "serving" consumers, 2) the advertisers—the public relations arm of business, 3) the media—the cultural homogenization agents, 4) governments—negotiating favorable trade agreements, and 5) transnational corporations—the global corporate elite determining the flow of resources around the globe.

The role of the producers is often camouflaged by neoclassical economics rhetoric about "the sovereign consumer." In this model, consumer preferences are said to determine the products industry chooses to make. While businesses do respond to consumer feedback, they are also responding to stockholders who want to see a strong bottom line. There is much ado these days about the green sovereign consumer who can choose to switch to green products, thereby decreasing environmental impact. Towards this end, consumer activists promote nontoxic cleaners, recycled paper products, and organic food. The sovereign consumer model assumes consumers make rational choices, but Schnaiberg (in Goodwin et al. 1997) says this cannot be true since consumers know so little about the manufacturing processes behind the products they buy. For example, if producers don't offer cars that run on alternative fuels, how can consumers "choose" them? Schnaiberg argues that consumption levels in industrial countries are determined by producers who

know that mass-produced items generate the greatest profits. To assure this profit, producers must create consumer interest in these cheaply produced mass market items. Information about the production process must be kept hidden from consumers, especially where it is resource and labor abusive. Schnaiberg urges activists who want to reduce environmental degradation to focus on the production systems rather than on consumer behavior (p30). It is the producers' drive for profit that permits and justifies ecosystem destruction, in the long run overriding consumers' basic life needs for safe water, food, and shelter.

Advertisers have the job of promoting these mass-produced products designed to generate profit for industry. By now it is quite clear that advertisers have been extremely successful at swamping and confusing buyers with product hype. Consider the sheer volume of ads: the average American is exposed to 3000 ads per day (Kanner and Gomes 1995). In 1994, businesses in the United States spent $147 billion for advertising—more than the country spends on all of higher education. This sum paid for 21,000 television commercials, a million magazine advertising pages, 14 billion mail-order catalogues, 38 billion junk-mail ads, and another billion signs, posters, and billboards (Loy 1997 p287). Advertisers will go everywhere and anywhere to sell their products; not content with radio, television, and billboards, they now print slogans on hot dogs and eggs (Durning 1992 p188). With competition so fierce for the consumer dollar, people are barraged by sales pitches on subways, at cash registers, in airports, and on ski lifts. Even if people don't remember specific ads, they get the message over and over again that there is a product to solve life's every problem.

Pollay (in Goodwin et al. 1997), among others, has enumerated some of the dangerous unintended consequences of advertising. Not only do advertisers deliberately obscure the environmental costs of their products, they foster a climate of self-involvement revolving around one's material desires that distracts people from actively caring for the environment. Ads rely on setting up idealized stereotypes that foster greed, status-envy, hyperstimulation, health fears, and at root, a sense of dissatisfaction and inadequacy. Children are particularly vulnerable to commercial brainwashing, too easily replacing their authentic needs and wants for what they've been told to want. "Shopaholism" has become a national disease where people turn to shopping to alleviate or bury their suffering, not unlike patterns in drug and alcohol consumption (Kanner and Gomes 1995). Addiction to material satisfaction precludes healthy development of social, psychological, and spiritual capacities that could be engaged in supporting the life of this planet.

Advertisers and producers benefit tremendously from the third system player—the media. Commercial television actively reinforces consumer values, promoting consumer class lifestyles with its programming. Many people watch four or more hours of television per day, and many households leave the TV on night and day. According to Durning, "aside from sleeping and working, watching TV is the leading activity in most consumer societies, from the United States and the United Kingdom to Japan and Singapore" (p125, 1992). US programming has wide receptivity in many countries, where the dazzle of "Dallas" and "Baywatch" replace local community and culture.

At least two dangers flow from the global lure to television: 1) cultural homogenization, and 2) corporate control by a media monopoly. As lines blur between news, ads, opinion pieces, and entertainment, advertising and lifestyle propaganda creep into more and more hours of airtime. Rick Crawford describes the new media environment as promoting *anti*-environmental education through its heavy emphasis on the "gospel of consumption." From McLuhan's concern that the medium is the message, Crawford argues the media have *become* the environment, the primary cultural filters across classes and continents. As he points out, "for the first time in human history, most children are born into homes where most of the stories [our main source of learning] do not come from their communities, schools, churches, or parents...but from a handful of conglomerates with something to sell" (p1).

The combination of these three powerful industries alone has become a relentless force promoting consumerism as the number one global cultural influence. Hidden behind the rhetoric of trickle-down economics—"growth is good for everyone"—the spiral of greed, production, and shopping seduction continues to spin into ever-widening circles. As each of these three has gained in corporate and financial strength, they have quite naturally used their political clout to influence government policy to support the consumption agenda. Their own survival is at stake; of course they will do what they can to assure it. National governments pro-

vide the political structure for negotiating inter-governmental agreements such as NAFTA and GATT which expedite trade flows. Opening up new global markets can be seen as yet another wave of conquest colonialism, benefiting the economically powerful. Structural adjustment loans to poor countries are often tied to trade requirements such as reduced tariffs, renovated banking systems, or specific production guarantees that benefit the more powerful trade partner. Within the US, government policies contribute to the system of consumption through tax regulation, loans, and subsidies. Gasoline prices, for example, have been kept artificially low to keep consumers buying gas and oil company profits growing. The net effect of these government policies and trade agreements is not only to mask the serious environmental costs but to rationalize them in the name of consumption (re: trade).

This condensed systems view of consumption would not be complete without recognizing the dominant influence of the transnational corporations (TNCs). David Kortens (1995) describes in detail how TNCs have come to form global for-profit superstructures, carrying more political and economic power than many individual nation-states. Leslie Sklair (in Goodwin et al. 1997) documents the recent rapid growth of a transnational capitalist class consisting of TNC corporate executives and those who support their interests—high ranking brokers for consumption among national government and media institutions. This class transcends state boundaries and perhaps also state loyalties, placing global corporate relations as top priority. The top executive class of the TNCs now form a kind of First World within Third World countries as well, consuming at the highest levels and making it their business to promote environmentally high impact lifestyles for the masses.

Taken altogether, the global system of businesses, advertisers, media, governments, and TNCs have very successfully colluded to bring global trade and the cultural ideology of high consumption to the top of the world agenda. The environmental impacts of these increasing rates of production and consumption are well documented. But to keep trade and economics top priority, these costs must be hidden from public view; the cruelty of sweatshop labor and massive clearcuts is jarring, breaking the illusion of the shiny product, gift of technology. Players in the consumption system have a great deal staked on globalization of consumer values. Their success utterly depends on the systematic destruction of the Earth's natural systems. They will do what they need to in order to keep their agenda the primary force in the world.

CONSTRUCTING ANOTHER VISION

Anything this out of balance generates a corrective systems response. There are active projects underway to rethink the scale of consumption in northern industrialized nations. In one study (Yearning for Balance 1995), Americans expressed concern that "materialism, greed, and selfishness increasingly dominate American life, crowding out a more meaningful set of values centered on family, responsibility, and community." Focus group surveys showed Americans strongly agreed that "the way we live produces too much waste...and consumes too many resources." The report spurred the Merck Family Fund to set up a new nonprofit, The Center for a New American Dream, whose mission is to reduce resource consumption in the US while improving the quality of life.

Other new groups have taken up the task of education and exposure: Northwest Environment Watch has researched and published short handbooks on cars, energy, and toxics in their bioregion. *Stuff* is one of their triumphs, telling the true stories of computers, bicycles, french fries, and hamburgers—including all the hidden links from cradle to grave. The Center for Media Literacy based in Los Angeles works with children and teens to raise consciousness about television programming and advertising. In the emerging field of ecopsychology, therapists expose the destructive beliefs of inadequacy generated by advertising, applying healing approaches from addiction/recovery models.

Some are engaged in active resistance to the various colluding elements of the consumption system. The "Unplug your TV" group has launched a national campaign to support television-fasts and encourage experiments with alternative community-building social activities. Local voluntary simplicity groups around the continent are organizing "Buy Nothing Day" events the day after Thanksgiving, challenging shoppers' habits on the highest sales volume day of the year. Organic food producers and advocates urge people to buy local and resist the temptations of long-distance food. Anti-junk mail campaigns have reduced personal mail flows to some extent. Vermont has banned bill-

boards from the state—how refreshing! I am personally plotting a campaign to get rid of airport waiting area TVs—who asked for this escalation of the invasion?

Education and resistance expose the scale and influence of consumerism, revealing the necessity to work at the structural level, and change systemic patterns. Norberg-Hodge urges people to break the runaway spiral of "bigness" by diversifying local economic activity—building bike paths instead of roads, improving spaces for small-scale public markets, decentralizing energy development. Structural policies that favor "localization" can counter the overwhelming trend toward globalization. Likewise, policies that favor reduced use of raw materials can help reduce environmental impact. Denmark, for example, successfully banned throwaway soft drink containers (Durning 1992 p93); German industry must now collect or recycle their packaging materials as well as parts in a number of consumer goods such as cars and appliances.

One of the most radical structural proposals is the replacement of GDP (Gross Domestic Product) with GPI (Genuine Progress Indicator). Redefining Progress, based in San Francisco, points out that the GDP simply measures the amount of money changing hands—whether that money goes for new goods, divorce mediation, medical care, or prison building. The GDP not only "masks the breakdown of the social structure and the natural habitat upon which the economy—and life itself—ultimately depend; worse, it actually portrays such breakdown as economic gain." (Cobb, Halstead, and Rowe 1995 p3). In fact, the GDP *serves* industries based on resource depletion by counting their earnings as a gain rather than a loss of natural capital. GIP, in contrast, includes in the tally the positive value of the household and volunteer economy, and subtracts the cost of air and water pollution to human health. Challenging the misleading figures of the GDP is a strategic way to change the feedback mechanisms in the system.

A fourth response to this juggernaut of consumption is to build community and culture that offer alternative sources of satisfaction. In northern Vermont and New Hampshire, "The Upper Valley: 2001 and Beyond" group facilitates community forums to help small towns articulate their values. They then set action priorities based on collaborative decision-making. Northwest Earth Institute volunteers participate in work exchange weekends to share large household projects and build friendships. A number of towns like Burlington, Vermont offer nonalcoholic First Night alternatives to traditional New Year's parties, using the event to share local talent with the community.

Wendell Berry writes eloquently of an alternative vision when he speaks of the true pleasure of eating (1990). Our enjoyment of food should not have to depend on our ignorance, he says. Rather, we can most freely enjoy what we eat if we truly know the whole rich story behind each bite—the faces of the farmers, the texture of the soil, the shape of the year's growing season, the source of the seed. We have a long way to go to get out from under the environmentally devastating thumb of consumerism and overconsumption, but there are many people making a start.

I have a button I picked up somewhere—it says "Heavily into Nothing." I think I'll wear it on Buy-Nothing Day. Want to join me? ▮

Literature Cited

Benton, Raymond, Jr. 1997. Alternative Approaches to Consumer Behavior summarized in Goodwin et al. The Consumer Society. Washington, DC: Island Press. p. 201-204.

Berry, Wendell. 1990. The Pleasures of Eating in Robert Clark, ed. Our Sustainable Table. San Francisco: North Point Press. p. 125-131.

Cobb, Clifford, Halstead, Ted, and Rowe, Jonathan. October 1995. If the Economy is Up, Why is America Down? Atlantic Monthly.

Crawford, Rick. 1995. Cultural Environment Perspectives: An Overview for Environmentalists. Draft Manuscript.

Durning, Alan. 1992. How Much is Enough? New York: W.W. Norton.

Duesenberry, James S. 1997. A Reformulation of the Theory of Saving summarized in Goodwin et al. The Consumer Society. Washington, DC: Island Press. p. 176-179.

Gallagher, Kevin. 1997. Overview Essay: Globalization and Consumer Culture summarized in Goodwin et al. The Consumer Society. Washington, DC: Island Press. p. 301-308.

Goodwin, Neva R., Ackerman, Frank, and Kiron, David, eds. 1997. The Consumer Society. Washington, DC: Island Press.

Kanner, Alan D. and Gomes, Mary E. 1995. The All-Consuming Self in Theodore Roszak, Mary E. Gomes, and Allen D. Kanner, eds. Ecopsychology. San Francisco: Sierra Club Books. p. 77-91.

Kortens, David. 1995. When Corporations Rule the World. West Hartford, Connecticut: Kumarian Press.

Loy, David. 1997. The Religion of the Market. Journal of the American Academy of Religion. 65 (2): 275-290.

Norberg-Hodge, Helena. Spring 1997. Buddhism and the Global Economy. Turning Wheel. p. 13-17.

Pollay, Richard. 1997. The Distorted Mirror: Reflections on the Unintended Consequences of Advertising summarized in Goodwin et al. The Consumer Society. Washington, DC: Island Press. p. 236-238.

Ryan, John C. and Durning, Alan Thein. 1997. Stuff: The Secret Lives of Everyday Things. Seattle: Northwest Environment Watch.

Schnaiberg, Allan. 1997. The Expansion of Consumption summarized in Goodwin et al. The Consumer Society. Washington, DC: Island Press. p. 27-31.

Sklair, Leslie. 1997. The Culture-Ideology of Consumerism in the Third World summarized in Goodwin et al. The Consumer Society. Washington, DC: Island Press. p. 320-322.

Yearning for Balance. 1997. Burlington, Vermont: Center for a New American Dream.

Stephanie Kaza is associate professor of environmental studies at the University of Vermont (Burlington, VT 05401) and author of The Attentive Heart: Conversations with Trees *and a book in progress,* Green Buddha Walking.

Next Door

by

Eleanor Garrell Berger

I don't have to travel to see overpopulation. It's right next door. A physician, a nurse practitioner, and four offspring. (Just like Al Gore.)

My neighbors know about family planning and enjoy unlimited access to modern methods of birth control. They are neither Mormon nor Catholic, neither Chasidic Jews nor recent immigrants. What they are is affluent, unaware, and unconcerned. Their fecundity signals a failure in our efforts to change American thinking about America's overpopulation.

My neighbors don't seem to care that too many of us are consuming too much stuff. They seem oblivious to the fact that affluence multiplies the effect of overpopulation and that the technology needed to support our affluence increases the United States' disproportionate exploitation of world resources. If pressed on the topic, they might concede that overpopulation is a problem somewhere else...in the developing world, perhaps, or in the inner city. They'd likely be surprised or confused by Paul and Anne Ehrlich's assertion in *Elephants in the Volkswagen: Facing the Tough Questions About Our Overcrowded Country*, that "The population problem in the United States is the most serious in the world." Nevertheless, this is true; the per capita environmental impact of our nation is fourteen times that of China and forty times that of India.[1]

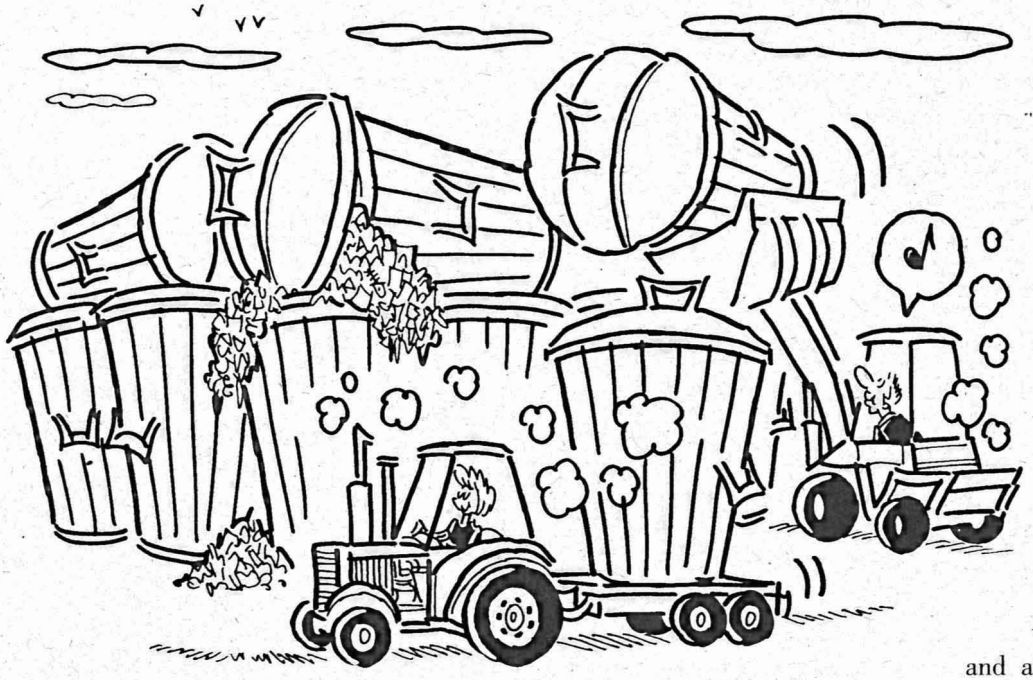
This reality, however, is not reflected in my neighbors' lakeside lifestyle. Their GMC Suburban truck transports kids and equipment to activities many gas guzzling times a day. Two other cars, a motorboat, canoe, rubber water craft, several bikes and sets of skates, and an abundance of electronic gear enrich the lives of their very nice (at least so far) offspring. I try not to think about their showers, laundry, paper products, septage, energy use, or the Stonehenge-size trash cans they put out each week for pick-up. My neighbors tell me they feel fortunate because they can afford to give their children every "advantage."

A few years back I tried to head off the baby boom next door. I said, "My, how lovely. Two healthy children, a boy and a girl. How lucky you are. A nice number for the planet, too." My neighbors' response? An offspring "doubling time" of four years.

What might I have said instead? That the ecosystem cannot afford their children's "advantages" because the costs of those advantages are externalized to the rest of the world? That if we Americans had fewer children, we could worry less about immigration? That nearly all arable land in the United States is already in production and that we are pumping water out of the ground 25 percent faster than it is being replenished and losing top soil 18 times faster than it is being replaced?[2] That the wholesale conversion of natural habitats to human uses, as exemplified by the loss of 91% of California's wetlands, has been a catastrophe for wildlife?[3] That the United States has already exceeded its sustainable carrying capacity and should return to its World War II population of 135 million? And that, according to John Holdren of the University of California, if we accomplished this, "we could enjoy today's level of per capita energy consumption without using any coal or importing any oil?"[4]

Today, I smile at my neighbors and say nothing. I have learned. Rational argument is no match for self-interest, self-indulgence, and impulsive consumption.

Nor is it any match for political cowardice. I am still waiting for Congress to show a sustained and substantive commitment to international family planning efforts, a commitment clearly in the best interest of this nation's security since poverty and political unrest tend to accompany high rates of population growth. Surely I am not the only voter who believes that this country needs to greatly reduce its population, that economic incentives are one means to begin this trend, and that it is time to rescind the child tax credit and impose, instead, a levy on couples who produce more than two children. Where is the political leadership?



I want my political leaders to act. I want them to reduce net immigration to near zero until we have stabilized our population at 135 million. According to the Carrying Capacity Network, legal immigration is three times as great as illegal immigration. The nation's annual growth from immigration, approximately 1.5 million people, is now comprised of about 300,000 illegal immigrants; about one million legal immigrants, which includes asylum claimants; and about 200,000 births, due to the higher relative fertility rates of immigrants.[5]

I want the federal government to take the lead in addressing overpopulation, by setting policies for controlling fertility both here and abroad, and by educating affluent consumers, like my neighbors, through public service announcements, such as: "America cannot afford another large family"; or "One can be fun." I also want my government to affirm that spending the world's environmental capital is wrong, and that it intends to "end spending as we know it." Now. In this generation.

I worry that the time may be past for changing minds and improving outcomes. With today's crazies shouting that government can't tell citizens what to do with their land, but should tell women what to do with their bodies, very few leaders, I'm afraid, are focused on the one issue that underlies all others. Overpopulation in the United States.

Congress isn't listening. My neighbors aren't listening. No one seems to be listening. Which is why overpopulation is thriving—right next door. ▮

I try not to think about their showers, laundry, paper products, septage, energy use, or the Stonehenge-size trash cans they put out each week for pick-up.

Eleanor Garrell Berger is a writer who lives in Plattsburgh, New York on the shore of Lake Champlain. For more than twenty-five years, she has worried about population growth while working to protect the lake she loves. Elle has served as New York chair of the Lake Champlain Committee, a non-profit advocacy organization, and was a member of the federally sponsored Lake Champlain Management Conference, which recently produced a plan intended to address the lake's problems and future.

Citations

1. Paul R. Ehrlich and Anne H. Ehrlich, "The Most Overpopulated Nation," Elephants in the Volskwagen: Facing the Tough Questions About Our Overcrowded Country, ed. Lindsey Grant (New York: W.H. Freeman and Company, 1992) pp. 126-127.
2. "Has the United States Exceeded Its Optimum Population Size?," Clearinghouse Bulletin (Washington, DC: Carrying Capacity Network, December 1991) 1.
3. "Why We Need U.S. Population Stabilization," in a membership letter (Washington, DC: Population-Environment Balance, 1994) pp. 1-2.
4. "Has the United States Exceeded Its Optimum Population Size?," Clearinghouse Bulletin (Washington, DC: Carrying Capacity Network, December 1991) 1.
5. "Many Unnecessary Problems, One Main Cause," in a membership letter (Washington: DC: Carrying Capacity Network, July 1997) 1.

cartoon by Mark Armstrong

The Catastrophic Peril of the Technological Imperative

(Or, Why We Are Killing Nature and Ourselves)

by Kirkpatrick Sale

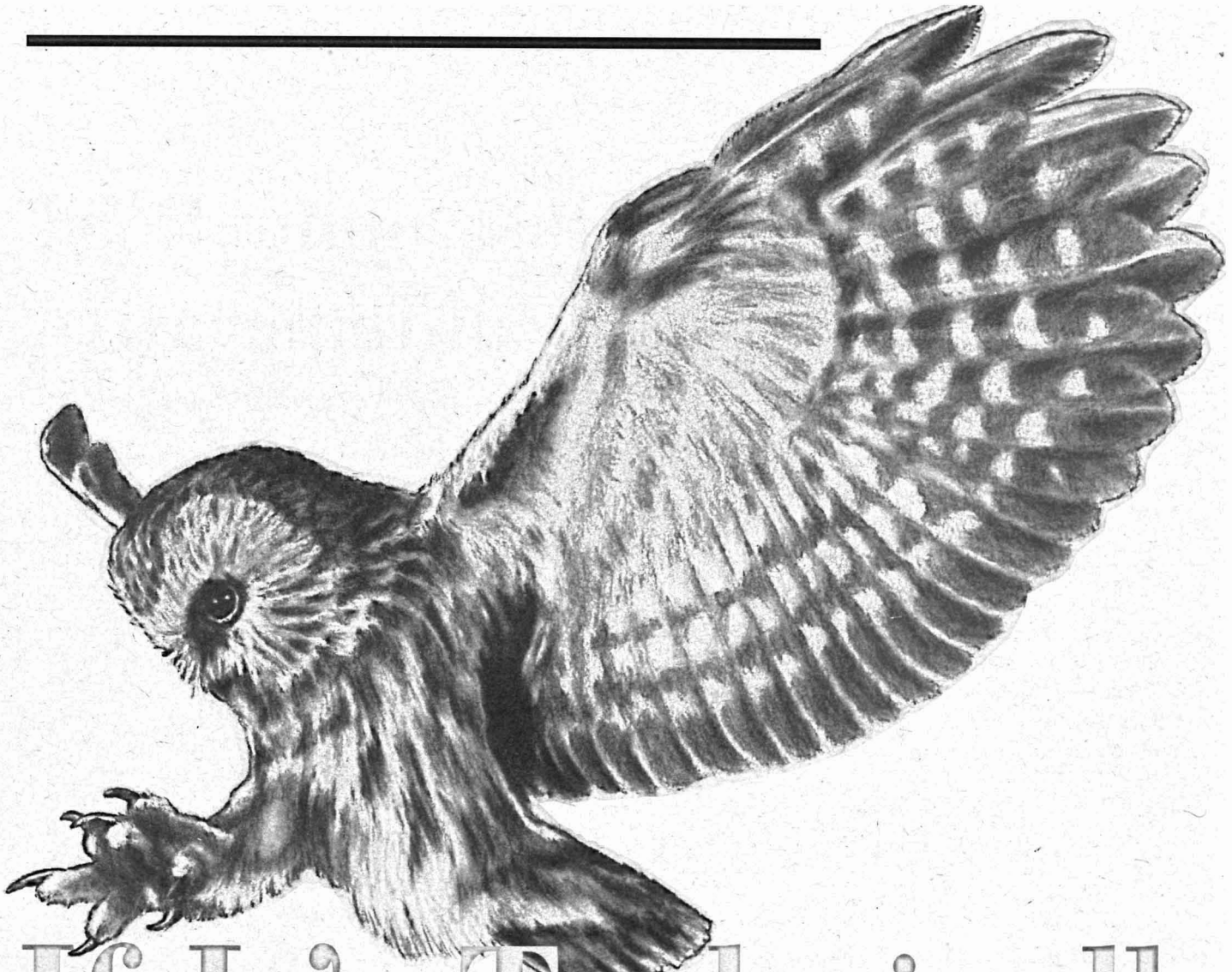
The first thing to understand is that the excesses that beset the world around us—overpopulation, yes, and overproduction, overconsumption, overpollution, overdevelopment, all of them leading to that ecological tragedy known as *overshoot*—are not accidental, happenstantial. They are, rather, the inevitable results of a technological imperative that lies at the heart of our industrial society and now in the second Industrial Revolution threatens the continued existence of life on the surface of the Earth as we have known it for these last 50 million years.

The second thing to understand is that "scaling back" in any true and meaningful way means an explicit assault upon that technological imperative and the machines it has engendered—some assortment of strategies that drastically reduce the impact of modern technology, swiftly and sweepingly, not only in our individual lives but in all the communities of the Earth, human and otherwise.

We need to be clear about the vast and disruptive effects wrought by the second Industrial Revolution, the one that since the end of World War II, and especially in the last two decades with the development and spread of the microchip, has so powerfully altered the world. It has produced an array of technological changes that go to the very core of our lives, creating a revolution in work and thought, politics and markets, culture and leisure, that as *Newsweek* pointed out more than a year ago, is "outstripping our capacity to cope, antiquating our laws, transforming our mores, reshuffling our economy, reordering our priorities, putting our Constitution to the fire, and shifting our concept of reality." (Of course, *Newsweek*, ever-anthropocentric, forgot to add that this revolution is also complicit in the degradation and destruction of Nature, on a scale never before possible.)[1]

Modern technology, in sum, dominates and pervades, it is imposed throughout our lives in such a way that it mediates experience to a degree no society before has ever undergone. Less and less is human life connected to other species, to natural systems...

1 Some, incidentally, would like to call this revolution "post-industrial," dependent on "information" rather than manufacturing jobs. But though the nature of many trades and businesses has changed, the economy is still industrial in all meaningful ways, and the processes of industrialism—including specialization, mechanization, commodification, mass production, expanding markets, large units, bureaucracies, capital investment, and monetization of worth—are all still at work. Tourism for example, though mainly based on service employment and only secondarily dependent on factory products, is every bit an industry—indeed, it is the world's largest—as are filmmaking, gambling, investment banking, advertising, and real estate, though none is much involved with assembly lines and smokestacks. "Post-industrial," when you get right down to it, is just a technophile's sleight of hand intended to direct attention away from industrial society horrors as rampant in the second Industrial Revolution as the first.



If It's Technically

We also need to appreciate that the engine that drives this Industrial Revolution—or, to come at the image differently, the religion that guides it—is a social and economic (and psychological) force I call the technological imperative, the unceasing drive to push technological possibilities as far as they can go, quite regardless of whatever consequences they may have. None have expressed it better than two of the men chiefly responsible for the atomic bomb—this is obviously not an accident—and who continued in their technological tasks relentlessly even when on occasion some twinge of conscience told them that in altering the very atoms of existence they might be crossing a limit that ought not be transgressed. Robert Oppenheimer, father of the bomb, said, "When you see something that is technically sweet you go ahead and do it"; his companion John von Neumann, the great mathematician, said, "Technological possibilities are irresistible to man. If man can go to the moon, he will. If he can control the climate, he will." Nothing should stand in the way of human achievement, in other words: if it can be done, it will be, for the doable is good and the undone bad.

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About 15 years ago the executives of IBM got together the biggest academic and intellectual mandarins they could find—best hotels, all expenses paid—to discuss the question of the long-term implications of the computer for American society. After a week of discussions the experts threw up their hands and said they couldn't possibly foretell the range of impacts the computer would have in even the short run, much less the long. As one of the historians there pointed out, if Henry Ford in 1910 had assembled the best minds of his age to ponder the implications of the automobile in America, they could

Saw-whet Owl *by Robert M. Smith*

not possibly have predicted even one of the personal, familial, social, architectural, cultural, industrial, economic, or environmental effects that it actually has had—and, he said, the computer is far more versatile and intrusive than the car. Indeed, since then, the computer has allowed a profusion of so many other technologies and functions—think only of faxes, robots, microwaves, photocomposition, credit cards, airline reservations, word processors, supermarket scanners, compact disks, lasers, supertankers, spacecraft, CAT scanners, and satellites—that it is no wonder there is a widespread sense that, in fact, technology is in the saddle and rides humankind; as the sign above the portals of the 1933 World's Fair in Chicago put it presciently, "Science explores: Technology executes: Man conforms." But that, as it turns out, is highly appropriate, for cybernetics, the science of computers, comes from the Greek *kubernetes*, "helmsman" or "governor," meaning simply that the machine is in charge.

More and more, it seems, human decisions get made because of technology rather than the other way around. As, for example, when Chrysler engineers invent power steering because they have stuffed so many new gadgets and parts into their car that it is too heavy to turn; as when microcomputer "notebooks" are created not to meet any known or expressed need but because miniaturization at some point has made it possible to put immense amounts of information on a very tiny silicon chip; as when space shuttle missions are repeatedly launched, at a cost of $6 billion a year, not for a valid scientific purpose but because NASA has the capability of doing so. Once again, it is the technological imperative, expressed by Robert Oppenheimer as "When you see something that is technically sweet you go ahead and do it."

But the kind of technology shaping the second Industrial Revolution has its own special and inescapable logic, just as the one wrought by the steam engine had its, that goes beyond the proliferation of its machines and methods. Automation, for example is an inevitable consequence of computerization and robotics, and serves to replace human endeavor in more and more ways and more and more settings. Simplification and routinization are similar consequences in tasks where humans are still involved, de-skilling and often dehumanizing the operatives and making them subject to minute monitoring and discipline. Massification and quantification are also built-in biases of the computer, indeed were probably the reason computers became so important in the first place, as necessary adjuncts to a mass society and its mass production, mass marketing, mass consumption, mass communications, mass education and mass culture. Add to these such other attributes of high technology as centralization, order, speed, uniformity, regularity, linearity, and passivity, and it becomes clear that when a civilization buys into the computer's logic it buys much else besides. In the words of the Canadian philosopher George Grant, "Computers do not present us with neutral means for building *any* kind of society. All their alternative ways lead us towards the universal and homogenous state."

Indeed, it is the imperative to *control*, whether by the state or other institutions, that may be the most decisive characteristic of computerization, since the possibilities of amassing information on such a large scale over such a wide population, and using that information then to identify, follow, manipulate, and regulate, are so clear. Information (or at least data-supply—whether it "informs" anything is another matter) is the fodder of the computer maw, and as more bits are fed into the machine the more it can know and use and administer. If what is in store for us, as many say, is an "information age" with "information highways" and "information supermarkets" then it is the computer and those who feed and handle it who reign supreme: in the country of the sighted, the all-seeing one is king. Control of information is control of power.

Modern technology, in sum, dominates and pervades, it is imposed throughout our lives in such a way that it mediates experience to a degree no society before has ever undergone. Less and less is human life connected to other species, to natural systems, to seasonal and regional patterns; more and more to the *technosphere*, to artificial and engineered constructs, to industrial patterns and procedures, even to man-made hormones, genes, cells, and life-forms. In one of the profound insights of one of the profound minds of the 20th century, Herbert Read paused at the end of *The Grass Roots of Art* to say:

Only a people serving an apprenticeship to nature can be trusted with machines. Only such people will so contrive and control those machines that their products are an enhancement of biological needs, and not a denial of them.

This society serves no such apprenticeship, alas, nor does there seem much hope that it would even know how to do so, so immersed is it in industrial culture that it has difficulty understanding experience in any other form than the technological.

Let us take, for example, the industrial view of Nature to which technology inclines us and by which

many of us understand the nonhuman environment. It argues, with the full power of industrial science, that most of Nature is inert and lifeless—rocks and mountains, winds and rivers—and that other species, without our form of consciousness, are innately inferior. All of those may therefore be considered "resources," for the human species to exploit in such ways as improve its condition, or at least its material amassment, and technologies should be designed to make the maximum use of such resources as completely as possible by as many people as possible. In the technological worldview it would be meaningless to talk of rocks as being alive, mountains as having souls, winds as gods; it would be absurd to consider a river system holy or an insect species sacred, or either one as having inherent rights; it would be mistaken to adopt as an ethical philosophy the position that "a thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community, wrong when it tends otherwise"; it would be insane to assign greater priority to old trees than new logs, to leave wetlands undeveloped while people need space to build on, to consign someone to death if a machine would provide life, to allow food to spoil if chemicals would preserve it.

An industrial society, it becomes obvious, has its own inevitable logic, simply because its needs and values are determined by its technology. In such a society the artifacts are not something added on, like a coat of paint or a caboose; they are basic, central, the revelation of its mind and heart.

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The pace and range of the technosphere, it seems, is unstoppable, as if it had a will of its own that no form of public protest or restrictive rule or moral caveat could appreciably affect, as if it were literally unable to understand that the planet cannot perpetually absorb its wastes like some infinite sink, that the destruction of Nature's species and systems cannot proceed forever without bitter consequences. Before this altar of the god of progress, attended by its dutiful acolytes of science and technology, our modern society has presented an increasing abundance of sacrifices from the natural world, and now we seem prepared even to offer up the very biosphere itself.

This is not accidental. It is inherent in the machines themselves that this high-tech civilization has chosen to express itself with—above all the computer. Computers are designed to work by a kind of linear, fact-based logic that is the language of science, to fulfill the scientific desire for understanding and ordering Nature, ultimately reducing all its "secrets" to reductive analysis and manipulation; but more than that, they are designed to give humans not merely analytical but physical control over Nature, putting all its elements to human use wherever possible, altering its systems and even its species for human enhancement, ultimately changing its atoms to create new compounds and life-forms for human aggrandizement. The fact that they can go such a long way to achieving what they are designed to do is stark evidence of the technological imperative at work: if we can destroy this only living planet, as von Neumann might have put it, we will. ❙

Kirkpatrick Sale is the author of eight books, including Rebels Against the Future: The Luddites and Their War on the Industrial Revolution: Lessons for the Computer Age, *from which this article has been liberally adapted.*

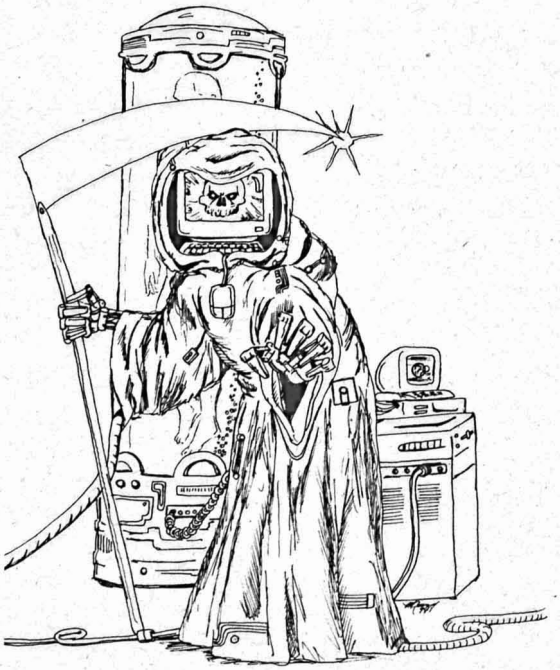

illustration by Michael Carey

Population and Environment, Politics and Policy

An Annotated Survey of Recent Population Publications

by Ed Lytwak

In the following selected survey of literature I note a variety of books and reports published in the 1990s that define and illustrate the impacts of US population and economic growth on the environment. Not included are many excellent publications written primarily from a global perspective. Further emphasis in selection was placed on those books where US population politics and policy are significantly considered. While most of the listed works are anthropocentric, nearly all contain information useful both to human population and economic growth activists and to conservationists working to protect wilderness and wildlife.

1997

Durning, Alan Thein, and Christopher D. Crowther. 1997. *Misplaced Blame: The Real Roots of Population Growth.* Seattle: Northwest Environment Watch.

Symptom or disease, cause or correlation, this book argues that population growth and overpopulation are just symptoms of social and civil root causes such as poverty, sexual abuse, underfunded family planning, public growth subsidies, and "misguided immigration policy." The authors contend that "when we take care of people, population growth will take care of itself."

Rohe, John F. 1997. *A Bicentennial Malthusian Essay: Conservation, Population, and the Indifference to Limits.* Traverse City, MI: Rhodes & Easton.

The book's short chapters are a series of interconnected essays examining the contemporary relevance of concepts and ideas put forth by Malthus in his classic 1798 *Essay on the Principle of Population.*

Haupt, Arthur, and Thomas T. Kane. (1978) 1997. *Population Handbook.* Washington, DC: Population Reference Bureau, Inc.

The new 1997 edition is the most recent of this irregularly updated reference for journalists, educators, activists, and others seeking an introduction to basic demographic concepts and terms.

1996

Beck, Roy. 1996. *The Case Against Immigration: The Moral, Economic, Social and Environmental Reasons for Reducing US Immigration Back to Traditional Levels.* New York: W.W. Norton and Co.

As the book's subtitle indicates, this is a factual and comprehensive exposition of the arguments for reducing US immigration. Beck largely avoids the emotional cultural arguments that made Peter Brimelow's *Alien Nation* a lightning rod for controversy and instead relies on a solidly informational approach to examine the negative impacts of high immigration on the American middle class, minorities (particularly blacks), labor force, population growth and the environment.

Brown, Lester et al. 1996. *State of the World 1996.* New York: W.W. Norton.

Brown, Lester, Christopher Flavin, and Hal Kane. 1996. *Vital Signs 1996.* New York: W.W. Norton.

These annual updates from the World Watch Institute are among the best surveys examining linkages among population, economics, technology, and environmental degradation. Also of interest are the various reports in the *World Watch Papers Series.*

Casterline, John B., Ronald D. Lee, and Karen A. Foote, eds. 1996. *Fertility in the United States: New Patterns, New Theories.* New York: The Population Council.

This supplement to *Population and Development Review*'s Volume 22, 1996, is based on papers presented at a workshop held by the Committee on Population, National

Research Council of the National Academy of Science in 1994. Among many useful articles on US fertility is one by University of Pennsylvania sociology professor S. Philip Morgan, "Characteristic Features of Modern American Fertility," which gives a good historical overview of American fertility in the 20th century.

Daly, Herman E. 1996. *Beyond Growth: The Economics of Sustainable Development.* Boston: Beacon Press.

The latest book from the "father of ecological economics" serves to further develop and summarize many of the key concepts of ecological economics Daly has articulated over the last two decades. Topics covered include the relationship between sustainable development and economic theory, operational policy, national accounts, overpopulation, and trade. For those already familiar with Daly's writings, there are interesting new materials here on economists Frederick Soddy and Nicholas Georgescu-Roegen, as well as chapters on "Ethics, Religion and Sustainable Development." With the integral connection between population size, the scale of human economic activity, and the impact on the environment, the importance of Daly's efforts to articulate a new ecologically based paradigm for human economic activity should not be underestimated.

De Vita, Carol J. 1996. "The United States at Mid-Decade," *Population Bulletin*, Vol. 50, No. 4, March 1996. Washington, DC: Population Reference Bureau.

De Vita's report is a good demographic profile of the US circa 1995. In addition to publishing its quarterly *Population Bulletin*, the nonprofit Population Reference Bureau produces a wide variety of excellent population-related materials including the periodically updated "Population Data Sheets" for the world, US, and US metropolitan areas.

Ehrlich, Paul R., and Anne H. Ehrlich. 1996. *Betrayal of Science and Reason.* Washington, DC, and Covelo, CA: Island Press.

The indefatigable and prolific Ehrlichs have written here an invaluable reference for activists looking for inspiration and information. In this volume they refute the "brownlash" of wise-users, Simonesque cornucopians, "the more the merrier" population growth apologists and other misguided miscreants who see protecting Earth's biological diversity as secondary to the profits of corporations, private property rights, or other speciest agendas.

Grant, Lindsey. 1996. *Juggernaut: Growth on a Finite Planet.* Santa Ana, CA: Seven Locks Press.

This new book by one of the country's best writers on US population and policy issues explores them in what has increasingly become the old fashioned way—by looking at numbers and ecological constraints. Also relatively unique among the current population literature is the book's emphasis on the United States and its population policy. Highly recommended for those looking for a very readable, informative overview of current demographic, resource, environmental, and economic issues.

Hardin, Garrett. 1996. Third Edition. *Stalking the Wild Taboo.* Petosky, MI: Social Contract Press.

A collection of essays that profile Hardin's prolific and diverse writings on population, biology, and human ecology from 1959 through 1996. The essays are arranged around themes like abortion, religion, technology, and competition, that tie together his frank discussion of sensitive population issues that are too often avoided, or as Hardin would say, treated as "taboos."

Hollingsworth, William G. 1996. *Ending the Explosion: Population Policies and Ethics for a Human Future.* Santa Ana, CA: Seven Locks Press.

University of Tulsa professor William Hollingsworth examines the moral and ethical aspects of overpopulation, birth control, and population policy. A non-technical discussion of population issues was long overdue; this book makes the topic accessible to anyone interested in the philosophical and political implications of specific population policies.

Mander, Jerry, and Edward Goldsmith, eds. 1996. *The Case Against the Global Economy.* San Francisco: Sierra Club Books.

This superb collection of essays from leading experts on globalization is an indispensable resource for persons wanting to understand how the integration of global economies is related to population and economic growth, sustainable development, and migration.

Meyer, William B. 1996. *Human Impact on the Earth.* Cambridge, UK: Cambridge University Press.

A condensation of the themes addressed in the mammoth *The Earth as Transformed by Human Action* (Turner, B.L. et al., eds. 1990), this book by Clark University's William Meyer "describes what changes human activities have produced in the global environment from 300 years ago to the present day."

Pimentel, David, and Marcia Pimentel, eds. (1979) 1996. Revised Edition. *Food, Energy, and Society.* Niwot, CO: University Press of Colorado.

In this second edition with additional new materials, the Drs. Pimentel show how our ecologically unsustainable

fossil-fuel based industrial agriculture system depletes key natural resources such as land, water, energy, and biodiversity in order to feed 5.8 billion humans. The environmental and resource implications of the continued growth of human population and agro-economic systems are definitively and comprehensively explored.

Population and Environment: A Journal of Interdisciplinary Studies. Human Sciences Press, Inc., 233 Spring St., New York, NY 10013-1578.

A bimonthly journal edited by Virginia Abernethy (*Population Politics*, 1993) "that focuses primarily upon the linkages between demographic and environmental variables." The journal's wide variety of articles span many disciplines and subjects including US and global population politics and policy.

The President's Council on Sustainable Development. 1996. *Sustainable America: A New Consensus for Prosperity, Opportunity, and a Healthy Environment for the Future.* Washington, DC: US Government Printing Office.
The President's Council on Sustainable Development. 1996. *Population and Consumption Task Force Report.* Washington, DC: US Government Printing Office.

Like most consensus documents, these reports to the President are long on vague rhetoric and short on specific policy recommendations necessary to implement sustainability. These documents are marred by avoiding the topic of immigration, de-emphasizing the importance of population growth, and refusing to question our political leadership's commitment to ever-increasing economic growth.

Wackernagel, Mathis, and William Rees. 1996. *Our Ecological Footprint: Reducing Human Impact on the Earth.* Gabriola Island, BC and Philadelphia: New Society Publishers.

The ecological footprint concept was a major step in elucidating the connection between population, consumption and destruction of Nature. This book is an essential resource on population and consumption issues and the definitive exposition of the "ecological footprint."

1995

Ashford, Lori S. 1995. "New Perspectives on Population: Lessons from Cairo," *Population Bulletin*, Vol. 50, No. 1, March 1995. Washington, DC: Population Reference Bureau.

An adequate but uncritical look at the "new" perspectives on population that came out of the UN Cairo conference on population and development. Readers interested in a critique of Cairo can turn to some of the *NPG Forum* articles by Donald Mann and Lindsey Grant (see Negative Population Growth below).

Brimelow, Peter. 1995. *Alien Nation: Common Sense About America's Immigration Disaster.* New York: Random House.

Although this book contains a large amount of material on the historic trends, politics, demographics, and economics of high levels of immigration, it was Brimelow's concern about the cultural and social effects of immigration that received the most attention and created such a furor.

Cohen, Joel E. 1995. *How Many People Can the Earth Support?* New York: W.W. Norton & Co.

Called by E.O. Wilson the "definitive work on global population problems," Rockefeller University biologist Joel Cohen's book is a comprehensive information resource on population and human carrying capacity, fully applicable to the US. The discussion of historic and future human population growth is superb. The chapters on Earth's human carrying capacity are the best available materials on this subject. Although the concluding chapters offering policy suggestions are much less complete, this book is an indispensable resource.

Cromartie, Michael, ed. 1995. *The 9 Lives of Population Control.* Grand Rapids, MI: The Ethics and Public Policy Center and William B. Eerdmans Publishing Co.

The book's essays grew out of a 1993 conference that asked the question "Is There a World Population Problem? A Challenge to the Conventional Wisdom." The pro and con essays present a variety of viewpoints characteristic of the approaches to population issues that solidified at Cairo in 1994 and emphasize the social-civil component of human population dynamics, including a variety of arguments that there really is no population "problem."

Ehrlich, Paul R., Anne H. Ehrlich, and Gretchen C. Daily. 1995. *The Stork and the Plow: The Equity Answer to the Human Dilemma.* New York: G.P. Putnam's Sons/A Grosset/Putnam Book/A publication of the Center for Conservation Biology, Stanford University.
[See full review in this issue.]

Hohm, Charles F., ed. 1995. *Population: Opposing Viewpoints.* San Diego: Greenhaven Press, Inc.

This point-counterpoint collection of short essays gives an interesting if somewhat superficial overview of a wide variety of positions on population issues such as, "Is Overpopulation Responsible for Hunger, Poverty, and Environmental Problems?" and "What Population Policies Should be Pursued?"

Immerwahr, George E. 1995. *World Population Growth: What You Should Know About It. What We Can Do About It.* Seattle, WA: Peanut Butter Publishing.

Despite the title, this book's discussion of population

issues greatly concerns population growth in the US. Topics considered are diverse: wanted children and their rights, the effects of overcrowding, sexuality and childbearing in America, immigration, etc. University of Washington professor George Immerwahr melds his demographic research with his experience in Africa, Asia, and Latin America to cover the population question from different and often unique perspectives.

Krishnan, Rajaram, Jonathan Harris, and Neva R. Goodwin, eds. 1995. *A Survey of Ecological Economics.* Washington, DC: Island Press.

Not strictly about population issues, this book provides valuable capsule summaries of all the major works on ecological economics; it is an excellent introduction to the fundamentals of a truly sustainable human economics.

LaRoe, Edward T. et al., eds. 1995. *Our Living Resources: A Report to the Nation on the Distribution, Abundance, and Health of US Plants, Animals, and Ecosystems.* Washington, DC: US Dept. of the Interior, National Biological Service.

While not strictly about population, this excellent document provides details on biodiversity losses due to population growth. Sections on "Human Influences" and "Non-Native Species" are particularly relevant.

Munasinghe, Mohan, and Walter Shearer, eds. 1995. *Defining and Measuring Sustainability: The Biogeophysical Foundations.* Washington, DC: The World Bank.

Despite its links to many destructive projects, the World Bank has taken small steps toward reform and does fund much valuable research. Their wide variety of publications are mostly global in perspective but many are relevant to the US. An example is this effort that attempts to quantify that most elusive of terms: "sustainability."

Orians, Carlyn E., and Marina Skumanich. 1995. *The Population-Environment Connection: What Does It Mean for Environmental Policy?* Battelle Seattle Research Center: US Environmental Protection Agency.

This unpublished study by the now defunded EPA Futures Studies Unit is a useful collection of demographic information, population impact analysis, and the policy implications of population growth for environmental protection.

Weigel, Van B. 1995. *Earth Cancer.* Westport, CT: Praeger.

Earth Cancer carries on the tradition established by Warren Hern and others of examining the similarity between human population growth and cancer—the uncontrolled growth of a dependent organism that eventually destroys the larger host organism. Weigel expands on the book's central metaphor to explore various ethical and economic aspects of uncontrolled human growth and the expropriation by humans of the planet's natural capital.

1994

Bouvier, Leon F., and Lindsey Grant. 1994. *How Many Americans? Population, Immigration and the Environment.* San Francisco: Sierra Club Books.

This collaboration by noted demographer Leon Bouvier and population policy pundit Lindsey Grant analyzes the environmental and demographic consequences of an implicit and largely unexamined national policy of population growth. Bouvier shows where high immigration and growth rates are leading us, while Grant investigates the social, political, and, most importantly, environmental ramifications of continuing current growth trends into the next century.

Brown, Lester R. and Hal Kane. 1994. *Full House: Reassessing the Earth's Population Carrying Capacity.* New York: W.W. Norton & Co.

Brown and Kane summarize much of World Watch's recent research in a look at the ultimate bottom line: the Earth's carrying capacity. The book begins with a detailed analysis of population growth, consumption, strains on global food systems, and the continued decline and degradation of key resources. It concludes with a discussion of carrying capacity and the population policy implications of a bottom line seriously in the red.

Daly, Herman E., and John B. Cobb Jr. 1994. *For the Common Good: Redirecting the Economy toward Community, the Environment, and a Sustainable Future.* Boston: Beacon Press.

An updated and expanded version of the 1989 classic on ecological economics. Marx may have been wrong on population, but he did recognize how economics drives politics and policy. Daly understands how economic organization drives population, consumption, and destruction of Nature. Cobb adds the social and ethical considerations.

Goudie, Andrew. (1981) 1994. *The Human Impact on the Natural Environment, Fourth Edition.* Cambridge, MA: MIT Press.

It ain't pretty, but if you are looking for a detailed analysis of exactly how humans degrade the Earth, this is the book.

Hardaway, Robert M. 1994. *Population, Law, and the Environment.* Westport, CT & London: Praeger.

Another interesting and different perspective on population from a small press, Praeger. University of Denver College of Law professor Hardaway explores in an understandable, non-technical way how family planning policies, abortion laws, and immigration are linked to environmental protection.

MacLeish, William H. 1994. *The Day Before America: Changing the Nature of a Continent.* New York:

Houghton Mifflin Co.

Not focused on demographics or policy, this book provides an interesting look at what Turtle Island was like before America, Inc.

Mazur, Laurie Ann, ed. 1994. *Beyond the Numbers: A Reader on Population, Consumption, and the Environment.* Washington, DC, Covelo, CA: Island Press.

Published in conjunction with the Cairo conference, this collection of essays and articles is a very good exposition of the various components of the "new" global perspective on population that emerged at Cairo. Among much useful material here is a reprint of Donella Meadow's classic essay from *The Economist*, "Seeing the Population Issue Whole."

Mumford, Stephen D. 1994. *The Life and Death of NSSM: How the Destruction of Political Will Doomed a US Population Policy.* North Carolina: Center for Research on Population and Security.

An interesting historical study of how the Vatican and American Catholic hierarchy successfully influenced the Reagan administration to abandon a US population policy that supported efforts to lower global population growth (as recommended by a Nixon/Ford National Security Council report) on the threat to US security and overseas interests posed by continuing global population growth.

Pimentel, David, and Mario Giampietro. 1994. *Food, Land, Population and the US Economy.* Washington, DC: Carrying Capacity Network.

This study's title neatly sums up the connections examined. Pimentel is one of the foremost authorities on sustainable agriculture and the inherent unsustainability of the massive fossil fuel inputs now propping up agricultural abundance. This report sees problems on the horizon; US population growth (the highest in the developed world) and the dependence of a growing world population on excess US food production may lead to calamity.

Redclift, Michael, and Ted Benton, eds. 1994. *Social Theory and the Global Environment.* London and New York: Routledge.

Global in perspective, I note this book because its essays provide a unique look at how social theories relate to conservation and sustainability. Part of *The Global Environmental Change Series*, which "emphasizes the way that human aspirations, choices and everyday behaviour influence changes in the global environment," the book's essays challenge "the technocentric 'managerialism' which dominates environmental policy."

Socolow, Robert, C. Andrews, F. Berkhout, and V. Thomas, eds. 1994. *Industrial Ecology and Global Change.* New York and Cambridge, UK: Cambridge University Press.

This work compiles 36 articles from the world's leading authorities on industrial ecology, whose disciplinary goal is "the evolution of the world's industrial activity into a sustainable and environmentally benign system." Not for Luddites, this book is about the specifics of transforming the current economic system into something that can meet the "needs" of human populations without destroying the environment.

Tobias, Michael. 1994. *World War III: Population and the Biosphere at the End of the Millennium.* Santa Fe, NM: Bear & Co. Publishing.

With its title that is both metaphor and reality, Tobias's book is about the world war humans are waging on Nature. Tobias writes powerfully, combining personal experience and factual information to confront population taboos and discusses population issues from new perspectives. For example, the chapter on India notes how in Kerala, low consumption, relative economic sustainability and social justice, combined with high absolute numbers, continue to yield environmental degradation.

1993

Abernethy, Virginia. 1993. *Population Politics: The Choices that Shape Our Future.* New York: Plenum Press.

Virginia Abernethy approaches the population issue from a perspective that reflects her training in psychiatry and anthropology. Motivation is crucial when her "economic opportunity" theory is offered as an alternative to the "demographic transition" theory as an explanation for changing fertility. The politics and policy implications of population growth and immigration—particularly for the US—are explored throughout this important book.

Daly, Herman E., and Kenneth N. Townsend, eds. 1993. *Valuing the Earth: Economics, Ecology, Ethics.* Cambridge, MA: MIT Press.

This collection of essays from some of the 20th century's seminal writers on population and economic issues is perhaps the best introduction to ecological economics available. It contains many classic population essays such as Paul and Anne Ehrlich's "Why Isn't Everyone as Scared as We Are?," M. King Hubbert's "Exponential Growth as a Transient Phenomenon in Human History," Herman Daly's "Sustainable Growth: An Impossibility Theorem," and Garrett Hardin's "The Tragedy of the Commons."

Douthwaite, Richard. 1993. *The Growth Illusion: How Economic Growth has Enriched the Few, Impoverished the Many, and Endangered the Planet.* Tulsa, OK: Council Oaks Books.

Population is just part of a general institutional, cultural, social and political obsession with growth. Douthwaite's book, written from a British perspective, is a good investigation of the negative impacts of this obsession.

Hardin, Garrett. 1993. *Living Within Limits: Ecology, Economics, and Population Taboos.* New York: Oxford University Press.

For more than 40 years, ecologist Garrett Hardin has been one of the planet's most important and fearless advocates for limiting human numbers to ecologically sustainable levels. In perhaps his best work, Hardin elaborates on many themes developed throughout his prolific writings. This volume is a true classic of population literature and absolutely essential for population stabilization activists (even more so for policy makers).

Jensen, Deborah B., Margaret S. Torn, and John Harte. 1993. *In Our Hands: A Strategy for Conserving California's Biological Diversity.* Berkeley and Los Angeles: University of California Press.

California is notable for the great diversity of species and habitats contained in a relatively small region. It is also an area that in the last 60 years has been subject to unprecedented population growth and development pressures. This book, primarily a survey of biodiversity and specific conservation policy recommendations, contains some of the best accounts available on the details of how population pressures affect biodiversity; see particularly Chapter 2 "How Biodiversity is Lost," and Chapter 4 "Threats to Biodiversity in California" that includes a section on "Land Use and Habitat Conversion."

Myers, Norman. 1993. *Ultimate Security: The Environmental Basis of Political Stability.* New York: W.W. Norton & Company.

This book by British environmental writer Norman Myers examines the connection between population growth, environmental destruction, and political instability.

1992

Durning, Alan. 1992. *How Much Is Enough: The Consumer Society and the Future of the Earth.* New York: W.W. Norton & Co.

Durning's focus here is on high consumption, with minimal attention to how population growth drives the increase in gross throughput. Still, it is an important book, for persons seeking detailed exposition of the "A" (affluence) in the I=PAT equation.

Goodland, Robert, Herman E. Daly, and Salah El Serafy. 1992. *Population, Technology, and Lifestyle: The Transition to Sustainability.* Washington, DC and Covelo, CA: Island Press.

In this collection of essays, leading experts on environment and development issues "argue that economic growth should no longer be the unquestioned objective of economic development policy." Both general goals and specific policies for achieving sustainability are included among the articles, several of which are among the best statements on the economics of ecological sustainability available.

Grant, Lindsey, ed. 1992. *Elephants in the Volkswagen.* New York: W.H. Freeman.

An excellent collection of essays compiled largely from articles that appeared in *NPG Forum* during the late 1980s and early 1990s, the book is organized to explore what an optimum human population should be. Contributors such as Cornell University's David Pimentel and the Institute for Ecological Economics's Robert Costanza go beyond speculation on optimum population size to carefully elucidate how human populations are supported by and dependent on natural ecosystems.

Harrison, Paul. 1992. *The Third Revolution: Environment, Population and a Sustainable World.* London, New York: I.B. Tauris & Co. Ltd.

Although global in perspective, Harrison does an excellent job of illustrating the connections between population, economic growth, and destruction of Nature. The emphasis here is on the limits of growth, including a realistic investigation of what genuine ecological sustainability would entail.

Meadows, Donella H., Dennis L. Meadows, Jorgen Randers. 1992. *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future.* Post Mills, VT: Chelsea Green Publishing Co.

This update of their 1972 classic, *The Limits to Growth*, reflects both the tremendous advances in computer technology and our understanding of how dependent humans are on Earth's life support systems. The section on "overshoot" is an invaluable exploration of this key concept expounded so forcefully in William Catton's 1982 classic book by the same name. Chapters on "The Driving Force: Exponential Growth," and "The Dynamics of Growth in a Finite World" are excellent. Economic and policy discussions in the latter part of the book maintain the consistent overall quality of thought and presentation though are somewhat general in their prescriptions.

Mitman, Gregg. 1992. *The State of Nature: Ecology,*

Community, and American Social Thought, 1900-1950. Chicago and London: The University of Chicago Press.

While social Darwinism has heavily influenced the ideology, politics, and institutions of the industrial growth society (and to some extent the population/resource debate, i.e., lifeboat ethics), few are familiar with Warder Clyde Allee and the development of the Chicago school of animal ecology and its view of Nature rooted not in competition and individual success, but in cooperation and community—an interesting historical study.

Ophuls, William, and A. Stephen Boyan, Jr. 1992. *The Ecology and the Politics of Scarcity Revisited: The Unraveling of the American Dream.* New York: W.H. Freeman and Co.

Another update, this time of Ophuls's influential 1977 work. This work is among, if not the best, critique of American politics and policy from an ecological perspective. While the focus is on the US, global connections are not ignored as the authors mull the tough choices ahead with a comprehensive analysis that is "blunt, objective, provocative, uncompromising, and at times unnerving."

1991

Bouvier, Leon. 1991. *Peaceful Invasions: Immigration and Changing America.* Washington, DC: Center for Immigration Studies.

A good summary of how immigration affects US demographics, economy, and culture. The historical overview of immigration/population demographics is solid, and the discussion of the implications of current trends is useful.

Brown, Lester R., Christopher Flavin, and Sandra Postel. 1991. *Saving the Planet: How to Shape an Environmentally Sustainable Global Economy.* New York: W.W. Norton and Co.

Global in scope, this book gives a good overview of current resource dilemmas and the general policies essential to developing a sustainable economy.

Daly, Herman E. 1991. *Steady-State Economics: Second Edition with New Essays.* Covelo, CA and Washington, DC: Island Press.

The first eight chapters of this book, first published in 1977, introduced and defined ecological economics. The second edition has nine more chapters and provides valuable new materials that update this classic for the next millennium. Part IV contains Daly's marvelous critique of Julian Simon's cornucopian fantasy *The Ultimate Resource.* This is an essential work on the economic and ecological effects of growth.

Meadows, Donella H. 1991. *The Global Citizen.* Covelo, CA and Washington, DC: Island Press.

Although the book's title refers to the responsibilities of global citizenship (particularly for those living in high consumption, high growth countries like the US), the topics covered are applicable to the US. Meadows provides a fine general discussion on the interrelationships among environmental, economic, growth, and population issues in the US at the end of the 20th century.

1990

Ehrlich, Paul, and Anne H. Ehrlich. 1990. *The Population Explosion.* New York: Simon and Schuster.

Ehrlich's *Population Bomb* started it all in 1968; this excellent follow-up is a vivid reminder of how little progress has been made in the subsequent two decades toward addressing population growth, particularly in the US. Although some might argue that awareness of population issues has declined among policy makers, the media, and general public, it is not because of a lack of effort by the Ehrlichs and many others.

Turner, B.L. et al., eds. 1990. *The Earth as Transformed by Human Action: Global and Regional Changes in the Biosphere over the Past 300 Years.* New York: Cambridge University Press.

This huge volume, the compilation of a historic decade-long project initiated at Clark University, details the sweeping changes humans have inflicted on the biosphere in the past three centuries. Of particular interest are the chapters "Changes in Population and Society," "The United States Great Plains," and "The Basin of Mexico."

Publication of *The Population Explosion* and *The Earth as Transformed by Human Action* marked a fitting beginning to the decade, which thus far has seen a relatively rich and sophisticated amount of literature published on population, growth, and ecological economics, even while the problems this literature explores continue to worsen. ▮

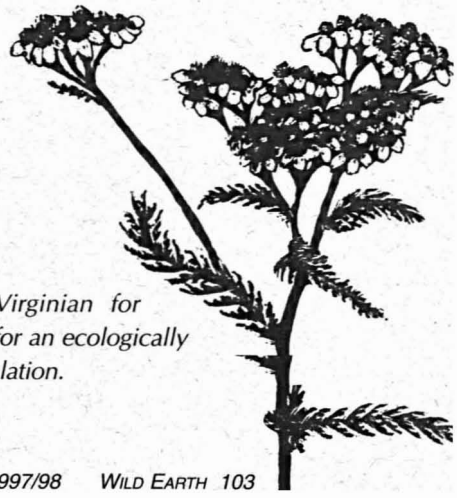

illustration by Eva Thompson

Ed Lytwak is a Virginian for Wilderness and activist for an ecologically sustainable human population.

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Resources for Overpopulation Action

Major Population Organizations with a US Focus

Carrying Capacity Network, 2000 P St., NW #240, Washington, DC 20036: 202-296-4548 (t); 202-296-4609 (f); CCN@igc.apc.org

Federation for American Immigration Reform,1666 Connecticut Ave., NW #400, Washington, DC 20077; 202-328-7004; http://www.fairus.org

Negative Population Growth, 210 The Plaza, Teaneck, NJ 07666-1206, 201-837-3555 (t); 201-837-0288 (f);1666 Connecticut Ave., NW #400, Washington, DC 20009; 202-667-8950 (t); 202-387-3447 (f); http://www.npg.org

Population-Environment Balance, 2000 P St., NW #210, Washington, DC 20036; 202-955-5700 (t) 202-955-6161 (f); uspop@balance.org

Zero Population Growth,1400 16th St., NW Suite 320, Washington, DC 20036; 202-332-2200/800-767-1956 (t); 202-332-2302 (f); zpg@igc.apc.org / http://www.zpg.org

National Groups with Population Programs

Izaak Walton League, Carrying Capacity Project, 707 Conservation Lane, Gaithersburg, MD 20878-2983; 301-548-0150

League of Women Voters, Population Coalition, 226 West Foothills Blvd. Ste. C, Claremont, CA 91711; 909-625-5717

National Audubon Society, Human Population and Resource Use Department, 4150 Darley Ave. Suite 7, Boulder, CO 80303; 303-499-5155 (Mid-Atlantic Region 717-763-4985)

National Audubon Society, Population Program, 666 Pennsylvania Ave., SE; Washington, DC 20003; 202-547-9009

National Wildlife Federation, Population Program, 1400 16th St. NW, Washington, DC 20036; 202-797-6639

Other National Groups with Population Concerns

National Resources Defense Council, 1200 New York Ave., NW Suite 400, Washington, DC 20005; 202-289-6868

Sierra Club, Population Program—Local Carrying Capacity Campaign, 408 C St. NE, Washington, DC 20002; 202-547-1141

Union of Concerned Scientists, 26 Church St., Cambridge, MA 02238; 617-547-5552

Wild Earth, POB 455, Richmond, VT 05477; 802-434-4077

The Wildlands Project, 1955 W. Grant Road, Suite 148A, Tucson, AZ 85745; 520-884-0875

Wilderness Society, 900 17th St. NW, Washington, DC 20006; 202-833-2300

Major State Groups

Californians for Population Stabilization, 926 J St. Suite 915, Sacramento, CA 95814; 916-446-1033

Colorado Population Coalition, POB 6201, Denver, CO 80206; 303-322-8290

Floridians for a Sustainable Population, 1400 Moravia Ave., Daytona Beach, FL 32117; 407-638-1414

New Hampshire Citizens for Sustainable Population, POB 2651, Concord, NH 03302; 603-526-6374

Vermont Population Alliance, POB 466, Norwich, VT 05055; 802-649-5168

Grassroots Groups

Canadian Population Action Network, POB 59045, Ottawa, Ontario, KIG 5T7 Canada; 403-466-2196

The Demographic, Environmental, and Security Issues Project (an online information service) 315 W. 91st St., Apt. 5A, New York, NY 10024; 212-595-9879; rbleir@igc.apc.org

Foundation for Optimum Planetary Survival, 8776 E Shea, B3A-207, Scottsdale, AZ 85260; 602-661-6350

Globally Responsible Birthing, Route 1, Box 28, DeLancey, NY 13752; 607-746-3872

National Optimum Population Commission, 1070 SE Denman Ave., Corvallis, OR 97333; 503-752-4383

Oregon Optimal Population Society, 1237 Wygant Ave., Coos Bay, OR 97420; 503-868-8234

Overpopulation Awareness, POB 40218, St. Paul, MN 55104; 612-633-6433

People for Sustainable Population, 1817 East End Ct., Olympia, WA 98502; 206-786-8326

Population Awareness, RR#8 Box 371A, Decatur, IL 62522; 217-865-2409

Population Control Legislative Service, POB 81, Maplewood, NJ; 07040; 201-762-2649

Population Environmental Network, 76 La Puerta Trail, Placitas, NM 87043; 505-867-6741

The US Sustainable Population Policy Project, 919 Vinecrest Lane, Richardson, TX 75080; 972-238-8805

Too Many People, POB 6431, Aloha, OR 97007; 503-591-0832

World Population Balance, POB 23472, Minneapolis, MN 55432; 612-869-1640

ZPG Boston, 6 April Lane #11, Lexington, MA 02173; 617-862-5927

ZPG Oregon, 85328 Willamette, Eugene, OR 97405; 503-687-0060

ZPG Santa Cruz/Monterey, 735 Cathedral Drive, Aptos, CA 95001; 408-688-3792

ZPG Seattle, 1510 NW Ballard Way, Seattle, WA 98107; 206-781-8877

Please note that this compilation primarily lists active population organizations with a US focus, and does not include many fine groups working to stop population growth internationally. Wild Earth *is interested, however, in compiling a resource list of organizations working to halt population growth in all of North America. If you know of active Canadian or Mexican population groups (or if we missed a US organization), please let us know at PO Box 455, Richmond, VT 05477.*

Book Reviews

The Stork and the Plow:
The Equity Answer to the Human Dilemma

by Anne and Paul Ehrlich and Gretchen Daily; G.P. Putnam's Sons (200 Madison Ave., New York, NY 10016); 1995; $30, 364 pp.

I recently took an Old Testament course during which I was surprised to find that there are several passages in the Bible that refer to the dangers of overpopulation. Isaiah, in Chapter 5:8 writes: "Woe unto them that join house to house, that lay field to field, till there be no place that they may be alone in the midst of the Earth." Again, in Chapter 48:16, he issues a warning against becoming so crowded that there will be no place for the children to live. Nahum 3:15 offers a curse against those who "multiply like the locust."

Anne and Paul Ehrlich have not been writing about overpopulation quite as long as Isaiah or Nahum, but in such influential works as *The Population Bomb*, *The Population Explosion*, and *Betrayal of Science and Reason* they have served a similar prophetic role. In *The Stork and the Plow* they are joined by co-author Gretchen Daily, their colleague at Stanford University's Center for Conservation Biology.

The central premise of their book is that we are witnessing a contest between the stork—or human fecundity—and the plow—or agricultural production. The authors contend that we must slow (and ultimately reverse) the former if we ever hope to adequately provide for Earth's human population. Toward this effort they have learned well the lessons of the Cairo UN Population Conference in 1994, and acknowledge that this must include efforts to improve "women's health, well-being and empowerment."[1] They echo the subtitle of their book when they write: "Working toward international equity is an essential step in the long and complicated negotiations necessary to create a sustainable global society."[2]

The race between the stork and the plow brings up one of the major criticisms leveled against the Ehrlichs by their Marxist, feminist, and cornucopian detractors who have suggested that the Earth could easily provide for its billions if only all the goods produced were evenly distributed. If inefficient and/or rapacious national and international entities could either be broken up or made to operate more compassionately, all would be well, they say. The socialists blame multinational capitalism, the cornucopians blame socialist policies, but either way a blithe optimism is the result.

The brilliant social analyst Lewis Mumford once wrote that the optimist, "like the sundial," can only tell time on a sunny day.[3] The Ehrlichs and Daily certainly don't argue against compassion, but they do advocate taking a realistic view of humanity's track record and likely future behavior.

The authors note that the Earth could "support a larger population of cooperative, far-sighted vegetarian pacifist saints than of competitive, myopic, meat-eating, war-making, typical human beings." Thereby, they "distinguish between *biophysical carrying capacity*...and *social carrying capacity*—the maximum that could be sustained" under typical patterns. "Human beings are prone

illustration by Eva Thompson

to error and greed, making resource use both inefficient and inequitable," they continue. "Social carrying capacity is smaller than biophysical carrying capacity also because the latter implies...a battery chicken lifestyle for people—that would be universally undesirable."[4]

They continue to drive this point home: "Claiming that population size has nothing to do with the food problem is like claiming it has nothing to do with smog in Los Angeles because if everyone walked or biked to work, the smog would disappear."[5] Of course, contrary to the optimists of both left and right, more people will continue to move to Southern California and most of them will want automobiles and other accoutrements of a high consumer lifestyle.

A recent survey conducted by *Utne Reader* reflected this reality: Of its own "very environmentally concerned readers, only 21% said they would be willing to do without a car and only 13% would forgo their quarter-pounders with cheese."[6] If this thoroughly depressing outcome of a survey of green-leaning households is accurate, what then can be expected of the average Joe and Jill Sixpack who never give these issues much (or any) thought? I think the Ehrlichs are entirely correct in arguing that we cannot expect utopian social or political changes to do away with basic human nature; rather, we must ultimately decrease the scale of the human enterprise.[7]

Another swipe taken at the Ehrlichs by virtually every brownlash writer of the last 25 years is to question and mock their prediction that hundreds of millions of people would starve if the population problem was not addressed. They answer that "an estimated 250 million people have died of hunger-related causes in the past quarter century—roughly 10 million each year. The victims of untimely death have been mostly infants and small children."[8]

One might think the fact that 1.4 billion humans now live in absolute poverty might give the cornucopians pause for thought, but it does not. As the Ehrlichs write:

Overweight, ignorant talk-show hosts can prosper while remaining perfectly clueless about overpopulation, hunger, and environmental deterioration because they are personally buffered (at least temporarily) by their wealth from many of the consequences of Earth's increasingly perilous state.[9]

One area in which I disagree with the authors is over China's population policies. In *The Stork and the Plow*, they come close to endorsing China's draconian one child policy. I agree with Alice Walker's statement that there is never any good reason to have more than one child, but the image of Chinese tanks rolling over protesters is strong; surely population reduction advocates can find better allies than the Beijing despots. If we seek examples to emulate, we ought to speak of Thailand, where democratic educational efforts have shown great promise, and where slogans like "Fewer is Better" have considerable grassroots appeal.[10]

I think a better way to approach the China dilemma is to stress that China is a good case of what happens when a nation's people wait too long to begin addressing their population problem. The Maoists used to boast that they would bury the world with their billions (a formulation used by Betsy Hartmann's favorite demographer Colin Clark, who believed that India would soon be the world's most powerful nation because of its expanding millions).[11]

In the 1970s, as they were gloating on the world stage, back home the Chinese were scrambling to enact a population program. Their utopian delusions of expanding populations had resulted in abysmally wrongheaded policies that led to the starvation of "upward of 20 million Chinese."[12] When they finally realized that not only were people not "the ultimate resource," but that the entire country was in danger of becoming a basketcase, the Chinese had to resort to severe and authoritarian policies.

The Ehrlichs and Daily astutely summarize a lesson learned: "Individuals who oppose mild and humane restrictions on reproduction now are encouraging an enormous further loss of both human freedom and human lives in the future."[13]

Another section of the book contains a fascinating discussion of how "drought follows the plow,"[14] and how during Plato's time, even under conditions of minimal technology, the sheer impact of numbers of people over time battered away at the Earth until it looked like "the skeleton of a sick man" compared to its former self.[15]

The authors then cite John Terborgh on his ecological survey of the border area between Haiti and the Dominican Republic:

On the Haitian side, there was no vegetation. The border sharply divided the scene, a boundary between green and gray. The landscape on the other side was naked

and bleak. Even more to my astonishment, when I scanned with binoculars, I could see that the bare rock in Haiti was dotted with houses, not just a few, but many, as far as I could see.[16]

It comes as no surprise when the Ehrlichs and Daily note the respective birth rates: The average Haitian woman has six children, the Dominican has only 3.3. With this powerfully stark image the authors contrast possible futures—a bleak and gray planet jammed with human dwellings—or a beautiful, green, and biologically diverse planet where birth rates are kept low. Toward this latter vision, I hereby advocate that instead of engaging in futile and rigged bets with the cornucopians, we set up a fund to send pronatalists like Julian Simon and Rush Limbaugh to spend a week in rural Haiti, or central Africa, so they can see just exactly what sort of world their policies of accelerated overcrowding are creating. ♦

—Reviewed by Bill McCormick (POB 1729, Charlottesville, VA 22902) who writes regularly on population issues.

References

1. Paul & Anne Ehrlich and Gretchen Daily, The Stork and the Plow, New York: G.P. Putnam's Sons, 1995, p. 80.
2. Ibid., p. 280.
3. Lewis Mumford, Faith for Living, New York: Harper, Collins & Co., 1940, p. 121. Mumford's importance in developing an ecological understanding among social scientists cannot be overstated.
4. The Stork and the Plow, p.4.
5. Ibid., p. 227.
6. Mike Hanauer, "Over-consumption and Overpopulation," ZPG Reporter, May/June 1997, p.2.
7. As a bicycle commuter and advocate of simplicity in all its forms, neither the Ehrlichs nor I its suggest that it is not unimportant for North Americans to reduce their rates of consumption, waste, and speed. I am simply trying to make the point that future forecasts cannot be made on the promise of mythical beings that behave like saints, any more than an elementary school teacher could leave a classroom for the entire morning and not expect to come back and find it in chaos.
8. The Stork and the Plow, p.22.
9. Ibid., p.55.
10. George Moffett, Critical Masses, New York: Viking, 1994, p. 136.
11. Ibid., p. 319. Colin Clark reminds me of what Ed Abbey said of James Watt—that he could always be expected to come up with some amusing and entertaining comment on any public occasion. Proof that there is a fool born every minute, Adrian Berry (no relation to Wendell or Thomas, please!), in his new book, The Next 500 Years, (New York: W.H. Freeman, 1996, p. 205), gleefully crows that the human population could potentially reach "330 trillion" with no negative ramifications whatever.
12. Ibid., p. 115.
13. Paul and Anne Ehrlich, Earth, New York: Franklin Watts, 1987, p. 234.
14. The Stork and the Plow, p. 176.
15. Ibid., p. 175.
16. Ibid., p. 177.

Beyond Motherhood:
Choosing a Life without Children

by Jeanne Safer; Pocket Books, a division of Simon and Schuster (1230 Avenue of the Americas, New York, NY 10020); 1996; $12; 190 pp.

Some women know from an early age that they never want to have children. For others, years of uncertainty and soul-searching lie between the time they could responsibly reproduce and the time when they firmly decide not to have a child. Jeanne Safer's *Beyond Motherhood: Choosing a Life without Children* offers personal accounts from both ever-certain and long-ambivalent women as they trace their individual histories to their eventual choice not to become mothers. In chronicling her own struggle with the question of whether or not to procreate, Safer will undoubtedly bring comfort to some readers. But *Beyond Motherhood* unintentionally reinforces stereotypes and ignores reasons for childlessness that transcend the strictly personal.

Safer explains that for many women, choosing not to become a mother is "a slow, partly subliminal decision-making process" dictated by dedication to career, or by life circumstances (especially a mate) that make parenthood problematic, and/or by a history that predisposes a woman to question whether motherhood will ever be a part of her life. Safer acknowledges that "any woman who does not have a child, and I include myself, is missing something, whether she knows it or not" and poignantly asks, "What could be harder than choosing between forever and never?" as she accepts that few decisions in life are as irrevocable, or as final, as the choice to forego procreation. Although the sociological statistics surrounding research on childless women are interesting, they seem also to confirm what common sense would suggest:

• One third of all childless women unambivalently reject the maternal role early in life. They are referred to as "early articulators" and they view motherhood totally negatively. They have usually had antagonistic relationships with their own mothers and according to the author, "needed to separate emotionally from them in a radical way."

• According to sociologists William Mosher and Christine Bachrach in "Childlessness in the US" (*Journal of Family Issues*, December, 1982), two-thirds of all women who choose to remain childless decide to do so slowly, over many years, ultimately viewing their childlessness primarily positively, with some sense of loss. These women are referred to as "postponers" because

they do not definitely choose childlessness until the end of their childbearing years. Mosher and Bachrach's studies suggest that childless women are typically first-born or only children and tend to be untraditional in a variety of ways; as a group they are better educated, more cosmopolitan, less religious, and much more likely to have professions than are mothers.

• According to Safer's statistics, couples childless after five years of marriage tend to remain so. Five to fifteen percent of American women are childless, and women without children are slightly more likely to have had unhappily married parents.

One weakness of Safer's book is that it unintentionally reinforces the unfair stereotypes about women who choose not to have children: such a woman must a) have had a damaged childhood and/or b) be selfish and dislike kids. A disturbingly high percentage of the women Safer chose to profile do seem to come from dysfunctional families. They were conceived in loveless marriages, were molested as young girls, had mothers who tried to live vicariously through their children, or had parents who were left-brain overachievers without much love left in their hearts to share with their children. And despite attempts to read generously between her words, the author seems not to like kids, and most of the women she interviewed share that sentiment. Safer describes children as distracting and demanding, ultimately deciding that they would limit her career and substantially restrict her relationship with her husband.

It is especially regrettable, however, that Safer chose not to profile women from emotionally healthy backgrounds who truly enjoy children, but who have chosen not to become mothers for reasons that transcend the strictly personal. Although she interviewed fifty women from around the country, ranging in age from 22-72, Safer did not seem to meet any whose primary motivation to remain childless was due to their environmental, social, or political concerns. One woman Safer interviewed states that she knew since adolescence that parenthood was not for her after selecting "Zero Population Growth" as the topic for her first school research paper. But Safer does not explore with even one more sentence this woman's early concern about the negative effects of human population growth. Instead, Safer concentrates on the woman's "lifelong unconscious goal to not emulate her neglectful mother." Safer is a psychoanalyst, and thus her predilection for exploring the dark side of the psyche is understandable. The book would simply have been more effective had the author considered other motivations for childlessness beyond the self-absorbed.

Beyond Motherhood: Choosing a Life without Children will undoubtedly be appreciated by women interested in the stories of fellow females who have chosen not to reproduce. But we need many more tales of women who have chosen to express their love for the world—and for children!—in a way that does not involve the creation of another human being. Powerful stories could be told of women who express such love by becoming doting aunts, raising adopted children, taking in foster kids, or helping "mother" others' children by assisting them as they grow up. Profiles could be written, too, of the honorable women dedicating their lives to conservation and/or social change, who "adopt" a stream restoration project, for example, instead of conceiving a human baby. Safer's readers would have been better served had she chosen to include examples of these women who have moved "beyond motherhood" for *positive* reasons, successfully nurturing new life in the world while abstaining from procreation. ♦

—Reviewed by Monique Miller, Wild Earth *executive director*

Picking Trash, Roadside

Each pace, each bow
and measured breath
a sour pleasure.

Nicotine filters
mostly, bottlecaps
and brown receipts.

I am glad to be
deceived by paper
birch ribbons.

Deerflies rummage,
frantic, through sudden
shifts of hair,
recalling me
to the moment.

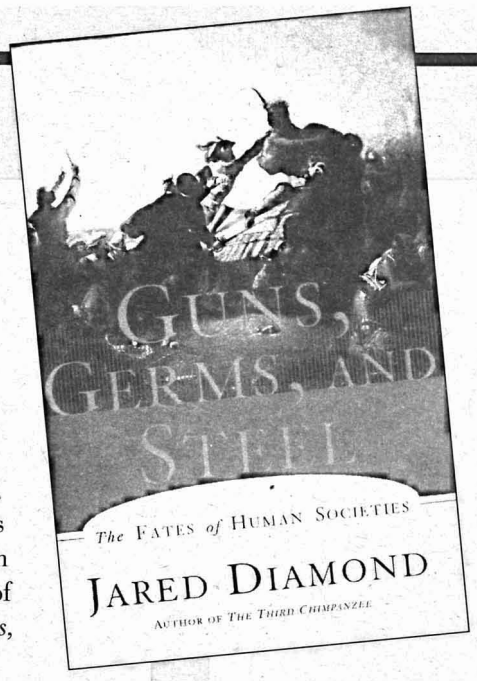
This work spent
too long tangled
in shadows flung
by anger
brought to flame
in pitchy wakes
of clearcuts.
Now,
gentle and thorough
as great apes grooming,
the land and I
pluck from one another
forgotten signs
of my kind's
reckless surge.

This path is not yours,
unless you find
yourself
on it.

—Laird Christensen

Guns, Germs, and Steel: The Fates of Human Societies

by Jared Diamond; W.W. Norton; 1997; $27.50; 480 pp., illustrated



On November 16, 1532, at the town of Cajamarca in Peru, the Spanish conquistador Francisco Pizarro captured Atahuallpa, the last emperor of the Incas. The scene is reproduced in a painting by Sir John Everett Millais that appears on the jacket of Jared Diamond's new book *Guns, Germs, and Steel*.

How was it, Diamond asks, that Pizarro could carry out this stunning victory? Was it just an accident of history? Or were there deeper underlying reasons? "We can identify the chain of proximate factors that enabled Pizarro to capture Atahuallpa," Diamond writes, "and that operated in European conquests of other Native American societies as well. Those factors included Spanish germs, horses, literacy, political organization, and technology (especially ships and weapons)." In short: guns, germs, and steel.

These may strike us as very basic reasons, but the object of Diamond's book is to lay bare reasons that are even more basic: not the proximate causes for Pizarro's victory, but the ultimate ones. The ultimate causes, Diamond argues, are environmental: the areas of the continental landmasses, their orientation (north-south or east-west), and the number of plants and animals on each continent that were suitable for agriculture or domestication. Even before the "starting line" of 11,000 BC—the point at which human settlement had spread through the Americas, the last Ice Age ended, and people began to domesticate plants and animals—the inhabitants of certain parts of the world had a head start.

To oversimplify Diamond's book-length argument, the people of Eurasia developed complex, specialized, and technologically advanced civilizations more rapidly than the rest of the world because their continent had the largest landmass, because it was oriented on a generally east-west axis, and because evolution favored it with the greatest number of animals suitable for riding, traction, and food, and the greatest number of plants suitable for agriculture. Of the 56 species of wild grass with the largest seeds, it seems 32 are concentrated in the Fertile Crescent or elsewhere in the Mediterranean. "That fact alone goes a long way toward explaining the course of human history."

Blessed with these advantages, the early Eurasians began to keep animals and to grow grains, rather than to roam for sustenance as hunter-gatherers. A reliable food supply made it possible to feed bigger communities and to support "specialists" such as artists and storytellers, and the chiefs and bureaucrats that orderly life in bigger communities required. Innovations such as writing and the wheel spread throughout the continent together with crops and farming techniques—a process made easier because they could spread in an east-west direction within the same latitudes and climate zones. Finally, by sharing germs with their domestic animals, the Eurasians caught diseases (and developed resistances to them) that would prove devastating when they came into contact with other peoples.

The implication is that the peoples of Europe (and, at the other end of the continent, China) gained dominance over much of the world not because of any innate superiority over the people they conquered but because of their home region's geophysical and biological characteristics. Diamond demonstrates that the traditional peoples of Africa, Asia, and the Americas had an encyclopedic knowledge of their local flora and fauna, making it inconceivable that they could have neglected to exploit a usable plant or animal. Nor were they hobbled by cultural conservatism, as the immediate adoption of guns and horses by the Plains Indians of the American West shows. Therefore *Guns, Germs, and Steel* is a powerful antidote to racist arguments (or unspoken assumptions) that traditional people are "primitive" not just in their technology but in themselves. Diamond maintains that the New Guineans he has worked with for over 30 years are at least as intelligent as Westerners, and probably more so, because their children spend almost all their time actively playing and interacting with other people rather than being passively entertained by TV. Additionally, he notes that the survival of Westerners, at least for the last few thousand years has largely been based on their resistance to epidemic diseases (i.e., body chemistry) rather than their ability to find food and to avoid murder, accidents, or death in battle—for which intelligence is a key advantage. (This second argument, though it is made on behalf of a "primitive"

people, would seem to veer dangerously close to the racist beliefs of 19th-century Social Darwinism, implying as it does that "civilized" society allows less intelligent individuals to survive and reproduce, bringing down the average level of intelligence.)

As farming developed, the bigger, denser populations it made possible drove fast-track societies—with their rapidly developing weapons and technology—to search for more land and more resources. To illustrate this process, Diamond highlights a historical conquest that is much less familiar (to us Westerners) than the European conquest of Africa and the Americas: the Austronesian expansion into Southeast Asia. As they hopped from island to island, moving as their settlements became too crowded, the Austronesians, who came from what is today China, provided a test case of how deeply environment shapes the destiny of peoples. Though they came from the same racial stock, the Austronesians who settled on larger islands with more natural resources—like the Maori of New Zealand—developed more technological, more specialized, and more warlike societies that overwhelmed and destroyed "backward" peoples when they encountered them.

Guns, Germs, and Steel makes its argument with admirable clarity, moving with impressive ease from continental trends to the fascinating minutiae that bolster its basic points. The book makes a convincing case that it is environmental factors that have given some societies an edge over others, and the ammunition it provides in demolishing racist beliefs is most welcome. But a more troubling message emerges indirectly—that technological societies not only *can* overcome less technological ones but almost always do so when given half a chance. To what extent this is a given of human societies, or of human biology, is an important question that requires another book as wide-ranging and clearsighted as this one. ♦

—Reviewed by Geoffrey Wisner (12 Suffolk St. Apt. 2, Cambridge, MA 02139), who frequently reviews books on Africa, Haiti, and environmental topics.

Tough Choices: Facing the Challenge of Food Scarcity

by Lester R. Brown; 1996; The Worldwatch Environmental Alert Series, Linda Starke, Series Editor; W.W. Norton and Company (500 Fifth Ave., New York, NY 10110) and London; $19.95; 159 pp.

We are living on borrowed time. Up until now, most people have treated efforts to ensure an environmentally sustainable future like a spectator sport. They have been sitting in the stands watching a handful of active participants on the playing field. But now, if we don't act quickly to turn around the demographic and environmental trends of recent decades—the next generation may go hungry.

Brown, founder of the Worldwatch Institute, believes food scarcity will replace ideological conflict as the defining issue of the new era now unfolding. The gains in agricultural productivity in the years since World War II cannot be sustained. Those gains were made at the expense of the land's long-term fertility, were achieved by putting practically all arable lands under cultivation, by depleting aquifers for irrigation, and by reliance on massive fossil fuel-based chemical inputs. Production has been pushed to its maximum and increased fertilizer use no longer increases yield. Climate changes in the United States and Canada make the critical grain harvest unstable. Increased population pressures, especially in Asia where economic development encourages affluent Asians to eat higher on the food chain, put an increased demand on grain resources.

Wild and semi-natural habitats continue to be converted to agricultural production to meet the increased demand. The domino theory Brown sees—environmental degradation leading to food scarcity and rising prices, leading to political instability, can come full circle causing further environmental degradation as civilization erodes.

Given the prospect of rising food prices and the wide disparity of incomes among countries, rising prices that are merely inconvenient for some may become life threatening to others. Scarcity will cause a new political dynamic to emerge. Will we be able to make the tough choices to stabilize population, reduce emissions of climate-changing pollutants, and protect the world's croplands and aquifers? Some of Brown's agricultural solutions such as phasing out tobacco may be warranted but perhaps too idealistic. Brown's assertion that extended use of synthetic fibers could make available for food production land that now grows cotton is also problematic, as it would prolong our dependency on oil. His notion of taxing livestock products as we now tax tobacco and alcohol, though, may be an ingenious method of pushing affluent consumers further down the food chain. Putting the scarcity issue and pressures on our environmental and food resources succinctly into perspective, *Tough Choices* is must reading for anyone planning on living into the next century. ♦

—Reviewed by Tricia Griffith, Wild Earth *intern*

One Child

Last night, midnight
tying flies that would lead us to the river
This morning silently we
follow the mist to where the river speaks
Son or daughter will you be that
knows the river as your mother
who lays your palm on passing water so
gently
that the trout sing out

Last night, midnight
spreading beeswax on our boots that
would lead us to the canyon rim
This morning hushed we
follow your cadence to where the canyon speaks
Son or daughter will you be that
knows the canyon as your father
who bows to the passing wren so
reverently
that she becomes your sister

Last night, midnight
breathing air that would lead us to the forest pool
This morning humble we
follow your direction to where our ancestors speak
One child you will be that
knows the river as your mother
the canyon as your father
the wren as your sister
who lays your life upon our imagination so
vividly
that our souls sing out

—Jo Fortier

ANNOUNCEMENTS

Living Deep Ecology Workshop

The Seventh Annual Living Deep Ecology Workshop will held in the Elk Mountains of Colorado from 10-14 August 1998. Featured speakers include George Sessions and Dolores LaChapelle, pioneers of the Deep Ecology movement in the US, and Michael P. Cohen, wilderness advocate and author of *The Pathless Way: John Muir* and *History of the Sierra Club*. For more information, contact the Aspen Center for Environmental Studies, PO Box 8777, Aspen, CO 81612; 970-925-5756.

Eastern Old-Growth Notes

The Eastern Old-Growth Clearinghouse now publishes a quarterly newsletter, *Eastern Old-Growth Notes*. The publication supplements the Clearinghouse news that is published in *WE*. The sponsorship rate of $30 is meant to support clearinghouse activities as well as cover newsletter costs. The benefactor rate is $60; low income, $15. Checks should be made out to ASPI and marked "for the Eastern Old-Growth Clearinghouse." Send to: PO Box 131, Georgetown, KY 40324; 502-868-9074; wildearth@igc.apc.org.

Western Ancient Forest Activists Conference

Headwaters' Seventh Annual Western Ancient Forest Activists Conference will gather forest protection activists at Southern Oregon University from 12-15 February 1998. A science seminar examining the importance of roadless areas for biodiversity conservation will be conducted by guest scientists Reed Noss, Dominock DellaSala, and Louisa Willcox. Conference fee is $60-$100 including 3 breakfasts and 2 lunches. Dakubetede Environmental Education Programs is offering undergraduate and graduate level academic credit for the conference through Antioch University. For information, contact Chant Thomas at 541-899-1712,482-4459; www.headwaters.org; chant@mind.net.

Whole Terrain

Whole Terrain, the annual publication of the Environmental Studies Department of Antioch New England Graduate School, is now available. In this 1997/1998 issue, Gary Paul Nabhan, Daniel Kemmis, Frances Moore Lappe, and others explore the theme of "creative collaboration." The cost is $7 per issue. To obtain this or back issues, contact Antioch New England Graduate School, Department of Environmental Studies, 40 Avon St., Keene, NH 03431; 603-357-3122, ext. 272; http://www.antiochne.edu.

Restoring the Wolf

Restoring the Wolf, a forum on wolf biology, recovery, management, and activism, will be held 11-15 November 1998 in Seattle, Washington. Defenders of Wildlife, sponsor of the conference, is accepting oral and poster presentation submissions. Appropriate topics for papers include wolf biology, behavior, tax-

onomy, general ecology, recovery, management, and economic impacts. Abstract submissions must be received by 16 January 1998, and final papers must be received by August 1st. For more information or to receive a conference registration form, contact Nina Fascione, Defenders of Wildlife, 1101 14th St. NW, Suite 1400, Washington, DC 20005; 202-789-2844 ext. 272; nfascione@defenders.org.

The Consumer Society

Island Press has released the second volume in the Frontier Issues in Economic Thought series, *The Consumer Society*. Edited by Neva R. Goodwin, Frank Ackerman, and David Kiron, the book is a compendium of articles on the environmental, moral, and social implications of a consumer culture. Billed as "an essential guide to and summary of the literature of consumption," the volume brings together over 70 authors approaching the topic from their various fields. To order *The Consumer Society*, call 1-800-828-1302 or write Island Press, PO Box 7, Dept. 3GD, Covelo, CA 95428. The cost of the volume is $24.95 for paper, $49.95 for cloth.

Immigration and US Population Growth: An Environmental Perspective

This Negative Population Growth special report by Mark W. Nowak explores the debate in the environmental community over immigration policy. Using Census Bureau and Immigration and Naturalization Service data, the paper shows that immigration will account for 60% of US population growth through 2050—indicating that immigration is likely to cause significant environmental impact in coming decades. The report is available from Negative Population Growth, 1608 20th St. NW, Suite 200, Washington, DC 20009; 202-667-8950; www.npg.org.

Powerful Video

Power, a film that tells the story of the James Bay Cree's 5-year struggle to stop the Great Whale hydroelectric development in Northern Quebec, is now available on VHS for $29.95. *Power*, which premiered at the Sundance Film Festival, remains timely, especially given Hydro-Quebec's June announcement that it intends to revive the James Bay Project. To order call 514-278-3140; e-mail ellen@cineflex.com.

Toward an Ecocentric Humanity

The Ferry Beach Park Association is planning a conference titled "Toward an Ecocentric Humanity" to be held June 28-July 5 1998 in Saco, Maine. For more information contact conference coordinator Tony Federer at the Ferry Beach Park Association, 5 Morris Ave., Saco ME 04072; 603-868-5463; compassb@nh.ultranet.com.

International Wildlife Law Conference

American University's School of Law in Washington, DC will host the Third International Wildlife Law Conference on 31 March 1998. For information or to request registration materials, contact Wil Burns, Greenlife Society—North America, 5208 Claremont Ave., Suite B, Oakland, CA 94618; 510-658-4380 tel; 510-659-5946 fax; greenlifesociety@msn.com.

Bioregional Association of the Northern Americas

The newly formed Bioregional Association of the Northern Americas (BANA) addresses important ecological issues from a bioregional perspective. It brings grassroots forces together in practical association to meet the challenge of the planetary ecological crisis. To join BANA or for more information, contact Annie Pyatak at 415-285-6556 tel; 415-285-6563 fax; planetdrum@igc.apc.org.

Malthus Submissions Sought

The quarterly journal *The Social Contract* will celebrate the bicentennial of the publication of Malthus's *Essay on the Principle of Population* in its summer 1998 issue. The journal seeks articles on Malthus, his times, his works, and his influence 200 years later. Modest authors' fees are paid for published materials. Manuscripts of between 1500-5000 words should be submitted by mid-April 1998 to *The Social Contract*, 316 1/2 E. Mitchell St., Petosky, MI 49770; 616-347-1171 tel; 616-347-1185 fax.

Food Production Threatened by US Population Growth

Carrying Capacity Network has published a new study "US Food Production Threatened by Rapid Population Growth," by Cornell University Professor David Pimentel. Copies of the study are available for $12 from CCN, 2000 P St. NW, Suite 240, Washington, DC 20036.

Earth Day Every Day

The Earth Day Every Day Radio Station Project believes the media has a responsibility to inform the public regarding current and forecasted threats to the biological integrity of the Earth, and is working to establish a radio station in a metropolitan area of the US. The project seeks individuals with integrated socio-environmental expertise to serve on its Board of Advisors, and solicits fundraising support from organizations and businesses. Non-profit fundraising partners may keep up to 50% for their own media-related projects; individuals who raise money can keep up to 15% for a favorite charity or to pay living expenses. For more information, contact the project coordinators, Traci or Dennis, PO Box 130, Bar Harbor, ME 04609; 207-288-5061; http://www.downeast.net/com/earthday.

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Back Issues

We list here only the major articles of each issue, by partial title or subject. For a more complete listing, request a comprehensive Back Issues List (see form on reverse).

1 Spring 1991 Ecological Foundations for Big Wilderness, Howie Wolke on The Impoverished Landscape, Reed Noss on Florida Ecosystem Restoration, Biodiversity & Corridors in Klamath Mtns., Earth First! Wilderness Preserve System, GYE Marshall Plan, Dolores LaChapelle on Wild Humans, and Bill McCormick's Is Population Control Genocide?

2 Summer 1991 Dave Foreman on the New Conservation Movement, Ancient Forests: The Perpetual Crisis, Wolke on The Wild Rockies, Grizzly Hunting in Montana, Noss on What Wilderness Can Do for Biodiversity, Mendocino NF Reserve Proposal, Christopher Manes on the Cenozoic Era, and Part 2 of McCormick's Is Population Control Genocide?

3 Fall 1991 SOLD OUT (but photocopies of articles are available). The New Conservation Movement continued. Farley Mowat on James Bay, George Washington National Forest, the Red Wolf, George Wuerthner on the Yellowstone Elk Controversy, The Problems of Of Post Modern Wilderness by Michael P. Cohen and Part 3 of McCormick's Is Population Control Genocide?

4 Winter 1991/92 Devastation in the North, Rod Nash on Island Civilization, North American Wilderness Recovery Strategy, Wilderness in Canada, Canadian National Parks, Hidden Costs of Natural Gas Development, A View of James Bay from Quebec, Noss on Biologists and Biophiles, BLM Wilderness in AZ, Wilderness Around the Finger Lakes: A Vision, National ORV Task Force

5 Spring 1992 Foreman on ranching, Ecological Costs of Livestock, Wuerthner on Gunning Down Bison, Mollie Matteson on Devotion to Trout and Habitat, Walden, The Northeast Kingdom, Southern Rockies Ecosystem Protection, Conservation is Good Work by Wendell Berry, Representing the Lives of Plants and Animals by Gary Paul

Nabhan, and The Reinvention of the American Frontier by Frank and Deborah Popper

6 Summer 1992 The Need for Politically Active Biologists, U.S. Endangered Species Crisis Primer, Wuerthner on Forest Health, Ancient Forest Legislation Dialogue, Toward Realistic Appeals and Lawsuits, Naomi Rachel on Civil Disobedience, Victor Rozek on The Cost of Compromise, The Practical Relevance of Deep Ecology, and An Ecofeminist's Quandary

7 Fall 1992 How to Save the Nationals, The Backlash Against the ESA, Saving Grandfather Mountain, Conserving Diversity in the 20th Century, Southern California Biodiversity, Old Growth in the Adirondacks, Practicing Bioregionalism, Biodiversity Conservation Areas in AZ and NM, Big Bend Ecosystem Proposal, George Sessions on Radical Environmentalism in the 90s, Max Oelschlaeger on Mountains that Walk, and Mollie Matteson on The Dignity of Wild Things

8 Winter 1992/93 Critique of Patriarchal Management, Mary O'Brien's Risk Assessment in the Northern Rockies, Is it Un-Biocentric to Manage?, Reef Ecosystems and Resources, Grassroots Resistance in Developing Nations, Wuerthner's Greater Desert Wildlands Proposal, Wolke on Bad Science, Homo Carcinomicus, Natural Law and Human Population Growth, Excerpts from *Tracking & the Art of Seeing* and *Ghost Bears*

Wildlands Project Special Issue #1 TWP (North American Wilderness Recovery Strategy) Mission Statement, Noss's Wildlands Conservation Strategy, Foreman on Developing A Regional Wilderness Recovery Plan, Primeval Adirondack Proposal, National Roadless Area Map, Preliminary Wildlands Proposals for Southern Appalachians & Northern Rockies, Gary Snyder's Coming into the Watershed, Regenerating Scotland's Caledonian Forest, Geographic Information Systems

9 Spring 1993 The Unpredictable As A Source of Hope, Why Glenn Parton is a Primitivist, Hydro-Quebec Construction Continues, RESTORE: The North Woods, Temperate Forest Networks, The Mitigation Scam, Bill McKibben's Proposal for a Park Without Fences, Arne Naess on the Breadth and Limits of the Deep Ecology Movement, Mary de La Valette says Malthus Was Right, Noss's Preliminary Biodiversity Plan for the Oregon Coast, Eco-Porn and the Manipulation of Desire

10 Summer 1993 Greg McNamee questions Arizona's Floating Desert, Foreman on Eastern Forest Recovery, Is Ozone Affecting our Forests?, Wolke on the Greater Salmon/Selway Project, Deep Ecology in the Former Soviet Union, Topophilia, Ray Vaughan and Nedd Mudd advocate Alabama Wildlands, Incorporating Bear, The Presence of the Absence of Nature, Facing the Immigration Issue

11 Fall 1993 Crawling by Gary Snyder, Dave Willis challenges handicapped access developments, Biodiversity in the Selkirk Mtns., Monocultures Worth Preserving, Partial Solutions to Road Impacts, Kittatinny Raptor Corridor, Changing State Forestry Laws, Wild & Scenic Rivers Act, Wuerthner Envisions Wildland Restoration, Toward [Population] Policy That Does Least Harm, Dolores LaChappelle's Rhizome Connection

12 Winter 1993/94 A Plea for Biological Honesty, A Plea for Political Honesty, Endangered Invertebrates and How to Worry About Them, Faith Thompson Campbell on Exotic Pests of American Forests, Mitch Lansky on The Northern Forest, Human Fear Diminishes Diversity in Rocky Mtn. Forests, Gonzo Law #2: The Freedom of Information Act, Foreman on NREPA and the Evolving Wilderness Area Model, Rocky Mtn. Nat. Park Reserve Proposal, Harvey Locke on Yellowstone to Yukon campaign

13 Spring 1994 Ed Abbey posthumously decries The Enemy, David Clarke Burks's Place of the Wild, Ecosystem Mismanagement in Southern Appalachia, Mohawk Park Proposal, RESTORE vs. Whole-Tree Logging, Noss & Cooperrider on Saving Aquatic Biodiversity, Atlantic Canada Regional Report, Paul Watson on Neptune's Navy, The Restoration Alternative, Intercontinental Forest Defense, Chris McGrory-Klyza outlines Lessons from Vermont Wilderness

14 Summer 1994 Bil Alverson's Habitat Island of Dr. Moreau, Bob Leverett's Eastern Old Growth Definitional Dilemma, Wolke against Butchering the Big Wild, FWS Experiments on Endangered Species, Serpentine Biodiversity, Andy Kerr promotes Hemp to Save the Forests, Mapping the Terrain of Hope, A Walk Down Camp Branch by Wendell Berry, Carrying Capacity and the Death of a Culture by William Catton Jr., Industrial Culture vs. Trout

15 Fall 1994 BC Raincoast Wilderness, Algoma Highlands, Helping Protect Canada's Forests, Central Appalachian Forests Activist Guide, Reconsidering Fish Stocking of High Wilderness Lakes, Using General Land Office Survey Notes in Ecosystem Mapping, Gonzo Law #4: Finding Your Own Lawyer, The Role of Radio in Spreading the Biodiversity Message, Jamie Sayen and Rudy Engholm's Thoreau Wilderness Proposal

16 Winter 1994/95 Ecosystem Management Cannot Work, Great Lakes Biodiversity, Peregrine Falcons in Urban Environments, State Complicity in Wildlife Losses, How to Burn Your Favorite Forest, ROAD-RIPort #2, Recovery of the Common Lands, A Critique and Defenses of the Wilderness Idea by J. Baird Callicott, Dave Foreman, and Reed Noss

17 Spring 1995 Christopher Manes pits Free Marketeers vs. Traditional Environmentalists, Last Chance for the Prairie Dog, interview with tracker Susan Morse, Befriending a Central Hardwood Forest part 1, Economics for the Community of Life: Part 1, Minnesota Biosphere Recovery, Michael Frome insists Wilderness Does Work, Wilderness or Biosphere Reserve: Is That a Question?, Deep Grammar by J. Baird Callicott

18 Summer 1995 Wolke on Loss of Place, Dick Carter on Utah Wilderness: The First Decade, *WE* Reader Survey Results, Ecological Differences Between Logging and Wildfire, Bernd Heinrich on Bumblebee Ecology, Michael Soulé on the Health Implications of Global Warming, Peter Brussard on Nevada Biodiversity Initiative, Preliminary Columbia Mtns. Conservation Plan, Environmental Consequences of Having a Baby in the US

19 Fall 1995 Wendell Berry on Private Property and the Common Wealth, Eastside Forest Restoration, Global Warming and The Wildlands Project, Paul J. Kalisz on Sustainable Silviculture in Eastern Hardwood Forests, Old Growth in the Catskills and Adirondacks, Threatened Eastern Old Growth, Andy Kerr on Cow Cops, Fending of SLAPPS, Using Conservation Easements to save wildlands, David Orton on Wilderness and First Nations

20 Winter 1995/96: TWP Special Issue #2 Testimony from Terry Tempest Williams, Foreman's Wilderness: From Scenery to Strategy, Noss on Science Grounding Strategy and The Role of Endangered Ecosystems in TWP, Roz McClellan explains how Mapping Reserves Wins Commitments, Second Chance for the Northern Forest: Headwaters Proposal, Klamath/Siskiyou Biodiversity Conservation Plan, Wilderness Areas and National Parks in Wildland Proposal, ROAD-RIP and TWP, Steve Trombulak, Jim Strittholt, and Reed Noss confront Obstacles to Implementing TWP Vision

21 Spring 1996 Bill McKibben on Finding Common Ground with Conservatives, Public Naturalization Projects, Curt Steger on Ecological Condition of Adirondack Lakes, Acid Rain in the Adirondacks, Bob Mueller on Central Appalachian Plant Distribution, Brian Tokar on Biotechnology vs. Biodiversity, Stephanie Mills on Leopold's Shack, Soulé asks Are Ecosystem Processes Enough?, Poems for the Wild Earth, Limitations of Conservation Easements, Kerr on Environmental Groups and Political Organization

22 Summer 1996 McKibben on Text, Civility, Conservation and Community, Eastside Forest Restoration Forum, Grazing and Forest Health, debut of Landscape Stories department, Friends of the Boundary Waters Wilderness, Private Lands in Ecological Reserves, Public Institutions Twisting the Ear of Congress, Laura Westra's Ecosystem Integrity and the Fish Wars, Caribou Commons Wilderness Proposal for Manitoba

23 Fall 1996 Religion and Biodiversity, Eastern Old Growth: Big Tree Update, Gary Nabhan on Pollinators and Predators, South African Biodiversity, NPS Prescribed Fires in the Post-Yellowstone Era, Alaska: The Wildlands Model, Why are Cougars Killing People?, The Adirondack Blowdown, The Yukon Wildlands Project, Mad Cows and Montanans, Humans as Cancer, Wildlands Recovery in Pennsylvania

24 Winter 1996/97 SOLD OUT (but photocopies of articles are available.) Opposing Wilderness Deconstruction: Gary Snyder, Dave Foreman, George Sessions, Don Waller, Michael McCloskey respond to attacks on wilderness. The Aldo Leopold Foundation, Grand Fir Mosaic, eastern old-growth report, environmental leadership. Andy Robinson on grassroots fundraising, Edward Grumbine on Using Biodiversity as a Justification for Nature Protection, Rick Bass on the Yaak Valley, Bill McCormick on Reproductive Sanity, and portrait of a Blunt-nosed Leopard Lizard

25 Spring 1997 Perceiving the Diversity of Life: David Abram's Returning to Our Animal Senses, Stephanie Kaza on Shedding Stereotypes, Jerry Mander on Technologies of Globalization, Christopher Manes's Contact and the Solid Earth, Connie Barlow Re-Stories Biodiversity by Way of Science. Imperiled Freshwater Clams, WildWaters Project, eastern old-growth report, American Sycamore, Kathleen Dean Moore's Traveling the Logging Road, Mollie Matteson's Wolf Re-story-ation, Maxine McCloskey on Protected Areas on the High Seas

26 Summer 1997 Doug Peacock on the Yellowstone Bison Slaughter, Reed Noss on Endangered Major Ecosystems of the United States, Dave Foreman challenges biologists, Hugh Iltis challenges abiologists, Virginia Abernethy explains How Population Growth Discourages Environmentally Sound Behavior. Gaian Ecology and Environmentalism, The Bottom Line on Option Nine, Eastern Old Growth Report, How Government Tax Subsidies Destroy Habitat, Geology in Reserve Design, part two of NPS Prescribed Fires in the Post-Yellowstone Era

27 Fall 1997 Bill McKibben discusses Job and Wilderness, Anne LaBastille values Silence, Allen Cooperrider and David Johnston discuss Changes in the Desert, Donald Worster on The Wilderness of History, Nancy Smith on Forever Wild Easements in New England, George Wuerthner on Subdivisions and Extractive Industries, More Threatened Eastern Old Growth, part 2, the Precautionary Principle, North and South Carolina's Jocasse Gorges, Effects of Climate Change on Butterflies, the Northern Right Whale, Integrating Conservation and Community in the San Juan Mtns., Las Vegas Leopard Frog

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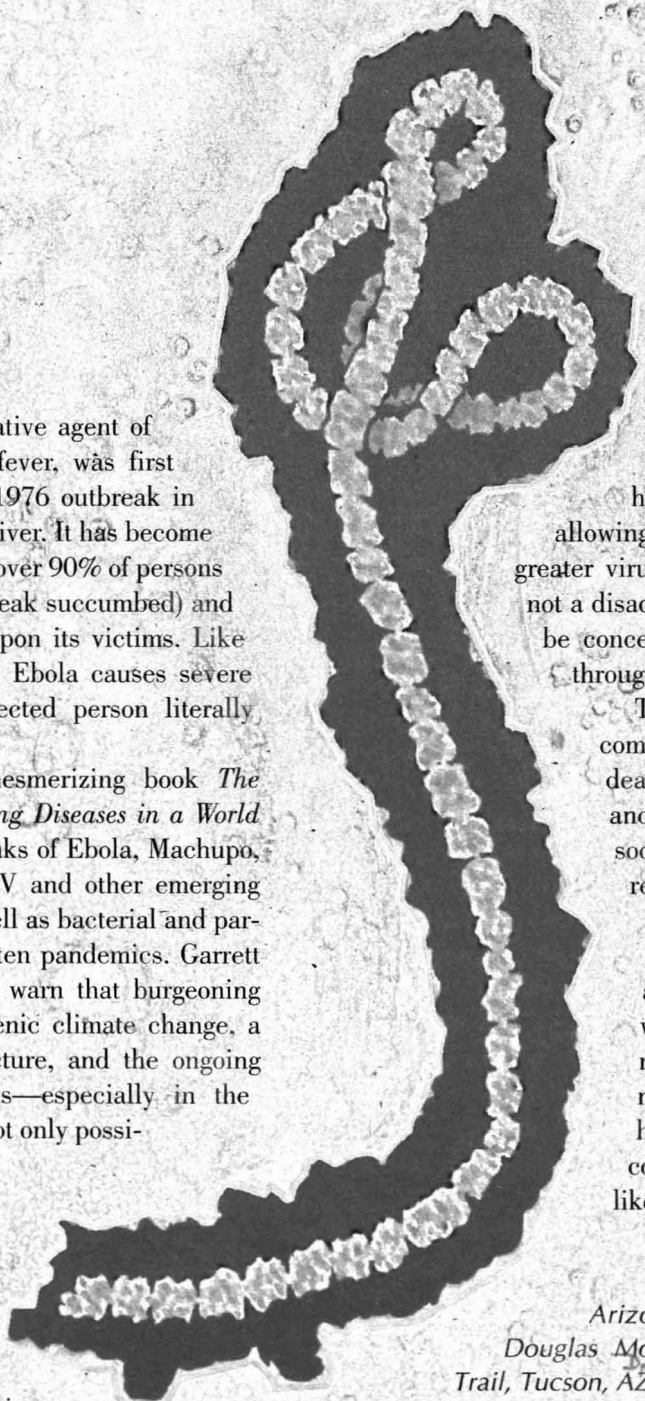
Ebola Virus *by Douglas Moore*



Ebola virus, the causative agent of Ebola hemorrhagic fever, was first identified during a 1976 outbreak in northern Zaire near the Ebola River. It has become infamous both for its virulence (over 90% of persons infected during the initial outbreak succumbed) and for the gruesome end visited upon its victims. Like other viral hemorrhagic fevers, Ebola causes severe internal hemorrhaging; an infected person literally turns into a bag of blood.

Laurie Garrett, in her mesmerizing book *The Coming Plague: Newly Emerging Diseases in a World Out of Balance*, profiles outbreaks of Ebola, Machupo, Meurto Canyon hantavirus, HIV and other emerging viruses deadly to humans, as well as bacterial and parasitic disease agents that threaten pandemics. Garrett and some microbial ecologists warn that burgeoning human populations, anthropogenic climate change, a global transportation infrastructure, and the ongoing destruction of natural habitats—especially in the tropics—make such episodes not only possible but inevitable.

As human numbers swell, we become ever more enticing prey for microbial predators. And as we encroach on the remnants of wild Nature, there arise new opportunites for *epizootic events*: viruses that may have persisted for millennia in a host or reservoir species will, upon contact, jump to a new host species—*Homo sapiens*—sometimes with disastrous consequences. Some scientists speculate that the increasing density of human populations may be allowing viruses to evolve toward greater virulence; increased lethality is not a disadvantage if a microbe needn't be concerned about quickly burning through a diffuse prey base.

The threat of pandemics to come, and the human misery and death they will bring, is yet another reason that we must soon stabilize and then begin to reduce human numbers, scale back our appropriation of Earth's natural capital, and allow room for wilderness and wildlife to recover. If we do not choose to reign in the human horde consciously and humanely now, Nature—and a coming plague from an Ebloa-like virus—may do it for us.

—*Tom Butler*

Arizona artist and ecologist Douglas Moore (6840 N. Featherstone Trail, Tucson, AZ 85743) is a well-known natural science illustrator whose work regularly appears in Wild Earth. *He produced over 250 illustrations for the forthcoming book* Grand Canyon: A Visitor's Guide *(Stackpole, 1998) by author and WE correspondent George Wuerthner.*

*Due to their extraordinary ability to mutate and recombine their genetic information with that of other organisms, some scientists think it more apt to speak of viruses, especially RNA viruses, as "quasispecies" that move about in a "swarm."

Not enough land or too many people?

"Population growth is the primary source of environmental damage."

-Jacques Cousteau

Zero, zilch, zip

That's how much credibility the United States has urging the rest of the world to protect the world's ecosystems by limiting global development and population growth.

And with good reason. Why should other nations believe a society that devours a disproportionate amount of the world's resources, generates more greenhouse gases than anyone else, and whose population is the fastest growing of the developed world? Our "do as I say not as I do" attitude doesn't play well in the eyes of other nations.

U.S. is already overpopulated

With our current population of 268 million Americans, we are simply using resources far too fast to be sustainable in the long run. Population growth is forcing cities to expand into the countryside further everyday. Unfortunately, this growth cannot go on infinitely.

What to do?

NPG advocates a voluntary and gradual *reduction of U.S. population to about 150 million.* With population as an aspect of overall US environmental policy, we'd have a chance at creating a more environmentally sustainable society for our future generations.

The driving forces

Two factors drive our nation's population growth: immigration and fertility. Our nation's birth rate, now slightly above replacement level, in conjunction with our historically high immigration levels, are causing the US population to grow by almost three million people every year. These numbers must be reduced to levels more compatible with the needs of our natural environment.

Two & 100,000

NPG urges couples to limit family size to no more than two children. We also want our government to cap legal immigration at 100,000 per year. By addressing these two factors now, we can reduce US population growth and give wildlife a chance to reclaim much of the natural habitat lost to sprawl and development in the past.

For over 25 years, NPG has been calling for gradual, voluntary reduction of U.S. and world populations to sustainable levels. Membership is $30 per year, which includes a subscription to our newsletter and current publications.

Negative Population Growth, Inc.
1608 20th Street NW, Suite 200
Washington, DC 20009
Voice: (202) 667-8950
E-Mail: npg@npg.org
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