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UNDER PRESSURE: HOW POPULATION IS PUTTING THE US AND OUR PLANET IN PERIL

An NPG Forum Paper
by Nathanial Gronewold

ABSTRACT

The United States is undeniably cleaner and less polluted today than it was in the 1950s and 60s when horrific environmental disasters inspired a wave of eco-friendly legislation and legislative action. People choking on exhaust fumes in Los Angeles and New York inspired the Clean Air Act. The Cuyahoga River in Ohio caught fire in 1969, inspiring the Clean Water Act, the Love Canal disaster led to the Superfund Act, and so on. Thanks to these laws and more, the air and water are cleaner, toxic waste sites are being remediated, and several species have been saved from the brink of extinction. All this while America's population has expanded by leaps and bounds.

Except for the fact that change is inevitable, and some things work until they don't anymore. Today, we're facing environmental crises related to overpopulation: our plastic-filled oceans, groundwater depletion, over-fishing, a new extinction crisis, and climate change, just to name a few. No eco-legislation wave is coming to save us this time. There are no signs of improvement on these fronts, and no forthcoming laws will try to fix them.

What follows is a purely factual assessment of our most pressing environmental problems and how population expansion makes these problems worse and more difficult to address.

THE ECO-REVOLUTION

I earned my PhD in part by pointing out the global revolution in biodiversity protections brought about by the United States Endangered Species Act (ESA) of 1973. The US was home to about 204 million people in 1970. The population is closer to 340 million today. Since the ESA's passing, dozens of governments across the world have emulated the US government's pioneering example, implementing their own laws and ordinances designed to save plants and animals from annihilation. It's too late for about 600 animal species wiped out by relentless human population expansion and spread: the dodo, great auk, Tasmanian tiger, passenger pigeon, and more are lost for good, and this generation will never get to enjoy these marvels of nature because of past generations' crimes against them. However, we can view with our own naked eyes pandas, whooping cranes, lions, wolves, and many more thanks to the ESA and a raft of other species protection laws.

Environmental catastrophes of the mid-20th Century eventually culminated in bipartisan legislation that helped the US turn the corner. This revolution was badly needed.

The National Environmental Policy Act (NEPA) of 1970 forced the government to consider the

environmental harms that may arise from major infrastructure projects like the national interstate highway system. The Clean Air Act of the same year led to catalytic converters in automobiles and other measures to tackle smog and horrid urban air pollution, pollution so bad that it led to deaths in New York City and other major urban centers. The Clean Water Act compelled communities to stop treating lakes, rivers, streams, and coastal water as open-air sewers. The ESA famously saved the whooping crane, the Attwater prairie chicken, and the black-footed ferret (declared extinct before a small surviving population was discovered holding on in Wyoming). Then came the 1980 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), more famously known as Superfund. That law passed after developers thought it wise to build a school and playgrounds on top of a toxic waste dump in the Love Canal neighborhood of Niagara Falls, New York. The site remains fenced off and subject to remediation efforts to this day.

The US population has increased by about 140 million since the 70s, equivalent to adding the entire population of Russia, but environmental conditions are unquestionably better. I'll be the first to admit this.

This is the power of legislation, though these laws didn't solve the American environmental problems they were supposed to address with 100% efficiency. Species first listed as endangered on the ESA are still endangered. Surface-level ozone threatens human health and has even been found to lower agricultural yields, yet nothing gets done about it. Every year, a massive dead zone appears in the Gulf of Mexico due to hypoxia caused by nitrogen runoff from Midwest farms, a pollution plume that the Environmental Protection Agency refuses to address. Still, despite relentless US population growth, life is better and the environment cleaner thanks to landmark legislation.

Unfortunately, we've now hit something of a wall.

Congress may be adept at curbing the population's impact on the environment, but today we're seeing an uptick in ecological disasters that our government won't or can't deal with either because lawmakers refuse to prioritize them or because these eco-crises transcend international boundaries, or because they are not viewed as profitable. These are the major environmental challenges of this generation, and we can draw a direct line to them and human population expansion.

This Forum paper will not offer any proscriptions, only factual descriptions of modern environmental disasters facing the US and the world today. They're rooted in economic activity designed to facilitate endless growth and meet rising consumer demand. These eco-crises are all inextricably linked to population expansion and may not get better so long as the human population continues to expand. In fact, we may only see improvement in many or all of these environmental catastrophes through slower and even negative population growth.

BEYOND THE BREAKING POINT

Research scientists at Australia's Flinders University recently issued a worldwide alarm back in late March, one credible enough to pass peer review and be published in the academic journal *Environmental Research Letters*.[1]

In this study, lead author Dr. Corey Bradshaw and his colleagues say the human population is expanding beyond the planet's ability to sustain it. Despite my earlier listing of major milestones in environmental legislation, their report notes how the rate of human population growth has been ebbing since the 1960s, ultimately culminating at the below-replacement rate birthrates we see manifesting almost everywhere. They see this as a sign of humanity crossing Earth's carrying capacity.

The Flinders University report estimates that Earth can sustain a population of about 2.5 billion people. We're well beyond that at a human population exceeding 8 billion today. Given the massive, mounting, and complicated environmental problems we are witnessing globally, something has got to give, the authors say. "The Earth cannot sustain the future human population, or even today's, without a major overhaul of socio-cultural practices for using land, water, energy, biodiversity, and other resources," they wrote.

Or as Bradshaw says, "we are pushing the planet harder than it can possibly cope."[2] I would add that, as clever as we are, we humans are also finding it increasingly difficult to cope with or get a handle on our own environmental footprint. This is a change from the 1970s-80s era of landmark United States environmental legislation and wave of United Nations

environmental agreements, like the Convention on Biological Diversity, Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and treaties governing international toxic substances trade.

One very clear sign of our inability to cope is the massive volume of plastic waste filling our world, especially in the oceans.

OUR PLASTIC OCEANS

We do not yet know the full scope of microplastics' impact on biology and human health, but we do know that these plastic particles now found everywhere in the environment are hurting us. And it may be too late to keep these particles from impacting human health; multiple studies have discovered microplastics riddling our bodies.[3] These particles are in our air, the rain, rivers, and streams, and are accumulating in the oceans.

Ocean plastic waste was, not too long ago, a major topic of discussion as the problem keeps getting worse with no clear end in sight. Perhaps we have given up talking about it more openly because we don't know how to get a handle on the problem.

The UN Environment Program (UNEP) estimates that at least 19 million metric tons of plastic waste is leaked into the environment every year.[4] The ultimate destination of this pollution is the sea. UNEP also strongly suspects that expanding plastic recycling initiatives won't even put a dent in this problem given the scale of it. The problem is rooted in an expanding economic system where we are seeing a rising demand for plastic products in fast-growing economies in regions such as Southeast Asia. "We will not recycle our way out of the plastic pollution crisis," UNEP director Inger Anderson says. "We need a systemic transformation to achieve the transition to a circular economy."

In the Pacific Ocean between California and Hawaii, you will find the Great Pacific Garbage Patch, the world's largest floating accumulation of ocean plastic waste. Spread out over 620,000 square miles, it is approximately the size of Alaska and more than twice the size of Texas. Researchers found that this massive plastic trash patch is rapidly accumulating given there is no sign of the world's voracious demand for plastic ebbing anytime soon. Microplastics make up 94% of the plastic waste found in the Great Pacific Garbage Patch, though these trillions of pieces only constitute about 8% of the total mass of this garbage patch.[6]

The circular economy Anderson is pointing to imagines a world where all waste stemming from economic activity is captured and recycled in a closed-loop system. She sees the "circular economy revolution" as the only possible solution because there is simply no other way to tackle this crisis now disrupting our food systems, fisheries, and public health other than to massively reduce demand for plastic. That won't happen until we start to see real population declines taking hold, especially in East and Southeast Asia, and even then, it will take time to truly put a dent in overconsumption and mass waste generation.

More scientists are starting to form a general consensus that population directly relates to the ocean plastic crisis and that this mounting environmental crisis won't truly get better until we see weaker population growth or major changes in human behavior and plastic consumption.

THE BIODIVERSITY CRISIS

Government signatories to the UN Convention on Biological Diversity have committed to protecting 30% of the world's surface area by 2030. They did this because an expanding and encroaching human population is crowding out wild species, creating a severe extinction crisis that the US Endangered Species Act and other environmental laws are incapable of halting and reversing.

The problem is significant. It's not just that we are losing species. The world's wildlife population is far lower today than at any other time in human history.

According to the World Wildlife Fund (WWF), average wildlife population sizes have plummeted 73% since the 1970s when the ESA was passed and inspired a wave of eco-protecting legislation. Some areas are worse off than others. WWF believes animal population sizes are down by 95% in Latin America and the Caribbean region and 76% lower in Africa. Freshwater species population sizes are down a staggering 85% globally. "This is based on almost 35,000 population trends across 5,495 species of amphibians, birds, fish, mammals, and reptiles," WWF says.[7]

WWF believes better conservation initiatives are badly needed to halt the accelerating decline in global biodiversity. But this alone is not enough to reverse the damage, the organization admits. "Working with rather than against nature can be a way to address other important issues for society," WWF researchers say.[8]

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) agrees that the global biodiversity crisis is quite serious and getting worse. That group ties the problem more directly to global human overpopulation, noting how land use changes stemming from expanding agriculture and urban settlements are destroying wildlife habitat and pushing species to the brink. "This expansion, alongside a doubling of urban area since 1992 and an unprecedented expansion of infrastructure linked to growing population and consumption, has come mostly at the expense of forests (largely old-growth tropical forests), wetlands, and grasslands," says IPBES in a recent report that group published on the biodiversity crisis.[9]

Noting how the world's population has more than doubled in just 50 years, IPBES assesses that there is simply no way to get a handle on the biodiversity crisis without tackling human population growth. "The negative trends in biodiversity and ecosystem functions are projected to continue or worsen in many future scenarios in response to indirect drivers such as rapid human population growth, unsustainable production and consumption and associated technological development."[10]

IT'S GETTING HOT IN HERE

Climate change – it's real and it's getting worse – despite the current US government position on this topic.

Carbon dioxide concentrations are now at approximately 431 parts per million according to the National Oceanic and Atmospheric Administration (NOAA). It was about 280 ppm prior to 1750. Methane concentrations are now closing in at 1,950 parts per billion compared to just 700 ppb before the Industrial Revolution. Nitrous oxide concentration levels are around 337 ppb compared to a preindustrial level of approximately 270 ppb.[11] With a rising population comes rising greenhouse gas emissions and the effect they will have on the planet's climate and weather systems.

The International Energy Agency (IEA) says that the annual growth of CO_2 emissions can be tied to "rising energy demand associated with rapid economic and population growth."[12]

There is some light on the horizon. IEA and others are predicting that China's energy demand and fossil fuel consumption could peak in the next couple of years if not sooner. This is because China's population is now declining, and this should bring lower overall energy demand to the world's largest source of greenhouse gas pollution. China's economy is also maturing, becoming less manufacturing heavy and more services oriented. But even if China's greenhouse gas emissions peak and then decline along with trends in its energy consumption, the world as a whole is likely to witness ever-increasing emissions given industrialization trends in major developing economies such as India, Indonesia, Vietnam, and the Philippines, to name a few.

Annual emissions levels can't just peak – they must fall lower, as close to pre-industrial levels as possible. This is a tall order. Our global economy is utterly dependent on the processing and burning of fossil fuels for energy, transportation, and industrial uses – the recent crisis at the Strait of Hormuz demonstrates this most definitively. Thus, it is very bad news that global efforts to tackle industrial emissions of greenhouse gases are waning as the problem gets worse every year.

Global warming negotiations are ongoing under the United Nations Framework Convention on Climate Change, but progress is in fits and starts, too often best characterized as one step forward, two steps back. As flawed and limited as it is, the Paris Agreement at least compelled governments to keep climate change mitigation high on their agendas. The US government's withdrawal from the agreement is a major setback, one that gives cover for other nations interested in shirking their responsibilities to lighten the burden on the atmosphere.

About the only positive trend with regards to climate change is the fact that falling birth rates and population declines in some major economies (Italy, Spain, China, Japan, South Korea, and others) has definitely contributed to a slower increase in greenhouse gas emissions, and may one day help lower global annual emissions levels if these

population declines are sustained and spread elsewhere. It's a foggy picture, though, because as advanced nations are declining in population, many developing nations' populations continue to expand. Meanwhile, development begets greater wealth and higher national energy consumption, and as long as this energy demand is met with fossil fuels, emissions increases in some regions will offset peaks or declines in others.

Yes, global warming is real. Climate change continues and is poised to get worse as the effects of higher greenhouse gas concentrations in the atmosphere mount. Population and demographic change are key to the world's climate future – falling populations in major economies should see emissions levels peaking and perhaps eventually declining, but rising energy demand from the industrialization of other economies threatens to offset this beneficial trend entirely.

Meanwhile, the situation is quite literally heating up. Researchers at the University of Sydney and Arizona State University recently catalogued the human toll record heat waves took in 2023 and 2024. The compiled data is sobering: 1,300 heat-related deaths in Mecca, Saudi Arabia during the 2024 Hajj; more than 2,300 heat-stress deaths in the United States in 2023; and nearly 1,500 heat-related fatalities in Southeast Asia during April 2024. Stories of people being burned by doorknobs in the Middle East during intense heat episodes are becoming common. Here in the US, we've seen roads buckling and asphalt partially melting due to extreme heat. This is a problem we cannot afford to ignore, one exacerbated by high population numbers and high energy demand.

PLENTY OF FISH IN THE SEA?

Some argue that the United States has one of the best-regulated ocean fisheries in the world. Activity and catches are managed to ensure steady production year-over-year. Sound management is seen as why the US avoided the type of catastrophe that hit Newfoundland in the wake of the collapse of eastern Canada's cod fishery.

I would argue that the image of sound US fisheries management is mainly an illusion. On the East Coast, wild catch fisheries are heavily focused on lobster, crab, and other shellfish. These species are in abundance because populations of their natural predators are way down thanks to overfishing in the past. To put it simply, decades of overfishing off the US East Coast took out all of the fatty, meaty species of fish and left the bugs behind. Unfortunately, protein-rich shellfish aren't as nutritious as oily fish.

Scientists call this shift a "trophic cascade" meaning depleting fish populations higher up the food chain leaves room for lower-order species to survive and thrive, leading to a population explosion of these lower food chain species. New England is famous for lobster only because the fishermen there took out all the other choice fish species from the ocean, leaving only the lobster behind. Luckily, consumers are fond of lobster, and the fishermen were brought under control to make sure they don't destroy this resource as well.

The US human population continued to rise as the eastern fisheries were forced to shift to shellfish in the 1950s and 60s. Overfishing decimated populations of flounder and haddock, for instance. Alaskan fisheries took up some of the slack, and one could credibly argue that fisheries in Alaska are better managed and largely sustainable given they had a chance to learn from mistakes made in the Lower 48 states.

Globally, the situation is dire.

The UN Food and Agriculture Organization (FAO) undertook a comprehensive assessment of 2,570 world commercial fish stocks and found that 35.5% of them are overfished. The problem is the worst in the southeastern Pacific region, FAO says, where "fisheries are central to food security and nutrition, employment, and poverty reduction, particularly through small-scale and artisanal operations."[13] Things are improving due to tighter management, and pressure on wild fish stocks has eased as aquaculture expanded to meet global fish protein demand. But FAO now warns that fishing fleets are going deeper and are starting to stress populations of deep-sea species. "Deep-sea species remain vulnerable, with only 29 percent of stocks sustainably fished," FAO warns. Its report also warns that massive harm is being inflicted on the world's shark species.[14]

US population growth directly contributed to the decline of the US Atlantic fisheries. We may not have seen a Canada-like dramatic cod fishery collapse, but the US cod fishery steadily dwindled until it was no

longer commercially viable. Ditto for haddock and flounder, paving the way for the dominance of lobster fishing as the bugs of the ocean grew in population and size thanks to the absence of their natural predators. Worldwide, fisheries were in bad shape as fish consumption rose with rising human populations. Things have stabilized somewhat as governments are cracking down, but still more than 35% of the world's fisheries are overfished while deep-sea fish stocks are now under threat, and those species are more vulnerable to depletion, like the orange roughy, widely considered to be one of the most seriously threatened and overfished deep-sea species in the world.

Much of this fish protein is heavily consumed in East Asia. With East Asia's population peaking and declining, might we see improvement in this global environmental problem? One can certainly hope. Meanwhile, the situation with US fish stocks could grow worse with a rising US population, though US consumption of fish products per capita isn't as high as in other jurisdictions.

WATER, WATER, EVERYWHERE, BUT…

Earlier this year, the United Nations University issued a comprehensive report warning that the world was facing a growing global water crisis, or "global water bankruptcy" as the researchers there called it.

The report warns that underground aquifers are being depleted faster than they can recharge. The study further warns that surface sources of fresh water appear to be shrinking, with evidence of this contraction evident in satellite photography. The real disturbing message is the rapid depletion of global groundwater supplies, critical to both urban water systems and especially to agriculture.[15]

There is an ongoing drought hitting the western United States. If it persists then there are credible fears that the Colorado River could effectively dry up, threatening water supplies for millions of urban residents in Nevada, Arizona, and California who rely on this crucial resource. Agriculture will be hard hit, as well. The river is drying because of climate change – shorter winters in the Colorado Rocky Mountains means less snowpack, thus less meltwater feeding the river system downstream. We also take too much water out of this system to keep otherwise unviable desert cities surviving and thriving – Las Vegas and Phoenix simply could not exist without this resource. With a drying Colorado River, the future survival of these cities is very much in doubt.

The drought is even threatening electricity supplies in the US West.

Dustin Bleizeffer of WyoFile recently reported that water levels at the Lake Powell reservoir on the Arizona-Utah border could drop so low that it would force the Glenn Canyon Dam hydroelectric power plant to shut down as there won't be enough water to keep the turbines spinning. The crisis has become so acute that the state and federal government agencies charged with monitoring the Colorado River and the water supplies tied to it are said to be unsure of just how bad things are or how bad they will get.[16] This summer, there is speculation that the average water volume distributed to Lake Powell from the Colorado River will be a fifth or less of what has been delivered in the past.

As winter ends and the Rockies warm up, the snow that is in those mountains will melt and feed the system, but it won't be enough. The soil is dry and the snowpack is at record lows. There is already talk of severe summer rationing ahead in western cities that depend on the Colorado River. Tourism to both regional parks and urban centers like Las Vegas could take a severe blow this year as the extent of the crisis becomes clearer in press reports, prompting would-be visitors to find other destinations to spend their time and money on.

Meanwhile, Midwest farmers continue to dramatically deplete the Ogallala Aquifer, the nation's largest underground water reservoir and the foundation of agriculture in the region. The situation is somewhat improving here – steps are being taken to ensure farmers reduce their water consumption without lowering their farms' yields. Still, the Ogallala's issues have been mounting for decades and are only getting worse with more severe droughts. A permanent fix has yet to be discovered.

It's much the same picture overseas, says United Nations University.

"Droughts, shortages, and pollution episodes that once looked like temporary shocks are becoming chronic in many places," the new report warns. UNU researchers point to disturbing signs of rapidly

depleting aquifers and other critical groundwater resources, drying surface waters, draining wetlands, and declining glaciers and mountain snowpacks. In other words, what we are seeing in the US is happening pretty much everywhere.

"A growing number of major rivers now fail to reach the sea or fall below environmental flow needs for significant parts of the year," the report says. "More than half of the world's large lakes have lost water since the early 1990s, affecting around one-quarter of the global population that depends directly on them for water security."[17]

Booming populations have taxed groundwater and surface water to their limits. Now, the world's climate is no longer cooperating or helping us keep ahead of overuse. Depletion is now exceeding replenishment, threatening the populations that created the problem in the first place – major cities and sprawling agriculture have diminished these water resources, and these desert urban oases are now poised to become victims of this profligacy.

Cities and farms may adjust and get through this latest crisis, but will that still hold true when future drought crises emerge?

Massively engineering the flow of the Colorado River made life in much of the Southwest possible, with past generations betting on the Rocky Mountain snows continuing to fall indefinitely and keeping the river well-supplied with fresh water. That assumption doesn't seem like such a sure thing anymore.

WHERE DO WE GO FROM HERE?

The United States is a pioneer of the global environmental movement. The evidence is clear. I've personally researched the global impact of the US Endangered Species Act. I have yet to qualify or quantify the influence of the Clean Air Act, Clean Water Act, or CERCLA, but I would not be surprised to discover similar effects as seen with the ESA.

The modern era is different. National and global environmental problems are mounting, and not only is the US not even attempting to legislate fixes, it's moving in the opposite direction.

Climate change is poised to hit the Colorado River and US Southwest with a vengeance. The government's response is to deny the very laws of physics underpinning global warming. Species loss is as bad as ever; the federal government responded by exempting offshore drillers from the Endangered Species Act. Superfund remediation has stalled, if it even exists at all. Emissions are largely unrestricted. I'm not sure what the current US federal government has planned for the Clean Water Act, but with the policy shifts elsewhere, it certainly won't be good.

One thing is for certain: we will not solve America's and the world's most pressing environmental problems by adding millions of more people to the picture. We know habitat loss from urbanization and agriculture is the force behind the global extinction crisis and a reason why endangered species rehabilitation has stalled in the US. We know a massive global population and its insatiable demand for fossil fuel energy is driving climate change. Maybe we'll resolve the problem in the future despite the huge global population, but certainly not because of it, and an expanding population pushes the goal further out. Global fisheries management is looking better, but disaster was averted largely thanks to aquaculture. More people and more demand for fish protein threatens a huge setback. Meanwhile, freshwater depletion is getting worse and won't be amended anytime soon so long as cities in dry sunbelt destinations keep growing, or as food production in semi-arid zones keeps expanding to meet global food demand.

It's true that, for many decades, the United States made great strides in environmental improvements despite an expanding human population. This is thanks to sound and thoughtful eco-legislation passed in bi-partisan spirit. And for the most part, the world through the United Nations system has kept the pace and passed truly groundbreaking environmental treaties that have led to genuine improvements, CITES being perhaps the best example.

But nothing lasts forever. Something works until it doesn't work anymore.

Our current situation is truly precarious. Our bodies and our oceans are filling with plastic waste. Our global fisheries are on a knife's edge. Mountain snowpack is receding and critical river systems are drying up. Groundwater is being used up faster than it can be recharged. Too many amazing animal and even plant species are at the cusp of extinction, potentially leaving our world forever.

All of this is happening mainly because there are too many people on the planet. Maybe we can make some adjustments to improve these dire environmental problems, but any success here would be in spite of a rising human population and demand for plastic, water, food, and fossil energy, certainly not because of it.

At the same time, a peaking, stalling, and falling human population would help policymakers and the public address these problems with a little more ease than may otherwise be the case.

The massive human population is part of the problem. Without it, there would be no massive Pacific Ocean garbage patch, global warming, dwindling deep-sea fish stocks, and accelerating extinctions.

Perhaps a new 70s and 80s-style environmental movement is just around the corner. I would certainly welcome one. Meanwhile, we must address the elephant in the room and at least be cognizant of the impact that our numbers are having on the planet, its natural resources, and on the other members of the animal kingdom that we share this world with. At the very least, we shouldn't pretend that these issues don't exist and that they aren't relevant to us today and to future generations. I, for one, do not want to pass on to today's children a world that's far hotter, drier, less hospitable, and with fewer amazing animals to marvel at, ideally not only in zoos.

NOTES:

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