# \*\*\*Warming/Climate Change\*\*\*

### No warming

#### Recent temperatures show no increase in warming

**Happer 12**

(William is a professor of physics at Princeton. “Global Warming Models Are Wrong Again”, Wall Street Journal, 3/27/12, <http://online.wsj.com/article/SB10001424052702304636404577291352882984274.html>)

What is happening to global temperatures in reality? The answer is: almost nothing for more than 10 years. Monthly values of the global temperature anomaly of the lower atmosphere, compiled at the University of Alabama from NASA satellite data, can be found at the website http://www.drroyspencer.com/latest-global-temperatures/. The latest (February 2012) monthly global temperature anomaly for the lower atmosphere was minus 0.12 degrees Celsius, slightly less than the average since the satellite record of temperatures began in 1979

#### Temperatures this decade seem to have balanced out; Earth’s climate is not continuing to change.

Michael **Totty,** 20**09** news editor in the WSJ's San Francisco bureau. reporter, editor and podcaster (<http://online.wsj.com/article/SB10001424052748703819904574551303527570212>.html) Wall Street Journal, “What Global Warming?”, December 6, 2009)

But this isn't evidence of a cooling planet. Partly, it's a result of picking an exceptionally hot year—1998—as a starting point. That year experienced an unusually strong El Niño, a natural and periodic warming of the Pacific Ocean that can have powerful effects on global climate. The long-term trend since the mid-1970s shows warming per decade of about 0.18 degree Celsius (about 0.32 degree Fahrenheit). That temperatures this decade have hardly increased demonstrates how natural year-to-year variations in climate can either add to or subtract from the long-term warming trend caused by the increase in greenhouse gases in the atmosphere. The '00s still have been exceptionally warm: The 12 years from 1997 through 2008 were among the 15 warmest on record, and the decade itself was hotter than any previous 10-year period. While 2008 was the coolest year since 2000—a result of the cooling counterpart of El Niño—it was still the 11th-warmest year on record. And 2009 is on track to be among the five warmest.

#### Warming slowing down; aerosols

#### Biello 11 (David Biello- award-winning online associate editor for environment and energy for Scientific American- Stratospheric Pollution Helps Slow Global Warming-July 11 2011- <http://www.scientificamerican.com/article.cfm?id=stratospheric-pollution-helps-slow-global-warming>)

Now, research suggests that for the past decade, such stratospheric aerosols—injected into the atmosphere by either recent volcanic eruptions or human activities such as coal burning—are slowing down [global warming](http://www.scientificamerican.com/topic.cfm?id=global-warming-and-climate-change). "Aerosols acted to keep warming from being as big as it would have been," says atmospheric scientist John Daniel of the National Oceanic and Atmospheric Administration's (NOAA) Earth System Research Laboratory, who helped lead the [research published online in *Science*](http://www.sciencemag.org/content/early/2011/07/20/science.1206027.abstract) on July 21. "It's still warming, it's just not warming as much as it would have been." Essentially, sulfur dioxide gets emitted near the surface, either by a coal-fired power plant's smokestack or a volcano. If that SO2 makes it to the stratosphere—the middle layer of the atmosphere 10 kilometers up—it forms droplets of diluted sulfuric acid, known as [aerosols](http://en.wikipedia.org/wiki/Aerosol). These aerosols reflect sunlight away from the planet, shading the surface and cooling temperatures. And some can persist for a few years, prolonging that cooling. By analyzing satellite data and other measures, Daniel and his colleagues found that such aerosols have been on the rise in Earth's atmosphere in the past decade, nearly doubling in concentration. That concentration has reflected roughly 0.1 watts per meter squared of sunlight away from the planet, enough to o/ffset roughly one-third of the 0.28 watts per meter squared of extra heat trapped by [rising atmospheric concentrations of greenhouse gases](http://www.scientificamerican.com/blog/post.cfm?id=a-24-degree-c-rise-by-2020-probably-2011-01-20) such as carbon dioxide. The researchers calculate that the aerosols prevented 0.07 degrees Celsius of warming in average temperatures since 2000.

### Not anthropogenic

#### Not anthropogenic – multiple warrants

**Spencer 12** (Roy, former NASA climatologist and author, “Ten Years After the Warming,” 2/26, http://www.drroyspencer.com/2012/02/)

As can be seen, in the last 10 years the estimated forcing has been the strongest. Yet, most if not all temperature datasets show little or no global-average warming recently, either in the atmosphere, at the surface, or in the upper 700 meters of the ocean. For example, here are the tropospheric temperatures up though a few days ago: So what is happening? You cannot simply say a lack of warming in 10 years is not that unusual, and that there have been previous 10-year periods without warming, too. No, we are supposedly in uncharted territory with a maximum in radiative forcing of the climate system. One cannot compare on an equal basis the last 10 years with any previous decades without warming. There are 5 possibilities for the recent cessation of warming which are most discussed: 1) cooling from anthropogenic aerosols has been cancelling out warming from more greenhouse gases 2) natural cooling from internal climate fluctuations or the sun is cancelling out the GHG warming 3) increased ocean mixing is causing the extra energy to be distributed into the deep ocean 4) the temperature ’sensitivity’ of the climate system is not as large as the IPCC assumes. 5) there is something fundamentally wrong with the GHG warming theory itself Of course, some combination of the above 5 explanations is also possible. The 1st possibility (aerosol cooling is cancelling out GHG forcing) is one of the more popular explanations with the climate modelers, and especially with NASA’s James Hansen. The uncertain strength (and even sign) of aerosol forcing allows the climate modelers to use aerosols as a tuning knob (aka fudge factor) in making their models produce warming more-or-less consistent with past observations. Using an assumed large aerosol cooling to cancel out the GHG warming allows the modelers to retain high climate sensitivity, and thus the fear of strong future warming if those aerosols ever dissipate. The 2nd possibility (natural cooling) is a much less desirable explanation for the IPCC crowd because it opens the door to Mother Nature having as much or more influence on the climate system than do humans. We can’t have that, you know. Then you would have to consider the possibility that most of the warming in the last 50 years was natural, too. Goodbye, AGW funding. The 3rd possibility (increased ocean mixing) is one of the more legitimate possibilities, at least theoretically. It’s popular with NCAR’s Kevin Trenberth. But one would need more observational evidence this is happening before embracing the idea. Unfortunately, how vertical mixing in the ocean naturally varies over time is poorly understood; the different IPCC models have widely varying strengths of mixing, and so ocean mixing is a huge wild card in the global warming debate, as is aerosol cooling. I believe much of past climate change on time scales of decades to many centuries might be due to such variations in ocean mixing, along with their likely influence on global cloud cover changing the amount of solar input into the climate system. The 4th possibility (the climate system is relatively insensitive to forcing) is the top contender in the opinion of myself, Dick Lindzen, and a few other climate researchers who work in this field. The 5th possibility (increasing GHGs don’t really cause warming) is total anathema to the IPCC. Without GHG warming, the whole AGW movement collapses. This kind of scientific finding would normally be Nobel Prize territory…except that the Nobel Prize has become more of a socio-political award in recent years, with only politically correct recipients. The self-flagellating elites don’t like the idea humans might not be destroying the Earth. The longer we go without significant warming, the more obvious it will become that there is something seriously wrong with current AGW theory. I don’t think there is a certain number of years – 5, 10, 20, etc. – which will disprove the science of AGW….unless the climate system cools for the next 10 years. Eek! But I personally doubt that will happen.

#### Warming linked to PDO, empirics prove

**Spencer 8** (Roy W. Ph.D., climatologist, author, former NASA scientist, “Global Warming as a Natural Response to Cloud Changes Associated with the Pacific Decadal Oscillation (PDO)”, Roy W. Spencer, 10/20/08, <http://www.drroyspencer.com/research-articles/global-warming-as-a-natural-response/>)

Here I present new evidence that most of the warming could be the result of a natural cycle in cloud cover forced by a well-known mode of natural climate variability: the Pacific Decadal Oscillation (PDO). While the PDO is primarily a geographic rearrangement in atmospheric and oceanic circulation patterns in the North Pacific, it is well known that such regional changes can also influence weather patterns over much larger areas, for instance North America or the entire Northern Hemisphere (which is, by the way, the region over which the vast majority of global warming has occurred).

The IPCC has simply ASSUMED that these natural fluctuations in weather patterns do not cause climate change. But all it would take is a small change in global average (or Northern Hemispheric average) cloudiness to cause global warming. Unfortunately, our global observations of cloudiness have not been complete or accurate enough to document such a change…until recently.

2. A SIMPLE MODEL OF NATURAL GLOBAL WARMING

As Joe D’Aleo, Don Easterbrook, and others have pointed out for years, the Pacific Decadal Oscillation (PDO) has experienced phase shifts that have coincidently been associated with the major periods of warming and cooling in the 20th Century. As can be seen in the following figure, the pre-1940 warming coincided with the positive phase of the PDO; then, a slight cooling until the late 1970s coincided with a negative phase of the PDO; and finally, the warming since the 1970s has once again coincided with the positive phase of the PDO.

#### Warming evidence skewed

**Evans 12**

(David has a PhD in electrical engineering, worked from 1999 to 2006 for the Australian Greenhouse Office, an agency of the Australian government, designing a carbon accounting system- Financial Post, "Global Warming Theory Is Based on False Science.", 7 Apr. 2011.)

There are now several independent pieces of evidence showing that the earth responds to the warming due to extra carbon dioxide by dampening the warming. Every long-lived natural system behaves this way, counteracting any disturbance. Otherwise the system would be unstable. The climate system is no exception, and now we can prove it. But the alarmists say the exact opposite, that the climate system amplifies any warming due to extra carbon dioxide, and is potentially unstable. It is no surprise that their predictions of planetary temperature made in 1988 to the U.S. Congress, and again in 1990, 1995, and 2001, have all proved much higher than reality. They keep lowering the temperature increases they expect, from 0.30C per decade in 1990, to 0.20C per decade in 2001, and now 0.15C per decade—yet they have the gall to tell us "it's worse than expected." These people are not scientists. They overestimate the temperature increases due to carbon dioxide, selectively deny evidence, and now they conceal the truth. One way they conceal is in the way they measure temperature. The official thermometers are often located in the warm exhaust of air conditioning outlets, over hot tarmac at airports where they get blasts of hot air from jet engines, at waste-water plants where they get warmth from decomposing sewage, or in hot cities choked with cars and buildings. Global warming is measured in 10ths of a degree, so any extra heating nudge is important. In the United States, nearly 90% of official thermometers surveyed by volunteers violate official siting requirements that they not be too close to an artificial heating source. Global temperature is also measured by satellites, which measure nearly the whole planet 24/7 without bias. The satellites say the hottest recent year was 1998, and that since 2001 the global temperature has levelled off. Why does official science track only the surface thermometer results and not mention the satellite results?

#### Global Warming is not manmade – it’s a cycle.

**Singer and Avery 07** (S. Fred Singer, Distinguished Research Professor at George Mason, and Dennis T. Avery, Director of the Center for Global Food Issues at the Hudson Institute, 2007 “Unstoppable Global Warming: Every 1,500 Years”, p. 34)

The key thing for us all to remember is that the 1,500-year climate cycle is not an unproven theory like the model-based predictions for the Greenhouse Theory. The 1,500-year climate cycle is real, based on a wide variety of physical evidence from around the globe. The ice cores were cut from real-world ice sheets built up into layers over thousands of years. The satellites actually measured the sun's varying rays. The mass spectrometers actually counted the isotopes from the cores that confirmed the pattern of solar variation. The sunspot counts of the last four hundred years are handwritten on the yellowed pages of the observers' diaries. The Armagh Observatory's solar record has been carefully kept daily for more than two hundred years. The flares on the sun are recorded on film. The tree rings are there to be counted and recounted. The sediment cores are in storage, awaiting further research. The heavy-oxygen isotopes are demonstrably different from the lighter ones. The midges whose heads are found in the sediments actually lived. The pollen grains fell from plants, recently or long ago, but the plants were alive. The stalagmites patiently built up over thousands of years. There's no 1,470-year solar cycle. However, the Holger Braun computer model run found that the sun's well-known 87-year and 210-year cycles, when superimposed, could create the longer 1,470-year cycle. None of this climate cycle evidence is as likely to mislead as the unverified computer models that have received so much funding and media attention during the "greenhouse years." Dansgaard, Lassen, and Bond all argue that the force behind the cycles is solar. Berger and von Rad argue that "internal oscillations of the climate system cannot produce" the quick-changing 1,500-year cycles. Jan Veizer and Nir Shaviv agree that the forcing producing the 1,500-year cycle is extraterrestrial, but add in the Milky Way and other galactic sources of cosmic rays. The more we learn about the 1,500-year cycle, the less likely it seems that the recent warming is man-made-or dangerous.

#### Warming not anthropogenic, two reasons

#### Lupo 10

(Anthony Lupo is science at the University of Missouri at Columbia and served as an expert reviewer for the UN’s Intergovernmental Panel on Climate Change- Global Warming Is Natural, Not Man-Made- February 22, 2012- <http://www.napsnet.com/pdf_archive/34/50144.pdf>)

Thus, any impartial jury should not come back with a guilty verdict convicting humanity of forcing recent climatological changes. Even the most ardent supporters of global warming will not argue this point. Instead, they argue that humans are only partially responsible for the observed climate change. If one takes a hard look at the science involved, their assertions appear to be groundless. First, carbon dioxide is not a pollutant as many claim. Carbon dioxide is good for plant life and is a natural constituent of the atmosphere. During Earth’s long history there has been more and less carbon dioxide in the atmosphere than we see today. Second, they claim that climate is stable and slow to change, and we are accelerating climate change beyond natural variability. That is also not true. Climate change is generally a regional phenomenon and not a global one. Regionally, climate has been shown to change rapidly in the past and will continue to do so in the future. Life on earth will adapt as it has always done. Life on earth has been shown to thrive when planetary temperatures are warmer as opposed to colder.

#### Warming not anthropogenic, based on Earth’s natural cycles

#### De Blij 9 (Harm, John A. Hannah Professor of Geography at Michigan State University, is author of The Power of Place: Geography, Destiny, and Globalization (Oxford University Press, 2009).

So might the greenhouse-effect-enhancing gases we are pouring into the atmosphere counter a cooling trend rather than exacerbate a warming swing? No doubt about it: the numerous cycles – axial, solar, orbital, oceanic, atmospheric – that generate nature’s environmental seesaws continue even as humanity has become a major factor in the process through massive modification of the planetary atmosphere. But supercomputer models and IPCC projections notwithstanding, no one knows the proportional contribution to the current phase of climate change from natural and human sources. Contrary to what some scientists are asserting, we do not know with any satisfactory level of confidence what form climate change would be taking today in the absence of human interference. What *is* clear is that humans have become an additional factor driving climate change, and that reducing the rate of pollution of the atmosphere should have priority as a public health as well as environmental matter. But don’t expect a reward in the form of “stopping climate change.” Ice ages will continue to come and go. Glaciers will wax and wane. Sea levels will fall and rise. Species, cultures, and civilizations will flourish and fail. Nature’s power will prevail.

### Warming inevitable

#### Most impacts inevitable

-Ice sheets, oceans, rainforest destruction

**Chestney 12** (Nina, writer for Reuters, “Global warming close to becoming irreversible: scientists,” 3/27 http://www.reuters.com/article/2012/03/27/us-climate-thresholds-idUSBRE82Q18720120327)

TIPPING POINTS

For ice sheets - huge refrigerators that slow down the warming of the planet - the tipping point has probably already been passed, Steffen said. The West Antarctic ice sheet has shrunk over the last decade and the Greenland ice sheet has lost around 200 cubic km (48 cubic miles) a year since the 1990s. Most climate estimates agree the Amazon rainforest will get drier as the planet warms. Mass tree deaths caused by drought have raised fears it is on the verge of a tipping point, when it will stop absorbing emissions and add to them instead. Around 1.6 billion tonnes of carbon were lost in 2005 from the rainforest and 2.2 billion tonnes in 2010, which has undone about 10 years of carbon sink activity, Steffen said. One of the most worrying and unknown thresholds is the Siberian permafrost, which stores frozen carbon in the soil away from the atmosphere. "There is about 1,600 billion tonnes of carbon there - about twice the amount in the atmosphere today - and the northern high latitudes are experiencing the most severe temperature change of any part of the planet," he said. In a worst case scenario, 30 to 63 billion tonnes of carbon a year could be released by 2040, rising to 232 to 380 billion tonnes by 2100. This compares to around 10 billion tonnes of carbon released by fossil fuel use each year. Increased CO2 in the atmosphere has also turned oceans more acidic as they absorb it. In the past 200 years, ocean acidification has happened at a speed not seen for around 60 million years, said Carol Turley at Plymouth Marine Laboratory. This threatens coral reef development and could lead to the extinction of some species within decades, as well as to an increase in the number of predators.

#### 3 degree shift inevitable

**AFP 12** (Agence France Presse, “Shadow of 'Anthropocene' falls over Rio Summit,” 3/26 http://www.france24.com/en/20120326-shadow-anthropocene-falls-over-rio-summit)

The UN's goal of limiting global warming to two degrees Celsius (3.6 degrees Fahrenheit) is already out of reach, said Bob Watson, former head of the UN's climate panel and chief advisor to Britain's environment ministry, as he presented the laureates' study. "If you look at the commitments today from governments around the world, we've only got a 50-50 shot at a 3 C (5.4 F) world, almost no chance of a 2 C (3.6 F) world, and to be quite honest I would say it's not unlikely that we will hit a 5 C (9.0 F) world," said Watson. "That is clearly a world with significant adverse consequences for ecological systems, for socio-economic systems and for human health." He added: "We have to realise that we are looking at a loss of biodiversity that is unprecedented in the last 65 million years... We are clearly entering the (planet's) sixth mass extinction."

#### Too late

**Metro 7** (Metro Magazine, “Global warming ‘irreversible'?” http://www.metro.co.uk/news/69537-global-warming-irreversible)

Climate change may have already passed the point of no return – despite earlier predictions to the contrary, an expert claimed. A UN climate change report out next month will show that greenhouse gases have reached dangerous levels, with emissions more likely to cause irreversible climate change, scientist Dr Tim Flannery warned. Greenhouse gas in the atmosphere reached 455 parts per million of carbon dioxide in 2005, the report by the Intergovernmental Panel on Climate Change will show. It had not been expected to reach this level for a decade. Dr Flannery, of Macquarie University in Australia, said this was 'beyond the worst-case scenario' originally envisaged in 2001 when the last major climate change report came out. He said: 'What the report establishes is that the amount of greenhouse gas in the atmosphere is already above the threshold that could potentially cause dangerous climate change.'

#### CO2 sticks around for a thousand years – its irreversible

**ENS 9** (Environmental News Service, “Global Warming 'Irreversible' For 1,000 Years,” http://www.ens-newswire.com/ens/jan2009/2009-01-27-01.html)

The climate change that takes place due to increases in carbon dioxide is "irreversible" and will have major consequences for agriculture, ecosystems, and coastal environments, finds a new scientific study published in the Proceedings of the National Academy of Sciences today. The pioneering study was conducted by an international team led by senior scientist Dr. Susan Solomon of the National Oceanic and Atmospheric Administration's Earth System Research Laboratory in Boulder. It shows how changes in surface temperature, rainfall, and sea level are irreversible for more than 1,000 years after carbon dioxide emissions are completely stopped. "People have imagined that if we stopped emitting carbon dioxide the climate would go back to normal in 100 years, 200 years. That's not true," said Solomon in a teleconference with reporters. "In the long run," said Solomon, "both carbon dioxide loss and heat transfer depend on the same physics of deep-ocean mixing. The two work against each other to keep temperatures almost constant for more than a thousand years, and that makes carbon dioxide unique among the major climate gases."

#### Global warming is irreversible; there is too much CO2 in the air.

McCarthy, 2006, Michael McCarthy, environment editor of The Independant, “Global Warming Passing the Tipping Point”, <http://www.independent.co.uk/environment/global-warming-passing-the-tipping-point-466187.html>

A crucial global warming "tipping point" for the Earth, highlighted only last week by the British Government, has already been passed, with devastating consequences. Research commissioned by The Independent reveals that the accumulation of greenhouse gases in the atmosphere has now crossed a threshold, set down by scientists from around the world at a conference in Britain last year, beyond which really dangerous climate change is likely to be unstoppable. The implication is that some of global warming's worst predicted effects, from destruction of ecosystems to increased hunger and water shortages for billions of people, cannot now be avoided, whatever we do. It gives considerable force to the contention by the green guru Professor James Lovelock, put forward last month in The Independent, that climate change is now past the point of no return. The danger point we are now firmly on course for is a rise in global mean temperatures to 2 degrees above the level before the Industrial Revolution in the late 18th century. At the moment, global mean temperatures have risen to about 0.6 degrees above the pre-industrial era - and worrying signs of climate change, such as the rapid melting of the Arctic ice in summer, are already increasingly evident. But a rise to 2 degrees would be far more serious. By that point it is likely that the Greenland ice sheet will already have begun irreversible melting, threatening the world with a sea-level rise of several metres. Agricultural yields will have started to fall, not only in Africa but also in Europe, the US and Russia, putting up to 200 million more people at risk from hunger, and up to 2.8 billion additional people at risk of water shortages for both drinking and irrigation. The Government's conference on Avoiding Dangerous Climate Change, held at the UK Met Office in Exeter a year ago, highlighted a clear threshold in the accumulation of greenhouse gases such as carbon dioxide (CO2) in the atmosphere, which should not be surpassed if the 2 degree point was to be avoided with "relatively high certainty". This was for the concentration of CO2 and other gases such as methane and nitrous oxide, taken together in their global warming effect, to stay below 400ppm (parts per million) in CO2 terms - or in the jargon, the "equivalent concentration" of CO2 should remain below that level. The warning was highlighted in the official report of the Exeter conference, published last week. However, an investigation by The Independent has established that the CO2 equivalent concentration, largely unnoticed by the scientific and political communities, has now risen beyond this threshold. This number is not a familiar one even among climate researchers, and is not readily available. For example, when we put the question to a very senior climate scientist, he said: "I would think it's definitely over 400 - probably about 420." So we asked one of the world's leading experts on the effects of greenhouse gases on climate, Professor Keith Shine, head of the meteorology department at the University of Reading, to calculate it precisely. Using the latest available figures (for 2004), his calculations show the equivalent concentration of C02, taking in the effects of methane and nitrous oxide at 2004 levels, is now 425ppm. This is made up of CO2 itself, at 379ppm; the global warming effect of the methane in the atmosphere, equivalent to another 40ppm of CO2; and the effect of nitrous oxide, equivalent to another 6ppm of CO2. The tipping point warned about last week by the Government is already behind us. "The passing of this threshold is of the most enormous significance," said Tom Burke, a former government adviser on the green issues, now visiting professor at Imperial College London. "It means we have actually entered a new era - the era of dangerous climate change. We have passed the point where we can be confident of staying below the 2 degree rise set as the threshold for danger. What this tells us is that we have already reached the point where our children can no longer count on a safe climate." The scientist who chaired the Exeter conference, Dennis Tirpak, head of the climate change unit of the OECD in Paris, was even more direct. He said: "This means we will hit 2 degrees [as a global mean temperature rise]." Professor Burke added: "We have very little time to act now. Governments must stop talking and start spending. We already have the technology to allow us to meet our growing need for energy while keeping a stable climate. We must deploy it now. Doing so will cost less than the Iraq war so we know we can afford it." The 400ppm threshold is based on a paper given at Exeter by Malte Meinhausen of the Swiss Federal Institute of Technology. Dr Meinhausen reviewed a dozen studies of the probability of exceeding the 2 degrees threshold at different CO2 equivalent levels. Taken together they show that only by remaining above 400 is there a very high chance of not doing so. Some scientists have been reluctant to talk about the overall global warming effect of all the greenhouses gases taken together, because there is another consideration - the fact that the "aerosol", or band of dust in the atmosphere from industrial pollution, actually reduces the warming. As Professor Shine stresses, there is enormous uncertainty about the degree to which this is happening, so making calculation of the overall warming effect problematic. However, as James Lovelock points out - and Professor Shine and other scientists accept - in the event of an industrial downturn, the aerosol could fall out of the atmosphere in a matter of weeks, and then the effect of all the greenhouse gases taken together would suddenly be fully felt.

#### Global Warming is naturally caused and not created by humans

**ScienceDaily** (June 15, 20**01**) “Global warming natural, may end within 20 years says researcher at Ohio state university.” <http://www.sciencedaily.com/releases>

/2001/06/010615071248.htm

The researcher suggests that atmospheric carbon dioxide -- often thought of as a key "greenhouse gas" -- is not the cause of global warming. The opposite is most likely to be true, according to Robert Essenhigh, E.G. Bailey Professor of Energy Conservation in Ohio State's Department of Mechanical Engineering. It is the rising global temperatures that are naturally increasing the levels of carbon dioxide, not the other way around, he says. Essenhigh explains his position in a "viewpoint" article in the current issue of the journal Chemical Innovation, published by the American Chemical Society. Many people blame global warming on carbon dioxide sent into the atmosphere from burning fossil fuels in man-made devices such as automobiles and power plants. Essenhigh believes these people fail to account for the much greater amount of carbon dioxide that enters -- and leaves -- the atmosphere as part of the natural cycle of water exchange from, and back into, the sea and vegetation. "Many scientists who have tried to mathematically determine the relationship between carbon dioxide and global temperature would appear to have vastly underestimated the significance of water in the atmosphere as a radiation-absorbing gas," Essenhigh argues. "If you ignore the water, you're going to get the wrong answer." How could so many scientists miss out on this critical bit of information, as Essenhigh believes? He said a National Academy of Sciences report on carbon dioxide levels that was published in 1977 omitted information about water as a gas and identified it only as vapor, which means condensed water or cloud, which is at a much lower concentration in the atmosphere; and most subsequent investigations into this area evidently have built upon the pattern of that report. For his hypothesis, Essenhigh examined data from various other sources, including measurements of ocean evaporation rates, man-made sources of carbon dioxide, and global temperature data for the last one million years. He cites a 1995 report from the Intergovernmental Panel on Climate Change (IPCC), a panel formed by the World Meteorological Organization and the United Nations Environment Programme in 1988 to assess the risk of human-induced climate change. In the report, the IPCC wrote that some 90 billion tons of carbon as carbon dioxide annually circulate between the earth's ocean and the atmosphere, and another 60 billion tons exchange between the vegetation and the atmosphere. Compared to man-made sources' emission of about 5 to 6 billion tons per year, the natural sources would then account for more than 95 percent of all atmospheric carbon dioxide, Essenhigh said. "At 6 billion tons, humans are then responsible for a comparatively small amount - less than 5 percent - of atmospheric carbon dioxide," he said. "And if nature is the source of the rest of the carbon dioxide, then it is difficult to see that man-made carbon dioxide can be driving the rising temperatures. In fact, I don't believe it does." Some scientists believe that the human contribution to carbon dioxide in the atmosphere, however small, is of a critical amount that could nonetheless upset Earth's environmental balance. But Essenhigh feels that, mathematically, that hypothesis hasn't been adequately substantiated. Here's how Essenhigh sees the global temperature system working: As temperatures rise, the carbon dioxide equilibrium in the water changes, and this releases more carbon dioxide into the atmosphere. According to this scenario, atmospheric carbon dioxide is then an indicator of rising temperatures -- not the driving force behind it. Essenhigh attributes the current reported rise in global temperatures to a natural cycle of warming and cooling. He examined data that Cambridge University geologists Nicholas Shackleton and Neil Opdyke reported in the journal Quaternary Research in 1973, which found that global temperatures have been oscillating steadily, with an average rising gradually, over the last one million years -- long before human industry began to release carbon dioxide into the atmosphere. Opdyke is now at the University of Florida. According to Shackleton and Opdyke's data, average global temperatures have risen less than one degree in the last million years, though the amplitude of the periodic oscillation has now risen in that time from about 5 degrees to about 10 degrees, with a period of about 100,000 years. "Today, we are simply near a peak in the current cycle that started about 25,000 years ago," Essenhigh explained. As to why highs and lows follow a 100,000 year cycle, the explanation Essenhigh uses is that the Arctic Ocean acts as a giant temperature regulator, an idea known as the "Arctic Ocean Model." This model first appeared over 30 years ago and is well presented in the 1974 book Weather Machine: How our weather works and why it is changing, by Nigel Calder, a former editor of New Scientist magazine. According to this model, when the Arctic Ocean is frozen over, as it is today, Essenhigh said, it prevents evaporation of water that would otherwise escape to the atmosphere and then return as snow. When there is less snow to replenish the Arctic ice cap, the cap may start to shrink. That could be the cause behind the retreat of the Arctic ice cap that scientists are documenting today, Essenhigh said. As the ice cap melts, the earth warms, until the Arctic Ocean opens again. Once enough water is available by evaporation from the ocean into the atmosphere, snows can begin to replenish the ice cap. At that point, the Arctic ice begins to expand, the global temperature can then start to reverse, and the earth can start re-entry to a new ice age. According to Essenhigh's estimations, Earth may reach a peak in the current temperature profile within the next 10 to 20 years, and then it could begin to cool into a new ice age.

### A2: Warming => War

#### Climate change does not cause wars or conflict between nations.

Bruno **Tertrais** Summer 20**11** “The Climate Wars Myth” <http://csis.org/files/publication/twq11summertertrais.pdf>

So much for ‘‘climate wars.’’ But the idea according to which climate change is nevertheless a new, important factor to be taken into account in defense and security planning is itself questionable. Of course, nothing precludes us from including it in the growing list of non-military issues that may have a bearing on global security. But this has to be done in a realistic way. It is not unreasonable to state that climate change may be a ‘‘threat multiplier,’’ for instance. However, stating this says nothing about the probability of increased violence or instability either at the global level or for a given crisis, or about the likelihood of state failure. Such consequences depend primarily on the reaction of governments and societies a factor which is impossible to calculate in advance. There are no data to support the vague idea that climate change can have a key role in triggering collective violence that is, be the proverbial straw that breaks the camel’s back, as argued by an alarmist study (citing once again the example of Darfur). Climate is ‘‘one of myriad factors in a complex causal web underlying conflict,’’ and the environment is just ‘‘one of manifold and nonessential causal factors’’ which may lead to war. The main causes of contemporary conflict are societal, not natural (in the broadest sense of the term, i.e., including man-made). Conflicts are borne out of human choices and mistakes. Could regional previsions of the impact of climate change at least inform policymakers and planners about the areas of the world which are more likely all things being equal to suffer from them? The answer is no. Regional effects are extremely difficult to predict with the degree of probability which can be useful for planning. The IPCC itself underscores that current models do not have the ability to deliver useful previsions at a higher scale than the continental one. Nobody knows, for instance, whether African monsoons will move northwards (with positive effects on agriculture) or southwards (with negative effects). Here, as noted by a contributor to the IPCC, ‘‘there is complete disagreement between the various models.’’

And when the IPCC attempts to give regional previsions on the evolution of agricultural output, for instance, it is in a way which does not buttress the case for alarmism. Its 2007 report mentions a possible reduction by 50 percent of rain-fed agricultural output in some African countries in 2020. But the sole source it cites to support this claim is a report produced for a Canadian non-governmental organization in which it is mentioned that (unpublished) studies evoke this scenario for three Maghreb countries. There are indeed, it seems, some causal links between climate and warfare. But they are of a seasonal nature: ‘‘nations address seasonal climate change in terms of where they fight, rather than through when or whether disputes occur. . . . Fighting moves to higher latitudes in the summer, and lower latitudes during the cooler months of the year.’’ The stakes of climate change are important and that is why this area should not be the object of intellectual fantasies or fashions. It is appropriate for defense and security planners to monitor the evolution of the scientific and political debate on its possible consequences. But there is no objective reason today to list climate change as a key issue for defense and security planning.

#### There is very little evidence that climate change results in more conflict: Many examples disprove.

Idean Salehyan 2007 (August, Assistant professor of political science at the University of North Texas, “The New Myth About Climate Change: Corrupt, tyrannical governments-not changes in the Earth’s climate-will be to blame for the coming resource wars”, <http://www.foreignpolicy.com/story/cms.php?story_id=3922>, Accessed 6/28/08)

First, aside from a few anecdotes, there is little systematic empirical evidence that resource scarcity and changing environmental conditions lead to conflict. In fact, several studies have shown that an abundance of natural resources is more likely to contribute to conflict. Moreover, even as the planet has warmed, the number of civil wars and insurgencies has decreased dramatically. Data collected by researchers at Uppsala University and the International Peace Research Institute, Oslo shows a steep decline in the number of armed conflicts around the world. Between 1989 and 2002, some 100 armed conflicts came to an end, including the wars in Mozambique, Nicaragua, and Cambodia. If global warming causes conflict, we should not be witnessing this downward trend. Furthermore, if famine and drought led to the crisis in Darfur, why have scores of environmental catastrophes failed to set off armed conflict elsewhere? For instance, the U.N. World Food Programme warns that 5 million people in Malawi have been experiencing chronic food shortages for several years. But famine-wracked Malawi has yet to experience a major civil war. Similarly, the Asian tsunami in 2004 killed hundreds of thousands of people, generated millions of environmental refugees, and led to severe shortages of shelter, food, clean water, and electricity. Yet the tsunami, one of the most extreme catastrophes in recent history, did not lead to an outbreak of resource wars. Clearly then, there is much more to armed conflict than resource scarcity and natural disasters.

### A2: Warming => Extreme Weather

#### No link between warming and changing weather patterns – its natural variability

**NCPA 11** (National Center for Policy Analysis, a think tank, “Extreme Weather: What Role Do Humans Play?” 3/18, http://www.ncpa.org/sub/dpd/index.php?Article\_ID=20447)

Tying weather extremes to global warming, or using them as "proof" that warming does not exist, is a popular rhetorical flourish by politicos of all stripes. But a string of soon-to-be-published papers in the scientific literature finds that despite all hue and cry about global warming and recent extreme weather events, natural climate variability is to blame, says Patrick J. Michaels, a senior fellow with the Cato Institute.¶ The first chink in the armor came back in the fall of 2010, when scientists from the Physical Sciences Division of the Earth System Research Laboratory of the National Oceanic and Atmospheric Administration presented the results of their preliminary investigation.¶ They concluded that "despite this strong evidence for a warming planet, greenhouse gas forcing fails to explain the 2010 heat wave over western Russia. The natural process of atmospheric blocking, and the climate impacts induced by such blocking, are the principal cause for this heat wave."¶ What about the past two winters?¶ In a soon-to-be-released paper to appear in Geophysical Research Letters, a team of scientists from the European Center for Medium-Range Weather Forecasts help untangle the causes of the unusual atmospheric circulation patterns that gave rise to the harsh winter of 2009-2010 on both sides of the Atlantic.¶ They find: "neither SST [sea surface temperature] nor sea ice anomalies explain the negative phase of the NAO [North Atlantic Oscillation] during the 2009/10 winter."¶ The point is that natural variability can and does produce extreme events on every time scale, from days (e.g., individual storms), weeks (e.g., the Russian heat wave), and months (e.g., the winter of 2009-2010). Folks would do well to keep this in mind next time global warming is being posited for the weather disaster du jour, says Michaels.

### A2: Warming => Disease

#### Your impact is bad and you should feel bad

**Morano 9** (Mark, writer for Climate Depot, “Claim that 'climate change is the cholera of our era' ridiculed as 'load of garbage' by renowned disease expert,” 5/25, http://climatedepot.com/a/914/Claim-that-climate-change-is-the-cholera-of-our-era-ridiculed-as-load-of-garbage-by-renowned-disease-expert)

AMay 25, 2009 article in the UK Times warning that "climate change is the cholera of our era" has raised the ire of an internationally known disease expert formerly of the UN IPCC**.¶ "**The article is a rehash of a similar load of garbage unloaded in 1996,plus (identical wording) other writings of the past, including, I suspect, IPCC,"Dr. Paul Reiter told Climate Depot**.** Reiter is a malaria expert formerly of the Centers for Disease Control and Prevention and professor of entomology and tropical disease with the Pasteur Institute in Paris and a member of the World Health Organization Expert Advisory Committee on Vector Biology and Control.¶ The UK Times article, by Professor Sir Muir Gray is Public Health Director of the Campaign for Greener Healthcare, alleges that man-made global warming is a greater threat to mankind than the scourge of cholera -- an acute diarrheal illness-- which killed an nearly 3000 people in Zimbabwe alone earlier this year. A May 26, 2009 article from VOA reveals cholera cases are expected to reach 100,000 in Zimbabwe alone.¶ Muir wrote in the UK Times: "In the 19th century, cholera outbreaks that escaped from the slums to kill rich and poor alike caused the great Victorian revolution in public health. Fear of cholera ensured that vast sums were spent on building sewers and ensuring that everyone had clean water. Climate change is the cholera of our era — fear of the havoc that climate change will wreak should stimulate a new public health revolution."¶ "Smoking, Aids, swine flu? They all pale into insignificance compared to climate change's threat to health," Muir added.¶ But Reiter, was blunt in his rebuttal to Muir's article in the UK Times.¶ "They have cherry picked without remorse. I have huge response to my article in Malaria Journal. Yet these peddlers of garbage quote a 1998 model by two activists whose work is ridiculed by those of us who work in this field," Reiter continued. "What the hell can we do? I am flabbergasted that this can go on, and on, and on," Reiter, who is featured in the U.S. Senate Report of more than 700 dissenting scientists of man-made global warming, concluded.¶ Reiter was also formerly with the UN IPCC and was so appalled at UN IPCC process that he threatened legal action to get his name removed from the reports.

#### Warming won’t affect incidence of disease

**Lafferty 9** (K.D., writing for the journal *Ecology*, “The ecology of climate change and infectious diseases” *Ecology* 90: 888-900. Background available here: http://co2science.org/articles/V12/N30/B1.php)

The "conventional wisdom," in the words of the author, "is that global climate change will result in an expansion of tropical diseases, particularly vector-transmitted diseases, throughout temperate areas," examples of which include "schistosomiasis (bilharzia or snail fever), onchocerciasis (river blindness), dengue fever, lymphatic filariasis (elephantiasis), African trypanosomiasis (sleeping sickness), leishmaniasis, American trypanosomiasis (Chagas disease), yellow fever, and many less common mosquito and tick-transmitted diseases of humans," as well as many diseases of "nonhuman hosts."¶ What was done¶ Lafferty reviews the scientific literature pertaining to: (1) how temperature drives several important biological processes, (2) how changes in climate might affect the spatial and temporal patterns of infectious disease transmission, and (3) how models predict the ways in which climate change might affect the spread of infectious diseases in the future.¶ What was learned¶ The U.S. government researcher concludes that "while climate has affected and will continue to affect habitat suitability for infectious diseases, climate change seems more likely to shift than to expand the geographic ranges of infectious diseases," and that "many other factors affect the distribution of infectious disease, dampening the proposed role of climate." In fact, he concludes that "shifts in climate suitability might actually reduce the geographic distribution of some infectious diseases." And of perhaps even greater import (because it is a real-world observation), he reports that "although the globe is significantly warmer than it was a century ago, there is little evidence that climate change has already favored infectious diseases."¶ What it means¶ So, will global warming lead to dramatic increases in the incidence of various infectious diseases, as climate alarmists claim it will? Lafferty's review of pertinent biological phenomena suggests that it need not do so, while his review of real-world observations suggests that it has not done so. Hence, in all likelihood, it probably will not do so.

### A2: Warming kills crops

#### Organic switch solves

**Striepe 7/12** (Becky, writer for Eat Drink Better, an advocacy and support website for sustainable farming practices, citing peer-reviewed studies and a writer for HuffPo, “Could organic farming be the key to feeding a warming world?” 2012 http://eatdrinkbetter.com/2012/07/12/could-organic-farming-be-the-key-to-feeding-a-warming-world/)

Climate change is about more than just hotter summers. As the world heats up, we’re also expected to see more extreme weather and increased incidences of drought. That presents challenges to the farmers producing our food, and according to research from the Rodale Institute, the answer may be organic farming. According to Tom Philpott at Mother Jones:

…organically managed soils deal with water better—both in conditions of drought and heavy storms (the frequency of which is also expected to increase as the climate changes). Soil rich in organic matter (well-decayed remnants of plants and other living creatures) bolster soil in weather extremes by helping store water in times of scarcity and by holding together and not eroding away during heavy rains.¶ We can argue all day about whether GMOs are healthy for our bodies, but what the GMO debate really comes down to is feeding the world. This is a major argument that pro-GMO groups use, and studies like this one call that reasoning into question. Rodale has been doing side-by-side testing of organic and GMO crops since the early 80s, and during times of drought they are finding that organics outperformed industrial farming techniques by 31 percent (you can check out the Rodale report (pdf) here). During times of more normal weather, organic and industrial yields were comparable.¶ ¶ GMO advocates often accuse folks who speak out against GMOs and industrial ag as being anti-science, but Rodale’s three decades of research looks like some pretty solid science to me.

### **A2: Spratly Islands Conflict**

#### Double bind – either war won’t escalate or miscalc makes it inevitable

**Branigan 7/13** (Tania, writer for the Guardian, “Chinese frigate runs aground in disputed part of South China Sea,” 2012, http://www.guardian.co.uk/world/2012/jul/13/chinese-frigate-runs-aground-sea)

Ian Storey of the Institute of South-east Asian Studies in Singapore said that while the grounding was in itself unlikely to escalate tensions, it indicated the growing militarisation of the waters. "Resolution of the dispute is even further out of reach," he added. "No one seriously envisages a major conflict in the South China Sea because it's not in anyone's interests. They depend on those sea lanes for the continued functioning of their economies.¶ "The real risk is that an accidental clash occurs and escalates. In my mind, it is just a matter of time before one of these standoffs gets really ugly and people get killed."¶ Tensions have been building in the area since 2007, with increasing keenness to claim¶ the¶ energy resources, and growing pressure from nationalists in several of the countries. Vietnam has seen unusual street protests over the dispute in the past few weeks.

Won’t escalate to involve the US or China

Piper 12 (David, writer for Fox News, “David against Goliath on the South China Sea,” 5/10, http://www.foxnews.com/world/2012/05/10/david-against-goliath-on-south-china-sea/#ixzz20W2KsqZ3)

China has been watching the growing presence of the U.S military in the region and analysts suggests this latest dispute is linked to the joint exercise, which involves dealing with terrorists who have taken over an oil rig in the South China Sea.¶ But the Philippines should be not expect help from the U.S. if it turns into a shooting war, says Subramaniam.¶ “Given this capability gap, the Philippines knows it has a lot to gain through alliance with the U.S. But any hope that the U.S. would provide 'cover' from China over disputed maritime borders in the South China Sea, in case of a military conflict, is unlikely to be met, as there is little for Washington to gain by openly siding with Manila in any dispute with Beijing.”¶ China has been prepared to support its claims in the South China Sea with military action in the past.¶ In 1974, China and Vietnam fought a short battle over the Paracel Islands in the South China Sea, a battle that China won.¶ Despite the rhetoric coming out of China at the moment of backing up its territorial claims by force, it's still questionable if it wants to cause an international crisis now while it continues to grow economically and militarily.

### A2: Tipping points

#### No tipping points

**IHRR 12** (Institute of Hazard, Risk and Resilience, “Moving beyond ‘the tipping point of climate change,’” 5/4, http://ihrrblog.org/2012/05/04/moving-beyond-the-tipping-point-of-climate-change/)

To begin, we are now observing climate change solely from the period of today or in the relatively recent past, which is a very small part of what came before it millions of years ago. Antony Long found the use of tipping point to describe climate change potentially nihilistic or disempowering for thinking about climate change when in fact we should be moving the other way. Also, tipping points may not necessarily be irreversible which is how climate change is often portrayed. While less complex than the climate problem ozone depletion was seen as veering towards a tipping point, but as production of CFCs ceased the ozone layer restored over time.

### Negative feedbacks solve

#### Current models for climate change wrong, misconstrue negative vs. positive feedback regulation

**Spencer 8** (Roy W. Ph.D., climatologist, author, former NASA scientist, “Satellite and Climate Model Evidence Against Substantial Manmade Climate Change (supercedes “Has the Climate Sensitivity Holy Grail Been Found?”)”, Roy W. Spencer, 12/27/08, <http://www.drroyspencer.com/research-articles/satellite-and-climate-model-evidence/>)

The comparisons modelers make between their models and satellite data are typically rather crude and cursory. They are not sufficiently detailed to really say anything of substance about feedbacks — in either the models or the satellite data – and yet it is the feedbacks that will determine how serious the manmade global warming problem will be. And as I have tried to demonstrate here, the main reason for the current inadequacy of such methods of comparison between models and observations is the contaminating effect of clouds causing temperatures to change (forcing) when trying to estimate how temperatures cause clouds to change (feedback). This not a new issue, as it has been addressed by Forster and Gregory (2006, applied to satellite measurements) and Forster and Taylor (2006, applied to climate model output). I have merely demonstrated that the same contamination occurs from internal fluctuations in clouds in the climate system. The bottom line from the model and observational evidence presented here is that: Net feedbacks in the real climate system — on both short and long time scales — are probably negative. A misinterpretation of cloud behavior has led climate modelers to build models in which cloud feedbacks are instead positive, which has led the models to predict too much global warming in response to anthropogenic greenhouse gas emissions.

#### Plants provide negative feedbacks

#### Watts 10 (Anthony, Meteorologist and president of IntelliWeather Inc., “NASA climate model shows plants slow Global Warming by creating a new negative feedback in response to increased CO2”, Watt’s up with That?, 12/7/10, <http://wattsupwiththat.com/2010/12/07/nasa-climate-model-shows-plants-slow-global-warming-by-creating-a-new-negative-feedback-in-response-to-increased-co2/>)

To date, only some models that predict how the planet would respond to a doubling of carbon dioxide have allowed for vegetation to grow as a response to higher carbon dioxide levels and associated increases in temperatures and precipitation. Of those that have attempted to model this feedback, this new effort differs in that it incorporates a specific response in plants to higher atmospheric carbon dioxide levels. When there is more carbon dioxide available, plants are able to use less water yet maintain previous levels of photosynthesis. The process is called “down-regulation.” This more efficient use of water and nutrients has been observed in experimental studies and can ultimately lead to increased leaf growth. The ability to increase leaf growth due to changes in photosynthetic activity was also included in the model. The authors postulate that the greater leaf growth would increase evapotranspiration on a global scale and create an additional cooling effect. “This is what is completely new,” said Bounoua, referring to the incorporation of down-regulation and changed leaf growth into the model. “What we did is improve plants’ physiological response in the model by including down-regulation. The end result is a stronger feedback than previously thought.” The modeling approach also investigated how stimulation of plant growth in a world with doubled carbon dioxide levels would be fueled by warmer temperatures, increased precipitation in some regions and plants’ more efficient use of water due to carbon dioxide being more readily available in the atmosphere. Previous climate models have included these aspects but not down-regulation. The models without down-regulation projected little to no cooling from vegetative growth.

#### Positive feedback models wrong, their impacts exaggerated

**Happer 12** (William is a professor of physics at Princeton. “Global Warming Models Are Wrong Again”, Wall Street Journal, 3/27/12, <http://online.wsj.com/article/SB10001424052702304636404577291352882984274.html>)

The direct warming due to doubling CO2 levels in the atmosphere can be calculated to cause a warming of about one degree Celsius. The IPCC computer models predict a much larger warming, three degrees Celsius or even more, because they assume changes in water vapor or clouds that supposedly amplify the direct warming from CO2. Many lines of observational evidence suggest that this "positive feedback" also has been greatly exaggerated. There has indeed been some warming, perhaps about 0.8 degrees Celsius, since the end of the so-called Little Ice Age in the early 1800s. Some of that warming has probably come from increased amounts of CO2, but the timing of the warming—much of it before CO2 levels had increased appreciably—suggests that a substantial fraction of the warming is from natural causes that have nothing to do with mankind.

#### Recent findings show negative feedback

**AAP 12** (AAP General News Wire, “NZ:Lowering Clouds May Combat Global Warming”, AAP, 2/22/2012, <http://search.proquest.com.proxy2.cl.msu.edu/docview/926807183/137DD2EB09336C75945/1?accountid=12598>)

Clouds around the world may be falling in response to rising global temperatures and having a cooling effect on global warming, according to analysis of satellite data by Auckland University scientists. The first 10 years of data from the NASA Terra satellite, which uses nine cameras at different angles to produce a stereo image of the world's clouds, shows their average height has lowered by about 1 per cent, or 30 to 40 metres. Most of the reduction was due to fewer clouds occurring at very high altitudes, says the study, published in the journal Geophysical Research Letters. "This is the first time we have been able to accurately measure changes in global cloud height and, while the record is too short to be definitive, it provides just a hint that something quite important might be going on," said lead researcher, Professor Roger Davies. In a "negative feedback mechanism", lower cloud height would allow the Earth to cool to space more efficiently, reducing the surface temperature of the planet and potentially slowing the effects of global warming.

#### Medieval Warming Period proves feedbacks are negative

**Worstall 12** (Tim, writer for Forbes, “If the MWP Was Global What Does That Tell Us About Climate Change Now?” http://www.forbes.com/sites/timworstall/2012/03/23/if-the-mwp-was-global-what-does-that-tell-us-about-climate-change-now/)

That the Earth has temperature cycles isn’t a surprise, we all know there were Ice Ages. So that we had a time when temperatures were higher than now and everything was just dandy doesn’t mean that it will all remain dandy if we carry on in our current manner. However, the great unknown of climate change science is “climate sensitivity”. This is how much temperature will rise given a doubling of atmospheric CO2 (technically, CO2-equivalent, converting all the methane etc to one handy unit). We know how much will come directly: 0.7 of a degree. That isn’t something to worry overmuch about. The question then becomes, well, what happens then: when the ice melts and albedo lowers, when warmer weather and higher CO2 increase plant growth, what happens to clouds and so on through a list of hundreds of possible feedbacks. We don’t even know if some of these will be positive or negative, will further increase temperatures or reduce them and we certainly don’t know what the cumulative effect will be. Currently the best guesses are in the 2 to 4.5 degree range but these are indeed guesses. Well informed guesses, being done with a variety of methods by very good scientists trying to get at the truth but they are guesses. And the most important information underlying them is, well, what happened previous times the Earth got warmer? Did it carry on doing so? Or did it get so far and stop or even retreat? Which is where the MWP comes in. If it was a truly global phenomenon then we’ve more evidence (only more evidence, nothing conclusive at all) that rises in temperature similar to what we’re seeing don’t, always, carry on. Sometimes at least they stop of their own accord: could be solar action, could be feedbacks. From which the takeaway point is that perhaps climate sensitivity is lower than currently thought and thus climate change is less dangerous than currently thought.

\*Note: MWP = Medieval Warming Period

#### Their model’s flawed, feedbacks are negative

**Evans 12**

(David has a PhD in electrical engineering, worked from 1999 to 2006 for the Australian Greenhouse Office, an agency of the Australian government, designing a carbon accounting system, Financial Post, "Global Warming Theory Is Based on False Science.",7 Apr. 2011)

The planet reacts to that extra carbon dioxide, which changes everything. Most critically, the extra warmth causes more water to evaporate from the oceans. But does the water hang around and increase the height of moist air in the atmosphere, or does it simply create more clouds and rain? Back in 1980, when the carbon dioxide theory started, no one knew. The alarmists guessed that it would increase the height of moist air around the planet, which would warm the planet even further, because the moist air is also a greenhouse gas. This is the core idea of every official climate model: For each bit of warming due to carbon dioxide, they claim it ends up causing three bits of warming due to the extra moist air. The climate models amplify the carbon dioxide warming by a factor of three—so two-thirds of their projected warming is due to extra moist air (and other factors); only one-third is due to extra carbon dioxide. That's the core of the issue. All the disagreements and misunderstandings spring from this. The alarmist case is based on this guess about moisture in the atmosphere, and there is simply no evidence for the amplification that is at the core of their alarmism. Weather balloons had been measuring the atmosphere since the 1960s, many thousands of them every year. The climate models all predict that as the planet warms, a hot spot of moist air will develop over the tropics about 10 kilometres up, as the layer of moist air expands upwards into the cool dry air above. During the warming of the late 1970s, '80s and '90s, the weather balloons found no hot spot. None at all. Not even a small one. This evidence proves that the climate models are fundamentally flawed, that they greatly overestimate the temperature increases due to carbon dioxide. This evidence first became clear around the mid-1990s.

Climate system dominated by negative feedback- model-centric prove

#### Spencer 12 (Roy Spencer is a climatologist, author and former NASA scientist. “Global Warming” <http://www.drroyspencer.com/global-warming-natural-or-manmade/>)

The resulting picture that emerges is of an IN-sensitive climate system, dominated by negative feedback. And it appears that the reason why most climate models are instead VERY sensitive is due to the illusion of a sensitive climate system that can arise when one is not careful about the physical interpretation of how clouds operate in terms of cause and effect (forcing and feedback). Indeed, climate researchers seldom (if ever) dig into the archives of satellite data and ask the question, “What are the satellite data telling us about the real climate system?” Instead, most climate research money now is funneled into building expensive climate models which are then expected to provide a basis for formulating public policy. Given the immense effort that has been invested, one would think that those models would be more rigorously tested. There is nothing inherently wrong with a model-centric approach to climate research…as long as the modeler continues to use the observations to guide the model development over time. Unfortunately, as Richard Lindzen at MIT has [pointed out](http://arxiv.org/ftp/arxiv/papers/0809/0809.3762.pdf), the fact that modelers use the term “model validation” rather than “model testing” belies their inherent preference of theory over observations. The allure of models is strong: they are clean, with well-defined equations and mathematical precision. Observations of the real climate system are dirty, incomplete, and prone to measurement error. The comparisons modelers make between their models and satellite data are typically rather crude and cursory. They are not sufficiently detailed to really say anything of substance about feedbacks — in either the models or the satellite data – and yet it is the feedbacks that will determine how serious the manmade global warming problem will be. And as I have tried to demonstrate here, the main reason for the current inadequacy of such methods of comparison between models and observations is the contaminating effect of clouds causing temperatures to change (forcing) when trying to estimate how temperatures cause clouds to change (feedback). This not a new issue, as it has been addressed by Forster and Gregory (2006, applied to satellite measurements) and Forster and Taylor (2006, applied to climate model output). I have merely demonstrated that the same contamination occurs from internal fluctuations in clouds in the climate system. The bottom line from the model and observational evidence presented here is that: Net feedbacks in the real climate system — on both short and long time scales — are probably negative. A misinterpretation of cloud behavior has led climate modelers to build models in which cloud feedbacks are instead positive, which has led the models to predict too much global warming in response to anthropogenic greenhouse gas emissions.

### Alt causes – Rainforests

#### Destruction of Rainforests pumps far more CO2 in to the atmosphere then human industry does

Daniel Howden, May 14 2007, “Deforestation: The Hidden Cause Of Global Warming”, deputy foreign editor of The Independent, <http://www.independent.co.uk/news/environment/climate_change/article2539349.ece>

Most people think of forests only in terms of the CO2 they absorb. The rainforests of the Amazon, the Congo basin and Indonesia are thought of as the lungs of the planet. But the destruction of those forests will in the next four years alone, in the words of Sir Nicholas Stern, pump more CO2 into the atmosphere than every flight in the history of aviation to at least 2025. Indonesia became the third-largest emitter of greenhouse gases in the world last week. Following close behind is Brazil. Neither nation has heavy industry on a comparable scale with the EU, India or Russia and yet they comfortably outstrip all other countries, except the United States and China. What both countries do have in common is tropical forest that is being cut and burned with staggering swiftness. Smoke stacks visible from space climb into the sky above both countries, while satellite images capture similar destruction from the Congo basin, across the Democratic Republic of Congo, the Central African Republic and the Republic of Congo. According to the latest audited figures from 2003, two billion tons of CO2 enters the atmosphere every year from deforestation. That destruction amounts to 50 million acres - or an area the size of England, Wales and Scotland felled annually. The remaining standing forest is calculated to contain 1,000 billion tons of carbon, or double what is already in the atmosphere. As the GCP's report concludes: "If we lose forests, we lose the fight against climate change."

### Model indicts

#### IPCC model stinks

**Spencer 12** (Roy, former NASA climatologist and author, “McKitrick & Michaels Were Right: More Evidence of Spurious Warming in the IPCC Surface Temperature Dataset,” 3/30 http://www.drroyspencer.com/page/2/)

The supposed gold standard in surface temperature data is that produced by Univ. of East Anglia, the so-called CRUTem3 dataset. There has always been a lingering suspicion among skeptics that some portion of this IPCC official temperature record contains some level of residual spurious warming due to the urban heat island effect. Several published papers over the years have supported that suspicion. The Urban Heat Island (UHI) effect is familiar to most people: towns and cities are typically warmer than surrounding rural areas due to the replacement of natural vegetation with manmade structures. If that effect increases over time at thermometer sites, there will be a spurious warming component to regional or global temperature trends computed from the data. Here I will show based upon unadjusted International Surface Hourly (ISH) data archived at NCDC that the warming trend over the Northern Hemisphere, where virtually all of the thermometer data exist, is a function of population density at the thermometer site.

**Temperature data proves**

**Lehr 5** (Jay, Science Director of the Heartland Institute, 1-12-2005, Yearbook of Experts)

EVIDENCE THAT THE TEMPERATURE OF THE EARTH IS NOT INCREASING SIGNIFICANTLY AS A RESULT OF MAN'S ACTIVITY ON THE PLANET 1 - Our most reliable sources of temperature data show no global warming trend. Satellite and weather balloon readings of temperatures in the lower troposphere (an area scientists predict would immediately reflect any global warming) show no warming since readings began 25 years ago, when the satellite system was first launched. Only land based temperature stations show a warming trend, and these stations do not cover the entire globe as satellite readings do, and these are often affected by heat generated by nearby urban development. 2 - All predictions of global warming are based on computer models not historical data. In order to get their models to produce predictions that are close to their designers expectations, modelers make adjustments to unknown variables that are many times greater than the effect of doubling carbon dioxide concentrations in the atmosphere. For example, knowledge of the amount of energy flowing from the equator to the poles is uncertain by an amount equivalent to 25 to 30 Watts per square meter (W/m2) of the earth's surface. the amount of sunlight absorbed by the atmosphere or reflected by the surface is also uncertain by as much as 25 W/m2. The role of clouds is uncertain by at least 25 W/m2. The heat added to the atmosphere by a doubling of CO2 is not uncertain. It is easily measured in laboratory experiments and amounts to only 4 Watts per square meter (4 W/m2) of the earth's surface. Obviously the uncertainties are many times larger than the input of energy resulting from a doubling of carbon dioxide in the atmosphere. 3 - When scientists analyzed the relationship between atmospheric CO2 levels and temperatures dating back 250,000 years in ice cores from Greenland and Antarctica, they found that sometimes concentration of CO2 was high when the temperature was low and sometime CO2 was low when temperature was high. 4 - While we hear much about one or another melting glaciers, a recent study of 246 glaciers around the world between 1946 and 1995 indicated a balance between those that are losing ice, gaining ice and remaining in equilibrium. There is no global trend in any direction. 5 - The gases in the atmosphere that absorb outgoing radiation forming the greenhouse effect are water vapor (absorbing 90% of outgoing heat), methane (4%), nitrous oxide (2%), carbon dioxide (4%). Thus a doubling of CO2 would not achieve a significant change in heat retained. 6 - Temperature fluctuations during the current 300 year recovery from the Little Ice Age which ended around 1700AD, following the Medieval Warming Period correlate almost perfectly with fluctuations in solar activity. This correlation long predates human use of significant amounts of fossil fuels such as coal, oil and natural gas. 7 - In defining the tremendous impact the sun has on climate one must really understands the actual movement of the earth around the sun. There are three variables, orbit shape, tilt and wobble which profoundly affect weather patterns. The earth's orbit does not form a circle as it moves around the sun - it forms an ellipse passing further away from the sun at the one end of the orbit than at the other end. During the 100,000 year cycle the tug of other planets on the earth causes its orbit to change shape. It shifts from a short broad ellipse that keeps the earth closer to the sun to a long flat ellipse that allows it to move farther from the sun and back again. 8 - There is no consensus of scientists in favor of human caused global warming. While opinion polls do not determine truth in science, more than 17,000 American scientists signed a petition drafted by the Oregon Institute of Science and Medicine which stated: "There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gases is causing or will, in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate. Moreover, there is substantial scientific evidence that increases in atmospheric carbon dioxide produce many beneficial effects upon the natural plant and animal environments of the Earth." 9 - A modest amount of global warming, should it occur would be beneficial to the natural world. The warmest period in recorded history was the Medieval Warm Period roughly 800 to 1200AD when temperatures were 7 to 9 degrees Fahrenheit warmer than today allowing great prosperity of mankind. 10 - Carbon dioxide is NOT a pollutant. On the contrary it makes crops and forests grow faster. Mapping by satellite shows that the earth has become about 6% greener overall in the past two decades, with forests expanding into arid regions. The Amazon rain forest was the biggest gainer, despite the much advertised deforestation caused by human cutting along their edges. Certainly climate change does not help every region equally, but careful studies predict overall benefit, fewer storms (not more), more rain, better crop yields, longer growing seasons, milder winters and decreasing heating costs in colder climates. The news is certainly not all bad and on balance may be rather good. 11 - Energy is the currency of technological progress. Billions of people in the Earth's poor countries are trying to lift themselves from poverty through use of simple technology. Hundreds of millions of these people are so close to the bottom rungs of the ladder of existence that loss of hydrocarbon fuels can cause their deaths. Many international elitists understand this well as they attempt to use the myth of global warming as a means of "population control". 12 - Global warming is a major industry today. Between 1992 and 2000 the U.S. Government spent $18 Billion on climate change research and now contributes $6 billion a year. This finances jobs, grants, conferences, international travel and academic journals. It not only keeps a huge army of people in comfortable employment, but also fills them with self righteousness and moral superiority regardless of the fact that real science did not support it.

#### Arctic ice decline is natural – we indict their models

**Spencer 12** (Roy, former NASA climatologist and author, 3/27, “Could Arctic Sea Ice Decline be Caused by the Arctic Oscillation?” http://www.drroyspencer.com/page/2/)

While the IPCC claims that recent Arctic sea ice declines are the result of human-caused warming, there is also convincing observational evidence that natural cycles in atmospheric circulation patterns might also be involved. And unless we know how much of the decline is natural, I maintain we cannot know how much is human-caused. In 2002, a paper was published in the Journal of Climate entitled Response of Sea Ice to the Arctic Oscillation, where the authors (one of whom, Mike Wallace, was a co-discoverer of the AO) shows that changing wind patterns associated with the AO contributed to Arctic sea ice declines from one decade to the next: from 1979-1988 to 1989-1998. The Arctic Oscillation involves sea level pressure patterns over the Arctic Ocean, North Atlantic, and North Pacific. Since sea ice moves around with the wind (see this movie example), sea level pressure patterns can either expose or cover various sections of the Arctic Ocean. When there are many winters in a row with high (or low) pressure, it can affect sea ice cover on decadal time scales. Over time, ice can become more extensive and thicker, or less extensive and thinner. There is a time lag involved in all of this, as discussed in the above paper. So, to examine the potential cumulative effect of the AO, I made the following plot of cumulative values of the winter (December-January-February) AO (actually, their departures from the long-term average) since 1900. I’ve attached a spreadsheet with the data for those interested, updated through this past winter. Consistent with the analysis in the above-cited paper, the sea ice decline since satellite monitoring began in 1979 was during a period of persistent positive values of the AO index (note the reversed vertical scale). Since the satellite period started toward the end of a prolonged period of negative AO values, this raises the question of whether we just happened to start monitoring Arctic sea ice when it was near peak coverage. Note that back in the 1920’s, when there were reports of declining sea ice, record warmth, and disappearing glaciers, there was similar AO behavior to the last couple of decades. Obviously, that was before humans could have influenced the climate system in any substantial way. I won’t go into what might be causing the cyclic pattern in the AO over several decades. My only point is that there is published evidence to support the view that some (or even most?) of the ~20 year sea ice decline up until the 2007 minimum was part of a natural cycle, related to multi-decadal changes in average wind patterns.

### No Ocean acidification

#### No long-term impact to ocean acidification

**Michaels, Davis and Balling 12** (Patrick J. Michaels is an American [climatologist](http://en.wikipedia.org/wiki/Climatology), senior research fellow for Research and Economic Development at [George Mason University](http://en.wikipedia.org/wiki/George_Mason_University), and a senior fellow in environmental studies at the [Cato Institute](http://en.wikipedia.org/wiki/Cato_Institute), Robert E. Davis is a Professor of [Climatology](http://en.wikipedia.org/wiki/Climatology) at the [University of Virginia](http://en.wikipedia.org/wiki/University_of_Virginia)'s Department of Environmental Sciences, Robert C. Balling, Jr. is a [professor](http://en.wikipedia.org/wiki/Professor) of geography at [Arizona State University](http://en.wikipedia.org/wiki/Arizona_State_University), and the former director of its Office of [Climatology](http://en.wikipedia.org/wiki/Climatology), “[Acclimation to Ocean Acidification: Give It Some Time](http://www.worldclimatereport.com/index.php/2012/03/29/acclimation-to-ocean-acidification-give-it-some-time/)”, World Climate Report, 3/29/12, <http://www.worldclimatereport.com/index.php/2012/03/29/acclimation-to-ocean-acidification-give-it-some-time/>)

The last sentence nicely sums up the problem underlying the proclamations of impending catastrophe from “ocean acidification”—that is, there are very few long-term studies of the response of organisms to changing conditions, instead, the vast majority of results come from studies which scoop things up out of the ocean, plop them into an aquarium, jack up the acidity of the water, and watch what for a few days to see what happens. That’s about as far from the real world as you can get, and it’s little wonder that the organisms don’t tend to fare particularly well. Basically, Form and Riebesell follow this same procedure, but in addition to watching what happens over a few days, they maintain vigilance, and follow the response for about 6 months. The organism they are studying is a cold-water coral species, Lophelia pertusa, which they describe as “the most common reef framework-forming and ecosystem engineering cold-water coral with a cosmopolitan distribution.” One reason they chose to look at a cold-water coral is that “cold-water coral reefs are considered the ecosystem most vulnerable to ocean acidiﬁcation.” What they found was that in an experiment that lasted only 8 days, that the growth rate of the coral was slowed down by the dissolution of extra CO2 into the aquarium water—the more the researchers added CO2 (increasing the acidity and lowering the pH) the worse the corals fared (Figure 1). In a second experiment in which the coral specimens were exposed to lower pH levels for 178 days, the growth rate did not decline, and in fact, even appeared to increase under the lower pH (more acid) conditions (Figure 2).

#### Algae solves

**UPI 8** (United Press International, “Global warming may boost algae growth”, 4/19/08, lexis)

British researchers said global warming may increase ocean plankton calcification and boost the development of algae. Scientists at the National Oceanography Centre and the University of Oxford said increased carbon dioxide in the atmosphere is causing microscopic ocean plants to produce greater amounts of calcium carbonate that increase the growth of coccolithophores. The single-cell, carbonate-encased algae are an important part of the of ocean food chain, The New York Times said Friday. The report, published in the Journal Science, said the rise in carbon dioxide produced by increased calcification is mitigated by its removal through increased photosynthesis. "This work contradicts previous findings and shows, for the first time, that calcification by phytoplankton could double by the end of this century," the report said. "This is important because the majority of ocean calcification is carried out by coccolithophores such as Emiliania huxleyi and the amount of calcium carbonate produced at the ocean surface is known to have a direct influence on levels of atmospheric carbon dioxide."

#### Species resilient to climate change – coral reefs

Cote and Darling 2010 (Isabelle M., tropical marine ecologist at Simon Fraser University; Emily S., marine ecologist at Simon Fraser University; July 27, 2010. “Rethinking Ecosystem Resilience in the Face of Climate Change”. <http://www.plosbiology.org/article/info%3Adoi%2F10.1371%2Fjournal.pbio.1000438> DA:7/11/2012)

Ecologists are increasingly aware that, in a variety of ecosystems, species loss following disturbance is non-random [3],[21],[22]. On coral reefs, selective mortality following disturbance has a direct impact of coral community structure, by changing the absolute and relative abundances of coral species [23]. Shifts in community assemblages have been observed in the aftermath of diverse natural and anthropogenic disturbances, including storms [23]–[25], pollution [26], sedimentation [27]–[31], fishing [32], disease [27], and coral predator outbreaks (e.g., crown-of-thorns sea stars, [33]).

The general trend of such community shifts is the loss of coral species with stress-sensitive life histories and increases in dominance (both in terms of absolute and relative abundance) of stress-tolerant species that survive the disturbance and of opportunistic species that rapidly colonize following a disturbance. In the Indo-Pacific region, this trend is exemplified by the replacement of stress-sensitive branching and plating coral genera, such as Acropora and Montipora, by stress-tolerant massive corals such as massive Porites, and the faviids Platygyra and Favia [26],[28],[34]. In the Caribbean, the primary reef-building corals, Acropora and Montastrea species, have been replaced by “weedy” coral species that form small colonies, grow quickly, and are short-lived [35],[36]. For example, the relative abundance of “weedy” Porites astreoides has increased significantly over the past four decades [37] as coral cover—an acknowledged sign of reef degradation—has declined across the region [38]. Disturbed Caribbean reefs have also been shown to converge to communities dominated by Agaricia, whose opportunistic life-history and high environmental tolerance have been suggested to explain its persistence in degraded reef habitats [27].

The conventional view of resilience predicts that these shifted or “degraded” coral assemblages should be more vulnerable to climate change. The fact that thermally induced coral bleaching events—currently the most visible manifestation of climate change on coral reefs—are increasing in frequency and extent [11],[39] on reefs that are globally degraded [38],[40] could be taken as supporting evidence. However, this signal is confounded by increasing sea surface temperature anomalies over time [11],[19]. To our knowledge, there is no evidence to suggest that bleaching events are now triggered by lower temperatures than they were in the past, when coral reefs were generally less degraded (Perry et al., unpublished data). Nearly “pristine” reefs can experience high bleaching-induced mortality (e.g., Phoenix Islands, [41]). In fact, isolated reefs, such as those of Palmyra in the Line Islands, can bleach as severely as more impacted reefs (e.g., in American Samoa, Fiji, and the Philippines), despite the fact that they experience temperature regimes that are not hotter (or cooler) [42]. Furthermore, the apparently higher bleaching resistance of one coral species (Montastrea faveolata) from an isolated Belizean atoll with low anthropogenic stress can also be ascribed to milder heat stress on these reefs than on more degraded reefs [43].

#### Worst impact is small

Roy **Spencer** MAY 1, 20**08** (Spencer is a Senior Scientist for Climate Studies at NASA’s Marshall Space Flight Center) (http://www.nationalreview.com/articles/224319/more-carbon-dioxide-please/roy-spencer)

Well, plant physiologists have known for a long time that most vegetation loves more carbon dioxide. It grows faster, is more drought-tolerant, and is more efficient in its water use. While the pre-industrial CO2 concentration of the atmosphere was only about 280 parts per million (ppm) by volume, and now it is around 380 ppm, some greenhouses pump it all the way up to around 1,000 ppm. How can environmentalists claim that helping vegetation to grow is a bad thing? The bigger concern has been the possible effect of the extra CO2 on the world’s oceans, because more CO2 lowers the pH of seawater. While it is claimed that this makes the water more acidic, this is misleading. Since seawater has a pH around 8.1, it will take an awful lot of CO2 it to even make the water neutral (pH=7), let alone acidic (pH less than 7). Still, the main worry has been that the extra CO2 could hurt the growth of plankton, which represents the start of the oceanic food chain. But recent research (published on April 18 in Science Express) has now shown, contrary to expectations, that one of the most common forms of plankton actually grows faster and bigger when more CO2 is pumped into the water. Like vegetation on land, it loves the extra CO2, too! It is quite possible that the biosphere (vegetation, sea life, etc.) has been starved for atmospheric CO2. Before humans started burning fossil fuels, vegetation and ocean plankton had been gobbling up as much CO2 out of the atmosphere as they could, but it was like a vacuum cleaner trying to suck through a stopped-up hose. Now, no matter how much CO2 we pump into the atmosphere each year, the biosphere takes out an average of 50 percent of that extra amount. Even after we triple the amount of CO2 we produce, nature still takes out 50 percent of the extra amount.

#### Doesn’t cause species extinctions

#### Laughlin 10

(Robert B. Laughlin is a professor of physics at Stanford University and a co-recipient of the 1998 Nobel Prize for Physics., “What the Earth Knows”, The American Scholar, Summer 2010, <http://theamericanscholar.org/what-the-earth-knows/>)

However, carbon dioxide, per se, is not responsible for most of this extinction stress. There are a handful of counterexamples, notably corals, which may be especially sensitive to acidification of the ocean surface, and amphibians, which are declining noticeably for unknown reasons. But, except in these few isolated cases, keeping carbon-based fuels in the ground a while longer won’t make much difference in mitigating the loss of biodiversity. The real problem is human population pressure generally—overharvesting, habitat destruction, pesticide abuse, species invasion, and so forth. Slowing man-made extinctions in a meaningful way would require drastically reducing the world’s human population. That is unlikely to happen.

### Ext: Coral is resilient

#### Coral is resilient – empirics prove

**Dove et. al. 9** (Sophie, researcher at the Centre for Marine Studies and Australian Research Council Centre of Excellence for Coral Reef Studies, et. al., “Doom and Boom on a Resilient Reef: Climate Change, Algal Overgrowth and Coral Recovery,” 3/19, http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0005239)

Inshore, high latitude coral reefs of the largest reef system in the world, the Great Barrier Reef (GBR), Australia, suffered severe mass bleaching of coral in early 2006. Reefs in the area exhibit low coral species diversity and are widely dominated by Acropora corals, with branching Acropora accounting for more than 90% of the coral species [21]. Sea surface temperatures in the inshore reefs of the Keppel Islands (23°10′S, 151°00′E) in the southern GBR rose rapidly in late 2005, with some locations reaching temperatures in December that are not normally found until February. The onset of high sea temperatures early in the season triggered coral bleaching by mid January 2006 [22]. Overall, bleaching damage was severe, affecting 77–95% of coral colonies [22], [23]. The purpose of this paper was to document some novel mechanisms for coral reef resilience based on changes in coral and seaweed abundance following the 2006 mass coral bleaching event that affected reefs of the Keppel Islands.¶ Results and Discussion Top¶ Abundance of corals and seaweeds showed strong dynamics in response to the warming-induced mass coral bleaching event (Figs. 1, 2). Cover of bleached but living coral (mainly branching Acropora spp.) on the reef slopes of Middle Island, Halfway Island, and Barren Island was high (77%–89%) during the bleaching event in January/February 2006. Five months after the onset of bleaching, coral cover was severely reduced, to values around 20–30% by July–August 2006. The coral mortality was followed by an extraordinary bloom of the brown seaweed Lobophora variegata, apparently unprecedented in magnitude on the GBR (GDP and LM personal observations, Fig. 2). This alga commonly grows between the branches of most Acropora colonies in the area, but under normal (i.e. undisturbed) conditions it is not able to grow beyond the base of the branches, probably due to competitive inhibition by the corals. Previous work on L. variegata growing amongst branching Porites cylindrica corals showed that the interaction is competitive, with both coral and alga inhibiting growth of the other [24], [25]. However, seaweeds and algal turfs were apparently released from space competition with the corals due to the bleaching mortality [9] and dramatically increased in cover (200–300% increase on Middle Island and Halfway Island) by August 2006. Importantly, coral bleaching preceded L. variegata overgrowth, and overgrowth only took place on bleached or dead corals at a range of spatial scales (from cm to 10 s of kilometers; careful inspection showed negligible overgrowth of healthy coral). Nonetheless, the seaweed apparently exacerbated coral mortality by overgrowing stressed coral tissue [24]–[26] (Figure S1D). Algal competitiveness may have been enhanced by uptake of nutrients and carbon generated by the coral mortality [27]. There are no previous observations of such an extensive bloom of L. variegata, or indeed any single species of fleshy alga, on the GBR, although large-scale blooms of filamentous algal turfs have occurred following coral mortality [9], [28], [29], and a small-scale bloom of a red seaweed was recorded in response to a ship-grounding [30]. Blooms of L. variegata are common in the Caribbean, particularly after the die-off of the sea urchin Diadema [14], [31] and following coral mortality [32], [33] (also personal observations in Islas del Rosario, Colombia and Flower Garden Banks, Gulf of Mexico, GDP and LM).¶ Unexpectedly, the rapid reversal and increase in coral cover did not involve settlement and recruitment of coral larvae. Coral recruitment was generally very low throughout the course of the study at all sites [recruit densities for Middle, Halfway, Barren and North Keppel Islands were 0, <1, <1 and 4 recruits m−2 respectively; Kruskal-Wallis Test indicated no increases in recruit densities through time after the bleaching event, Table 2]. Instead, coral recovery involved a rapid regeneration and regrowth of remnant coral tissue after bleaching mortality, with branches of Acropora emerging from the algal mat to reestablish high cover much faster than could occur from growth of new recruits (Figs. 2, 3). Growth rates of branching Acropora from the Keppel Islands appear unusually high, with rates of calcification nearly 100% faster than those of corals from offshore the GBR (Fig. 4). Linear extension rates of branching Acropora from other Pacific inshore reefs are also extraordinarily high, with mean values of 333 (±42 SD) mm/year [34]. This rapid, vegetative regeneration allowed the corals to out-compete and overgrow the algae settled on dead skeletons.We propose that this unusually rapid and successful regrowth stems from several key factors: i. the strong competitive ability of the corals; ii. the corals' ability to regrow from relatively small amounts of live tissue; iii. and a seasonal dieback in the single species of dominant seaweed. Although overgrowth by seaweeds probably inhibited coral growth, a natural seasonal decline in L. variegata, between December 2006 and March/April 2007 (Fig. 2), markedly reduced the apparent effects of this competitive inhibition. Cover of L. variegata decreased significantly from 50% to <20% in Middle Island and from 75% to 45% in North Keppel Island during that period of time (Table 1; P<0.005 for Tukey's comparisons of August 2006 and March/April 2007 for both islands).

### A2: Scientific concensus = warming

#### Scientific consensus doesn’t matter – they all use the same false assumptions and models

**Spencer 9** (Roy, former climatologist at NASA, “The MIT Global Warming Gamble,” May, http://www.drroyspencer.com/2009/05/the-mit-global-warming-gamble/)

True, there are many scientists who really do think our tinkering with the climate system through our greenhouse gas emissions is like playing Russian roulette. But the climate system tinkers with itself all the time, and the climate has managed to remain stable. There are indeed internal, chaotic fluctuations in the climate system that might appear to be random, but their effect on the whole climate system are constrained to operate within a certain range. If the climate system really was that sensitive, it would have forced itself into oblivion long ago. The MIT research group pays lip service to relying on “peer-reviewed science”, but it looks like they treat peer-reviewed scientific publications as random events, too. If 99 papers have been published which claim the climate system is VERY sensitive, but only 1 paper has been published that says the climate system is NOT very sensitive, is there then a 99-in-100 (99%) chance that the climate system is very sensitive? NO. As has happened repeatedly in all scientific disciplines, it is often a single research paper that ends up overturning what scientists thought they knew about something. In climate research, those 99 papers typically will all make the same assumptions, which then pretty much guarantees they will end up arriving at the same conclusions. So, those 99 papers do not constitute independent pieces of evidence. Instead, they might be better described as evidence that ‘group think’ still exists. It turns out that the belief in a sensitive climate is not because of the observational evidence, but in spite of it. You can start to learn more about the evidence for low climate sensitivity (negative feedbacks) here. As the slightly-retouched photo of the MIT research group shown above suggests, I predict that it is only a matter of time before the climate community placing all its bets on the climate models is revealed to be a very bad gamble.

# \*\*\*Biodiversity\*\*\*

### Biodiversity resilient

#### Biodiversity resilient – ecosystems will recover from damage

McDermott 2009 (Mat, Editor for Business and Energy sections; Master Degree from NYU’s Center for Global Affairs in environment and energy policy. May, 27, 2009: “Good News: Most Ecosystems Can Recover in One Lifetime from Human-Induced or Natural Disturbance”; <http://www.treehugger.com/natural-sciences/good-news-most-ecosystems-can-recover-in-one-lifetime-from-human-induced-or-natural-disturbance.html> DA: 7/10/2012)

There's a reason the phrase "let nature take its course" exists: New research done at the Yale University School of Forestry & Environmental Science reinforces the idea that ecosystems are quiet resilient and can rebound from pollution and environmental degradation. Published in the journal PLoS ONE, the study shows that most damaged ecosystems worldwide can recover within a single lifetime, if the source of pollution is removed and restoration work done. The analysis found that on average forest ecosystems can recover in 42 years, while in takes only about 10 years for the ocean bottom to recover. If an area has seen multiple, interactive disturbances, it can take on average 56 years for recovery. In general, most ecosystems take longer to recover from human-induced disturbances than from natural events, such as hurricanes.

To reach these recovery averages, the researchers looked at data from peer-reviewed studies over the past 100 years on the rate of ecosystem recovery once the source of pollution was removed.

Interestingly, the researchers found that it appears that the rate at which an ecosystem recovers may be independent of its degraded condition: Aquatic systems may recover more quickly than, say, a forest, because the species and organisms that live in that ecosystem turn over more rapidly than in the forest.

As to what this all means, Oswald Schmitz, professor of ecology at Yale and report co-author, says that this analysis shows that an increased effort to restore damaged ecosystems is justified, and that:

Restoration could become a more important tool in the management portfolio of conservation organizations that are entrusted to protect habitats on landscapes.

We recognize that humankind has and will continue to actively domesticate nature to meet its own needs. The message of our paper is that recovery is possible and can be rapid for many ecosystems, giving much hope for a transition to sustainable management of global ecosystems.

### Biodiversity loss inev

#### Overshoot makes the impact inevitable

**Mora and Sale 11** (Camilo, Department of Biology, Dalhousie University, and Peter, Institute for Water, Environment and Health, United Nations University, “Ongoing global biodiversity loss and the need to move beyond protected areas: a review of the technical and practical shortcomings of protected areas on land and sea,” 6/28, http://www.int-res.com/articles/theme/m434p251.pdf)

The causes of biodiversity loss are varied and some are unlikely to be regulated as part of the management of a PA (see Fig. 3). Developing actions to address those other threats requires increased research and attention, but that is not addressed here (see Mora et al. 2009, Butchart et al. 2010). It is clear from the on going loss of biodiversity (Fig. 1) that current conservation efforts, whether through PAs alone or in combination with other approaches, are not coping with the challenge. The data also indicate that the likelihood of success is small unless the conservation community radically rethinks the strategies needed. One could safely argue that biodiversity threats are ultimately determined by the size of the world’s human population and its consumption of natural resources (Fig. 3). The explosive growth in the world’s human population in the last century has led to an increasing demand on the Earth’s ecological resources and a rapid decline in biodiversity (Fig. 3). According to recent estimates, about 1.2 Earths would be required to support the different demands of the 5.9 billion people living on the planet in 1999 (our Fig. 4, Kitzes et al. 2008). This ‘excess’ use of the Earth’s resources or ‘overshoot’ is possible because resources can be harvested faster than they can be replaced and because waste can accumulate (e.g. atmospheric CO2). The cumulative overshoot from the mid-1980s to 2002 resulted in an ‘ecological debt’ that would require 2.5 planet Earths to pay (Kitzes et al. 2008). In a business-as-usual scenario, our demands on planet Earth could mount to the productivity of 27 planets Earth by 2050 (Fig. 4). Exceeding ecological demand beyond regenerative levels leads to the degradation of ecological capital (Kitzes et al. 2008), which is evident in the ongoing declining trend in biodiversity (Fig. 3).

#### Biodiversity loss inevitable – past conservation failures prove

The Nature Conservancy 10 (Apr 29, http://www.mnn.com/earth-matters/wilderness-resources/stories/new-study-biodiversity-continues-to-decline-worldwide)

Species continue to be lost at steady rates across nearly every habitat type on Earth — this despite an international commitment eight years ago to significantly reduce the rate of such losses by 2010, according to a new study coauthored by a Nature Conservancy scientist. The study, published today in Science magazine, is the first to comprehensively measure progress toward achieving the goals of the Convention on Biological Diversity (CBD), a treaty that pledged to significantly reduce 2002 rates of biodiversity loss by this year toward the end of alleviating global poverty. The study’s authors found that virtually all of the indicators of the state of biodiversity — everything from species’ population trends to extinction risk to habitat conditions — have declined since 2002. Alarmingly, these declines have continued despite increases in policies and funds to promote biodiversity, write the authors. The drivers for these declines include invasive alien species, the impacts of climate change and aggregate human consumption of Earth’s ecological assets.

#### Bio–D extinction inevitable and It’s impossible to solve without targeting an assortment of different types of localized Species in different areas

**Center for Biological Diversity 9** (Based in Tucson, Arizona, is a nonprofit membership organization with approximately 220,000 members and online activists, known for its work protecting endangered species through legal action and scientific petitions. “THE EXTINCTION CRISIS,” <http://www.biologicaldiversity.org/programs/biodiversity/elements_of_biodiversity/extinction_crisis/index.html>)

It’s frightening but true: Our planet is now in the midst of its sixth mass extinction of plants and animals — the sixth wave of extinctions in the past half-billion years. We’re currently experiencing the worst state of species die-offs since the loss of the dinosaurs 65 million years ago. Although extinction is a natural phenomenon, it occurs at a natural “background” rate of about one to five species per year. Scientists estimate we’re now losing species at 1,000 to 10,000 times the background rate, with literally dozens going extinct every day [1]. It could be a scary future indeed, with as many as 30 to 50 percent of all species possibly heading toward extinction by mid-century [2].¶ Unlike past mass extinctions, caused by events like asteroid strikes, volcanic eruptions, and natural climate shifts, the current crisis is almost entirely caused by us — humans. In fact, 99 percent of currently threatened species are at risk from human activities, primarily those driving habitat loss, introduction of exotic species, and global warming [3]. Because the rate of change in our biosphere is increasing, and because every species’ extinction potentially leads to the extinction of others bound to that species in a complex ecological web, numbers of extinctions are likely to snowball in the coming decades as ecosystems unravel. ¶ Species diversity ensures ecosystem resilience, giving ecological communities the scope they need to withstand stress. Thus while conservationists often justifiably focus their efforts on species-rich ecosystems like rainforests and coral reefs — which have a lot to lose — a comprehensive strategy for saving biodiversity must also include habitat types with fewer species, like grasslands, tundra, and polar seas — for which any loss could be irreversibly devastating. And while much concern over extinction focuses on globally lost species, most of biodiversity’s benefits take place at a local level, and conserving local populations is the only way to ensure genetic diversity critical for a species’ long-term survival.

#### Bio-d extinction inevitable – Humans driving species extinct faster than new species can evolve.

**Jowit 10** (Juliette, political correspondent for the Guardian, “Humans driving extinction faster than species can evolve, say experts,” 3/7, http://www.guardian.co.uk/environment/2010/mar/07/extinction-species-evolve)

For the first time since the dinosaurs disappeared, humans are driving animals and plants to extinction faster than new species can evolve, one of the world's experts on biodiversity has warned.¶ Conservation experts have already signalled that the world is in the grip of the "sixth great extinction" of species, driven by the destruction of natural habitats, hunting, the spread of alien predators and disease, and climate change.¶ However until recently it has been hoped that the rate at which new species were evolving could keep pace with the loss of diversity of life. Speaking in advance of two reports next week on the state of wildlife in Britain and Europe, Simon Stuart, chair of the Species Survival Commission for the International Union for the Conservation of Nature – the body which officially declares species threatened and extinct – said that point had now "almost certainly" been crossed. "Measuring the rate at which new species evolve is difficult, but there's no question that the current extinction rates are faster than that; I think it's inevitable," said Stuart.¶ The IUCN created shock waves with its major assessment of the world's biodiversity in 2004, which calculated that the rate of extinction had reached 100-1,000 times that suggested by the fossil records before humans.¶

#### Bio-d calculated risk claims are mathematically flawed, empirically wrong, lowly warranted, and essentially arbitrary

**Knight 12** (Richard, PHD in Ecology/Zoology, University of Wisconsin, “Biodiversity loss: How accurate are the numbers?”4/24, http://www.bbc.co.uk/news/magazine-17826898)

One statement on the Convention's website claims: "We are indeed experiencing the greatest wave of extinction since the disappearance of the dinosaurs."¶ While that may (or may not) be true, the next sentence is spuriously precise: "Every hour three species disappear. Every day up to 150 species are lost."¶ Even putting aside the apparent mathematical error in that claim (on the face of it, if three species are disappearing every hour, 72 would be lost every day) there is an obvious problem in generating any such number. No-one knows how many species exist. And if we don't know a species exists, we won't miss it when it's gone.¶ "Current estimates of the number of species can vary from, let's say, two million species to over 30 or even 100 million species," says Dr Braulio Dias, executive secretary of the Convention on Biological Diversity. "So we don't have a good estimate to an order of magnitude of precision," he says.¶ Continue reading the main story¶ “¶ Start Quote¶ Extinction rates vary a lot”¶ Prof Georgina Mace¶ Imperial College London¶ It is possible to count the number of species known to be extinct. The International Union for Conservation of Nature (IUCN) does just that. It has listed 801 animal and plant species (mostly animal) known to have gone extinct since 1500.¶ But if it's really true that up to 150 species are being lost every day, shouldn't we expect to be able to name more than 801 extinct species in 512 years?¶ Professor Georgina Mace, who works in the Centre for Population Biology at Imperial College London, says the IUCN's method is helpful but inadequate. "It is never going to get us the answers we need," she says. That's why scientists prefer to use a mathematical model to estimate species loss.¶ Recently, however, that model has been attacked in the pages of Nature. Professor Stephen Hubbell from the University of California, Los Angeles, says that an error in the model means that it has - for years - over-estimated the rate of species loss.¶

#### Biodiversity loss inevitable – extinction debts mean that species will go extinct no matter what efforts are taken

Sample 7/12/2012 (Ian Sample, Science Correspondent for ‘The Guardian’. “Amazon's doomed species set to pay deforestation's 'extinction debt'” <http://www.guardian.co.uk/environment/2012/jul/12/amazon-deforestation-species-extinction-debt?newsfeed=true> DA: 7/13/2012)

The destruction of great swaths of the Brazilian Amazon has turned scores of rare species into the walking dead, doomed to disappear even if deforestation were halted in the region overnight, according to a new study.

Forest clearing in Brazil has already claimed casualties, but the animals lost to date in the rainforest region are just one-fifth of those that will slowly die out as the full impact of the loss of habitat takes its toll. In parts of the eastern and southern Amazon, 30 years of concerted deforestation have shrunk viable living and breeding territories enough to condemn 38 species to regional extinction in coming years, including 10 mammal, 20 bird and eight amphibian species, scientists found.

The systematic clearance of trees from the Amazon forces wildlife into ever-smaller patches of ground.

Though few species are killed off directly in forest clearances, many face a slower death sentence as their breeding rates fall and competition for food becomes more intense.

Scientists at Imperial College, London, reached the bleak conclusion after creating a statistical model to calculate the Brazilian Amazon's "extinction debt", or the number of species headed for extinction as a result of past deforestation. The model draws on historical deforestation rates and animal populations in 50 by 50 kilometre squares of land.

It stops short of naming the species most at risk, but field workers in the region have drawn attention to scores of creatures struggling to cope with habitat destruction and other environmental threats.

White-cheeked spider monkeys, which feed on fruits high in the forest canopy, are endangered largely because of the expansion of farmland and road building. The population of Brazilian bare-faced tamarins has halved in 18 years, or three generations, as cities, agriculture and cattle ranching has pushed into the rainforest. The endangered giant otter, found in the slow-moving rivers and swamps of the Amazon, faces water pollution from agricultural runoff and mining operations in the area.

Writing in the journal Science, Robert Ewers and his co-authors reconstructed extinction rates from 1970 to 2008, and then forecast future extinction debts under four different scenarios, ranging from "business as usual" to a "strong reduction" in forest clearance, which required deforestation to slow down 80% by 2020.

"For now, the problem is along the arc of deforestation in the south and east where there is a long history of forest loss. But that is going to move in the future. We expect most of the species there to go extinct, and we'll pick up more extinction debt along the big, paved highways which are now cutting into the heart of the Amazon," Ewers told the Guardian from Belém, northern Brazil.

Under the "business as usual" scenario, where around 62 sq miles (160 sqkm) of forest are cleared each year, at least 15 mammal, 30 bird and 10 amphibian species were expected to die out locally by 2050, from around half of the Amazon. Under the most optimistic scenario, which requires cattle ranchers and soy farmers to comply with Brazilian environmental laws, the extinction debt could be held close to 38 species.

Ewers said the model reveals hotspots in the Brazilian Amazon where conservation efforts should be focused on the most vulnerable wildlife. "This shows us where we are likely to have high concentrations of species which are all in trouble, and that becomes a way for directing our conservation efforts. We are talking about an extinction debt. Those species are still alive, so we have an opportunity to get in there and restore the habitat to avoid paying that debt," Ewers said.

The Brazilian Amazon is home to 40% of the world's tropical forest and one of the most biodiverse regions on the planet. About 54% of the area is under environmental protection, and in the past five years, stricter controls and better compliance have driven deforestation rates down to a historical low.

The trend towards less deforestation might not last though. Under pressure from the financial crisis, the Brazilian government has proposed a rapid development programme in the Amazon to fuel the economy. The move foresees the construction of more than 20 hydroelectric power plants in the Amazon basin and an extensive push into the rainforest.

Environmentalists are further concerned about an overhaul to Brazil's Forest Code, which is widely expected to weaken the protection of the rainforest, and potentially speed up deforestation once more, according to an accompanying article in Science by Thiago Rangel, an ecologist at the Federal University of Goiás in Brazil. "Extinction debts in the Brazilian Amazon are one debt that should be defaulted on," he writes.

Reducing the rate that extinction debts build up is not enough to preserve the Amazon's biodiversity, Rangel argues. "The existing debt may eventually lead to the loss of species. To prevent species extinctions, it is necessary to take advantage of the window of opportunity for forest regeneration. Restored or regenerated forests initially show lower native species richness than the original forests they replaced, but they gradually recover species richness, composition and vital ecosystems functions, reducing extinction debt and mitigating local species loss," he writes.

### Protections Fail

#### Protections fail – four reasons

-Don’t cover enough land, too long timeframe, no funding, trade off with development

**UNU 11** (United Nations University publication, “Ongoing Global Biodiversity Loss Unstoppable with Protected Areas Alone: Study,” 7/28, http://www.sciencenewsline.com/nature/2011072817400007.html)

The study says continuing heavy reliance on the protected areas strategy has five key technical and practical limitations: Expected growth in protected area coverage is too slow While over 100,000 areas are now protected worldwide, strict enforcement occurs on just 5.8% of land and 0.08% of ocean. At current rates, it will take between 185 years in the case of land and 80 years for oceans to cover 30% of the world's ecosystems with protected areas - a minimum target widely advocated for effective biodiversity conservation. This slow pace contrasts sharply with the rapid growth of threats, including climate change, habitat loss and resource exploitation, predicted to cause the extinction of many species even before 2050. The size and connectivity of protected areas are inadequate To ensure species' survival, protected areas must be sufficiently large to sustain viable populations in the face of the inevitable mortality of some individuals trespassing their borders, and areas must be close enough together for a healthy exchange of individuals among protected populations. Globally, however, over 30% of the protected areas in the ocean, and 60% on land are smaller than 1 square kilometer - too small for many larger species. And they tend to be too far apart to allow a sufficient exchange among populations for most species. Protected areas only ameliorate certain human threats Biodiversity loss is triggered by a host of human stressors including habitat loss, overexploitation, climate change, pollution and invasive species. Yet protected areas are useful primarily against overexploitation and habitat loss. Since the remaining stressors are just as deleterious, biodiversity can be expected to continue declining as it has done until now. The study shows that approximately 83% of protected areas on the sea and 95% of protected areas on land are located in areas with continuing high impact from multiple human stressors. Underfunding Global expenditures on protected areas today are estimated at US $6 billion per year and many areas are insufficiently funded for effective management. Effectively managing existing protected areas requires an estimated $24 billion per year - four times current expenditure. Despite strong advocacy for protected areas, budget growth has been slow and it seems unlikely that it will be possible to raise funding appropriate for effective management as well as for creation of the additional protected areas as is advocated. Conflicts with human development Humanity's footprint on Earth is ever expanding in efforts to meet basic needs like housing and food. If it did prove possible to place the recommended 30% of world habitats under protection, intense conflicts with competing human interests are inevitable - many people would be displaced and livelihoods impaired. Forcing a trade-off between human development and sustaining biodiversity is unlikely to lead to a solution with biodiversity preserved.

#### Protected area’s effectiveness overestimated – IUCN definitions, inconsistent measures, and variable statistics

Gaston et al. 2008 ( Kevin J. Gaston, Biodiversity & Macroecology Group, Department of Animal & Plant Sciences, University of Sheffield, Sarah F. Jackson, Penny Anderson Associates Ltd., Park Lea, Buxton, Derbyshire, Lisette Cantu-Salazar, Biodiversity & Macroecology Group, Department of Animal & Plant Sciences, University of Sheffield, Gabriela Cruz-Pinon, Biodiversity & Macroecology Group, Department of Animal & Plant Sciences, University of Sheffield. 11/6/2012. “The Ecological Performance of Protected Areas”; <http://www.cebem.org/cmsfiles/articulos/Gaston_et_al_2008.pdf> DA: 7/12/2012)

Much of the Earth’s surface has been transformed by human activities. Most obviously this has¶ involved extensive destruction of natural habitat. However, even where the primary components¶ of habitats have been retained they have often been degraded, and assemblage structures have additionally¶ been altered through direct exploitation and the introduction of alien species. Whether¶ at local, regional, or global scales, a key strategy for protecting biodiversity from such pressures has¶ been the establishment and maintenance of protected areas. Indeed, in recent decades substantial¶ time, effort, and resources have been invested in prioritizing areas for such designation, in the¶ establishment of protected areas, and in their management.¶

The situation is constantly changing, syntheses are heavily constrained by the availability and¶ accuracy of data, and much rests on precisely how such areas are defined. Nonetheless, a recent¶ summary estimates that worldwide there are more than 106,000 legally designated (statutory)¶ protected areas, covering more than 19.6 million km2, equivalent to ∼3.8% of the Earth’s overall¶ surface area and ∼11.6% of the total area of countries and their territorial waters (WDPA 2006).¶ This comprises total coverages of terrestrial and marine systems approximately equal to the areas¶ of South America and of the Caribbean Sea, respectively. Such statistics are impressive, particularly¶ with regard to terrestrial regions, and the designation of protected areas arguably constitutes “one¶ of the most stunning conservation successes of the twentieth century” (Ervin 2003a).¶

Aside from limitations on the quality of the data, inevitably there are some crucial caveats¶ on these observations, including that: (a) a substantial proportion (about a quarter) of the total¶ coverage by protected areas comprises those categorized by the IUCN (1994) as “protected landscape/¶ seascape” (managed mainly for landscape/seascape and recreation) and “managed resource¶ protected area” (managed mainly for the sustainable use of natural ecosystems), and thus are¶ typically of conspicuously less value for biodiversity conservation and are not protected areas in¶ the strict sense normally employed in conservation biology; (b) there are other areas (particularly¶ nonstatutory), albeit of substantially smaller total extent, that do not fall within the general IUCN¶ definition of a protected area (“an area of land and/or sea especially dedicated to the protection and¶ maintenance of biological diversity, and of natural and associated cultural resources, and managed¶ through legal or other effective means”; IUCN 1994) but doubtless effectively function as such;¶ (c) the gross statistics hide great variation both globally and regionally in the spatial distribution of¶ protected areas (Figures 1 and 2); and (d ) areal coverages per se convey little, if anything, about¶ the contribution that protected areas are actually making to conservation.¶

Given the heavy reliance that conservation strategies place on protected areas, and the high¶ levels of investment that have obviously been made in them (including in terms of forgone opportunities¶ for other kinds of land use), it is important to understand how effectively they are¶ performing. The literature on this topic is large, but extremely scattered and with little in the way¶ of attempted syntheses. In this review, acknowledging that other axes of performance may also¶ be considered important (e.g., cultural, economic, social), we examine what is known particularly¶ about the ecological performance of protected areas for biodiversity conservation. In so doing, we¶ endeavor to integrate both terrestrial and marine perspectives, although the associated literatures¶ tend to be quite distinct.

#### Current measures to protect biodiversity fail because they neglect to ensure genetic diversity

Bell and Okamura 2005 (J.J Bell, Institute of Biological Sciences, University of Wales, Beth Okamura, University Professor, School of Biological Sciences, The University of Reading. May 22, 2005. “Low genetic diversity in a marine nature reserve: re-evaluating diversity criteria in reserve design”; <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1599875/> DA: 7/12/2012)

The designation of protected areas is one of the most important tools used in marine conservation, but the main focus of the conservation effort is usually directed towards the protection of a specific species, habitat or biodiversity hotspot, and mostly overlooks genetic diversity (e.g. Kelleher & Kenchington 1991). Marine reserve management and designation have received renewed interest in recent years, with studies focusing on issues such as the persistence of reserve populations, recruitment processes and the potential for self-seeding (Palumbi 2001, 2003; Dethier et al. 2002; Palumbi et al. 2003). However, despite new insights into reserve function and ecology, little attention has focused on whether current marine reserves are suitable for conserving genetic diversity, or the extent that genetic variation of a species is represented in protected populations. Indeed, until recently, the field of conservation genetics has centred primarily on terrestrial ecosystems (Soulé & Terborgh 1999; Pullin 2002), with reserve designation focusing on preserving habitat while maintaining connectivity between populations (Frankham et al. 2003). The direct application of these principles to marine ecosystems is problematic because of the different characteristics these environments display (Carr et al. 2003).

#### Genetic diversity is lost in protected areas, harming overall resilience to changing environmental conditions

Bell and Okamura 2005 (J.J Bell, Institute of Biological Sciences, University of Wales, Beth Okamura, University Professor, School of Biological Sciences, The University of Reading. May 22, 2005. “Low genetic diversity in a marine nature reserve: re-evaluating diversity criteria in reserve design”; http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1599875/ DA: 7/12/2012)

Our results clearly demonstrate that a lack of genetic exchange, inbreeding and reduced genetic diversity characterize a marine-reserve population. This demonstration confirms that degree of isolation may well be an important consideration in reserve management and design, particularly with regard to the long-term sustainability of benthic invertebrate populations in relatively isolated sites, and the ability of such sites to act as sources of propagules for surrounding areas (Palumbi 2003; Shanks et al. 2003). Another potential outcome gained by genetic investigation is the demonstration of genetic distinctiveness of populations. In our case, there was no evidence for unique alleles in the reserve population. Thus, there are a number of ways in which genetic investigations may complement existing biological and ecological considerations to enable effective conservation and management of the marine environment (Palumbi 2003).

It is important to conserve genetic diversity since it provides the raw material for the maintenance of species over longer evolutionary time-scales, and is also of particular relevance at present in terms of providing the basis for responses to rapid environmental change (e.g. climate), since reduced genetic diversity has been correlated with decreased fitness (e.g. Hoelzel et al. 2002). There is no doubt that Lough Hyne populations are smaller and more isolated than populations in most marine reserves, and that these features almost certainly account for the relatively high levels of inbreeding, reduced genetic diversity and isolation for the N. lapillus population reported here. Population size and isolation may be of reduced concern in large-scale reserves, such as occur in the Great Barrier Reef, but isolation versus connectivity remains a relevant issue for networks of marine reserves (Palumbi 2003; Shanks et al. 2003). Thus, although our data may be representative of a relatively extreme situation, they nevertheless provide a case study demonstrating a lack of genetic exchange, inbreeding and reduced genetic diversity in an isolated reserve population. It is therefore of great interest to determine whether such patterns similarly pertain to populations in other existing and proposed marine reserves which are topographically isolated, including islands, sea mounts, bays, lagoons and other sea loughs.

#### Focus on protected areas kills public support and prevents more effective solutions

**UNU 11** (United Nations University publication, “Ongoing Global Biodiversity Loss Unstoppable with Protected Areas Alone: Study,” 7/28, http://www.sciencenewsline.com/nature/2011072817400007.html)

"While many protected areas have helped preserve some species at local scales, promotion of this strategy as a global solution to biodiversity loss, and the advocacy of protection for specific proportions of habitats, have occurred without adequate assessment of their potential effectiveness in achieving the goal." Drs. Mora and Sale warn that long-term failure of the protected areas strategy could erode public and political support for biodiversity conservation and that the disproportionate allocation of available resources and human capital into this strategy precludes the development of more effective approaches. The authors based their study on existing literature and global data on human threats and biodiversity loss. "The global network of protected areas is a major achievement, and the pace at which it has been achieved is impressive," says Dr. Sale. "Protected areas are very useful conservation tools, but unfortunately, the steep continuing rate of biodiversity loss signals the need to reassess our heavy reliance on this strategy."

#### Protected areas not enough to stem biodiversity loss

Mora and Sale 2011 (Camilo Mora, Department of Biology at Dalhousie University, Halifax, Nova Scotia. Peter F. Sale, Institute for Water, Environment and Health, United Nations University, Port Carling, Ontario. July 28, 2011. “Ongoing global biodiversity loss and the need to move beyond protected areas: a review of the technical and practical shortcomings of protected areas on land and sea” <http://www.int-res.com/articles/theme/m434p251.pdf> DA: 7/12/2012)

A strategy at the forefront of biodiversity conservation¶ is the use of protected areas (PAs) (Pimm et al.¶ 2001, Gaines et al. 2010). The rationale is that by¶ reducing habitat loss and mortality due to harvesting,¶ populations can grow and individuals can survive¶ longer (also often getting larger) and produce more¶ offspring. The theoretical basis for these results is¶ grounded on the simple fact that the size of a population¶ is determined by the balance between mortality,¶ natality, immigration and emigration and that, therefore,¶ reducing mortality and ensuring suitable habitats¶ should increase the size and number of individuals living¶ within a PA. The frequently documented empirical¶ corroboration of this rationale (Halpern & Warner¶ 2002, Lubchenco et al. 2003, 2007, Micheli et al. 2004,¶ Lester et al. 2009) has sparked interest in, and strong¶ advocacy for, the creation of more PAs to reduce ongoing¶ biodiversity losses (Pimm et al. 2001, Lubchenco et¶ al. 2003, 2007, Chape et al. 2005, Game et al. 2009,¶ Lester et al. 2009, Gaines et al. 2010, Gray 2010).¶ Unfortunately, this interest has grown without full consideration¶ of the shortcomings of PAs. Although¶ numerous reviews and meta-analyses have built the¶ case for increased use of PAs (Pimm et al. 2001,¶ Halpern & Warner 2002, Lubchenco et al. 2003, 2007,¶ Micheli et al. 2004, Lester et al. 2009, Gaines et al.¶ 2010), few have dealt with failures of PAs or with the¶ general effectiveness of PAs at halting global biodiversity¶ loss. Evaluation of the performance of PAs is critical¶ since failure of PAs to protect biodiversity could¶ erode public and political support for conservation.¶ Additionally, PA performance evaluations will help de -¶ termine whether alternative approaches are necessary¶ while providing the justification to reallocate available¶ conservation resources and human capital to them.

Here we review the literature and use available data¶ to show that globally the use of PAs is not going to be¶ sufficient, by itself, to offset the ongoing loss of biodiversity,¶ and we identify the various practical and technical¶ difficulties that may explain this. The limitations¶ outlined here are similar for terrestrial and marine protected¶ areas (MPAs); however, while we provide a terrestrial¶ parallel in most cases we focus primarily on¶ MPAs. The paper finishes with a scenario analysis of¶ human population density and human consumption,¶ which suggests that without an effort to directly ad -¶ dress our overall appropriation of resources, we will be¶ unable to stem biodiversity loss. We caution that we do¶ not advocate abandoning the creation and use of PAs,¶ particularly where they are preventing imminent¶ extinctions or the loss of critical habitats, and where¶ there is the capacity to manage them appropriately.¶ Rather, we suggest that a concerted global effort to stabilize¶ human population growth, reduce consumption¶ and increase the Earth’s biocapacity (e.g. by making¶ current production endeavors more efficient through,¶ for instance, transference of technology; Kitzes et al.¶ 2008) offers the clearest path under which humanity¶ could achieve sustainability on Earth before 2050—¶ renewed efforts toward these aims should provide¶ definitive solutions to reverse ongoing biodiversity loss¶ triggered by the expansion and increasing intensity of¶ human stressors.

#### Protected areas fail to maintain biodiversity growth – extinction debts prevent stable, long-term growth

Mora and Sale 2011 (Camilo Mora, Department of Biology at Dalhousie University, Halifax, Nova Scotia. Peter F. Sale, Institute for Water, Environment and Health, United Nations University, Port Carling, Ontario. July 28, 2011. “Ongoing global biodiversity loss and the need to move beyond protected areas: a review of the technical and practical shortcomings of protected areas on land and sea” <http://www.int-res.com/articles/theme/m434p251.pdf> DA: 7/12/2012)

Most of the enthusiasm for establishing new PAs¶ derives from results of meta-analyses showing greater¶ richness and/or abundance (or biomass) of species¶ within than outside individual PAs (Halpern & Warner¶ 2002, Lubchenco et al. 2003, 2007, Micheli et al. 2004,¶ Lester et al. 2009). Yet numerous studies of PAs show¶ that such an effect is not universal (Newmark 1987,¶ Rakitin & Kramer 1996, Thouless 1998, Epstein et al.¶ 1999, Meijaard & Nijman 2000, Rivard et al. 2000,¶ Brashares et al. 2001, Rogers & Beets 2001, Woinarski¶ et al. 2001, Caro 2002, Parks & Harcourt 2002, Tupper¶ & Rudd 2002, Edgar et al. 2004, Ashworth & Ormond¶ 2005, McClanahan et al. 2006, Coelho & Manfrino¶ 2007, Guidetti & Sala 2007, Whitfield et al. 2007, Graham¶ et al. 2008, Mora 2008, Western et al. 2009, Mora¶ et al. 2011). This contrast in the outcomes of PAs¶ might be related to differences in the characteristics¶ of PAs such as size and year of implementation (e.g.¶ Micheli et al. 2004, but see Cote et al. 2001), the types¶ of regulations implemented in the PAs (Lester &¶ Halpern 2008), the quality of enforcement (e.g. Jennings¶ et al. 1996, Kritzer 2004) or differences in the¶ species assessed (e.g. harvested vs. non-harvested¶ species [Micheli et al. 2004, Guidetti & Sala 2007] or¶ species exposed to threats other than harvesting¶ [Jones et al. 2004, Graham et al. 2008]). Another suggested¶ possibility is that available information is¶ biased by the tendency to publish significant results¶ (Gaston et al. 2008). Stochastic phenomena or local¶ differences that complicate proper replication (Levin¶ 1992), in combination with the considerable uncertainty¶ of assessing the status and trends of populations¶ (Hall 1998), make small-scale studies particularly prone to large variability. If this is combined with¶ publication biases for significant and expected results,¶ then our knowledge could be significantly biased¶ toward cases where PAs have worked (Gaston et al.¶ 2008). It is possible that PA failures may be just as¶ common. In fact, several recent field studies, sampling¶ groups of PAs using the same sampling methodology,¶ indicate that PA failure may be more the rule than the¶ exception (McClanahan et al. 2006, Mora et al. 2006,¶ 2011, Guidetti & Sala 2007, Graham et al. 2008, Mora¶ 2008, Western et al. 2009). An additional explanation¶ for the contrasts among the observed results for PAs is¶ the possibility of an ‘extinction debt’ within PAs (Hanski¶ & Ovaskainen 2002, Baldi & Voros 2006). According¶ to this idea, initial isolation of biodiversity inside a¶ new PA, while habitat deteriorates outside the boundaries,¶ can lead at first to results showing ‘healthier’¶ populations inside compared to outside. However,¶ over time, populations inside PAs can become nonviable¶ and head toward extinction if they are too¶ small to be self-sustaining or if they cannot persist¶ without occasional input from other nearby (non-protected)¶ sites (Hanski & Ovaskainen 2002, Malanson¶ 2002, Baldi & Voros 2006). The initial extinction debt¶ provides false positive results early on, but eventually,¶ after such debt is paid, the effects of PAs may become¶ negligible or even negative if such isolation leads to¶ inbreeding and a reduction in genetic diversity (Bell¶ & Okamura 2005).

#### Protected areas are failing to prevent biodiversity loss – lack of coverage

Mora and Sale 2011 (Camilo Mora, Department of Biology at Dalhousie University, Halifax, Nova Scotia. Peter F. Sale, Institute for Water, Environment and Health, United Nations University, Port Carling, Ontario. July 28, 2011. “Ongoing global biodiversity loss and the need to move beyond protected areas: a review of the technical and practical shortcomings of protected areas on land and sea” <http://www.int-res.com/articles/theme/m434p251.pdf> DA: 7/12/2012)

At the global scale there are >100 000 PAs (Chape et¶ al. 2005, Jenkins & Joppa 2009). The most recent count¶ indicates that 4435 are MPAs (Wood et al. 2008). The¶ global network of PAs covers 12.9% of the Earth’s land,¶ with 5.8% having strict protection for biodiversity¶ (Jenkins & Joppa 2009), and 0.65% of the world’s¶ oceans, with 0.08% inside no-take MPAs (Wood et al.¶ 2008). Political recommendations about the area of the¶ world’s ecosystems that should be inside PAs vary from¶ 10%, as recommended by the Convention on Biological¶ Diversity, to 30%, as recommended by the 2003¶ World Parks Congress. Ecological arguments vary concerning¶ the amount of space that needs to be protected,¶ reaching as high as 50% of a given area being¶ set aside as PAs (Soulé & Sanjayan 1998). Projections of¶ the rate of creation of PAs in the ocean indicate that the¶ 10% target could be reached by 2067, the 30% target¶ by 2092 (Wood et al. 2008) and the 50% target by¶ about 2105 (extrapolated from Fig. 9 in Wood et al.¶ 2008). Assuming that the current rate of land coverage¶ by new PAs of 0.13% yr–1 (Jenkins & Joppa 2009) holds¶ constant, the 10% target could be achieved by 2043,¶ the 30% target by 2197 and the 50% target by 2351.¶ Note that these calculations may be underestimated as¶ they assume a linear rate of expansion of PA coverage.¶ In reality, we would expect a declining rate because¶ competing societal needs will grow as more and more¶ area is sequestered within PAs; thus, the conservation¶ targets outlined above are likely to be achieved at a¶ much later date. The creation of new PAs is clearly¶ slow and, unfortunately, there are concerns that rushing¶ efforts to meet conservation targets could be¶ counter-productive if they lead to the creation of poorquality¶ PAs or ‘paper parks’ (Wood et al. 2008).¶ Unfortunately, the limited increase in number and/or¶ size of PAs contrasts sharply with the growing extent of¶ human threats. For instance, demand on marine fisheries¶ is projected to increase by 43% by 2030 to supply¶ ongoing food demands (Delgado et al. 2003), while¶ projected CO2 emissions by 2050 are expected to¶ severely impact >80% of the world’s coral reefs (Donner¶ 2009) and affect marine fish communities globally,¶ causing local extinctions and facilitating invasions¶ resulting in changes in species composition of up to¶ 60% (Cheung et al. 2009). On land, the growing¶ human population and demand for housing, food and¶ energy are expected to substantially increase the intensity of stressors associated with the conversion of¶ land cover to agriculture and urbanization, e.g. the¶ release of nutrients and other pollutants, climate¶ warming and altered precipitation (Sala et al. 2000,¶ Millennium Ecosystem Assessment Project at www.¶ maweb. org). In short, the extent of coverage by PAs is¶ still limited and is growing at a slower rate than that at¶ which biodiversity threats are developing.

#### Protected areas fail due to isolation and small areas

Mora and Sale 2011 (Camilo Mora, Department of Biology at Dalhousie University, Halifax, Nova Scotia. Peter F. Sale, Institute for Water, Environment and Health, United Nations University, Port Carling, Ontario. July 28, 2011. “Ongoing global biodiversity loss and the need to move beyond protected areas: a review of the technical and practical shortcomings of protected areas on land and sea” <http://www.int-res.com/articles/theme/m434p251.pdf> DA: 7/12/2012)

Many marine populations operate as a cluster of¶ interconnected populations or metapopulations (Krit -¶ zer & Sale 2006). The protection of these systems¶ requires the design of networks of MPAs that are large¶ enough to avoid the mortality of individuals crossing¶ their borders (Kramer & Chapman 1999, Tupper &¶ Rudd 2002, Palumbi 2004, Sale et al. 2005, Mora 2011)¶ and close enough to each other so that populations can¶ remain viably connected through propagule dispersal¶ (Pal umbi 2003, Shanks et al. 2003, Sale et al. 2005, Steneck¶ et al. 2009, Mora 2011). The conditions of size and¶ spacing of PAs are also critical on land, where PAs¶ need to be sufficiently large to accommodate species’¶ home ranges and complemented with dispersal corridors¶ to ensure population connectivity and the viability¶ of populations (e.g. Buechner 1987, DeFries et al.¶ 2005).¶ Kramer & Chapman (1999) provide an elegant¶ demonstration of the trade-offs between MPA size and¶ the individual home ranges of target species. Given the¶ possibility of individual fish crossing MPA boundaries,¶ fishing outside the MPA can create density gradients¶ inside an MPA. According to their analyses, reducing¶ fishing exposure inside an MPA to 2% of the fishing¶ pressure outside will require MPAs to be 12.5 times¶ larger than the home range of the individuals. Body¶ size relates to home range such that for an average fish¶ of 20 cm an effective MPA would have to be ~1.8 km2¶ (Kramer & Chapman 1999). In the global network¶ of MPAs, about 30% of the MPAs are <1 or 2 km2¶ (Fig. 2a). In this large fraction of the global network of¶ MPAs, even relatively small animals (i.e. fishes¶ ≥20 cm) can be lost directly to harvesting. Populations¶ inside such small MPAs are also more vulnerable to the¶ effects of poaching compared to those in larger ones¶ (Kritzer 2004). The deleterious effects of small PAs, via¶ home ranges overlapping their boundaries, also occur¶ in terrestrial systems (Buechner 1987, Woodroffe &¶ Ginsberg 1998), where nearly 60% of the PAs are¶ <1 km2 (Fig. 2e).¶ The scales of propagule dispersal are perhaps one of¶ the greatest and most crucial unknowns impacting efforts to design effective MPAs (Sale et al. 2005, Steneck¶ et al. 2009). While there is opportunity for very¶ long-distance dispersal, the scales of most propagule¶ dispersal are likely to fall within the order of a few tens¶ of kilometers (Mora & Sale 2002, Palumbi 2003, 2004,¶ Shanks et al. 2003, Cowen et al. 2006, Jones et al.¶ 2007). As such, recommendations about the spacing¶ among MPAs range between 10 to 20 km (Shanks et al.¶ 2003) and 20 to 150 km (Palumbi 2003). At the global¶ scale, the average distance between adjacent (nearest¶ neighbor) MPAs is 42 km (Fig. 2b), although this isolation¶ increases considerably when >1 neighboring MPA¶ is considered (Fig. 2b). For instance, the average distance¶ from any MPA to the nearest 20 MPAs is¶ ~430 km (inset, Fig. 2b). At the global scale, establishing¶ a network of MPAs to ensure coral reef connectivity¶ in the range of 15 km would require nearly 3 times¶ the number of existing MPAs on coral reefs (Mora et al.¶ 2006). On land, PAs are clearly closer together, with¶ >50% of the PAs having their closest PA within <3 km¶ (Fig. 2f); the challenge on land, however, is that the¶ mechanisms of dispersal of most terrestrial animals¶ often require direct connectors (‘dispersal corridors’)¶ between PAs to ensure the viability of populations (e.g.¶ DeFries et al. 2005). In addition to making populations¶ inside PAs non-viable, the consequences of isolation¶ can also include inbreeding and reduction in genetic¶ diversity, further compromising the species’ resilience¶ to disturbances (Bell & Okamura 2005).

#### Major budget and funding shortfalls destroy the potential effectiveness of protected areas

Mora and Sale 2011 (Camilo Mora, Department of Biology at Dalhousie University, Halifax, Nova Scotia. Peter F. Sale, Institute for Water, Environment and Health, United Nations University, Port Carling, Ontario. July 28, 2011. “Ongoing global biodiversity loss and the need to move beyond protected areas: a review of the technical and practical shortcomings of protected areas on land and sea” <http://www.int-res.com/articles/theme/m434p251.pdf> DA: 7/12/2012)

The global funds expended in establishing and managing¶ PAs are estimated at US$6 billion yr–1 (James et¶ al. 1999a), despite a major shortfall relative to the¶ actual requirements for effective management. In¶ developing countries, the deficit for effective management¶ of PAs ranges from 66 to 74% (Bruner et al. 2004),¶ while for MPAs worldwide the current deficit is estimated¶ at ~44.8% (Balmford et al. 2004). Troublingly,¶ increasing the coverage of PAs to cover 20% of the¶ world’s seas would cost on the order of an additional¶ US$12.5 billion yr–1 (Balmford et al. 2004), and an additional¶ US$10.6 billion would be required to cover 15%¶ of the land (James et al. 2001). For land alone, adding¶ the costs of monitoring and compensation for those displaced¶ by PAs would make the annual cost of a comprehensive¶ network of terrestrial PAs on the order of¶ US$300 billion yr–1 (James et al. 1999b). A similar calculation¶ is not available for the ocean, but the price tag¶ could be equal or higher given the larger area of the¶ world’s oceans. Comparison of the expected costs of a¶ well-managed network of PAs with the actual expenditure¶ of US$6 billion annually highlights the clear economic¶ deficit in the current management of PAs, while¶ pinpointing a major vulnerability limiting the chances¶ for their expansion.¶

Procurement of funds to support the establishment¶ and management of PAs is clearly a significant problem,¶ especially if the extent of PAs is to be increased.¶ Balmford & Whitten (2003) analyzed different funding¶ alternatives and concluded that the principal route for¶ covering the costs of conservation will have to be via¶ governments combined with foreign aid from developed¶ nations. Yet governmental investment on PAs has¶ been limited (Balmford et al. 2004, Bruner et al. 2004).¶ Reasons for this include the general lack of economic¶ resources in developing nations, the need to prioritize¶ on seemingly more critical human development issues¶ and the limited political support for projects whose¶ results are not evident within an electoral time frame¶ (Soulé 1991, Wood et al. 2008). The current limited¶ scale of transfer of resources from north to south (Balmford¶ & Whitten 2003) is unlikely to grow in the near¶ future given the current global financial situation and¶ the fact that developed countries face their own deficits¶ in conservation spending (e.g. spending for the effective¶ use of PAs should be increased from US$5.3 to¶ US$12.6 billion annually in developed nations; James¶ et al. 2001). In addition, there is a need for essentially¶ perpetual funding for the management of PAs, and this¶ is the type of expense that is not normally covered by¶ foreign aid (McClanahan 1999). Several studies argue¶ that the full cost of a global network of PAs could be¶ met by redirecting a portion of the government spending¶ on subsidies to fishing and other industries that¶ damage biodiversity, estimated to lie between US$0.95¶ and US$1.45 trillion annually, toward the protection of¶ biodiversity (James et al. 1999b, Balmford et al. 2004).¶ One problem with this argument is that most subsidies¶ are provided in developed nations, while those most in¶ need of conservation funding are in developing countries¶ (James et al. 2001). A second problem is that those¶ subsidies are intended to stimulate local economies or¶ prevent job losses and other socio-economic problems.¶ Removing economic subsidies will require expenditure¶ of considerable political capital, perhaps the reason¶ why subsidies have not been diverted despite their¶ known harm to biodiversity (Myers 1998). In short, the¶ economic cost of an effective global network of PAs is¶ high, whereas the funding sources appear to be limited.

#### Protected areas are failing to stop the loss of global biodiversity and repay our “ecological debt”

Mora and Sale 2011 (Camilo Mora, Department of Biology at Dalhousie University, Halifax, Nova Scotia. Peter F. Sale, Institute for Water, Environment and Health, United Nations University, Port Carling, Ontario. July 28, 2011. “Ongoing global biodiversity loss and the need to move beyond protected areas: a review of the technical and practical shortcomings of protected areas on land and sea” <http://www.int-res.com/articles/theme/m434p251.pdf> DA: 7/12/2012)

The causes of biodiversity loss are varied and some¶ are unlikely to be regulated as part of the management¶ of a PA (see Fig. 3). Developing actions to address¶ those other threats requires increased research and¶ attention, but that is not addressed here (see Mora et¶ al. 2009, Butchart et al. 2010). It is clear from the on -¶ going loss of biodiversity (Fig. 1) that current conservation¶ efforts, whether through PAs alone or in combination¶ with other approaches, are not coping with the¶ challenge. The data also indicate that the likelihood of¶ success is small unless the conservation community¶ radically rethinks the strategies needed. One could¶ safely argue that biodiversity threats are ultimately¶ determined by the size of the world’s human population¶ and its consumption of natural resources (Fig. 3).¶ The explosive growth in the world’s human population¶ in the last century has led to an increasing demand on¶ the Earth’s ecological resources and a rapid decline in¶ biodiversity (Fig. 3). According to recent estimates,¶ about 1.2 Earths would be required to support the different¶ demands of the 5.9 billion people living on the¶ planet in 1999 (our Fig. 4, Kitzes et al. 2008). This¶ ‘excess’ use of the Earth’s resources or ‘overshoot’ is¶ possible because resources can be harvested faster¶ than they can be replaced and because waste can¶ accumulate (e.g. atmospheric CO2). The cumulative¶ overshoot from the mid-1980s to 2002 resulted in an¶ ‘ecological debt’ that would require 2.5 planet Earths¶ to pay (Kitzes et al. 2008). In a business-as-usual¶ scenario, our demands on planet Earth could mount to¶ the productivity of 27 planets Earth by 2050 (Fig. 4).¶ Exceeding ecological demand beyond regenerative¶ levels leads to the degradation of ecological capital¶ (Kitzes et al. 2008), which is evident in the ongoing¶ declining trend in biodiversity (Fig. 3).

Sgro, Lowe, and Hoffmann 2010 (Carla M Sgro, Centre for Environmental Stress & Adaptation Research (CESAR) and Australian Centre for Biodiversity, School of Biological Sciences, Monash University, Andrew J Lowe, Australian Centre for Evolutionary Biology and Biodiversity (ACEBB), School of Earth and Environmental Science, University of Adelaide and Department for Environment and Heritage, State Herbarium of South Australia, Ary A Hoffmann, Department of Zoology, Centre for Environmental Stress & Adaptation Research (CESAR), The University of Melbourne. October 28, 2010. “Building evolutionary resilience for conserving biodiversity under climate change” http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3352557/ DA: 7/13/2012)

Systematic conservation planning is often about spatial planning, and traditional conservation reserves and methods of designing them are static, with the implicit assumption that threats to biodiversity are themselves static. Protected areas play a central role in the conservation of biodiversity, but they are geographically fixed and increasingly isolated by habitat fragmentation (Hannah et al. 2007). Furthermore, current conservation practices are based on an implicit assumption of a relatively stable climate. However, range shifts have been a predominant response to past climate change, with each species tracking its preferred climatic conditions (Hannah 2010). Although range shifts in response to current climate change have also been observed, the ability of species to track climate change will be affected by ongoing habitat loss and fragmentation. Moving beyond single-species approaches to planning, it is increasingly recognized that ecological processes must also be conserved on biologically relevant scales (Hannah 2010), which may not fit within the fixed boundaries of protected areas as they now stand. However, evolutionary considerations are still lacking from these discussions about protected area planning under climate change. Overall, protected areas as they currently stand are poorly suited to accommodating in situ evolution in response to climate change.

While evolutionary processes have been acknowledged by some as central to the maintenance of biodiversity in reserves and in the maintenance of species borders (Cowling and Pressey 2001; Moritz 2002; Rouget et al. 2006; Taylor and Figgis 2007; Mace and Purvis 2008), they are yet to be explicitly incorporated into conservation planning schemes and approaches. Reserves need to be interconnected across landscapes. This will help to increase population size, protect against ecological catastrophes and provide links to refuge areas (Hannah 2010). Yet, reserve selection can be based on factors that extend beyond interconnectedness (which has been the traditional argument for such strategies): they can facilitate ongoing in situ evolution by encompassing a range of habitats where specific genotypes can be selected (Dunlop and Brown 2008). These habitats might include steep ecological gradients and areas with recent geological or climatic change (Cowling and Pressey 2001; Davis et al. 2008).

#### Aff strategy is insufficient to solve

**UNU 11** (United Nations University publication, “Ongoing Global Biodiversity Loss Unstoppable with Protected Areas Alone: Study,” 7/28, http://www.sciencenewsline.com/nature/2011072817400007.html)

Continued reliance on a strategy of setting aside land and marine territories as "protected areas" is insufficient to stem global biodiversity loss, according to a comprehensive assessment published today in the journal Marine Ecology Progress Series. Despite impressively rapid growth of protected land and marine areas worldwide - today totalling over 100,000 in number and covering 17 million square kilometers of land and 2 million square kilometers of oceans - biodiversity is in steep decline. Expected scenarios of human population growth and consumption levels indicate that cumulative human demands will impose an unsustainable toll on the Earth's ecological resources and services accelerating the rate at which biodiversity is being loss. Current and future human requirements will also exacerbate the challenge of effectively implementing protected areas while suggesting that effective biodiversity conservation requires new approaches that address underlying causes of biodiversity loss - including the growth of both human population and resource consumption.

### A2: Keystone species

#### No such thing – Local extinctions don’t kill global biodiversity

[**Pereira**](http://www.sciencemag.org/search?author1=Henrique+M.+Pereira&sortspec=date&submit=Submit) **10** (Henrique, Universidade de Lisboa, Portugal, “Scenarios for Global Biodiversity in the 21st Century,” 10/26, http://www.sciencemag.org/content/330/6010/1496.abstract)

Field and laboratory experiments mimicking reductions in species and functional group diversity have shown that species loss at local scales can have negative impacts on ecosystem services such as primary productivity, nutrient cycling, and invasion resistance (3). Extinctions of species that play dominant roles in ecosystem functioning, such as large predators and pollinators, could be extremely detrimental for ecosystem services (30). However, it has proved difficult to scale these studies up to regional or global scales.

#### Individual systems aren’t key to global biodiversity

Sedjo 0 (Roger, Sr. Fellow, Resources for the Future, Conserving Nature’s Biodiversity: insights from biology, ethics and economics, eds. Van Kooten, Bulte and Sinclair, 2000, p. 114)

As a critical input into the existence of humans and of life on earth, biodiversity obviously has a very high value (at least to humans). But, as with other resource questions, including public goods, biodiversity is not an either/or question, but rather a question of “how much.” Thus, we may argue as to how much biodiversity is desirable or is required for human life (threshold) and how much is desirable (insurance) and at what price, just as societies argue over the appropriate amount and cost of national defense. As discussed by Simpson, the value of water is small even though it is essential to human life, while diamonds are inessential but valuable to humans. The reason has to do with relative abundance and scarcity, with market value pertaining to the marginal unit. This water-diamond paradox can be applied to biodiversity. Although biological diversity is essential, a single species has only limited value, since the global system will continue to function without that species. Similarly, the value of a piece of biodiversity (e.g., 10 ha of tropical forest) is small to negligible since its contribution to the functioning of the global biodiversity is negligible. The global ecosystem can function with “somewhat more” or “somewhat less” biodiversity, since there have been larger amounts in times past and some losses in recent times. Therefore, in the absence of evidence to indicate that small habitat losses threaten the functioning of the global life support system, the value of these marginal habitats is negligible. The “value question” is that of how valuable to the life support function are species at the margin. While this, in principle, is an empirical question, in practice it is probably unknowable. However, thus far, biodiversity losses appear to have had little or no effect on the functioning of the earth’s life support system, presumably due to the resiliency of the system, which perhaps is due to the redundancy found in the system. Through most of its existence, earth has had far less biological diversity. Thus, as in the water-diamond paradox, the value of the marginal unit of biodiversity appears to be very small.

### Alt causes

#### Biodiversity loss is not being stemmed by international efforts – degradation will persist

Bruno 10 (John F., Marine ecologist; Associate Professor, UNC Chapel Hill. May 3, 2010. “Biodiversity Loss Continues Unabated Despite International Efforts”; <http://www.huffingtonpost.com/john-f-bruno/biodiversity-loss-continu_b_561699.html> DA: 7/10/2012)

Betting on biodiversity loss is a pretty sure thing. The earth's plant and animal species are disappearing at a sobering rate due to pressures including habitat loss, climate change, pollution and over-harvesting. Despite a few success stories and steps in the right direction, we are falling far short of stemming these losses.

Biodiversity is the entire range of biological variety in the world, including the diversity of genotypes, species and ecosystems. It can be measured on levels from DNA molecules all the way up to broad taxonomic categories such as families and phyla. Monitoring the fate of any of these aspects of biodiversity at a global scale is a daunting task. Thus, we know little about the rates and patterns of biodiversity loss or the effectiveness of global mitigation plans such as the 2002 Convention on Biological Diversity.

Dr. Stuart Butchart of the UNEP World Conservation Monitoring Centre and BirdLife International tackled the problem by assembling an international team of conservation scientists (that I was part of) to calculate trends in global biodiversity. The idea was to assemble several dozen indices that we had sound, long term data for including population trends for birds and other vertebrates and the loss of habitats such as forests, seagrass beds and coral reefs.

As we recently reported in Science magazine, our analysis indicates that biodiversity has continued to decline over the past four decades with no detectable abatement for most indices. This is largely due to increased pressures resulting from human population growth, economic development and globalization but it also seems clear that our international response to the biodiversity crisis has been inadequate.

Every aspect of biodiversity on earth is unique. The species that we have already driven extinct, from the Dodo to the Tasmanian Tiger, can never be resurrected or replaced. As a field ecologist, I have been lucky to experience and work on some truly wondrous examples of the earth's biodiversity from the tide pools of the Pacific Northwest to rainforests in Costa Rica to alpine habitats in the Rocky Mountains. The downside of my otherwise fantastic job is that I witness the degradation of nature firsthand. The coral reefs of the Florida Keys of today bear little resemblance to the underwater jungles patrolled by large sharks that I snorkeled over as a kid 35 years ago. Over the last two decades I have observed and documented striking biodiversity losses even on isolated and seemingly untouched reefs.

Understandably, my sentimental views of nature don't underlie national policy or motivate parents struggling to feed their families in poor countries. But there are far more pragmatic reasons to conserve biodiversity, the primary one being that we simply cannot live without it. Countless aspects of biodiversity make life on earth possible: coral reefs and mangroves shelter our coastal communities from storms, wetlands filter our water and sequester and store the carbon we emit, and rainforests oxygenate the air we breath and harbor plants with undiscovered biomedical value. In agriculture alone bees pollinate our crops, birds control pest insects, and invertebrates mix and aerate the soil. Farming would not be economically viable if farmers had to pay for these services provided for free by the earth's biodiversity. In nearly all cases, the preservation of biodiversity is in sync with our economic interests. Over its lifetime, a whale is far more valuable as a tourist magnet than as sushi or canned meat in Tokyo. Every species that goes extinct and every habitat that disappears represents a socioeconomic loss that would make any hard-nosed financial planner cringe.

Despite the bleak picture, there are still many near-pristine places, like the unique Galapagos Islands ecosystem with incredible amounts of biodiversity that can still be conserved. Most of the world's species, including some on the brink of extinction, can be saved with a mixture of international leadership, pragmatic decision-making and modest capital investment. And unlike other political or economic opportunities, this really is one that we can't afford to pass up.

#### Biodiversity loss inevitable even if slowed

OneWorld.com 11 (6/20/2011; <http://uk.oneworld.net/article/view/166233/1/1949> DA: 7/10/2012

A new analysis of several major global studies of future species shifts and losses foresees inevitable continuing decline of biodiversity during the 21st century but offers new hope that it could be slowed if emerging policy choices are pursued.

Led by experts Henrique Miguel Pereira and Paul Leadley, the 23-member scientific team from nine countries, under the auspices of DIVERSITAS, UNEP-WCMC and the secretariat of the CBD compared results from five recent global environmental assessments and a wide range of peer-reviewed literature examining likely future changes in biodiversity.

Published today in the journal Science, the analysis found universal agreement across the studies that fundamental changes are needed in society to avoid high risk of extinctions, declining populations in many species, and large scale shifts in species distributions in the future.

Says Dr. Leadley, of the University Paris-Sud, France: "There is no question that business-as-usual development pathways will lead to catastrophic biodiversity loss. Even optimistic scenarios for this century consistently predict extinctions and shrinking populations of many species."

He notes that the target of stopping biodiversity loss by 2020 "sounds good, but sadly isn't realistic".

Among the brightest spots of hope: recent scenarios show that slowing climate change and deforestation can go hand-in-hand to reduce biodiversity loss thanks to "significant opportunities to intervene through better policies, such as those aimed at mitigating climate change without massive conversion of forests to biofuel plantations" says Dr. Leadley. But action must be taken quickly, as the study indicates the window of opportunity is closing rapidly, as differences in policy action taken now could either lead to an increase in global forest cover of about 15% in the best case or losses of more than 10% in the worst case by 2030.

The authors say the creation of an Intergovernmental Panel on Climate Change (IPCC)-like mechanism for biodiversity (to be called the Intergovernmental Platform on Biodiversity and Ecosystem Services -- IPBES) is "extremely important" for achieving commonly-agreed definitions and indicators for biodiversity and to inform decision making.

"The issues are so urgent and the stakes for humanity so important, scientists need to coalesce through the IPBES to inform policy-makers with a unified, authoritative voice," states Dr. Pereira, of the Universidade de Lisboa, Portugal.

IPBES could also play an important role in organizing the scientific co-operation to reduce uncertainty in biodiversity scenarios. Models foresee extinction rates ranging from less than 1% per century (close to the current rate of extinctions) to more than 50%.

"The degree of both land use and climate change explains a substantial fraction of the range of projected extinctions, but incomplete understanding of species ecology is also an important source of uncertainty," says Dr. Leadley.

Among the key issues is the lack of consensus defining the length of time involved in species' extinction - which may be decades or millennia - leading to "considerable uncertainty in models and substantial disagreement within scientific community concerning the likelihood of massive extinctions over the coming century."

Furthermore, the researchers note that changes in species distributions and population sizes should receive more attention because they are likely more critical to human well-being and better short-term indicators of the pressures of humans on ecosystems. For example the continuing overall decline in populations of large-bodied fish species due to over-fishing, the poleward migration of marine species at a rate of more than 40 km per decade due to climate change, and the 10 to 20% decline in the abundance of terrestrial species by mid-century primarily due to land-use change.

The analysis also concludes that the difficulty of trade-offs between meeting human wants and needs and protecting biodiversity is likely to intensify.

"Future extinctions risks are projected to be high, but the biodiversity crisis is much more than extinctions," says Dr. Pereira. "Much of what will happen to biodiversity in 21st century is not global extinctions, but major changes in the abundance of species and the composition of communities".

#### Alternative Causality – Deforestation is the major source of biodiversity loss

Sarno 8 (Niccolo, Media coordinator for FoEI; May 22, 2008; “Deforestation Threatens Biodiversity Efforts”; <http://www.foei.org/en/media/archive/2008/deforestation-threatens-biodiversity-efforts> DA: 7/10/20120

The continuing failure to prevent catastrophic deforestation is hampering global efforts to reverse the loss of biodiversity and has become a major threat to forest-dependent people, warned Friends of the Earth International on ‘International Biodiversity Day’, 22 May.

The warning was made during a May 19-30 United Nations meeting of the Convention on Biological Diversity. The Bonn gathering, attended by delegates from 191 countries, aims to find ways to meet a globally agreed target for reversing the loss of biodiversity.

“The destruction of forests and the consequent erosion of biodiversity severely impact millions of forest-dependent people. But it also affects global food security and accelerates climate change,” according to Belmond Tchoumba, co-coordinator of the Forest and Biodiversity Programme of Friends of the Earth International.

“Governments must let local communities and Indigenous Peoples who depend on forests manage their forests, rather than evicting them and selling off the forests,“ added the Cameroonian activist.

According to Friends of the Earth International the Bonn conference participants should take immediate action to stop the deforestation of prime forests, to stop the destructive illegal logging and to stop the trade of illegally derived forest products.

They should also oppose false solutions such as damaging monoculture tree plantations and genetically engineered (GE) trees. GE trees are as damaging as other monocultures, but they also pose a specific threat to the genetic diversity of trees.

“Genetically engineered trees know no borders: once planted, they contaminate large areas,” according to Hubert Weiger, President of BUND / Friends of the Earth Germany.

“Planting GE trees flies in the face of the precautionary approach of the Convention on Biological Diversity. GE trees should be strongly and urgently opposed by this UN Convention and by all national governments,” he added.

“Forest-dependent local communities and Indigenous Peoples around the world know how to conserve and restore forests. Their community-based activities are successfully geared towards sustainable forest use,” said Isaac Rojas, co-coordinator of the Forest and Biodiversity Programme of Friends of the Earth International.

“Community forest management not only ensures the conservation of biological diversity, it also ensures sustainable livelihoods for forest-dependent people,” added the Costa Rican activist.

### BioD loss survivable

#### Biodiversity loss inevitable, yet survivable – evolution and time will bring the return of biodiversity

Climate Change Wisdom.com 2009 (<http://www.climate-change-wisdom.com/biodiversity-loss.html> DA: 7/10/2012)

Significant biodiversity loss happens because there is a major change in global conditions, hitting hard whole swathes of biodiversity adapted to the previous status quo. Usually it's a shift in the composition of the atmosphere, a change in energy from the levels reaching or retained within the huge heat sinks of the oceans and atmosphere or specific forceful events such as a major meteorite strike.

Remember that most of the earth is actually molten, held together by gravity and a thin crust. Hit a bounded liquid hard and it wobbles for a long time.

Volcanic activity witnessed by any dinosaurs who survived the initial strike would have been spectacular.

Dinosaurs notwithstanding, past extinction events were most significant in the oceans. So this warning from the Oxford meeting is important.

It tells us that the modifications we have made to the environment both locally from clearing land, polluting rivers and fishing out populations of fish; and globally from changing the atmospheric composition; are enough for extinction rates to be high enough to qualify as a mass extinction.

Biodiversity loss in a geological instant. It is as though the earth had been hit by a big chunk of space rock.

More biodiversity loss seems inevitable. Our carbon pollution grows, we still clear forests for agriculture, divert water to intensify production on the fields we already had, and consume resources as our numbers and affluence grow. The mass extinction event is here and now.

There have been wins. A handful of pioneer conservationists at the start of the industrial revolution laid the foundations and serious effort was ignited in the 1960?s that has led to most countries having some form of regulated attention to protection of at least some habitat and iconic species. This effort has focused on the land, for that is where we live.

Now we have reserves, wildlife corridors, species recovery plans, planning restrictions, land management restrictions, water regulations, a paid workforce to look after the natural areas and a small army of volunteers actively promoting conservation and sustainability. Thankfully.

At best these actions will save some of those icons and keep a few wild places. Yet this is critically important for these will be islands, or perhaps arks, to provide the raw material for evolution after the biodiversity loss.

A little like the stock market, even with crashes from extinction events biodiversity keeps growing over geological time. This is what happens. Evolution and time will see a return to a diverse flora and fauna, only it will take all our ingenuity to survive long enough to see it.

#### Turn – attempting to protect ecosystems from negative effects will lower their resilience

Cote and Darling 2010 (Isabelle M., tropical marine ecologist at Simon Fraser University; Emily S., marine ecologist at Simon Fraser University; July 27, 2010. “Rethinking Ecosystem Resilience in the Face of Climate Change”. http://www.plosbiology.org/article/info%3Adoi%2F10.1371%2Fjournal.pbio.1000438 DA:7/11/2012)

The two predictions of the conventional view of ecological resilience are poorly supported by empirical evidence pertaining to coral reefs. We believe that the selective culling of disturbance-sensitive taxa by local stressors can explain why more intact reef communities do not appear to be more resilient to climate disturbance. If a species' tolerance to a non-climatic disturbance is correlated with its tolerance to climatic impacts (e.g., positive co-tolerance, [55]), then degradation can actually increase the abundance of disturbance-tolerant species within a community [26],[28] and thus the ability of an ecosystem to resist the impacts of climate disturbance.

This alternative view, which is more consistent with the majority of empirical observations, is depicted in Figure 1. Thus, with continued degradation caused by local stressors, altered communities become composed of disturbance-tolerant species and the tipping point in response to climate change will shift to the right (Figure 1B; black arrows), making the ecosystem more resilient to climate disturbance. Management that seeks to control local anthropogenic disturbances and reverse degradation (Figure 1B; red block arrows) will inadvertently shift the tipping point back to the left, towards lower resilience (Figure 1B; red arrows) to climate disturbance. Thus, management that controls local stressors to reverse degradation and recover original species assemblages will actually increase the proportion of sensitive taxa within the assemblage, and may effectively decrease ecosystem resilience to climate change.

Note that the alternative states depicted in Figure 1 are not assumed to be stable. Moreover, our conceptual model works with or without thresholds. If ecosystem state declines linearly with climate disturbance, we expect that the slope of this relationship will decrease as degradation increases (i.e., as the intercept decreases).

#### No impact – ecosystem degradation hasn’t harmed human well-being (possible retag)

**Raudsepp-Hearne et al. 2010** (Ciarra, PhD in the Department of Geography, Elena M. Bennett is¶ an assistant professor in the Department of Natural Resource Sciences and¶ McGill School of Environment, Graham K. MacDonald is a doctoral student¶ in the Department of Natural Resource Sciences, and Laura Pfeifer is¶ a master’s student in the Department of Natural Resource Sciences and the¶ McGill School of Environment, all at McGill University, in Montreal, Quebec.¶ Garry D. Peterson is a researcher at the Stockholm Resilience Centre and the¶ Department of Physical Geography and Quaternary Geology, at Stockholm¶ University. Maria Tengö is currently a researcher at the Department ofSystems Ecology and the Stockholm Resilience Centre, Stockholm University. Tim Holland currentlyworks for SNV Netherlands Development Organisation in Hanoi, Vietnam.¶ Karina Benessaiah ¶ is currently a¶ doctoral student in the Department of Geographical Sciences and Urban¶ Planning at Arizona State University. September 2010; “Untangling the Environmentalist’s¶ Paradox: Why Is Human Well-being¶ Increasing as Ecosystem Services¶ Degrade?”; <http://www.aibs.org/bioscience-press-releases/resources/Raudsepp-Hearne.pdf> DA: 7/11/2012)

Although many people expect ecosystem degradation to¶ have a negative impact on human well-being, this measure¶ appears to be increasing even as provision of ecosystem¶ services declines. From George Perkins Marsh’s Man and¶ Nature in 1864 to today (Daily 1997), scientists have described¶ how the deterioration of the many services provided¶ by nature, such as food, climate regulation, and recreational¶ areas, is endangering human well-being. However, the Millennium¶ Ecosystem Assessment (MA), a comprehensive study of¶ the world’s resources, found that declines in the majority of¶ ecosystem services assessed have been accompanied by steady¶ gains in human well-being at the global scale (MA 2005). We¶ argue that to understand this apparent paradox, we need to¶ better understand the ways in which ecosystem services are¶ important for human well-being, and also whether human¶ well-being can continue to rise in the future despite projected¶ continued declines in ecosystem services. In this article, we¶ summarize the roots of the paradox and assess evidence¶ relating to alternative explanations of the conflicting trends¶ in ecosystem services and human well-being.¶

The environmentalist’s expectation could be articulated¶ as: “Ecological degradation and simplification will be followed by a decline in the provision of ecosystem services, leading to a decline in human well-being.” Supporters¶ of this hypothesis cite evidence of unsustainable¶ rates of resource consumption, which in the past have had¶ severe impacts on human well-being, even causing the collapse¶ of civilizations (e.g., Diamond 2005). Analyses of the¶ global ecological footprint have suggested that since 1980,¶ humanity’s footprint has exceeded the amount of resources¶ that can be sustainably produced by Earth (Wackernagel¶ et al. 2002). Although the risk of local and regional societies¶ collapsing as a result of ecological degradation is much¶ reduced by globalization and trade, the environmentalist’s¶ expectation remains: Depletion of ecosystem services translates¶ into fewer benefits for humans, and therefore lower¶ net human well-being than would be possible under better¶ ecological management.¶ By focusing on ecosystem services—the benefits that¶ humans obtain from ecosystems—the MA set out specifically¶ to identify and assess the links between ecosystems and¶ human well-being (MA 2005). The MA assessed ecosystem¶ services in four categories: (1) provisioning services, such¶ as food, water, and forest products; (2) regulating services, which modulate changes in climate and regulate floods,¶ disease, waste, and water quality; (3) cultural services, which¶ comprise recreational, aesthetic, and spiritual benefits; and¶ (4) supporting services, such as soil formation, photosynthesis,¶ and nutrient cycling (MA 2003). Approximately 60%¶ (15 of 24) of the ecosystem services assessed by the MA were¶ found to be in decline. Most of the declining services were¶ regulating and supporting services, whereas the majority of¶ expanding ecosystem services were provisioning services,¶ such as crops, livestock, and fish aquaculture (table 1). At the¶ same time, consumption of more than 80% of the assessed¶ services was found to be increasing, across all categories. In¶ other words, the use of most ecosystem services is increasing¶ at the same time that Earth’s capacity to provide these¶ services is decreasing.¶

The MA conceptual framework encapsulated the environmentalist’s¶ expectation, suggesting tight feedbacks between¶ ecosystem services and human well-being. However, the¶ assessment found that aggregate human well-being grew¶ steadily over the past 50 years, in part because of the rapid¶ conversion of ecosystems to meet human demand for food,¶ fiber, and fuel (figure 1; MA 2005). The MA defined human¶ well-being with five components: basic materials, health,¶ security, good social relations, and freedom of choice and¶ actions, where freedom of choice and actions is expected to¶ emerge from the other components of well-being. Although¶ the MA investigated each of the five components of well-being¶ at some scales and in relation¶ to some ecosystem services,¶ the assessment of global¶ trends in human well-being¶ relied on the human development¶ index (HDI) because of¶ a lack of other data. The HDI¶ is an aggregate measure of¶ life expectancy, literacy, educational¶ attainment, and per¶ capita GDP (gross domestic¶ product) that does not capture¶ all five components of¶ well-being (Anand and Sen¶ 1992).¶

#### No impact – scientists are acquiring the ability to revive extinct species

Ridley 3/13/2012 (Matt, 2007 Davis Award winner for the History of Science, “Reversing extinction”; <http://www.rationaloptimist.com/blog/reversing-extinction.aspx> DA: 7/11/2012)

The fruit of a narrow-leaved campion, buried in permafrost by a ground squirrel 32,000 years ago on the banks of the Kolyma river in Siberia, has been coaxed into growing into a new plant, which then successfully set seed itself in a Moscow laboratory. Although this plant species was not extinct, inch by inch scientists seem to be closing in on the outrageous goal of bringing a species back from the dead. I don't expect to live to see a herd of resurrected mammoths roaming the Siberian steppe, but I think my grandchildren just might.

The mammoth is the best candidate for resurrection mainly because flash-frozen ones with well-preserved tissues are regularly found in the Siberian permafrost. Occasionally these have been fresh enough to tempt scientists to cook and eat them, usually with disappointing results. Just last week a Chinese paleontologist in Canada, Xing Lida, filmed himself frying and eating what he said was a small mammoth steak. Cells from such carcasses have been recovered, encouraging a rivalry between Japanese and Russian scientists to be the first to revive one of these huge, elephant-like mammals by cloning. Four years ago the mammoth genome was sequenced, so we at least now know the genetic recipe.

The news of the resurrected flower does, apparently, remove one obstacle. After 32,000 years the plant's DNA had not been so damaged by natural radioactivity in the soil as to make it unviable, which is a surprise. Mammoth carcasses are often much younger - the youngest, on Wrangel Island, being about 4,700 years old, contemporary with the Pharoahs. So the DNA should be in even better shape.

However, plants are much better at cloning themselves from any old cutting. Coaxing an elephant cell into becoming an embryo is not at all easy; though, as Dolly the sheep showed, not impossible. To do the same for a mammoth cell would be harder still. And then there is the problem of how to get the embryo to grow. Implanting it into the womb of an Indian elephant (its closest living relative) is the best bet, but experiments with implanting rare embryos into other species' wombs have been mostly unsuccessful. For example, a rare form of wild ox, the gaur, was going to have its embryos reared in cattle wombs, but it did not work.

So do not book the Siberian mammoth safari trip just yet. Equally, don't bet against it eventually coming off.

Which other species might follow? One that only recently went extinct (last seen in 1936) is the marsupial carnivore called the thylacine, or "Tasmanian tiger". A few years ago, genes from a dead thylacine were injected into a mouse and "expressed" in its tissue. The great auk, the dodo and other creatures that died out before the invention of refrigeration are going to be much harder to revive.

Perhaps fortunately, Neanderthals, dead for 28,000 years, unfrozen and not very closely related to their likely surrogate parent (you and me), would be harder still, though their DNA sequence is now known. And as for the dinosaurs - 65 million years dead - forget it. Although come to think of it, re-engineering a chicken until it looks like a dinosaur cannot be ruled out, once people learn to play genetics well enough.

The real significance of the Siberian flower, though, is that it makes future extinctions potentially reversible. So long as we can flash-freeze seeds and tissues from threatened species (a disused mine in a frozen mountain in Spitsbergen already holds a seedbank of rare plant varieties), then we can give posterity the chance to resurrect them. Combine this with the news that extinction rates, at least of birds and mammals, have been falling in recent decades, and there are grounds for a glimmer of ecological optimism. The great spasm of extinction caused by humans - mainly when we spread our rats, weeds and bugs to oceanic islands - may be coming to an end.

Far more significant than the reversal of extinction, however, is the revival of wild ecosystems. Ecologists are finding that wild habitats can be put back together more easily than they thought. A marine reserve off Mexico is now teeming with large fish again. Yellowstone Park's ecological revival following the introduction of the wolf is remarkable: by cutting the numbers of elk, wolves have brought back aspen trees and long grass and hence beavers, rodents and hawks.

In Costa Rica, a rainforest rich in tree species is now thriving on what was, in 1993, exhausted farmland. Once a canopy of sun-loving trees was planted, hundreds of other tree species moved in naturally. One commentator says: "The accepted belief is that once destroyed, tropical rainforests could never be restored. But is that really the case or just a myth?"

Environmentalists will worry that such optimism breeds complacency about habitat destruction. But it might instead breed ambition to restore habitats and revive rare species. Over the past 50 years, agricultural yields have risen and, in real terms, food prices have fallen, with the result that marginal land has been released from growing food worldwide. Forest cover has increased in most of Europe and North America; nature reserves have expanded even in the tropics.

So here's an image of the future. With much of the world's meat grown, brain-free and legless, in factories, and much of its fruit and vegetables in multi-storey urban farms lit with cheap fusion power, there will again be vast steppes, savannahs, prairies and rain forests, teeming with herds of wild game. Perhaps even a few woolly mammoths among them.

#### Biodiversity loss inevitable – 5 reasons why protected areas are failing

ScienceNewsline.com 2011 (July 28th, 2011. “Ongoing Global Biodiversity Loss Unstoppable with Protected Areas Alone: Study”; <http://www.sciencenewsline.com/articles/2011072817400007.html> DA: 7/11/2012)

Continued reliance on a strategy of setting aside land and marine territories as "protected areas" is insufficient to stem global biodiversity loss, according to a comprehensive assessment published today in the journal Marine Ecology Progress Series.

Despite impressively rapid growth of protected land and marine areas worldwide - today totalling over 100,000 in number and covering 17 million square kilometers of land and 2 million square kilometers of oceans - biodiversity is in steep decline.

Expected scenarios of human population growth and consumption levels indicate that cumulative human demands will impose an unsustainable toll on the Earth's ecological resources and services accelerating the rate at which biodiversity is being loss.

Current and future human requirements will also exacerbate the challenge of effectively implementing protected areas while suggesting that effective biodiversity conservation requires new approaches that address underlying causes of biodiversity loss - including the growth of both human population and resource consumption.

Says lead author Camilo Mora of University of Hawaii at Manoa: "Biodiversity is humanity's life-support system, delivering everything from food, to clean water and air, to recreation and tourism, to novel chemicals that drive our advanced civilization. Yet there is an increasingly well-documented global trend in biodiversity loss, triggered by a host of human activities."

"Ongoing biodiversity loss and its consequences for humanity's welfare are of great concern and have prompted strong calls for expanding the use of protected areas as a remedy," says fellow author Peter F. Sale, Assistant Director of the United Nations University's Canadian-based Institute for Water, Environment and Health.

"While many protected areas have helped preserve some species at local scales, promotion of this strategy as a global solution to biodiversity loss, and the advocacy of protection for specific proportions of habitats, have occurred without adequate assessment of their potential effectiveness in achieving the goal."

Drs. Mora and Sale warn that long-term failure of the protected areas strategy could erode public and political support for biodiversity conservation and that the disproportionate allocation of available resources and human capital into this strategy precludes the development of more effective approaches.

The authors based their study on existing literature and global data on human threats and biodiversity loss.

"The global network of protected areas is a major achievement, and the pace at which it has been achieved is impressive," says Dr. Sale. "Protected areas are very useful conservation tools, but unfortunately, the steep continuing rate of biodiversity loss signals the need to reassess our heavy reliance on this strategy."

The study says continuing heavy reliance on the protected areas strategy has five key technical and practical limitations:

Expected growth in protected area coverage is too slow

While over 100,000 areas are now protected worldwide, strict enforcement occurs on just 5.8% of land and 0.08% of ocean. At current rates, it will take between 185 years in the case of land and 80 years for oceans to cover 30% of the world's ecosystems with protected areas - a minimum target widely advocated for effective biodiversity conservation.

This slow pace contrasts sharply with the rapid growth of threats, including climate change, habitat loss and resource exploitation, predicted to cause the extinction of many species even before 2050.

The size and connectivity of protected areas are inadequate

To ensure species' survival, protected areas must be sufficiently large to sustain viable populations in the face of the inevitable mortality of some individuals trespassing their borders, and areas must be close enough together for a healthy exchange of individuals among protected populations. Globally, however, over 30% of the protected areas in the ocean, and 60% on land are smaller than 1 square kilometer - too small for many larger species. And they tend to be too far apart to allow a sufficient exchange among populations for most species.

Protected areas only ameliorate certain human threats

Biodiversity loss is triggered by a host of human stressors including habitat loss, overexploitation, climate change, pollution and invasive species. Yet protected areas are useful primarily against overexploitation and habitat loss. Since the remaining stressors are just as deleterious, biodiversity can be expected to continue declining as it has done until now. The study shows that approximately 83% of protected areas on the sea and 95% of protected areas on land are located in areas with continuing high impact from multiple human stressors.

Underfunding

Global expenditures on protected areas today are estimated at US $6 billion per year and many areas are insufficiently funded for effective management. Effectively managing existing protected areas requires an estimated $24 billion per year - four times current expenditure. Despite strong advocacy for protected areas, budget growth has been slow and it seems unlikely that it will be possible to raise funding appropriate for effective management as well as for creation of the additional protected areas as is advocated.

Conflicts with human development

Humanity's footprint on Earth is ever expanding in efforts to meet basic needs like housing and food. If it did prove possible to place the recommended 30% of world habitats under protection, intense conflicts with competing human interests are inevitable - many people would be displaced and livelihoods impaired. Forcing a trade-off between human development and sustaining biodiversity is unlikely to lead to a solution with biodiversity preserved.

Concludes Dr. Mora: "Given the considerable effort and widespread support for the creation of protected areas over the past 30 years, we were surprised to find so much evidence for their failure to effectively address the global problem of biodiversity loss. Clearly, the biodiversity loss problem has been underestimated and the ability of protected areas to solve this problem overestimated."

#### International efforts to stem biodiversity failing

Lalasz 2010 (Robert, director of science communications at The Nature Conservancy; April 29, 2010; “New study: Biodiversity continues to decline worldwide”; <http://www.mnn.com/earth-matters/wilderness-resources/stories/new-study-biodiversity-continues-to-decline-worldwide> DA: 7/11/2012)

Species continue to be lost at steady rates across nearly every habitat type on Earth — this despite an international commitment eight years ago to significantly reduce the rate of such losses by 2010, according to a new study coauthored by a Nature Conservancy scientist.

The study, published today in Science magazine, is the first to comprehensively measure progress toward achieving the goals of the Convention on Biological Diversity (CBD), a treaty that pledged to significantly reduce 2002 rates of biodiversity loss by this year toward the end of alleviating global poverty.

The study’s authors found that virtually all of the indicators of the state of biodiversity — everything from species’ population trends to extinction risk to habitat conditions — have declined since 2002.

Alarmingly, these declines have continued despite increases in policies and funds to promote biodiversity, write the authors. The drivers for these declines include invasive alien species, the impacts of climate change and aggregate human consumption of Earth’s ecological assets.

To go deeper into the numbers, Cool Green Science talked with two of the study’s authors — Dr. Stuart H. M. Butchart of the United Nations Environment Programme and BirdLife International, and Dr. Carmen Revenga, a senior scientist with The Nature Conservancy’s Global Marine Team, who contributed the indicator on river fragmentation:

Cool Green Science: We’ve been hearing for a while that biodiversity worldwide is in decline. What’s new in this study?

Butchart: Although the findings are no surprise to those of us who work in the field, I often find that the general public are surprised to discover this. Decision-makers and politicians are also insufficiently aware of the issue, I suspect.

What is new here is that governments in 2002 made a specific commitment to address the issue and meet a milestone by 2010. We have shown for the first time that they failed. Further, we found that the gap between the intensifying pressures and the responses put in place is widening.

Among the declines in biodiversity indicators cited in the study, which are the most dramatic and indicative? Or is the totality of the declines that should catch our attention?

Butchart: There are dramatic declines in animal populations (which have declined by one-third since 1970) and coral reef condition (by 40 percent since 1980), but it is the consistency of the results that is most alarming. Humanity is destroying nature in all corners of the planet.

Carmen Revenga: For me, the aggregated indices of species and population trends give a clear signal that we have not made progress reducing the rate of biodiversity loss. And it’s very worrisome that pressures on resources are increasing at the same time — these trends should really raise people’s eyebrows, because the conservation community has spent a lot of energy and resources trying to reverse these trends and calling attention to them.

How much do these rates of loss have to get before we take them seriously? Can we afford those rates of loss getting higher, especially given the uncertainties of climate change impacts and the capacity for ecosystems to recover or adapt?

Some of the indicators are for Europe alone. Can we extrapolate from these indicators to a global portrait of, say, bird population responses to climate change?

Butchart: There is one indicator which is based only on European bird populations (climate impacts) and another based only on North American and European data (the Wild Bird Index), but the others are global in coverage.

While there are no other groups or regions yet in which it is possible to show an indicator testing the impacts of climate change on the population trends of a whole suite of organisms, there is plenty of other evidence that climate change is having severe impacts on organisms across the planet.

The indicators on government action have increased — funding for biodiversity protection, protected area coverage, number of countries that have now developed biodiversity action plans, the steps countries have taken against invasives. Yet none of these efforts has slowed the rates of biodiversity decline.

If you had to pick three concrete additional things that need to be addressed on a policy and a conservation level to stop these declines, what would they be?

Butchart: Here are three:

1. Policies tackling biodiversity loss have been inadequately targeted, implemented and funded. For example, there are lots of protected areas, but they are not in most important places for biodiversity, and they are insufficiently funded and inadequately managed.

2. Biodiversity needs to be integrated and embedded into all parts of government and business. It’s not just a job for the environment ministries.

3. The economic value of biodiversity needs to be accounted for adequately in decision-making.

Revenga: I’d add to that by saying we need better design and management of landscapes through incorporating protected areas into larger landscape management. For example, while marine protected areas are good, they would be much more powerful in combination with fisheries management practices, territorial access rights, etc.

From a scientific standpoint, we really need to show that healthy biodiversity (species, populations, communities) is a key component in managing ecosystem service delivery, and that we need full ecosystems, not just parts of them, to sustain us. Science can also demonstrate that ecosystems (especially healthy resilient ecosystems) can help mitigate the impacts of climate change (e.g., natural floodplains are much better at attenuating floods than man-made structures).

Finally, what more do we need to know regarding biodiversity loss? What are the indicator gaps?

Butchart: Many of these indicators have been developed in the last few years — for instance, the IUCN’s Red List Index measuring trends in extinction risk, or indicators of coral reef condition. But we still know less about the tropics than temperate regions, and much less about trends in plants and invertebrates and trends in the benefits we obtain from biodiversity.

Revenga: If we want to hold countries accountable to their commitments, we can’t continue to set targets that are not measurable; and we need to invest into tracking progress – just as we are doing for our work at The Nature Conservancy with our measures program.

Warming turns BioD

### Warming turns BioD

#### Global Warming causes a Massive deal of Bio –d extinctions – Not just in oceans

Hannah 12 (Lee, senior researcher in climate change biology at Conservation International, “As Threats to Biodiversity Grow, Can We Save World’s Species?” 4/19, <http://e360.yale.edu/feature/as_threats_to_biodiversity_grow_can_we_save_worlds_species/2518/>)

The world community has the power to greatly reduce the prospect of an extinction spasm by lowering greenhouse gas emissions and launching large-scale conservation and forest preservation programs that both slow global warming and provide a sanctuary for countless species. But progress on these fronts is slow, and pressure on the world’s biodiversity remains relentless.¶ An important part of the solution is preserving the ability of species to move across a changing landscape. Before humans, species responded to climate change by migrating, sometimes long distances, to track their preferred climatic conditions. Fully natural landscapes were conducive to these movements, with even slow-dispersing plants shifting the heart of their range on continental scales. The mechanisms of these changes are still being worked out, but we know they happened: Insects once found in Britain are now found only in the Himalayas, and centers of oak distribution have moved from the Mediterranean to Central Europe and from Georgia to Pennsylvania.¶ Recent studies have shown that migration was an important method for species to cope with rapid climate change as far back as 55 million years ago, a period known as the Paleocene-Eocene Thermal Maximum, or PETM. A key part of the solution is preserving the ability of species to move across a changing landscape. Then, for reasons that are still not entirely clear, vast amounts of greenhouse gases were released into the atmosphere and oceans, leading to an increase in global temperatures of 4 to 9 degrees C (7 to 14 degrees F) in less than 10,000 years. Geological and fossil studies, using techniques such as stable isotope analysis, show major extinctions, the evolution of new animals and plants, and the migration of species on a large scale.

### A2: Amazon

#### No impact – Amazon

**NEW YORK POST 6-9-2005** (Posted at Cheat Seeking Missiles, date is date of post, http://cheatseekingmissiles.blogspot.com/2005/06/stop-global-whining-2.html)

"One of the simple, but very important, facts is that the rainforests have only been around for between 12,000 and 16,000 years. That sounds like a very long time but, in terms of the history of the earth, it's hardly a pinprick. "Before then, there were hardly any rainforests. They are very young. It is just a big mistake that people are making. "The simple point is that there are now still - despite what humans have done - more rainforests today than there were 12,000 years ago." "This lungs of the earth business is nonsense; the daftest of all theories," Stott adds. "If you want to put forward something which, in a simple sense, shows you what's wrong with all the science they espouse, it's that image of the lungs of the world. "In fact, because the trees fall down and decay, rainforests actually take in slightly more oxygen than they give out. "The idea of them soaking up carbon dioxide and giving out oxygen is a myth. It's only fast-growing young trees that actually take up carbon dioxide," Stott says. "In terms of world systems, the rainforests are basically irrelevant. World weather is governed by the oceans - that great system of ocean atmospherics. "Most things that happen on land are mere blips to the system, basically insignificant," he says. Both scientists say the argument that the cure for cancer could be hidden in a rainforest plant or animal - while plausible - is also based on false science because the sea holds more mysteries of life than the rainforests. And both say fears that man is destroying this raw source of medicine are unfounded because the rainforests are remarkably healthy. "They are just about the healthiest forests in the world. This stuff about them vanishing at an alarming rate is a con based on bad science," Moore says.

#### Amazon does not regulate oxygen—their argument doesn’t factor decomposition which consumes all the oxygen rainforests create

**NEW WORLD ENCYCLOPEDIA 2009** (“Rainforest,” date is last mod, March 27, http://www.newworldencyclopedia.org/entry/Rainforest)

It is commonly believed, erroneously, that one of the key values of rainforests is that they provide much of the oxygen for the planet. However, most rainforests do not in fact provide much net oxygen for the rest of the world. Through factors such as the decomposition of dead plant matter, rainforests consume as much oxygen as they produce, except in certain conditions (primarily swamp forests) where the dead plant matter does not decay, but is preserved underground instead (ultimately to form new coal deposits over enough time).

#### Amazon is not key to oxygen—decomposition makes it net neutral

**LOMBORG 2001** (Bjorn, adjunct professor at the Copenhagen Business School, director of the Copenhagen Consensus Centre and a former director of the Environmental Assessment Institute in Copenhagen, The Skeptical Environmentalist, p. 115)

There are two primary reasons for viewing the tropical forests as a vital resource. In the 1970s we were told that rainforests were the lungs of the Earth. Even in July 2000, WWF argued for saving the Brazilian Amazon since “the Amazon region has been called the lungs of the world.” But this is a myth. True enough, plants produce oxygen by means of photosynthesis, but when they die and decompose, precisely the same amount of oxygen is consumed. Therefore, forests in equilibrium (where trees grow but old trees fall over, keeping the total biomass approximately constant) neither produce nor consume oxygen in net terms. Even if all plants, on land as well as at sea, were killed off and then decomposed, the process would consume less than 1 percent of the atmosphere’s oxygen.

#### Amazon is not key to oxygen

**LA TIMES 6-8-2005** (https://listserv.umd.edu/cgi-bin/wa?A2=ind0506b&L=ecolog-l&D=1&P=2745)

Even without the massive burning, the popular conception of the Amazon as a giant oxygen factory for the rest of the planet is misguided, scientists say. Left unmolested, the forest does generate enormous amounts of oxygen through photosynthesis, but it consumes most of it itself in the decomposition of organic matter. Researchers are trying to determine what role the Amazon plays in keeping the region cool and relatively moist, which in turn has a hugely beneficial effect on agriculture - ironically, the same interests trying to cut down the forest. The theory goes that the jungle's humidity, as much as water from the ocean, is instrumental in creating rain over both the Amazon River basin and other parts of South America, particularly western and southern Brazil, where much of this country's agricultural production is concentrated. "If you took away the Amazon, you'd take away half of the rain that falls on Brazil," Moutinho said. "You can imagine the problems that would ensue." A shift in climate here could cause a ripple effect, disrupting weather patterns in Antarctica, the Eastern U.S. and even Western Europe, some scholars believe. This is what worries ecologists about the continued destruction of the rain forest: not the supposed effect on the global air supply, but rather on the weather. "Concern about the environmental aspects of deforestation now is more over climate rather than [carbon emissions] or whether the Amazon is the 'lungs of the world,' " said Paulo Barreto, a researcher with the Amazon Institute of People and Environment. "For sure, the Amazon is not the lungs of the world," he added. "It never was."

# \*\*\*Air pollution\*\*\*

### Terminal Defense

#### Trends Prove – Air quality has been increasing

**Schwartz 12/11/06** – Joel Schwartz is the professor of environmental epidemiology at Harvard School of Public health in Boston Massachusetts. He also works for Harvard’s Department of Environmental Health and the Department of Epidemiology. (“Facts Not Fear on Air Pollution,” National Center for Policy Analysis, December 2006, Found online at <http://www.ncpa.org/pub/st294>? , PM)

Air pollution has been declining for decades across the United States. Since the passage of the Clean Air Act in 1970, the U.S. Environmental Protection Agency (EPA) has beenthe federal agency charged with monitoring and regulating emissions of air pollutants. Trends for the monitored concentrations of some regulated pollutants are displayed in Figure I. [Also see the Appendix Table.][1](http://www.ncpa.org/pub/st294?pg=7) Note the large improvements for all of them. Between 1980 and 2005:Fine particulate matter (PM2.5) declined 40 percent. Peak 8-hour ozone (O3) levels declined 20 percent, and days per year exceeding the 8-hour ozone standard fell 79 percent. The improvement was even greater for the older, less stringent 1-hour ozone standard; peak levels dropped 28 percent and exceedances days dropped 94 percent. Nitrogen dioxide (NO2) concentrations in air dropped 37 percent while sulfur dioxide (SO2) decreased 63 percent; carbon monoxide (CO) levels dropped 74 percent; and lead declined 96 percent. "Levels of regulated pollutants in the air have fallen dramatically." Not all pollutants have been tracked since 1980. Those that have only been monitored more recently are also declining. For instance: Specific components of particulate matter are also declining; for example, sulfate particulates formed from sulfur dioxide (SO2) emissions, most of which comes from burning coal for electricity, declined 32 percent from 1989 to 2004.[2](http://www.ncpa.org/pub/st294?pg=7) EPA also recently reported that larger particulate matter - less than 10 microns in diameter (PM10) - dropped 25 percent between 1990 and 2005. As Figure II shows, total emissions also improved dramatically. Between 1980 and 2005: Oxides of nitrogen (NOx) emissions decreased 30 percent and SO2 dropped 42 percent; Emissions of volatile organic compounds (VOCs), which are a variety of compounds regulated as pollutants, fell 47 percent; CO emissions were reduced by 50 percent; and Lead dropped 96 percent. “Emissions of regulated pollutants have also fallen." **Meeting Federal Standards.** These large pollution reductions have significantly improved compliance with federal air pollution standards for metropolitan areas: Virtually the entire nation meets federal standards for CO, NO2, SO2 and lead.[3](http://www.ncpa.org/pub/st294?pg=7) The nation is also near full compliance with the 1-hour standard for ozone and soot (PM10). Compliance has also greatly improved for the more stringent ozone and soot standards EPA adopted in 1997: About 75 percent of the nation's ozone monitors violated the 8-hour ozone standard in 1980, but the violation rate was 18 percent at the end of 2005.[4](http://www.ncpa.org/pub/st294?pg=7) About 90 percent of monitoring locations violated federal PM2.5 standards in 1980, compared to only 16 percent by the end of 2005.[5](http://www.ncpa.org/pub/st294?pg=7) "Remarkably, pollution fell while energy use rose, automobile travel increased and the economy grew." These pollution reductions translate into corresponding decreases in the fraction of Americans living in areas that violate federal air pollution health standards. **Air Pollution, Transportation and Economic Growth.** What makes these air quality improvements so extraordinary is that they occurred during a period of increasing motor vehicle use, energy production and economic growth. As Figure III shows, between 1980 and 2005: Miles driven each year nearly doubled for automobiles (93 percent), while diesel truck miles more than doubled (112 percent). Tons of coal burned for electricity production increased 61 percent. The dollar value of goods and services (gross domestic product or GDP) more than doubled (114 percent). Nevertheless, air pollution of all kinds sharply declined because of cleaner motor vehicles, power plants, factories, home appliances and consumer products.

#### Air quality is an insignificant aspect in America’s health

**Schwartz 12/11/06** – Joel Schwartz is the professor of environmental epidemiology at Harvard School of Public health in Boston Massachusetts. He also works for Harvard’s Department of Environmental Health and the Department of Epidemiology. (“Facts Not Fear on Air Pollution,” National Center for Policy Analysis, December 2006, Found online at <http://www.ncpa.org/pub/st294>? , PM)

Pollution and Other Health Conditions**.** Although they don't publicize it, even regulators and environmental activists have quietly concluded that air pollution is a minor factor in Americans' health. EPA estimated that reducing nationwide ozone from 2002 levels (by far the highest ozone levels of the last six years) to the federal 8-hour standard would reduce respiratory hospital admissions by 0.07 percent and asthma emergency room visits by only 0.04 percent.[44](http://www.ncpa.org/pub/st294?pg=7) Similarly, California Air Resources Board (CARB) estimates[45](http://www.ncpa.org/pub/st294?pg=7) indicate that eliminating all human-caused ozone in the state would reduce respiratory-related hospital admissions by 0.23 percent and asthma emergency room visits by 0.35 percent.[46](http://www.ncpa.org/pub/st294?pg=7) A study commissioned by the Clean Air Task Force, an activist group, estimated that completely eliminating all U.S. power plant pollution would reduce serious respiratory and cardiovascular health events (e.g., hospital visits) by only 0.4 percent to 1.6 percent.[47](http://www.ncpa.org/pub/st294?pg=7) Power plants contribute roughly a third of all PM2.5 in the United States, yet even environmentalists have concluded, implicitly at least, that they are a minor contributor to respiratory and cardiovascular distress.[48](http://www.ncpa.org/pub/st294?pg=7)

#### Deaths can’t be caused by today’s levels of pollution

**Schwartz 6**- Joel Schwartz is a professor of Environmental Epidemiology at Harvard School of Public Health. He works in the Department of Environmental Health and the Department of Epidemiology. He has a Ph.D., 1980, from Brandeis University. (“Air Pollution and Health: Do Popular Portrayals Reflect the Scientific Evidence?”, American Enterprise Institute Environmental Policy Outlook, 5.)

By far the most serious health claim about air pollution is that it kills tens of thousands of Americans each year, mainly due to exposure to PM2.5. There is no question that high levels of air pollution can kill. About 4,000 Londoners died during the infamous five-day “London Fog” of December 1952, when soot and sulfur dioxide soared to levels tens of times greater than the highest levels experienced in developed countries today, and visibility dropped to less than 20 feet.34

However, current fears center on whether today’s comparatively low levels of air pollution are also deadly. An embarrassment for proponents of low-level air pollution as a cause of death is that the evidence is almost solely circumstantial, being based on statistical studies reporting small correlations between long- or short-term air pollution levels and risk of dying. These “observational” studies are not based on randomized trials, but on non-random data that inherently suffer from confounding by non-pollution factors with much larger effects on health than the purported effects of air pollution.

Observational studies could be taken more seriously if they were supported by evidence from randomized, controlled studies that eliminate the possibility of con- founding by non-pollution factors. Such studies can not, of course, be done with people, but they can be done with animals. However, researchers have been unable to kill animals with air pollution at levels any- where near as low as the levels found in ambient air.

#### Levels of air pollution are exaggerated

**Schwartz 6** Joel Schwartz is a professor of Environmental Epidemiology at Harvard School of Public Health. He works in the Department of Environmental Health and the Department of Epidemiology. He has a Ph.D., 1980, from Brandeis University. (“Air Pollution and Health: Do Popular Portrayals Reflect the Scientific Evidence?”, American Enterprise Institute Environmental Policy Outlook, 8-9.)

Most public information on air pollution and health comes from environmental activists, regulators, and health researchers. As these case studies show, their claims of harm from current, historically low air pollution levels are at best exaggerations and at worst fabrications. The result is unwarranted public fear, and continued support for ever more costly regulatory requirements that deliver little or no benefit in exchange for their high costs. Regulators, environmentalists, and scientists enjoy substantial credibility with the public and the press. But like other interest groups, their goals often do not coincide with the interests of the vast majority of Americans. Environmental groups want to increase support for ever more stringent regulations, maintain and enhance their control over other people’s lives, and bring in the donations that support their activism. Regulators want to show the success of their efforts to reduce air pollution, but they also want to justify the need to preserve or expand their powers and budgets. Maintaining a climate of crisis and pessimism meets these institutional goals, but at the expense of encouraging people to exaggerate the risks they face. While it is not surprising that activists and regulators exaggerate air pollution risks, they would not be taken as seriously without scientific authority to back them up. The credibility of science and scientists flows from the power of scientific methods to uncover truths about the world, and from the perceived objectivity of scientists themselves. As the case studies above show, trust in scientific authority is often misplaced. Scientific and medical research does have checks and balances that are absent from more explicitly political endeavors. Environmental health research nevertheless suffers from its own set of pressures that militate against evenhanded inquiry and dispassionate analysis and presentation of evidence. Studies that report harm from air pollution are more likely to be published than studies that do not. Regulatory agencies, whose power and budgets depend on the perception that air pollution is a serious health problem, are also major funders of the research intended to demonstrate the severity of the problem. Scientists who believe air pollution is a serious health threat and who report larger health effects are more likely to attract research funding. It is not a big leap to conclude that there is a great deal of selection bias in who does environmental health research, what questions they ask, and how they report their results. Journalists should be acting as a check on air pollution misinformation, but they are not. Media outlets face their own pressures to sensationalize stories. Good news does not sell newspapers or attract viewers. As a result, journalists and editors are more likely to cover studies claiming harm from air pollution, and to pass along these claims with little or no critical review. True, few journalists have the expertise to evaluate the technical merits of specific studies. But continuing to rely on scientific authority will only perpetuate the problem of risk exaggeration. Among the major providers of public information on environmental risks, investigative reporters are in the best position to assess how the political economy of environmental health research affects the production and portrayal of scientific evidence. It would be a breath of fresh air if journalists and editors took up this challenge.

#### Most pollution studies excluded- limited data magnifies unnecessary fear

**Schwartz 6**- Joel Schwartz is a professor of Environmental Epidemiology at Harvard School of Public Health. He works in the Department of Environmental Health and the Department of Epidemiology. He has a Ph.D., 1980, from Brandeis University. (“Air Pollution and Health: Do Popular Portrayals Reflect the Scientific Evidence?”, American Enterprise Institute Environmental Policy Outlook, 6-7.)

At the March meeting of the California Air Resources Board, staff members gave a detailed presentation on Jerrett et al. (2005)—a new epidemiological study of the Los Angeles region that reported a stronger link between PM2.5 and mortality than suggested in previous research regulators have used to support tougher PM2.5 standards.46 What CARB’s staff did not tell its board is that right around the same time that Jerrett et al. was published, another study of PM2.5 risks in California by Enstrom (2005) concluded that PM2.5 was having no effect on mortality.47 Several California papers, including the *Los Angeles Times,* covered the alarming findings of Jerrett et al. But none covered the benign results reported by Enstrom. This is a typical pattern. Studies that report harm from air pollution receive a great deal of attention from regulators, environmentalists, and journalists. Studies finding no harm from air pollution are ignored. As a result, claims of harm from air pollution appear more consistent and robust than suggested by the actual weight of the evidence. The American Lung Association’s website includes an area called Medical Journal Watch, which summarizes hundreds of air pollution health studies.48 But the site omits studies that do not report any harm from air pollution. For example, the site does not include any studies by Fred Lipfert, Suresh Moolgavkar, Richard Smith, Gary Koop, William Keatinge, or James Enstrom—all of whom have provided evidence against a connection between low-level air pollution and risk of death.49 The ALA also excludes specific studies and portions of studies that fail to find any harm from air pollution. For example, Medical Journal Watch does not mention Gong et al. (2003) and Holgate et al. (2003), which found little or no adverse health effects in human volunteers who breathed high levels of PM2.5 and diesel soot, respectively.50 The ALA does summarize the CHS findings on children’s lung capacity discussed earlier, but does not mention that the study found that even the highest ozone levels in the country had no effect on lung growth. Three studies have used CHS data to assess whether ozone is associated with increases in school absences. One study reported an increase.51 Two reported no effect.52 The ALA mentions only the first study on Medical Journal Watch. CARB likewise cites only the first study in its review of California’s ozone standard.53

#### Health risks are very minimal and overstated

**Schwartz 6**- Joel, professor of Environmental Epidemiology at Harvard School of Public Health. He works in the Department of Environmental Health and the Department of Epidemiology. He has a Ph.D., 1980, from Brandeis University. (“Health Risks of Ozone Are Exaggerated”, The Heartland Institute, http://news.heartland.org/newspaper-article/2006/04/01/health-risks-ozone-are-exaggerated-part-1-series.)

The costs of reducing ozone might be worth bearing if ozone were exacting a large toll on people's health. But even as environmental activists have become more strident in asserting health alarms, evidence has mounted that ozone at current levels is causing little or no harm, even in the most polluted areas of the country. The prevalence of asthma has nearly doubled in America during the past 25 years, at the same time levels of ozone and other air pollutants sharply declined nationwide. Emergency room visits for asthma are at their lowest in July and August--when ozone levels are at their highest. A government-funded study of thousands of children in California reported that children who grew up in the highest-ozone areas had a 30 percent lower risk of developing asthma, when compared with children in low-ozone areas. While ozone can trigger asthma attacks, the effect is small. According to estimates by the California Air Resources Board (CARB), eliminating virtually all human-caused ozone in California--where millions of people live in areas with by far the highest ozone levels in the country--would reduce asthma-related emergency room (ER) visits by only 1.8 percent. If ozone is at worst a minor health issue, why does the problem seem so serious? Regulators and environmental activists don't maintain their jobs, power, and funding by admitting we've solved the problems that justify their existence. These groups need to maintain a climate of fear to stay in business, and they do so by creating an unwarranted appearance of serious and pervasive harm from air pollution. According to an EPA fact sheet, "ozone can irritate lung airways and cause inflammation much like a sunburn. ... People with respiratory problems are most vulnerable, but even healthy people that are active outdoors can be affected when ozone levels are high." These claims stand in stark contrast to EPA's own estimates of the actual health effects of ozone. In a recent paper published in the journal *Environmental Health Perspectives*, EPA scientists predicted that going from ozone levels during 2002, which were by far the highest of the past several years, down to national attainment of the new federal eight-hour ozone standard--about a 10 percent to 20 percent ozone reduction for most non-attainment areas--would reduce respiratory-related hospital admissions by 0.35 percent and asthma-related emergency room visits by 0.2 percent**.** The story is similar for long-term ozone exposure. CARB's Children's Health Study (CHS) followed nearly 1,800 children in 12 California communities from ages 10 to 18. Researchers from the University of Southern California (USC), who carried out the study, reported ozone had no effect on children's lung development, despite the fact that the study included areas with the worst air pollution in the country: more than 100 days per year exceeding the federal eight-hour ozone standard. Nevertheless, in its *State of the Air 2005* report, the American Lung Association claimed, "Almost half of all Americans are living in counties where [ozone] places them at risk for decreased lung function."

### Current efforts solve

#### All types of air pollution are significantly decreasing- output is closely monitored

**EPA 11** (United States Environmental Protection Agency, “Taking Toxics out of the Air”, http://www.epa.gov/air/toxicair/takingtoxics/pl.html#8).

EPA has consistently worked to develop air toxics standards that achieve the required reductions in air pollution while providing regulated communities with as much flexibility as possible in deciding how to comply with the standards. For example, under a flexible regulation, industries may reduce their emissions by redesigning their processes, capturing and recycling emissions, changing work practices, or installing any of a variety of control technologies. Flexibility helps industries minimize the cost of compliance and encourages pollution prevention. To provide flexibility, EPA makes every effort to develop standards that are based on performance measures rather than specific control devices, and that allow for equivalent alternative control measures. To date, EPA has primarily focused efforts to reduce emissions of toxic air pollutants on technology-based or MACT emission standards. Over the next few years, EPA will continue to work with industry; environmental groups; state, local, and tribal agencies; and other interested groups to develop standards for the remaining source categories that will reduce air toxics emissions even further. By 2002, EPA is scheduled to issue 62 technology-based standards covering 96 remaining source categories. EPA anticipates that its technology-based approach will continue to prove successful at reducing air toxics. Additional air toxics reductions are also expected to indirectly reduce toxics. To identify additional measures beyond the technology standards that may be needed to protect the public health and the environment from toxic air pollutants, EPA will use a more risk-based focus. EPA’s efforts underway include national air toxics assessment activities, residual risk standards, evaluation of the impacts of air toxics deposition, data-gathering on mercury emissions from coal-fired electric utilities, and implementation of an urban air toxics strategy.

#### CAA effectively controls and reduces pollution

**EPA 11** (United States Environmental Protection Agency, “Taking Toxics out of the Air”, http://www.epa.gov/air/toxicair/takingtoxics/pl.html#8).

As of August 2000, EPA has issued 45 air toxics MACT standards under Section 112 of the Clean Air Act Amendments. These standards affect 82 categories of major industrial sources, such as chemical plants, oil refineries, aerospace manufacturers, and steel mills, as well as eight categories of smaller sources, such as dry cleaners, commercial sterilizers, secondary lead smelters, and chromium electroplating facilities. EPA has also issued two standards under Section 129 of the Clean Air Act to control emissions, including certain toxic pollutants, from solid waste combustion facilities (one standard for municipal waste combustors and the other for medical waste incinerators). Together, these standards reduce emissions of over 100 different air toxics. When fully implemented, all of these standards will reduce air toxics emissions by about 1.5 million tons per year—almost 15 times the reductions achieved prior to 1990.

#### Pollution remains a small issue- current success is masked

**Schwartz 1**- Joel Schwartz is a professor of Environmental Epidemiology at Harvard School of Public Health. He works in the Department of Environmental Health and the Department of Epidemiology. He has a Ph.D., 1980, from Brandeis University. (“Muddy Statistics Dirty Air”, American Enterprise Institute Tech Central Station, http://www.aei.org/article/energy-and-the-environment/muddy-statistics-dirty-air/.)

According to *State of the Air 2002*, a report released today by the American Lung Association (ALA), "more than 142 million Americans live in areas where the air they breathe puts them at risk."

If that were true, air pollution would be one of the most serious health challenges in the United States. Fortunately, it's not. ***State of the Air*** vastly exaggerates Americans' exposure to air pollution, and misleads the public into believing that air pollution is getting worse, when in fact it has been improving. How did one of the nation's foremost public health charities get the numbers so wrong? Rather than basing its study on actual air pollution levels as directly measured by pollution monitors, and upon research-based assessments of who is actually harmed by a given level and frequency of air pollution, ALA used statistical legerdemain to cook the books. *Clean counted dirty*: Ozone can affect your health only if it's high where you're located. Because air pollution varies from place to place, many counties monitor pollution levels at several locations. Yet, ALA tallied a countywide pollution violation for each day that at least one monitor in a county registered ozone greater than 0.084 parts per million (ppm) during an 8-hour averaging period. As a result, ALA counts more ozone violation days for a county as a whole than occurred at any single location in the county. For example, ALA claims Los Angeles County averaged 37 days per year with elevated ozone, even though the most polluted location (Glendora) averaged 22, and most areas far fewer. Indeed, dozens of populous areas, including Los Angeles, Chicago, Phoenix and Sacramento, have only one or a few areas with a substantial number of elevated-ozone days, while most of their counties rarely or never have elevated ozone. Nevertheless, by applying its inflated ozone value to the county as whole, ALA counts clean areas as dirty.

***Extreme grading standards***: The Environmental Protection Agency (EPA) has two ozone health standards. The current standard, known as the "1-hour standard," has been in place for more than two decades. EPA plans to implement soon a newer more stringent standard known as the "8-hour standard." EPA's independent Clean Air Science Advisory Committee, a panel of health experts and atmospheric scientists, found that EPA's proposed new standard would protect human health with an adequate margin of safety. ALA's grading standard is much more stringent. It is akin to requiring students to get 95 or better on a test in order to pass. For example, areas that average only four elevated-ozone days per year get the same F grade as areas with dozens of annual ozone violations--ozone violations, as noted above, that are based on an inflated number of ozone days. By inflating the number of elevated ozone days, and going beyond the standard necessary to protect health, ALA was able to give dozens of areas an undeserved failing grade. But it also blurred the distinction between serious and minor air pollution problems.

***Outdated data***: ALA used pollution data from 1998 to 2000, even though data from 2001 are available. Since air pollution has been declining in many areas, using older data makes air pollution look higher than current actual levels.

***"Sensitive" people***: Health research has shown that in many people, high ozone levels--0.12 ppm and above--especially combined with exposures longer than three hours, pre-existing respiratory disease, and exercise, can cause both substantial decreases in measured lung function and increases in subjective symptoms, such as coughing and pain while breathing deeply. ALA doesn't stop there. It assumes 40 percent of the population--including all children under 14, all adults over age 65, and all people with a respiratory disease--are "sensitive" to ozone, and suffer serious and permanent harm even when ozone levels are in the range of 0.085 to 0.105 ppm on just three or four days per year. A wide range of research, including research on children and the elderly, shows that most people don't experience measurable reductions in lung function and even fewer experience subjective respiratory symptoms when ozone levels are this low. Furthermore, the vast majority of the effects of low-level, infrequent ozone exposure are temporary and don't harm long-term health. The fight against smog is a great success story in environmental protection. According to EPA, ozone levels decreased by an average of about 24 percent nationwide between 1980 and 2000. Southern California, the region with the worst air in the country, reduced its annual violations of EPA's one-hour ozone standard by about 80 percent between 1980 and 2001. Houston, the second most polluted area in the country, reduced ozone violations by about 60 percent during the same period. Most, though not all, metropolitan areas have also achieved significant improvements. And these gains occurred at the same time that Americans increased their driving by 75 percent. Readers of the ALA report would never know these facts. Instead, ALA misleads readers into believing air pollution is getting worse. Only a few metropolitan areas--San Bernardino, Houston, and Fresno--still have serious air pollution problems. The vast majority of other regions have clean air, or have air pollution at a level harmful to only a few percent of the population. Rather than the 142 million claimed by ALA, perhaps 20 million Americans are now at risk from ozone pollution. This is still a large number, and everyone deserves to breathe healthful air. Nevertheless, the real state of the air is far more favorable than ALA's scare-tactics would have Americans believe. Ironically, ALA's efforts could actually end up reducing Americans' overall health and safety. "State of the Air" will encourage the public to demand unnecessary additional expenditures to clean up air that is already clean. But in a world of limited resources, society can address only some of the many risks people face. When society wastes effort on small or non-existent risks, fewer real problems get the attention they deserve, reducing our health and safety.

"If you torture the data enough, it will confess," goes a cautionary statistics joke. ALA seems to have adopted this maxim without a trace of irony.

### Air Pollution Inev

#### Effects are inevitable – Respiratory problems not caused by air pollution

**Schwartz 12/11/06** – Joel Schwartz is the professor of environmental epidemiology at Harvard School of Public health in Boston Massachusetts. He also works for Harvard’s Department of Environmental Health and the Department of Epidemiology. (“Facts Not Fear on Air Pollution,” National Center for Policy Analysis, December 2006, Found online at <http://www.ncpa.org/pub/st294>? , PM)

**Air Pollution and Asthma.** Asthma is the most conspicuous example of the extent to which the conventional wisdom on air pollution is demonstrably false. According to the Centers for Disease Control, the incidence of asthma in the United States rose 75 percent from 1980 to 1996, and nearly doubled for children. This rise in the asthma rate may have leveled off since then.[34](http://www.ncpa.org/pub/st294?pg=7) Researchers have proffered a number of hypotheses to account for the rise - from increased exposure to roach allergens in urban areas to a decrease in exposure to infectious agents as a result of antibacterial cleansers and antibiotics.[35](http://www.ncpa.org/pub/st294?pg=7) But air pollution cannot be the cause, since it declined at the same time asthma prevalence increased. Figure IV displays trends in asthma and various air pollutants for California. The graph displays data for ozone, carbon monoxide, nitrogen dioxide and PM10. While the incidence of asthma has more than doubled in California since 1982, air pollutants of all kinds have steadily declined. "Asthma levels rose while air pollution levels declined." The pattern of hospital visits for asthma suggests air pollution cannot be significantly exacerbating the condition. For example, emergency room visits and hospitalizations for asthma are lowest during July and August, when ozone levels are highest.[36](http://www.ncpa.org/pub/st294?pg=7) Similarly, a study of California children found that while higher ozone was associated with a greater risk of developing asthma for children who played three or more team sports (8 percent of children in the study), higher ozone was also associated with a 30 percent lower risk of asthma among all children in the study. Other air pollutants, such as nitrogen dioxide and particulate matter, were also associated with a lower risk of developing asthma. "Hospital admissions for asthma are lowest in summer, when ozone levels are highest." International data also show that air pollution is not causing asthma. Asthma rates are highest in wealthy Western countries that have relatively low air pollution levels, while developing countries with awful air pollution have low asthma rates.[37](http://www.ncpa.org/pub/st294?pg=7) Before 1991, for example, the former East Germany had high air pollution levels and low asthma prevalence. But after reunification East Germans adopted Western lifestyles, incomes increased and air pollution declined - but the incidence of asthma rose to levels comparable to West Germany.[38](http://www.ncpa.org/pub/st294?pg=7)

#### Respiratory problems triggered not only by air pollution

Jaimie Dalessio 6/1 – Jaimie Daleessio, senior editor of *Everyday Health*, has a degree in magazine journalism from Syracuse University, worked on print, online, book, and custom publication projects for the weeding company she worked for, but then she decided to shift over to the health world and work for *Everyday Health*. (“Bad News for Baby Boomers With Asthma,” Everydayhealth.com, June 2012, Found online at <http://www.everydayhealth.com/asthma/0601/bad-news-for-baby-boomers-with-asthma.aspx> PM)

As the number of candles on baby boomers' birthday cakes climbs, so does the number of older adults in the country with [asthma](http://www.everydayhealth.com/asthma/index.aspx). The current count, 3.1 million asthmatics 65 and older, is expected to double in the next 25 years, according to estimates from the United States Census Bureau. This poses a problem for doctors and patients alike. "Asthma can be more difficult to treat in older adults," says lead study author Tolly Epstein, MD, an allergist and assistant professor of clinical medicine at the University of Cincinnati. For this reason, Dr. Epstein and colleagues set out to pinpoint what makes asthma so tough to control in older patients. Physicians need the insight. Death rates among people with asthma ranked highest in [adults 65 and older](http://www.everydayhealth.com/asthma/0501/asthma-increases-to-record-levels-deaths-among-baby-boomers-highest.aspx) in a report released last month by the U.S. Centers for Disease Control and Prevention's National Center for Health Statistics. The University of Cincinnati researchers' findings, published in the Annals of Allergy, Asthma & Immunology, the journal of the American College of Allergy, Asthma and Immunology, show a number of factors contribute — most notably obesity and traffic pollution."Obesity by itself, even without air pollution, had an effect," Epstein explains, but "pollution had the biggest effect in people who were also obese. We're not sure exactly why." While obesity is a known risk factor for difficult-to-control asthma in [children](http://www.everydayhealth.com/asthma/1227/overweight-7-year-olds-face-higher-risk-of-asthma.aspx) and adults, it hasn't been looked at as fully in older asthmatics, says Epstein. There are a few different theories surrounding why obesity worsens asthma, she says, from inflammation patterns to body mechanics, such as how well an overweight person can expand his chest. Traffic exhaust is another story. Exactly why it's worse on seniors is unclear and under-studied, according to the researchers. In their report, they hypothesize age-related decline in antioxidant defenses may make older asthmatics more susceptible to environmental air pollutants.

#### International industrialization causes pollution- makes pollution inevitable

**Ebenstein 12**- Avi Ebenstein received his Ph.D. in economics from University of California, Berkeley in 2007 ([The Consequences of Industrialization: Evidence from Water Pollution and Digestive Cancers in China](http://pluto.huji.ac.il/~ebenstein/Ebenstein_WaterPollution_2012.pdf), Review of Economics and Statistics, 2012, 94(1):186-201.)

Despite an increase in cleanup efforts in recent years, the overall degradation of China’s waterways continues. While the capacity of wastewater treatment facilities has grown, it has not kept pace with the growth of industrial output. The pollution intensity of China’s industrial firms has declined (discharge per yuan of output), but the tonnage of water dumping has continued to increase (World Bank, 2007). Although China’s economy has grown rapidly and brought with it many benefits, the adverse health effects of pollution threaten to mitigate the health benefits of the country’s newly found wealth. The results presented here highlight one channel by which China’s industrial growth has led to deterioration in health outcomes. The dumping of untreated wastewater in densely populated areas has contributed to China’s increasing cancer rate, and cancer is now the country’s leading cause of death (Chinese Ministry of Health, 2008). The cost of industrial pollution is also disproportionately borne by the millions of Chinese farmers who are unable to access safe drinking water and are least able to share in the benefits of China’s urban manufacturing boom. Estimates by the World Bank (2006) indicate that as many as half of China’s inhabitants still lack access to safe drinking water. In 2005, China’s Ministry of Water Resources announced ambitious plans to reduce the number of residents without access to clean drinking water by one-third by 2010 and to provide safe access to drinking water to all rural residents by 2030. Recent reports suggest that much progress on this front has been made.42 Even if these goals are met, the need to curb industrial dumping of untreated wastewater in the near future is clear and pressing. India is also facing similar struggles due to industrialization, with heavily polluted rivers, a large exposed population, and an environmental regulation regime that has struggled to contain emissions (Maria, 2003). The analysis reveals a relatively low cost to averting deaths by water cleanup of roughly $30,000, suggesting that dumping regulations need to be more aggressively enforced. The gaps in enforcement of China’s regulations reveal inexpensive opportunities to avert deaths relative to the value of life that Chinese citizens report in contingent valuation surveys. These surveys indicate average valuations of roughly $175,000 for the value of a statistical life (Krupnick et al., 2006). Protests by villagers who are justifiably angered by the contamination of the water supply also suggest that the current Chinese policy may represent an ongoing threat to political stability in China. The government reported 50,000 environmental protests in 2005 alone (Magnier, 2006), pro- viding further motivation for tightening environmental standards on China’s industrial firms. Wastewater dumping is in part responsible for China’s emerging cancer epidemic, and addressing this problem through stricter levy enforcement may yield large improvements in public health and life expectancy at a reasonable cost. Failure to act could prove costly for the millions of rural Chinese farmers who continue to rely on surface water for their drinking supply. This paper examines the health consequences of industrialization by focusing narrowly on water pollution and digestive cancers in China, but this issue has salience in other developing countries that face similar challenges. Like many other developing countries, China’s ability to industrialize has preceded its ability to deal with the resultant waste. Developing countries such as China and India must design environmental policy that balances the interests of industry and those it employs against the interests of the population vulnerable to the health risks of industrial waste. As this analysis demonstrates, tighter regulations may yield large human health benefits with relatively low economic costs.

### Nuclear War Turns Air Pollution

#### Turn – nuclear war will sends radioactive pollutants in the atmosphere

**Pike 10/21/98** – John Pike, scientist of the Federation of American Scientists since 1982 to 2000. In 1983 he established the Space Policy Working Group and in 1991 he was on NASA’s Near-Earth Objects detention panel. Congress passed the International Traffic in Arms Regulations after diminishing his critique on dual use (“Nuclear Weapon Effects,” Federation of American Scientists, October 21, 1998, found online at, <http://www.fas.org/nuke/intro/nuke/effects.htm>, PM)

Because of the tremendous amounts of energy liberated per unit mass in a nuclear detonation, temperatures of several tens of million degrees centigrade develop in the immediate area of the detonation. This is in marked contrast to the few thousand degrees of a conventional explosion. At these very high temperatures the nonfissioned parts of the nuclear weapon are vaporized. The atoms do not release the energy as kinetic energy but release it in the form of large amounts of electromagnetic radiation. In an atmospheric detonation, this electromagnetic radiation, consisting chiefly of soft x-ray, is absorbed within a few meters of the point of detonation by the surrounding atmosphere, heating it to extremely high temperatures and forming a brilliantly hot sphere of air and gaseous weapon residues, the so-called fireball. Immediately upon formation, the fireball begins to grow rapidly and rise like a hot air balloon. Within a millisecond after detonation, the diameter of the fireball from a 1 megaton (Mt) air burst is 150 m. This increases to a maximum of 2200 m within 10 seconds, at which time the fireball is also rising at the rate of 100 m/sec. The initial rapid expansion of the fireball severely compresses the surrounding atmosphere, producing a powerful blast wave.

# \*\*\*Water Pollution\*\*\*

### No impact

#### Water pollution declining – magnitude decreases

**Lyon and Stein 9 –** Greg S. Lyon works for the Sothern California Coastal Water Research Project. Eric D. Stein also works for the Sothern California Coastal Water Research Project, and they both have extensive experience from all the research projects they have done. (“*Clearer Structure, Cleaner Water: Improving Performance and Outcomes At the State Water Boards,*”

Between 1971 and 2000, the effluent volume discharged to the SCB increased by 31% (Table 1). However, over the same time period, total mass emissions of nearly all constituents decreased by more than 50% (Figure 1). Total suspended solids, BOD, oil and grease, phosphorus, and cyanide loads all decreased by greater than 65%. Of the general constituents, nitrate-N was the only constituent load that increased between 1971 and 2000. Nitrate-N emissions increased 91% to 2,462 mt by 2000, primarily from storm water runoff. Annual emissions of all metals analyzed decreased between 22% (selenium) and 98% (cadmium), with a median reduction of 88%. Total DDT and PCB each decreased by three orders of magnitude between 1971 and 2000. Overall phenols decreased by 57%, while the measured emissions of non-chlorinated phenols increased 190% to over 58 mt in 2000.

#### The US’s drinking water is some of the best in the world

**EPA 12 –** The United States Environmental Protection Agency (EPA) was for formed in 1970 when President Richard Nixon submitted a reorganization plan to congress. The EPA is an agency that puts policies and regulations on certain things to decrease environmental degradation. (“Research Areas,” United States Environmental Protection Agency, March 14, 2012, found online at <http://www.epa.gov/nrmrl/wswrd/research.html#dw>, PM)

The United States has one of the cleanest drinking water systems in the world. Drinking water standards are in place to ensure that clean water arrives at your tap. NRMRL plays a vital role in the scientific research that leads to safe drinking water. Given the wide range of drinking water sources and distribution practices, NRMRL studies ways to protect and restore our water resources so that consumers receive clean drinking water, delivered in the safest possible way. Under the 1974 Safe Drinking Water Act, EPA sets standards for drinking water quality and assists the states, localities, and water suppliers who implement those standards. The law protects us against both naturally occurring and human-made contaminants that might be found in drinking water. EPA, states, and water utilities work together to make sure these standards are met.

### Water Pollution inev

#### Contamination inevitable- too many chemicals to track

**Luntz 9**- (Taryn Luntz is a Washington correspondent for the Seattle Times and the Santa Barbara News-Press through the Medill News Service. (“U.S. Drinking Water Widely Contaminated,” Scientific American, http://www.scientificamerican.com/article.cfm?id=tap-drinking-water-contaminants-pollutants.)

A three-year study of the nation's drinking [water](http://www.scientificamerican.com/topic.cfm?id=water) quality has found more than 200 unregulated chemicals in the tap water of 45 states. The Environmental Working Group analysis of 20 million tap water quality tests found a total of 316 [contaminants](http://www.scientificamerican.com/article.cfm?id=chromium-california-drinking-water) -- including industrial solvents, weed killers, refrigerants and the rocket fuel component perchlorate -- in water supplied to the public between 2004 and 2009. [U.S. EPA](http://www.epa.gov/) regulates 114 of those pollutants, setting maximum legal levels that water utilities achieved 92 percent of the time, according to the study. [EWG](http://www.ewg.org/) frets that the remaining chemicals, which have no mandatory federal safety standards, can come in potentially toxic combinations for long-term consumption. "Utilities do the best job that they can treating a big problem with limited resources, but we must do better," said Jane Houlihan, the group's senior vice president for research. "It is not uncommon for people to drink tap water laced with 20 or 30 chemical contaminants. This water may be legal, but it raises serious health concerns." The pollutants derive from a wealth of sources, including [agriculture](http://www.scientificamerican.com/blog/post.cfm?id=moove-that-manure-agricultural-runo-2009-09-18), factory discharges, consumer products, urban runoff and [wastewater](http://www.scientificamerican.com/article.cfm?id=marcellus-shale-natural-gas-drilling-radioactive-wastewater) treatment [plants](http://www.scientificamerican.com/topic.cfm?id=plants). The annual water quality reports that utilities are required to send customers provide a partial picture, the study says, as they contain no information on unregulated chemicals. They also provide average levels of most contaminants, which do not reveal if there were short periods when chemicals spiked past legal limits. EPA in September said it was [considering regulating](http://www.scientificamerican.com/article.cfm?id=tap-water-contaminant-epa-pharmaceuticals) 104 additional chemicals in tap water, including pesticides, commercial chemicals, disinfection byproducts, and for the first time, pharmaceuticals. The list was the longest ever compiled by the agency under a 1996 law requiring it to evaluate possible tap-water pollutants every five years and make regulatory determinations for at least five of them. EPA said it will continue to research the [contaminants](http://www.scientificamerican.com/article.cfm?id=selenium-wastewater-coal-power-plant-gibson-lake) and will determine by 2013 whether to propose drinking water regulations for some of them. The EWG study says the nation should adopt new policies for drinking water that include regulating more contaminants and spending more money on measures that prevent [pollution](http://www.scientificamerican.com/article.cfm?id=water-pollution-illegal-sewage-dog-sable). While water utilities across the country spend more than $50 billion a year to treat drinking water, the nation spends $207 million a year to protect source waters and prevent pollution from sources such as urban runoff, the study says. The report recommends investing more money in conserving land in buffer zones around public water supplies. It also suggests that EPA "greatly expand" requirements for testing water for unregulated contaminants and that Congress provide more money to get the testing done.

### Water Pollution – Agencies Controlling

#### Clean Water Act regulates pollutant discharge

**EPA 12 –** The United States Environmental Protection Agency (EPA) was for formed in 1970 when President Richard Nixon submitted a reorganization plan to congress. The EPA is an agency that puts policies and regulations on certain things to decrease environmental degradation. (“Summary of the Clean Water Act,” United States Environmental Protection Agency, April 13, 2012, found online at, <http://www.epa.gov/lawsregs/laws/cwa.html>, PM)

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. The basis of the CWA was enacted in 1948 and was called the Federal Water Pollution Control Act, but the Act was significantly reorganized and expanded in 1972. "Clean Water Act" became the Act's common name with amendments in 1972. Under the CWA, EPA has implemented pollution control programs such as setting wastewater standards for industry. We have also set water quality standards for all contaminants in surface waters. The CWA made it unlawful to discharge any pollutant from a point source into navigable waters, unless a permit was obtained. EPA's [National Pollutant Discharge Elimination System (NPDES)](http://cfpub.epa.gov/npdes/) permit program controls discharges. Point sources are discrete conveyances such as pipes or man-made ditches. Individual homes that are connected to a municipal system, use a septic system, or do not have a surface discharge do not need an NPDES permit; however, industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters.

#### EPA sets standards for safe drinking water

**EPA 12 –** The United States Environmental Protection Agency (EPA) was for formed in 1970 when President Richard Nixon submitted a reorganization plan to congress. The EPA is an agency that puts policies and regulations on certain things to decrease environmental degradation. (“Summary of Safe Drinking Water Act,” United States Environmental Protection Agency, February 24, 2012,found online at, <http://www.epa.gov/lawsregs/laws/sdwa.html>, PM)

The Safe Drinking Water Act (SDWA) was established to protect the quality of drinking water in the U.S. This law focuses on all waters actually or potentially designed for drinking use, whether from above ground or underground sources. The Act authorizes EPA to establish minimum standards to protect tap water and requires all owners or operators of public water systems to comply with these primary (health-related) standards. The 1996 amendments to SDWA require that EPA consider a detailed risk and cost assessment, and best available peer-reviewed science, when developing these standards. State governments, which can be approved to implement these rules for EPA, also encourage attainment of secondary standards (nuisance-related). Under the Act, EPA also establishes minimum standards for state programs to protect underground sources of drinking water from endangerment by underground injection of fluids.

#### Programs are effective

Martins – Tim Martins works at NASA at the Glenn Research Center. He has experience with a lot of research on many scientific topics one being water pollution and how it is being prevented. (“What is the Clean Water Act?,” *Glenn Research Project*, , found online at <http://www.grc.nasa.gov/WWW/k-12/fenlewis/cwa.htm>, PM)

 After twenty-five years, the Act continues to provide a clear path for clean water and a solid foundation for an effective national water program**.** Today, two-thirds of our waters are safe for fishing and swimming, the loss of wetlands is only 70,000-90,000 acres, the amount of soil loss to agricultural runoff has been cut by a billion tons annually and the phosphorus and nitrate levels are down, and modern wastewater treatment facilities serve 173 million people.